

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:

Colloidal particles always carry an electric charge which may be either positive or negative. For example, when AgNO_3 solution is added to KI solution, a negatively charged colloidal sol is obtained. The presence of equal and similar charges on colloidal particles provide stability to the colloidal sol and if, somehow, charge is removed, coagulation of sol occurs. Lyophobic sols are readily coagulated as compare to lyophilic sols.

What is the reason for the charge on sol particles?

2. Why the presence of equal and similar charges on colloidal particles provide stability?

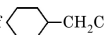
3. Why a negatively charged sol is obtained on adding AgNO_3 solution to KI solution?

4. Name one method by which coagulation of lyophobic sol can be carried out.

5. Out of KI or K_2SO_4 , which electrolyte is better in the coagulation of positive sol?

6. Name the depressant which is used to separate PbS and ZnS containing ore in froth floatation process.

7. Answer the following:

Out of -CH₂Cl and -CH₂-Cl, which will react faster in $\text{S}_{\text{N}}1$ reaction with OH^- ?

8. Out of CH_3NH_2 and CH_3OH , which has higher boiling point?

9. Which one of the following is a narcotic analgesic?

Penicillin, Codeine, Ranitidine

10. Write the name of linkage joining two monosaccharides.

11. The coordination number of 'Co' in the complex $[\text{Co}(\text{en})_3]^{3+}$ is

(a) 3 (b) 6 (c) 4 (d) 5

12. An electrochemical cell behaves like an electrolytic cell when

- (a) $E_{\text{cell}} = E_{\text{external}}$ (b) $E_{\text{cell}} = 0$ (c) $E_{\text{external}} > E_{\text{cell}}$ (d) $E_{\text{external}} < E_{\text{cell}}$

13. The half-life period for a zero order reaction is equal to

- (a) $\frac{0.693}{k}$ (b) $\frac{2k}{[R]_0}$ (c) $\frac{2.303}{k}$ (d) $\frac{[R]_0}{2k}$

(where $[R]_0$ is initial concentration of reactant and k is rate constant.)

14. The crystal field splitting energy for octahedral (Δ_o) and tetrahedral (Δ_t) complexes is related as

- (a) $\Delta_t = \frac{2}{9}\Delta_o$ (b) $\Delta_t = \frac{5}{9}\Delta_o$ (c) $\Delta_t = \frac{4}{9}\Delta_o$
(d) $\Delta_t = 2\Delta_o$

15. α -D(+) glucose and β -D(+) glucose are

- (a) Geometrical isomers (b) Enantiomers
(c) Anomers (d) Optical isomers

16. **Assertion (A):** F_2 has lower bond dissociation enthalpy than Cl_2 .

Reason (R): Fluorine is more electronegative than chlorine.

17. **Assertion (A):** Hydrolysis of an ester follows first order kinetics.

Reason (R): Concentration of water remains nearly constant during the course of the reaction.

18. **Assertion (A):** Transition metals have high melting point.

Reason (R): Transition metals have completely filled d-orbitals.

19. **Assertion (A):** $(CH_3)_3C-O-CH_3$ gives $(CH_3)_3C-I$ and CH_3OH on treatment with HI .

Reason (R): The reaction occurs by S_N1 mechanism.

20. **Assertion (A):** Benzoic acid does not undergo Friedel-Crafts reaction.

Reason (R): The carboxyl group is activating and undergo electrophilic substitution reaction.

Section B

21. Write the balanced chemical equations involved in the preparation of KMnO_4 from pyrolusite ore (MnO_2).

OR

Write the balanced ionic equations showing the oxidising action of acidified dichromate ($\text{Cr}_2\text{O}_7^{2-}$) solution with (i) Iron (II) ion and (ii) Tin (II) ion.

22. What happens when:

- (i) a pressure greater than osmotic pressure is applied on the solution side separated from solvent by a semipermeable membrane?
- (ii) acetone is added to pure ethanol?

23. Write IUPAC name and hybridization of the following complexes:

- (i) $[\text{Ni}(\text{CO})_4]$ (ii) $[\text{CoF}_6]^{3-}$

(Atomic number Ni = 28, Co = 27)

24. State Henry's law. Calculate the solubility of CO_2 in water at 298 K under 760 mm Hg.

(K_H for CO_2 in water at 298 K is 1.25×10^6 mm Hg)

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

- (i) Tranquilizers
- (ii) Anionic detergent

26. Write the reactions showing the presence of following in the open structure of glucose:

- (i) an aldehyde group
- (ii) a primary alcohol

27. Write the principle of the following refining methods:

- (a) vapour phase refining
- (b) chromatography

OR

Write chemical equations involved to obtain:

- (i) Cu from Cu_2S
- (ii) Ag from $[\text{Ag}(\text{CN})_2]^-$ complex

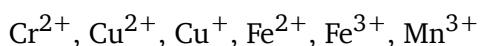
Section C

28. The rate constant for the first order decomposition of N_2O_5 is given by the following equation:

$$k = (2.5 \times 10^{14} \text{ s}^{-1}) e^{-25000 K/T}$$

Calculate E_a for this reaction and rate constant if its half-life period be 300 minutes.

29. Following ions are given:



Identify the ion which is

- (i) a strong reducing agent.
- (ii) unstable in aqueous solution.
- (iii) a strong oxidising agent.

Give suitable reason in each.

30. The freezing point of a solution containing 5 g of benzoic acid ($M = 122 \text{ g mol}^{-1}$) in 35 g of benzene is depressed by 2.94 K. What is the percentage association of benzoic acid if it forms a dimer in solution?

$$(K_f \text{ for benzene} = 4.9 \text{ K kg mol}^{-1})$$

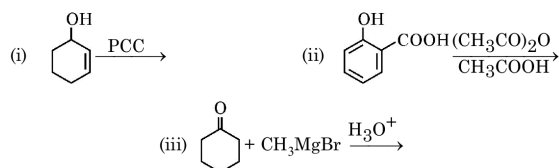
31. Write the name and structures of monomers in the following polymers:

- (i) Nylon 6, 6
- (ii) Terylene
- (iii) PHBV

32. Arrange the following compounds as directed:

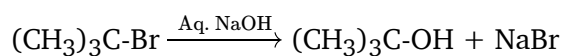
- (i) In increasing order of solubility in water: $(\text{CH}_3)_2\text{NH}$, CH_3NH_2 , $\text{C}_6\text{H}_5\text{NH}_2$
- (ii) In decreasing order of basic strength in aqueous solution: $(\text{CH}_3)_3\text{N}$, $(\text{CH}_3)_2\text{NH}$, CH_3NH_2
- (iii) In increasing order of boiling point: $(\text{C}_2\text{H}_5)_2\text{NH}$, $(\text{C}_2\text{H}_5)_3\text{N}$, $\text{C}_2\text{H}_5\text{NH}_2$

33. Write the product(s) of the following reactions:



OR

(a) Write the mechanism of the following $\text{S}_{\text{N}}1$ reaction:



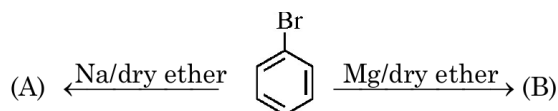
(b) Write the equation for the preparation of 2-methyl-2-methoxypropane by Williamson synthesis.

34. (i) Write the structure of major alkene formed by β -elimination of 2,2,3-trimethyl-3-bromopentane with sodium ethoxide in ethanol.

(ii) Which one of the compounds in the following pairs is chiral?



(iii) Identify (A) and (B) in the following:



OR

How can you convert the following?

- (i) But-1-ene to 1-iodobutane
- (ii) Benzene to acetophenone
- (iii) Ethanol to propanenitrile

Section D

35. (a) Account for the following:

- (i) Tendency to show -2 oxidation state decreases from oxygen to tellurium.
 - (ii) Acidic character increases from HF to HI.
 - (iii) Moist SO_2 gas acts as a reducing agent.
- (b) Draw the structure of an oxoacid of sulphur containing S-O-S linkage.
- (c) Complete the following equation:
 $\text{XeF}_2 + \text{H}_2\text{O} \rightarrow$

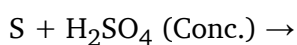
OR

(a) Among the hydrides of group 16, write the hydride:

- (i) Which is a strong reducing agent.
- (ii) Which has maximum bond angle.
- (iii) Which is most thermally stable.

Give suitable reason in each.

(b) Complete the following equations:



36. (a) The electrical resistance of a column of 0.05 M KOH solution of length 50 cm and area of cross-section 0.625 cm^2 is $5 \times 10^3 \text{ ohm}$. Calculate its resistivity, conductivity and molar conductivity.

(b) Predict the products of electrolysis of an aqueous solution of CuCl_2 with platinum electrodes.

(Given: $E^\circ_{\text{Cu}^{2+}/\text{Cu}} = +0.34 \text{ V}$, $E^\circ_{1/2\text{Cl}_2/\text{Cl}^-} = +1.36 \text{ V}$, $E^\circ_{\text{H}^+/\text{H}_2(\text{g}), \text{Pt}} = 0.00 \text{ V}$, $E^\circ_{1/2\text{O}_2/\text{H}_2\text{O}} = +1.23 \text{ V}$)

OR

(a) Calculate e.m.f. of the following cell:



Given: $E^\circ_{\text{Zn}^{2+}/\text{Zn}} = -0.76 \text{ V}$, $E^\circ_{\text{Ag}^+/\text{Ag}} = +0.80 \text{ V}$

[Given: $\log 10 = 1$]

(b) X and Y are two electrolytes. On dilution molar conductivity of X increases 2.5 times while that of Y increases 25 times. Which of the two is a weak electrolyte and why?

37. (a) An organic compound (A) having molecular formula C_4H_8O gives orange-red precipitate with 2,4-DNP reagent. It does not reduce Tollens' reagent but gives yellow precipitate of iodoform on heating with NaOH and I_2 . Compound (A) on reduction with $NaBH_4$ gives compound (B) which undergoes dehydration reaction on heating with conc. H_2SO_4 to form compound (C). Compound (C) on ozonolysis gives two molecules of ethanal. Identify (A), (B) and (C) and write their structures. Write the reactions of compound (A) with (i) NaOH/ I_2 and (ii) $NaBH_4$.

(b) Give reasons:

(i) Oxidation of propanal is easier than propanone.

(ii) α -hydrogen of aldehydes and ketones is acidic in nature.

OR

(a) Draw structures of the following derivatives:

(i) Cyanohydrin of cyclobutanone

(ii) Hemiacetal of ethanal

(b) Write the major product(s) in the following:

(i) $CH_3-CH=CH-CH_2-CN \xrightarrow{(1) DIBAL-H, (2) H_3O^+}$?

(ii) $CH_3-CH_2-OH \xrightarrow{CrO_3}$?

(c) How can you distinguish between propanal and propanone?