

Question Paper

Conducted by the Central Board of Secondary Education (CBSE)



Time Allowed: 3 Hours

Maximum Marks: 70

General Instructions

- (i) This question paper contains **37 questions**. All questions are compulsory.
- (ii) Section A: Questions 1 to 20 are very short answer questions, carrying 1 mark each.
- (iii) Section B: Questions 21 to 27 are short answer questions, carrying 2 marks each.
- (iv) Section C: Questions 28 to 34 are long answer type i questions, carrying 3 marks each.
- (v) Section D: Questions 35 to 37 are long answer type ii questions, carrying 5 marks each.
- (vi) Attempt one alternative where an internal choice is provided. Follow the instructions within each question.
- (vii) Use of calculators is not allowed.

Section A

1. Read the given passage and answer the questions 1 to 5 that follow:

The halogens have the smallest atomic radii in their respective periods. The atomic radius of fluorine is extremely small. All halogens exhibit -1 oxidation state. They are strong oxidising agents and have maximum negative electron gain enthalpy. Among halogens, fluorine shows anomalous behaviour in many properties. For example electro negativity and ionisation enthalpy are higher for fluorine than expected whereas bond dissociation enthalpy, m.p. and b.p. and electron gain enthalpy are quite lower than expected. Halogens react with hydrogen to give hydrogen halides (HX) and combine amongst themselves to form a number of compounds of the type XX' , XX'_3 , XX'_5 and XX'_7 called inter-halogens.

Why halogens have maximum negative electron gain enthalpy?

2. Why fluorine shows anomalous behaviour as compared to other halogens?

3. Arrange the hydrogen halides (HF to HI) in the decreasing order of their reducing character.

4. Why fluorine is a stronger oxidizing agent than chlorine?

5. What are the sizes of X and X' in the interhalogen compounds?

6. Name the cell used in hearing aids and watches.

7. How much charge in terms of Faraday is required to reduce one mol of MnO_4^- to Mn^{2+} ?

8. Write the slope value obtained in the plot of $\log [R_0] / [R]$ Vs. time for a first order reaction.

9. Name the sweetening agent used in the cooking of sweets for a diabetic patient.

10. Name the polymer which is used for making electrical switches and combs.

11. In the Mond's process the gas used for the refining of a metal is

- | | |
|-----------|------------|
| (A) H_2 | (B) CO_2 |
| (C) CO | (D) N_2 |

12. The conversion of an alkyl halide into an alcohol by aqueous NaOH is classified as

- (A) a dehydrohalogenation reaction
(B) a substitution reaction
(C) an addition reaction
(D) a dehydration reaction

13. CH_3CONH_2 on reaction with NaOH and Br_2 in alcoholic medium gives

- (A) $\text{CH}_3\text{CH}_2\text{NH}_2$ (B) $\text{CH}_3\text{CH}_2\text{Br}$
(C) CH_3NH_2 (D) CH_3COONa
-

14. The oxidation state of Ni in $[\text{Ni}(\text{CO})_4]$ is

- (A) 0 (B) 2
(C) 3 (D) 4
-

15. Amino acids are

- (A) acidic (B) basic
(C) amphoteric (D) neutral
-

16. For Q16-Q20, choose the correct option:

- (A) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).
(B) Both Assertion (A) and Reason (R) are correct statements, but Reason (R) is not the correct explanation of the Assertion (A).
(C) Assertion (A) is correct, but Reason (R) is wrong statement.
(D) Assertion (A) is wrong, but Reason (R) is correct statement.

Assertion (A): Conductivity of an electrolyte increases with decrease in concentration.

Reason (R): Number of ions per unit volume decreases on dilution.

- (A) A (B) B
(C) C (D) D
-

17. **Assertion (A):** The C-O-C bond angle in ethers is slightly less than tetrahedral angle.

Reason (R): Due to the repulsive interaction between the two alkyl groups in ethers.

- (A) A (B) B
(C) C (D) D
-

18. **Assertion (A):** Low spin tetrahedral complexes are rarely observed.

Reason (R): Crystal field splitting energy is less than pairing energy for tetrahedral complexes.

- (A) A (B) B
(C) C (D) D
-

19. **Assertion (A):** Elevation in boiling point is a colligative property.

Reason (R): Elevation in boiling point is directly proportional to molarity.

- (A) A (B) B
(C) C (D) D
-

20. **Assertion (A):** Oxidation of ketones is easier than aldehydes.

Reason (R): C-C bond of ketones is stronger than C-H bond of aldehydes.

- (A) A (B) B
(C) C (D) D
-

Section B

21. State Raoult's law for a solution containing volatile components. What is the similarity between Raoult's law and Henry's law?

22. Write the role of

- (a) Dilute NaCN in the extraction of Gold.
- (b) CO in the extraction of Iron.

OR

How is leaching carried out in the case of low grade copper ores? Name the method used for refining of copper metal.

23. Define adsorption with an example. What is the role of adsorption in heterogeneous catalysis?

OR

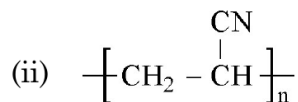
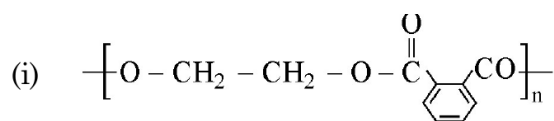
Define Brownian movement. What is the cause of Brownian movement in colloidal particles? How is it responsible for the stability of Colloidal Sol?

24. (a) Write the IUPAC name and hybridisation of the complex $[\text{Fe}(\text{CN})_6]^{4-}$. (Given: Atomic number of Fe = 26)

(b) What is the difference between an ambidentate ligand and a chelating ligand?

25. How do antiseptics differ from disinfectants? Name a substance which can be used as a disinfectant as well as an antiseptic.

26. Identify the monomers in the following polymers:



27. Draw the structures of the following:

(i) $\text{H}_2\text{S}_2\text{O}_6$

(ii) XeF_4

Section C

28. A 0.01 m aqueous solution of AlCl_3 freezes at -0.068°C . Calculate the percentage of dissociation. [Given: K_f for Water = $1.86\text{ K kg mol}^{-1}$]

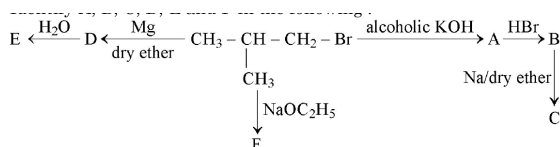
29. When a steady current of 2A was passed through two electrolytic cells A and B containing electrolytes ZnSO_4 and CuSO_4 connected in series, 2 g of Cu were deposited at the cathode of cell B. How long did the current flow? What mass of Zn was deposited at cathode of cell A?

[Atomic mass: Cu = 63.5 g mol^{-1} , Zn = 65 g mol^{-1} ; $1F = 96500\text{ C mol}^{-1}$]

30. Differentiate between following:

- (i) Amylose and Amylopectin
- (ii) Globular protein and Fibrous protein
- (iii) Nucleotide and Nucleoside

31. Identify A, B, C, D, E and F in the following:



32. Give the structures of final products expected from the following reactions:

- (i) Hydroboration of propene followed by oxidation with H_2O_2 in alkaline medium.
- (ii) Dehydration of $(\text{CH}_3)_3\text{C}-\text{OH}$ by heating it with 20% H_3PO_4 at 358 K.
- (iii) Heating of $\text{C}_6\text{H}_5-\text{CH}_2-\text{O}-\text{C}_6\text{H}_5$ with HI.

OR

How can you convert the following?

- (i) Phenol to o-hydroxybenzaldehyde.
- (ii) Methanal to ethanol.
- (iii) Phenol to phenyl ethanoate.

33. Give reasons:

- (i) Aniline does not undergo Friedel-Crafts reaction.
- (ii) Aromatic primary amines cannot be prepared by Gabriel's phthalimide synthesis.
- (iii) Aliphatic amines are stronger bases than ammonia.

34. Write three differences between lyophobic sol and lyophilic sol.

OR

Define the following terms:

- (i) Protective colloid
- (ii) Zeta potential
- (iii) Emulsifying agent

Section D

35. (a) Give reasons:

- (i) Transition metals and their compounds show catalytic activities.
- (ii) Separation of a mixture of Lanthanoid elements is difficult.
- (iii) Zn, Cd and Hg are soft and have low melting point.

(b) Write the preparation of the following:

- (i) $\text{Na}_2\text{Cr}_2\text{O}_7$ from Na_2CrO_4
- (ii) K_2MnO_4 from MnO_2

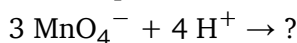
OR

(a) Account for the following:

- (i) Ti^{3+} is coloured whereas Sc^{3+} is colourless in aqueous solution.
- (ii) Cr^{2+} is a strong reducing agent.

(b) Write two similarities between chemistry of lanthanoids and actinoids.

(c) Complete the following ionic equation:



36. (a) Write the products formed when benzaldehyde reacts with the following reagents:

- (i) CH_3CHO in presence of dilute NaOH
- (ii) $\text{H}_2\text{N-NH-C}_6\text{H}_5$ (phenylhydrazine)
- (iii) Conc. NaOH

(b) Distinguish between following:

- (i) $\text{CH}_3\text{-CH=CH-CO-CH}_3$ and $\text{CH}_3\text{-CH}_2\text{-CO-CH=CH}_2$
- (ii) Benzaldehyde and Benzoic acid.

OR

(a) Write the final products in the following:

- (i) $(\text{CH}_3)_2\text{C=O} \xrightarrow{\{\text{Zn/Hg, Conc. HCl}\}}$
- (ii) $\text{C}_6\text{H}_5\text{-COONa} \xrightarrow{\{\text{NaOH/CaO}\}}$
- (iii) $\text{CH}_2=\text{CH-CH}_2\text{-CN} \xrightarrow{\{(a) \text{DIBAL-H; (b) H}_2\text{O}^+\}}$

(b) Arrange the following in the increasing order of their reactivity towards nucleophilic addition reaction:



(c) Draw the structure of 2,4-DNP derivative of acetaldehyde.

37. (a) A first order reaction is 25% complete in 40 minutes. Calculate the value of rate constant. In what time will the reaction be 80% completed?

(b) Define order of reaction. Write the condition under which a bimolecular reaction follows first order kinetics.

OR

(a) A first order reaction is 50% complete in 30 minutes at 300 K and in 10 minutes at 320 K. Calculate activation energy (E_a) for the reaction.

$$(R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1})$$

(b) Write the two conditions for collisions to be effective collisions.

(c) How order of reaction and molecularity differ towards a complex reaction?

[Given: $\log 2 = 0.3010$, $\log 3 = 0.4771$, $\log 4 = 0.6021$, $\log 5 = 0.6991$]

- End of Question Paper -