

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 interhalogens.

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?

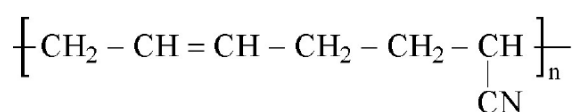
6. A hydrocarbon C_5H_{12} gives only one monochloride on photochemical chlorination. Identify the compound.

7. Out of $(CH_3)_3N$ and $(CH_3)_2NH$, which one is more basic in aqueous solution?

8. Out of $cis-[Pt(en)_2Cl_2]^{2+}$ and $trans-[Pt(en)_2Cl_2]^{2+}$, which one is optically active?

9. Name the method of refining used to obtain semiconductor of very high purity.

10. Is the following a homopolymer or copolymer?



11. The amount of electricity required to produce one mole of Zn from $ZnSO_4$ solution will be :

- (A) 3F (B) 2F
(C) 1F (D) 4F

12. Zinc is coated over iron to prevent rusting of iron because

- (A) $E^\circ_{Zn^{2+}/Zn} = E^\circ_{Fe^{2+}/Fe}$ (B) $E^\circ_{Zn^{2+}/Zn} < E^\circ_{Fe^{2+}/Fe}$
(C) $E^\circ_{Zn^{2+}/Zn} > E^\circ_{Fe^{2+}/Fe}$ (D) None of these

13. The unit of rate constant depends upon the
- (A) molecularity of the reaction (B) activation energy of the reaction
- (C) order of the reaction (D) temperature of the reaction
-

14. The formula of the complex triamminetri(nitrito-O)Cobalt (III) is
- (A) $[\text{Co}(\text{ONO})_3(\text{NH}_3)_3]$
- (B) $[\text{Co}(\text{NO}_2)_3(\text{NH}_3)_3]$
- (C) $[\text{Co}(\text{ONO}_2)_3(\text{NH}_3)_3]$
- (D) $[\text{Co}(\text{NO}_2)(\text{NH}_3)_3]$
-

15. Which of the following is a disaccharide?
- (A) Glucose (B) Starch
- (C) Cellulose (D) Lactose
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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): An ideal solution obeys Henry's law.

Reason (R): In an ideal solution, solute-solute as well as solvent-solvent interactions are similar to solute-solvent interaction.

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

17. **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
-

18. **Assertion (A):** Benzaldehyde is less reactive than ethanal towards nucleophilic addition reactions.

Reason (R): Ethanal is more sterically hindered.

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

19. **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
-

20. **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
-

Section B

21. (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?

22. Draw the structures of the following:

(i) HClO_4

(ii) XeOF_4

23. Write the role of

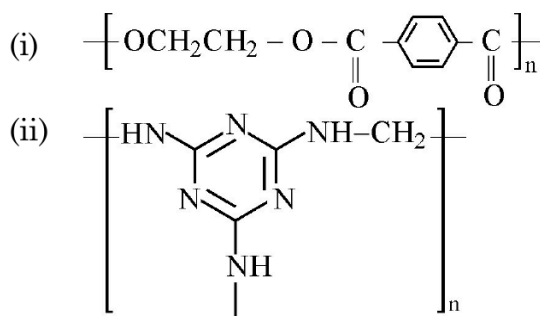
(a) Dilute NaCN in the extraction of Gold.

(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.

24. Identify the monomers in the following polymers:



25. 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?

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

27. Define the following terms with a suitable example in each:

(i) Bacteriocidal antibiotics

(ii) Food preservatives.

Section C

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

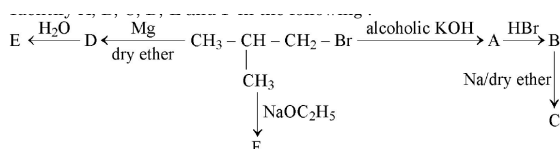
- (i) Hydroboration of propene followed by oxidation with H_2O_2 in alkaline medium.
- (ii) Dehydration of $(\text{CH}_3)_3\text{C}-\text{OH}$ by heating it with 20% H_3PO_4 at 358 K.
- (iii) Heating of $\text{C}_6\text{H}_5-\text{CH}_2-\text{O}-\text{C}_6\text{H}_5$ with HI.

OR

How can you convert the following?

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

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



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

- 31.** (i) What are the hydrolysis products of DNA?
 (ii) What happens when D-glucose is treated with Bromine water?
 (iii) What is the effect of denaturation on the structure of proteins?

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

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

OR

Define the following terms:

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

34. 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.

Section D

35. (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:

CH_3COCH_3 , HCHO , CH_3CHO , $\text{C}_6\text{H}_5\text{COCH}_3$

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

36. (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: $\log 2 = 0.3010$, $\log 3 = 0.4771$, $\log 4 = 0.6021$, $\log 5 = 0.6991$]

37. (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:

$3 \text{MnO}_4^- + 4 \text{H}^+ \rightarrow ?$

- End of Question Paper -