



ಶಾಲಾ ಶಿಕ್ಷಣ ಮತ್ತು ಸಾಕ್ಷರತಾ ಇಲಾಖೆ

**ಕಲಿಕಾಫಲ ಆಧಾರಿತ ಮೌಲ್ಯಾಂಕನ ಪ್ರಶ್ನೆಕೋರಿ
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ವಿಷಯ: ವಿಜ್ಞಾನ

ತರಗತಿ: X

**ರಾಜ್ಯ ಶಿಕ್ಷಣ ಸಂಶೋಧನೆ ಮತ್ತು ತರಬೇತಿ ಇಲಾಖೆ,
ಬನಶಂಕರಿ 3ನೇ ಹಂತ, ಬೆಂಗಳೂರು-560085**

ಮತ್ತು

ಜಿಲ್ಲಾ ಶಿಕ್ಷಣ ಮತ್ತು ತರಬೇತಿ ಸಂಸ್ಥೆ ಚಿತ್ರದುರ್ಗ

ಪರಿಕಲ್ಪನೆ ಮತ್ತು ಮಾರ್ಗದರ್ಶನ	
ಶ್ರೀಮತಿ ರಶ್ಮಿ ಮಹೇಶ್.ವಿ, ಭಾ.ಆ.ಸೇ ಅಪರ ಮುಖ್ಯ ಕಾರ್ಯದರ್ಶಿಗಳು, ಶಾಲಾ ಶಿಕ್ಷಣ ಮತ್ತು ಸಾಕ್ಷರತಾ ಇಲಾಖೆ	
ಶ್ರೀಮತಿ. ಡಾ. ಕೆ. ವಿದ್ಯಾಕುಮಾರಿ, ಭಾ.ಆ.ಸೇ ರಾಜ್ಯ ಯೋಜನಾ ನಿರ್ದೇಶಕರು, ಸಮಗ್ರ ಶಿಕ್ಷಣ ಕರ್ನಾಟಕ, ಬೆಂಗಳೂರು	ಶ್ರೀಮತಿ ಅನಿತಾ ನಾಜರೆ ನಿರ್ದೇಶಕರು, DSERT, ಬೆಂಗಳೂರು
ಡಯಟ್ ಸಹಕಾರ	
ಪ್ರಾಂಶುಪಾಲರು ಶ್ರೀ ನಾಗಭೂಷಣ ಉಪನಿರ್ದೇಶಕರು(ಅಭಿವೃದ್ಧಿ) DIET, ಚಿತ್ರದುರ್ಗ	ನೋಡಲ್ ಅಧಿಕಾರಿ ಶ್ರೀಮತಿ. ಎಂ.ಎನ್. ಶಿವಲೀಲ ಉಪನ್ಯಾಸಕರು DIET, ಚಿತ್ರದುರ್ಗ
ಸಂಯೋಜನೆ	
ಶ್ರೀಮತಿ ರಾಧಾ P, ಹಿರಿಯ ಸಹಾಯಕ ನಿರ್ದೇಶಕರು, DSERT, ಬೆಂಗಳೂರು	
ರಚನಾ ಸಂಪನ್ಮೂಲ ತಂಡ	ಪರಿಷ್ಕರಣಾ ಸಂಪನ್ಮೂಲ ತಂಡ
1. ಶ್ರೀ ನಾಗಭೂಷಣ್. ಕೆ. ಟಿ, GHS ರೇಖಲಗೇರಿ ಲಂಬಾಣಿಹಟ್ಟಿ, ಚಳ್ಳಕೆರೆ 2. ಶ್ರೀ ಶ್ರೀನಿವಾಸ್. ಟಿ, ಚೆನ್ನಲಾದ್ರಿ ರಾಷ್ಟ್ರೀಯ ಪ್ರೌಢಶಾಲೆ, ಚಿತ್ರದುರ್ಗ 3. ಶ್ರೀಮತಿ. ಜಯಚಿತ್ರ. ಕೆ. ಪಿ, GHS ನೆಲಗೇತನಹಟ್ಟಿ, ಚಳ್ಳಕೆರೆ 4. ಶ್ರೀ ಕುಮಾರಸ್ವಾಮಿ. ಎಂ. ಹೆಚ್, GHS ಎನ್.ಜಿ.ಹಳ್ಳಿ, ಹೊಳಲ್ಕೆರೆ 5. ಶ್ರೀ ವೀರಣ್ಣ.ಸಿ, GHS ಕಲಮರಹಳ್ಳಿ, ಚಳ್ಳಕೆರೆ 6. ಶ್ರೀ ಕಾಂತರಾಜು. ಕೆ. ಸಿ, GHS ಎನ್ ದೇವರಹಳ್ಳಿ, ಚಳ್ಳಕೆರೆ 7. ಶ್ರೀ ರಾಜೇಶ್. ಎಲ್. ಎನ್, GJC (ಪ್ರೌಢಶಾಲಾ ವಿಭಾಗ) ತುರುವನೂರು, ಚಿತ್ರದುರ್ಗ 8. ಶ್ರೀ ಡಾ ಮಹೇಶ್. ಕೆ. ಎನ್, ಆಂಜನೇಯ ಪ್ರೌಢಶಾಲೆ ಕಡ್ಲಗುದ್ದು, ಚಿತ್ರದುರ್ಗ 9. ಶ್ರೀ ಮುತ್ತುರಾಜ್. ಸಿ, GHS ಅಲೂರು, ಹಿರಿಯೂರು 10. ಶ್ರೀ ಸಯ್ಯದ್ ಸಾದಿಕ್, ಶರಣಬಸವೇಶ್ವರ ಪ್ರೌಢಶಾಲೆ ಚಿತ್ರಹಳ್ಳಿ, ಚಿತ್ರದುರ್ಗ 11. ಶ್ರೀ ನವೀನ್. ಪಿ. ಎಸ್, GHS ಬೇತೂರು ಪಾಳ್ಯ, ಹಿರಿಯೂರು 12. ಶ್ರೀಮತಿ ರೂಪ. ಸಿ, GHS ಮೆಂಗಸಂದ್ರ, ಹೊಸದುರ್ಗ 13. ಶ್ರೀ ಡಾ ಅನಿಲ್ ಕುಮಾರ್. ಸಿ. ಎನ್, GHS ಭರಮಸಾಗರ, ಚಿತ್ರದುರ್ಗ 14. ಶ್ರೀ ಮೃತ್ಯುಂಜಯ ಸ್ವಾಮಿ, ಪಟೇಲ್ ಬಸಣ್ಣ ಪ್ರೌಢಶಾಲೆ, ಮಾಡನಾಯಕನಹಳ್ಳಿ, ಚಿತ್ರದುರ್ಗ 15. ಶ್ರೀ ಅಶೋಕ್. ಎ. ಟಿ, ಶ್ರೀ ವಾಸವಿ ವಿದ್ಯಾ ಸಂಸ್ಥೆ, ಚಿತ್ರದುರ್ಗ 16. ಶ್ರೀ ಯೋಗೇಶ್. ಎಸ್. ಹೆಚ್, GHS ಹಾನಗಲ್ಲು, ಅರಕಲಗೂಡು ತಾಲ್ಲೂಕು, ಹಾಸನ ಜಿಲ್ಲೆ	1. ಶ್ರೀಮತಿ. ಜಯಚಿತ್ರ. ಕೆ. ಪಿ, GHS ನೆಲಗೇತನಹಟ್ಟಿ, ಚಳ್ಳಕೆರೆ 2. ಶ್ರೀ ಅರುಣ್ ಕುಮಾರ್. ಜಿ. ಎಸ್, GPUC ಉಪ್ಪರಿಗೇನಹಳ್ಳಿ, ಹೊಳಲ್ಕೆರೆ 3. ಶ್ರೀ ಕಾಂತರಾಜು. ಕೆ. ಸಿ, GHS ಎನ್ ದೇವರಹಳ್ಳಿ, ಚಳ್ಳಕೆರೆ
ಮಾರ್ಗದರ್ಶಕರು / MENTORS	ಪರಿಶೀಲಕರು / REVIEWERS
ಶ್ರೀ ಚಲುವನಾರಾಯಣಸ್ವಾಮಿ.ಪಿ, ಉಪ ಪ್ರಾಂಶುಪಾಲರು ಕೆ.ಪಿ.ಎಸ್, ಕಿಕ್ಕೇರಿ, ಕೆ.ಆರ್.ಪೇಟೆ, ಮಂಡ್ಯ ಜಿಲ್ಲೆ ಶ್ರೀ ಚನ್ನೇಗೌಡ. ನಿವೃತ್ತ ಮುಖ್ಯ ಶಿಕ್ಷಕರು, ಶ್ರೀ ಗಂಗಾಧರೇಶ್ವರ ಪ್ರೌಢಶಾಲೆ, ಮಾಗಡಿ, ಬೆಂಗಳೂರು ದಕ್ಷಿಣ ಜಿಲ್ಲೆ.	ಶ್ರೀಮತಿ ಅನಂತಲಕ್ಷ್ಮಿ.ಎಸ್.ಎಸ್ NKS English High School, Upperpet, Bengaluru N-2

ಆಶಯನುಡಿ

‘ವಿಜ್ಞಾನವನ್ನು ಕಲಿಯಿರಿ, ಪ್ರಶ್ನೆಗಳನ್ನು ಕೇಳಿರಿ, ಉತ್ತರಗಳನ್ನು ಹುಡುಕಿರಿ’

ವಿಜ್ಞಾನ ಎಂಬುದು ಕೇವಲ ಸತ್ಯ ಮತ್ತು ಮಾಹಿತಿ ಸಂಗ್ರಹವಲ್ಲ; ಅದು ಕುತೂಹಲ, ವೀಕ್ಷಣೆ ಮತ್ತು ಅನ್ವೇಷಣೆಗಳ ನಿರಂತರ ಪಯಣ. ವಿದ್ಯಾರ್ಥಿಗಳಲ್ಲಿ 21ನೇ ಶತಮಾನದ ಕೌಶಲಗಳಾದ ವೈಜ್ಞಾನಿಕ ಮನೋಭಾವ, ವಿಮರ್ಶಾತ್ಮಕ ಚಿಂತನೆ, ಸೃಜನಶೀಲತೆ ಇತ್ಯಾದಿಗಳನ್ನು ಅಭಿವೃದ್ಧಿಪಡಿಸುವ ಉದ್ದೇಶದಿಂದ **ಕಲಿಕಾಫಲ ಆಧಾರಿತ ಮೌಲ್ಯಾಂಕನ ಪ್ರಶ್ನೆಕೋರಿ (LBA)** ಉಪಕ್ರಮವನ್ನು ಸಿದ್ಧಪಡಿಸಲಾಗಿದೆ.

ಕಲಿಕೆಯು ಕೇವಲ ಪಠ್ಯಪುಸ್ತಕಗಳಿಗೆ ಸೀಮಿತವಾಗದೆ, ದೈನಂದಿನ ಜೀವನದ ಅರ್ಥಪೂರ್ಣ ಗ್ರಹಿಕೆಯಾಗಿ ಬದಲಾಗುವುದನ್ನು ಖಚಿತಪಡಿಸಿಕೊಳ್ಳಲು, ರಾಜ್ಯ ಶಿಕ್ಷಣ ಸಂಶೋಧನೆ ಮತ್ತು ತರಬೇತಿ ಇಲಾಖೆಯು (DSERT) ಕಲಿಕಾಫಲ ಆಧಾರಿತ ಪ್ರಶ್ನೆಕೋರಿಯನ್ನು ಹೊರತಂದಿದೆ. ಪ್ರತಿ ಪಾಠ ಮತ್ತು ಅದರಲ್ಲಿರುವ ಮೂಲ ಪರಿಕಲ್ಪನೆಗಳನ್ನು ನಿರ್ದಿಷ್ಟ ಕಲಿಕಾಫಲಗಳಿಗೆ (LOs) ವ್ಯವಸ್ಥಿತವಾಗಿ ಮ್ಯಾಪ್ ಮಾಡಲಾಗಿದೆ. ಮಕ್ಕಳ ಕಲಿಕಾ ಪ್ರಗತಿಯನ್ನು ಅರ್ಥಪೂರ್ಣವಾಗಿ ಮೌಲ್ಯಾಂಕನ ಮತ್ತು ಮೌಲ್ಯಮಾಪನ ಮಾಡಲು, ಕಲಿಕಾ ಅಂತರವನ್ನು ಗುರುತಿಸಲು ಹಾಗೂ NAS, CSAS, PARAKH ನಂತಹ ಸಮೀಕ್ಷೆಗಳು ಮತ್ತು NMMS ನಂತಹ ರಾಜ್ಯ ಮತ್ತು ರಾಷ್ಟ್ರಮಟ್ಟದ ಸ್ಪರ್ಧಾತ್ಮಕ ಪರೀಕ್ಷೆಗಳಿಗೆ ವಿದ್ಯಾರ್ಥಿಗಳನ್ನು ಸಜ್ಜುಗೊಳಿಸುವ ನಿಟ್ಟಿನಲ್ಲಿ ಈ ಯೋಜನೆಯು ಬಹಳ ಸಹಕಾರಿಯಾಗಲಿದೆ.

ಈ ಉಪಕ್ರಮದ ಯಶಸ್ವಿ ಅನುಷ್ಠಾನ ನಮ್ಮ ನಿಷ್ಠಾವಂತ ಶಿಕ್ಷಕರ ಕೈಯಲ್ಲಿದೆ. ಶಿಕ್ಷಕರು ಈ ಮ್ಯಾಪ್ ಮಾಡಲಾದ ಕಲಿಕಾಫಲಗಳನ್ನು ಆಳವಾಗಿ ಅರ್ಥೈಸಿಕೊಂಡು, ಕ್ರಿಯಾಶೀಲ ಹಾಗೂ ಚಟುವಟಿಕೆ ಆಧಾರಿತ ತರಗತಿ ವಾತಾವರಣವನ್ನು ನಿರ್ಮಿಸಬೇಕು. ತರಗತಿ ಪ್ರಕ್ರಿಯೆಯಿಂದ ಮೌಲ್ಯಾಂಕನದವರೆಗೂ ಪ್ರತಿ ಹಂತದಲ್ಲಿಯೂ ನಿರಂತರವಾಗಿ (CCE) ಈ ಉಪಕ್ರಮವನ್ನು ಬಳಸಿಕೊಳ್ಳುವುದು.

ಈ ಕಲಿಕಾಫಲಾಧಾರಿತ ಪ್ರಶ್ನೆಕೋರಿ ಉಪಕ್ರಮವು ಶಿಕ್ಷಕರಿಗೆ ಮತ್ತು ವಿದ್ಯಾರ್ಥಿಗಳಿಗೆ ಸ್ಪೂರ್ತಿದಾಯಕ ಮಾರ್ಗದರ್ಶಿಯಾಗಲಿ ಎಂದು ಆಶಿಸುತ್ತೇನೆ. ಸದರಿ ಉಪಕ್ರಮವನ್ನು ಸಿದ್ಧಪಡಿಸಲು ಶ್ರಮಿಸಿರುವ ಎಲ್ಲಾ ಸಂಪನ್ಮೂಲ ವ್ಯಕ್ತಿಗಳು, ಮಾರ್ಗದರ್ಶಕರು ಮತ್ತು ಪರಿಶೀಲಕರಿಗೆ ಇಲಾಖೆ ಕೃತಜ್ಞತೆ ಸಲ್ಲಿಸುತ್ತದೆ.

ನಿರ್ದೇಶಕರು

ಡಿ.ಎಸ್.ಇ.ಆರ್.ಟಿ, ಬೆಂಗಳೂರು

ಕಲಿಕಾ ಫಲ ಆಧಾರಿತ ಪ್ರಶ್ನೆಕೋರಿಯನ್ನು ಬಳಸಲು ಅನುಸರಿಸಬೇಕಾದ ಸೂಚನೆಗಳು

- ಇದು ಕಲಿಕಾ ಫಲ ಆಧಾರಿತ ಪ್ರಶ್ನೆಕೋರಿಯಾಗಿದ್ದು, ಪ್ರತಿ ಎಲ್ ಓ ಗಳಿಗೆ ಸಾಧ್ಯವಿರುವ ಎಲ್ಲಾ ಪ್ರಶ್ನೆಗಳನ್ನು ಸಿದ್ಧಪಡಿಸಿ ಇದರಲ್ಲಿ ನೀಡಲಾಗಿದೆ.
- ಇದನ್ನು ಶಿಕ್ಷಕರು ತಮ್ಮ ದೈನಂದಿನ ಕಲಿಕಾ ಬೋಧನಾ ಪ್ರಕ್ರಿಯೆಯಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಲು ಸೂಚಿಸಲಾಗಿದೆ
- ಈ ಪ್ರಶ್ನೆ ಕೋರಿಯು ಬಹುಆಯ್ಕೆ, ಒಂದು ಅಂಕ, ಎರಡು ಅಂಕ, ಮೂರು ಅಂಕ, ನಾಲ್ಕು ಅಂಕ ಮತ್ತು ಐದು ಅಂಕದ ಪ್ರಶ್ನೆಗಳನ್ನು ಒಳಗೊಂಡಿದ್ದು, ಪ್ರತಿ ಎಲ್ ಓ ಗಳಿಗೆ ಅನ್ವಯಿಸುವಂತೆ ಸಿದ್ಧಪಡಿಸಿದ್ದು, ಅವುಗಳನ್ನು ಅಧ್ಯಾಯವಾರು ನೀಡಲಾಗಿದೆ.
- ಸದರಿ ಪ್ರಶ್ನೆಕೋರಿಯು ಎಲ್ ಓ ಆಧಾರಿತ ಪ್ರಶ್ನೆಗಳು ಮತ್ತು ಪ್ರತಿ ಪ್ರಶ್ನೆಗಳಿಗೆ ಸಂಬಂಧಿಸಿದ ಸೂಕ್ತವಾದ ಉತ್ತರವನ್ನು ಸಹ ನೀಡಲಾಗಿದೆ. ಇಲ್ಲಿ ನೀಡಲಾದ ಉತ್ತರವನ್ನು ಹೊರತು ಪಡಿಸಿ ಬೇರೆ ಉತ್ತರಗಳು ಸಾಧ್ಯವಿದ್ದರೆ, ಅದನ್ನು ತರಗತಿಯ ಪ್ರಕ್ರಿಯೆಯಲ್ಲಿ ಚರ್ಚಿಸಲು ಅವಕಾಶವಿದೆ.
- ಇದನ್ನು ತರಗತಿಯ ಕಲಿಕಾ ಬೋಧನಾ ಪ್ರಕ್ರಿಯೆಯಲ್ಲಿ ನಿರಂತರವಾಗಿ ಮತ್ತು ಸಮಗ್ರವಾಗಿ ಪ್ರತಿ ಮೌಲ್ಯಮಾಪನದ ಸಂದರ್ಭದಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಲು ಸೂಚಿಸಲಾಗಿದೆ.
- ಸದರಿ ಸಾಮಗ್ರಿಯನ್ನು ಶಿಕ್ಷಕರು ಒಂದು ಸಂಪನ್ಮೂಲವಾಗಿ ಬಳಸಿಕೊಳ್ಳಲು ಸೂಚಿಸಿದ್ದು, ಇದನ್ನು ಪ್ರತಿ ಮಗುವಿಗೆ ಯುರಾಕ್ಸ್ ಮಾಡಿ ನೀಡಲೇ ಬೇಕೆಂದು ತಿಳಿಸಿರುವುದಿಲ್ಲ. ಮಕ್ಕಳಿಗೆ ಎಲ್ ಓ ಆಧಾರಿತ ಕಲಿಕೆಯು ಖಾತರಿ ಪಡಿಸಿಕೊಳ್ಳಲು ನಡೆಸುವ ನಿರಂತರ ಮತ್ತು ಸಮಗ್ರ ಮೌಲ್ಯಮಾಪನ ಪ್ರಕ್ರಿಯೆಯಲ್ಲಿ ಅಳವಡಿಸಿಕೊಳ್ಳಲು ಸೂಚಿಸಿದೆ.
- ಇಲಾಖೆಯು ಹಮ್ಮಿಕೊಳ್ಳುವ ಎಲ್ಲಾ ತರಗತಿವಾರು ಮೌಲ್ಯಮಾಪನ ಪ್ರಕ್ರಿಯೆಯಲ್ಲಿ ಸದರಿ ಪ್ರಶ್ನೆಕೋರಿಯಲ್ಲಿ ನೀಡಲಾದ ಎಲ್ ಓ ಗಳನ್ನು ಆಧಾರವಾಗಿ ಯೋಜನೆಯನ್ನು ಸಿದ್ಧಪಡಿಸಿ ನಡೆಸಲಾಗುವುದು.

ಕಲಿಕಾಫಲಗಳ ಪಟ್ಟಿ

Curricular Goals	Competency	Learning Outcomes	Applicable Lessons
CG-1-Explores the world of matter, its interactions, and properties at the atomic level.	C-1.1- Describes classification of elements in the Periodic Table and explains how compounds (including carbon compounds) are formed based on atomic structure (Bohr's model) and properties (valency).	1. Explain the unique properties of carbon due to which various useful carbon compounds having different chemical properties are formed. 2. Develop the skills of drawing the structures and the naming of various carbon compounds with their molecular formula. 3. Compare/ Differentiate between soaps and detergents.	4. Carbon and Its Compounds
	C-1.2-Investigates the nature and properties of chemical substances (distillation, crystallisation,		

	chromatography, centrifugation, types and properties of mixtures, solutions, colloids, and suspensions).		
	C-1.3- Describes and represents chemical reactions and changes using symbols and chemical equations (acid and base, metal and non-metal, reversible and irreversible).	4. Represent the chemical changes as word equations and balanced chemical equations with the physical states of reactants and products; define and compare different types of chemical reactions with demonstrations.	1. Chemical Reactions and Equations
		5. Identify the materials having acids and bases used in daily life; Confirm the acidic and basic properties of the materials by using different indicators and pH scale; 6. Examine the chemical properties of acids and bases accurately in the laboratory; Explain and chemically present the procedures followed to prepare salts and uses of them in different fields.	2. Acids, Bases and Salts
		7. Tabulate the physical properties of metals and non-metals; Identify the chemical properties of metals and non-metals by conducting demonstrations. Analyze the reasons for corrosion of metals and suggest the methods of its prevention.	3. Metals and Non-Metals
CG-2- Explores the physical world around them, and understands scientific principles and laws based on observations and analysis.	C-2.1- Applies Newton's laws to explain the effect of forces (change in state of motion, displacement and direction, velocity and acceleration, uniform circular motion, acceleration due to gravity) and analyses graphical		

	and mathematical representations of motion in one dimension.		
	C-2.2- Explains the relationship between mass and weight using the universal law of gravitation and connects it to laws of motion.		
	C-2.3- Manipulates the position of the objects and the properties of lenses (focus, centre of curvature) to observe image characteristics and correspondence with ray diagrams of the images and extends this for understanding different applications of lenses.	8. Explain the phenomenon of reflection of light in spherical mirrors and observe the image formation in concave and convex mirrors practically by writing ray diagrams and also use concave and convex mirrors in daily life situations; Solve various problems based on mirror formula. 9. Explain the phenomenon of refraction of light by citing various examples from daily life, and observe the image formation in concave and convex lens practically by writing ray diagrams; Solve various problems based on lens formula.	9. Light – Reflection and Refraction
		10. Explain the mechanism of functioning of the human eye and identify the eye defects and suggest remedies; Experimentally observe the dispersion of light through a glass prism; Explain and appreciate the natural phenomena occurring due to atmospheric refraction and scattering of light.	10. The Human Eye and the Colourful World

	C-2.4-Analyses different characteristics of electric circuits (current, voltage, resistance) and mathematises their relationship (Ohm's law), and applies it to everyday life.(electricity bill, short circuit, safety measures).	<i>11. Construct a simple electric circuit using proper symbols of electric components; Define various physical quantities related to electricity with their SI units; Analyze the relationship between voltage and current experimentally and identify the factors affecting resistance and solve various problems in daily life using the relationship; Arrange the resistors in series and parallel in an electric circuit; differentiate between them and calculate the total resistance in each case.</i> <i>12. Explain the functioning of fuse and electric bulb; Define Joule's law of heating and apply the law in daily life situations; Calculate the consumption of electricity in daily life situations. Understand the symbols commonly used in electric circuits.</i>	11. Electricity
		<i>13. Investigate the properties of magnetic field lines around a bar magnet/current carrying straight conductor/circular loop/solenoid experimentally using magnetic needle;</i> <i>14. Conduct experiments to show the magnetic effect of electric current and identify the direction of current and magnetic field using Right-Hand Thumb Rule; Prove experimentally that the current carrying conductor in a magnetic field experiences force and identify the direction of this force using Fleming's Left-Hand Rule; Explain domestic wiring and</i>	12. Magnetic Effects of Electric Current

		suggest safety measures to prevent overloading.	
	C-2.5- Defines work in scientific terms and represents the relationship between potential energy and kinetic energy (conservation of energy) in mathematical expressions.		
	C-2.6- Demonstrates the principle of mechanical advantage by constructing simple machines (systems of levers and pulleys).		
	C-2.7- Describes the origin and properties of sound (wavelength, frequency, amplitude) and differences in what we hear as it propagates through different instruments.		
CG-3- Explores the structure and function of the living world at the cellular level.	C-3.1- Explains the role of cellular components (nucleus, mitochondria, endoplasmic reticulum, vacuoles, chloroplast, cell wall), including the semi-permeability of the cell membrane, in making the cell the structural basis of living organisms	15. Explain the importance of ; Human nervous system and endocrine system in bringing control and coordination between various life processes with the structures and functions of certain tissues, organs and glands. 16. Explain the interaction of plants with environmental triggers and chemical coordination in their bodies in order to bring control and coordination between various Life activities.	6. Control and Coordination

	and the functional basis of life processes.		
	C-3.2- Analyses similarities and differences in life processes involved in nutrition. They are, • Nutrition in plants (photosynthesis) • Absorption of nutrients in fungi • Digestion in animals), • Transportation of water and food in plants • Circulation in animals • Exchange of materials (respiration and excretion), • Reproduction	<i>17. Define various life processes; Explain the structure and function of organs associated in a specific organ system in the human body; Identify and observe the methods of different life processes in unicellular organisms.</i> <i>Manipulate the interrelationship between the components of environment and sustainability of life on the earth and connect these with life processes that happen in the plant bodies.</i>	5. Life Processes
		<i>18. Distinguish between asexual and sexual reproduction with examples; List different methods of asexual reproduction in different organisms; Explain the significance of DNA in the process of reproduction</i>	7. How Do Organisms Reproduce?
	C-3.3- Heredity: Describes the functional mechanism of DNA, genes, chromosomes in order to bring similarities and variations (as changes in the sequence of DNA).	<i>19. Analyze the basic principle for causing similarities or variations among the progenies of successive generations and Mendel's contributions in this regard: State the role of father in deciding the sex of a child in humans and in other groups of organisms.</i>	8. Heredity
CG-4- Explores interconnectedness between organisms and	C-4.1- Applies knowledge of cellular diversity in organisms along with the ecological roles		

their environment.	organisms play (autotrophic nutrition /heterotrophic nutrition) to classify them into the five kingdoms.		
	C-4.2- Illustrates different levels of organization in living organisms (from molecules to organisms).		
	C-4.3- Analyses different levels of biological organization from organisms to ecosystems and biomes, along with the interactions that take place at each level.	20. Elicit the relationship between the environments in bringing a balance in the ecosystem with illustrations; analyze the intervention of humans in imbalancing the environment.	13. Our Environment
	C-4.4- Analyses patterns of inheritance of traits in terms of Mendel's laws and their consequences at a population level (using models / simulations).		
	C-4.5- Analyses evidence of biological evolution, demonstrating the consequences of natural selection in terms of changes in allele frequency in populations and changes in the structure and function of organisms.		
CG-5- Draws linkages between	C-5.1- Explores how literature and the arts have influenced on		

scientific knowledge and knowledge across other curricular areas.	the development of science.		
	C-5.2- Examines a case study related to the use of science in human life from the perspectives of Social Sciences and ethics. For example ; • The life and contributions of Marie Curie, • Research of Jenner, • History of treatment of patients with mental illness, • The story of the atomic bomb, • Green Revolution and GMOs, • Conservation of biodiversity.		
	C-5.3- Applies scientific principles to explain phenomena in other subjects For example; • Sound pitch, octave, and amplitude in music; • The use of muscles in dance forms and sports.		
CG-6- Understands and appreciates the contribution of India through history and the present times to the overall field of Science,	C-6.1- Knows and explains the significant contributions of India in the concepts, explanations and methods with		

including the disciplines that constitute it.	reference to all topics studied within the curriculum in an integrated manner.		
CG-7- Develops awareness of the most current discoveries, ideas, and frontiers in all areas of scientific knowledge in order to appreciate that Science is ever evolving, and that there are still many unanswered questions.	C-7.1- States concepts that represent the most current understanding of the topics being studied, ranging from mere familiarity to conceptual understanding, as appropriate to the developmental stage of the students.		
	C-7.2- Formulates questions related to matters in the curriculum for which current scientific understanding is well recognized to be inadequate.		
CG-8- Explores the nature of Science by doing Science.	C-8.1- Develops accurate and appropriate models (including geometric, mathematical, graphical) to represent real-life events and phenomena using scientific principles, and uses these models to manipulate variables and predict results.		
	C-8.2- Designs and implements a plan for scientific inquiry (formulates hypotheses, makes predictions, identifies variables, accurately uses		

	scientific instruments, represents primary and secondary data in multiple modes, draws inferences based on data and understanding of scientific concepts, theories, laws, and principles, and communicates findings using scientific terminology).		
		21. Map various life processes integratedly, draw flow charts to depict certain biological sequences and processes, draw the structures of certain organs of the human body with labeling and certain structures of plants. Draw the arrangement of apparatus used in certain chemical experiment to learn properties of metals, non-metals as its bases including some chemical reactions. Develop the skill of drawing the ray diagrams to show the formation of image using lenses and mirrors; draw the symbols of electrical components, simple circuits, arrangement of resistance in different combinations, graphs etc.	

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Chapter-1: Chemical Reactions and Equations

Curricular Goals	Competency	ಕಲಿಕಾ ಫಲಗಳು (Learning Outcomes)	Question No.
CG-1-Explores the world of matter, its interactions, and properties at the atomic level.	C-1.3- Describes and represents chemical reactions and changes using symbols and chemical equations (acid and base, metal and non-metal, reversible and irreversible).	4. Represent the chemical changes as word equations and balanced chemical equations with the physical states of reactants and products; define and compare different types of chemical reactions with demonstrations.	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80.
		21.Map various life processes integratedly, draw flow charts to depict certain biological sequences and processes, draw the structures of certain organs of the human body with labeling and certain structures of plants. Draw the arrangement of apparatus used in certain chemical experiment to learn properties of metals, non-metals as its bases including some chemical reactions. Develop the skill of drawing the ray diagrams to show the formation of image using lenses and mirrors; draw the symbols of electrical components, simple circuits, arrangement of resistance in different combinations, graphs etc.	62

Weightage –Difficulty level:

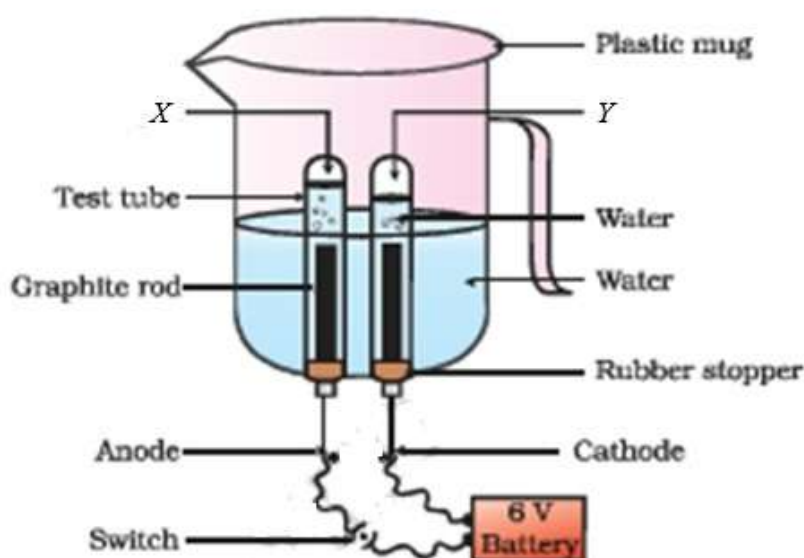
Difficulty level	No. of questions	Marks	Percentage
Easy (E)	25	40	30
Average (A)	35	66	50

Difficulty (D)	20	26	20
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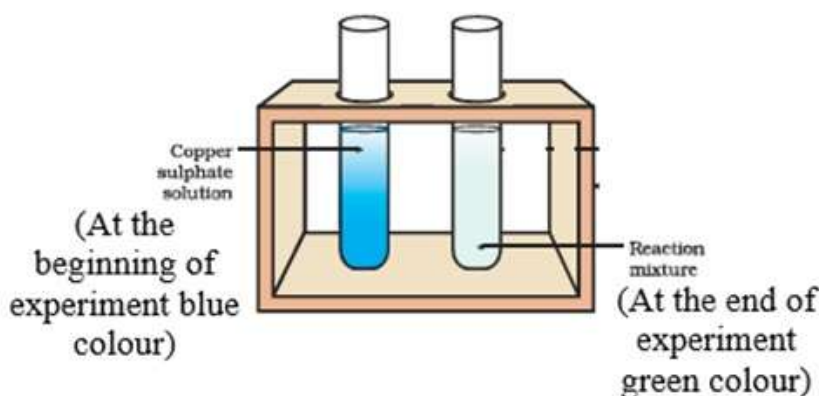
I. Multiple choice answer questions (One Mark Questions):

- An example for chemical change among the following is E
 A. Dissolving salt in water B. Tearing of paper
 C. Rusting of iron D. Boiling of water.
- This is not a property of a chemical reaction among the following is E
 A. Change in colour B. Release of heat
 C. Change in shape D. Release of gas.
- $\text{Fe}_2\text{O}_3 + 2\text{Al} \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe}$ (SUP 2019) A
 The above chemical reaction is an example for
 A. Combination reaction B. Decomposition reaction
 C. Displacement reaction D. Double displacement reaction
- The group of reactants among the following which react with each other to exchange ions and form a precipitate is A
(MAR-2023)
 A. BaCl_2 and Na_2SO_4 B. Al_2O_3 and HCl
 C. NaOH and H_2SO_4 D. Na_2O and CO_2
- The evolution of Oxygen and Hydrogen gases in the electrolysis of water. This reaction is A
(Model 1 2025)
 A. Displacement reaction B. Exothermic reaction
 C. Endothermic reaction D. Redox reaction
- The chemical reaction that takes place when reactants exchange their ions mutually is A
 A. Double displacement reaction B. Displacement reaction
 C. Decomposition reaction D. Combination reaction
- $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$ In this reaction, the reactants that undergo oxidation and reduction respectively are D
(Mar 2020, Apr 2025-1)
 A. CuO and H_2 B. H_2 and CuO
 C. Cu and H_2O D. H_2O and Cu
- Silver nitrate turns into grey colour in the presence of sunlight because A
 A. Silver chloride decomposes to form silver and chlorine
 B. Silver chloride decomposes to form only chlorine.
 C. Silver chloride decomposes to form only silver
 D. Silver chloride does not decompose.
- The ratio of hydrogen and oxygen gases released in the electrolysis of water is (Aug2024) A
 A. Hydrogen : Oxygen:: 1 : 2 B. Oxygen : Hydrogen:: 2 : 3
 C. Hydrogen : Oxygen :: 2 : 1 D. Oxygen : Hydrogen:: 3 : 2
- Due to breakdown of vegetable waste compost will be formed. This is an example for A
 A. Reduction reaction B. Exothermic reaction
 C. Endothermic reaction D. Redox reaction.
- The gas released at the cathode in the electrolysis of water is (April 2022) A
 A. Oxygen B. Hydrogen C. Chlorine D. Nitrogen
- Identify the chemical equation in which the chemical reaction takes place in the following A
(Jun 2019)
 A. $\text{FeSO}_4 + \text{Pb} \rightarrow \text{PbSO}_4 + \text{Fe}$ B. $\text{ZnSO}_4 + \text{Fe} \rightarrow \text{FeSO}_4 + \text{Zn}$
 C. $2\text{AgNO}_3 + \text{Cu} \rightarrow \text{Cu}(\text{NO}_3)_2 + \text{Ag}$ D. $\text{PbCl}_2 + \text{Cu} \rightarrow \text{CuCl}_2 + \text{Pb}$
- A dilute hydrochloric acid is added to iron fillings then A

- A. Hydrogen gas and Iron chloride are produced
 B. Chlorine gas and ferric hydroxide are produced.
 C. No reaction takes place
 D. Iron salt and water are produced.
14. The metal that displaces copper from copper sulphate is (June2022 Apr2022) **E**
 A. Gold B. Silver C. Copper D. Iron
15. Ferrous sulphate crystals lose their green colour when heated because this compound (Apr-2024) **E**
 A. Breaks down into simpler compounds B. Loses water molecules
 C. Releases sulphur dioxide gas D. Produces brown smoke
16. Chips manufacturers flush bags of chips with nitrogen gas because **A**
 A. To prevent corrosion B. To prevent oxidation
 C. To cause corrosion. D. To prevent reduction.
17. The chemical reaction in which iron undergoes corrosion is **A**
 A) combination and redox reaction. B) displacement and redox reaction.
 C) redox and oxidation reaction. D) displacement and oxidation reaction.
18. $\text{MnO}_2 + 4\text{HCl} \rightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$ In this reaction Oxidized and reduced compounds **E**
 respectively are,
 (A) MnO_2 and HCl (B) HCl and MnO_2
 (C) MnO_2 and H_2O (D) MnO_2 and Cl_2
19. $\text{Pb}(\text{NO}_3)_2 \rightarrow \underline{b}\text{PbO} + \underline{c}\text{NO}_2 + \underline{d}\text{O}_2$ **D**
 When this equation is balanced, the number of atoms at positions a, b, c and d respectively are
 (A) 2, 2, 3, 2 (B) 2, 2, 4, 1
 (C) 3, 2, 3, 1 (D) 2, 2, 3, 3
20. A situation where chemical change occurs is **A**
 (A) Sugar is dissolved in water (B) Paper is being torn
 (C) Grape fermented (D) Boiling of water
21. An observation that helps us to decide the rusting of iron is **E**
 (A) Change in colour (B) Change in temperature
 (C) Change in state (D) Evolution of gas
22. On heating calcium carbonate, it produces calcium oxide and carbon dioxide this reaction is **A**
 A. Combination reaction B. Decomposition reaction
 C. Displacement reaction D. Double displacement reaction
23. Observe the figure given below. The gases found in *X* and *Y* test tubes with their ratio **D**
 respectively are

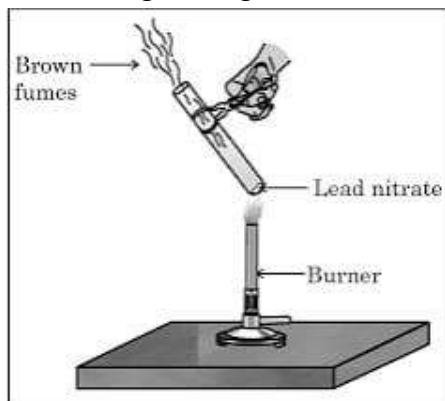


24. Combustion of coal is an example of
 (A) Hydrogen : Oxygen = 1 : 2
 (B) Oxygen : Hydrogen = 2 : 1
 (C) Hydrogen : Oxygen = 2 : 1
 (D) Oxygen : Hydrogen = 1 : 2
25. Observe the figure given below. In the following this metal is added to X test tube to see change in colour is
 (A) Combination reaction
 (B) Decomposition reaction
 (C) Displacement reaction
 (D) Double displacement reaction



- (A) Magnesium
 (B) Lead
 (C) Zinc
 (D) Iron
- II. Very short answer questions (one-mark questions):**
26. What is a chemical reaction? E
27. What is a chemical equation? E
28. Why should a magnesium ribbon be cleaned with sandpaper before burning in air? E
29. Chemical equation must be balanced. Why? A
30. The decomposition of vegetable matter into compost and the respiration process are exothermic reactions. Why? A
31. What is precipitation reaction? Give an example. A
32. What is corrosion? E
33. Manufacturers of chips flush bags of chips with nitrogen. Why? (Sep2020, Mar2023, Apr2025-1) E
34. Iron articles are painted. Why? A
35. What is rancidity? (Apr2025-1, Apr2024-1, Apr2022) A
36. Suggest any two methods to prevent rancidity. (Model2025-1, Apr2025-1, Apr2024-1) A

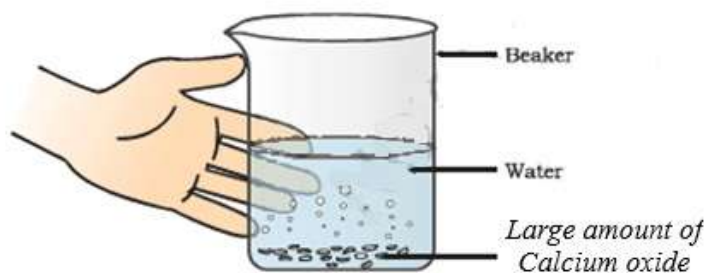
37. $\text{ZnO} + \text{C} \rightarrow \text{Zn} + \text{CO}$ name the reactants that are oxidized and reduced in this reaction. (Model 2025-4, Apr2024, Apr2022, Apr2020) A
38. When sodium sulphate solution is added to barium chloride solution, a white precipitate of barium sulphate is formed. Which are the ions responsible for this precipitate formation? A
39. Name the product formed when calcium oxide reacts with water. (June2023, Sep2020) A
40. The magnesium ribbon burns with a dazzling white flame in air and changes into magnesium oxide. Identify the type of reaction. A
41. What is the reason for the formation of brown coloured fume in the experiment shown through the below given figure? A



42. Why do iron objects get a reddish-brown coating on them? A
43. Observe the given equation. A
- $$\text{WPb(NO}_3)_2 \rightarrow \text{XPbO} + \text{YNO}_2 + \text{ZO}_2$$
- When this equation is balanced, what will be the respective numbers of molecules at positions W, X, Y, and Z? (MAIN EXAM 2026)

III. Short answer questions (two marks questions):

44. List out the observations that help us to determine whether a chemical reaction has taken place. A
45. Analyse the experiment depicted in the given below figure. Can we touch the beaker with bare hands. Justify your answer. D



46. What is a combination reaction? Give an example. A
47. What is a decomposition reaction? Give an example. A
48. What is a displacement reaction? Give an example. A
49. An iron nail changes its colour when immersed in copper sulphate solution. Why? Write the chemical equation for this reaction. (Apr2022 Aug2024-3) A
50. $\text{FeSO}_4 + \text{Cu} \rightarrow \text{CuSO}_4 + \text{Fe}$ A
- Is it possible for the above chemical reaction to take place? Justify your answer.
51. What is a double displacement reaction? Give an example. A
52. Which colour precipitate is formed, when the lead nitrate solution is added to potassium iodide solution? Name that precipitate and identify the type of chemical reaction. A
53. Name the brown fumes liberated when lead nitrate is heated. Write the balanced chemical A

- equation for this reaction. (Apr2019)
54. What are endothermic and exothermic reactions? Give an example for each. A
55. When calcium carbonate is heated, calcium oxide and carbon dioxide are produced. Write the balanced chemical equation for this reaction and state the type of chemical reaction. A
(June2022, Mar2023)
56. What is a redox reaction? Give an example. (Aug2024-3) A
57. The chemical reaction that takes place between sodium sulphate solution and barium chloride solution is called double displacement reaction. Why? Write the balanced chemical equation for this reaction. A
(Sup-2022)
58. Which is the type of chemical reaction where quicklime is obtained from limestone Calcium carbonate? Write the chemical equation for this reaction. A
(June-2022)
59. Mention any two measures to prevent Corrosion. (Mar-2020) A
60. A shiny brown coloured element X on heating in air becomes a black in colour. Name the element X and black coloured compound formed. A
61. The given equation shows the reaction of copper sulphate with an element X. D

$$\text{CuSO}_4 + \text{X} \rightarrow \text{Cu} + \text{Y}$$
 a) Which element is represented by X among Fe and Ag? Justify your answer.
 b) Write the molecular formula of the compound Y.
62. Draw a diagram of the apparatus used in electrolysis of water and label cathode. A
(Apr2019, June2019, July2022)
63. Write the balanced chemical equations for the following. A
 i) Manganese oxide + hydrochloric acid $\rightarrow$ manganese chloride + chlorine + water
 ii) Calcium hydroxide + carbon dioxide $\rightarrow$ calcium carbonate + water
64. Convert the following into chemical equations. A
 i) Nitrogen gas reacts with hydrogen gas to form ammonia.
 ii) Sodium oxide reacts with water to form sodium hydroxide and hydrogen gas.
- IV. Long answer questions (three marks questions):**
65. Write the balanced equation for the following chemical reactions. E
 i) Combustion of natural gas
 ii) Reaction of potassium metal with water
 iii) Reaction of iron with copper sulphate.
66. Explain the following with chemical equations. E
 i) Oxidation ii) Reduction.
67. Balance the following equations A
 i) $\text{Na} + \text{O}_2 \rightarrow \text{Na}_2\text{O}$
 ii) $\text{Mg} + \text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$
 iii) $\text{Al} + \text{O}_2 \rightarrow \text{Al}_2\text{O}_3$
68. To obtain silver from silver nitrate and copper from copper sulphate which type of reaction could be used . Write the equations for these reactions. D
69. The green colour of ferrous sulphate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) crystals changes when it is heated in a dry boiling tube. D
 a) Change in their colour is due to? How can the colour of crystals be restored?
 b) What happens if heating is continued?
70. Write any two differences between endothermic and exothermic reactions with an examples. D
71. $\text{MnO}_2 + 4\text{HCl} \rightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$ A
 Is the above reaction, redox reaction? Justify your answer.
72. a) Identify the type of reaction in the given below equations and write it. A

- i) $\text{ZnCO}_3 \rightarrow \text{ZnO} + \text{CO}_2$
 ii) $\text{H}_2 + \text{Cl}_2 \rightarrow 2\text{HCl}$
- b) Are the reactions in (i) and (ii) opposite to each other? Justify your answer. A
73. Observe the compound solutions which are given below and answer the following questions A
 $\text{Pb}(\text{NO}_3)_2$, BaCl_2 , Na_2SO_4 and KI
 a) Which solutions react with each other to produce a white precipitate?
 Mention the type of this reaction.
 b) This precipitate is produced by which type of positive and negative ion combination?
74. Name the salts that are used in black and white photography. Write an equation for the reactions when they are exposed to sunlight? A
75. Take two test tubes X and Y with CuSO_4 , CuCl_2 solutions adding Zn and Pb respectively to them write balanced equations for the chemical change observed. A
76. Give an example each for the decomposition reactions that take place when energy is supplied in the form of heat, light and electricity. A
77. A solution of substance X is used for white washing. A
 i) Name the substance X and write its formula.
 ii) Write the reaction for the substance named in (i) above with water.
78. The reaction of barium chloride with aluminium sulphate solution is an example for which type of chemical reaction? Why? Write the balanced chemical equation for this reaction. A
- V. Long answer questions (four marks questions):**
79. Lead nitrate is mixed with potassium iodide solution. Answer the following questions related to the above chemical reaction. A
 i) Write the balanced equation for this reaction.
 ii) Name the precipitate formed in this reaction.
 iii) Mention the colour of the precipitate.
 iv) What type of chemical reaction is this?
80. Write the balanced chemical equations for the following chemical reactions and identify the type of reaction in each case. A
 i) Hydrogen + oxygen $\rightarrow$ water
 ii) Zinc sulphate + copper $\rightarrow$ copper sulphate + zinc
 iii) Zinc carbonate $\rightarrow$ zinc oxide + Carbon dioxide
 iv) Sodium chloride + Silver nitrate $\rightarrow$ Silver chloride + Sodium nitrate.

Chapter-2: Acids, Bases and Salts

Curricular Goals	Competency	ಕಲಿಕಾ ಫಲಗಳು (Learning Outcomes)	Question No.
CG-1-Explores the world of matter, its interactions, and properties at the atomic level.	C-1.3- Describes and represents chemical reactions and changes using symbols and chemical equations (acid and base, metal and non-metal,	5. Identify the materials having acids and bases used in daily life; Confirm the acidic and basic properties of the materials by using different indicators and pH scale;	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80.

	reversible and irreversible).	6. Examine the chemical properties of acids and bases accurately in the laboratory; Explain and chemically present the procedures followed to prepare salts and uses of them in different fields	35,36,37,38,39,40, 41,42,43,44,45,46, 47,48,49,50,51,52, 53,54,55,56,57,58 81,82,83,84,85,86, 87
		21. Map various life processes integratedly, draw flow charts to depict certain biological sequences and processes, draw the structures of certain organs of the human body with labeling and certain structures of plants. Draw the arrangement of apparatus used in certain chemical experiment to learn properties of metals, non-metals as its bases including some chemical reactions. Develop the skill of drawing the ray diagrams to show the formation of image using lenses and mirrors; draw the symbols of electrical components, simple circuits, arrangement of resistance in different combinations, graphs etc.	76

Weightage –Difficulty level:

Difficulty level	No. of questions	Marks	%
Easy (E)	30	40	30
Average (A)	40	66	50
Difficulty (D)	17	27	20

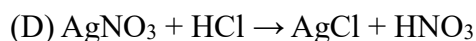
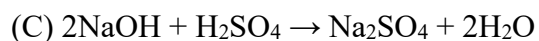
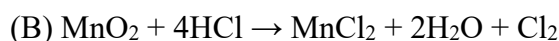
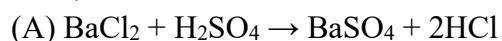
I. Multiple choice answer questions (One Mark Questions):

1. The chemical equation that represents neutralization reaction among the following is

E

(APR -

2019)



2. As the pH value of a neutral solution increases, the (APR-2020) **A**
 (A) basic property decreases and number of OH^- ions increases
 (B) acidic property increases and number of H^+ ions decreases
 (C) basic property increases and number of OH^- ions increases
 (D) acidic property decreases and number of H^+ ions increases.
3. A compound that reacts with both acids as well as bases to produce salts and water is (SEP-2021) **A**
 (A) Aluminium Oxide (B) Copper Oxide
 (C) Iron Oxide (D) Sodium Oxide
4. The gas liberated when sodium carbonate reacts with dilute hydrochloric acid is **E**
 (A) Carbon Dioxide (B) Nitrogen Dioxide
 (C) Hydrogen (D) Chlorine
5. The substance that converts blue litmus paper into red colour is (SUP-2021) **A**
 (A) Lime water (B) Pure water
 (C) Sodium hydroxide solution (D) Gastric juice
6. An acid present in the stinging hair of nettle plant leaves is (SUP-2021) **E**
 (A) Methanoic acid (B) Oxalic acid
 (C) Citric acid (D) Lactic acid
7. The compound used to remove the permanent hardness of water is **E**
 (A) Sodium carbonate (B) Sodium hydroxide
 (C) Sodium hydrogen carbonate (D) Sodium chloride
8. The pH value range of an acid is **A**
 (A) 0-7 (B) 2-12 (C) 7-14 (D) 12 - 14
9. As the number of hydrogen ions increases in a solution, it becomes **E**
 (A) Neutral (B) Acidic
 (C) Basic (D) Amphoteric
10. When the dilute sulphuric acid is mixed with lead the gas released is **A**
 (A) oxygen (B) nitrogen (C) Hydrogen (D) carbon
11. When an acid is mixed with a metal the product obtained is **E**
 (A) Metal oxide & water (B) Salt & water
 (C) Metal oxide & hydrogen gas (D) Salt & hydrogen gas
12. The molecular formula of lime water is **E**
 (A) CaO (B) Ca(OH)_2 (C) CaCO_3 (D) CO_2
13. When hydrochloric acid is added to a copper oxide solution, its colour turns into blue-green due to **A**
 (A) Copper oxide (B) Water (C) Copper hydroxide (D) Copper chloride
14. An acid should be added to water, not water to acid. Because it is **E**
 (A) Exothermic and may explode. (B) Endothermic and may explode
 (C) It does not mix (D) Mix very slowly
15. An acidic salt is to be obtained. Then the kind of acid and base that have to be reacted with each other are **A**
 (A) Weak base and weak acid
 (B) Weak acid and strong base
 (C) Strong acid and strong base
 (D) Strong acid and weak base
16. A change that can be observed when red and blue litmus papers are dipped one after the other **A**

in two solutions M and N is

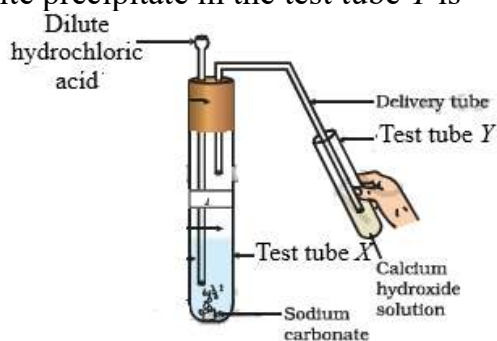
- (A) If M is a metallic oxide solution, the blue litmus turns red.
- (B) If N is a metallic oxide solution, the red litmus does not change colour
- (C) If M is a non-metallic oxide solution, the blue litmus turns red
- (D) If N is a non-metallic oxide solution, the red litmus turns blue

17. $X + Y \rightarrow \text{Salt} + \text{Water}$

In the above reaction X and Y respectively are

- (A) BaCl_2 and H_2SO_4
- (B) MnO_2 and HCl
- (C) NaOH and HCl
- (D) AgNO_3 and HCl

18. Analyse the experimental figure given below. The gas that is responsible for the formation of white precipitate in the test tube Y is



- (A) Carbon dioxide
- (B) Carbon monoxide
- (C) Hydrogen
- (D) Chlorine

19. Observe the table below. The solutions that turn red litmus paper to blue are

P	NaOH
Q	CH_3COOH
R	$\text{Ca}(\text{OH})_2$
S	HCOOH

- (A) P and Q
- (B) Q and R
- (C) P and R
- (D) Q and S

20. Compound that is used for bleaching cotton and linen in the textile industry is

- (A) CaOCl_2
- (B) NaOH
- (C) Na_2CO_3
- (D) NaCl

21. pH value of the mouth that causes tooth decay is

- (A) Less than 5.5
- (B) 6 to 7
- (C) 8 to 9
- (D) Above 10

22. The products obtained when metal pieces added to an acid are

- (A) Metallic oxide and water
- (B) Salt and water
- (C) Metallic oxide and hydrogen gas
- (D) Salt and hydrogen gas

23. Metallic oxide + hydrochloric acid $\rightarrow X$ + water (blue-green colour solution). In this chemical reaction X is the reason for colour change of the solution, then the product X is

- (A) Copper (II) Oxide
- (B) Copper (II) Carbonate
- (C) Copper (II) Sulphate
- (D) Copper (II) Chloride

24. Observe the process shown in the figure. The gases X and Y released in the above experiment respectively are

D

E

D

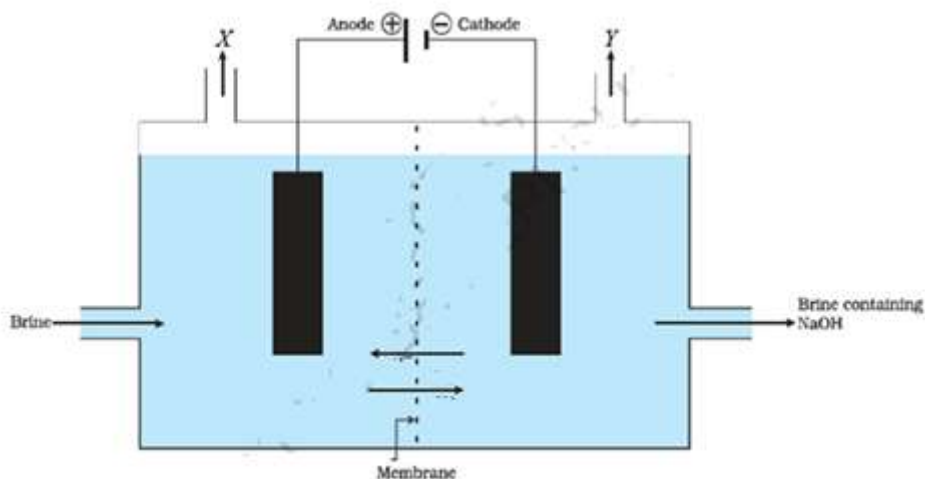
A

A

A

E

A



(A) H_2 and Cl_2

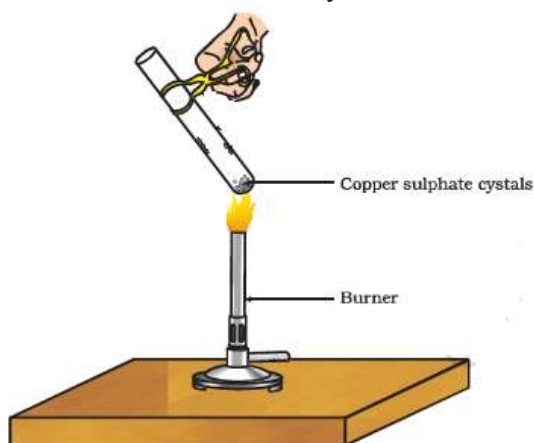
(B) Cl_2 and H_2

(C) O_2 and H_2

(D) Cl_2 and CO_2

25. Observe the experimental activity given below. The blue colour of copper sulphate crystals turns white when heated because the crystals

E



(A) Break down into simpler products

(B) Lose water molecules

(C) Release sulphur dioxide gas

(D) Release sulphur trioxide gas

26. $X + Y \rightarrow \text{Salt} + \text{Water}$; to obtain an acidic salt the X and Y reactants *in this* chemical reaction respectively are

E

(A) Weak base and Weak acid

(B) Weak base and Strong acid

(C) Strong base and Strong acid

(D) Strong base and Weak acid

27. Read the data given in the table below. The acids found in P , Q , R and S respectively are

E

Acids	Natural source
P	Ant sting
Q	Sour milk(curd)
R	Tomato
S	Orange

(A) Methanoic acid, Lactic acid, Oxalic acid and Citric acid

(B) Acetic acid, Lactic acid, Oxalic acid and Citric acid

(C) Methanoic acid, Citric acid, Oxalic acid and Lactic acid

(D) Tartaric acid, Citric acid, Oxalic acid and Lactic acid

28. The ions responsible for the basic property of a solution are

A

(A) H^+

(B) OH^-

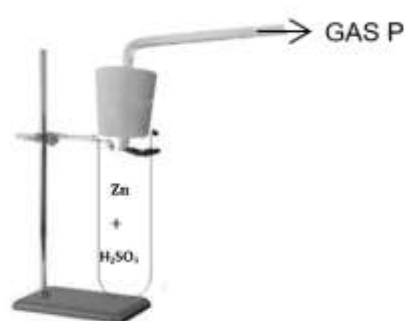
(C) H^+ and OH^-

(D) H^+ and Cl^-

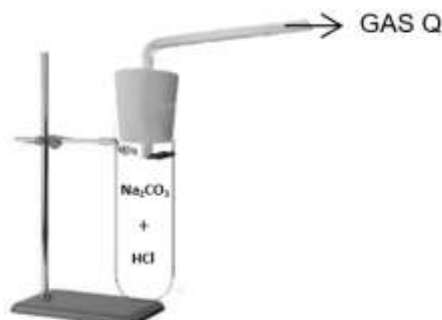
29. The acid added to NaHCO_3 to prepare baking powder is E
 (A) Tartaric acid (B) Hydrochloric acid
 (C) Sulphuric acid (D) Nitric acid

II. Answer the following questions. (1 Mark)

30. What is neutralisation reaction? E
 31. Plaster of Paris should be stored in a moisture-proof container. Give scientific reason. A
(JUNE 2019)
 32. What are amphoteric oxide? E
 33. Can detergents be used to detect the permanent hardness of water? Give reason. E
 34. Name the ions responsible for acidic and basic nature of the substance. A
(JUNE-2023)
 35. Write any two uses of washing soda. A
 36. 1ml of acetic acid is mixed with 1ml of sodium hydroxide solution. Determine the nature of the salt obtained here with suitable reason. A
(JUNE-2024)
 37. How is concentrated acid diluted? E
(APRIL-2025)
 38. How do you detect acid with litmus paper? A
 39. What is an acid? A
 40. Write a chemical equation for the reaction of a metal with a base. A
 41. Which precipitate is produced when air is blown into lime water? A
 42. Which gas is released when acids react with metal carbonate and metal hydrogen carbonate? E
 43. A metal oxides are called as basic oxides. Why? E
 44. A non-metal oxides called as an acidic oxides. Why? A
 45. What are alkalis? A
 46. The ion formed when an acid dissolves in water? A
 47. What happens if the number of hydroxide ions in a solution increases? A
 48. What is the pH value of acid rain? A
 49. What is the chemical name of bleaching powder? A
 50. Write the chemical equation for the preparation of bleaching powder. A
 51. What is baking powder? A
 52. Mention the molecular formula and chemical name of washing soda. A
 53. Which salt is used in fire extinguishers? A
 54. Bread dough rise when baking powder is added to it. Why? A
 55. 20 mL of concentrated sodium hydroxide solution is added to a beaker containing 100 mL of water. How does this affect the concentration and the strength of OH^- ions in that solution? A
 56. How are the released gases P and Q detected in the experiments depicted in the following figures? A

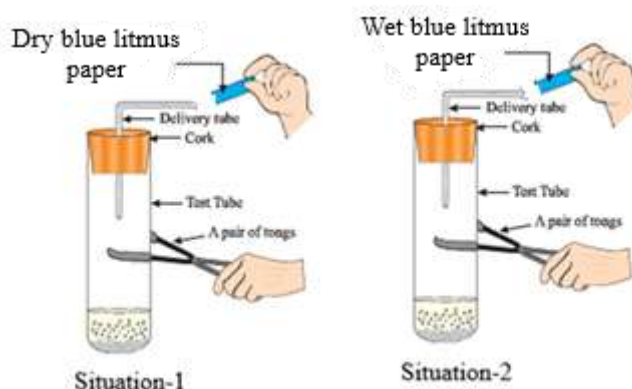


Experiment 1



Experiment 2

57. Why does distilled water not conduct electricity, whereas rain water does? A
 58. Review the two scenarios of the practical activities given in below figures. In which scenario does the colour of litmus paper change? Justify your answer. A



59. Take a 100mL water in *X* and *Y* beakers then add 10mL concentrated HCl and 10mL concentrated NaOH respectively. What happens when solutions in both beakers were mixed? **A**

III Answer the following questions. (2 Marks) **A**

60. Give scientific reason. While diluting an acid should be added to water. (JUNE-2019) **A**
61. Agricultural scientists have suggested to add a certain amount of lime powder to an agricultural field. What is the reason? Explain. **A**
62. The pH values of the solutions A, B and C are 5, 6 and 7 respectively. Which of these solutions has the most acidic nature and why? **A**
63. List any two chemical properties of acids. **D**
64. List any two chemical properties of bases. **D**
65. In X, Y and Z test tubes, distilled water in X, acidic solution in Y and basic solution in Z is taken. If you are provided with red litmus only then how will you find out the samples? **D**
66. HCl and HNO₃ exhibit an acidic property in aqueous solution but compounds like alcohol and glucose do not exhibit an acidic property. Why? **E**
67. Rain water conducts electric current but distilled water does not. Why? **D**
68. The pH of fresh milk is 6. How does its pH change as it turns curd? Explain. **D**
69. A milkman adds a small amount of baking soda to fresh milk. **E**
- a) The pH of the fresh milk is shifted from 6 to slightly alkaline. Why?
- b) This milk take a long time to set as curd. Why?
70. Write the equations for preparing sodium hydroxide and baking soda from sodium chloride. **E**
71. A solution of baking soda is commonly applied to the area of a honeybee sting. Justify this practice. **D**
72. When an aqueous solution of 'P' is subjected to electrolysis in the chlor-alkali process, then the gases 'Q' and 'R' released at cathode and anode respectively **D**
- i) Name P, Q and R.
- ii) Write any one use of the gas Q.
73. Solutions A, B, C and D have pH values of 5.6, 1.8, 13.5 and 8.1 respectively. **E**
- a) Which of these solutions used to neutralize the acidity of the stomach?
- b) Predict the change in the concentration of H⁺ and OH⁻ ions in the solution that forms when solutions B and D are mixed in equal volumes.
74. When carbon dioxide is passed through the lime water, then a white precipitate forms first. If passing carbon dioxide is continued, then precipitate disappears. What is the reason for this effect? Name the final product of this reaction. **A**
75. When an acid is diluted with distilled water what is the effect on the H⁺ ions concentration of that solution? Is there any change in the pH value of this solution? Clarify. **A**

IV. Answer the following questions. (3 Marks)

- 76.. Draw the diagram of arrangement of the apparatus to show the reaction of zinc granules with **E**

dilute sulphuric acid and testing hydrogen gas by burning. Label the parts given below.

i) Zinc granules

ii) Soap solution (MAIN EXAM-2019, 2020, 2022, 2024 SUP EXAM-2020, 2022, 2024)

77. Name the gas liberated when an acid reacts with metal carbonate. Write the chemical equation of the reaction when this gas is passed through lime water. What is the colour of the precipitate obtained in this reaction? **A**
78. There is no change in the colour of red litmus and blue litmus paper when dipped into an aqueous solution of sodium chloride. After passing direct current through the same solution, red litmus changes to blue colour. Which product is responsible for this change? Mention any two uses of this product. **A**
79. How are concentrated acids and weak acids different? State the precautions to be taken while concentrating an acid. **A**
80. What is a strong acid? Explain how tooth decay is caused. How can it be prevented? **A**
81. Analyse the pH values given in the below table. Answer the questions below. **D**

Solutions	pH value
e	5
f	13
g	9
h	2

- a) Classify these into acidic and basic solutions:
- b) Name the antacid used to neutralise excess of acid in the stomach. (MAIN - 2023)
82. Solutions A, B, C and D are having pH values of 2, 6, 8 and 13 respectively. Then, **D**
- i) Which solution has more H^+ and which solution has more OH^- ions concentration? Why?
- ii) The reaction between these two solution can produce neutral salt.
83. Four solutions A, B, C and D when tested with universal indicator showed pH as 5, 2, 7 and 11 respectively. Which solution **A**
- i) Has more hydronium ions?
- ii) Is neutral?
- iii) Is the strong acid?

V. Answer the following questions. (4 Marks)

84. What is chlor-alkali process? Name the products of this process. Write one use of each. **E**
85. Observe the materials given below and answer the following questions. **E**
- NaOH, $Ca(OH)_2$, H_2 and Cl_2
- i) Which materials can be used to prepare bleaching powder? Write the chemical equation for this.
- ii) Mention any two uses it?

86. Write the differences between acid and base. **A**

V. Answer the following questions. (5Marks)

87. a) How the baking soda and washing soda are prepared explain with chemical equations. **E**
- b) Name the salts used in the following situations
- i) To remove the permanent hardness of water.
- ii) To disinfect drinking water.
- iii) To support the fractured bones at the right position

Chapter 5 : Life Processes

Curricular Goals	Competency	Learning Outcomes	Applicable Lessons
CG-3- Explores the structure and function of the living world at the cellular level.	C-3.2- Analyses similarities and differences in life processes involved in nutrition. They are, *Nutrition in plants (photosynthesis) *Absorption of nutrients in fungi *Digestion in animals), *Transportation of water and food in plants *Circulation in animals *Exchange of materials (respiration and excretion), *Reproduction	17. Define various life processes; Explain the structure and function of organs associated in a specific organ system in the human body; Identify and observe the methods of different life processes in unicellular organisms. Manipulate the interrelationship between the components of environment and sustainability of life on the earth and connect these with life processes that happen in the plant bodies.	1,2,3,4,5,6,7,8,9, 10,11,12,13,14,15, 16,17,18,19,20,21, 22,23,24,25,26,27, 28,29,30,31,32,33, 34,35,36,38,39,40, 41,43,44,45,46,47, 49,50,51,52,53,54, 55,56,57,58,59,60, 61,62,63,64,65,66, 67,68,69,70,71,72, 73,74,75,76,77,78, 79,81,82,83,84,85, 86,87,88.
		21. Map various life processes integratedly, draw flow charts to depict certain biological sequences and processes, draw the structures of certain organs of the human body with labeling and certain structures of plants. Draw the arrangement of apparatus used in certain chemical experiment to learn properties of metals, non-metals as its bases including some chemical reactions. Develop the skill of drawing the ray diagrams to show the formation of image using lenses and mirrors; draw the symbols of electrical components, simple circuits, arrangement of resistance in different combinations, graphs etc.	37,42,48,80

Weightage –Difficulty level:

Difficulty level	No. of questions	Marks	%
Easy (E)	20	28	23%
Average (A)	50	108	57%
Difficulty (D)	18	29	20%

I. Four alternative answers are given to the following questions or incomplete statements. Write the correct answer in alphabetical order along with the complete answer.

- The correct statement regarding digestion that takes place in the small intestine is (A)
(JUNE 2019)
A. Acidic food becomes alkaline due to bile.
B. Food becomes acidic due to hydrochloric acid.
C. Starch is digested by the action of amylase.
D. Protein is digested by the action of pepsin.
- The place where carbohydrates, proteins and fats are completely digested. (E)
(SEP-2020) (JUNE-2020)
A. Stomach B. Large intestine C. Small intestine D. Liver
- Blood vessels that carry blood from all parts of the human body to the heart (E)
(JUL-2021)
A. Arteries B. Capillaries C. Pulmonary arteries D. Veins
- Transport of soluble photosynthesis products in plants (SEP-2021) (E)
A. Evaporation B. Osmosis C. Diffusion D. Translocation
- Important function of xylem in plants (JUN-2022) (A)
A. Water transport B. Food transport
C. Amino acid transport D. Oxygen transport
- The place where carbon dioxide and water are released due to the breakdown of pyruvate is (E)
A. cytoplasm B. mitochondria C. chloroplast D. nucleus
- The important function of the stomata among the following is (MQP-3,25-26) (A)
A. Exchange of gases B. Transport of water and food
C. Food preparation D. Creating osmotic pressure
- The blood vessel that carries oxygenated blood from the heart is (PRE-3,25-26) (E)
A. Pulmonary vein B. Superior vena cava
C. Aorta D. Pulmonary artery
- Transpiration process in plant body (SEP-2024) (A)
A. Balancing the amount of oxygen and water
B. To establish a water column in the xylem tissue
C. To help in the transport of soluble photosynthesis products
D. To create osmotic pressure
- The need for suction pressure in plants is, (AUG-2024) (D)
A. To overcome the difference in ion concentration between the root and the soil
B. To transport food in two directions
C. To carry water to higher parts

D. To remove excess water from the leaves

11. i, ii, iii and iv represent mouth cavity, liver, first part of small intestine and complete small intestine respectively of human digestive system. (D)

Match the labelling referred in column I and correlate with the function in column II .

Column I	Column II
i	a. The length of this depends of food the organism exists
ii	b. Initial phase of starch digestion
iii	c. Increase the efficiency of lipase enzyme action.
iv	d. This is the site of the complete digestion of carbohydrates, proteins and fats

A. i-c ; ii-d ; iii-a ; iv-b

B. i-b ; ii-c ; iii-d ; iv-a

C. i-a ; ii-c ; iii-d ; iv-b

D. i-d ; ii-a ; iii-b ; iv-c

12. The important role of stomata in transportation of water (Mar/Apr-2026) (A)

A. performing continuous transpiration B. absorbing carbon di oxide

C. releasing oxygen D. creating upward tension

13. As the food moves forward in the human digestive system the enzyme that help for the digestion respectively are (A)

A. Pepsin→Trypsin→Lipase B. Amylase →Pepsin→Lipase

C. Lipase→Amylase→Trypsin D. Trypsin→Pepsin→Amylase

14. Observe below given arrangement of experimental apparatus. (D)

Chemical indicated as 'X' which absorbs gas liberated as byproduct in respiration reaction.



A. NaOH B. KOH C. Ca(OH)₂ D. K₂CO₃

15. An enzyme that secretes by the pancreas to digest protein is (MQP-1,25-26) (E)

A. amylase B. pepsin C. trypsin D. lipase

16. The correct statement regarding bile juice among the following is, this juice is secreted by the (MQP-2,25-26) (A)

A. stomach and acidifies food B. stomach and alkalises food

C. liver and alkalises food D. pancreas and alkalises food

II. Answer the following questions (one-mark questions)

17. Under which situation lactic acid is produced in muscle cells? (APR-2019) (A)

18. How is oxygen supply more efficient in birds and mammals? (A)

19. Name the products of anaerobic respiration (JUNE -2019) (E)

20. Why is the respiration rate of aquatic animals faster than that of terrestrial animals? (APR-2020) (A)

21. Write the function of the platelets. (A)

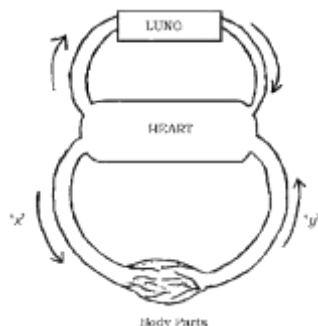
22. Name the type of transport where food material transported from the leaves to other parts? (E)

23. "Osmotic pressure in the phloem tissues of plants helps in the transport of materials". Justify your answer. (D)

24. What is the finger-like structures in the small intestine called? (E)

25. Humans can't digest grass like plants. Give Reason. (D)

26. Diffusion is not enough to meet the oxygen requirement in multicellular organisms Why? (A)
27. Enzymes are biological catalysts. Justify this statement. (A)
28. Name the two types of respiration (E)
29. Name the product released when the 6-carbon molecule of glucose is broken down in cytoplasm? (E)
30. Name the two types of vascular tissues in plants (E)
31. What is cellular respiration? (E)
32. The schematic representation of blood circulation in the mammals is given below. (D)



- a) Name the blood vessels x and y.
- b) Which blood vessel has a valve?
33. Mention the importance of transpiration in plants. (A)
34. How does suction will occur? (A)
35. There is sufficient time for oxygen to be absorbed and carbon di oxide to be released at the time of respiration. Justify (D)
36. Gastric juice contains HCl. But why it does not destroy internal lining of stomach? (A)
37. Draw the diagram to show the structure of open stomata. (May/June-25, II) (E)
38. Double circulation of the blood is essential to maintain constant temperature in mammals. why? (MQP-3,25-26) (A)
39. What is the relationship between the amount of haemoglobin in the blood and the amount of ATP released in the human body? (MQP-2,25-26) (A)
40. What is the importance of xylem tissue in plants? (MQP-1,25-26) (A)
41. The haemoglobin content in the blood of two persons A and B is found to be 9gm/dl and 13 gm/dl respectively. Which statement is correct regarding the oxygen supply in their body? (D)
- A) More in Person A than in B
- B) More in Person B than in A

III Answer the following questions (two marks questions)

42. Draw the diagram to show the structure of open stomata and label the below parts. (A)
- i) Guard cells ii) stomata (JUNE-2019)(MAY-2025)
43. The approximate lengths of the small intestines of animals X and Y are given in the table. (D)
- Observe the table and answer the questions

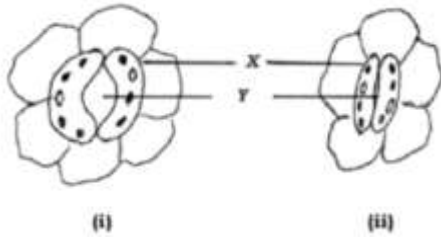
Animals	Small intestine length
X	20 to 40 feet
Y	5 to 8 feet

Identify the herbivorous and carnivorous animals in the table and support your conclusions with scientific reasons.

(MQP-4,25-26)(JUN-2019)

44. Chapati tastes sweeter when chewed slowly. Why? (SEP-2020) (D)
45. Give reason: (APR-2022) (A)

- a) The ventricles of the human heart have thick walls.
 b) In mammals and birds, it is necessary to separate oxygenated and deoxygenated blood.
46. Name the enzyme present in Saliva. Write its function. (E)
47. Observe the pictures given below: (MARCH- 2023) (D)



- a) Which picture indicates a high rate of gas exchange? Why?
 b) Name the parts X and Y and what is the function of the part X?
48. Draw the diagram to show the structure of nephron and label glomerulus. (JUNE-2023) (E)
49. How are oxygen and carbon dioxide transported in humans? (A)
50. The body temperature of frogs and lizards depends on the environment temperature. Justify. (D)
 (MAR-2020)
51. What is the advantage of having four chambered heart in human ? (A)
52. Write the importance of double circulation. (A)
53. Photosynthesis does not occur in plants growing in deserts as it does in normal plants. (D)
 Give reason
54. What is photosynthesis? What is the organic product released in this process? Write the function of this product. (A)
 (MAR-2020)
55. Lymph plays an important role in maintaining the body's immune system. Justify this statement. (D)
 (2016)
56. Write the difference between arteries and veins. (A)
57. What is the role of hydrochloric acid in our stomach? (A)
58. How does ATP synthesize in the cells by cellular respiration in our body? Is the role of these molecules essential in the transportation of food in plants? Support your answer. (D)
59. Mention any three strategies by which the food is taken in and used in heterotrophs with an example for each. (A)
60. The rate of respiration is more in which organism among human and fish? Why? (A)
 (Mar/Apr-2026)
61. What is the role of platelets in human circulatory system? (A)
62. "Transpiration in plants is a necessary evil" Justify this statement with two reasons. (D)
63. "Photosynthesis and respiration processes are opposite reactions with each other" Justify. (D)
64. Observe this structure showing human excretory system. Answer below questions. (A)



- i) Where in our body kidneys are found?
 ii) Why we have to excrete waste products?

65. Why is diffusion insufficient to meet the oxygen requirements of multicellular organisms like humans? (A)
66. Where do plants get each of the raw materials required for photosynthesis? (E)
67. How is the small intestine designed to absorb digested food? (A)
68. How are fats digested in our body? Where does this process take place? (A)
69. Name the following. (E)
- Structures that prevent the collapsing of air passage part of trachea in the humans
 - Nitrogenous chemicals that are separated from the blood by the kidney

OR

- In which form the excess glucose is stored in plants and animals?
- Name the structures of the human's small intestine that absorb digested food.

IV Answer the following questions (Three marks questions)

70. Explain the translocation of food in plants. (A)
71. The pictures given below represent the hearts of three different animals. Observe them and answer the questions. (D)

(JUNE-2019)



(1)



(2)



(3)

Which of these hearts is useful for an animal that needs a lot of energy and why?

72. How are the functions of arteries, veins and capillaries related to each other in blood circulation? (A)
- (SEP-2020)
73. How is water transported to the higher parts of a plant? Explain. (A)
- (SEP-2020)
74. Write the differences between the circulatory systems of fish and humans. (A)
- (JUNE-2022)
75. Explain the structure and function of nephron. (E)
- (MPQ 2023)
76. Explain the mode of nutrition process in amoeba. (A)
77. How do the quantity of urine production in humans is controlled? (A)
78. What is the role of the following enzymes in the human digestive track? (E)

(APR-2025)

- Trypsin
- Amylase
- Lipase

V. Answer the following questions (4 marks questions)

79. a) What is anaerobic respiration? What are the products produced in this process? (A)
- b) What is double circulation? How is this type of blood circulation useful in birds and mammals? (Mar/April-2024-25)
80. Draw a diagram showing the longitudinal section of the human heart. Label the following parts. (A)
- septum
 - right ventricle
- (MQP-1,25-26)(Mar/April-1, 2025-26)(MAR-2020)
81. a) What are the functions of the aorta and pulmonary veins? (A)
- b) Write the events that occur during the photosynthesis in plants .

OR

- In the first stage of cellular respiration, the glucose molecule is broken down into which molecule in the cytoplasm? How are this broken molecule breaks down in muscle cells?

- b) Write any two differences between xylem and phloem (MQP-2,25-26)
82. a) Explain the digestion process in the small intestine of humans. (A)
b) What is the main function of alveoli in the human lungs.
- OR
- a) How are inorganic substances transported from the xylem tissue in plants? Explain.
b) Write any four methods used by plants to eliminate waste materials. (MQP-3,25-26)
83. a) How does glucose convert into energy molecules during aerobic respiration? What is the role of alveoli in the process? (AUG-2024)
b) What is anaerobic respiration? What are the products produced in this process? (May-2025)
84. What are the advantages that terrestrial animals have compared to aquatic animals in terms of obtaining oxygen for respiration? (A)
85. How are the lungs designed in humans to increase the area for gas exchange? (A)
86. a) Compare the air sacs in the lungs and the nephrons in the kidneys on the basis of structure and function. (A)
b) The muscle cramps occur in the legs of a football player due to continuous practice. Give a suitable reason.
87. a) How does the structure of the human heart help in the transport of oxygenated and deoxygenated Blood? Explain. (A)
b) How is digested food absorbed into the blood in humans? Explain the function of blood in the transport of essential substances.
- VI Answer the following questions (5 marks questions)**
88. a) Draw a schematic diagram showing the breakdown of glucose by various pathways. (A)
b) What is the function of bile juice?

Chapter 6 : Control and Coordination

Curricular Goals	Competency	Learning Outcomes	Applicable Lessons
CG-3- Explores the structure and function of the living world at the cellular level.	C-3.1- Explains the role of cellular components (nucleus, mitochondria, endoplasmic reticulum, vacuoles, chloroplast, cell wall), including the semi-permeability of the cell membrane, in making the cell the structural basis of living organisms and the functional	15.Explain the importance of ; Human nervous system and endocrine system in bringing control and coordination between various life processes with the structures and functions of certain tissues, organs and glands.	1,2,3,5,6,9,10,11,15,17,19,22,24,26,27,28,31,32,34,35,36,38,40,41,43,45,46,47,48,49,50,51,53,54,55,56,57,58,60,61,64,65,66,67,68,69,70.

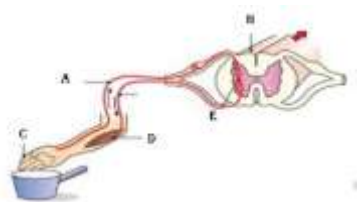
	basis of life processes.		
		16.Explain the interaction of plants with environmental triggers and chemical coordination in their bodies in order to bring control and coordination between various Life activities.	4,7,8,12,13,14,16, 18,20,21,23,25, 29,30,33,37,39,42, 44,52,59,62,71.
		21. Map various life processes integratedly, draw flow charts to depict certain biological sequences and processes, draw the structures of certain organs of the human body with labeling and certain structures of plants. Draw the arrangement of apparatus used in certain chemical experiment to learn properties of metals, non-metals as its bases including some chemical reactions. Develop the skill of drawing the ray diagrams	63.

Weightage –Difficulty level:

Difficulty level	No. of questions	Marks	%
Easy (E)	24	43	33%
Average (A)	35	62	49%
Difficulty (D)	13	20	18%

I. Multiple Choice Questions. (One-mark questions.)

- The incorrect statement related to thyroxin hormone among the following is (A)
(MAIN- 2020)
A. it regulates fat metabolism
B. its deficiency leads to goitre
C. it is secreted by parathyroid gland
D. iodine in the food is essential for its production.
- The gap between two neurons is called as (Jul-2021) (E)
A. dendrite B. synapse C. axon D. impulse
- The following is an example of reflex action (E)
A. sliding the chair.
B. Applause at the end of the program.
C. Pulling hand back when touching a sharp object

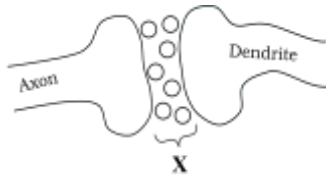
- D. Tasting food
4. If the roots of a plant grow towards an area of nitrate concentration, it is (E)
 A. Phototropism B. Hydrotropism
 C. Thigmotropism D. Chemotropism
5. Correct path of transmission of nerve impulses in the neuron (A)
 (MAIN 2019, SUP- 2021)
 A. Dendrite → nerve ending → cell body → axon
 B. Dendrite → Axon → Cell body → Nerve ending
 C. Dendrite → Cell body → Axon → Nerve ending
 D. Nerve ending → Cell body → Axon → dendrite
6. Correct path of reflex arc in the figure given below (D)
 A. A → B → C → D → E
 B. C → A → B → E → D
 C. C → A → B → D → E
 D. C → D → A → D → E
- 
7. An example of positive geotropism in plants is (E)
 A. Growth of the stem B. Growth of roots deep into the soil
 C. Growth of shoots of veins D. Upward growth of roots
8. A pot that has growing seedling is kept in a dark room. A burning candle is placed near it for a few days. The top part of the seedling bends towards the light of burning candle. This is (D)
 A. Chemotropism B. Phototropism C. Geotropism D. Hydrotropism
9. Blood sugar level increases : Under secretion of insulin hormone :: Swelling of the neck : (A)
 (EXAM-1 2025)
 A. Under secretion of thyroxine hormone
 B. More secretion of insulin hormone
 C. More secretion of thyroxine hormone
 D. Excess intake of iodine
10. The hormone secreted by the pancreas, (EXAM-3 2024) (E)
 A. regulates metabolic activities B. regulates blood sugar level
 C. stimulates the growth in the body organs D. increases breathing rate
11. The correct path of the movement of nerve impulses in the following diagram is (D)
- 
- A. Q → S → R → P B. P → Q → R → S
 C. S → R → Q → P D. P → R → S → Q
12. Upward growth of stem in plants (EXAM-2 2025) (A)
 A. Negative geotropism and positive hydrotropism
 B. Positive geotropism and negative hydrotropism
 C. Negative phototropism and positive geotropism
 D. Negative geotropism and positive phototropism
13. Identify the correct statement regarding plant hormones. (MP-2020) (A)
 A. Cytokinin promotes leaf wilting
 B. Auxin inhibits stem elongation
 C. Absciscic acid inhibits plant growth.

D. Gibberellin promotes leaf abscission.

14. The pattern of root responses in plants (MP (A)
2021)

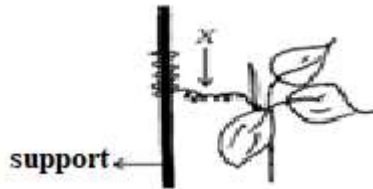
- A. Directed and negative phototropism
B. Positive phototropism and negative geotropism
C. Undirected and positive geotropism
D. Growth-dependent and positive hydrotropism

15. In the figure below, the name and function of the part 'X' are: (D)



- (A) Neuron and transmits chemicals into electrical impulses
(B) synapse and transmits electrical signals generated at the axon terminal to the dendrite
(C) Neuron and transmits electrical impulses into chemicals
(D) synapse and transmits chemical signals generated at the axon terminal to the dendrite

16. Observe the given diagram. The response shown by part X is (D)



- (A) Positive thigmotropism and directional movement
(B) Positive geotropism and independent movement
(C) Positive phototropism and non-directional movement
(D) Positive chemotropism and independent movement
17. Receptors are generally sense organs. Gustatory receptors are present in. (A)
(A) Nose (B) Tongue (C) Eye (D) Ear
18. Height of a plant is regulated by (D)
(A) DNA which is directly influenced by growth hormone.
(B) Genes which regulate the proteins directly
(C) Growth hormones under the influence of the enzymes coded by a gene
(D) Growth hormone directly under the influence of a gene
19.is generally known as personality hormone (Mar/April-2015) (E)
(A) Adrenaline (B) Thyroxine (C) Insulin (D) Glucagon

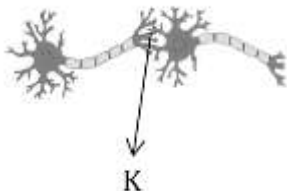
II. Answer the Following (One Mark Questions)

20. What are the tropism movements necessary for growth in the roots and shoots of plants? (MP-2024) (E)
21. What is geotropism? (MP 2019) (E)
22. What is nerve cell (neuron)? (EXAM-1 2025) (E)

23. Which hormone inhibits the growth of plants? (SUP-2022) (E)
24. What is reflex action? Give an example. (E)
25. How does chemical coordination occur in plants? (A)
- 26.. Name the mineral necessary for the production of thyroxine hormone. (E)
27. How do muscle cells respond to nerve impulses? (A)
28. What is the difference between reflex action and walking? (A)
29. The folding up of leaves of sensitive plant (touch-me-not plant) on touching with a finger is not a tropism. Why? (MQP-2 2025) (A)
30. Observe the below figure. In this type of plants how does tendril contribute for the growth of plant parts that are away from the support? (D)



31. Which process takes place in the part labelled as K among the below given images of neuron? (A)



32. What is the role of the brain in reflex action? (A)
33. What are plant hormones? (E)
34. Which signals will get disrupted in case of a spinal cord injury? (A)

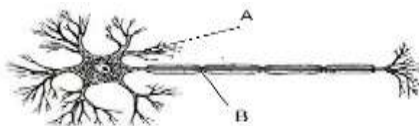
III. Answer the Following (TWO MARK QUESTIONS)

35. How does chemical coordination take place in animals? (A)
36. Write the differences in functioning methods between the nerve and hormones in animals for control and coordination. (A)
37. "Phototropism is beneficial for plants". Justify. (A)
38. What causes mouth-watering at the sight of delicious food? Which part of the brain controls this? (A)
39. Which of the following figures shows the correct tropic movements? Give reason (D)



40. Write two differences between the central nervous system and the peripheral nervous system. (MQP-1,25-26) (A)
41. Write two differences between the endocrine glands and the nervous system. (A)
42. How do auxins promote the growth of tendrils of climbing plants around a support? (Exam-1 2025) (A)
43. How does our body respond when adrenaline is secreted into the blood? (How does our body prepare to deal the situations of stress and anxiety? Explain. (A)
44. Mention two important plant hormones that help for the growth of the stem. Give an example for the hormone that stops the growth of the plant. (Mar/Apr-2026) (E)

45. What happens at the synapse between two neurons. (A)
46. How do we detect the smell of an incense stick? (A)
47. Why is the use of iodised salt advisable ? (A)
48. Why are some patients of diabetes treated by giving insulin injection? (A)
49. What is the function of receptors in our body? Think of situations where receptors do not work properly. What problems are likely to arise? (D)
50. How are involuntary actions and reflex actions different from each other? (A)
51. Observe the below given diagram of neuron. Answer the given questions. (D)

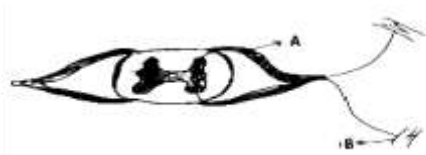


- i) Identify the part where information travels.
- ii) In which form does information travels?
52. Which hormone does farmer has to give to fruit trees in orchard to get more fruits? (D)
What is the function of that hormone?
53. Dwarfism-what is the reason for this person's state? Which part of the brain controls this? (A)
54. How is the action of heart beat different from reflex action? (A)
55. Name the glands that secrete the following hormones and mention the function of these hormones. (E)
i) Insulin
ii) Thyroxine
56. Name the hormones that control the following activities in humans. (E)
i) Control the level of sugar in the blood.
ii) Prepare the body to face the emergency situation
57. What is reflex arc? In many organisms reflex arcs are considered as efficient ways of functioning. Why? (A)
58. a) Name the prominent parts of reflex arc (E)
b) Which hormones are responsible for sexual maturation in humans?
59. Why does the stem of a growing plant bend towards the light? Explain (A)
(MQP-1,25-26)

IV. Answer the following questions (THREE MARKS QUESTIONS)

60. "Functioning of Reflex arc is more effective than thinking process of the brain." (D)
Clarify this statement with scientific reason.
61. In multicellular organisms, chemical communication is more stable and continuous. Compared to electrical Communication. Give reason. (A)
62. How is phototropism, thigmotropism and chemotropism coordinated in the apparent movement of creepers (climber plants) towards a particular direction? (D)
(MP-2 -2025)
63. Draw a diagram of the structure of the human brain and label the parts. (E)
(Exam-1, 2, 3 2025, Main 2023, March-2022, June 2020)
64. What is the role of insulin, oestrogen and thyroxine hormones in our body? (E)
(MQP-1-2025)
65. Imagine the following situations: (SUP-2019) (E)
i) Clapping at the end of a programme.

- ii) Fluctuating blood pressure in the body.
How these situations are functionally different? Give reason.
66. Mention the function of each part of the human brain given below: (E)
i) Cerebrum
ii) Cerebellum
iii) Medulla (MQP-2 2025) (APRIL-2026)
67. In a situation where we withdraw our leg when stepped on thorn unknowingly. (A)
Then
i) Write the sequences of the events that occur to give the response in this situation.
ii) Which part of the human nervous system controls this action?
(SUP-2019) (MQP-4,25-26)
68. Name the hormones that perform the following functions in humans (E)
i) Controlling the sugar levels in the blood.
ii) Prepare the body to deal with emergency situations
iii) Controlling the fats, proteins and carbohydrates metabolism. (MQP-1,25/26)
69. i) Name the structural and functional unit of nervous tissue. (E)
ii) Write the path of transmission of nerve impulses in this unit
iii) State its function.
- VI. Answer the following questions. (Four Mark Questions)**
70. What is reflex arc? Trace the sequence of events that occur in this structure, when a bright light is focused on our eyes. (E)
71. How is the movement of leaves of a touch me not plant different from the movement of a shoot towards light? (A)
72. Name the given structure. What is its general function? Mention the function of the parts labelled as A and B. (A)
(MAIN-2020)



Chapter 11 : Electricity

Curricular Goals	Competency	Learning Outcomes	Questions numbers
CG-2- Explores the physical world around them, and understands scientific principles and laws based on observations and analysis.	C-2.4- Analyses different characteristics of electric circuits (current, voltage, resistance) and mathematises their relationship (Ohm's law), and applies it to everyday life.(electricity bill,	11 Construct a simple electric circuit using proper symbols of electric components; Define various physical quantities related to electricity with their SI units; Analyze the relationship between voltage and current experimentally and identify the factors affecting resistance and solve various problems in daily life using the relationship; Arrange the resistors in series and parallel in an electric circuit; differentiate	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,19,20,21,22,24,26,30,32,35,36,37,38,39,40,42,43,44,45,47,48,49,50,51,52,68,69,72,78,82,83,84,89,90,93,96,97,99,101

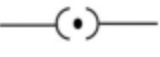
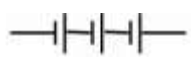
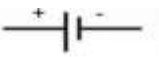
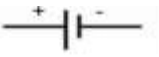
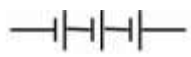
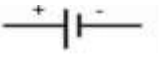
	short circuit, safety measures).	between them and calculate the total resistance in each case.	
		Explain the functioning of fuse and electric bulb; Define Joule's law of heating and apply the law in daily life situations; Calculate the consumption of electricity in daily life situations. Understand the symbols commonly used in electric circuits.	6,18,23,25,27,28,29,31,33,34,41,46,53,54,55,58,59,63,64,65,67,70,71,73,75,76,77,79,80,81,85,86,87,88,91,92,94,95,98,100,102,103,104
		21.Map various life processes integratedly, draw flow charts to depict certain biological sequences and processes, draw the structures of certain organs of the human body with labeling and certain structures of plants. Draw the arrangement of apparatus used in certain chemical experiment to learn properties of metals, non-metals as its bases including some chemical reactions. Develop the skill of drawing the ray diagrams to show the formation of image using lenses and mirrors; draw the symbols of electrical components, simple circuits, arrangement of resistance in different combinations, graphs etc	57,60,61,62,66

Weightage –Difficulty level:

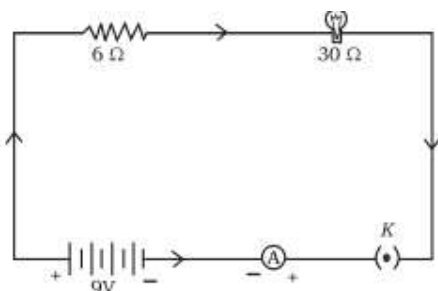
Difficulty level	No. of questions	Marks	%
Easy (E)	26	28	16
Average (A)	53	104	58
Difficulty (D)	25	45	26

I. Multiple Choice Questions. (One-mark questions.)

- The SI unit of Electric current (E)
A. Ampere (A) B. ohm (Ω) C. Volt (V) D. Watt (W)
- The SI unit of Power (E)
A. Ampere (A) B. ohm(Ω) C. Volt (V) D. Watt (W)

3. The property of the conductor that opposes the flow of charges through it is called (E)
 A. electric current B. electric potential difference
 C. electric resistance D. electric power
4. The Rate of flow of electric charges is called (E)
 A. Electric current B. Electric potential C. Electric resistance D. Electric power
5. The work done in bringing a unit charge from one point to another through a conductor is called (A)
 A. electric current B. electric potential C. electric resistance D. electric power
6. The Rate of consumption of energy is called (A)
 A. electric current B. electric potential difference
 C. electric resistance D. electric power
7. The symbol used to represent an Electric cell (A)
 A.  B.  C.  D. 
8. The symbol for closed key/switch in electric circuit (A)
 A.  B.  C.  D. 
9. The symbol used to represent a dry cell in a circuit (A)
 A.  B.  C.  D. 
10.  Symbol in electric circuit represents (A)
 A. resistor B. ammeter C. dry cell D. voltmeter
11. In an electric circuit, the ammeter and voltmeter are generally connected as follows: (A)
 A. both are connected in parallel
 B. both are connected in series
 C. ammeter in series & voltmeter in parallel
 D. ammeter in parallel & voltmeter in series
12. The formula that does not represent Ohm's law is: (A)
 A. $V/I = R$ B. $V = IR$ C. $I = V/R$ D. $V = I/R$
13. The net resistance when $2\ \Omega$ & $4\ \Omega$ resistors are connected in series, and then connected in parallel with another $4\ \Omega$ resistor, is: (D)
 A. $2\ \Omega$ B. $2.4\ \Omega$ C. $4\ \Omega$ D. $10\ \Omega$
14. A conductor has a resistance of $27\ \Omega$. If it is cut into three equal parts and these parts are connected in parallel, its total resistance is: (D)
 A. $6\ \Omega$ B. $3\ \Omega$ C. $9\ \Omega$ D. $27\ \Omega$
15. The net resistance when $2\ \Omega$ & $3\ \Omega$ resistors are connected in parallel and then connected in series with a $2\ \Omega$ resistor, is: (D)
 A. $3.2\ \Omega$ B. $2\ \Omega$ C. $3\ \Omega$ D. $1\ \Omega$
16. A piece of metallic wire of resistance R is cut into 3 equal parts. These parts are then connected in parallel. If the total resistance of this combination is R_1 , then the ratio $R : R_1$ is (D)
 (June-2019)
 A. 1:3 B. 1:9 C. 9:1 D. 3:1
17. In an electric circuit with a potential difference of 6 V, 24J of work is done, the amount of charge that flows is: (D)
 A. 2 C B. 4 C C. 6 C D. 10 C

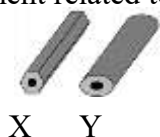
18. If a charge of 10C flows through an electric circuit with a potential difference of 4 V, the amount of work done is: (D)
 A. 10 J B. 20 J C. 40 J D. 30 J
19. An electric lamp with a resistance of $30\ \Omega$ and a conductor with a resistance of $6\ \Omega$ are connected in series to a 9 V battery, as shown in the figure. The total current flowing through the circuit is: (D)



- A. 4 A B. 36 A C. 0.25 A D. 0.6 A
20. In a conductor, if the electric current is 4 A when the resistance is $12\ \Omega$. what will the electric current is, if the resistance is doubled? (D)
 A. 2 A B. 3 A C. 4 A D. 8 A
21. The resistance of a conductor of length $4l$ is $4\ \Omega$, If its length changed to $2l$ its resistance will be: (D)
 A. $0.5\ \Omega$ B. $2\ \Omega$ C. $4\ \Omega$ D. $8\ \Omega$
22. The device used to measure potential difference is: (E)
 A. Galvanometer B. Ammeter C. Speedometer D. Voltmeter
23. The formula for electric power is: (E)
 A. $P=I R$ B. $VI= P$ C. $P = VR$ D. $VR =P$
24. Which of the following statements about resistance is correct? (D)
 A. directly proportional to potential difference but inversely proportional to current
 B. inversely proportional to potential difference but directly proportional to current
 C. inversely proportional to both potential difference and current
 D. directly proportional to both potential difference and current
25. The safety device used to prevent damage from a short circuit is a: (E)
 A. fuse B. switch C. resistor D. transistor
26. The formula used to measure electric current (A)
 A. $E=VIt$ B. $E=Pt$ C. $E=RCt$ D. $E=Vt$
27. The device used to change the resistance in an electric circuit is a: (E)
 A. Voltmeter B. Ammeter C. Galvanometer D. rheostat
28. 'Ohm' is the SI unit of (E)
 A. Electric Charge B. Resistance
 C. Electric Current D. Electric Potential Difference
29. The metal used in the filament of an electric bulb is: (E)
 A. Manganese B. Tungsten C. Nickel D. Chromium
30. The SI unit of electric potential difference is: (E)
 A. Volt B. Ampere C. Ohm D. Coulomb
31. An electric heater coil has a resistance of $110\ \Omega$ The electric current that the heater draws from a 220 V source is: (A)
 (Sep-2021)
 A. 0.5 A B. 0.11 A C. 2 A D. 3 A
32. The device connected in series in an electric circuit is: (E)
 A. Voltmeter B. Bar Magnet C. Turbine D. Ammeter
33. Based on the table above, the best conductor of electricity among these materials is: (D)

Material	Resistivity (Ωm)
K	2.63×10^{-8}
L	5.20×10^{-8}
M	1.60×10^{-8}
N	6.84×10^{-8}

- A. N B. M C. K D. L
34. The main function of a fuse in an electric circuit is to: (E)
 A. Reverses the direction of an electric current
 B. Shows the direction of motion of the electric current
 C. Measures the potential difference
 D. Protects the electrical appliances
35. The correct formula showing the relationship between potential difference, electric current, and resistance in an electric circuit is: (A)
 A. $I = V / R$ B. $I = VR$ C. $V = R I$ D. $R = I V$
36. The device used to measure the rate of electric current in a circuit is: (E)
 A. Ammeter B. Voltmeter C. Galvanometer D. Battery
37. The SI unit of resistivity is: (E)
 A. ohm B. volt C. watt D. ohm-metre.
38. Ohm's law gives the relationship between: (A)
 A. potential difference and electric charge B. potential difference and resistance
 C. electric current and potential difference D. electric current and electric power
39. In an electric circuit, to get an equivalent resistance R_s , four resistors of 2Ω each are first connected in series. Later, to get an equivalent resistance R_p the same resistors are connected in parallel. Then, the ratio of R_s / R_p is : (A)
 A. 16:1 B. 2:1 C. 4:1 D. 8:1
40. The SI unit of electric charge is: (E)
 A. Coulomb B. Ampere C. Joule D. Volt
41. The rate of energy consumed in an electric circuit is electric: (A)
 (A) current (B) potential difference
 (C) resistance (D) power
42. When three resistors of different resistances are connected in parallel, the quantity that remains the same across all resistors is: (A)
 (A) current (B) potential Difference
 (C) resistance (D) resistivity
43. The correct statement related to conductors X and Y given in the figures below is: (D)

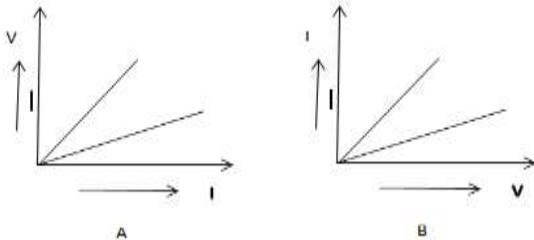


- (A) Since the cross-sectional area of conductor X is smaller, the flow of current in this conductor is greater.

- (B) The cross-sectional area of conductor Y is greater; hence, its resistance is higher.
 (C) Since the cross-sectional area of conductor X is small, it has a low resistance.
 (D) Conductor Y has a larger cross-sectional area than conductor X; hence, the flow of current in it is greater.

II. One-mark Questions:

44. Two connecting wires of the same length and diameter are made of copper and iron. Which of these two has greater resistance? Give a reason. (A)
 45. Two students, A and B, conduct an experiment connecting resistors R_1 and R_2 in series and parallel, and plot the V–I graph as shown below. Who plotted the graph correctly? (D)



46. How many joules are in 1 unit (1 kWh)? (E)
 47. Define 1 ohm (E)
 48. What is the meaning of 1 ampere? (E)
 49. How many electrons are in 1 coulomb (C) of charge? (E)
 50. The potential difference between two points in a connecting wire is 1 volt." Explain this statement. (E)
 51. What is the resistance of a conductor? (E)
 52. When does the resistance of a conductor become 1 Ω ? (E)
 53. Why are nitrogen and argon gases filled inside an electric bulb? (A)
 54. How is a fuse connected in an electric circuit? (E)
 55. Why are tungsten wires used in electric bulbs? (E)
 56. Write the symbols for the following terms in electric circuit. (A)
 i) A wire joint ii) electric bulb.
 57. Write the diagram of the symbol of resistors used in electric circuit. (A)
 58. Suggest any two measures to avoid overloading in domestic circuits. (A)
 59. What are the reasons for occurring overload in an electric circuit? (A)
 60. Write the symbols of the following components used in an electric circuit. (A)
 i) Rheostat ii) Wires crossing without joining
 61. Write the symbols of the following components used in an electric circuit. (A)
 i) Electric cell ii) Voltmeter
 62. Draw the symbol diagram of two electric cells connected in series in an electric circuit. (A)
 (MQP2-25)
 63. Can an electric heater of 2kW capacity be connected to an electric circuit of 15A rating, 220V potential difference? Justify your answer. (A)
 (Mar/Apr-2024)
 64. What happens if the fuse is connected to the neutral wire instead of connecting it to the live wire in the meter board of the house? (A)
 65. When the number of turns of a current carrying circular loop is increased by ten times what change that occurs in the magnetic field of it? (A)

III. Two marks Questions:

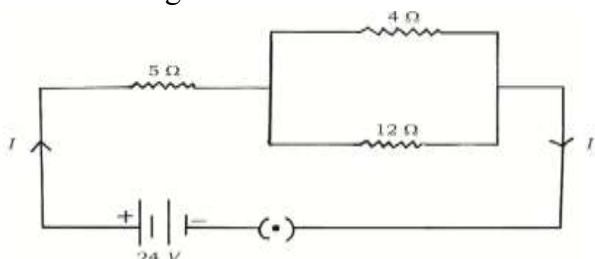
66. What is electric circuit? Write the schematic diagram of an electric circuit comprising cell, electric bulb, ammeter & plug key. (Main-2022) (E)
 67. In which of the below devices the electric energy is used maximum? (D)

Electric devices	Electric power	Time used
TV	250W	1 Hour
Toaster	1200W	10 Minutes

68. $2\ \Omega$, $3\ \Omega$ & $4\ \Omega$ resistors are connected in parallel & then in series. In which connection does their total resistance will be less than their resistance? (A)
69. $2\ \Omega$ and $4\ \Omega$ resistors are connected in parallel. If $6\ \Omega$ resistor is used in place of $4\ \Omega$, find the difference of total resistance of two types of connections. (D)
70. Resistivity of copper $1.63 \times 10^{-8}\ \Omega\text{m}$ & its cross section is $10.3 \times 10^{-5}\text{cm}^2$. Calculate the length of wire needed to make a coil of $10\ \Omega$ resistance. (A)
71. Electrical resistivity of some substances at 20°C is given below. (D)

Materials	Resistivity
Silver	$1.60 \times 10^{-8}\ \Omega\text{m}$
Copper	$1.63 \times 10^{-8}\ \Omega\text{m}$
Tungsten	$5.2 \times 10^{-8}\ \Omega\text{m}$
Nichrome	$100 \times 10^{-6}\ \Omega\text{m}$

- i) Among silver and copper which is the good conductor. Why?
- ii) Which material is suitable for electrical heating. Why?
72. Define electric resistance and resistivity. How are they interrelated? (A)
73. Explain the working mechanism of an electric bulb. (A)
74. In domestic electric circuit it is suitable to connect electrical devices in parallel. Mention two reasons for it. (A)
75. State Joule's law of heating. How fuse is connected in an electrical circuit. Mention the metal used in a filament of an electric bulb and the gas filled in the bulb. (E)
76. A bulb is marked $220\ \text{V}$ and $40\ \text{W}$. Calculate the current flowing through the bulb and its resistance. (A)
77. The resistivity of manganese wire of length $1\ \text{m}$ is $1.84 \times 10^{-2}\ \Omega\text{m}$ at 20°C . If the diameter of the wire is $3 \times 10^{-4}\ \text{m}$, what will be the resistance of the wire at that temperature? (D)
78. Observe the given circuit: (A)



Calculate the total resistance in the circuit and the total current flowing in the circuit.

79. $1000\ \text{J}$ of heat is produced each $2\ \text{seconds}$ in a $5\ \Omega$ resistor. Find the potential difference across the resistor. (D)
(JUNE-2023)
80. A wire of given material having length ' l ' and area of cross section ' A ' has a resistance of $4\ \Omega$. Find the resistance of another wire of the same material having length $\frac{1}{2}$ and area of cross-section ' $2A$ '. (D)
(JUNE-2023)
81. Placing a fuse in domestic electric circuits is essential. Why? Explain. (A)
(August-2024)
82. How much energy is supplied to each coulomb of charge passing through a 6V electric cell? (A)
83. When a thick wire or a thin wire of the same material is connected to a common source, through which wire does electricity flow more easily? And how? (A)

84. If the resistance of an electrical component is constant and the potential difference across its two terminals is reduced by half its previous value, what is the change in the current flowing through it? (D)
85. Why does the coil of an electric heater not glow red as heating elements do? (A)
86. What determines the rate of energy delivered by an electric current? (A)
87. Why are the elements of electric toasters and electric irons made of an alloy rather than a pure metal? (A)
88. Why are copper and aluminium wires forbidden from being used as internal heating elements in an electric room heater? (A)
89. Can you apply Ohm's law to electrolytes and gases? (A)
90. Why are electrical connections made tight? What happens if they are loose? (A)
91. A circuit breaks down internally because a component shorts out. What happens to the current in the remaining active parallel branches? (A)
92. Can you connect a fuse in parallel with an appliance? Why? (A)
- IV. Three marks questions:**
93. The value of resistors R_1 , R_2 & R_3 are $5\ \Omega$, $10\ \Omega$ & $30\ \Omega$. If they are connected to dry cell of 12V potential difference. Calculate (A)
- Electric current flowing through each resistor
 - Total electric current through circuit.
 - Total resistance of entire circuit.
94. A Refrigerator of 400 Watt works 10 hrs daily; an electric fan of 80 Watt works 6 hrs daily and an electric bulb of 18-Watt glows 6 hrs daily. If the rate of per unit is 3 rupees, then what is the amount of electric bill the owner has to pay in the month of June? (D)
95. Among iron, silver and nichrome which one is utilised inside an electric iron box which works on the heating effect of electric current. Justify your answer with 3 reasons. (A)
96. A connecting wire of $20\ \Omega$ resistance is drawn to double its length. Calculate the resistance in new situation. (D)
97. i) State ohm's law. (Mar / Apr-2025, Main-2024, Sep-2019) (E)
- List the factors on which the resistance of conductor depends.
98. State Joule's law of heating. Explain the working of electric filament bulb. (A)
99. The resistors R_1 , R_2 and R_3 have the values $10\ \Omega$, $20\ \Omega$ and $60\ \Omega$ respectively, which have been parallelly connected to a battery of 24 V in an electric circuit. Then calculate the following: (A)
- The current flowing through each resistor
 - The total current in the circuit
 - The total resistance of the circuit. (MARCH-2023)
100. Resistance of a metal wire of length 2 m is $28\ \Omega$ at 20°C . If the diameter of the wire is 0.04 mm, then what will be the resistivity of the metal at that temperature? (MQP4-25) (A)
- V. Four marks questions:**
101. a) A bread-toaster rated 350 W is used for 15 hours a day. An electric iron box rated 250 W is used for 5 hours a day. Calculate the cost of using these appliances for 30 days, if the cost of 1 kWh is Rs. 4. (A)
- b) In which method the resistors R_1 and R_2 could be connected so that the equivalent resistance of that electric circuit becomes low? What is the change in the value of current in the circuit by this type of connection? (JUNE-2023)
102. An electric heater connected to a 220 V generator draws a current of 10 A. What is the power of the electric heater? If it is used for 8 hours a day, then calculate the total cost of using it for 30 days at Rs. 5.00 per 1 kWh. (MQP1-25) (D)
103. Observe the following three unknown materials and their resistivities at 20°C : (D)

$$X = 1.6 \times 10^{-8} \Omega m$$

$$Y = 100 \times 10^{-6} \Omega m$$

$$Z = 10^{10} \times 10^{14} \Omega m$$

Analyse which material should be used for

(a) transmission wires

(b) the heating element of an electric iron

(c) the handle of a tester.

Justify your choice based on the relationship between resistivity and current flow

104. A cylindrical conductor of resistance is stretched so that its length is doubled while its volume remains constant. Analyse how the physical change affects both the area of cross-section and the total resistance. Calculate the ratio between the original resistance and the new resistance (D)

Chapter 12 : Magnetic Effects of Electric Current

Curricular Goals	Competency	Learning Outcomes	Questions numbers
CG-2- Explores the physical world around them, and understands scientific principles and laws based on observations and analysis.	C-2.4- Analyses different characteristics of electric circuits (current, voltage, resistance) and mathematizes their relationship (Ohm's law), and applies it to everyday life.(electricity bill, short circuit, safety measures).	13. Investigate the properties of magnetic field lines around a bar magnet/current carrying straight conductor/circular loop/solenoid experimentally using magnetic needle;	1,2,3,5,8,10,15,16,17,19,22,23,24,25,28,30,31,32,34,35,39,41,43,45,46,47,48,49,50
		14. Conduct experiments to show the magnetic effect of electric current and identify the direction of current and magnetic field using Right-Hand Thumb Rule; Prove experimentally that the current carrying conductor in a magnetic field experiences force and identify the direction of this force using Fleming's Left-Hand Rule; Explain domestic wiring and suggest safety measures to prevent overloading.	4,6,7,9,11,12,13,14,18,20,21,26,27,36,37,38,40,44,51,52,53,54,55,56,57
		21. Map various life processes integratedly, draw flow charts to depict certain biological sequences and processes, draw the structures of certain organs of the human body with labeling and certain structures of plants.	29,33,42

		Draw the arrangement of apparatus used in certain chemical experiment to learn properties of metals, non-metals as its bases including some chemical reactions. Develop the skill of drawing the ray diagrams to show the formation of image using lenses and mirrors; draw the symbols of electrical components, simple circuits, arrangement of resistance in different combinations, graphs etc	
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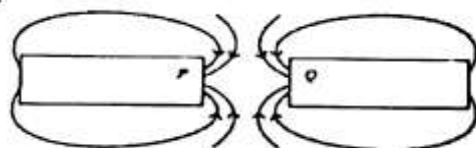
Weightage –Difficulty level:

Difficulty level	No. of questions	Marks	%
Easy (E)	19	26	27
Average (A)	27	48	50
Difficulty (D)	13	22	23

I. Multiple Choice Questions. (One-mark questions.)

1. Observe the given figure

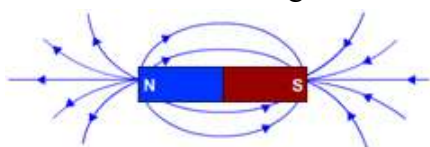
(E)



The magnetic poles represented by P and Q are

- A) South (S) and South (S) B) North (N) respectively and South (S)
 C) North (N) and North (N) D) South (S) and North (N)
2. Inside a solenoid, the magnetic lines of force are parallel straight lines. Therefore, the magnetic field inside the solenoid is (A)
 A) Very high B) Uniform
 C) Zero D) Caused by electric current.
3. Which of these is not a characteristic of magnetic lines of force? (A)
 A) Magnetic lines of force are dense near the poles.
 B) Magnetic lines of force are closed networks.
 C) Magnetic lines of force intersect each other.
 D) Magnetic lines of force are emitted at the north pole and merge at the south pole.
4. Assume that you are holding a straight conductor carrying current with your right thumb pointing upwards. Then the direction of the magnetic force lines of the magnetic field. (D)
 A) Downward. B) Upward. C) Anticlockwise. D) Clockwise.
5. The magnetic field inside a long straight solenoid carrying an electric current is (A)
 A) Downward and equal at all points

- B) Zero
C) Decreases as we move towards its end.
D) Increases as we move towards its end.
6. In Fleming's left-hand rule, the direction in which the middle finger points is (E)
A) Magnetic field B) Electric current
C) Motion of a conductor D) Induced electric current
7. A rod carrying an electric current is placed between the poles of a horseshoe magnet. The angle between the direction of the current and the direction of the magnetic field for the maximum displacement of the rod is (D)
A) 0° B) 45° C) 90° D) 180°
8. If the number of turns in a circular conductor carrying current is increased by 10 times, then the magnetic field produced increases by (D)
A) 100 times B) 10 times C) 20 times D) 1000 times
9. When a magnetic needle is brought near a current-carrying wire, it is deflected. The direction of deflection of the needle depends on (D)
A) Length of the conductor B) Amount of current in the conductor
C) Direction of current in the conductor D) Strength of the needle
10. If the density of magnetic lines of force is high, the strength of the magnetic field is (E)
A) High B) Low C) Neutral D) Zero
11. In Fleming's left-hand rule, the finger that represents the magnetic field is (E)
A) Index finger B) Thumb C) Middle finger D) Little finger
12. Safety method used to prevent damage caused by overload in domestic electrical appliances (A)
A) Providing earthing system B) Installing electrical transformers
C) Use of fuses D) Installing electricity meter
13. Which of the following electrical appliances is not suitable for use in circuits that allow 5A current to flow. (E)
A) Bulb B) Mixer C) Fan D) Geyser
14. In case of short circuit, the current in the circuit (A)
A) becomes very low. B) remains neutral
C) becomes very high. D) changes continuously
15. The part where the magnetic force is maximum in a bar magnet is (A)
A) At the N end B) At the S end C) Between N and S D) At both ends
16. Which of the following correctly describes the magnetic field around a long straight wire? (A)
A) The magnetic field consists of straight lines perpendicular to the wire.
B) The magnetic field consists of lines parallel to the wire.
C) The magnetic field consists of lines like rays emanating from the wire.
D) The wire is the centre of the concentric magnetic force lines of the magnetic field.
17. Which of the following conclusions does a student come to after observing the following picture (E)

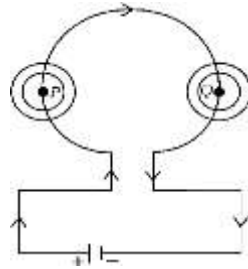


- A. Magnetic force lines are emitted at the north pole and merge at the south pole.
B. The strength of the magnetic field is greater when the density of magnetic lines is greater.
C. No two magnetic lines of force intersect each other
D. All of the above are correct
18. The magnetic field around a current carrying circular loop can be increased by (D)

- a) increasing the radius of the coil
- b) converting the coil into straight wire
- c) decreasing the radius of the coil
- d) reducing the amount of electric through the coil

II. Answer the following questions (One Mark)

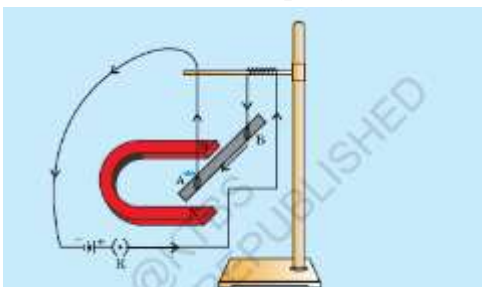
- 19. Why do magnetic lines of force not intersect each other? (A)
- 20. What is the cause of overload in an electrical circuit? (A)
- 21. What does the thumb indicate in the right-hand thumb rule? (E)
- 22. Write the characteristics of the magnetic lines of force around a solenoid carrying current. (E)
- 23. Observe the circuit diagram given below. State the direction of the magnetic field around the point P and around the point Q of the conducting wire. (D)



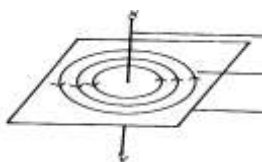
- 24. What is a magnetic field? (E)
- 25. What are magnetic lines of force? (E)
- 26. When does a current-carrying conductor experience a greater force when placed in a large magnetic field? (A)
- 27. Name some instruments using a current-carrying conductor and a magnetic field. (E)
- 28. Why does a compass needle move when brought near a bar magnet? (A)
- 29. Draw magnetic lines of force around a bar magnet. (A)
- 30. List two methods of producing a magnetic field. (A)
- 31. 'The magnetic field is equal at every point inside the solenoid.' Give reason. (A)
- 32. If a bar magnet is broken into two halves, what happens to its poles? (E)
- 33. How can you map the magnetic field lines of an unknown object practically? (E)
- 34. If the direction of current in a solenoid is reversed, what happens to its magnetic poles? (A)

III. Answer the following questions (Two marks)

- 35. State two properties of magnetic lines of force. (E)
- 36. What are the reasons for overload in an electrical circuit? (E)
- 37. Electrical appliances with a metal surface are connected to the earth wire. Why? (D)
- 38. Observe the figure and state the direction of the force acting on the current carrying wire AB. Name the law that helped you to know the direction of the force.



- 39. What is a solenoid? How can it be converted into an electromagnet? (E)
- 40. Observe the given picture and answer the questions given below. (A)

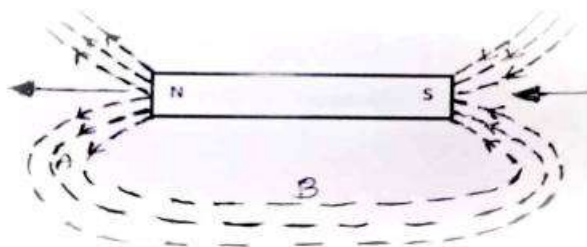


- i) Mention the direction of the electric current flowing in the conductor.
 ii) State the rule that helps in determining the direction of the electric current.

41. What are the methods of increasing the magnetic field in a solenoid? (E)
 42. Draw a diagram showing the magnetic lines of force around a straight conductor. Label the following. (A)
 A) Direction of magnetic lines of force B) Direction of electric current.
 43. List the magnetic lines of force and the characteristics of the magnetic field inside a solenoid. (E)
 44. A microwave oven with a current rating of 5A and a power of 2 KW is used in a domestic electrical circuit (220V). What effect would you expect? (D)
 45. Write the rules used to determine the directions of the following. (A)
 A) Magnetic field around a current-carrying straight conductor.
 B) Force experienced when a current-carrying straight conductor is placed perpendicular to the magnetic field.
 46. In the figure given below, are the poles marked as P and Q are the north pole or the south pole? Justify your answer. (D)



47. A student who observes the magnetic field lines around a bar magnet as shown in the figure below states that the magnetic field at point A is greater than that at point B. Is the student's statement correct? Justify your answer. (D)



48. One end of the bar magnet is brought near the south pole of a magnetic needle. Then this end of the magnetic needle deflects away from the end of the bar magnet. Name the pole of the bar magnet that has been directed towards the south pole of this magnetic needle. Give reason for your answer. (A)
 49. Can we use a copper wire as a replacement fuse wire? Justify. (A)

IV. Answer the following questions (Three Mark)

50. How do you identify the magnetic field lines around a bar magnet using a compass? Explain. (A)
 51. a) Which factor helps in determining the relative strength of a magnetic field? (E)
 b) State the right-hand thumb rule. Write any two characteristics of magnetic force lines.
 52. A uniform magnetic field is directed horizontally towards the north. A positive alpha-particle is projected towards the east. What is the direction of the magnetic force acting on the particle? (A)
 53. A circular coil is placed in the plane of a table and a current flow through it in a clockwise direction. What is the direction of the magnetic field inside and outside the coil? (D)
 54. An electron enters a uniform magnetic field at right angles to it. What is the direction of force acting on the electron? (A)
 55. How does the displacement of a current-carrying rod (placed in a magnetic field) get affected if (D)

(a) the current is increased, or (b) a stronger magnet is used?

IV. Answer the following questions (Four Marks)

56. Explain the function of the earthing wire. (A)

57. Explain an experiment to show that a conductor carrying an electric current experience a force when it is placed in a magnetic field. (A)

Chapter-3: Metals and Non-metals

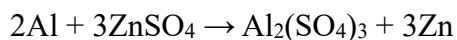
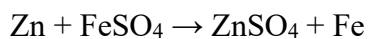
Curricular Goals	Competency	ಕಲಿಕಾ ಫಲಗಳು (Learning Outcomes)	Question No.
CG-1 -Explores the world of matter, its interactions, and properties at the atomic level.	C-1.3 - Describes and represents chemical reactions and changes using symbols and chemical equations (acid and base, metal and non-metal, reversible and irreversible).	7. Tabulate the physical properties of metals and non-metals; Identify the chemical properties of metals and non-metals by conducting demonstrations. Analyze the reasons for corrosion of metals and suggest the methods of its prevention.	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80.
		21. Map various life processes integratedly, draw flow charts to depict certain biological sequences and processes, draw the structures of certain organs of the human body with labeling and certain structures of plants. Draw the arrangement of apparatus used in certain chemical experiment to learn properties of metals, non-metals as its bases including some chemical reactions. Develop the skill of drawing the ray diagrams to show the formation of image using lenses and mirrors; draw the symbols of electrical components, simple circuits, arrangement of resistance in different combinations, graphs etc.	72

Weightage –Difficulty level:

Difficulty level	No. of questions	Marks	%
Easy (E)	25	45	30
Average (A)	35	60	50
Difficulty (D)	20	25	20

I. Multiple Choice Questions. (One-mark questions.)

- The group of reactants will give displacement reaction is E
 A. NaCl solution and copper metal B. MgCl₂ solution and aluminium metal
 C. FeSO₄ solution and silver metal D. AgNO₃ solution and copper metal.
- Food cans are coated with tin and not with Zinc. Because A
 A. Zinc is more expensive than tin
 B. The melting point of zinc is higher than that of tin.
 C. Zinc is more reactive than tin.
 D. Zinc is less reactive than tin.
- The gas released when metals react with an acid is A
 A. H₂ B. CO₂ C. SO₂ D. NO₂
- Copper reacts with moist carbon dioxide in the air to produce a green coat. The compound reason for this is A
 A. Copper carbonate B. Copper chloride C. Copper nitrate D. Copper oxide
- Observe the following equations and identify the correct statement. E
 $\text{CuSO}_4 + \text{Fe} \rightarrow \text{FeSO}_4 + \text{Cu}$
 $2\text{AgNO}_3 + \text{Cu} \rightarrow \text{Cu(NO}_3)_2 + 2\text{Ag}$
 A. Copper is more reactive than iron and silver.
 B. Iron is less reactive than copper and silver.
 C. Copper is more reactive than silver but less reactive than iron.
 D. Silver is more reactive than copper and iron.
- The electron configuration of element X is 2, 8, 8, 1 and the electron configuration of element Y is 2, 8, 7. Then the type of bond formed between these elements is A
 A. Covalent bond B. Metallic bond C. Hydrogen bond D. Ionic bond
- The correct order to write Al, Na, K, Ca, Mg metals in increasing order of their reactivity is A
 A. Al < Mg < Ca < Na < K B. K < Mg < Ca < Na < Al
 C. K < Na < Ca < Mg < Al D. Al < Na < Mg < Ca < K
- A process used to convert metal sulphide ores into their oxides is E
 A. Calcination B. Roasting C. Reduction D. Electrolysis
- A metal which displaces copper from copper sulphate solution is E
 A. Mercury B. Gold C. Iron D. Silver
- Observe the following chemical reactions A
 $\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$
 $\text{Zn} + \text{FeSO}_4 \rightarrow \text{ZnSO}_4 + \text{Fe}$
 The order of decreasing reactivity of the metals in the above reactions is
 A. Zn > Fe > Cu B. Fe > Cu > Zn C. Zn > Cu > Fe D. Cu > Fe > Zn
- Observe the equations of the following chemical reactions A
(JULY-2022)



The order of increasing reactivity of the metals in the above reactions is

- A. $\text{Fe} < \text{Zn} < \text{Al}$ B. $\text{Al} < \text{Zn} < \text{Fe}$ C. $\text{Zn} < \text{Fe} < \text{Al}$ D. $\text{Al} < \text{Fe} < \text{Zn}$

12. Aluminium, iron, magnesium and zinc metals are treated with concentrated hydrochloric acid. Write the reactivity of these metals in decreasing order. E

- A. $\text{Mg} > \text{Al} > \text{Zn} > \text{Fe}$ B. $\text{Al} > \text{Mg} > \text{Fe} > \text{Zn}$
C. $\text{Fe} > \text{Zn} > \text{Al} > \text{Mg}$ D. $\text{Fe} > \text{Mg} > \text{Zn} > \text{Al}$

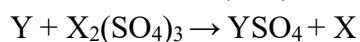
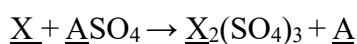
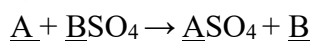
13. Possible chemical reaction in the following is (APR 2019) A

- A. $\text{FeSO}_4 + \text{Pb} \rightarrow \text{PbSO}_4 + \text{Fe}$ B. $\text{ZnSO}_4 + \text{Fe} \rightarrow \text{FeSO}_4 + \text{Zn}$
C. $2\text{AgNO}_3 + \text{Cu} \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{Ag}$ D. $\text{PbCl}_2 + \text{Cu} \rightarrow \text{CuCl}_2 + \text{Pb}$

14. The electron configurations of elements A, B and C are 2, 8, 2; 2, 8 and 2,8,7 respectively. Among these, the elements which react with each other to form an ionic compound are E

- A) Elements A and B B) Elements B and C
C) Elements A and C D) Elements A and C

15. The equations of displacement reactions involving the elements A, B, X and Y are given below. Analyse them. Among these elements the most reactive element is E



- (A) Y (B) A (C) X (D) B

15. For iron to be hard and strong A

- A) some carbon is added to pure iron
B) nothing is added to pure iron
C) ductility and malleability properties are given to pure iron
D) pure iron is obtained by reduction.

16. When dilute hydrochloric acid is added to a compound 'X', gas 'Y' is released. The gas 'Y' is passed through lime water, then a white precipitate forms. Here X and Y respectively are E

- (A) Sodium carbonate and Hydrogen
(B) Sodium hydrogen carbonate and Oxygen
(C) Sodium carbonate and Carbon dioxide
(D) Sodium hydrogen carbonate and Chlorine

17. The most ductile metal is A

- (A) Gold (B) Silver
(C) Copper (D) Iron

18. The silver materials exposed to the air will gain black surface after some time. The element responsible for this change is D

- (A) Oxygen (B) Sulphur
(C) Carbon di oxide (D) Nitrogen

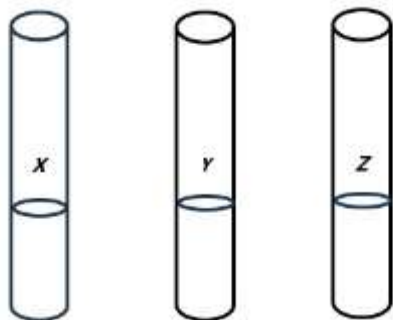
19. To make pure iron hard and strong (MAIN EXAM 2026) E

- (A) Combined with other metals (B) Anodisation will be done
(C) Zinc will be added (D) Carbon will be added in a definite proportion

20. The gas liberated when a reactive metal reacts with a dilute acid is D

- (A) H_2 (B) CO_2
(C) SO_2 (D) NO_2

21. Solutions of copper sulphate, ferrous sulphate and zinc sulphate are taken in X, Y and Z test tubes respectively as shown in the below figures. If the pieces of magnesium metal are added to each test tube then, this metal displaces A



- A) Only copper from copper sulphate solution
 B) Only iron from ferrous sulphate solution
 C) Both copper and iron from their solutions
 D) All the three metals from their solutions

22. Alloys that have different constituents are listed in the below table. An alloy that has a low melting point among these is

Components	Alloys
Fe, Ni and Cr	<i>p</i>
Cu and Zn	<i>q</i>
Cu and Sn	<i>r</i>
Pb and Sn	<i>s</i>

- (A) *p* (B) *q*
 (C) *r* (D) *s*

II. **Answer the following questions: (One-mark questions).**

22. Name two metals that react with highly concentrated nitric acid.
 23. Name the metals that are good and the poor conductors of heat.
 24. What is ductility of metals?
 25. What are ionic compounds?
 26. An iron ring needs to be plated with copper. How can this be done without using electricity?
 27. Name any two metals that do not corrode easily.
 29. What is an alloy?
 30. What is the chemical method used to obtain a metal from its oxide?
 31. Ionic compounds have high melting and boiling points. Why?
 32. What is roasting in metallurgy?
 33. What is calcination in metallurgy?
 34. Name two metals that react with very dilute nitric acid to liberate hydrogen gas.
 35. Name the following non-metals.
 i) The hardest natural substance.
 ii) A good conductor of electricity.
 36. If one of the component of an alloy is mercury. Then it is called as?
 37. Analyse the activity carefully that is expressed in the below figure. From this activity, how can NaCl be considered as an ionic compound?

A

E

E

E

E

A

A

A

E

A

E

E

A

A

A

A

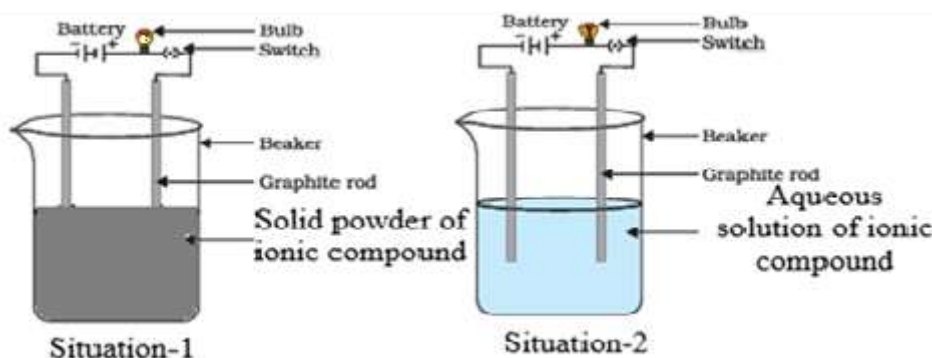


38. i) $X + \text{acid} \rightarrow X \text{ salt} + \text{water}$
 ii) $X + \text{base} \rightarrow X \text{ salt} + \text{water}$

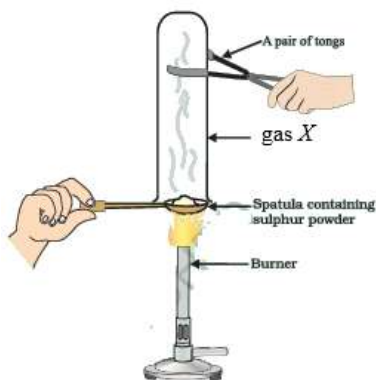
With the help of both the reactions above, predict the nature of X reactant.

III **Answer the following questions: (Two marks questions)**

39. What are amphoteric oxides? Give two examples. E
 40. What is a thermite reaction? Where is this reaction used? E
 41. $X + \text{acid} \rightarrow X \text{ salt} + \text{water}$; Decide which of the metals can be used as 'X' reactant to get the given products among magnesium, iron, copper and silver? Support your selection with suitable justifications. A
 42. What is malleability of metals? Name two most ductile metals. A
 43. Introspect both of the practical situations exhibited in the below diagrams. In which of these situations does current flow? Clarify the answer with reasons.

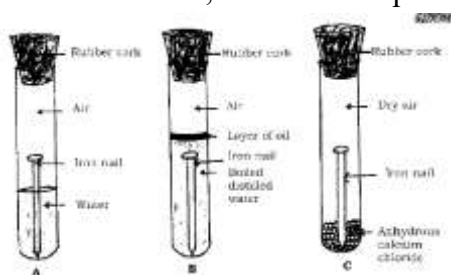


44. Observe the experiment shown in the following figure. Answer the question given below. A



- a) Name the gas X released here.
 b) Which product will be formed when this gas is dissolved in water?
 45. Which gas is released when concentrated hydrochloric acid is added to a reactive metal? Write the balanced chemical equation for the reaction of iron with concentrated hydrochloric acid. A

46. Write the balanced equation for the chemical reaction of aluminium oxide reacting with acid and base. **A**
47. Why does calcium metal do not ignite and burn even though it releases hydrogen gas when it reacts with water? Write its chemical equation. **A**
48. Name two metals that react quickly with cold water. Write the products formed when these metals react with cold water. **A**
49. Which physical properties of metals are used in the following situations? (April-2020) **A**
- Gold is used in making jewellery.
 - Nickel is used in guitar strings.
50. List any four physical properties of metals. (March-2025) **A**
51. List any four physical properties of non-metals. **A**
52. Name the metals that match the following physical properties. **A**
- It is liquid at room temperature.
 - It can be easily cut with a knife.
 - It is a good conductor of heat.
 - It is a poor conductor of heat.
53. Write chemical equations for the following reactions. (SUP EXAM,MQP2025) **A**
- Reaction of iron with steam
 - Reaction of calcium with water
54. Carbon cannot reduce oxides of metals like sodium, magnesium, aluminium. Why? Then how these metals are extracted from their ores? **A**
55. Write any four measures to be taken to prevent iron from rusting. **A**
56. What is galvanisation? How it is helpful in preventing rusting of iron? **A**
57. What are ores? Write the methods of converting metal sulphide and carbonate ores to metal oxides. **A**
58. Name the constituent elements of bronze and brass. **A**
59. Write two differences between calcination and roasting. **A**
60. Explain how mercury is reduced from cinnabar? **A**
61. Observe the test tubes A, B & C in the pictures given below. Answer the following questions. **A**



- In which test tube does iron nail rust?
 - The iron nails in the other two test tubes does not rust. Why?
62. Define the following. **A**
- Malleability of Metals
 - Sonorousness of metals
63. How do potassium and zinc metals react with water? Write a balanced chemical equation to represent action of water with potassium. **D**
64. Give reasons.
- Platinum, gold and silver are used to make jewellery.
 - Carbonate and sulphide ores are usually converted into oxides during the process of extraction.

65. Write any two differences between physical properties of metals and non-metals. **D**
66. Draw the diagram of arrangement of apparatus to show electrolytic refining of copper and label anode mud. **E**
67. Explain the extraction of copper from Cu_2S . **D**
68. Explain electrolytic refining of copper. **D**
69. Hydrogen gas is not evolved when a metal reacts with nitric acid. Why? Explain. **E**
70. How do Manganese and magnesium react with dilute nitric acid? Write the balanced chemical equations. **E**

IV. Answer the following questions (Three marks questions)

71. Give a scientific reason. **D**
- Ionic compounds at solid state do not conduct electricity.
 - Sodium, potassium and lithium metals are stored in kerosene.
 - Although aluminium is a reactive metal, yet it is used to make utensils of cooking.
72. Draw the diagram of arrangement of apparatus to show the action of steam on metal. Label the parts below: **E**
- Metal sample
 - Delivery tube
73. Write the steps of extraction of zinc from zinc sulphide and zinc carbonate. **A**
74. a) Why do copper vessels lose shine when exposed to moist air? **A**
- b) What substances are used at home to clean these vessels? How do they make the copper vessels shiny again?
75. a) Name any two metals that occur in a free state in nature. **E**
- b) Why are the ores of many metals found in the form of oxides?
- c) How is sodium extracted from sodium chloride? Explain.
76. Define the following terms. **E**
- Mineral
 - Ore
 - Gangue
77. Explain the formation of an ionic bond between magnesium and chlorine atom. **A**

V. Answer the following questions: Four marks questions.

78. Observe the results of the experimental activities given in the table below and answer the following questions. **D**

Metals	Iron sulphate	Copper sulphate	Zinc sulphate	Silver nitrate
A	No reaction	Displaces copper	No reaction	Displaces silver
B	No reaction	No reaction	No reaction	Displaces silver
C	Displaces iron	Displaces copper	No reaction	Displaces silver
D	No reaction	No reaction	No reaction	No reaction

- Identify the most reactive and less reactive metals. Justify your selection.
 - Write the metals in decreasing order of their reactivity.
79. Give reason: **A**
- Iron alloys are more useful than pure iron.
 - Copper is used for making electric circuits.
 - Solder is used to weld electric wires.

D. School bells are made of metals.

VI. Answer the following questions: (Five marks questions)

80. a) Draw the electron dot structure of sodium, oxygen and magnesium. A
 b) Show the formation of Na₂O and MgO by the transfer of electrons.
 81. a) Explain the formation of ionic bond between sodium and chlorine. A
 b) List any four general properties of ionic compounds. (JUNE-2022,MQP2025)

Chapter-4: Carbon and its compounds

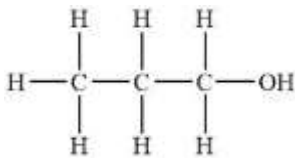
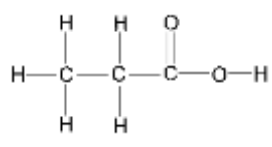
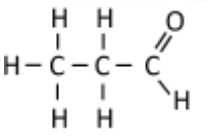
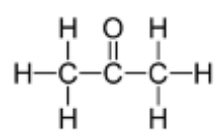
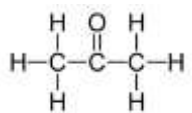
Curricular Goals	Competency	ಕಲಿಕಾ ಫಲಗಳು (Learning Outcomes)	Question No.
CG-1-Explores the world of matter, its interactions, and properties at the atomic level.	C-1.1- Describes classification of elements in the Periodic Table and explains how compounds (including carbon compounds) are formed based on atomic structure (Bohr's model) and properties (valency).	1. Explain the unique properties of carbon due to which various useful carbon compounds having different chemical properties are formed.	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,63,64,
		2. Develop the skills of drawing the structures and the naming of various carbon compounds with their molecular formula	18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,
		Compare/ Differentiate between soaps and detergents.	65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80

Weightage –Difficulty level:

Difficulty level	No. of questions	Marks	%
Easy (E)	25	45	30
Average (A)	43	76	50
Difficulty (D)	20	26	20

I. Multiple Choice Questions. (One-mark questions.)

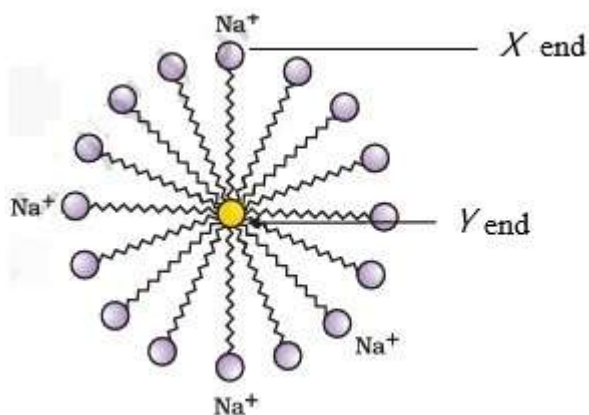
1. The number of valence electrons in carbon atom is E
 (A) 1 (B) 2 (C) 3 (D) 4
 2. A molecule is formed due to double bond between the atoms is A
 (A) Cl₂ (B) O₂ (C) N₂ (D) NH₃
 3. The major component of compressed natural gas is A
 (MQP2020-21, MAIN EXAM2021, SUP
 EXAM202)
 (A) propane (B) butane (C) methane (D) ethane

4. Carbon bonds with other carbon atoms to form large molecules. This unique property of carbon is (MQP2020-21,2024-25) E
 A. saponification B. catenation C. hydrogenation D. esterification
5. An unsaturated compound that has a triple bond between carbon atoms is A
 A. methane B. ethane C. ethene D. ethyne
6. Functional group present in butanol is A
 (A) -Cl or -Br (B) -OH (C) -CHO (D) -COOH
7. Structural formula of propanol is (MAIN EXAM 2021) A
 A)  B) 
 C)  D) 
8. Name of this compound is A

 A. propanone B. propanol C. propanal D. propanoic acid
9. The number of single bonds and double bonds present in a structure of benzene molecule respectively are (MQP2020-21, MAIN EXAM2021)
 A. 6 and 6 B. 9 and 3 C. 7 and 5 D. 3 and 9
10. The number of single bonds present in the structure of a cyclohexane is (MQP2020-2)
 A. 12 B. 18 C. 24 D. 6
11. The number of carbon and hydrogen atoms that are present in the molecule of fifth member of alkene is (MQP2024-25)
 A. five and ten B. five and twelve C. six and twelve D. six and six
12. The molecular formula for cyclohexane and hexane is (MQP2020-21, SUP EXAM2021)
 A. C₆H₁₂ B. C₆H₁₄ C. C₆H₁₀ D. C₆H₆
13. The difference found between any two successive members of homologous series of carbon compounds is
 A. CH₂ B. CH₄ C. C₂H₂ D. C₂H₄
14. The group which has carbon compounds that are in homologous series is (MQP2019-20, 2020-21)
 (A) CH₄, C₂H₄, C₃H₄ (B) CH₃OH, C₂H₅CHO, C₃H₇COOH
 (C) C₂H₂, C₂H₆, CH₄ (D) C₂H₂, C₃H₄, C₄H₆
15. The correct group having saturated hydrocarbons only is (MQP2020-21, SUP EXAM2021)
 A. methane, ethene, ethyne B. ethane, propane, butane

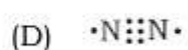
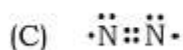
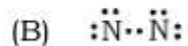
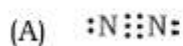
- C. ethyne, ethane, methane
D. ethyne, propene, butyne
16. General formula of alkyne is (MAIN EXAM 2021)
(A) C_nH_{2n-2} (B) C_nH_{2n+2} (C) C_nH_{2n} (D) C_nH_{2n+1}
17. The molecular formula of three carbon compounds which are in homologous series are C_2H_6 , C_3H_8 , C_4H_{10} . The suitable general formula for these compounds is (MAIN EXAM 2020)
(A) C_nH_{2n} (B) C_nH_{2n-1} (C) C_nH_{2n-2} (D) C_nH_{2n+2}
18. Organic compounds obtained by the reaction between carboxylic acid and alcohol (EXAM-1 2024)
A. aldehydes B. ketones C. esters D. halo-alkanes
19. An oxidising agent used to convert ethanol into ethanoic acid is
(A) $KMnO_4$ only (B) $K_2Cr_2O_7$ only
(C) $KMnO_4$ and $K_2Cr_2O_7$ (D) HNO_3 and CrO_3
20. Observe the table given below. The suitable compounds for the positions of P , Q , R and S are

Sl.No.	Alcohols	Carboxylic acids
First member	CH_3OH	P
Second Member	C_2H_5OH	Q
Third Member	C_3H_7OH	R
Fourth Member	C_4H_9OH	S

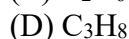
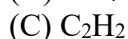
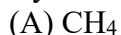
- (A) $HCOOH$, CH_3COOH , C_2H_5COOH and C_3H_7COOH
(B) C_3H_6O , C_4H_8O , $C_5H_{10}O$ and $C_6H_{12}O$
(C) CH_3CHO , C_2H_5CHO , C_3H_7CHO and C_4H_9CHO
(D) CH_3COOH , C_2H_5COOH , C_3H_7COOH and C_4H_9COOH
21. Observe the micelle structure of soap in water is given below in which X and Y are



- (A) Both are hydrophilic ends
(B) Both are hydrophobic ends
(C) The X end is the hydrophilic and the Y end is the hydrophobic
(D) The X end is the hydrophobic and the Y end is the hydrophilic
22. Correct statement related to the soaps among the following is, soaps (MAIN EXAM 2025)
(A) easily give excess of foam in hard water
(B) form insoluble precipitate in hard water
(C) easily clean oils like dirt in hard water
(D) are sodium salts of sulphonic acid
23. The correct electron dot structure of nitrogen molecule in the following is (SUP EXAM 2020)



24. Hydrocarbon which undergoes hydrogenation in the following is (MAIN EXAM 2020)



II. Answer the following questions (1 Mark each)

25. Write the electron dot structure of methane.

(MQP2022-23, EXAM-1 2024, 2025)

26. Mention the number of single bonds and double bonds present in the structure of $\text{C}_2\text{H}_5\text{COOH}$ molecule. (MQP2022-23)

27. Write the structural formula of ethene molecule.

(MAIN EXAM 2022)

28. Name the below given organic compounds

(MQP2024-25)



29. Write the structural formula of the ketone having three carbon atoms.

(MQP2024-25)

30. In a homologous series, if the first member of hydrocarbon group has the molecular formula of C_2H_4 , then find the molecular formula of fifth member. (MQP2024-25)

31. The first member of a group of carbon compounds is CH_3Cl . Write the molecular formula and name of the third member of this group.

32. Write the molecular and structural formula of benzene.

(MQP2024-25)

33. Hydrocarbon compounds are usually used as fuels. Why?

34. Addition reaction is used in hydrogenation of vegetable oils. Why?

35. Ethanoic acid known as glacial acetic acid. Why?

36. The solution of 5-8% acetic acid in water is called as?

37. Name the compound produced when ethanoic acid reacts with base.

38. What are detergents?

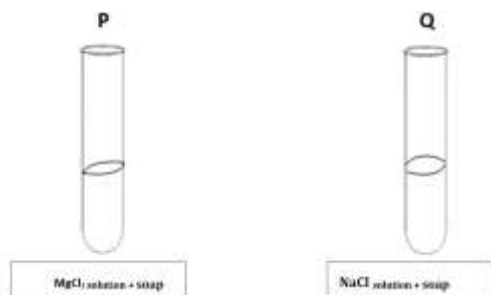
39. What is saponification?

40. What are micelles?

41. What are oxidising agents?

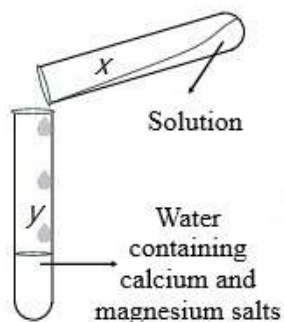
42. The molecular formulae of three carbon compounds that are in homologous series are C_2H_6 , C_3H_8 and C_4H_{10} . Then write the general formula for this homologous series.

43. An activity is conducted in the test tubes **P** and **Q** as shown in the below figures. Observe. In which test tube insoluble precipitate and in which test tube excessive foam will be formed? Determine.



44. Mention the number of single bonds and double bonds present in the structure of $\text{C}_3\text{H}_7\text{COOH}$ molecule

45. Observe the figure showing an activity. The liquid cleansing agent in test tube X is added by continuous stirring to water in test tube Y, the foam will be formed easily. Predict the cleansing material in test tube X.



46. What is an homologous series of carbon compounds?
47. What is the role of catalyst used in hydrogenation?
48. What is the role of $\text{con H}_2\text{SO}_4$ during the conversion of ethanol to ethene?
49. Write the name and structure of simplest hydrocarbon.
50. Which of the following hydrocarbons undergo addition reactions: C_2H_6 , C_3H_8 , C_3H_6 ಮತ್ತು C_2H_2 ?

51. Carbon is called as tetravalent. Why?

III. Answer the following questions (2 Marks each)

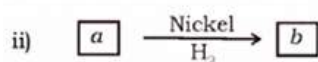
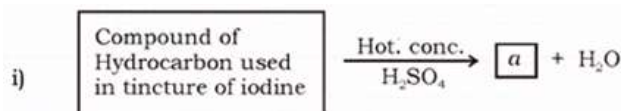
52. Give reason:
 - a) The melting and boiling point of covalent compounds are low.
 - b) Covalent compounds are generally poor conductors of electricity.
53. What is substitution reaction? Give an example.
54. What is an addition reaction? Give an example.
55. Write the two important factors that can be observed in carbon?
56. Explain the oxidation reaction of ethanol to ethanoic acid.
57. How ethanol is converted into ethene?
58. Give reason:
 - a) As the molecular mass increases in homologous series a gradation in physical properties are seen.
 - b) Chemical properties determined solely by the functional group remain similar in homologous series.
59. Write the electron dot structure of the following molecules:
(MQP2024-25)
 - i) Hydrogen
 - ii) Ethane
60. What are functional groups? Name the functional group present in propanal and propanol.
(MQP2024-25)
61. In a specific group of unsaturated hydrocarbons, though the ratio of carbon and hydrogen atoms is 1:2, CH_2 is not the first member of those hydrocarbons. What is the reason for this? Write the structural formula of the first member of that hydrocarbon group. (SUP EXAM-2017)
62. The molecular formula of the first member of a certain group of organic compounds is CH_2O (HCHO). Determine the name and the molecular formula of the third member of this group if the members of this group are in homologous series. What is the general name for this group of organic compounds? (MAIN EXAM-2018)
63. $\text{CH}_4 + \text{Cl}_2 \rightarrow \text{CH}_3\text{Cl} + \text{HCl}$ takes place in the presence of sunlight. Is this reaction an addition or substitution reaction. Justify your answer
64. What are alkynes? Name the first member of alkynes and write its molecular formula.

(SUP EXAM-2019)

65. Complete the equation by writing product X in the following reaction. Name this reaction.

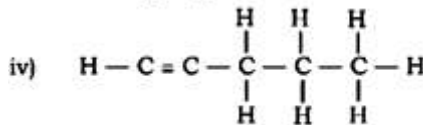
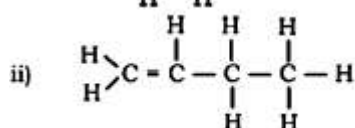
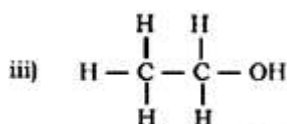
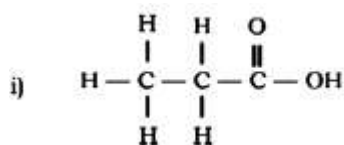


66. Observe the following chemical reactions. Answer the question below. (MQP2024-25)



Name 'a' and 'b' products. Identify saturated and unsaturated product in 'a' and 'b'.

67. Name the following carbon compounds. (MQP2023-24)



68. Write an activity to show the formation of ester. Explain how it can be detected?

69. Explain the reaction of ethanoic acid with sodium carbonate and sodium hydrogen carbonate using balanced chemical equations.

70. What is esterification? Mention two uses of esters. (MQP2024-25)

71. Write the molecular formula and structures of the following carbon compounds.

i) Chloro butane ii) Propanol

72. What is your observation in the following situations?

a) Ethene is subjected to addition reaction.

b) Methane is made to react with chlorine in the presence of UV rays.

73. Carbon compounds are found in extremely large number in nature. Why? Clarify.

74. What is catenation? Mention the different ways of catenation.

75. a) What is the product obtained when ethanol is heated with excess concentrated H₂SO₄ at 443K?

b) What happens if the product obtained in the above reaction undergoes an addition reaction?

76. What is hydrogenation? Mention its industrial application.

77. How can ethanol and ethanoic acid be differentiated on the basis of their physical and chemical properties?

78. Explain the formation of scum when hard water is treated with soap.

IV. Answer the following questions (3 Marks each)

79. What is the difference between the structures of hexane, cyclo-hexane and benzene? Depict your answer through writing structures of these compounds.

80. a) What are saturated carbon compounds? (MQP2023-24)

b) Define the following:

i) Homologous series

ii) Esters

81. What is covalent bond? Write any two properties of covalent compounds. (MQP2023-24)

82. a) How will you experimentally distinguish between an alcohol and a carboxylic acid?

b) Write any two differences between addition reaction and substitution reaction of carbon compounds.

83. What is the difference between the structures and molecular formulae of propane, propene and propyne? Depict your answer through writing their structures and molecular formula.

V. Answer the following questions (4 Marks each)

84. a) The conversion of ethanol to ethanoic acid is an oxidation reaction. Why?

b) What are structural isomers? Write the structural isomers of butane.

(MQP2022-23, 2024-25, SUP EXAM2020, MAIN EXAM2021, 2022, EXAM-1 2025)

85. a) Explain the mechanism of cleaning action of soaps. (MQP2024-25, SUP EXAM2019)

b) Which are the salts responsible for hardness of water? Detergents are effective even in hard water. Why?

86. a) Carbon atoms do not form C^{4-} anion and C^{4+} cation. Why? (MIAN EXAM2019, EXAM-1 2024)

b) List any two differences between soaps and detergents.

VI. Answer the following questions (5 Marks)

87. a) What are soaps?

b) What is the role of micelles in cleaning action? Explain.

c) How can the hardness of water be detected using detergents?

88. a) Write any two differences between saturated and unsaturated carbon compounds.

(MQP2024-25, MAIN EXAM 2017, 2019, SUP EXAM2022, EXAM-3 2024, EXAM-1 2025)

b) Write the molecular formula and structural formula for the following carbon compounds

i. propanoic acid ii. cyclohexane iii. pentane. (MQP2021-22, EXAM-3 2024)

Chapter 7: How do Organisms Reproduce?

Curricular Goals	Competency	Learning Outcomes	Question numbers
CG-3- Explores the structure and function of the living world at the cellular level.	C-3.2- Analyses similarities and differences in life processes involved in nutrition. They are, *Nutrition in plants (photosynthesis) *Absorption of nutrients in fungi *Digestion in animals), *Transportation of water and food in plants *Circulation in animals *Exchange of materials (respiration and excretion), Reproduction	18. Distinguish between asexual and sexual reproduction with examples; List different methods of asexual reproduction in different organisms; Explain the significance of DNA in the process of reproduction	1,2,3,4,5,6,7,8,9, 10, 11,12,13,14,15, 16,17,18, 19,20,21,22,23, 24,25,26,27, 28,29,30,31,33, 34,35,36,37, 39,40,41,42,43, 44,45,46,47, 48, 49,50,51,52,53, 54,55.

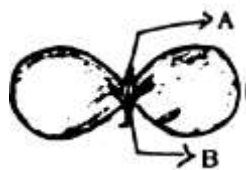
		21. Map various life processes integratedly, draw flow charts to depict certain biological sequences and processes, draw the structures of certain organs of the human body with labeling and certain structures of plants. Draw the arrangement of apparatus used in certain chemical experiment to learn properties of metals, non-metals as its bases including some chemical reactions. Develop the skill of drawing the ray diagrams to show the formation of image using lenses and mirrors; draw the symbols of electrical components, simple circuits, arrangement of resistance in different combinations, graphs etc.	32,38.
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Weightage –Difficulty level:

Difficulty level	No. of questions	Marks	%
Easy {E}	18	23	33%
Average {A}	28	71	51%
Difficulty {D}	09	14	16%

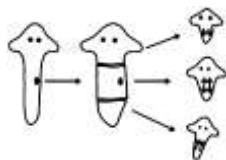
I. Multiple Choice Questions:

- The group of organisms that reproduce through fission only is (June-2019) (E)
 - Amoeba, Hydra, Spirogyra
 - Leishmania, Amoeba, Yeast
 - Amoeba, Plasmodium, Planaria
 - Plasmodium, Amoeba, Leishmania.
- In the given figure of Cotyledon the parts labelled as A and B respectively are (A) (April -2020)

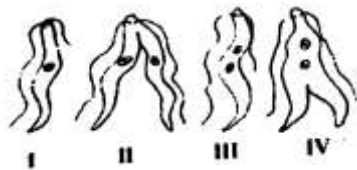


- fruit, shoot
 - primary shoot, primary root
 - secondary root, primary shoot
 - bud, leaf.
- The type of reproduction found in Spirogyra is (Sep-2020, April-2025) (E)
 - Budding
 - Fragmentation
 - Vegetative reproduction
 - Spore formation.

4. The common passage for both sperms and urine in human male reproductive system is (E)
(Jul-2021)
A. Urethra B. Ureter C. Vas deferens D. Urinary bladder
5. The correct sequence found in the process of sexual reproduction in a flower is (A)
(Jul-2021)
A. pollination, fertilization, seed, embryo
B. seed, embryo, fertilization, pollination
C. embryo, seed, pollination, fertilization
D. pollination, fertilization, embryo, seed
6. In the human female reproductive system, the egg is carried from ovary to the uterus through this part (E)
(Sep-2021)
A. cervix B. fallopian tube C. placenta D. vagina
7. A common bacterial infection that spreads through sexual contact in human beings is (E)
(Sep-2021)
A. Gonorrhoea B. AIDS C. Hepatitis-B D. Warts
8. In humans, sexually transmitted viral infection is (E)
(April-2022)
A. AIDS B. Syphilis C. Tuberculosis D. Gonorrhoea
9. The parts that develop into fruit and seed in a flower respectively are (E)
(Sep-2021, Jun-2022)
A. Stamen and ovary B. ovule and ovary
C. ovary and ovule D. stamen and ovule
10. In humans, the testes are located outside the lower abdomen in the scrotum because (A)
(March-2023)
A. to protect testes from mechanical shocks
B. to increase the production of sperms
C. to maintain the secretion of testosterone hormone
D. to maintain the temperature required for sperm production.
11. Biological process that has been shown in the diagram is (D)
(June-2023)

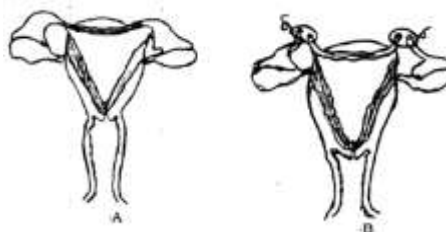


- A. production of progenies by fragmentation method
B. production of progenies by multiple fission method
C. regeneration of tissues by development in specialized cells
D. asexual reproduction by vegetative propagation.
12. The correct order of binary fission in Leishmania is (D)

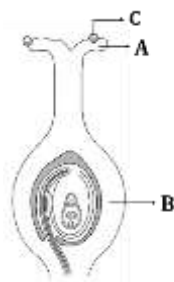


- A. II, III, IV, B. I, III, IV, II C. IV, I, III, II D. III, I, II, IV
13. AIDS : Virus :: Warts : _____ (E)
(March-2022)
A. Bacteria B. Fungus C. Protozoan D. Virus
14. Part of flower that develops into fruit and part of the seed that develops into root respectively are (E)
(March-2019)

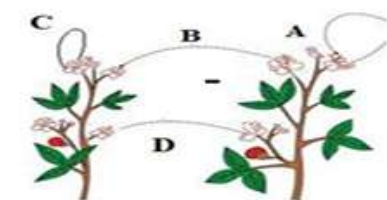
- A. Ovary and Plumule B. Plumule and radicle
C. Ovary and radicle D. Ovary and ovule
15. The process that occurs in the production of new individuals of planaria is (E)
(MQP-2024)
A. binary fission B. regeneration C. budding D. fragmentation
16. The embryo gets nutrition from the mother's blood with the help of special part called (A)
(March-2021)
A. Fallopian tube B. Ovary C. Uterus D. Placenta
17. Observe the structures of the female reproductive system given in Figure-A and (D)
Figure-B. The correct statement regarding these figures is (MQP-2025)



- A. Fertilization of the egg is possible in both the structures
B. Fertilization of the egg is possible only in the structure shown in Figure-B
C. Fertilization of the egg is possible only in the structure shown in Figure-A
D. Fertilization of the egg is not possible in both the structures
18. Observe the below given diagram. The type of tropic movement that helps the (D)
movement of C present on A towards B

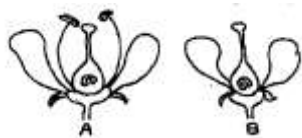


- A) Phototropism B) Geotropism C) Chemotropism D) Hydrotropism
19. A farmer wants to grow banana plants genetically similar enough to the plants already (D)
available in his field. Which one of the following methods would you suggest for this
purpose?
A) Regeneration B) Budding C) Vegetative propagation D) Sexual reproduction
20. The diagram shown below depicts pollination. Choose the options that will show a (D)
maximum variation in the offspring



- A) A, B and C B) B and D C) B, C and D D) A and C
21. An organism that reproduces by the method of budding (E)
A) Amoeba B) Hydra C) rhizopus D) planaria
22. Microbe that causes syphilis. (E)
A) bacteria B) virus C) fungus D) algae
- II. Answer the following questions. (One mark)**

23. Is self-pollination possible in flowers that have only stamens? Justify your answer. (A)
(S-2024)
24. Sexual reproduction causes more variation in organisms. Why? (A)
25. Among the flowers A and B which flower undergoes self-pollination?(May-2025) (A)



26. If a woman uses Copper-T, will it help protect her from sexually transmitted diseases? (A)
27. Drumstick plants are grown from the seeds and the stems separately. Which of these plants show variations and why? (A)
28. A type of amoeba has 30 chromosomes. Human parent cells have 23 pairs of chromosomes. Then how many chromosomes are found in the amoeba daughter cells and in the gametes that produce in the human body? (A)
29. Identify the group of plants that can be grown by vegetative propagation among the following: (A)
P: Rose, Jackfruit, Bryophyllum
Q: Money plant, Mustard, Watermelon
R: Banana, Rose, Hibiscus.
S: Papaya, Hibiscus, Mustard
30. Define Menstruation. (A)
31. How will an organism be benefitted if it reproduces through spores? (A)
32. Draw the diagram showing the germination of pollen on stigma. (E)
33. What is DNA replication? (E)

III. Answer the following questions (Two-mark questions)

34. How does germ cell receive half the amount of DNA? What is the need of this process? (A)
35. How can pregnancy be prevented using surgical methods of contraception in humans? (E)
(June-2020, Sept-2020)
36. How is pollination different from fertilization? Justify this statement. (D)
37. List out any two contraceptive methods with examples. (A)
38. Draw a labelled diagram of the longitudinal section of a flower. (A)
39. What are the changes seen in girls at the time of puberty? (A)
40. How does binary fission differ from multiple fission? (A)
41. How does reproduction help in providing stability to population of species? (A)

IV. Answer the following questions: (Three marks questions)

42. In sustaining reproductive fertility of a person, (A)
(a) position of the testis in the body
(b) secretion of the testosterone
(c) secretion of the prostate gland is supplementary to each other. Explain scientifically
43. A student assumes that an organism reproduces through spores. How would another student evaluate whether this statement is true or false? (D)
44. Name the following parts of the human male reproductive system: (E)
i) The organ that produces sperms.
ii) The part that serves as a common passage for both sperms and urine.
iii) The glands that secrete fluids to nourish the sperms.
45. Name the parts that perform following actions in human female reproductive system. (E)
i) produces eggs.

- ii) fertilization of eggs and sperm occurs
- iii) embryo is implanted.

V. Answer the following: (Four marks questions)

46. State the advantages of Vegetative reproduction. How it is favour for farmers in agricultural field? (A)

VI. Answer the following questions: (five marks)

47. a) How do daughter organisms produced in hydra, spirogyra and amoeba? Explain briefly (A)
 b) What are the changes that occur in flowers after fertilization?

OR

- a) Explain the important functions of
 i) Testis and
 ii) Seminal vesicle in male reproductive system
 b) How does a fertilized egg in a female develop into an embryo in the uterus? How does this embryo get nourishment in the mother's womb? Explain (MQP-3,25-26)
48. a) List any two methods of contraception that human beings usually follow. (A)
 b) How does menstrual cycle Occur? Explain
 c) Write any two differences between self and cross pollination. (Mar/April-2026, I)
49. a) Is surgical contraception a better method of contraception than physical (A)
 contraception? Justify your answer.
 b) List any four advantages of vegetative propagation.
 c) Write two examples for the organisms that reproduce by binary fission. (MQP-4,25-26)
50. a) Growth of thread-like structures along with the gradual spoilage of tomato can be (A)
 observed when a cut tomato is kept aside for four days. Interpret the causes for this change. (April-2019)
 b) In the human body, the testicles are located outside the abdomen in the scrotum. Why?
 c) How does the number of chromosomes rearrange in sexual reproduction?

OR

- a) How is the reproductive process different in Hydra and Planaria? Explain.
 b) How does a seed grow into future plant? (MQP-2,25-26)
51. a) "Reaching sexual maturity is a necessary event for mammals such as humans." (D)
 Justify this statement. (June-2023)
 b) What is the function of prostate gland in the human male reproductive system? (MQP-1,25-26)
52. a) Explain the structure and function of the female reproductive system in humans. (A)
 (SQP-2023)
 b) In which of the following situations more variations are observed among the progenies of next generation? Clarify your answer.
 a) When the mother amoeba cell produces the offsprings.
 b) When plant generations are produced through pollination.
53. a) What is pollination? Write any two differences between two types of pollination. (A)
 b) What changes occur in flower after fertilization?
54. a) What are the functions of testes in humans? (A)
 b) What changes are found among the boys at the time of sexual maturation?

- c) What happens if the egg is not fertilized in women? Explain
55. a) Testes are located in the lower abdomen in men . Why? Explain (A)
- b) Explain the role of placenta in the development of embryo.
- c) List any two differences between the methods of reproduction found in spirogyra and planaria

Chapter 8 : Heredity

Curricular Goals	Competency	Learning Outcomes	Question numbers
CG-3- Explores the structure and function of the living world at the cellular level.	C-3.3- Heredity: Describes the functional mechanism of DNA, genes, chromosomes in order to bring similarities and variations (as changes in the sequence of DNA).	19. Analyze the basic principle for causing similarities or variations among the progenies of successive generations and Mendel's contributions in this regard: State the role of father in deciding the sex of a child in humans and in other groups of organisms.	1,2,3,4,5,6,7,8,9,10, 11,12,13,14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26,27,28,29,30,31,32.
		21. Map various life processes integratedly, draw flow charts to depict certain biological sequences and processes, draw the structures of certain organs of the human body with labeling and certain structures of plants. Draw the arrangement of apparatus used in certain chemical experiment to learn properties of metals, non-metals as its bases including some chemical reactions. Develop the skill of drawing the ray diagrams	33,34,35,36,37,38,39, 40.41.

Weightage –Difficulty level:

Difficulty level	No. of questions	Marks	%
Easy (E)	12	12	29%
Average (A)	15	34	37%
Difficulty (D)	14	22	34%

I. Multiple choice questions

1. Biologist who is called 'father of modern genetics' is (E)
A) Mendeleev B) Gregor Mendel C) Lamarck D) Charles Darwin
2. The plants selected by Mendel for his experiment of inheritance is (E)
A) Rose B) Pea C) Hibiscus D) Sunflower
3. The phenomenon of transferring of the traits from one generation to the next generation is (E)
A) DNA replication B) Mutation C) Transportation D) Heredity
4. When a tall pea plant is crossed with a short pea plant, all the plants of the next generation are found to be tall. The correct conclusion can be drawn by this result is (E)
A) Only gene for tall trait inherited
B) gene for short trait is completely weak
C) genes for short traits may not be present.
D) genes for both the traits are neither dominant nor recessive
5. Tall pea plant bearing violet flower is crossed with short pea plant bearing white flower. All progeny of the next generation are having violet flowers and a half of them are having short stems. Then the genetic makeup of the tall plant can be depicted as (E)
(MAR-2023)
A) TTWW B) TTww C) ttww D) TtWw
6. If a trait is appeared among the progenies of many generations, then the trait must be (D)
(MQP 4 2025)
A) dominant trait B) recessive trait C) acquired trait D) intermediate trait

7. The information source for making proteins in the cells is (MAR-2025) (E)
 A) Nucleus B) Chromosome C) DNA D) Ribosome
8. Mendel used the following type of breeding technique to obtain second generation offsprings. (E)
 A) Self-pollination B) Cross-pollination
 C) Fragmentation D) Vegetative propagation
9. A pure pea plant producing round, yellow (RRYY) seeds is crossed with a pure pea plant producing wrinkled, green (rryy) seeds. Then the number of plants obtained with round, green seeds in the F₁ generation is (APRIL-2019) (D)
 A) 0 B) 1 C) 3 D) 9
10. If a round, green seed bearing pea plant (RRyy) is crossed with a wrinkled yellow seed bearing pea plant (rrYY), then the seeds produced in F₁ generation are (D)
 (MARCH 2021)
 A) Round and green seeds B) wrinkled and yellow seeds
 C) Round and yellow seeds D) wrinkled and green seeds
11. Pea plants with round seeds (RR) are crossed with pea plant with wrinkled seeds (rr). Percentage of plants with RR trait in F₁ generation is (MARCH 2024 A) (D)
 A) 25% B) 50% C) 30% D) 75%
12. Organisms that reproduce sexually are more likely to survive in their environment because, in sexual reproduction these organisms, (D)
 (A) do not produce any variations.
 (B) will have the maximum number of successful variations in the next generation.
 (C) will have the same body design in all generations.
 (D) will not have any errors during DNA replication.
13. If a pure tall pea plant is crossed with a pure dwarf pea plant, then the percentage of pea plants having tall trait in F₁ and F₂ generation respectively are (D)
 A) 25% ; 25% B) 50% ; 50%
 C) 75% ; 100% D) 100%, 75%

II. Answer the following questions (One-mark questions)

14. Observe the table below showing different forms of pea plants (Jun-2019) (A)

Seed colour	Flower position
Green (G)	Middle of stem (A)
Yellow (g)	Top of stem (a)

Write the indicator of the trait having green seeds and flowers at the top of the stem.

15. What is the sex of a child who received an X chromosome from the father? (E)
(JUNE 2022)
16. What is the phenotypic ratio and genotypic ratio of the plants obtained in Mendel's monohybrid cross? (E)
17. Is self-pollination possible in flowers with only stamens? Justify your answer. (D)
18. "In sexual reproduction, the copies of offspring that are completely identical to their parent organisms cannot be produced." Justify. (D)
(MQP 3 2025)
19. What is monohybrid cross? (E)
20. Write the differences between male sex chromosomes and female sex chromosomes in humans. (A)
(Apr-2019)
21. How is the equal genetic contribution of male and female parents ensured in the progeny during sexual reproduction? (A)
22. If a trait A exists in 10% of a population of an asexually reproducing species and a trait B exists in 60% of the same population. Which trait is likely to have arisen earlier? (D)
23. Define gene. (E)
24. A zygote is having 32 chromosomes then how many chromosomes could be there in the germ cells? (E)

III Answer the following questions: (Two marks)

25. How do Mendel's experiments show that 'parental traits are inherited independently among the progenies'? Explain briefly. (A)
26. (D)

Answer the given questions by observing the table below

F ₂ Generation / Gametes	B (black coloured dog)	b (white coloured dog)
B (black coloured dog)	BB	Bb
b (white coloured dog)	Bb	Bb

- a) What is the number of pure white dogs in the phenotypic ratio?
- b) Name the types of dogs found in the gene pattern.
27. a) What is dihybrid cross? What is the ratio of plants obtained in the F₂ generation of Mendel's dihybrid experiment? (A)
(APRIL-2022)
28. 'Variations appear more among the young ones produced by sexual reproduction than the young ones produced by asexual reproduction'. How? Explain. (D)
29. Why did Mendel choose pea plants in his experiments? (A)
30. How is the sex of young ones determined in the organisms like snails or tortoises? (A)

31. How does a gene determine a particular trait in an organism? Explain with an example. (A)

IV Answer the following questions (Three marks questions)

32. Mendel crossed plants with red flowers (RR) with plants with white flowers (rr) and produced offspring from them. Then the plants with red flowers obtained in the F₁ generation were different from the plants with red flowers of the parent generation. Why? Explain with reasons. (A)
(Sep-2020, MQP1 2025)

33. How do Mendel's experiments show that the traits can be dominant or recessive? (D)
(APRIL-2020, AUG-2024)

34. Round seed producing dominant pea plant is crossed with wrinkled seed producing recessive pea plant. Show the results obtained in the F₂ generation with the help of a checkerboard and write the genotypic ratio of the plants obtained here. (A)
(SEP 2020)

35. Tall stemmed, Yellow seeds producing (TTYy) pea plant is crossed with short stemmed, green seeds (ttyy) producing pea plant. Mention the types of plants obtained in the F₁ generation and write the ratio of the plant varieties. (D)

36. Read and analyse the statements listed below and answer the questions given. (D)

Statement 1: A Woman has blue eyes while her parents and brother have black eyes.

Statement 2: The woman's husband has black eyes while his mother has blue eyes and father has black eyes.

a) On the basis of the above given information is the blue eye colour a dominant or recessive trait? Justify your answer.

b) What is the possible genetic makeup of woman's brothers eye colour?

c) What is the possibility that the offspring of woman and her husband will have blue eyes? Also show the inheritance of the eye colour in the offspring with the help of a suitable flow chart.

37. a) Mendel crossed plants with red flowers (RR) with plants with white flowers (rr). Show the result obtained in the F₂ generation with the help of a checker board. (A)

b) How is the sex of the male child in humans is determined?

OR

How is the sex of baby girl will be determined? (MQP-1,25-26) (Mar/Apr-I,25-26)

38. a) A tall pea plant (TT) is crossed with a short pea plant (tt). Express the result obtained in the F₂ generation with the help of checkerboard and write the types of plants obtained. (A)
(APR-2022, JUNE-2022, MQP 1,4,2025)

OR

a) How is the sex of the child determined in humans? Explain. (Prep-3,25-26)

b) Write the differences between dominant and recessive inheritance characteristics.

39. Plants producing round yellow seeds (RrYy) are self-pollinated. Express the result obtained in the F₂ generation of dihybrid with the help of a checkerboard. State the types of plants obtained in the F₂ generation. (APRIL A 2020, JUNE-2023 MQP- 2025) **(A)**
40. Pea plants producing yellow (YY) seeds are crossed with pea plants with green (yy) seeds. Then write the checker board that shows the result obtained in F₂ generation. **(A)**

OR

Red flowering tall pea plants (TTRR) is hybridised with white flowering short pea plant (ttrr). Then write a checker board showing the results obtained in F₂ generation

(MQP-3&2,25-26)

41. Explain the law of independent assortment of traits with the help of Mendel's dihybridisation experiment **(A)**

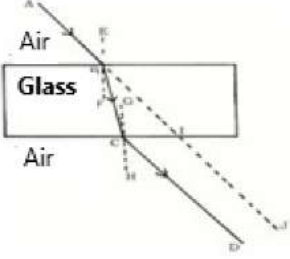
Chapter 9 : Light – Reflection and Refraction

Curricular Goals	Competency	Learning Outcomes	Questions numbers
CG-2- Explores the physical world around them, and understands scientific principles and laws based on observations and analysis.	C-2.3- Manipulates the position of the objects and the properties of lenses (focus, centre of curvature) to observe image characteristics and correspondence with ray diagrams of the images and extends this for understanding different applications of lenses.	8.Explain the phenomenon of reflection of light in spherical mirrors and observe the image formation in concave and convex mirrors practically by writing ray diagrams and also use concave and convex mirrors in daily life situations; Solve various problems based on mirror formula.	1,3,10,12,13,14,16,17,18,27,28,30,31,36,37,40,41,42,43,44,45,46,50,56,61,67,68,69,71,73,76,79,84,86,90,97,99,102
		9.Explain the phenomenon of refraction of light by citing various examples from daily life, and observe the image formation in concave and convex lens practically by writing ray diagrams; Solve various problems based on lens formula.	2,4,5,6,7,8,9,11,15,19,20,21,22,23,24,25,26,29,31,33,34,35,38,39,47,48,49,51,52,53,54,55,57,58,60,62,63,64,65,66,70,72,74,75,77,78,80,81,82,83,88,89,98,100,102
		21.Map various life processes integratedly, draw flow charts to depict certain biological sequences and processes, draw the structures of certain organs of the human body with labeling and certain structures of plants.	28,59,85,87,91,92,93,94,95,96,101

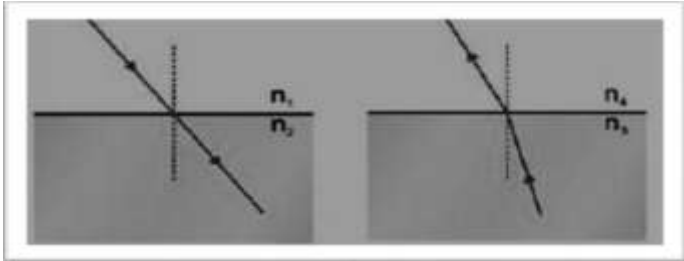
		Draw the arrangement of apparatus used in certain chemical experiment to learn properties of metals, non-metals as its bases including some chemical reactions. Develop the skill of drawing the ray diagrams to show the formation of image using lenses and mirrors; draw the symbols of electrical components, simple circuits, arrangement of resistance in different combinations, graphs etc	
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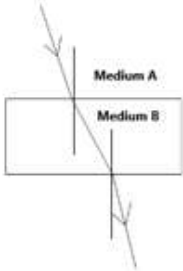
Weightage –Difficulty level:

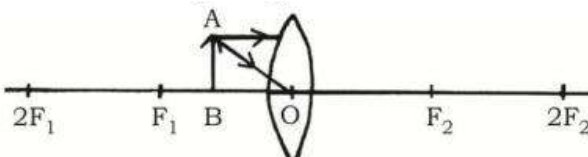
Difficulty level	No. of questions	Marks	%
Easy (E)	30	42	24
Average (A)	46	91	53
Difficulty (D)	27	39	23

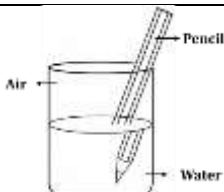
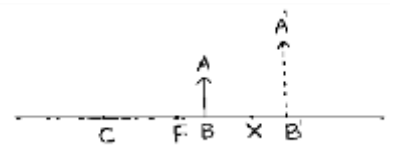
I.	Four alternatives are given for each of the following questions or incomplete statements. Choose the correct alternative and write the complete answer along with its letter of alphabet.	
1.	In order to obtain an image smaller than the object in a concave mirror, the object should be placed. (April-2019) (F=principal confluence, C=centre of curvature, P=pole) A) Between C and F B) Far from C C) Between P and F. D) At F₂.	(A)
2.	Identify the emergent ray in this image. (June-2019)  A) CD B) BC C) AB D) IJ	(D)
3.	An object is placed in front of a concave mirror at the centre of curvature, what is the position and nature of the image formed? (April-2020) (A) Between F and C and inverted (B) Behind the mirror and erect	(A)

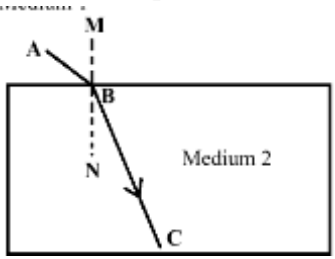
	(C) Between F and P and erect (D) At the centre of curvature and inverted											
4.	The convergence distance of a lens is +0.50m. Then the power and type of the lens are. (Apr- 2020) (A) +2.0 D and a convex lens (B) +2.0 D and a concave lens (C) -2.0 D and a concave lens (D) -2.0 D and a convex lens	(D)										
5.	The nature and size of the image formed when an object is placed between the principal focus F_1 and the focal point O of a convex lens is (APRIL-2021) (A) virtual, erect and large. (B) Real, inverted and small. (C) Virtual, inverted and small. (D) Real, inverted and large.	(D)										
6.	Observe the table below. <table border="1"><thead><tr><th>Material Medium</th><th>Refractive index</th></tr></thead><tbody><tr><td>P</td><td>1.52</td></tr><tr><td>Q</td><td>1.44</td></tr><tr><td>R</td><td>2.42</td></tr><tr><td>S</td><td>1.33</td></tr></tbody></table> In which material medium the velocity of light is high? A) Q B) P C) S D) R	Material Medium	Refractive index	P	1.52	Q	1.44	R	2.42	S	1.33	(A)
Material Medium	Refractive index											
P	1.52											
Q	1.44											
R	2.42											
S	1.33											
7.	Which of the following is a property of a convex lens? (APRIL 2021) (A) Diverged light rays (B) Thick at the edges and thin in the middle (C) Produces a real and erect image (D) Thin at the edges and thick in the middle.	(E)										
8.	To obtain a small and real image of an object from a concave lens, the object should be placed (MARCH 2022) (A) At the principal focus F_1 (B) Between the principal focus F_1 and $2F_1$ (C) Beyond $2F_1$ (D) Between the principal focus F_1 and the focal point O	(A)										
9.	Which of the following is the correct statement regarding your lens? (JUNE 2022) (A) Converges light rays. (B) Diverges light rays. (C) Produces inverted image (D) Produces real image	(A)										
10.	A mirror produces erect and enlarged image of an object. Then the type of that mirror and the nature of that image is (JUNE-2023) (A) Concave mirror and virtual image (B) Convex mirror and real image (C) Plane mirror and real image (D) Convex mirror and virtual image											
11.	If a ray of light enters a rarer medium from a denser medium, then the speed of that ray of light (MARCH-2023) A) Decreases and bends towards the normal B) Increases and bends away from the normal C) Decreases and bends away from the normal D) Increases and bends towards the normal	(D)										
12.	Type of mirror used in the rear-view mirror of a vehicle is (AUGUST-2024) (A) Plane mirror (B) Convex mirror (C) Concave mirror (D) Plane Concave mirror	(E)										

13.	Convex mirrors are used in. A) Torches C) Inspection lamps	(B) Rear view mirrors of vehicles (D) Shaving mirrors	(APRIL -2025)	(E)				
14.	The reflecting surface of a spherical mirror is A) Centre of curvature C) Radius of curvature	B) Pole D) Aperture	(MQP -1)	(E)				
15.	Which of the following is the correct statement regarding a concave lens A) Converges light rays. C) Produces an inverted image	B) Diverges light rays. D) Produces a real image	(JUNE 2022)	(A)				
16.	The distance between the principal focus and the focal point of the lens is A) Radius of curvature C) Object distance	B) Focal length D) Image distance		(A)				
17.	The image formed by the concave mirror is virtual, real and larger than an object. Then the position of the object is A) At C B) Between C and F C) At F D) Between F and O			(D)				
18.	The relationship between the centre of curvature and the principal focus distance is A) $R=2f$ B) $R=1/2f$ C) $f=2R$ D) $f=2/3R$			(A)				
19.	The SI unit of power of the lens is A) Meter B) Dioptre C) Ohm D) Centimetre			(E)				
20.	The power of the lens prescribed by the ophthalmologist for vision correction is +2D. Then the focal distance of that lens is A) 2 m. B) 0.2m C) 0.50m D) 5m			{A }				
21.	The object distance and the image distance of an object placed in front of a lens are -60 cm and -20 cm respectively. Then the magnification of the image is A) -0.33 B) +3.0 C) +0.33 D) +4.0			(A)				
22.	The refractive index of some media is given. In which medium the speed of light is minimum and maximum respectively <table border="1"><tr><td>K -1.62</td><td>L -1.81</td><td>M -1.94</td><td>N- 2.43</td></tr></table> A) K and N B) N and K C) N and L D) M and N	K -1.62	L -1.81	M -1.94	N- 2.43			(D)
K -1.62	L -1.81	M -1.94	N- 2.43					
23.	Which of the following is correct regarding the optical density of the transparent media in the figure below?  A) $n_1 = n_2$ & $n_3 > n_4$ C) $n_1 = n_2$ & $n_3 < n_4$ B) $n_1 > n_2$ & $n_3 > n_4$ D) $n_1 = n_2$ & $n_3 = n_4$			(D)				
24.	The focal lengths of 4 convex lenses P, Q, R and S are 20 cm, 15 cm, 5 cm and 10 cm respectively. The lens with the highest power is A) Q B) P C) R D) S			(D)				
25.	The position of an object that produces the image obtained at infinity in a convex lens is A) Beyond $2F_1$ C) At F_1 B) Between $2F_1$ and F_1 D) Between F_1 and O			(D)				

26.	In the process of refraction of light, the angle between the incident ray and the perpendicular drawn to the point of incidence is 40° but the angle between the reflected ray and the mirror surface is A) 40° B) 50° C) 60° D) 90°	(D)
27.	If a spherical mirror with a focal length of 30 cm is to be considered for an experiment, its aperture should be A) 30 cm B) 40 cm C) 60 cm D) 25 cm	(D)
28.	A student is standing in front of a plane mirror at a distance of 2 m. The distance between the student and his image is A) 2 m. B) 3 m. C) 4 m. D) 6 m.	(D)
29.	 The correct statement regarding the above image is A) The speed of light is higher in medium A. B) The speed of light is higher in medium B C) A is optically rarer medium D) B is optically denser medium	(E)
30.	The image of the English letter L in a concave mirror looks like this. (September-2020) (A)  (C)  (B)  (D) 	(A)
31.	The magnification of the image formed by a mirror is 1.73 then the nature of this image is (MQP 3) (A) Real and enlarged (B) Real and diminished (C) Virtual and enlarged (D) virtual and diminished	(D)
32.	The power of a lens is - 2.5 D. Then the focal length and type of the lens are. (SUP 2021) (A) + 0.40 m and convex lens (B) - 0.40 m and convex lens (C) + 0.40 m and concave lens (D) - 0.40 m and concave lens	(D)
33.	Which of the following is a property of concave lens (SUP 2021) (A) Converges light rays (B) Thick at the edges and thin in the middle (C) Thin at the edges and thick in the middle. (D) produces a real and inverted image	(A)
34.	The focal length of a lens is + 0.50 m Then the power and type of the lens is (MAR-2021) (A) + 2.0 D and convex lens (B) + 2.0 D and concave lens (C) - 2.0 D and concave lens (D) - 20 D and convex lens	(A)
35.	To obtain a real image of the same size of an object from a convex lens an object is to be placed at the position of	(A)

	(A) At F_1 (C) Between F_1 and $2F_1$	(B) At $2F_1$ (D) Beyond $2F_1$	
II.	Answer the following questions. (1-mark questions)		
36.	Why is a convex mirror generally used as a rear-view mirror of vehicles? (April-2019)		(E)
37.	What is the centre of curvature of a spherical mirror? (June-2019)		(E)
38.	Observe the given incomplete diagram and complete the diagram by drawing the rays of refraction and show the image formed. (September-2020)		(A)
			
39.	Find the power of a convex lens with a focal length of + 0.5 m. (JUNE 2022)		(A)
40.	Find the radius of curvature of a spherical mirror whose focal length is 25 cm. (MQP 2)		(A)
41.	What is reflection of light?		(E)
42.	What is lateral inversion?		(E)
43.	What are spherical mirrors?		(E)
44.	Define the principal focus of a concave mirror.		(E)
45.	Define the principal focus of a convex mirror.		(E)
46.	What is an aperture of a spherical mirror?		(E)
47.	What is Refractive index? Write the formula to find the focal length of a mirror.		(E)
48.	When light passes through two different media having the same refractive index, it does not undergo refraction. Why?		(E)
49.	In the experiment on refraction of light from a rectangular glass slab, the incident ray and the emergent ray are parallel. Why?		(D)
50.	How does the position of the image change as an object is brought from an infinite distance to pole of a mirror in convex mirror?		{A }
51.	What is the principal focus of a convex lens?		(E)
52.	What is the principal focus of a concave lens?		(E)
53.	Same quantity of light is incident on two convex lenses A and B with focal lengths 10 cm and 30 cm respectively. The light becomes more convergent in which of these lenses? Justify your answer.		(D)
54.	The refractive indices of the media A and B are $n_A = 1.36$ and $n_B = 1.65$ respectively. Then in which of the medium the speed of light is more? Justify your answer.		(D)
55.	Define 1 dioptre of power of a lens.		(E)
III.	Answer the following questions. (2 marks questions)		
56.	State the two laws of reflection of light.		(E)
57.	The focal distance of a concave lens is 30 cm. How far should the object be placed from the lens so that the image is formed at a distance of 20 cm from the lens? Find the magnification produced by the lens. (April-2019/June 2019)		(A)
58.	An object is placed perpendicular to principal axis of a convex lens of focal length 40cm. If the distance of image is to be 80cm, then at what distance the object is to be placed from the lens?		(A)
59.	Draw the diagram of the image formed when an object is placed at the following positions of a convex lens.		(A)

	i) Between F_1 and $2F_1$ ii) When placed at $2F_1$	(June 2019)	
60.	The object distance and image distance of a lens are -30cm and -10cm respectively. Find the magnification and determine the type of lens used and the nature of the image.	(D)	
61.	An object is placed 25 cm in front of a mirror with a focal length of 15cm. How far should the screen be raised from the mirror to obtain a clear image?	(D)	
62.	How far should the object be placed from the concave lens having focal length of 30cm, so that the image is formed at a distance of 10 cm from the lens.	(A)	(March-2022)
63.	Light is entering benzene from air with refractive index of 1.50. Calculate the speed of light in benzene. (Speed of light in air: 3×10^8 m/s)	(D)	(MARCH-2023)
64.	A concave lens of focal length 12cm. How far should the object be placed from the lens so that the image is 9cm away from the lens?	(D)	
65.	Define the following with respect to a lens: i) Focal point ii) Aperture	(E)	
66.	What is the refraction of light? State Snell's law of refraction.	(E)	(JUNE-2022)
67.	Write any two differences between a convex mirror and concave mirrors.	(A)	(JUNE-2022)
68.	What are spherical mirrors? Write its 2 types.	(E)	
69.	List the uses of concave mirror.	(E)	
70.	Write any two differences between a convex lens and a concave lens.	(E)	
71.	Write the difference between real and virtual images?	(E)	
72.	The refractive index of ice is 1.31 and the refractive index of water is 1.33. In which of the two media does light travel faster?	(A)	
73.	State two rays that can be considered to determine the position of the reflection while drawing diagrams of reflections caused by spherical mirrors.	(E)	
74.	Why does a pencil partially immersed in water appear to be displaced? What is the name of this phenomenon?	(A)	
75.	Draw any two rays that can be considered while drawing diagrams of reflections caused by convex lenses.	(E)	
76.	Write the nature of image formed by a plane mirror.	(E)	
77.	The ratio between the refractive indices of two transparent media P and Q is 1.82 and the speed of light in medium Q is 2.25×10^8 m./s. Then find out the speed of light in medium P. (Speed of light in air $C = 3 \times 10^8$ ms ⁻¹)	(D)	
78.	 Observe the above figure. Name the phenomenon responsible for the pencil to appear as shown in the figure at the interface of air and water. What is the cause for this phenomenon.	(D)	
79.	a) Which mirror is to be at the position X in the ray diagram given below? b) Write the nature and the position of the image formed if the object BA is placed between C and F.  kept	(D)	
80.	The magnification produced by a plane mirror is +1. What does this mean?	(A)	

81.	Find the power of a concave lens of focal length 2 m.	(A)
82.	Find the focal length of a lens of power -2.0 D. What type of lens is this?	(A)
83.	A doctor has prescribed a corrective lens of power +1.5 D. Find the focal length of the lens. Is the prescribed lens diverging or converging?	(A)
IV.	Answer the following questions. (Three marks questions)	
84.	The magnification of the image formed by a spherical mirror is -1. If this mirror forms an image of an object at a distance of 50 cm. i) What is the type of mirror? ii) At what distance is the object placed? iii) State the nature and size of the image.	(A)
85.	Draw a diagram of the image formed when an object is placed at the following positions of a convex lens. i) At the principal focus F_1 . ii) beyond $2F_1$	(JUNE-2019) (JUNE-2023/MAR-2023)
86.	An object is placed on the principal axis in front of concave mirror with a focal distance of 12cm. If the object is 18cm away from the mirror, calculate the distance of the image formed and determine the nature of the image by finding the magnification caused by the mirror. APRIL 2020	(D)
87.	Draw a diagram of the image formed when an object is placed at the following positions of a convex lens. i) Between F_1 and $2F_1$	(E) (APRIL 2020)
88.	A doctor has prescribed a corrective lens of power -0.5 D to a person. Find the focal distance of the lens. Is it a converging lens? or a diverging lens? Give a reason. How is this property of the lens used in correcting eye defects?	(A) (APRIL 2020)
89.	a) Explain the laws of refraction of light. b) In the given figure, AB is the incident ray, BC is the curved ray and MN is the perpendicular drawn at the point of incidence. Which medium is denser? Why?	(SEP-2020) (A)
		
90.	Write any 3 new Cartesian symbols for spherical mirrors.	(A)
91.	Draw a diagram of the image formed when an object is placed between C and F in front of concave mirror. Find out the position and nature of the image with the help of the diagram.	(A)
92.	Draw a diagram of the image formed when an object is placed at C in front of a concave mirror. Find out the position and nature of the image with the help of the diagram.	(A)
93.	Draw a diagram of the image formed when an object is placed beyond C in front of concave mirror. Find out the position and nature of the image with the help of the diagram.	(A)
94.	Draw a diagram of the image formed when an object is placed at F in front of concave mirror. Find out the position and nature of the image with the help of the diagram. [F: Principal confluence of the mirror; C: Centre of curvature of the mirror]	(A)
95.	Draw a diagram of the image formed when an object is placed between F and P in front of concave mirror. Find out the position and nature of the image with the help of the diagram. [F: Principal confluence of the mirror; P is the pole of the mirror]	(A)

96.	Draw the diagram and position nature of the image formed when an object is placed between F_1 and O in front of a convex lens.	(A)
97.	If the magnification of the image formed by a convex mirror is 0.5 and the object is 15 cm away from the mirror, find the focal length of the convex mirror and write the nature and size of the image.	(A)
98.	Explain the activity of a convex lens converges parallel light rays.	(A)
99.	Explain the activity of finding the approximate focal length of a concave mirror.	(A)
V.	Answer the following questions. (Questions of four marks)	
100.	Explain the activity of refraction of light by a rectangular glass slab.	(A)
101.	a) What is magnification? If the magnification of an image produced by a lens is +2 then, mention the type of this lens. b) The refractive index of medium A is lesser than that of medium B. Then which medium is optically denser? In which medium is the speed of light more?	(A)
102.	One-half of a convex lens is covered with a black paper. Will this lens produce a complete image of the object? Verify your answer experimentally. Explain your observations.	(D)

Chapter 10: Human Eye and Colourful World

Curricular Goals	Competency	Learning Outcomes	Questions numbers
CG-2- Explores the physical world around them, and understands scientific principles and laws based on observations and analysis.	C-2.3- Manipulates the position of the objects and the properties of lenses (focus, centre of curvature) to observe image characteristics and correspondence with ray diagrams of the images and extends this for understanding different applications of lenses.	10.Explain the mechanism of functioning of the human eye and identify the eye defects and suggest remedies; Experimentally observe the dispersion of light through a glass prism; Explain and appreciate the natural phenomena occurring due to atmospheric refraction and scattering of light.	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,54,55,56,57,58,60,61,62,63,64,65,66,67
		21.Map various life processes integratedly, draw flow charts to depict certain biological sequences and processes, draw the structures of certain organs of the human body with labeling and certain structures of plants.	53,59

		Draw the arrangement of apparatus used in certain chemical experiment to learn properties of metals, non-metals as its bases including some chemical reactions. Develop the skill of drawing the ray diagrams to show the formation of image using lenses and mirrors; draw the symbols of electrical components, simple circuits, arrangement of resistance in different combinations, graphs etc	
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Weightage –Difficulty level:

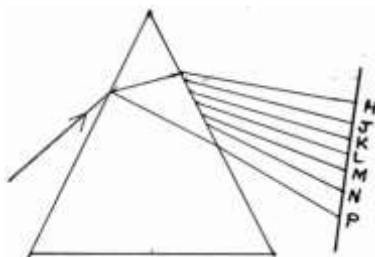
Difficulty level	No. of questions	Marks	%
Easy (E)	25	31	26
Average (A)	27	49	42
Difficulty (D)	16	38	32

I. Four alternatives are given for each of the following questions/incomplete statements. Only one of them is correct or most appropriate. Choose the correct alternative and write the complete answer along with its letter of alphabet. (1 Marks)

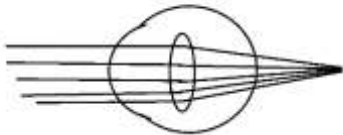
- The area where the image is formed in the eye (E)
A. cornea B. retina C. iris D. lens
- The part of the eye that forms an inverted real image of the object on the retina (E)
A. eye lens B. pupil C. iris D. cornea
- The lens used to correct near sightness: (E)
A. biconvex lens B. plano-convex lens C. concave lens D. none of the above
- In old age, sometimes the eye lens becomes cloudy and whitish like milk. This condition is called (E)
A. hypermetropia B. myopia C. presbyopia D. cataract
- A person can only see objects clearly those are between 40 and 80cm. Identify the defect and suggested cure (A)
A. near-sightedness and use of concave lens
B. farsightedness and use of appropriate convex lens
C. presbyopia and use of appropriate bifocal lens
D. eye surgery
- Structure that controls change in focal length of the eye lens (E)
A. Ciliary muscles B. Eyelid C. Retina D. Iris
- Why the sun is visible two minutes before actual sunrise and after actual sunset (A)
A. Refraction of light B. Reflection of light

- | | | | |
|-----|---|--------------------------------------|-----------------|
| | C. Scattering of light | D. Dispersion of light | |
| 8. | Colour of the sky seen from the surface of the moon is | | (MP-2024) (A) |
| | A. Blue | B. Red | C. Black |
| | | | D. Violet |
| 9. | Colour that bends the least in a glass prism: | | (A) |
| | A. Violet | B. Blue | C. Green |
| | | | D. Red |
| 10. | The following change in the eye takes place while viewing distant object | | (A) |
| | | | (April 2020) |
| | A. Decrease in focal length of the eye lens | B. Increase in curvature of the lens | |
| | C. Increase in focal length of the eye lens | D. Relaxation of ciliary muscles | |
| 11. | The correct statement regarding scattering of light and particle size is | | (A) |
| | | | (April 2024) |
| | A. small particles scatter red light | | |
| | B. Large particles scatter blue light | | |
| | C. Large particles scatter violet light | | |
| | D. Very large particles scatter all colours equally | | |
| 12. | Nature of the image formed by the eye lens on the retina | | (MP – 2023) (A) |
| | A. Real and inverted | B. Virtual and upright | |
| | C. Real and upright | D. Virtual and inverted | |
| 13. | The colour that is least scattered by fog and smoke is | | (E) |
| | A. orange | B. blue | C. red |
| | | | D. violet |
| 14. | Identify the wrong statement among the following statements regarding refraction and dispersion of light. | | (A) |
| | | | (June- 2024) |
| | A. Stars twinkle | | |
| | B. sky appears blue to an astronaut flying at very high altitudes | | |
| | C. the sun is visible to us about two minutes before the actual sunrise | | |
| | D. planets do not twinkle | | |
| 15. | In the following diagram, the angle of deviation is | | (D) |

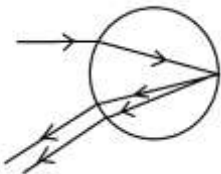
(A) 38° (B) 43° (C) 55° (D) 142°



17. What is the near point of the eye? State the value of near point of the normal eye. (E)
18. What is the far point of the eye? State the value for normal eye. (E)
19. What is the spectrum of white light? April (2024) (E)
20. What are common defects of vision? (E)
21. What is the angle of deviation? (E)
22. What is the angle of prism? (E)
23. What is the emergent angle? (E)
24. Name eye part of the following: (E)
- a) It forms the transparent bulge on the front surface of the eyeball
- b) It is a dark muscular diaphragm
25. Identify the eye in the image and mention its remedy. (A)



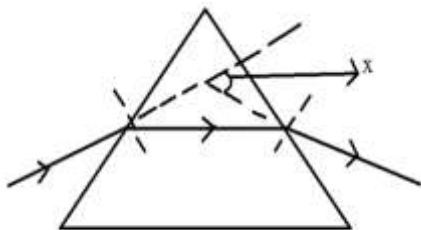
26. What is dispersion of light? (SP-2023) (E)
27. Can this phenomenon be observed on the moon? Justify your answer. (D)



28. What is the near point and far point of a person with normal vision? (A)
- (June 2019, March 2024)
29. Name any two atmospheric phenomena caused by light refraction. (E)
- (March 2019, 2024)
30. What is power of accommodation of the eye? (E)
31. What colour is used in danger signals and why? (A)
32. A student at the back bench struggle to read the blackboard. What is the defect and how can this defect be corrected? (D)
- (June 2024)
33. Identify the eye defect shown in the image and suggest a remedy? (A)



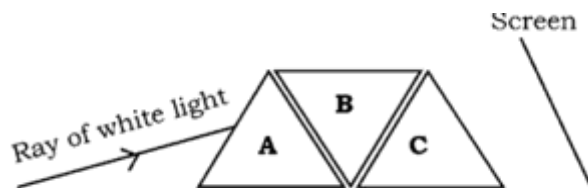
34. What is the function of the pupil in the human eye? (June 2019) (A)
35. Observe the below figure showing the refraction of light through a glass prism. (D)



Name the angle represented as angle X and give reason for the formation of that angle.

36. What is cataract? (March 2024) (E)
37. After the light is split in a prism, state the colour of the light that is least bent and the colour of the light that is most bent. (E)
- (March 2019, 2023, June 2019)

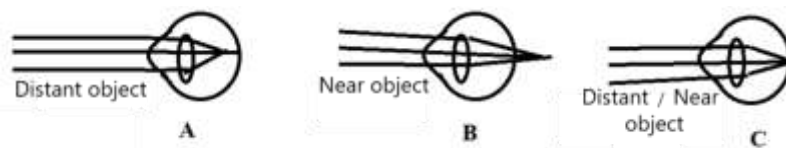
38. Glass prisms A, B and C are arranged as shown in the figure below. When a beam of white light is passed through the prism A, will a spectrum of light be produced on the screen? Give the reason. (D)
(May 2025)



39. Define dispersion of light. (E)
40. A person with a myopic eye cannot see objects beyond 1.2 m distinctly. What should be the type of the corrective lens used to restore proper vision? (E)

III. Answer the following questions (Two mark)

41. What is hypermetropia? What are its causes? (June 2019) (E)
42. Explain the formation of a rainbow in nature (March 2023, June 2023) (A)
43. Describe Newton's experiment to show the recombination of white light. (A)
(April-2025)
44. Write the differences between the myopic eye and hypermetropic eye. (E)
(April 2025)
45. Identify and justify the type of eye shown in the diagrams: normal, near-sightedness, farsightedness. (A)



46. A person with eye defect purchases spectacles with a lens power of -2.0 D. which lens is suitable for the given eye defect? Analyse. (D)
(A-2024)



47. Explain how the human eye lens adjusts for viewing near and distant objects. (A)
(March 2023, June 2023, August 2024)
48. Observe the given figure. Identify the eye defect indicated in this figure. (A)

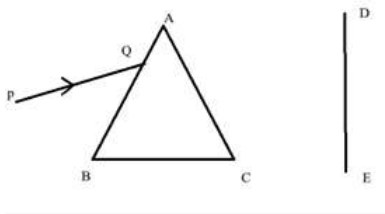


49. At the time of sunrise and sunset the sky appears red. Why? (A)
50. What happens to the image distance in the eye when we increase the distance of an object from the eye? (E)

IV. Answer the following questions (Three mark)

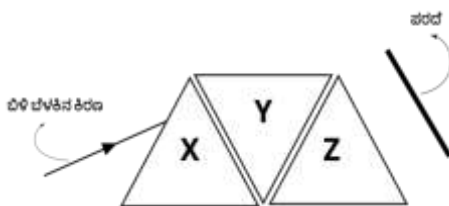
51. What is the Tyndall effect? Give two examples. (March 2019) (A)
52. Why the clear sky is blue in colour? Explain (A)
53. Draw the diagram to show the recombination of white light. (June-2024) (A)
54. Why do stars twinkle but planets do not? Explain. (August 2024) (A)
55. What is presbyopia? What are its causes? Mention the remedy (A)
56. A doctor prescribes a lens with power -0.5 D. Find its focal length. Is it a converging and diverging lens? Justify. How does a concave lens correct near-sightedness (March 2020) (D)

57. a) Why can't we see objects clearly closer than 25cm with normal eye? (D)
 b) Explain the relationship between the colour of light scattered in the atmosphere and the size of the scattering particles.
58. 1) a) What is the reason for the whiteness of the sun's rays on the scalp in the afternoon? (D)
 b) What is the working principle of the human eye?
 2) Write the main function of each of the following
 a) iris b) pupil c) cornea
59. A short beam of white light PQ passes through a glass prism as shown in the figure. (D)



Redraw this and draw the resulting ray path that can be viewed on the DE screen.

- a) Name the phenomenon seen here
 b) Write the reasons.
60. a) A student clearly reads letters in a textbook only after a distance of 50 cm from the eyes without difficulty. Then (D)
 i) Identify this defect of the eye and mention its cause.
 ii) Suggest a remedy for this defect.
 b) When sunlight passes through the trees of a dense forest on a foggy morning then the path of the beam of light appears between the trees.
 i) What is this phenomenon called?
 ii) This same phenomenon is not normally visible in air. Why? Write your analysis.
61. a) The apparent position of an object seen through hot air above a flame fluctuates. Justify this statement. (D)
 b) When white light is passed through the given arrangement of three prisms (X, Y, and Z) as shown in the below figure, spectrum of light is seen on the screen. What is the role of prism Z here?



62. a) Imagine when a mass of thorn ignited it is burning brightly. If a tree present on the other side of the fire is observed through the hot air on the fire, then the positions of the parts of that tree appear to be changed apparently. Why? Explain. (D)
 b) When green, yellow and red rays are incident at the same angle separately on a glass prism which of these rays forms greater angle of deviation? Why?
63. The far point of a myopic person is 80 cm in front of the eye. What is the nature and power of the lens required to correct the problem? (D)
64. Make a diagram to show how hypermetropia is corrected. The near point of a hypermetropic eye is 1 m. What is the power of the lens required to correct this defect? Assume that the near point of the normal eye is 25 cm. (D)

V. Answer the following questions (Four marks)

65. a) Explain the phenomenon of formation of the rainbow in the atmosphere. (A)

- b) Why do stars twinkle? (May 2025)
66. a) What is near-sightedness (myopia)? Mention the causes for this defect? How can this defect be corrected (E)
- b) What is power of accommodation of the eye? What are the changes that occur in the eye while seeing the distant objects? (May 2025)
67. a) Why does the Sun appear reddish early in the morning? (A)
- b) Why does the sky appear dark instead of blue to an astronaut?
68. A person needs a lens of power -5.5 dioptres for correcting his distant vision. For correcting his near vision, he needs a lens of power +1.5 dioptre. What is the focal length of the lens required for correcting (i) distant vision, and (ii) near vision? (D)

Chapter-13: Our Environment

Curricular Goals	Competency	Learning Outcomes	Question numbers
CG-4- Explores interconnectedness between organisms and their environment.	C-4.3- Analyses different levels of biological organization from organisms to ecosystems and biomes, along with the interactions that take place at each level.	20. Elicit the relationship between the environments in bringing a balance in the ecosystem with illustrations; analyze the intervention of humans in imbalancing the environment.	1,2,3,4,5,6,7,8,9, 10,11,12,13,14, 15,16,17,18,19,20, 21,22,23,24,25,26, 27,28,29,30,32,33, 34,35,36,37,38,39
		21. Map various life processes integratedly, draw flow charts to depict certain biological sequences and processes, draw the structures of certain organs of the human body with labeling and certain structures of plants. Draw the arrangement of apparatus used in certain chemical experiment to learn properties of metals, non-metals as its bases including some chemical reactions. Develop the skill of drawing the ray diagrams	16,17,31

Weightage –Difficulty level

Difficulty level	No. of questions	Marks	%
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Easy (E)	15	24	38%
Average (A)	15	32	38%
Difficulty (D)	9	19	23%

- I. Four alternatives are given for each of the following questions/incomplete statements. Only one of them is correct or most appropriate. Choose the correct alternative and write the complete answer along with its letter of alphabet. (1 Mark)**

- The correct statement with respect to biodegradable substances among the following is these (A)
(MAIN- 2021)
A. undergo recycling naturally in the environment
B. harm various organisms in the ecosystem
C. increase the density of harmful chemicals in different trophic levels
D. remain inert in the environment for a long time
- The materials that change their form and the structure very slowly in the environment are (E)
(SUP- 2021)
A. Plant fibres
B. Peels of vegetables
C. Waste papers
D. Used tea leaves
- Atmospheric layer that absorbs ultraviolet rays coming from the sunlight is made up of this molecule (E)
(MAIN- 2022)
A. N₂ B. H₂ C. O₃ D. O₂
- Producers of an aquatic eco-system are (SUP-2023) (E)
A. algae B. small fishes C. larvae D. protozoa.
- The arrangement of trophic levels in this food chain: Algae → Small insects → Large insects → Small fish → Large fish → Humans is in the order of (A)
A. increasing energy availability.
B. increasing energy availability and accumulation of harmful chemicals.
C. increasing accumulation of harmful chemicals.
D. decreasing energy availability and accumulation of harmful chemicals.
- The group that has only biodegradable items in the following is (A)
A. Grass, flowers, synthetic leather B. Grass, nylon, limestone
C. Fruit-peels, cake, lime juice. D. Cake, glass, grass
- An environment-friendly practice is. (D)
A. Using cloth- bags

B. cutting down unnecessary use of electricity

C. Reaching short distance by walking.

D. All the above practices.

8 The production and the use of “X” is prohibited worldwide to prevent the depletion of “Y”. Then X and Y respectively are : (D)

A. Ozone; CFC

B. CFC; Aerosols

C. CFC; Ozone

D. Aerosols ; CFC

II. Answer the following questions(One-mark questions)

9. Grass → Frog → Snake; If the amount of energy in the first trophic level of this food chain is about 1000 J, find the amount of the energy of the organism at the third trophic level. (A)

10 What are biodegradable substances ? (E)

11 State the 10% law that is found in the ecosystem. (E)

12 Which synthetic chemical is responsible for the depletion of the ozone layer? (E)

13 Write two examples for decomposers. (Mar/Apr-2026)(MQP-2, 25-26) (E)

14. How does ozone form? (A)

15. How is the ozone layer depleting? (A)

16. Construct a food chain of a grassland ecosystem. (E)

17. Construct a food chain of an aquatic ecosystem (E)

III Answer the following questions(Two marks questions)

18. If all the wastes that we generate are biodegradable, What kind of the effects this would impact on our environment ? Justify the answer (MQP-3,25-26) (D)

19. “As energy moves progressively through various trophic levels in a food chain it is no longer available to the previous level.” Give reasons (D)

20. What is an ecosystem? What are its components? (E)

21. Use of non-biodegradable substances should be minimised. Why? (2025-model) (E)

22. “The improvised life styles of human beings caused imbalance in the environment.” Explain this statement with any two effects. (D)

23. Mention the difference between abiotic and biotic components of the ecosystem with an example for each. (A)

24. Name different groups of biotic components of the environment with an example for each. (E)

25. Dumping more and more biodegradable wastes in our surroundings is not good though these are eco-friendly materials. Justify this statement. (D)

IV Answer the following questions (Three marks questions)

26. What is trophic level? Flow of energy in an ecosystem is always unidirectional. Why? (E)
Explain.
27. Write the differences between biodegradable and non-biodegradable substances with examples. (A)
(MAY-2026-2)
28. Give reason: (Sup-2020) (A)
- a) Any food chain consists of a maximum of five steps only.
 - b) Decomposers play an important role in an ecosystem.
 - c) Protecting ozone layer is necessary.
29. a) Ozone layer is a boon to the life on the earth. Justify (D)
b) Which trophic level organisms in a food chain are most affected by biological magnification. Why? [MQP-1, 25-26]
30. a) Define the following : [MQP-4, 25-26] [Mar/April-26] (E)
- i) Food chain
 - ii} Biological magnification
- b) Mention the function of ozone /Mention the importance of ozone.
31. Construct a food chain using these organisms; snake, frog, grass and grasshopper. Which organism has more accumulation of harmful chemicals in this food chain? Why? (A)
(2025-exam-1) (May-2026 exam2)
32. a) A student places a piece of cucumber, glass piece, banana peel and a plastic pen in a pit and closes it. What changes can be observed in these materials after a month? (D)
Give scientific reason for these changes. (Main-2019)
- b) Bacteria and fungi are called decomposers. Why? (SUP-2019)
33. a) What will happen if all the organisms of a trophic level are accidentally destroyed? (A)
b) The role of decomposers in an ecosystem is important. Why?(SUP-2020)(Main -2022)
34. a) A food chain in a polluted aquatic ecosystem is given. Observe this and answer the following questions. (A)
Fresh water → Algae → Fishes → Birds. (MAIN-2019)
- (i) Which organisms are disturbed more due to biological magnification? Why?
 - (ii) This ecosystem will vanish gradually. How? Explain.
- b) Name the component of the ecosystem that captures the maximum energy of the sun
35. a) Food chains consist of a maximum of five trophic levels only. Why? (SUP-2020) (D)

b) “The number of organisms decreases by reaching a higher trophic level of a food chain in an ecosystem.” Why? (2024-EXAM-1)

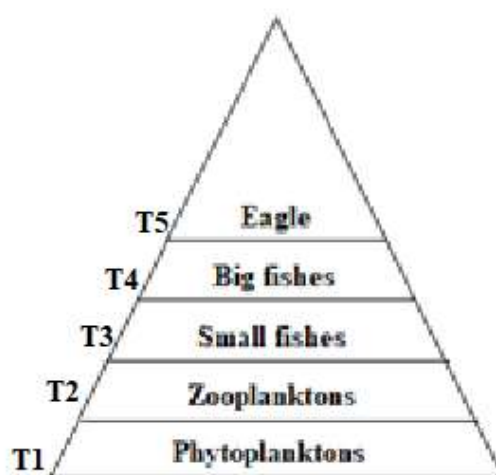
36. a) How does the ozone layer form? Protection of the ozone layer is necessary. Why? (A)
(SUP-2020) (2025-Model-1)

b) The use of CFCs in refrigerating units is strictly banned. Why? (2024-EXAM-2)

37. a) Suggest any two measures that reduce the problems caused while disposing the wastes. (A)

b) Give an example for a food chain of grassland ecosystem. If there is an increase in the number of organisms in the second trophic level, how does this effect on that food chain? (Main - 2023)

38. Observe the diagram of pyramid of trophic levels in a food chain and answer the given questions. (A)



i) **Organisms** of which trophic level consist harmful chemicals in higher concentration? Why?

ii) Zoo planktons have more energy than big fishes. How?

39. What are producers , consumers and decomposers in the environment? Give an example for each (E)

Model Answers

Chapter-1: Chemical Reactions and Equations

I. Multiple choice answer questions (One Mark Questions):

1. C. Rusting of iron
2. C. Change in shape
3. C. Displacement reaction
4. A. BaCl_2 and Na_2SO_4
5. C. Endothermic reaction
6. A. Double displacement reaction
7. B. H_2 and CuO
8. A. Silver chloride decomposes to form silver and chlorine
9. C. Hydrogen : Oxygen :: 2 : 1
10. B. Exothermic reaction
11. B. Hydrogen
12. C. $2\text{AgNO}_3 + \text{Cu} \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{Ag}$
13. A. Hydrogen gas and Iron chloride are produced
14. D. Iron
15. B. Loses water molecules
16. B. To prevent oxidation
17. A) combination and redox reaction
18. (B) HCl and MnO_2
19. (B) 2, 2, 4, 1
20. (C) Grape fermented
21. (A) Change in colour
22. B. Decomposition reaction
23. (D) Oxygen : Hydrogen = 1 : 2
24. (A) Combination reaction
25. (D) Iron

II. Very short answer questions (one-mark questions):

26. The process of forming a new substance with different properties through the rearrangement of atoms and molecules.
27. Symbolic representation of a chemical reaction.
28. To remove the oxide layer from the surface of a magnesium strip.
29. To justify the law of conservation of mass.
30. In both reactions, heat is released along with the products.
31. A reaction that produces precipitation.
32. The reaction in which a metal interacts with moisture, air, etc., in its environment and corrodes.
33. To prevent chips from becoming rancid.
34. To prevent rusting.
35. The process in which oils and fats undergo oxidation, changing their smell and taste.
36. Use of antioxidants — storing in airtight containers.
37. Oxidized substance: C; Reduced substance: ZnO .
38. SO_4^{2-} and Ba^{2+} .
39. Calcium hydroxide.

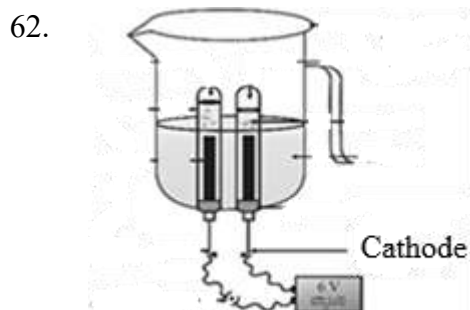
40. Combination reaction.
41. Due to the release of nitrogen oxide gas.
42. Galvanization.
43. 2, 2, 4, 1.

III. Short answer questions (two marks questions):

44. 1) Change of state
2) Change of color
3) Gas release
4) Change in temperature
45. No
Intense exothermic reaction / burns occur
46. Two or more reactants combine to form a single product.
 $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$
47. A single reactant breaks down to form two or more products.
 $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
48. A more reactive metal displaces a less reactive metal from its compound.
 $\text{CuSO}_4 + \text{Fe} \rightarrow \text{FeSO}_4 + \text{Cu}$
49. Iron nail reacts with copper sulfate and displaces copper.
 $\text{CuSO}_4 + \text{Fe} \rightarrow \text{FeSO}_4 + \text{Cu}$
50. No
Copper is less reactive than iron.
51. Reactants exchange their ions to form new products.
 $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 + 2\text{NaCl}$
52. Yellow precipitate
Lead iodide
Double displacement
53. Nitrogen dioxide:
 $2\text{Pb}(\text{NO}_3)_2 \rightarrow 2\text{PbO} + 4\text{NO}_2 + \text{O}_2$
54. Absorbs heat.
 $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
Releases heat.
 $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O} + \text{heat}$
55. $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
Thermal decomposition reaction
56. Oxidation and reduction occur simultaneously.
 $\text{ZnO} + \text{C} \rightarrow \text{Zn} + \text{CO}$
57. Sodium sulphate and Barium chloride exchange their ions to form new products.
 $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \rightarrow \text{BaSO}_4 + 2\text{NaCl}$
58. ಉಷ್ಣವಿಭಜನೆ ಕ್ರಿಯೆ
 $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
59. Painting
Greasing
Oiling
Anodization
Galvanization (zinc coating)
Alloying

(any two)

60. Copper
Copper oxide
61. Iron (Fe)
Iron is more reactive than silver
 FeSO_4



63. (i) $\text{MnO}_2 + 4\text{HCl} \rightarrow \text{MnCl}_2 + \text{Cl}_2 + 2\text{H}_2\text{O}$
(ii) $\text{Ca(OH)}_2 + \text{CO}_2 \rightarrow \text{CaCO}_3 + \text{H}_2\text{O}$
64. (i) $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$
(ii) $\text{Na}_2\text{O} + \text{H}_2\text{O} \rightarrow 2\text{NaOH}$

IV. Long answer questions (three marks questions):

65. i) $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O} + \text{ಶಾಖ}$
ii) $2\text{K} + 2\text{H}_2\text{O} \rightarrow 2\text{KOH} + \text{H}_2$
iii) $\text{CuSO}_4 + \text{Fe} \rightarrow \text{FeSO}_4 + \text{Cu}$
66. 5) i) $2\text{Cu} + \text{O}_2 \rightarrow 2\text{CuO}$ (Oxidation reaction)
6) ii) $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$ (Reduction reaction)
67. (i) $4\text{Na} + \text{O}_2 \rightarrow 2\text{Na}_2\text{O}$
(ii) $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$
(iii) $4\text{Al} + 3\text{O}_2 \rightarrow 2\text{Al}_2\text{O}_3$
68. Displacement reaction
 $\text{AgNO}_3 + \text{Cu} \rightarrow \text{Cu(NO}_3)_2 + \text{Ag}$
 $\text{CuSO}_4 + \text{Fe} \rightarrow \text{FeSO}_4 + \text{Cu}$
69. a) Loss of water molecules
Addition of water molecules
b) errous sulfate decomposes to form iron oxide, sulfur dioxide, and sulfur trioxide.
- 70.
- | Endothermic reaction | Exothermic reaction |
|--|---|
| Heat absorbed | Heat released |
| (usually decomposition) | (usually combination) |
| $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ | $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2$ |
71. Yes — In the reaction, HCl is oxidized to Cl_2 while MnO_2 is reduced to MnCl_2 .
Oxidation: Gain of oxygen or loss of hydrogen.
Reduction: Loss of oxygen or gain of hydrogen.
72. a) i) Decomposition reaction
ii) Combination reaction
b) Yes — In decomposition, one reactant gives two products; in combination, two reactants give one product.

73. a) BaCl_2 and Na_2SO_4
Double displacement reaction
b) Ba^{2+} and SO_4^{2-} ions
74. Silver Chloride and Silver Bromide
 $2\text{AgCl} \rightarrow 2\text{Ag} + \text{Cl}_2$
 $2\text{AgBr} \rightarrow 2\text{Ag} + \text{Br}_2$
75. $\text{CuSO}_4 + \text{Zn} \rightarrow \text{ZnSO}_4 + \text{Cu}$
 $\text{CuCl}_2 + \text{Pb} \rightarrow \text{PbCl}_2 + \text{Cu}$
Zn and Pb are more reactive than Cu
76. $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
 $2\text{AgCl} \rightarrow 2\text{Ag} + \text{Cl}_2$
 $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$
77. i) Calcium oxide
CaO
ii) $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2$
78. Precipitation reaction
Insoluble salt forms.
 $3\text{BaCl}_2 + \text{Al}_2(\text{SO}_4)_3 \rightarrow 3\text{BaSO}_4 + 2\text{AlCl}_3$
- V. Long answer questions (four marks questions):**
79. i) $\text{Pb(NO}_3)_2 + 2\text{KI} \rightarrow \text{PbI}_2 + 2\text{KNO}_3$
ii) Lead iodide
iii) Yellow color
iv) Double displacement reaction
80. ii) $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ (Combination)
ii) $\text{ZnSO}_4 + \text{Cu} \rightarrow \text{CuSO}_4 + \text{Zn}$ (Displacement)
iii) $\text{ZnCO}_3 \rightarrow \text{ZnO} + \text{CO}_2$ (Decomposition)
iv) $\text{NaCl} + \text{AgNO}_3 \rightarrow \text{NaNO}_3 + \text{AgCl}$ (Double displacement)

Chapter-2: Acids, Bases and Salts

I. Multiple choice answer questions (One Mark Questions):

1. (C) $2\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$
2. (C) basic property increases and number of OH^- ions increases
3. (A) Aluminium Oxide
4. (A) Carbon Dioxide
5. (D) Gastric juice
6. (A) Methanoic acid
7. (A) Sodium carbonate
8. A) 0-7
9. (B) Acidic
10. (C) Hydrogen
11. (A) Metal oxide & water
12. B) Ca(OH)_2
13. (A) Copper oxide
14. (A) Exothermic and may explode.
15. (D) Strong acid and weak base

16. (C) If M is a non-metallic oxide solution, the blue litmus turns red
17. (C) NaOH and HCl
18. (A) Carbon dioxide
19. (C) P and R
20. (A) CaOCl₂
21. (A) Less than 5.5
22. (A) Copper (II) Oxide

Question Detected

23. (B) Cl₂ and H₂
24. (B) Lose water molecules
25. (D) Strong base and Weak acid
26. (A) Methanoic acid, Lactic acid, Oxalic acid and Citric acid
27. (B) OH⁻
28. (A) Tartaric acid

II. Answer the following questions. (1 Mark)

29. The reaction between an acid and a base produces salt and water.
30. It reacts with moisture and turns into hard solid gypsum.
31. Metal oxides that show both acidic and basic properties.
32. Yes, detergent produces foam in both hard water and soft water.
33. Hydrogen ion / Hydronium ion, Hydroxide ion.
34. Glass making, Soap making, Paper making, As a cleaning agent (any two only).
35. Basic salt — Acetic acid is a weak acid / strong base.
36. By slowly adding acid to water with continuous stirring.
37. Blue litmus paper dipped in acid turns red / Red litmus paper dipped in acid does not change color.
38. A chemical compound that produces hydrogen ions or hydronium ions when dissolved in water.
39. $2\text{NaOH} + \text{Zn} \rightarrow \text{Na}_2\text{ZnO}_2 + \text{H}_2$
40. Calcium carbonate.
41. Carbon dioxide.
42. Produces a base when dissolved in water.
43. Produces an acid when dissolved in water.
44. Bases that dissolve in water are alkalis.
45. (H⁺) / H₃O⁺
46. Basicity increases.
47. Less than 5.6.
48. Calcium oxychloride.
49. $\text{Ca}(\text{OH})_2 + \text{Cl}_2 \rightarrow \text{CaOCl}_2 + \text{H}_2\text{O}$
50. Mixture of baking soda and tartaric acid in food.
51. Na₂CO₃ – Sodium carbonate.
52. Sodium hydrogen carbonate.
53. On heating, carbon dioxide gas is produced. This gas passes through the dough, making it rise.
54. Concentration and strength of OH⁻ ions decreases.
55. When gas P is brought near a burning candle flame, a “pop” sound is heard. When gas Q is passed through limewater, it turns milky.
56. Rainwater has a slightly acidic nature.
57. Situation – 2: Acidic compounds show acidic nature only in water.

58. Salt and water are formed / The effect of acid is neutralized by the base.

III Answer the following questions. (2 Marks)

59. If water is added to concentrated acid, the heat produced may cause the mixture to splash out, leading to burns. Excessive heating can also break the glass container.

60. For healthy growth of plants, a specific pH range is required. His farmland soil is acidic. Since lime is basic, adding lime to the soil reduces or neutralizes its acidity.

61. Solution A has the strongest acidic nature. Its pH value is lower than B and C.

62. Acids contain hydrogen ions and are good conductors of electricity.

63. Bases contain hydroxide ions, and they are poor conductors of electricity.

64. When litmus paper strips are placed in all test tubes, only in the basic solution does it turn blue. When the basic solution is added to the other two test tubes, in the one containing water the litmus turns blue.

65. HCl and HNO₃ produce hydrogen ions in aqueous solution. Compounds like alcohol and glucose contain hydrogen but do not produce hydrogen ions.

66. As milk curdles, its pH value decreases. This is because milk turns into lactic acid when it curdles. Acids have lower pH values.

67. i) To increase the storage period of milk, the pH of fresh milk is shifted towards alkalinity.

ii) Since milk becomes slightly more alkaline, it takes longer to curdle.

68. $\text{NaCl} + \text{H}_2\text{O} \rightarrow \text{NaOH} + \text{H}_2 + \text{Cl}_2$

$\text{NaCl} + \text{NH}_3 + \text{H}_2\text{O} + \text{CO}_2 \rightarrow \text{NaHCO}_3 + \text{NH}_4\text{Cl}$

69. When a bee stings, methanoic acid is secreted. Baking soda is a mild base. Baking soda reacts with methanoic acid to form salt and water, reducing the burning sensation.

70. i) P: Sodium chloride solution Q: Hydrogen R: Chlorine

ii) Uses: As fuel, in artificial butter preparation, in fertilizers, and in ammonia production (any one).

71. a) D

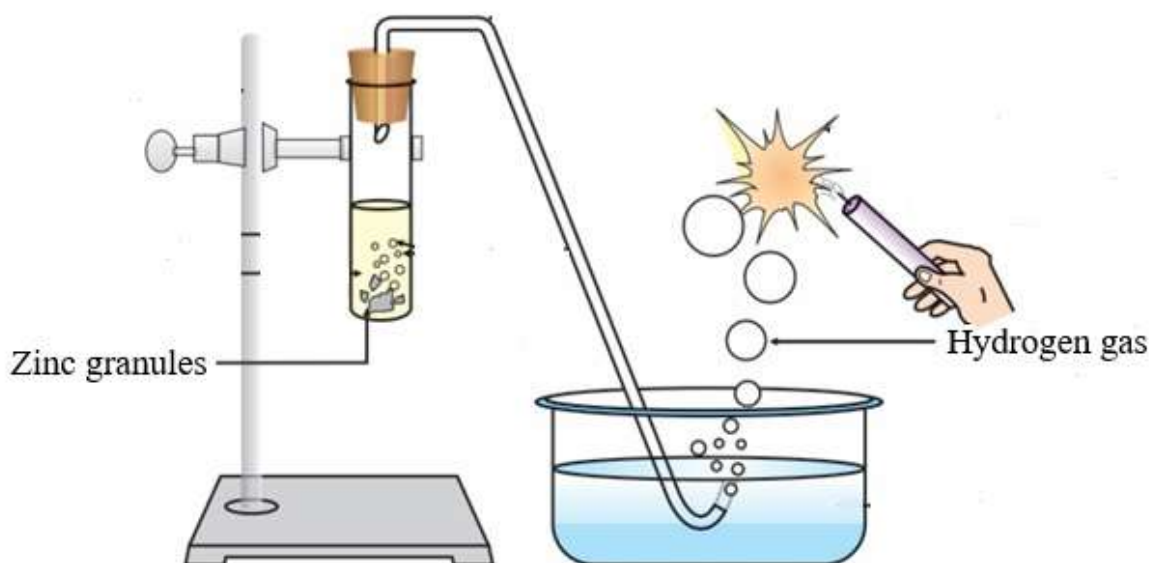
b) Concentration of ions decreases.

72. ☐ Calcium hydrogen carbonate dissolves in water.

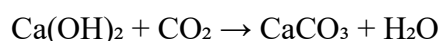
73. ☐ The concentration of H⁺ ions in the solution decreases. The pH value increases.

IV. Answer the following questions. (3 Marks)

74.



75. Carbon dioxide



Lime

76. * Sodium hydroxide
Uses: Removal of grease from metals, Soap and detergent production, Paper making, Artificial fiber production (any two only)
77. Dilute acid contains more water and less acid.
Acids that produce fewer H^+ ions are called weak acids.
Always add acid to water slowly with continuous stirring.
78. Acids that produce more H^+ ions are called strong acids.
After eating food, bacteria in the mouth decompose the remaining sugar and food particles, producing acids
The best way to prevent this is to clean the mouth after eating
Toothpaste, which is usually basic, neutralizes excess acid and prevents tooth decay.
79. a) Acidic solutions- e and h
Basic solutions- f and g
b) Magnesium hydroxide
80. a) Solution A has a higher concentration of H^+ ions. The reason is: the lower the pH value, the higher the concentration of H^+ ions. Solution D has a higher concentration of OH^- ions. The reason is: the higher the pH value, the greater the concentration of OH^- ions.
b) Solution A and D / Solution B and C
81. (i) B
(ii) C
(iii) D

V. Answer the following questions. (4 Marks)

82. • When an electric current is passed through an aqueous solution of sodium chloride, it decomposes to produce sodium hydroxide, chlorine, and hydrogen.
• Products formed:
• Hydrogen
• Chlorine
• Sodium hydroxide
• Uses of hydrogen: As a fuel, in artificial butter preparation, in fertilizers, and in ammonia production (choose any one).
• Uses of chlorine: In water purification, as a disinfectant in swimming pools, as an antiseptic, and as a pesticide (choose any one).
• Uses of sodium hydroxide: For removing grease from metals, in soap and detergent production, in paper making, and in artificial fiber production (any one).
83. $Ca(OH)_2$ ಮತ್ತು Cl_2
 $Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$
* In textile factories, to bleach cotton and fibers, In paper factories, to bleach wood pulp,
• In laundries, to bleach washed clothes,
• As an oxidizing agent in many chemical factories,
• To disinfect drinking water (choose any two only).

84.

Acids	Bases
have a sour taste	have a bitter taste.
blue litmus paper red.	red litmus paper blue.
hydrogen ions (H^+).	hydroxide ions (OH^-).

good conductors of electricity.	poor conductors of electricity.
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V. Answer the following questions. (5Marks)

85. a) $\text{NaCl} + \text{H}_2\text{O} + \text{CO}_2 + \text{NH}_3 \rightarrow \text{NH}_4\text{Cl} + \text{NaHCO}_3$
 $\text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2$
 $\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O} \rightarrow \text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
b) i) Washing soda ii) Bleaching powder iii) Plaster of Paris

CHAPTER 5

Life Processes

I. MULTIPLE CHOICE

1. A. Acidic food becomes alkaline due to bile.
2. C. Small intestine
3. D. veins
4. D. Translocation
5. A. Water transport
6. B. Mitochondria
7. A. Exchange of gases
8. C. Aorta
9. B. To establish a water column in the xylem tissue
10. C. To carry water to higher parts
11. B. i-b ; ii-c ; iii-d ; iv-a
12. D. creating upward tension
13. B. Amylase $\rightarrow$ Pepsin $\rightarrow$ Lypase
14. B. KOH
15. C. trypsin
16. D. pancreas and alkalises food

II. Answer the following questions (one-mark questions) Key answers

17. Lactic acid is produced when there is a lack of oxygen in muscle cells
18. The left and right sides of the heart are separated, so oxygenated and deoxygenated blood do not mix.
19. ethanol and carbon dioxide.
20. The amount of oxygen in water is less than the amount of oxygen in air.
Therefore, aquatic organisms breathe faster to get more oxygen
21. Blood clots in injured areas and stops the leakage
22. Translocation.
23. Osmotic pressure in plants causes materials to move from the phloem to tissues of lower pressure, thereby transporting food.
24. Villi
25. Because humans do not have the enzyme to digest starch.
26. In multicellular organisms, all cells are not in contact with the surrounding environment.
27. They help in the conversion of complex food into simpler forms so that it can be absorbed by the digestive tract.
28. 1. Aerobic respiration 2. Anaerobic respiration
29. Pyruvate
30. Xylem and Phloem
31. The process by which glucose reacts with oxygen in a cell to release energy.
32. a) x = artery y = vein
b) Veins have valves
33. i) Excreting excess water in plants

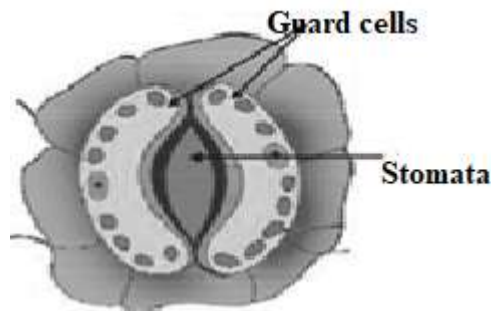
ii) Helping in the upward movement of water

34. Suction will occur from evaporation of water molecules from cells of leaves.

35. Because the lungs always contain a residual volume of air.

36. Because mucus builds a thick protective wall between inner lining of stomach and acid.

37.



38. * It allows more efficient supply of oxygen to the body cells.

* It generates the extra energy needed to maintain constant body temperature.

39. *As the amount of haemoglobin in the blood increases, the oxygen supply to the cells increases.

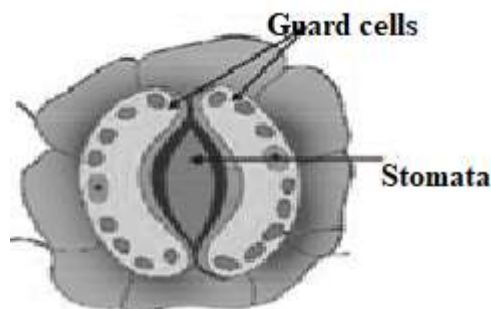
*Therefore, the amount of ATP released increases.

40. It carries water from the roots to other parts.

41. B) More in Person B than in A

III. Answer the following questions (two marks questions) Key answers

42.



43. Animal X = Herbivorous Animal

Animal Y = Carnivorous Animal

The length of the small intestine in herbivorous animals is longer than in carnivorous animals

44. * The saliva released while chewing chapati contains the enzyme amylase

* This enzyme breaks down the starch in chapati and converts it into simple sugar.

45. a) Because the heart has to pump blood into several organs

b) Because it requires a lot of energy to maintain its body temperature.

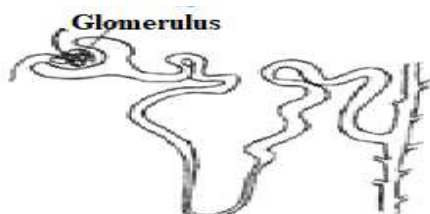
46. Amylase

Function: Breaks down the complex molecule starch and releases sugar.

47. a) Figure (1) / Open stomata Since stomata is open

b) X- Guard cell Y - Stomata

48.



49. * Haemoglobin in red blood cells has a high affinity for oxygen, which carries oxygen from the lungs to other parts of the body.

* Carbon dioxide is more soluble in water than oxygen, so it is transported to the lungs through the blood

plasma

50. * They have a three-chambered heart.
* Oxygenated and deoxygenated blood mix to some extent.
51. * prevents the mixing of oxygenated and deoxygenated blood.
* It allows to maintain a constant body temperature and high energy levels
52. * Double circulation helps in the rapid delivery of oxygenated blood to all parts of the body.
* This enables organisms to meet their high energy needs.
* Double circulation in mammals and birds helps regulate body temperature
53. * As plants growing in deserts face water scarcity, stomata close in the morning, preventing transpiration.
* At night, they take in carbon dioxide and produce an intermediate substance, which is then absorbed by chlorophyll during the day and the energy acts on this substance.
54. * The process by which green plants make food using carbon dioxide and water with the help of sunlight and chlorophyll (a pigment in leaves) is called photosynthesis.
* Carbohydrates / Glucose
* Carbohydrates are used to meet energy needs in plants.
55. A) Produces antibodies.
B) Lymphocyte cells eliminate bacteria and unnecessary substances
- 56.
- | Artery | Vein |
|--------------------------------------|-----------------------------|
| * Carries blood away from the heart. | *Carries blood to the heart |
| *Have thick walls | *Have thin walls |
| *Does not have valves | *Does have valves |
57. * Creates an acidic environment to promote the action of the enzyme pepsin.
* Destroys microorganisms that enter the stomach with food.
58. *ATP is synthesized during cellular respiration, which break down glucose to generate a large amount of usable energy.
*In plants, ATP is crucial for active transport, providing the necessary energy for moving nutrients, such as the food molecules produced during photosynthesis, against their concentration gradients from the leaves to other parts of the plant.
59. *Some organisms break-down the food material outside the body and then absorb it. Examples are fungi like bread moulds, yeast and mushrooms.
*Others take in whole material and break it down inside their bodies. What can be taken in and broken down depends on the body design and functioning.
* Some other organisms derive nutrition from plants or animals without killing them. This parasitic nutritive strategy is used by a wide variety of organisms like cuscutea (amar-bel), ticks, lice, leeches and tapeworms.
60. * fish
*Human/ terrestrial organism: The amount of oxygen in the atmosphere is more
* Fish/aquatic organism:The amount of dissolved oxygen is low in water Compared to that in the atmosphere.
61. * The blood has platelet cells that circulates around the body.
* They stop the leaks by helping to clot the blood at points of injury.
62. * It is the main cause for upward pull of water.
* It causes unavoidable water loss . It pressurises plants to absorb water

63.

Photosynthesis	Respiration
*It stores food by absorbing energy	* It breakdowns food by liberating energy

*By utilising carbon di oxide and water liberates carbohydrates and oxygen	* By utilising carbohydrates and oxygen liberates carbon di oxide and water
--	---

64. i) In the abdomen on either side of the backbone
ii) To prevent accumulation of toxic substances in body, to maintain bodys internal environmental balance,
65. *All the body cells are not in direct contact with the surrounding environment and diffusion is a slow process.
* Therefore is insufficient to meet the requirements.
66. *Water- Absorb water from the soil through roots
* Carbon di oxide- From atmosphere through respiration
*Minerals- Absorb through roots
*Sunlight
67. * The digested food is absorbed by walls of small intestine.
* The inner lining of the small intestine has numerous finger like projections called villi.
* The villi are richly supported with blood vessels will take absorbed food to each cell of the body.
68. * Bile juice emulsifies the fats by dividing large globules into fine globules.
* Lipase enzyme present in pancreatic juice converts fats into fatty acids and glycerol
* Small intestine.
69. i) Rings of cartilage
ii) Urea and uric acid

OR

- a) In the plant: starch
b) Villi.

IV Answer the following questions (Three marks questions)

70. * The translocation of food substances in plants takes place in the phloem tissue.
* The translocation of food and other substances takes place in both upward and downward directions
with the help of the lateral companion cells of the phloem
* This action is achieved by Osmotic pressure.
71. * Heart - B
* Oxygenated and deoxygenated blood are transported separately.
* Provides maximum oxygen to the body.
72. * Arteries carry blood from the heart to various organs of the body. Once an artery reaches a tissue, it divides into smaller vessels to bring the blood into contact with each cell.
* The exchange of substances between the blood and the surrounding cells takes place through the thin walls of very small vessels called capillaries. The capillaries then join together to form veins.
* Arteries carry blood away from an organ or tissue. Veins collect blood from different organs and bring it back to the heart.
73. *Cells in contact with the soil or in the roots actively absorb ions. This creates a difference in the concentration of ions between the roots and the soil.
*To overcome this difference, water moves from the soil to the roots. There, the constant movement of water within the xylem of the roots creates a column of water that continually pushes water upward.
* In transpiration, water molecules evaporating from the stomata of leaves cause absorption, which draws water from the xylem cells of the roots.

74.

Fish

Human

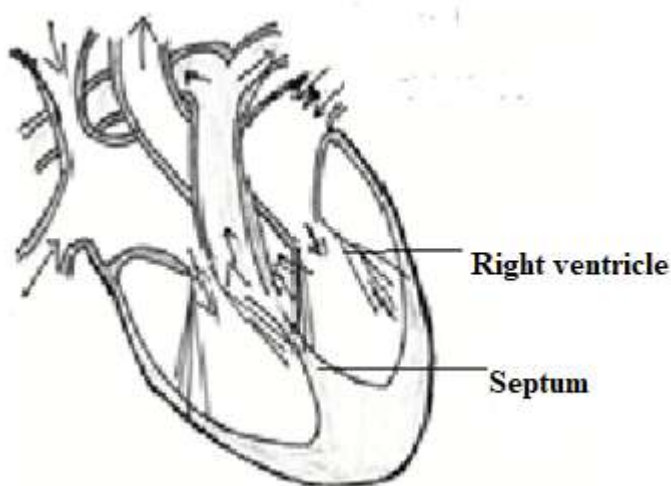
* Two-chambered heart	* Four-chambered heart
*Double blood circulation is not seen	*Double blood circulation is seen.
*Blood containing acid moves directly from the gills to the body parts	*Blood containing oxygen is supplied to the heart through the respiratory system and then reaches the body parts

75. * Nephrons are the structural and functional units of the kidneys.
 * Nephrons are the blood-purifying units of the kidney, consisting of the glomerulus, Bowman's capsule, and the loops of Henle.
 * These are the structures that remove nitrogenous wastes such as urea or uric acid from the blood.
76. * Amoeba ingests food using temporary finger-like cell surface protrusions.
 * These structures engulf and fuse food particles, forming a food sac
 * complex food substances are broken down into simple food substances, which are then diffused into the cell membrane.
 * The remaining undigested substances move to the cell surface and are excreted.
77. * The amount of urine excreted is less than the amount of urine produced in Bowman's capsule
 * The amount of urine produced depends on the water content of the body.
 * The more water content in the body, the more urine produced.
78. i) Digests protein in food.
 ii) Breaks down complex molecules called starch and releases sugar.
 iii) Breaks down emulsified unsaturated fats.

V. Answer the following questions (4 marks questions)

79. a) * Respiration in the absence of oxygen is called anaerobic respiration.
 * Alcohol, carbon dioxide and energy
 b) * To provide the body with pure blood, the blood passes through the heart twice. This is called double circulation.
 * To provide more energy.
 * To maintain a constant temperature in the body.

80.



81. a) Aorta : Carries oxygenated blood from the heart to all parts of the body
 Pulmonary vein : Carries oxygenated blood from the lungs to the heart
 b)
 * Absorption of light energy by chlorophyll
 * Conversion of light energy to chemical energy

- * Breaking of water molecules into hydrogen and oxygen
- * Reducing carbon di oxide to carbohydrates

OR

a) Pyruvate

Converted into lactic acid by lack of oxygen.

b)

Xylem	Phloem
Transports water and salts/inorganic substances.	Transports food/organic substances
One-way flow of materials	Two-way flow of materials
Xylem vessels and phloem transport materials from the root to the stem	Sieve vessels and companion cells transport materials from the leaves to all parts
Operation by suction pressure	Operation by Osmotic pressure

82. a) *Bile juice from the liver makes the acidic food alkaline

* Bile salts break the complex fats into smaller globules to increase the efficiency of enzyme actions.

* Trypsin of the pancreatic juice digests proteins.

* Lipase of the pancreatic juice breaks down emulsified fats.

* Enzymes of intestinal juice convert proteins to amino acids, complex carbohydrates to glucose and fats into fatty acids and glycerol.

b) * It facilitates the exchange of gases between air and the blood

* It provides a larger area for the exchange of these gases.

* The oxygen from the inhaled air diffuses into the blood stream.

* Carbon di oxide diffuses from the blood into the alveoli to be exhaled.

OR

a) * In xylem tissue, vessels and tracheids form a continuous water conducting channels reaching all parts of the plant.

* At the roots, the cells in contact with the soil actively takes up ions.

* This creates a difference in the concentration of these ions between the roots and the soil.

Water therefore moves into the roots from the soil.

* Evaporation of the water molecules from the cells of a leaf creates a suction which pulls water from the xylem cells of roots.

b) * Accumulation of waste in the form of glue and resins in old xylem

* By shedding leaves

* By releasing waste into the soil around them

* Increased water loss through evaporation

* Oxygen through photosynthesis

* Carbon dioxide through respiration

83. a)* In cytoplasm the glucose breaks down into pyruvate.

* In mitochondria the pyruvate breaks down into carbon di oxide and water.

* The energy released during the respiration is used in synthesis of ATP molecule.

b) *Respiration that takes place in the absence of oxygen is called anaerobic respiration.

*Alcohol, carbon di oxide and energy

84. * Aquatic organisms use oxygen dissolved in water.

* Terrestrial organisms use free oxygen in the environment.

* The amount of oxygen in the land area is more than the oxygen dissolved in water.

* Since it is free oxygen, it does not require any further modification in the body

85. * In lungs the trachea branches into bronchioles.

- * The bronchioles eventually become balloon-like structures called air sacs.
- * These air sacs provide a surface
- * The walls of the alveoli have an extensive network of blood vessels. Here gas exchange takes place

86. a)

Air sacs	Nephrons
Functional units of the lungs	Functional units of the excretory system
Function: Exchange of gases	Function: Separation of nitrogenous wastes from the blood
Has a large surface area and blood supply	Has a large surface area and blood supply

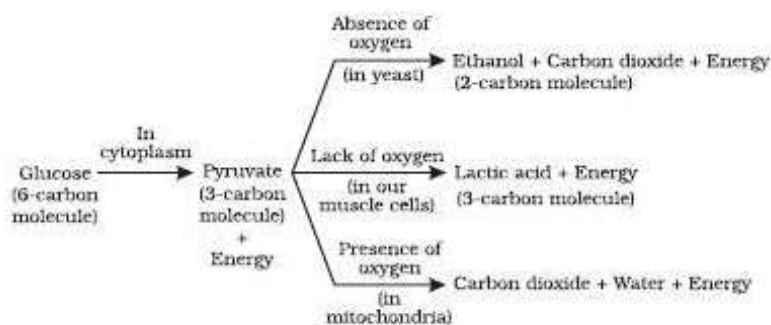
b) His legs are deprived of oxygen due to constant exercise and lactic acid builds up.

87. a) * The heart has different chambers.
 * Valves between the chambers prevent the backflow of blood.
 * Has a dividing wall called a septum.
 * A structure called a septum creates separate pathways for the transport of oxygenated and deoxygenated blood.
- b) * Absorbed by finger-shaped structures called villi in the small intestine.
 * Blood plasma - transports food, carbon dioxide, and nitrogenous wastes.
 * RBC - transports oxygen

Blood carries many other substances, such as salts.

VI Answer the following questions (5 marks questions)

88. a)



- b) * Alkalizing food and
 * Breaking down large fat particles into smaller particles to increase the efficiency of enzymes

CHAPTER – 6: CONTROL AND COORDINATION KEY ANSWER

I. Multiple choice

- C. it is secreted by parathyroid gland
- B. synapse
- C. Pulling hand back when touching a sharp object.
- D. Chemotropism
- C. Dendrite → Cell body → Axon → Nerve ending
- B. C → A → B → E → D
- B. Growth of roots deep into the soil
- B. Phototropism
- A. Under secretion of thyroxine hormone
- B. regulates blood sugar level

11. D. $P \rightarrow R \rightarrow S \rightarrow Q$
12. D. Negative geotropism and positive phototropism
13. C. Abscissic acid inhibits plant growth
14. D. Growth-dependent and positive hydrotropism
15. D. synapse and transmits chemical signals generated at the axon terminal to the dendrite
16. A. Positive thigmotropism and directional movement
17. B. Tongue
18. C. Growth hormones under the influence of the enzymes coded by a gene
19. B. Thyroxine

II. ONE MARK QUESTIONS

20. *Geotropism
* phototropism.
21. The movement of plant part in response to gravity is called geotropism.
22. The structural and functional unit of nervous system / nerve tissue
23. Abscissic acid
24. *A sudden response for stimulation is called Reflex action.
*Eg: With holding hands when touching sharp or hot objects.
25. Chemical coordination takes place by the production of hormones in plants.
26. Iodine
27. Muscle cells contain special proteins that cause movement by changing both their shape and composition within the cell in response to electrical impulses from nerves.
28.

Walking	Reflex action
* A Voluntary action.	* An involuntary response to a stimulus.
* It is controlled by the cerebellum of the brain.	* It is controlled by the spinal cord.
29. This movement is independent of growth and non-directional.
30. Contribute to the remaining parts of the stem in growth and protection above the ground
31. Messages are transmitted from one neuron to another in the form of chemical messengers.
32. *Brain has no role
* as reflex action is controlled by spinal cord.
33. The chemical substances which help in controlling growth, flowering, height, plants response to the environment.
34. * All involuntary actions
* Reflex actions

III. TWO MARK QUESTIONS

35. *In animals, chemical adaptation occurs through hormones secreted by the endocrine glands
*They diffuse directly into the blood and help to produce an appropriate response to a stimulus
36.

Nervous system	Hormones coordination
*Communication takes place through electrical impulses	*Communication takes place through chemicals
*Only reaches connected cells	*Reaches every cell in the body
*Cannot continuously generate and transmit electrical impulses	*Communication is continuous and more consistent
37. *It directs stems towards light to maximize photosynthesis for energy production.
*It allows roots to grow away from light into the soil to secure water and nutrients.
38. *Since salivation is an involuntary action, the mouth waters as soon as the sight of delicious food appears.
* Medulla oblongata.
39. *Figure C shows the correct tropical movement of plants
* plant roots towards grow towards gravity, which is positive geotropism.

* Similarly, stem growth is growth against gravity, which is negative geotropism

40.	Central nervous system	Peripheral nervous system
	*Includes the brain and spinal cord.	*Contains 12 pairs of cranial nerves and 31 pairs of spinal nerves
	*They receive information from all parts of the body and integrate it.	*The peripheral nervous system facilitates communication between the central nervous system and the rest of the body.

41.	Endocrine glands	Nervous system
	*Messages are carried through specific chemicals.	*Messages are carried through nerve impulses.
	*The long-term effect is that messages are transmitted slowly and reactions occur slowly.	*The short-term effect is that messages are transmitted very quickly. And reactions occur very quickly.

42. *When growing plants detect light, a hormone called auxin, synthesised at the shoot tip,
 *It helps the cells to grow longer.
 * When light is coming from one side of the plant, auxin diffuses towards the shady side of the shoot i.e. phototropism

43. *Adrenaline increases the heart rate,
 *which results in more oxygen being delivered to the muscles, preventing them from tiring.
 *It also dilates the blood vessels in the legs
 *allowing blood from the stomach to be supplied to the muscle cells in the legs.

44. *Auxin
 gibberilin
 *Absciscic acid

45. * Chemical substance is produced at the end of axon reaches to the other nerve cell through dendrite.
 * Thus information is transmitted from one nerve cell to other nerve cell by synapse.

46. * Smell of agarbatti diffuses is detected by olfactory receptors present in the nose.
 * This information is sent to forebrain by sensory nerves, responds to the information

47. * Because thyroid gland needs iodine to produce thyroxin hormone .
 * Thyroxin hormone controls all the metabolic activities.

48. *To treat harmful effects of increased level of blood sugar.
 * Insulin hormone regulates blood sugar levels.

49. *Receptors are specialised cells located in our sense organs.
 *If they do not work properly the response to the environmental stimulus will be delayed causing harm to the body.

50.	Involuntary actions	Reflex actions
	* Occur immediately without Thinking	* An immediate response to an event
	* Controlled by mid and hind brain	* Controlled by spinal cord
	* Ex: Breathing	* Ex: sneezing

51. * Through B
 * In the form of electrical impulse.

52. * cytokinin
 * It promotes cell division

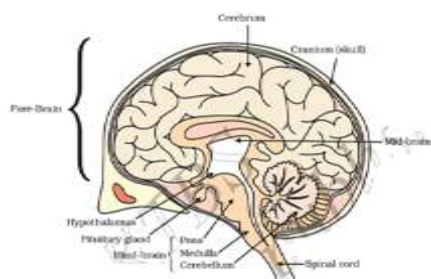
53. * This condition occurs due to deficiency of growth hormone during childhood
 * Hypothalamus plays an important role in releasing this hormone

54.	Heart beat	Reflex action
	*Doesnot require any external stimulus.	* Requires definite external and internal stimulus.

* Emerges in heart	* controlled by central nervous system
* Rhythmic, continuous	* immediate, temporarily
* It pumps blood to transport oxygen and nutrients	*Defensive mechanism against immediate danger.

55. i) Insulin : * Pancreas
 * Regulate the blood sugar level
 ii) Thyroxin: * Thyroid gland
 * Regulates the carbohydrate, protein and fat metabolism
56. i) Insulin
 ii) Adrenalin
57. *The pathway through which the impulses of reflexes travel to set a response.
 *Because the thinking process of the brain is not fast enough.
 *Many animals have little or none of the complex neuron network needed for thinking
58. *Receptors, Sensory neuron, relay neuron,, motor neuron and effector
 *In male: Testosterone
 *In female: Estrogen
59. * When growing plants detect light, a hormone called auxin, synthesised at the cells of shoot tip
 * When light is coming from one side of the plant auxin diffuses towards the shady side of the shoot
 * This makes the stem of a growing plant bend towards the light.
- IV. THREE MARK QUESTIONS**
60. *“Immediate response to the stimuli is called reflex action.
 *This process is controlled by spinal cord.
 *Thinking is a complex activity, and reflexive arcs have naturally evolved by spinal cord in animals
 *because the brain's thinking process is not fast enough.
 *Therefore, they arise spontaneously in the spinal cord. So, the performance is very fast, and the responses are quick.
 * It helps organisms to respond quickly to environmental changes.
61. *There are some limitations of electric communication –
 ➤ They reach only the cells in the animal body that are connected by nerve cells.
 ➤ Cells cannot continuously generate and propagate electrical impulses.
 ➤ But chemical communication reaches all the cells of the body. This can be done consistently and continuously.
62. *When growing plants perceive light, auxin hormone synthesis at the tip of its stem helps the cells to grow longer.
 *When light coming from one side of the plant, auxin diffuses towards the shady side of the stem (photo tropism).
 *This stimulates the cells in the stem to grow longer, making the plant appear bent towards the light i.e. phototropism.
 *The auxin concentration increases in the cells opposite to the apex where the tendrils of the plant come into contact and grow longer
 *so that the tendrils wrap around the base in a circle and adhere to it.
 *Thus, photo tropism, thigmotropism and chemo tropism are coordinated in the orientational movement of vine plants.

63.



64. *Insulin – regulates the blood sugar level.

*Estrogen – changes associated with puberty in females, regulates menstrual cycle.

*Thyroxin - regulates carbohydrate, protein and fat metabolism.

65. i) *Voluntary action:

* Based on deciding what to do next (Action performed based on thinking)

*Controlled by forebrain.

ii)* Involuntary action:

*Action without thinking

*Controlled by hind brain.

66. i) * Centre of thinking

* Information from receptors is interpreted

* Separate areas are specialised for hearing, smell, sight etc

ii) Precision of voluntary activities, maintaining posture, and balance of the body.

iii) Control involuntary actions like blood pressure , salivation, vomiting etc

67. i) Receptors → Sensory neuron → Association neuron → Motor neuron → effectors

ii) Spinal cord

68. i) Insulin

ii) Adrenalin

iii) Thyroxin

69. i) Neuron

ii) Dendrite → cell body → axon → nerve terminal

Neuron transmits nerve impulses from the brain to all parts of the body, enabling the process of consciousness.

VI. Answer the following questions. (Four Mark Questions)

70. Reflex Arc: The pathway of nerve impulses in a reflex action.

*Receptors in the eye receive the stimulus of bright light.

*Messages reach spinal cord through sensory neuron.

*Responses reach motor neuron through association neuron.

*Responses reach effector through motor neuron.

*Muscles of eye close the eyelid.

71.

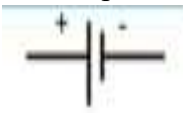
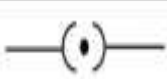
	Movement of leaves of a sensitive plant	Movement of a shoot towards light
1	It does not depend on the direction of stimulus applied.	Depends on the direction of stimulus applied.
2	Thigmotropism	Phototropism
3	Touch is the stimulus	Light is the stimulus
4	Caused by the sudden loss of water from the swellings at the base of leaves	Caused by the unequal growth on the two sides of the shoot.
5	Not a growth movement	Growth movement
6	Occurs very fast	Occurs slowly

72. *Reflex arc It gives sudden action in response to the event happening in the environment.

- *A. Sensory neuron: It conducts the impulse of stimulus from receptor to the spinal cord.
- *B. Effectors: Which shows the sudden visible response.
- *Reflex arcs have evolved in animals because the thinking process of brain is not fast enough in many animals.
- *Meanwhile many animals have very little of the complex neuron network needed for thinking.
- *So, it can function in the absence of true thought process and increase the chance of survival.

Chapter 11 : Electricity

I. II. Multiple Choice Questions:

1. A) Ampere (A)
2. D) Watt (W)
3. C) Electric resistance
4. A) Electric current
5. B) Electric potential difference
6. D) Electric power
7. 
D)
8. 
A)
9. 
B)
10. A) resistor
11. C) Ammeter in series & voltmeter in parallel
12. D) $V = I/R$
13. B) 2.4Ω
14. B) 3Ω
15. A) 3.2Ω
16. B) 9 : 1
17. B) 4C
18. C) 40 J
19. C) 0.25 A
20. A) 2 A
21. B) 2Ω
22. A) Voltmeter
23. B) $VI = P$
24. A) resistance directly proportional to potential difference but inversely proportional to current
25. A) fuse
26. B) $E = Pt$
27. D. Rheostat
28. B. Resistance
29. B. Tungsten
30. A. Volt
31. C. 2 A
32. D. Ammeter
33. B. M

34. D. Protects the electrical appliances
 35. D. $R = \frac{V}{I}$
 36. A. Ammeter
 37. D. ohm-metre
 38. C. electric current and potential difference
 39. A. 16:1
 40. A. Coulomb
 41. D. power
 42. B. potential Difference
 43. D. The conductor Y has more cross section than the conductor X and hence the flow of current is more in it.

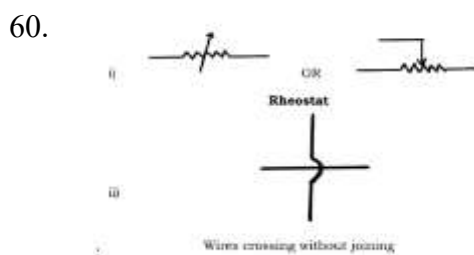
III. One-mark Questions:

44. Iron because the resistivity of iron is more compared to copper.
 45. Both are correct. $\Delta V/\Delta I = R$. The resistance is more in series and less in parallel.
 46. $3.6 \times 10^6 \text{ J}$
 47. If the potential difference across the two ends is 1V & the current through it is 1A then the resistance is said to be 1Ω .
 48. Flow of one coulomb of charge per second is 1 Ampere.
 49. 6×10^{18} electrons.
 50. Means that when 1 Joule of work is done to move a charge of 1 coulomb from one point to another.
 51. It is the property of the conductor to resist the flow of charges through it.
 52. If the potential difference is 1V & the current through it is 1A then the resistance becomes 1Ω .
 53. To prolong the life of filament.
 54. In series.
 55. Due to its high resistivity, it is used in electric bulb.

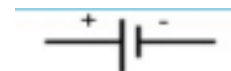
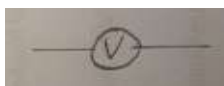


58. • Live and neutral wires should not come into direct contact.
 OR
 • There should not be any short-circuit in the circuit.
 • Too many appliances should not be connected to a single socket.
 • Should always use quality wires and good quality electrical appliances. (Any Two)

59. • Accidental hike in the supply voltage
 • Connecting too many appliances to a single socket
 • When live wire and neutral wire come into direct contact. (Any two)



61.



62.



63.

Yes,

Because the circuit rating is less than 15 A

64

If fuse wire is connected to the neutral wire instead of live wire, then even when the fuse burns out the appliance remains connected to the live wire and the current supply will not be disrupted due to overloading.

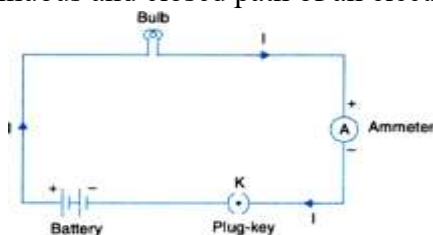
65.

The magnetic field strength increases by ten times.

III **Two-marks questions:**

66.

A continuous and closed path of an electric current.



67.

TV - 250 W X 1 h = 0.25 kWh

Toaster- 1200 W X 10 min = 1.2 Kw X 0.16h = 0.192kWh

Therefore, TV consumes more energy.

68.

Resistors connected in series = $2\Omega + 4\Omega + 3\Omega = 9\Omega$

Resistors in parallel: $1/R_p = 1/2\Omega + 1/4\Omega + 1/3\Omega$

$= 6/12\Omega + 3/12\Omega + 4/12\Omega$

$= 13/12\Omega$

Therefore $R_p = 12/13\Omega = 0.92\Omega$

69.

$$\frac{1}{R_{p1}} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{2} + \frac{1}{4} = \frac{2+1}{4} = \frac{3}{4}$$

$$R_{p1} = \frac{4}{3} = 1.33\Omega$$

$$\frac{1}{R_{p2}} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{2} + \frac{1}{6} = \frac{3+1}{6} = \frac{4}{6} = \frac{2}{3}$$

$$R_{p2} = \frac{3}{2} = 1.5\Omega$$

$$R_{p2} - R_{p1} = 1.5 - 1.33 = 0.17\Omega$$

70.

$\rho = 1.63 \times 10^{-8} \Omega\text{m}$, $A = 10.3 \times 10^{-5} \text{cm}^2 = 10.3 \times 10^{-5} \times 10^{-3} \text{m}^2$, $R = 20\Omega$, $l = ?$

Formula $R = \rho l / A$ Therefore $l = RA / \rho$

$$= 20 \times 10.3 \times 10^{-5} \times 10^{-3} / 1.63 \times 10^{-8}$$

$$= 20 \times 10.3 \times 10^{-8} / 1.63 \times 10^{-8} = 126.38 \text{ m}$$

71.

i) Silver because its resistivity is less.

ii)

Nichrome because it is having high resistivity.

72.

a) It is the property of the conductor to resist the flow of charges through it.

b) It is the characteristic property of the material which is a constant of proportionality.

Resistance measures how much it opposes the flow of current. whereas resistivity is an intrinsic property of material.

73. The melting point and resistivity of tungsten are very high. It does not melt readily at a high temperature. The electric lamps glow at very high temperature. Hence tungsten is mainly used as heating element of electric bulbs.

74. * The total resistance of the circuit decreases.

* The total current in the circuit increases.

* Even if one device in the circuit breaks down, the other devices will work properly.

75. The heat generated in a resistor

i. is directly proportional to the square of the current flowing through a given resistance.

ii. The resistance is directly proportional to the current flowing through the resistor.

iii. The time taken for the current to flow through the resistor is directly proportional to the current.

$$H = I^2 R t$$

• Tungsten

• Nitrogen / N, or Argon / Ar (consider if He / Ne / Kr is written)

76.

$$I = \frac{P}{V}$$

$$= \frac{40}{220}$$

$$I = \frac{2}{11} \text{ A (OR } 0.18 \text{ A)}$$

$$R = \frac{V}{I}$$

$$= \frac{220}{\frac{2}{11}}$$

$$= \frac{220 \times 11}{2}$$

$$R = 1210 \, \Omega \quad (\text{OR } 1222 \, \Omega)$$

77. Resistivity $\rho = 1.84 \times 10^{-6}$ length $l = 1 \text{ m}$

Diameter $d = 3 \times 10^{-4} \text{ m}$

Cross section of wire

$$\begin{aligned} A &= \frac{\pi d^2}{4} \\ &= \frac{22}{7} \times \frac{3 \times 10^{-4} \times 3 \times 10^{-4}}{4} \\ &= \frac{99}{14} \times 10^{-8} \text{ m}^2. \end{aligned}$$

Resistivity

$$R = \frac{\rho \times l}{A}$$

$$= \frac{1.84 \times 1 \times 14 \times 10^{-6}}{99 \times 10^{-8}}$$

$$= \frac{25.76 \times 10^2}{99}$$

$$= 26.02 \, \Omega$$

78. Here, $R_1 = 5 \, \Omega$, $R_2 = 4 \, \Omega$, $R_3 = 12 \, \Omega$, $V = 24 \text{ V}$.

Total resistance of the circuit $R_T = ?$

Total current flowing through the circuit, $I = ?$

$$\begin{aligned}
 &\text{Total resistance of the circuit,} \\
 R_T &= R_1 + \left[\frac{1}{R_2} + \frac{1}{R_3} \right] \\
 &= 5 \Omega + \left[\frac{1}{4 \Omega} + \frac{1}{12 \Omega} \right] \\
 &= 5 + \left[\frac{3+1}{12} \right] \\
 &= 5 + \frac{4}{12} \\
 &= 5 + \frac{1}{3} \\
 &= 5 + 3 \\
 \therefore R_T &= 8 \Omega
 \end{aligned}$$

$$\begin{aligned}
 * \quad \text{Total current flowing through the circuit, } I &= \frac{V}{R_T} \\
 &= \frac{24V}{8 \Omega} \\
 \therefore I &= 3A
 \end{aligned}$$

79. Solution : $H = 1000 \text{ J}$

$$R = 5 \Omega$$

$$t = 2 \text{ seconds}$$

$$V = ?$$

$$H = I^2 R t$$

$$\begin{aligned}
 \therefore I &= \sqrt{\frac{H}{Rt}} \\
 &= \sqrt{\frac{1000 \text{ J}}{5 \Omega \times 2 \text{ s}}} = \sqrt{\frac{1000}{10}}
 \end{aligned}$$

$$I = 10 \text{ A}$$

Potential difference across the resistor

$$V = IR$$

$$= 10 \times 5$$

$$V = 50 \text{ V}$$

80. Solution : For first wire

$$R_1 = \rho \frac{l}{A} = 4 \Omega$$

Now for second wire .

$$R_2 = \rho \frac{\frac{l}{2}}{\frac{A}{2}}$$

$$= \frac{1}{4} \cdot \rho \frac{l}{A}$$

$$R_2 = \frac{1}{4} \cdot R_1$$

$\therefore$ The resistance of the another wire is

$$\frac{1}{4} \cdot 4 = 1 \Omega$$

81. Fuse is a safety device which protects electric circuits and electric appliances by stopping the flow of any unduly high electric current. It is a piece of wire made of a metal or an alloy of appropriate melting point, placed in series with the device. If current larger than the specified value flows, the temperature of fuse wire increases. This melts the fuse wire and breaks the circuit. Thus, placing of fuse is must in electric circuits

82. Electric potential (V) = 6 V
 Charge (Q) = 1 C (each coulomb of charge)
 $W = V \cdot Q$
 $W = 6V \cdot 1C$
 $W = 6J$
83. Electricity flows easily through a thick wire.
 Reason:- The resistance of a wire is inversely proportional to its cross-sectional area
84. When the potential difference is halved, the current, which is directly proportional to it, also halve.
 Reason:- According to Ohm's law, when the resistance (R) is constant, the current (I) is directly proportional to the potential difference (V).
85. The heating element of an electric heater and its connecting wire are made of two different materials and the main reason for this is the difference in their resistance.
86. The rate of energy delivered by an electric current determines the electrical capacity.
87. Alloys have a much higher resistivity than their constituent pure metals.
 Alloys do not oxidize (burn or melt) easily at high temperatures.
88. They have low resistivity and low melting points compared to alloys. They would draw excessive current, fail to generate enough heat, and quickly melt.
89. No, Ohm's law generally applies to metallic conductors under stable physical conditions. Electrolytes and gases behave non-linearly.
90. Loose connections introduce small air gaps and reduce contact surface area, creating high localized resistance. This resistance generates intense heat (I^2Rt), which can melt insulation or spark a fire.
91. No. In a parallel circuit, each branch operates independently. A change or failure in one branch does not affect the voltage or current in the other branches
92. No. Fuses must be placed in series. In parallel, current would bypass the fuse line entirely, preventing it from cutting off power during an overload.

IV. Three marks Questions:

93. $R_1 = 5\Omega$, $R_2 = 10\Omega$, $R_3 = 30\Omega$.
 Voltage between each resistor is , $v = 12 \text{ v}$.
 Electric current through R_1 is $I_1 = V/R_1 = 12 \text{ v}/5\Omega = 2.4 \text{ A}$
 Electric current through R_2 $I_2 = V/R_2 = 12 \text{ v}/10\Omega = 1.2 \text{ A}$
 Electric current through R_3 $I_3 = V/R_3 = 12 \text{ v}/30\Omega = 0.4 \text{ A}$
 Total electric current through $I = I_1 + I_2 + I_3$
 $= 2.4 \text{ A} + 1.2 \text{ A} + 0.4 \text{ A} = 4 \text{ A}$
 Total resistance $1/R_p = 1/R_1 + 1/R_2 + 1/R_3 = 1/5 + 1/10 + 1/30$
 $= 6/30 + 3/30 + 1/30 = 10/30 = 1/3 \Omega$
 Therefore $R_p = 3 \Omega$
94. Refrigerator $400 \text{ W} = 0.4 \text{ kW}$ unit = $\text{kWh} = 0.4 \times 10 = 4 \text{ kWh}$
 Electric fan $80 \text{ W} = 0.08 \text{ kW}$, $0.08 \times 6 = 0.48 \text{ kWh}$.
 Electric bulb $18 \text{ W} = 0.018 \text{ kW}$, $0.018 \times 6 = 0.108 \text{ kWh}$.
 $4 \text{ kWh} + 0.48 \text{ kWh} + 0.108 \text{ kWh} = 4.588 \text{ kWh}$.
 days in June $30 \times 4.588 = 137.64 \text{ kWh}$.
 rupees per unit $137.64 \times 3 = 412.92 \text{ rupees}$.
95. Using Nichrome.
 Because: i) due to high resistivity high amount of heat is produced.
 ii) high melting point.
 iii) In high temperature it will not melt easily.
96. $R = 20 \Omega$ $R = \rho l/A$
 $L_1 = 2l$ $R_1 = \rho l_1/A_1 = 4\rho l/A$
 $A_1 = A/2$ $R_1/R = 4/1$
 $R_1 = 80 \Omega$

97. a) The potential difference across the wire in an electric circuit is directly proportional to the current flowing through it provided if the temperature remains the same.
 b) The Resistance of the conductor depends on
 i) its length
 ii) area of cross-section
 iii) nature of the material
 iv) its temperature.

98. Joule's law of heating: $H = I^2 RT$

Heat produced by the Resistor is directly proportional to the

- i) Square of the current for a given resistor.
 ii) Resistance for a given current.
 iii) time taken to flow the current through the resistor

Working of Electric filament bulb:

In an incandescent type of bulb an electric current is passed through a thin metal filament heating the

filament until it glows and produces light. filament has a lot of resistance to electricity. As a result of their resistance, the filament heats up & starts glowing by converting electrical energy to light energy

• Tungsten • Nitrogen / N OR Argon / Ar

99.

$$i) \quad I_1 = \frac{V}{R_1} = \frac{24 \text{ V}}{10 \Omega} = 2.4 \text{ A}$$

$$I_2 = \frac{V}{R_2} = \frac{24 \text{ V}}{20 \Omega} = 1.2 \text{ A}$$

$$I_3 = \frac{V}{R_3} = \frac{24 \text{ V}}{60 \Omega} = 0.4 \text{ A}$$

$$ii) \quad I = I_1 + I_2 + I_3$$

$$= (2.4 + 1.2 + 0.4) \text{ A}$$

$$= 4 \text{ A}$$

$$iii) \quad \frac{1}{R_p} = \frac{1}{10} + \frac{1}{20} + \frac{1}{60} = \frac{1}{6}$$

$$\frac{1}{R_p} = \frac{1}{6}$$

$$R_p = 6 \Omega.$$

100. Given - $R = 28 \Omega$, $d = 0.04 \text{ mm}$, $l = 2 \text{ m}$, $\rho = ?$.

$$r = d/2 = 0.04/2 = 0.02 \text{ mm} = 2 \times 10^{-5} \text{ m}$$

$$A = \pi r^2 = 3.14 \times (2 \times 10^{-5})^2 = 12.56 \times 10^{-10} \text{ m}^2$$

$$R = \rho l A \Rightarrow \rho = R A l = 28 \times 12.56 \times 10^{-10} / 2 = 175.84 \times 10^{-10} = 1.758 \times 10^{-8} \Omega \text{ m}$$

V. Four marks questions.

101. a) Solution:

$$\begin{aligned} \text{The energy consumed by the bread-toaster in 30 days} &= 350 \text{ W} \times 15 \text{ hours} \times 30 \text{ days} \\ &= 157500 \text{ Wh} = 157.5 \text{ kWh} \end{aligned}$$

$$\begin{aligned} \text{The energy consumed by the iron box in 30 days} &= 250 \text{ W} \times 5 \text{ hours} \times 30 \text{ days} = 37500 \text{ Wh} \\ &= 37.5 \text{ kWh} \end{aligned}$$

1 The total cost of energy at the rate of Rs. 4.00 for 1 kWh for 30 days. = (157.5 + 37.5) kWh $\times$ 4
 = 195 $\times$ 4 = Rs. 780

b) Parallel connection.

102. $V = 220 \text{ V}$, $I = 10 \text{ A}$, $P = ?$, $E = ?$

$$P = VI = 220 \times 10 = 2200 \text{ W} = 2.2 \text{ kW}$$

Total energy consumed by the electric heater in 30 days would be

$$2.2 \text{ W} \times 8 \text{ hours/day} \times 30 \text{ days} = 528 \text{ kWh}$$

Thus, the cost of energy to operate the refrigerator for 30 days is

$$= 528 \text{ kWh} \times \text{Rs. } 5.00$$

$$= \text{Rs. } 2640.$$

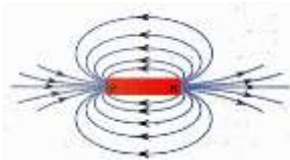
- 103.
- (a) Transmission wires: Material X
 - (b) Heating element of an electric iron: Material Y
 - (c) Handle of a tester: Material Z
- (a) Transmission Wires: Material X
- Why: Material X has an extremely low resistivity, which is characteristic of highly conductive metals like silver or copper.
 - Justification: Transmission wires need to carry electricity over long distances without losing energy. Low resistivity ensures minimal resistance, allowing current to flow freely with negligible heat loss
- (b) Heating Element of an Electric Iron: Material Y
- Why: Material Y has a moderate to high resistivity, typical of alloys like Nichrome.
- Justification: Heating elements require a high resistance to deliberately oppose current flow. This opposition converts the electrical energy efficiently into thermal energy (heat). Alloys also have a high melting point and do not oxidize (burn) easily at high temperatures
- (c) Handle of a Tester: Material Z
- Why: Material Z has an exceptionally high resistivity, making it an excellent electrical insulator (like rubber or plastic).
 - Justification: The handle of a tester must protect the user from dangerous electric shocks. Because the resistivity is so high, it offers near-infinite resistance, completely blocking the flow of electric current to the human hand.
109. The current flowing through it is also halved.
- According to Ohm's law, when the resistance (R) is constant, the current (I) is directly proportional to the potential difference (V).
- Formula: $I = V/R$
 - Original current: $I_1 = V/R$
 - If the new potential difference is halved: $V_2 = V/2$
 - New current: I_2
- $$I_2 = V_2/R = V/2/R = \frac{1}{2}(V/R) = I_1/2$$

Chapter 12: Magnetic Effects of Electric Current Points

I. Multiple Choice Questions

1. A. South (S) and South (S)
2. B. Uniform.
3. C. Magnetic lines of force intersect each other
4. C. Anticlockwise
5. A. Same at all points
6. B. Electric current
7. C. 90°
8. B. 10 times
9. C. Direction of electric current in a conductor
10. A. High
11. A. Index finger
12. C. Use of fuses
13. D. Geyser
14. D. Very high.
15. D. At both ends
16. D. The wire is the centre of the concentric magnetic lines of force of the magnetic field
17. D. All of the above are correct
18. C. decreasing the radius of the coil

19. At the point of intersection, the needle of the compass should point in both directions but this is not possible.
20. If, both the live wire and the neutral wire come into direct contact.
21. Direction of electric current
22. At the ends / poles of a solenoid, the magnetic force lines appear as concentric circles.
At the centre / inside the solenoid, the magnetic force lines appear as parallel straight lines.
23. At point P, it is anticlockwise.
At point Q, it is clockwise.
24. The area of magnetic force around a bar magnet.
25. The imaginary lines representing the magnetic field around a magnet are called the lines of force of the magnet
26. The electric current experiences the greatest force when its direction is perpendicular to the direction of the magnetic field.
27. Electric motors, electric generators, loudspeakers, microphones and electrical meters. etc.
28. A compass is a small bar magnet, the magnetic fields of the compass and the bar magnet interact, so that when the compass is brought near the bar magnet, it moves.
- 29.

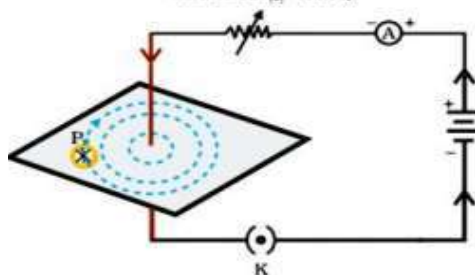


30. i) Permanent magnet method
ii) Electromagnetic method
31. Because the magnetic field lines are parallel, straight, and equally spaced, making the field uniform.
32. Both pieces instantly become independent magnets, each developing its own North and South pole. Isolated magnetic poles cannot exist.
33. By sprinkling iron filings around it on a cardboard sheet and tapping it gently, or by tracking the deflection paths using a small magnetic compass.
34. Its North and South poles interchange positions

III Two Mark Questions

35. 34. Properties of magnetic lines of force:
 - No two magnetic lines of force intersect each other.
 - The density of magnetic lines of force is higher at the magnetic poles.
 - Magnetic lines of force are emitted at the north pole and merge at the south pole.
 - Inside the magnet, there are magnetic lines of force from the south pole of the magnet to the north pole.
 - Magnetic lines of force are a closed network
36. Overload can occur when both the live wire and the neutral wire come into direct contact.
 - This happens when the insulating covering on the wires is damaged or there is any fault in the electrical equipment.
 - This can happen due to a sudden increase in the supplied voltage
 - Overload can occur when the current in the circuit suddenly increases too much.
37. The earth wire connected to the metal surface creates a path of low resistance for the electric current.
Thus, if any kind of electrical leakage occurs to the equipment having a metal surface, its potential difference equalizes to the earth potential difference and the user does not get a severe electric shock
38. Left. (or) is towards the magnet (or towards the north pole of the magnet)
Rule:- Fleming's left-hand rule

39. A solenoid is a cylindrical coil of copper wire with many turns wound around it. A piece of soft iron, a magnetic material, can be placed inside a current-carrying solenoid to make it an electromagnet.
40. i) Figure (B) shows the direction of the magnetic field correctly.
 ii) "Right-hand thumb rule"
 the magnetic field's direction when the direction of the current in the current carrying conductor.
41. The number of turns of the coils Increasing.
 Increasing the current flowing in the coil
- 42.



- 43.
- At the ends/poles of a solenoid, the magnetic field lines appear as concentric circles.
 - In the centre/inside of the solenoid, the magnetic field lines appear as parallel lines
 - The magnetic lines of force inside the solenoid are parallel to each other.
 - This shows that the magnetic field is equal at each point inside the solenoid. (Uniform).
44. $P = 2\text{KW} = 2000\text{W}$ $V = 220\text{V}$ $I = P/V = 2000/220$ $I = 9.09\text{A}$
 The rating of the circuit is 5A. However, a current of 9.09A is flowing in it. Since the current is flowing more than the capacity, it causes overload and generates more heat.
45. A) Maxwell's right-hand law
 B) Fleming's left-hand law.
46. P and Q are north poles, because the magnetic lines of force are repulsive.
47. The student's statement is correct, since the density of magnetic lines of force is higher at the poles of the magnet, the magnetic field at end A is higher than at end B.
48. Pole: South
 Same poles repel reach other.
49. Copper has low resistance and a very high melting point. It will not melt easily when excessive current flows, defeating the safety purpose of the fuse and putting household wiring at risk of burning.

IV. Three-mark questions

- 50.
- Take a small compass and a bar magnet. Place the bar magnet on a white sheet attached to a drawing sheet and mark the boundary around the bar magnet.
 - Place the compass near the north pole of the bar magnet and mark the position of the two ends of the compass.
 - The compass should be moved so that the south pole of the compass occupies the position previously occupied by the north pole of the compass.
 - Similarly, the compass should be continued until it reaches the south pole of the bar magnet. The marked points should be joined by a smooth curve. This represents the magnetic lines of force.
 - By repeating the above procedure, we can measure a sufficient number of lines of force

51. a) The magnetic field produced in a solenoid by an electric current is the same as the magnetic field produced around a bar magnet.
The magnetic field is uniform inside the solenoid.
Two ways to increase the magnetic field in a solenoid:-
b) Right-hand thumb rule:- When a current-carrying conductor is held in the right hand, the thumb indicates the direction of the current. The fingers are wrapped around the conductor in the direction of the magnetic field. Law of magnetic force lines:- Magnetic force lines are emitted at the north pole and merge at the south pole.
- They are closed networks.
 - Have direction and magnitude.
- No two magnetic lines of force intersect each other.
The density of magnetic lines of force is higher at the magnetic poles. Magnetic lines of force are emitted at the north pole and merge at the south pole.
Inside the magnet, magnetic lines of force are present from the south pole of the magnet to the north pole.
52. Upwards.
Reasoning: The direction of current is the same as the direction of motion of the positively charged alpha-particle (East). Using Fleming's Left-Hand Rule, if the forefinger points North (magnetic field) and the middle finger points East (current), the thumb will point vertically upwards.
53. a. Inside the loop: Perpendicular to the table downwards.
b. Outside the loop: Perpendicular to the table upwards.
c. *Reasoning:* Apply the Right-Hand Thumb Rule. Curl your right-hand fingers in the direction of the clockwise current. Your thumb will point downwards inside the centre of the loop, meaning the field lines enter the table.
54. Perpendicular to both the magnetic field and the direction of motion, pointing into the page.
Reasoning: An electron carries a negative charge. Therefore, the direction of current is opposite to the motion of the electron. Use Fleming's Left-Hand Rule, reverse the direction of the thumb to account for the negative charge, and the force goes into the plane of the paper.
55. (a) The displacement increases because the magnetic force is directly proportional to the magnitude of the current.
(b) The displacement increases because the force is directly proportional to the strength of the magnetic field.

V. Four Mark Questions

56. Functions of earth wire:-
- It is used for the safety of electrical appliances having a metal surface in the domestic electrical circuit.
 - It creates a path of low resistance for electric current.
 - If there is any kind of electrical leakage in the appliance, its potential difference is equal to the potential difference of the earth and the user does not get a severe electric shock.
- 57.
- A small rod of aluminium is suspended with the help of two conducting wires.
 - Take a powerful horseshoe magnet and place it between the two poles with its magnetic field facing upwards.
 - The aluminium bar is connected in series to a battery, switch and rheostat
 - Now, current is passed through the aluminium bar in a particular direction.

- The bar is displaced in one direction.
- When the direction of the current in the bar is changed, it is displaced in the opposite direction.
- Therefore, a bar carrying an electric current experience a force perpendicular to its length in a magnetic field

Chapter-3: Metals and Non-metals

I. Multiple Choice Questions. (One-mark questions.)

1. D) Silver nitrate solution and copper metal
2. C) Zinc is more reactive than tin
3. A) H_2
4. A) Copper carbonate
5. C) Copper is more reactive than silver but less reactive than iron
6. D) Ionic bond
7. A) $Al < Mg < Ca < Na < K$
8. B) Roasting
9. C) Iron
10. A) $Zn > Fe > Cu$
11. A) $Fe < Zn < Al$
12. A) $Mg > Al > Zn > Fe$
13. C) $2AgNO_3 + Cu \rightarrow Cu(NO_3)_2 + 2Ag$
14. C) Metals A and C
15. A) Y
16. C) Sodium carbonate and carbon dioxide
17. A) Gold
18. B) Sulphur
19. D) Carbon is added in fixed proportion
20. D) NO_2
21. D) All three metals from their solutions
22. D) s

II. Answer the following questions: (One-mark questions).

23. Magnesium (Mg) and Manganese (Mn)
24. Silver / Copper, Lead / Mercury (any one)
25. the property of metals to be drawn into thin wires (ductility).
26. Compounds formed by transfer of valence electrons from metal to non-metal.
27. When an iron ring is dipped in copper sulphate solution, copper is displaced from the salt solution and gets deposited on the iron ring.
28. Gold and platinum.
29. A homogeneous mixture of two or more metals or a metal and non-metal (alloy).
30. Reduction method.
31. Strong ionic bonds between atoms require high energy to break.
32. Metal sulphide ore is converted into oxide by heating strongly in excess air (roasting)
33. Metal carbonate ore is converted into oxide by heating strongly in limited air (calcination).
34. i) Diamond,
ii) Graphite.
35. Amalgam.

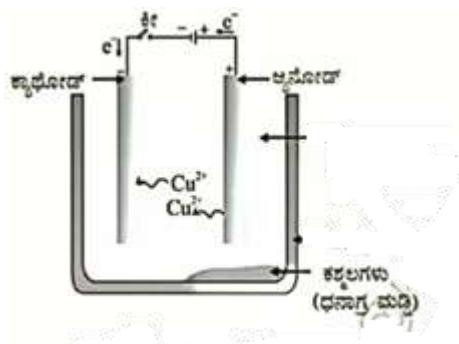
36. Ionic compounds have high melting and boiling points.
37. Amphoteric oxide.
- III **Answer the following questions: (Two marks questions)**
38. oxides that react with both acids and bases to produce salt and water are called amphoteric oxides — e.g., aluminum oxide, zinc oxide.
39. Highly exothermic displacement reactions are used for joining railway tracks and repairing broken machine parts.
40. The property of metals to be beaten into thin sheets (malleability) — e.g., gold and silver.
41. Situation-2: Ionic compounds are non-conductors in solid state but conduct electricity in molten or aqueous state because ions move freely.
42. a) Sulfur dioxide, b) Sulfuric acid.
43. Hydrogen gas
 $\text{Fe} + \text{H}_2\text{SO}_4 \rightarrow \text{FeSO}_4 + \text{H}_2$
44. $\text{Al}_2\text{O}_3 + \text{HCl} \rightarrow \text{AlCl}_3 + \text{H}_2\text{O}$
 $\text{Al}_2\text{O}_3 + \text{NaOH} \rightarrow \text{NaAlO}_2 + \text{H}_2\text{O}$
45. Calcium reacts less vigorously with water. The heat released is not enough to ignite hydrogen gas.
 $\text{Ca} + \text{H}_2\text{O} \rightarrow \text{CaO} + \text{H}_2$
46. Sodium and potassium → Sodium hydroxide and potassium hydroxide.
47. a) Shiny metallic luster, ductility, malleability. b) Sonority, ductility.
48. Metals are generally hard, solid (except mercury, liquid at room temperature), lustrous, malleable, ductile, good conductors of heat and electricity, and have high melting and boiling points (any four).
49. Non-metals exist as solids or gases (bromine is liquid), are non-lustrous (except iodine), poor conductors of heat and electricity (except graphite), not malleable or ductile, and have low melting and boiling points (any four).
50. i) Mercury, ii) Sodium, iii) Silver and copper, iv) Lead and mercury.
51. i) Reaction of iron with steam: $3\text{Fe} + 4\text{H}_2\text{O} \rightarrow \text{Fe}_3\text{O}_4 + 4\text{H}_2$ ii) Reaction of calcium with water: $\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{H}_2$
52. These metals have greater affinity for oxygen than carbon, so they cannot be reduced by carbon. They are extracted from ores by electrolysis.
53. Methods to prevent rusting: Painting, oiling, greasing, galvanization, chromium plating, anodizing, alloying (any four).
54. Coating iron objects with zinc is called galvanization. Zinc reacts with air to form a protective zinc oxide layer.
55. Minerals are ores that contain a high proportion of a specific metal. Roasting, Calcination.

Calcination	Roasting
Heating ores in limited air at high temperature	eating ores in excess air at high temperature
converts carbonates to oxides	converts sulfides to oxides)

57. Cinnabar (HgS) is an ore of mercury. On roasting, it first forms mercury oxide (HgO). Further heating reduces it to mercury. $2\text{HgS} + 3\text{O}_2 \rightarrow 2\text{HgO} + 2\text{SO}_2$ $2\text{HgO} \rightarrow 2\text{Hg} + \text{O}_2$
58. i) In test tube A, iron nail rusts because both air and moisture are present. ii) In test tube B, only moisture is present but no air. iii) In test tube C, only air is present but no moisture
59. Potassium reacts vigorously with cold water. Zinc does not react with cold water but reacts with steam. $\text{K} + \text{H}_2\text{O} \rightarrow \text{KOH} + \text{H}_2$

60. a) Shiny metallic luster, ductility, malleability. b) Metals are easily reduced from their oxides.

61.

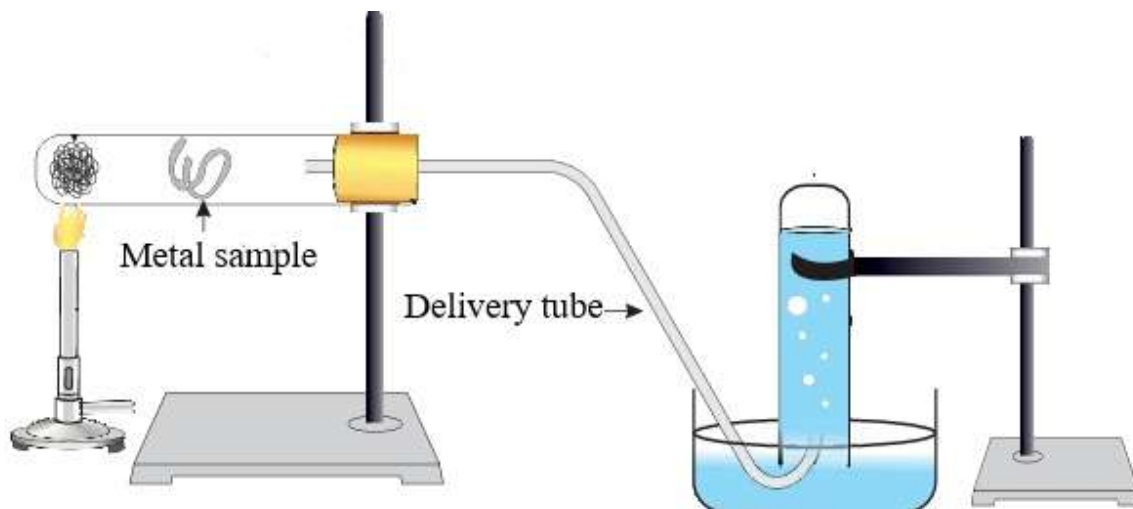


62. To obtain copper, CuS is roasted in air: $2\text{CuS} + 3\text{O}_2 \rightarrow 2\text{CuO} + 2\text{SO}_2$ $\text{CuO} + \text{CuS} \rightarrow 6\text{Cu} + \text{SO}_2$
63. Electrolytic refining of copper: Impure copper as anode, copper sulfate solution as electrolyte, pure copper deposited at cathode.
64. Nitric acid is a strong oxidizing agent. It reacts with hydrogen to form water and gets reduced to nitrogen oxides.
65. $\text{Mn} + \text{HNO}_3 \rightarrow \text{Mn}(\text{NO}_3)_2 + \text{H}_2$
 $\text{Mg} + \text{HNO}_3 \rightarrow \text{Mg}(\text{NO}_3)_2 + \text{H}_2$

IV. Answer the following questions (Three marks questions)

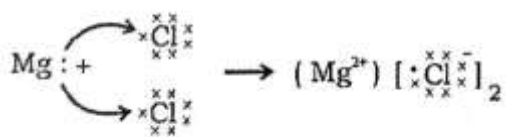
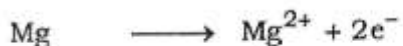
66. A) Strong electrostatic forces between positive and negative ions make ionic compounds hard; ions cannot move. B) Metals react quickly with air and water but not with organic solvents. C) Aluminum reacts with oxygen to form a protective oxide layer that prevents further corrosion.

67.



68. a) On calcination, zinc carbonate forms zinc oxide: $\text{ZnCO}_3 \rightarrow \text{ZnO} + \text{CO}_2$ On roasting, zinc sulfide forms zinc oxide: $2\text{ZnS} + 3\text{O}_2 \rightarrow 2\text{ZnO} + 2\text{SO}_2$ b) Metals have greater affinity for oxygen.
69. a) Copper reacts with moist carbon dioxide in air to form a brown layer of copper carbonate. b) Lemon and tamarind juice contain acids that react with basic carbonates and neutralize them.
70. a) Gold, silver, platinum, copper (any two). b) Metals are highly reactive with oxygen; oxygen is abundant in the atmosphere. c) Their molten chlorides are electrolyzed.
71. (i) Minerals: Naturally occurring substances in the earth's crust containing metals or compounds. ii) Ores: Minerals containing metals in high proportion, economically viable for extraction. iii) Gangue: Unwanted impurities like sand, clay present in ores.

72.

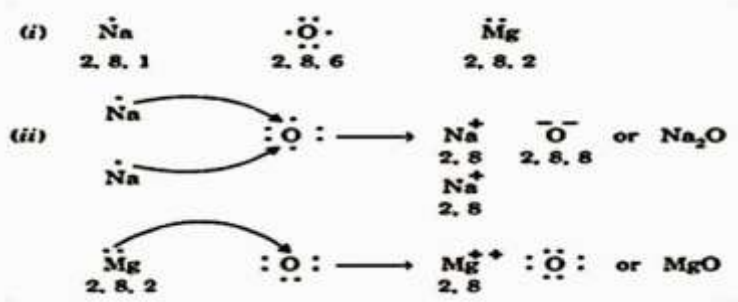


V. Answer the following questions: Four marks questions.

73. A. A) Pure iron is soft and malleable, but alloys are hard because mixing iron with other substances changes its properties. B) Copper reacts with moist carbon dioxide in air to form a brown layer of copper carbonate. C) Zinc oxide. D) Nitric acid is a strong oxidizing agent. It oxidizes hydrogen to water and itself gets reduced to an oxide.

VI. Answer the following questions: (Five marks questions)

74.

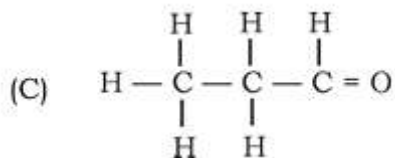


75. • a) Sodium atom electron configuration: 2, 8, 1 Chlorine atom electron configuration: 2, 8, 7 To attain stable octet, sodium loses one electron to form Na^+ , chlorine gains one electron to form Cl^- . Electrostatic attraction between Na^+ and Cl^- forms sodium chloride (NaCl). b) Properties of ionic compounds:
- Solid state
 - High melting and boiling points
 - Soluble in water
 - Conduct electricity in molten or aqueous state

Chapter -4 : Carbon and its compounds

I. MCQ(1marks)

- (D) 4
- (B) O_2
- (C) Methane
- (B) Catenation
- (D) Ethyne
- (B) -OH
-



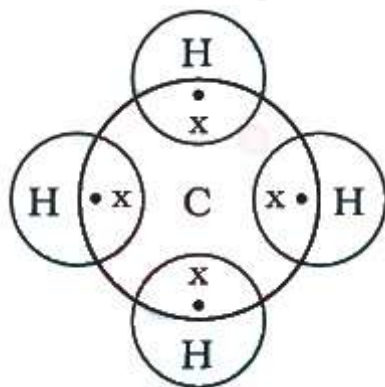
- A) Propanone
- (B) 9 and 3
- (B) 18

11. (C) Six and Twelve
12. (A) C_6H_{12}
13. (A) CH_2
14. (D) C_2H_2 , C_3H_4 , C_4H_6
15. (B) Ethane, Propane, Butane
16. (A) C_nH_{2n-2}
17. (D) C_nH_{2n+2}
18. (C) Esters
19. (C) $KMnO_4$ or $K_2Cr_2O_7$
20. (A) $HCOOH$, CH_3COOH , C_2H_5COOH , C_3H_7COOH
21. (C) X end hydrophilic and Y end hydrophobic
22. (B) Form insoluble scum in hard water
23. (A) $:N:::N:$

24. (C) C_2H_2

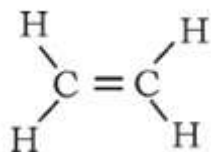
II. Answer the following questions. (1 Mark)

25.



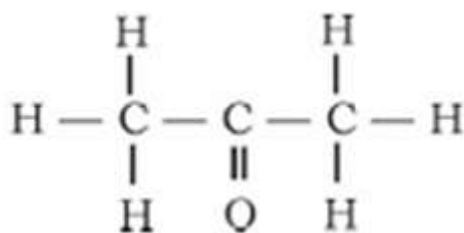
26. 9 single bonds and 1 double bond / 9 and 1

27.

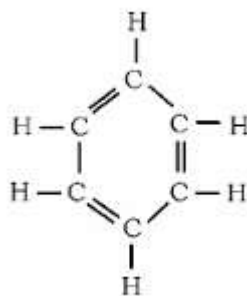


28. i) Methanol ii) Bromoethane

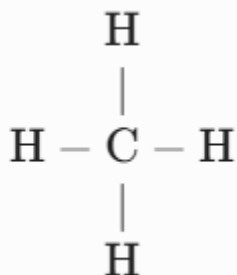
29.



30. C_6H_{12}
31. C_3H_7Cl and Chloropropane
32. C_6H_6

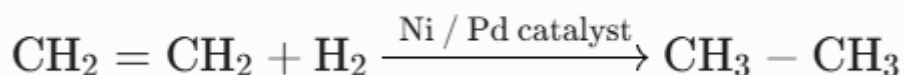


33. Vinegar
34. Sodium salts of sulfonic acids
35. Esters react with NaOH to form alcohol + sodium salt of acid → saponification
36. Soap ionic end interacts with water, hydrocarbon end with grease → micelle formation
37. Substances that add oxygen to others
38. C_nH_{2n+2}
39. Insoluble scum: P; Excess foam: Q
40. 9 and 1
41. Cleaning solution
42. Series of compounds with same functional group replacing hydrogen → homologous series
43. Change rate of reaction → catalysts
44. Ethanol heated with conc. H_2SO_4 at 443K → dehydration → ethene
45. Alkalis are water-soluble bases
46. Vinegar
47. Sodium salts of sulfonic acids
- 48.



Methane

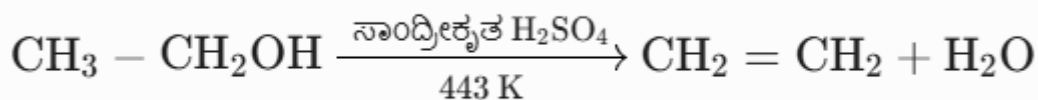
49. C_2H_2
 50. Carbon has 4 valence electrons
- III**
51. a) Covalent compounds have weak intermolecular forces → low melting/boiling points b) No charged particles → poor conductors of electricity
 52. Unsaturated hydrocarbons + H_2 in presence of Pd/Ni catalyst → saturated hydrocarbons →



hydrogenation

53. Show catenation, tetravalency
54. Ethanol oxidized with alkaline $KMnO_4$ or acidic $K_2Cr_2O_7$ → ethanoic acid

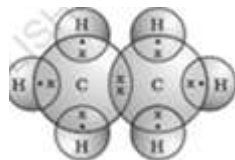
55. Ethanol + conc. H_2SO_4 at 443K $\rightarrow$ dehydration $\rightarrow$ ethene



56. a) In homologous series, molecular mass increases $\rightarrow$ physical properties show gradation b) Chemical properties remain same due to functional group



i)

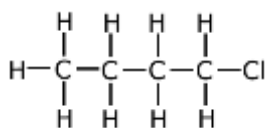


ii)

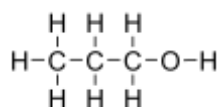
58. Functional groups cause specific properties regardless of chain length: -CHO, -OH
 59. Unsaturated hydrocarbons need ≥ 2 carbons with double/triple bond $\rightarrow$ CH_2 cannot be first member $\rightarrow \text{C}_2\text{H}_4$
 60. Substitution reaction: one atom/group replaces another. Example: $\text{CH}_4 + \text{Cl}_2 \rightarrow \text{CH}_3\text{Cl} + \text{HCl}$ (sunlight)
 61. Hydrocarbons with triple bonds $\rightarrow$ alkynes. Example: Ethyne/Acetylene (C_2H_2)
 62. $\text{CH}_3\text{COOC}_2\text{H}_5 + \text{NaOH} \rightarrow \text{C}_2\text{H}_5\text{OH} + \text{CH}_3\text{COONa}$ (saponification)
 63. i) a – Ethene (unsaturated) ii) b – Ethane (saturated)

IV.

64. i) Propanoic acid ii) Butene iii) Ethanol iv) Pentyne
 65. Mix ethanol + acetic acid + conc. H_2SO_4 , heat $\rightarrow$ ester formation $\rightarrow$ sweet smell
 66. Ethanoic acid + $\text{Na}_2\text{CO}_3 \rightarrow$ sodium acetate + CO_2 + H_2O Ethanoic acid + $\text{NaHCO}_3 \rightarrow$ sodium acetate + CO_2 + H_2O
 67. Carboxylic acid + alcohol $\rightarrow$ esterification $\rightarrow$ esters used in perfumes/flavourings
 68. i) $\text{C}_4\text{H}_9\text{Cl}$



ii) $\text{C}_3\text{H}_7\text{OH}$



69. a) Ethene $\rightarrow$ Ethane b) Methane $\rightarrow$ Chloromethane
 70. Carbon's versatility due to: catenation, tetravalency, multiple bonding, isomerism

V.

71. Catenation: Carbon atoms bond with each other to form long chains.
- Straight chain
 - Branched chain
 - Ring chain

VI.

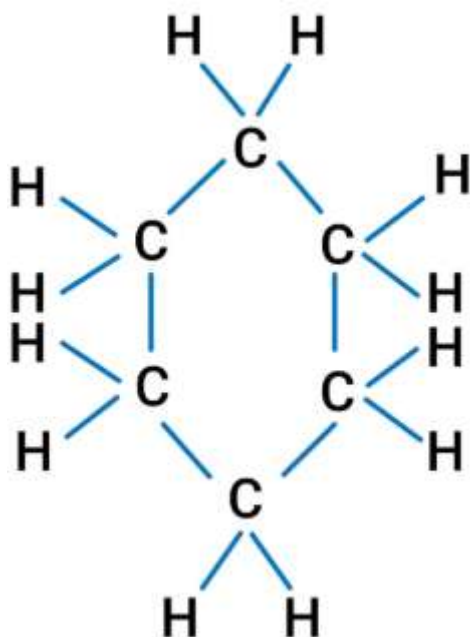
72. Unsaturated hydrocarbons hydrogenated with Pd/Ni catalyst → saturated hydrocarbons. Used in hydrogenation of oils.
73. Ethanol does not react with NaHCO₃, no litmus change. Ethanoic acid reacts → CO₂ release, blue litmus turns red. Hard water contains Ca/Mg salts → soap forms insoluble scum.
- Unsaturated hydrocarbons hydrogenated with Pd/Ni catalyst → saturated hydrocarbons. Used in hydrogenation of oils.

V.

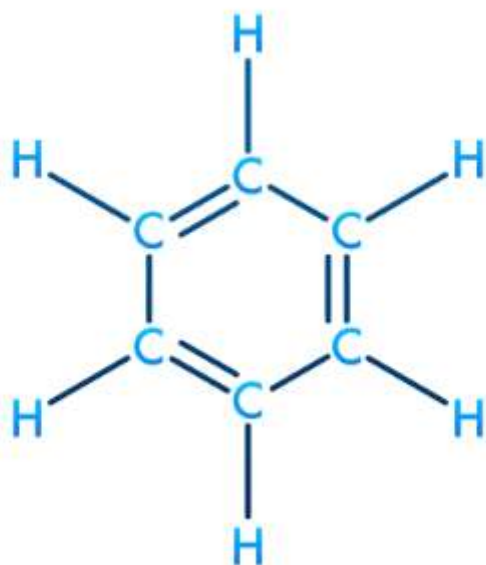
74. Hexene



Cyclohexane



Benzene



75. 7) **a)** It is difficult for the carbon nucleus to hold on to four extra electrons. Similarly, it is difficult to remove four electrons from a carbon atom. Therefore, it is not possible to form a C⁴⁻ or C⁴⁺ ion.

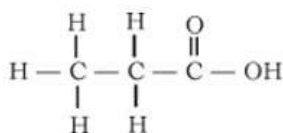
- 8) **b)** Compounds that have the same molecular formula but different structures are called **structural isomers**. Structural isomers of butane:



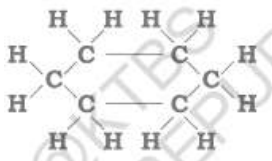
a)

Saturated compounds	Unsaturated compounds
Contain only single bonds between carbon atoms	Contain double or triple bonds between carbon atoms
Less reactive	More reactive
Undergo substitution reactions	Undergo addition and substitution reactions
Burn with a blue flame	Burn with a red or yellow flame

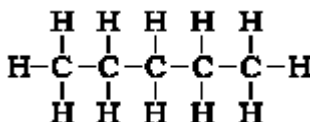
b) i) C_2H_5COOH



ii) C_6H_{12}



iii) C_5H_{12}



CHAPTER-7: HOW DO ORGANISMS REPRODUCE?

KEY ANSWER

I. Multiple Choice Questions:

- D) Plasmodium, Amoeba, Leishmania
- B) primary shoot, primary root
- B) Fragmentation
- A) Urethra
- D) pollination, fertilization, embryo, seed
- B) fallopian tube
- A) Gonorrhoea
- A) AIDS
- C) ovary and ovule
- D) to maintain the temperature required for sperm production.
- C) regeneration of tissues by development in specialized cells
- B) I, III, IV, II
- A) Bacteria
- C) Ovary and radicle
- B) regeneration

16. D) Placenta
17. C) Fertilization of the egg is possible only in the structure shown in Figure-A
18. C) Chemotropism
19. C) Vegetative propagation
20. B) B and D
21. B) Hydra
22. A) Bacteria

II. Answer the following questions (One mark)

23. No.
Reason: For self-pollination, a flower must have stamens and pistils / the flower must be bisexual
24. *Sexual reproduction involves the combining of genetic material from two organisms.
* Sex cells are produced by meiosis.
25. Flower A undergoes self-pollination,
because it is a bisexual flower (has both male and female reproductive parts)
26. No. This is because the copper T is inserted into the uterus to prevent pregnancy.
Sexually transmitted diseases can be prevented by using a condom.
27. Plants that grow from seeds exhibit variation.
This is because sexual reproduction produces more variation.
28. Amoeba: 30
Gamete: 23
29. R: Banana, Rose, Hibiscus.
30. *If the egg is not fertilised inner lining of uterus breaks and comes out through vagina as blood and Mucous.
*This is known as menstruation
31. * spores are surrounded by thick layer which protects them in adverse conditions.

32.



33. The process where cell makes exact duplicate of its DNA .

III. Answer the following questions (Two-mark questions)

34. •Germ cells receive half the amount of DNA by a process of cell division called meiosis.
•This is necessary to ensure that the number of chromosomes and the amount of DNA in the new generation are reassigned
35. •In men, a vasectomy surgery is to block the vas deferens and prevent the transport of sperm.
•In women, a tubectomy surgery is to block the fallopian tubes and prevent the transport of eggs
36. •Pollination is the process by which the pollen grains of stamens in a flower are transferred to the stigma of pistil.
*It occurs through wind, water, and insects.
•Fertilization occurs in the ovary by the union of male and female gametes
37. * Creation of a mechanical barrier
* Example- Condoms on the penis
*Changing the hormonal balance of the body.
*taken in the form of pills.

38.



39. * The breasts enlarge
* Tips of breasts becomes large
* Menstruation starts.

- 40.
- | Binary fission | Multiple fission |
|--|---|
| * An organism divides into two similar organisms | * An organism produces two or more organisms. |
| * Thick layer is not formed around the cell | * Thick layer is formed around the cell. |
| * It generally occurs in favourable conditions
EX: Amoeba, paramecium | * It can take place in unfavourable conditions too
Ex: Malarial parasite |
41. * It provides to the populations of species by preventing them from getting wiped out during adverse conditions.
* it helps to generate copies of individuals which are suited to a particular environment.
- IV. Answer the following questions: (Three marks questions)**
42. (a) Sperm formation requires a lower temperature than body temperature.
(b) Testosterone regulates / stimulates the formation of sperm.
(c) Secretion of Prostate gland makes the transportation of sperm easier.
43. • Spores are produced in large numbers. This increases the number of organisms of this species.
• Spores are covered with a thick wall that protects them until they come into contact with moisture and begin to grow.
• Spores are dispersed over long distances by the wind, which results in the spread of organisms over long distances.
44. i) Testis
ii) Penis
iii) Prostate gland and Seminal vesicle
45. i) Ovary
ii) Oviduct
iii) uterus
- V. Answer the following: (Four marks questions)**
46. • They produce flower and fruit quickly.
• This method is useful in plants that do not produce seeds.
• They are genetically similar to the parent plant.
• They produce high-yielding, disease-free plants.
• A large number of plants can be grown in less time and at lower cost.
- VI. Answer the following questions (Five marks)**
47. a) * Hydra- a bud develops as an outgrowth at one specific site. These buds develop into new independent individuals.
* Spirogyra- breaks up into smaller pieces upon maturation and these pieces grow into new individuals.
* Amoeba- formation of two daughter cells from the mother cell.
b) * After fertilization, the zygote divides several times inside the egg, producing an embryo.
* The petals, sepals, stamens, pistils and stigmas fall off easily.
* The egg develops a thick layer that slowly changes into a seed.
* The ovary grows rapidly matures and ripens.
- OR
- a) i) Testis: Produce testosterone hormone and sperms
ii) Seminal vesicle: * Its secretion makes the transport of the sperm easier.
* Its secretion provides nutrition to the sperms.
- b) * The zygote divides and becomes an embryo
* The embryo is implanted in the lining of the uterus.
* The embryo continues to grow and develop organs to become foetus.
* Through the help of disc shaped special tissues embedded in the uterine wall is called placenta.
* Placenta contains villi on the side of embryo provides area to transport oxygen and glucose from mother.
48. a) * Wearing condoms on the penis
* Covering worn on the penis

- * placing loop/Copper-T in the uterus
 - * Pills/Changing hormonal balance
 - * Applying surgical methods (any two)
- b) * If the egg is not fertilized, it lives for about one day, then the lining of the uterus slowly breaks later.
- * Everything comes out through vagina in the form of blood and mucus.
- c)

Self-Pollination	Cross pollination
The pollen grains in the stamen of a flower are transferred to the pistil of the same flower.	The pollen grains in the stamen of one flower are transferred to the pistil of another flower.
No external media required	External media is required.
Occurs in bisexual flower	Occurs in monosexual and bisexual flower.

- 49.. a) • Physical contraceptive methods have side effects.
- Contraceptive devices such as the IUCD or Copper-T are inserted into the uterus to prevent pregnancy. They can cause side effects due to uterine irritation.
- b)
- They produce flower and fruit quickly.
 - This method is useful in plants that do not produce seeds.
 - They are genetically similar to the parent plant.
 - They produce high-yielding, disease-free plants.
 - A large number of plants can be grown in less time and at lower cost.
- c) Amoeba, and Leishmania
50. a)
- The thread-like structures that grow on the tomato are hyphae of Rhizopus (Bread mould)
 - They have blob-like structures called sporangia. Sporangia contain spores, they are reproductive structures
 - When spores come into contact with a moist surface, they begin to grow
 - Therefore, cut tomato gets spoiled gradually.
- b) Sperm production requires a temperature lower than body temperature.
- c) * In sex cells, meiosis results in the number of original chromosomes being half
- * In sexual reproduction, the male and female gametes fuse to form a zygote.

OR

- a) Hydra:
- Reproduction by budding
 - Development of an external bud by repeated cell division in a specific part
 - The bud develops into an independent organism.
- Planaria :
- Reproduction by regeneration.
 - Specialized cells grow.
 - Differentiated cells undergo changes and become tissues / development.
 - Many parts of the organism grow into separate organisms.
- b)
- * The seed contains an embryo that germinates under suitable conditions.
 - * The radicle develops into a future root.
 - * The plumule develops into future stem
 - * The food stored in the cotyledon is used for growth until photosynthesis begins.
51. a) Sexual maturity is necessary because,
- In Males:
- * Development of testicles for sperm production/testosterone production.
 - * Development of testicles for reproduction.

*To develop secondary male sexual characteristics.

In females:

*For menstruation, for production and release of eggs.

* For the development of uterus.

* For the production of female related hormone estrogen

*Development of breasts for breast feeding after birth.

b) Prostate gland : It provides the fluid medium and nutrients necessary for the transportation of sperm.

52. a)
- Ovary: Produces eggs (female sex cells) and some hormones.
 - Fallopian tube: The passage way through which the egg travels and where fertilization occurs.
 - Uterus: A distendable sac-like structure where a fertilized egg attaches and develops into an embryo.
 - Vagina: The part that receives sperm during sexual intercourse.
- b) *When plant generations are produced through pollination.
 *Because variations are greater through sexual reproduction.
53. a) Pollination is the process by which pollen grains from the stamens of a flower are transferred to the stigma of a pistil.

Self-Pollination	Cross pollination
The pollen grains in the stamen of a flower are transferred to the pistil of the same flower.	The pollen grains in the stamen of one flower are transferred to the pistil of another flower.
No external media required	External media is required.

- b) * After fertilization, the zygote divides several times inside the egg,producing an embryo.
 *The petals,sepals,stamens,pistils and stigmas fall off easily.
 *The egg develops a thick layer that slowly changes into a seed.
 * The ovary grows rapidly matures and ripens.

54. a) Produce testosterone hormone and sperms
 b) * to have thick hair growth on face
 * their voices begin to crack
 * penis occasionally begins to become enlarged and erect at night
 c) * If the egg is not fertilized, it lives for about one day,then the lining of the uterus slowly breaks later.
 *Everything comes out through vagina in the form of blood and mucous.

55. a) because sperm production requires a temperature lower than body temperature.
 b) Placenta:
 *Provides a large surface area for glucose and oxygen to pass from the mother to the embryo.
 * Removes waste substances generated by the developing embryo by transferring into the mother's blood

c)

Spirogyra	Planaria
Reproduces by fragmentation	Reproduces by regeneration
After growth, they divide into small pieces. These pieces grow into new organisms.	When broken into many pieces, each piece grows into a complete organism.

CHAPTER-8: Heredity

Key Answers

I. Multiple Choice Questions

1. B. Gregor Mendel
2. B. Pea
3. D. Heredity
4. A. Only gene for tall trait inherited
5. D. TtWw
6. A. Dominant trait
7. C. DNA
8. D. Self-pollination
9. A. 0
10. C. Round and yellow seeds
11. A. 25%
12. B. will have the maximum number of successful variations in the next generation.
13. D. 100%, 75%

II. One mark questions

14. Ggaa
15. Female
16. 3 : 1 and 1 : 2 : 1
17. No, because the flower is unisexual/ The flower has only male reproductive part
18. *In sexual reproduction hereditary material of two organisms Join.
* gametes are produced due to meiosis cell division.
19. Crossbreeding of parents showing different traits for one trait is called monohybrid cross.

20.	Male sex chromosomes	Female sex chromosomes
	There is a pair of mismatched sex chromosomes	There is a complete pair of sex chromosomes
	There is a normal size X chromosome and a smaller size Y chromosome.	There are XX chromosomes of equal size

21. Organism consists of pair of chromosomes one come from mother and another comes from father, fusion of these will form zygote. Therefore the equal genetic contribution of parents
22. Trait B because it is 60% of population
23. The unit of DNA that provides the information required for the production of proteins is called a gene
24. 16 chromosomes

III. Two mark questions

25. In dihybrid cross when Mendel crossed round seeded tall plants with wrinkled seeded dwarf plants ,all plants in F1 generation is round seede tall plants. But in F2 generation they show round seede dwarf plants, wrinkled seede tall plants. Like this Mendels experiments shows traits are expressed independently.
26. a) Pure white dog breed with expression ratio 1: 1
b) Dog breed types found in gene pattern
1 : 2 : 1
Pure black dog : Mixed black dog : Pure white dog
27. Crossbreeding of parents showing different traits for two traits is called dihybrid cross.
Ratio: 9 : 3 : 3 : 1
28. * because it combines genetic material from two distindt parents
* whereas asexual involves only a single parent
29. * they have short life cycle
*clear contrasting characacters

*bisexual flowers

30 *Snails can change their sex based on social context

*the incubation temperature of the eggs determine the sex in tortoises.

- 31
- Genes control the characteristics by making specific protein
 - Each gene contain two characters and this instructs cells to make protein.

IV. Three mark questions

32. * In the parent plants, the trait for red flowering is dominant and the trait for white flowering is weak

* The sex genes of the parent organism have only one copy of these traits.

* The plant in the generation has one copy of the dominant trait (R) and one copy of the weak trait (r).

* All the plants in the F1 generation produce red flowers.

* The gene pattern of the parent organism that produces red flowers is RR

The gene pattern of the F1 generation plant is Rr

33. * Mendel crossed pure tall and dwarf pea plants. He sowed the seeds obtained from them and called the resulting plants the first generation (F1).

* All these plants were tall. He made sure that the tall plants were self-pollinating. When the resulting seeds were sown, he called the resulting generation the second generation (F2).

* Not all of these plants were as tall as the first generation. Instead, about a quarter of them were dwarfs.

* From this experiment, Mendel concluded that the tall plants obtained in the first generation were not pure plants. Instead, they had both the tall and dwarf traits. The reason they were all tall was because the tall trait was strong and the dwarf trait was weak.

34.

F ₂ generation	R	r
R	RR	Rr
r	Rr	rr

Types of plants: Round : Wrinkled
Phenotypic ratio 3 : 1

35. .

TTYy × ttyy

TY × ty

TtYy

F₂ generation:

	TY	Ty	tY	ty
TY	TTYy	TTYy	TtYy	TtYy
Ty	TTYy	Ttyy	TtYy	Ttyy
tY	TtYy	TtYy	ttYy	ttYy
ty	TtYy	Ttyy	ttYy	ttyy

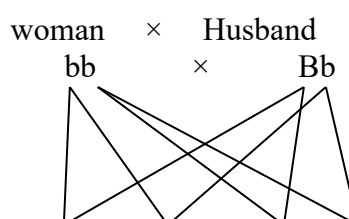
Phenotypic ratio:

Yellow seeded tall plant	green seeded tall plant	Yellow seeded dwarf plant	Green seeded dwarf plant
9	3	3	1

36. a) Except woman all others are having black coloured eyes. Its ratio is 3:1 therefore the blue colour is recessive.

a) Possible genetic ratio : Bb

b)



37. . a)

Bb bb Bb bb

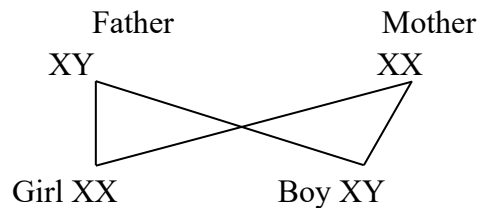
F ₂ generation	R	r
R	RR	Rr
r	Rr	rr

Types of plants : Red colour : white colour

Phenotypic ratio : 3 : 1

b) If zygote gets Y Chromosomes from father then zygote becomes male child

OR



OR

If zygote gets X chromosomes from father then that zygote becomes girl child.

38.

gametes	T	t
T	TT	Tt
t	Tt	tt

Phenotypic ratio 3 : 1

Genotypic ratio: 1 : 2 : 1

OR

a)

- In humans, females have two X chromosomes and males have one X and one Y chromosome.
- During meiosis, the chromosomes are halved.
- The female produces an X and the male produces an X or Y, so sex is determined by the male chromosomes.
- If the male's X combines with the female's X, the child will be a girl.
- If the male's Y combines with the female's X, the child will be a boy.

b) Dominant Traits: If one of the two copies of a trait shows more of the visible trait in the offspring, it is a dominant trait

Weak Trait: If one of the two copies of a trait shows less of the visible trait in the offspring, it is

a

weak trait

39.

Gametes	RY	Ry	rY	ry
RY	RRYY	RrYY	RrYY	RrYY
Ry	RRYy	Rryy	RrYy	Rryy
rY	RrYY	RrYy	rrYY	rrYy
ry	RrYy	Rryy	rrYy	rryy

Ratio : 9 : 3 : 3 : 1

Round yellow seeds-9

Round green seeds -3

Wrinkled yellow seeds-3

Wrinkled green seeds-1

40.

F ₂ generation	Y	y
Y	YY	Yy
y	Yy	yy

Phenotypic ratio : 3 : 1

Genotypic ratio : 1 : 2 : 1

OR

F ₂ generation	TR	Tr	tR	tr
TR	TTRR	TTRr	TtRR	TtRr
Tr	TTRr	TTrr	TtRr	Ttrr
tR	TtRR	TtRr	ttRR	ttRr
tr	TtRr	Ttrr	ttRr	ttrr

Phenotypic ratio: 9 : 3 : 3 : 1

41. *Mendel proved law of independent assortment with pure dominant yellow round seeds(YYRR) and pure recessive green wrinkled seeds(yyrr)
 *All offsprings of F₁ generation are yellow round seeds.
 *When self pollinated in F₂ generation gametes are separated and recombined in 9:3:3:1 ratio.

Chapter 9 : Light Reflection and Refraction

I. Multiple choice questions.

1. B) Beyond C
2. A) CD
3. D) At the centre of curvature and inverted.
4. B) +2.0 D and convex lens
5. A) Virtual, erect and enlarged.
6. C) S
7. D) Thin at the edges and thick in the middle
8. C) Beyond 2F₁
9. B) Diverges the light rays.
10. A) Concave mirror and virtual image
11. B). Increases and bends away from the normal
12. B) Convex mirror
13. B) Rear view mirrors of vehicles
14. B) Pole
15. B) Diverges the light rays.
16. B) Focus
17. D) Between F and O
18. A) R=2f
19. B) Dioptre
20. C) 0.50m
21. B) +3.0
22. B) N and K
23. A) $n_1 = n_2$ & $n_3 > n_4$
24. C) R
25. C) In F₁
26. B) 50°
27. D) 25 cm.
28. C) 4 m.
29. B) Speed of light is more in medium B



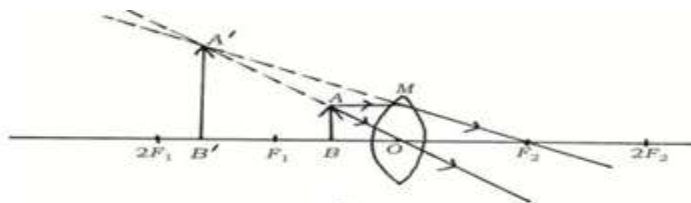
B)

31. A) Real and enlarged.
 32. D) – 0.40 m and concave lens
 33. B) is thick at the edges and thin in the middle
 34. A) + 2.0 D and convex lens
 35. B) At $2F_1$

II. Answer the following questions. (1-mark questions)

36. The field of view is very large due to curvature towards the outer edge.
 37. The reflecting surface of a spherical mirror forms a part of a sphere. The centre of this sphere is called the centre of curvature.

38.



39. Converging distance of the lens (f) = + 0.5 m

$$\begin{aligned}\text{Power of the lens} = P &= 1/f \\ &= 1/0.5 \\ P &= + 2D\end{aligned}$$

40. $f = 25$, $R = ?$

$$\begin{aligned}R &= 2f \\ &= 2 \times 25 \\ &= 50 \text{ cm}\end{aligned}$$

41. The phenomenon of light falling on a surface returning back to same medium.
 42. The fact that the sides of the image are exchanged with the sides of the object is called lateral inversion
 43. If the reflecting surface of a mirror is a surface of a spherical mirror, it is called a spherical mirror.
 44. Parallel light rays falling on a concave mirror are reflected and meet at a point on the principal axis. This point is called the principal focus.
 45. Parallel light rays falling on a convex mirror are reflected as if they had come from a point on the principal axis. This point is called the principal focus of the convex mirror.
 46. The diameter of the reflecting surface of the spherical mirror.
 47. $1/f = 1/v + 1/u$
 48. • Because the velocity of light is the same in both the media.
 There is no change in the direction of propagation of light.
 49. The opposite faces of the glass slab are parallel, and the bending of the light ray is equal and opposite.
 50. The image moves from the principal focus towards the mirror.
 51. Parallel light rays passing through a convex lens are refracted and intersect at a point on the principal axis. This point is the focal point.
 52. Parallel light rays passing through a concave lens are refracted as if they were coming from a point on the principal axis. This point is the focal point of the concave lens.
 53. 10cm
 A lens with a shorter focal length converges light more strongly, while a lens with a longer focal length converges it less strongly.
 54. The speed of light is faster in medium A.
 Because it has a lower refractive index compared to medium B

55. 1 dioptre is defined as the power of a lens of focal length 1 metre.

III. Answer the following questions. (2 Mark Questions)

56. i. The angle of incidence is equal to the angle of reflection.
 ii. The incident ray, the reflected ray and the perpendicular drawn at the point of incidence lie in the same plane.

57.

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f} \quad \text{or,} \quad \frac{1}{u} = \frac{1}{v} - \frac{1}{f}$$

$$\frac{1}{u} = \frac{1}{-20} - \frac{1}{(-30)} = -\frac{1}{20} + \frac{1}{30}$$

$$\frac{1}{u} = \frac{-3+2}{60}$$

$$\frac{1}{u} = \frac{1}{-60} \quad \text{or} \quad u = -60 \text{ cm}$$

$\therefore$ Object distance 60 cm

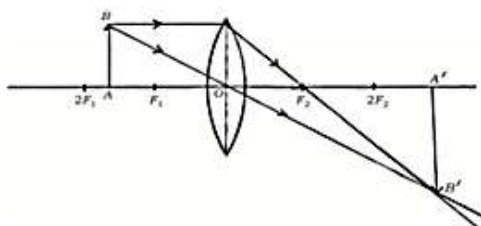
$$\begin{aligned} \text{Magnification : } m &= \frac{v}{u} \\ &= \frac{-20}{-60} \\ &= \frac{1}{3} \end{aligned}$$

$$m \approx 0.33.$$

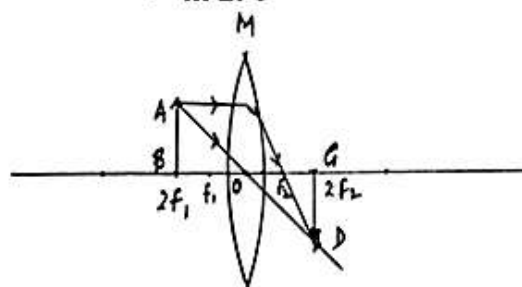
58. Try as in the above question.

59.

i) Between F_1 and $2F_1$



ii) In $2F_1$



60.

Object distance $u = -30 \text{ cm}$

Image distance $v = -10 \text{ cm}$ ಆಗಿದೆ.

$$\begin{aligned} \text{Magnification} \quad m &= \frac{v}{u} \\ &= \frac{-10 \text{ cm}}{-30 \text{ cm}} \\ &= \frac{1}{3} = +0.33. \end{aligned}$$

Since v and u are negative, the lens used is concave lens. Since the magnification is also positive and less than one, the image is erect and diminished virtual.

61.

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{1}{-15} - \frac{1}{-25}$$

$$\frac{1}{v} = \frac{-5+3}{75} = \frac{-2}{75}$$

$$v = \frac{75}{-2} = -37.5 \text{ cm}$$

62.

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{u} = \frac{1}{v} - \frac{1}{f} = \frac{1}{-10} - \frac{1}{-15}$$

$$\frac{1}{u} = \frac{-3+2}{30} = \frac{-1}{30}$$

$$u = -30 \text{ cm}$$

63.

Refractive index of a medium = $\frac{\text{Velocity of light in air}}{\text{Velocity of light in benzene}}$

or

$$n_m = \frac{C}{V}$$

$$1.50 = \frac{3 \times 10^8}{\text{Velocity of light in benzene}}$$

$$1.50 \times \text{Velocity of light in benzene} = 3 \times 10^8$$

$$= \frac{3 \times 10^8}{1.50}$$

$$\text{Velocity of light in benzene} = 2 \times 10^8 \text{ ms}^{-1}$$

64.

$$f = -12 \text{ cm} \quad \frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$v = -9 \text{ cm} \quad \frac{1}{u} = \frac{1}{v} - \frac{1}{f}$$

$$u = ? \quad \frac{1}{u} = \frac{1}{-9} + \frac{1}{-12}$$

$$\frac{1}{u} = -\frac{1}{9} + \frac{1}{12}$$

$$\frac{1}{u} = \frac{-4+3}{36}$$

$$\frac{1}{u} = \frac{-1}{36}$$

$$-u = 36$$

$$u = -36 \text{ cm}$$

- 65.
- The central point of a lens is called optic centre.
 - The diameter of the circular boundary of a spherical lens is called its aperture.

66. When light travels obliquely from one medium to another, the direction of propagation in the second medium changes.

For a given colour of light and a given pair of media, the ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant.

$$\sin i / \sin r = \text{constant}$$

67. Mirrors with curved surfaces are called spherical mirrors,

Types: Concave mirror convex mirror

68. Convex mirror	Concave mirror
The reflecting surface is bent outwards	The reflecting surface is bent inwards. It is bent.
diverges the rays of light.	converges the rays of light.
Always produces virtual and erect image	Always produces a real and inverted image.

- 69.
- Used in torches, searchlights, and vehicle headlights to produce a powerful parallel beam of light.
 - Used by doctors to examine cavities in teeth
 - Used to get a large image of a face in a barber shop
 - To focus the sun's rays in solar ovens.

70. Convex lens	Concave lens
Thin at the edge and thick in the middle	Thick at the edge and thin in the middle
converges the rays of light	Diverges the rays of light
Produces real and inverted image	Produces false and direct image
71 Real image	virtual image

Inverted image	Erect image
Image that can be obtained on a screen	Image that cannot be obtained on a screen

- 72.
- Light travels faster through ice.
 - Because the refractive index of ice is less than that of water, light travels faster in optically rarer medium than in an optically denser medium.
- 73.
- The reflected ray through the principal focus of a ray incident parallel ray to the principal axis
 - The reflected ray of a ray incident through the principal focus.
 - The reflected ray in the same direction as the ray incident through the centre of curvature.
 - The reflected ray of a ray incident obliquely on the pole of a mirror.
- 74.
- The light coming towards us from the part of a pencil immersed in water appears to come from a different direction than the surface adjacent to the outside of the pencil.
 - Refraction of light
- 75.
- The ray refracted through F_2 coming from an object parallel to the principal axis.
 - The refracted ray of a ray passing through the principal focus from an object.
 - The ray passing through the optical centre from an object.
- 76.
- Virtual and erect.
 - The image is equal to the size of the object.
 - The image is formed at the same distance behind the mirror as the object is in front of the mirror.
 - It has a lateral inversion.

77.

$$\frac{R \cdot I_P}{R \cdot I_a} = \frac{C}{V_P}$$

$$1.82 = \frac{C}{V_P} \times \frac{V_a}{C}$$

$$1.82 = \frac{V_a}{V_P}$$

$$V_P = \frac{V_a}{1.82}$$

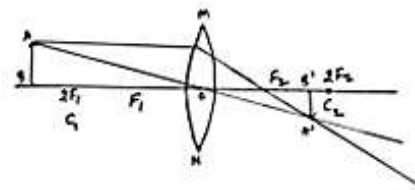
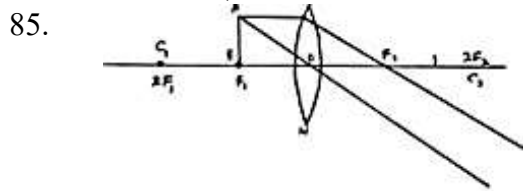
$$V_P = \frac{2.25 \times 10^8}{1.82}$$

$$V_P = 1.23 \times 10^8 \text{ m s}^{-1}$$

78. The phenomenon is caused by the refraction of light.
Density of the mediums is different and light is passing through the both mediums.
79. a) concave mirror
b) virtual and erect, behind the mirror.
80. Magnification for a plane mirror is +1. The positive sign means the image is virtual and erect.
The numerical value (magnitude) '1' means that the size of the image is exactly equal
81. Given, focal length = -2 m (focal length of a concave lens is negative).
Power, $P = 1/f = 1/(-2.0)$
or $P = -0.5$ Diopter
82. Given, power, $P = -2.0$ D
Power, $P = 1/f$
or $f = 1/P = 1/(-2) = -0.5$ m
= -50 cm
83. Given, power, $P = +1.5$ D
Power, $P = 1/f$
or $f = 1/P = 1/(+1.5) = 10/15 = +2/3$ m
or $f = +0.66$ m = +66 cm
The lens is a convex (or converging) lens.

IV. Answer the following questions. (Three marks questions)

84. i) Concave mirror
 ii) 50 cm
 iii) Virtual, erect and same size as the object.



86. $f = -12 \text{ cm}$
 $u = -18 \text{ cm}$

$$\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$$

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$$

$$= -\frac{1}{12} - \left(-\frac{1}{18}\right)$$

$$= -\frac{1}{12} + \frac{1}{18}$$

$$= \frac{-3+2}{36}$$

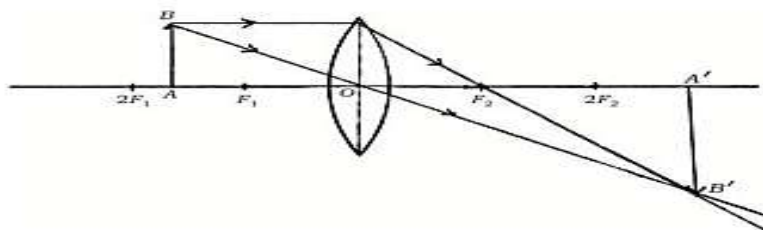
$$\therefore \frac{1}{v} = -\frac{1}{36} \Rightarrow v = -36 \text{ cm}$$

$$m = \frac{-v}{u}$$

$$= -\left(\frac{-36}{-18}\right)$$

$$= -2$$

87.



Beyond the $2F_2$

Real inverted and diminished

88. This is a diverging lens.

Because the power is negative, concave lens

The diverging property of concave lens is to correct near-sightedness. The image of the object is formed on the retina, in front of the retina. Your lens of appropriate power produces a diverging image on the retina.

89. a) The laws of refraction of light are as follows.

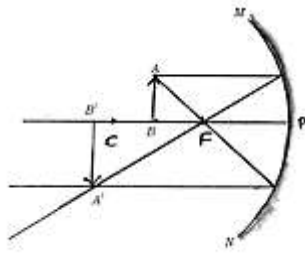
- (1) The incident ray, the refracted ray, and the perpendicular drawn to the point of incidence at the point of contact of the two media are all in the same plane.
- (2) For a given colour of light and a given pair of media, the ratio of the sine of the angle of incidence to the sine of the angle of refraction is constant. This is called Snell's law of refraction.

b) Medium one is denser because when a ray of light enters a denser medium from a rarer medium, it bends towards the vertical.

- 90.
- The object is always placed on the left side of the mirror. This indicates that the light from the object always falls from the left side.
 - All distances parallel to the principal axis are measured from the mirror pole.
 - All distances measured to the right of the origin (+X) are taken as positive and all distances measured to the left of the origin (-X) are taken as negative.
 - Distances measured perpendicular to or above the principal axis are taken as positive.

- Distances measured perpendicular to or below the principal axis are taken as negative.

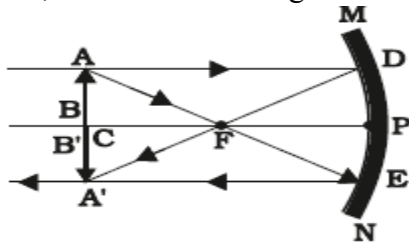
91.



Beyond C

Real, inverted and enlarged

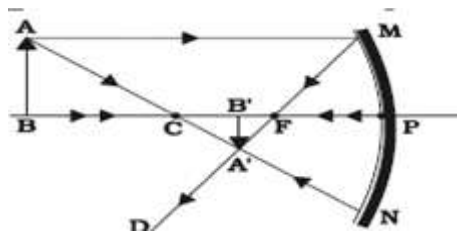
92.



At C

Real, inverted and same size

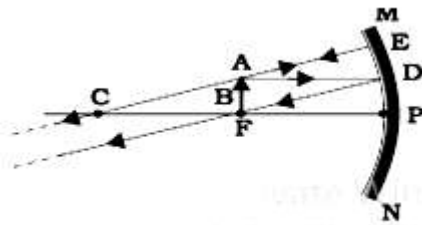
93.



Real, inverted

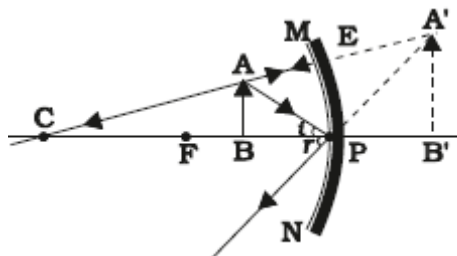
Smaller than object

94.



Real, Inverted, Enlarged, At infinite

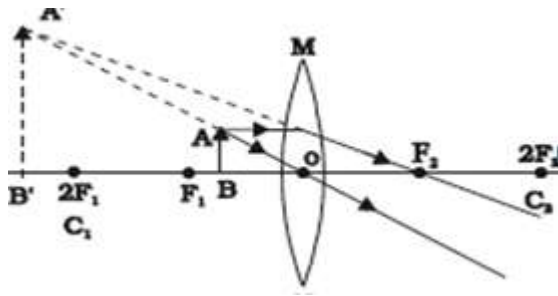
95.



Virtual and Erect

Back side of the mirror

96.



Virtual and Erect

Enlarged

97. Solution.

Magnification of image = $m = -0.5$

Object distance $u = -15$ cm

Image distance $v = ?$

$f = ?$

$m = -v/u$

$-v = m \times u$

$= 0.5 \times -15$

$-v = -7.5$ cm

$v = 7.5$ cm

Convergence distance

$1/f = 1/v + 1/u$

$1/f = 1/7.5 - 1/15$

$f = 5$ cm

Nature of image – virtual and erect

Size:- Diminished

98.

- A convex lens is held in the hand and directed towards the solar image.
- The rays of sunlight are focused on a sheet of paper.
- A bright and sharp solar image is obtained on the sheet.
- The paper and the lens are held in this position for some time.
- The sheet of paper starts burning, emitting smoke.
- The parallel rays of the sun are focused and a sharp solar reflection is formed

99.

- Hold a concave mirror in your hand and point its reflecting surface towards the sun.
- Direct the reflected rays to fall on a sheet of paper held close to the mirror.
- Slowly move the sheet of paper back and forth until a sharp point of bright light rays is seen on the sheet.
- Hold the mirror and the sheet of paper in this position for a few minutes.
- The paper will start to burn, producing smoke.
- The mirror will focus the sunlight.
- The distance between the mirror and the paper is the approximate focal length of the mirror.

IV. Answer the following questions. (Questions of four marks)

100.

- Fix a sheet of white paper on a drawing board with the help of drawing pins.
- Place a rectangular glass plate in the middle of the sheet.
- Draw lines around the glass plate with the help of a pencil.
- Take four identical ballpoint pens and pierce two of them in such a way that they form a slanted line with the upper edge perpendicular to the sheet.

- Look at the reflections of the pierced pins from the opposite edge of the plate and pierce the other two pins so that they are in line with the reflections of the first pins.
 - Remove the pins and the glass plate.
 - Join the ends of the upper pins to the upper edge and the ends of the lower pins to the lower edge.
 - Join the two points of the glass plate.
101. a) Magnification is the ratio of the size of an image to the size of an object. magnification of +2 means a convex lens.
b) Medium B, Medium A
102. The convex lens will form a complete image of an object, even if it's one half is covered with black paper. Only the brightness of the image will be reduced, in this case it will be half of the brightness of the original image. It can be understood by the following two cases:
(a) Let the upper half of the lens be covered and an object be placed between the optical centre and the focus F_1 . The light rays from the object falling on the lower half of the lens form a virtual, erect and magnified image

Chapter 10 : The Human Eye and Colourful World

I. MULTIPLE CHOICE QUESTIONS

1. B. retina
2. A. eye lens
3. C. concave lens
4. D. cataract
5. B. farsightedness and use of appropriate convex lens
6. A. ciliary muscles
7. A. refraction of light
8. C. black
9. D. red
10. C. focal length of the lens increases
11. D. very large particles scatter all colours equally
12. A. real and inverted
13. C. red
14. B. sky appears blue to an astronaut flying at very high altitudes
15. A. 38°
16. B. Red and Blue

II. Answer the following questions (One mark)

17. The minimum distance at which an object can be clearly seen by the eye is called the near point .The minimum point of normal vision is 25cm.
18. The maximum distance at which the eye can see clearly is called the far point. The maximum point of normal vision is infinity
19. The spectrum of white light is the list of coloured components obtained when light is dispersed through a glass prism.
20. There are three common defects of vision
 - a) Myopia
 - b) Hypermetropia
 - c) Presbyopia
21. The particular shape of the prism makes the emergent ray bend at an angle to the direction of the incident ray. This angle is called angle of the deviation.
22. The angle between its two lateral faces is called the angle of the prism.
23. The emergent angle of the prism is the angle at which a light ray exits the prism.
24. a) cornea

- b) iris
25. farsighted eye; remedy is a using convex lens
 26. The splitting of white light into its constituent colours.
 27. No, rainbows are not observed on the moon as there is no atmosphere.
 28. Near point: 25 cm far point: Infinity
 29. Rainbow, blue sky, atmospheric refraction
twinkling of stars, blue sky
 30. Adjustment of the lens focal length to clearly focus near or distant objects
 31. Red, because it scatters the least and is visible from long distances even in fog
 32. Student can't read the blackboard from back: suffer from near-sightedness. It can be corrected with the concave lens
 33. Farsightedness can be corrected with concave lens
 34. to control the amount of light entering the eye
 35. X- angle of deviation
The particular shape of the prism makes the emergent ray bend at an angle to the direction of the incident ray.
 36. Sometimes the crystalline lens of people at old age becomes milky and cloudy. This condition is called cataract.
 37. least bent colour is red, and most bent colour is violet
 38. Yes / The spectrum of light forms on the screen.
Prism A disperses the white light into 7 colours; Prism B recombines the 7 colours of the spectrum to form the white light and Prism C disperses this white light into 7 colours and hence we see the spectrum of light on the screen.
 39. Dispersion of light is the phenomenon where white light splits into its constituent colours (the spectrum) as it passes through a medium like a prism.
 40. To correct this defect of vision, he must use a concave lens.

III. Answer the following questions (Two mark)

41. Farsightedness is the ability to see distant object clearly but not nearby objects.
Cause: the eye lens is too short or the eyeball is too small.
42. A rainbow forms when the sunlight is refracted, dispersed, and reflected inside water droplets, causing a spectrum of colours.
43. Isaac Newton was the first to use to obtain the spectrum of sunlight. He tried to split glass prism the colours of the spectrum of white light further by using another similar prism. However, he could not get any more colours. He then placed a second identical prism in an inverted position with respect to the first prism. He allowed the colours of the spectrum to pass through the second prism. He found a beam of white light emerging from the other side of the second prism. This observation gave Newton the idea that sunlight is made up of 7 colours.

44.

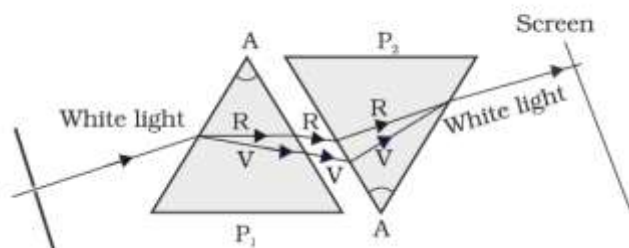
MYOPIA	HYPERMETROPIA
(1) Myopia is a defect of vision in which a person can see nearby objects clearly, but cannot see distant objects distinctly.	(1) Hypermetropia is a defect of vision in which a person can see distant objects clearly but cannot see nearby objects distinctly.
(2) Myopia is also known as short sightedness.	(2) Hypermetropia is also known as far sightedness.
(3) The image is formed in front of the retina.	(3) The image is formed behind the retina.
(4) Concave lens (diverging lens) is used to correct myopia.	(4) Convex lens (converging lens) is used to correct hypermetropia.

45. A: nearsighted eye, the image forms in front of retina
 B: farsighted eye, the image forms behind retina
 C: normal eye, the image forms on retina
46. A -2.0 D lens is a concave lens, used for near-sightedness. The conditions described is farsightedness requiring a convex lens. Hence this lens is not suitable for correcting that defect.
47. To see distant objects: ciliary muscles relax, lens become thin, focal length increases
 To see near objects: ciliary muscles contract, lens become thick, focal length decreases
48. The correct option is c) myopia
 Predominately young folks suffer from myopia which occurs due to elongation of eye balls or bulging of cornea. When the normal curvature of the cornea bulges, the light rays are refracted so that the image is formed in front of the retina. The rods and cones of eyes have areas where the image has the best clarity when the image is focused. Thus as the image of the distant objects is not formed at the right spot, it is perceived as blurry.
49. At sunrise and sunset, the sky appears red because sunlight travels a longer distance through the atmosphere, causing blue light (shorter wavelengths) to be scattered away more effectively by air particles.
50. The size of the eye cannot be increased or decreased. Therefore, the image distance remains constant. When we increase the distance of an object from the eye, the image distance in the eye does not change. The increase in the object distance is compensated by the change (increase) in the focal length of the eye lens such that the image is formed at the retina of the eye.

IV. Answer the following questions (Three mark)

51. The scattering of light by tiny particles in a colloid or in the atmosphere is the Tyndall effect.
 Ex: blue sky, smoke from engines, light in milk
52. The molecules of air and other fine particles in the atmosphere have size smaller than the wavelength of visible light. These are more effective in scattering light of shorter wavelength at the blue end than light of longer wavelengths at the red end. The red light has a wavelength about 1.8 times greater than blue light. Thus, when sunlight passes through the atmosphere, the fine particles in air scatter the blue colour more strongly than red. The scattered blue light enters our eye.

53.



54. Stars are far away and appear as point sources of light. As their light enters the earth's atmosphere, it gets refracted continuously due to air layers. This causes their positions and brightness to fluctuate; hence they twinkle.

Planets are closer and appear as extended sources. The light from different parts of a planet averages out, so they appear steady and do not twinkle.

55. Presbyopia is age-related farsightedness caused by the hardening of the eye lens or weakening of ciliary muscles. It is corrected with bifocal lenses. A condition usually seen in older people where they can't see nearby objects clearly.

Causes: weakening of ciliary muscles, loss of flexibility in the lens

Remedy: use of bifocal lenses

56. Power (P) = -0.5 D

Focal length (f) = $1/P = 1/-0.5 = -2$ meters

Since the power is negative, it is a concave lens.

In myopia, the image forms in front of the retina. A concave lens diverges incoming light rays so they focus correctly on the retina, not in front of it.

57. a) A normal eye cannot focus on objects closer than 25 cm due to the limits of the eye's lens to adjust its focal length. This distance is called the least distance of distinct vision.

b) Smaller particles scatter shorter wavelengths (like blue and violet) more, which is why the sky appears blue. Larger particles scatter all wavelengths equally, leading to white light.

58. 1. a) At noon, sunlight travels a shorter distance through the atmosphere, so there is minimal scattering of colours. As a result, all wavelengths reach our eyes, and the sun appears white.

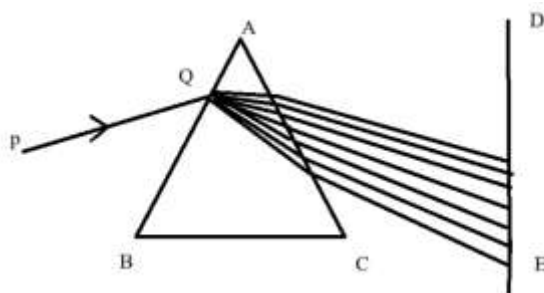
b) The human eye functions like a camera. The convex lens focuses light onto the retina. The eye adjusts the lens's shape to focus on objects at various distances (accommodation).

- 2) a) Iris – Controls the amount of light entering the eye by adjusting the pupil size.

b) Pupil – The opening through which light enters the eye.

c) Cornea – Transparent front layer of the eye that helps in focusing light onto the retina.

59.



- a) Name the phenomenon seen here.

- Dispersion of light.

- b) Write the reasons.

- Different colours (wavelengths) of light refract at different angles when passing through the prism, resulting in the separation of white light into its constituent colours (VIBGYOR)

60. a) i) The student has myopia (near-sightedness).
This is caused by the eye's lens having too much converging power or the eyeball being too long.
ii) The defect can be corrected by using a concave lens.
- b) i) This phenomenon is called the Tyndall effect.
ii) The Tyndall effect is not normally visible in clean, clear air because the air is a true solution, not a colloid.
61. a) Because the hot air is constantly rising and mixing with cooler air, creating a turbulent medium with a continually changing refractive index.
b) Splits white light into components.
62. a) This is because of the atmospheric refraction of light. This happens because the air near the fire is heated, causing it to become less dense than the cooler air surrounding it.
b) The green ray will have a greater angle of deviation than the yellow and red rays. The deviation for each color depends on its wavelength and the refractive index of the glass.
63. For myopia, focal length is given by,
 $f = -x = -80 \text{ cm} = -0.8 \text{ m}$
 Power, $P = 1/f = 1/(-0.8)$
 $= -1.25 \text{ dioptres}$.
 The lens is a concave lens.
64. Here, $y = 1 \text{ m}$
 $1/f = 1/0.25 - 1/y = 1/0.25 - 1/1$
 $= 100/25 - 1 = 4 - 1 = +3$
 or $f = +(1/3) = +0.3333 \text{ m} = +33.33 \text{ cm}$
 Power, $P = 1/f = +3 \text{ dioptres}$.

V. Answer the following questions (Four mark)

65. a) Phenomenon of formation of rainbow in the atmosphere: Rainbow is caused by the dispersion of sunlight by tiny water droplets present in the atmosphere. The water droplets act like small prisms; they refract and disperse the incident sunlight, then reflect it internally and finally refract it again when it comes out of the raindrop. Due to the dispersion of light and internal reflection, different colours reach the observer's eye.
 b) Twinkling of stars: The twinkling of stars is due to atmospheric refraction of starlight. The starlight on entering the earth's atmosphere, undergoes refraction continuously before it reaches the earth.
 The atmospheric refraction occurs in a medium of gradually changing refractive index as the path of rays of light coming from the star goes on varying slightly, the apparent position of the star fluctuates and the amount of starlight entering the eye flickers. This is the twinkling effect of stars.
66. a) Myopia: Myopia is a defect of vision; a person with this defect can see nearby objects clearly but cannot see distant objects distinctly. A person with this defect has the far point nearer than infinity. Total In a myopic eye, the image of a distant object is formed in front of the retina and not at the retina itself.
 Causes for myopia:
- Excessive curvature of the eye lens.
 - Elongation of the eyeball.
- b) Power of accommodation of eye: The ability of the eye lens to adjust its focal length. While seeing the distant objects
- the curvature of the eye lens gets modified / decreases by ciliary muscles

- the focal length of the eye lens increases
 - the eye lens becomes thin
67. a) In the morning, the sun is near the horizon. Light reaching the eye of an observer travels a larger distance in the atmosphere. Thus, most of the blue light and shorter wavelength rays are scattered away by the air particles. Hence, the light that reaches the eye of an observer is of longer wavelengths (of red end). Thus, the sun appears reddish at sunrise or sunset.
- b) The sky appears dark instead of blue to an astronaut because there is no atmosphere in outer space that can scatter the sunlight. As the sunlight is not scattered, no scattered light reaches the eyes of the astronauts and the sky appears black to them.
68. (i) Focal length f is given by,
 $f = 1/P$
 or $f = 1/(-5.5) = -0.1818 \text{ m}$
 $= -18.18 \text{ cm}$
- (ii) Focal length f is given by,
 $f = 1/P$
 or $f = 1/(+1.5) = +0.6667 \text{ m}$
 $= +66.67 \text{ cm}$

CHAPTER – 13: OUR ENVIRONMENT

KEY ANSWER

I. Multiple choice questions (one mark)

1. A. undergo recycling naturally in the environment
2. A. Plant fibers
3. C. O_3
4. A. algae
5. C. increasing accumulation of harmful chemicals
6. C. Fruit-peels, cake, lime juice.
7. D. All the above practices
8. C. CFC; Ozone

II. Answer the following questions(One-mark questions)

9. 10J
10. Substances that are broken down by biological processes
11. At each trophic level of a food chain, 10 percent of the energy is lost. Due to this, the availability of energy for the next trophic levels decreases
12. CFC/Chlorofluorocarbon
13. Examples: Bacteria, Saprophytes (fungi)
14. The free oxygen atoms combine with the molecular oxygen to form Ozone
15. The CFCs break into chlorine that destroys the Ozone layer

16. Grass $\longrightarrow$ rabbit $\longrightarrow$ snake $\longrightarrow$ eagle (Any example)
17. Phytoplanktons $\longrightarrow$ zooplanktons $\longrightarrow$ small fish $\longrightarrow$ Big fish

III. Answer the following questions(Two marks questions)

18. * Biodegradable wastes release bad smell and cause air pollution.
 * Areas where biodegradable wastes are dumped act as a breeding ground for insects, pests and spread the diseases
19. * Very little energy is available (10%) for the next level of consumers.
 * The loss of energy at each step is so great that very little usable energy remains after four trophic levels.
20. Any unit in nature that interacts between biotic and abiotic components is called an ecosystem. Its main components are biotic and abiotic components.

1) Biotic component: All units that have the characteristics of living things

For example: plants, animals and microorganisms.

2) Abiotic components: Components without living things

Ex: air, water, soil, heat

21. • remain inert in the environment.
• cause 'Biological magnification'.
• cause environmental pollution

22. Improvised lifestyles have two major effects

i) Depletion of the ozone layer – rely heavily on refrigerators which destroys ozone layer

ii) Heavy production of garbage led to environmental pollution..

23.	<table><tr><th>Biotic Components</th><th>Abiotic components</th></tr><tr><td>*Living part of the ecosystem</td><td>*Non living part oh the ecosystem</td></tr><tr><td>* Example-animals</td><td>* Example- Soil</td></tr></table>	Biotic Components	Abiotic components	*Living part of the ecosystem	*Non living part oh the ecosystem	* Example-animals	* Example- Soil
Biotic Components	Abiotic components						
*Living part of the ecosystem	*Non living part oh the ecosystem						
* Example-animals	* Example- Soil						

24. * producers-plants

* consumers- insects

*Decomposers- bacteria

25. * Biodegradable wastes releases bad smell and causes air pollution .

* Areas where biodegradable wastes are dumped act as a breeding ground for insects, pests and spread the diseases.

IV. Answer the following questions (Three marks questions)

26. • Each step of the food chain is called a trophic level(T).
• The energy that is captured by autotrophs does not revert back to the solar input.
• The energy which passes to the herbivores does not come back to autotrophs.
• The energy available at each trophic level gets diminished progressively due to loss of energy at each level.

27.	<table><tr><th>Biodegradable materials</th><th>Non-biodegradable materials</th></tr><tr><td>Broken down by biological processes</td><td>Do not break down by biological processes.</td></tr><tr><td>Does not remain intact in the environment for a long time</td><td>Remain intact in the environment for a long time</td></tr><tr><td>Less harmful</td><td>More harmful</td></tr><tr><td>Less polluting</td><td>More polluting</td></tr></table>	Biodegradable materials	Non-biodegradable materials	Broken down by biological processes	Do not break down by biological processes.	Does not remain intact in the environment for a long time	Remain intact in the environment for a long time	Less harmful	More harmful	Less polluting	More polluting
Biodegradable materials	Non-biodegradable materials										
Broken down by biological processes	Do not break down by biological processes.										
Does not remain intact in the environment for a long time	Remain intact in the environment for a long time										
Less harmful	More harmful										
Less polluting	More polluting										

(any two)

Examples: cow dung, Vegetables peels, fruits (Anyone suitable example)	Examples : DDT, plastic, metal surface, metal scrap ((Anyone suitable example)
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28. a) * Very little energy is available (10%) for the next level of consumers. Or the loss of energy at each step is so great that very little usable energy remains after four trophic levels.
b) *Decomposers breakdown the dead remains and waste products of organisms / Decomposers breakdown the complex organic substances into simple inorganic substances.
* These substances are used up once more by the plants / Decomposers help in the natural replenishment of the soil.
c) *Ozone layer shields the surface of the earth from ultraviolet radiation from the sun. This radiation is highly damaging to organisms.
29. a) The Ozone layer is a boon to life on earth by blocking harmful ultraviolet rays from the sun.
b) *Organisms at higher trophic levels.
* The accumulation of harmful chemicals increases as move to the next trophic level in a food

Chain

- 30.. a) i) is a series of organisms taking part at various basic levels/ It is a representation that shows the movement of food and energy through different trophic levels.
ii) Biomagnification is the phenomenon where certain harmful non-degradable chemicals accumulated progressively at each trophic level in a food chain.
b) *Ozone shields the surface of the earth from ultraviolet radiation from the sun
31. * Grass → Grasshopper → Frog → Snake
* Snake has more toxic chemicals.
Due to biological magnification snake has maximum accumulation of toxic chemicals
- 32.. a)
•Cucumber piece and banana peel are organic substances.
•They are biodegradable substances and are ecofriendly.
•Glass piece and plastic pen are inorganic / synthetic substances.
•They are non-biodegradable substances and cause soil pollution.
b) Break down the complex organic substances into simple inorganic substances. Break down dead remains and wastes of organisms
33. a) * Biodegradable wastes releases bad smell and causes air pollution .
* Areas where biodegradable wastes are dumped act as a breeding ground for insects, pests and spread the diseases
b) Decompose dead wastes (organic) of plants and animals thus keep surroundings clean and maintain ecological balance
34. a) (i) Birds are disturbed more due to biomagnification.
As the birds occupy the topmost level in the given food chain, the maximum concentration of harmful chemicals causing bio magnification get accumulated in their body.
(ii) Biomagnification is the process of accumulation of non degradable chemicals in the various trophic levels of food chain.
As the chemicals are non-degradable or cannot be washed, they cannot be removed from the organisms of the food chain. This leads to gradual destroying of the ecosystem.
b) Producers/ plants.
35. a) •The flow of energy in the food chain is unidirectional.
•Only 10% of energy is available to the next trophic level.
•Amount of harmful chemicals increases in the food chain at the higher trophic levels.
b) Because as reaching to high trophic level of food chain, the amount of available energy goes on decreasing.
36. a) • The higher energy UV radiations split apart some molecular oxygen (O₂) into free oxygen (O) atoms. These atoms then combine with the molecular oxygen to form ozone.
• Ozone protects the earth's surface from ultraviolet radiation of the sun
b) CFCs cause the thinning of the ozone layer.
37. a) By adopting following methods:
• Segregation of dry wastes and wet wastes.
• Reusing of wet wastes by converting them into manures.
• Recycling dry wastes • Limiting the use of disposable materials
• Following eco-friendly packaging. (any two)
b) Grass → Grasshopper → Frog → Snake → Eagle •
• If the number of organisms in the second trophic level increases, then the number of organisms in the first trophic level decreases.

Eventually population of the rest of the organisms in the trophic levels decreases and leads to ecological imbalance.

38. i) Fifth trophic level /eagle

Due to biomagnification the concentration of harmful chemicals increases as we move to higher trophic levels.

ii) As zooplanktons are in lower trophic level than big fishes, the amount of energy get will be high/10% law

a)

* The flow of energy in a food chain is one-way.

- The energy captured by autotrophs does not return to the solar energy.
- The energy that is absorbed by herbivores does not return to their parents.
- The energy available at each trophic level gradually decreases due to energy loss at each level.

b) At each trophic level of a food chain, 10 percent of the energy is lost. Due to this, the availability of energy for the next trophic levels decreases

39. *Producers- Produce their food by photosynthesis

Example- plants

*Consumers- eat other animals to get energy

Example- animals

*Decomposers- Breakdown dead matter

Example- bacteria