

CBSE Class 12 Chemistry 2025 - 56-S-2 - Compartment



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 **33 questions**. All questions are compulsory.
- (ii) Section A: Questions 1 to 16 are multiple choice questions, carrying 1 mark each.
- (iii) Section B: Questions 17 to 21 are very short answer questions, carrying 2 marks each.
- (iv) Section C: Questions 22 to 28 are short answer questions, carrying 3 marks each.
- (v) Section D: Questions 29 to 30 are case-based questions, carrying 4 marks each.
- (vi) Section E: Questions 31 to 33 are long answer questions, carrying 5 marks each.
- (vii) There is no overall choice. Internal choice is provided in a few questions in all sections except Section A.
- (viii) There is a separate question paper for visually impaired candidates.
- (ix) Use of calculators is not allowed.

Section A

1. When phenyl methyl ether is heated with HI, it produces :

- (A) Methyl chloride and Iodobenzene (B) Benzene and Methanol
(C) Iodobenzene and Methanol (D) Phenol and Methyl iodide

2. Out of the following organic compounds, the one which will react with Lucas reagent at room temperature is :

- (A) $\text{CH}_2=\text{CH}-\text{CH}_2\text{OH}$ (B) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
(C) $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$ (D) $(\text{CH}_3)_3\text{COH}$

3. Which of the following amines has the highest boiling point ?

- (A) 2,2-Dimethyl propanamine (B) 3-Methylbutanamine
(C) 2-Methylbutanamine (D) Pentanamine

4. A compound $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$ undergoes complete dissociation in water. The Van't Hoff factor (i) is :

- (A) 9 (B) 6
(C) 4 (D) 3

5. Which one of the following halides contains $\text{C}_{\text{sp}^2}\text{-X}$ bond ?

- (A) Alkyl halide (B) Allyl halide
(C) Benzyl halide (D) Vinyl halide

6. Identify the Freon from the following compounds :

- (A) CCl_2F_2 (B) CCl_2Br_2
(C) $\text{CH}_2\text{Cl}-\text{CHCl}_2$ (D) $\text{CHCl}_2-\text{CHCl}_2$

7. The transition element which shows both +1 and +2 oxidation states is :

- (A) Sc (B) Mn
(C) Cu (D) Zn

8. If the half-life period of a first order reaction is 1386 s, then the rate constant of this reaction is :

- (A) $0.5 \times 10^{-2} \text{ s}^{-1}$ (B) $0.5 \times 10^{-3} \text{ s}^{-1}$
(C) $5 \times 10^{-2} \text{ s}^{-1}$ (D) $5 \times 10^{-3} \text{ s}^{-1}$

9. The standard electrode potential of 'A', 'B' and 'C' are +0.68 V, -2.54 V and -0.50 V respectively. The order of their reducing power is :

- (A) $A > B > C$ (B) $A > C > B$
(C) $B > C > A$ (D) $C > B > A$

10. Silver nitrate is not stored in Zn vessel because :

- (A) Silver nitrate gets decomposed (B) Ag^+ gets reduced
(C) Ag gets oxidised (D) Zn gets reduced

11. Glucose on reaction with nitric acid gives :

- (A) Gluconic acid (B) Hexanoic acid
(C) Saccharic acid (D) Glycolic acid

12. The value of K_H for Ar(g) , $\text{CO}_2\text{(g)}$, HCHO(g) and $\text{CH}_4\text{(g)}$, are 40.38, 1.69, 1.84×10^{-5} and 0.418 kbar respectively at 298 K. When these gases are arranged in decreasing order of solubility, the correct order is :

- (A) $\text{HCHO} > \text{CH}_4 > \text{CO}_2 > \text{Ar}$ (B) $\text{HCHO} > \text{CO}_2 > \text{CH}_4 > \text{Ar}$
(C) $\text{Ar} > \text{CO}_2 > \text{CH}_4 > \text{HCHO}$ (D) $\text{CH}_4 > \text{CO}_2 > \text{Ar} > \text{HCHO}$

13. **Assertion (A):** The molecularity of the reaction $\text{H}_2 + \text{Br}_2 \rightarrow 2\text{HBr}$ appears to be 2.

Reason (R): Two molecules of the reactants are involved in the given elementary reaction.

- (A) Both A and R are true and R is the correct explanation of A. (B) Both A and R are true, but R is not the correct explanation of A.
(C) A is true, but R is false. (D) A is false, but R is true.

14. **Assertion (A):** p-methoxyphenol is a stronger acid than p-nitrophenol.

Reason (R): Methoxy group shows -I effect whereas nitro group shows +I effect.

- (A) Both A and R are true and R is the correct explanation of A. (B) Both A and R are true, but R is not the correct explanation of A.
(C) A is true, but R is false. (D) A is false, but R is true.

15. **Assertion (A):** Actinoids show wide range of oxidation states.

Reason (R): Due to comparable energies of 5f, 6d and 7s orbitals.

- (A) Both A and R are true and R is the correct explanation of A. (B) Both A and R are true, but R is not the correct explanation of A.
(C) A is true, but R is false. (D) A is false, but R is true.

16. **Assertion (A):** Presence of $-\text{NO}_2$ group at meta position increases the reactivity of haloarenes towards nucleophilic substitution reactions.

Reason (R): $-\text{NO}_2$ group decreases the electron density over the benzene ring and thus facilitates the attack of nucleophile on haloarenes.

- (A) Both A and R are true and R is the correct explanation of A. (B) Both A and R are true, but R is not the correct explanation of A.
(C) A is true, but R is false. (D) A is false, but R is true.

Section B

17(a). Define Fuel cell. Write two advantages of fuel cell over ordinary cell.

OR

17(b). Predict the products of electrolysis in each of the following :

- (i) A dilute solution of H_2SO_4 with platinum electrodes
 - (ii) An aqueous solution of CuCl_2 with platinum electrodes
-

18. (a) Name the reaction which can be used to distinguish chemically between aniline and N,N-dimethylaniline.

(b) Why can aniline not be prepared by the ammonolysis of chlorobenzene under normal conditions ?

19. Visha diluted the solutions of two electrolytes 'A' and 'B'. She observed that Λ_m of 'A' increased 1.6 times whereas Λ_m of 'B' increased 22 times. Which of the two is a weak electrolyte and why ?

20. By giving reasons, explain that how the rate of reaction for a given reaction will be affected when :

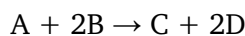
- (a) the temperature is increased.
 - (b) catalyst is added.
-

21. Give one point of difference between the following :

- (a) α -helix and β -pleated sheet structure of proteins
 - (b) Amylose and Amylopectin
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Section C

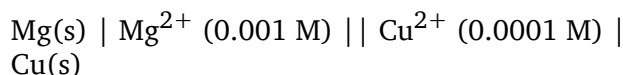
22. The following data were obtained during the kinetic studies of the reaction :



Experiment	Initial [A] (mol/L)	Initial [B] (mol/L)	Initial rate of formation of C ($M \min^{-1}$)
1	0.10	0.10	3.0×10^{-4}
2	0.30	0.30	9.0×10^{-4}
3	0.10	0.30	3.0×10^{-4}
4	0.20	0.40	6.0×10^{-4}

Determine the order of reaction with respect to each reactant and the overall order of the reaction. Write the rate law expression for the reaction.

23. Calculate emf of the following cell at 298 K :

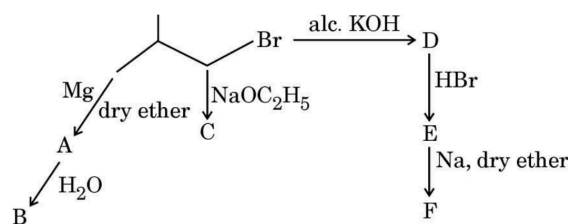


Given: $E^\circ_{\text{cell}} = 2.71 \text{ V}$, $\log 10 = 1$

24. Give plausible explanation for each of the following :

- Sodium hydrogen sulphite is used for separation and purification of aldehydes.
- 2,2,6-trimethylcyclohexanone does not form cyanohydrin.
- Only one $-NH_2$ group of semicarbazide is involved in the formation of semicarbazone.

25(a). Identify 'A' to 'F' in the following reaction sequence :



OR

25(b). What happens when :

- methyl chloride is treated with KCN ?
- methyl bromide is treated with NaI in dry acetone ?
- methyl bromide is treated with silver fluoride ?

26. (a) Write IUPAC name of the complex $[Co(H_2O)(CN)(en)_2]^{2+}$.

(b) Write the hybridization of $[Ni(CO)_4]$ and predict its magnetic behaviour. [Atomic number: Ni = 28]

(c) What type of isomerism is shown by $[Co(en)_3]^{3+}$?

27. Give reasons for the following :

- Phenol is more acidic than alcohol.
- t-butyl bromide on reaction with sodium ethoxide gives alkene as main product and not ether.
- p-nitrophenol is not steam volatile while o-nitrophenol is steam volatile.

28. Methanamine reacts with benzoyl chloride to form a product 'P'. Give the structure and IUPAC name of 'P'. Can 'P' undergo Hoffmann bromamide degradation reaction ? If yes, then give the structure of the product. If no, then give reason.

Section D

29(a). Reduce carbohydrates, increase protein to check diabetes, older people may need greater carbohydrates reduction. An average Indian derives 61-64% of energy from consumption of food rich in carbohydrates. A study published in the Journal of Diabetes Care has recommended reducing this to 49-56% for remission or prevention of Type 2 diabetes, one of the leading cause of death worldwide. Along with reducing carbohydrate intake, the study suggests that one should also increase protein intake up to 14-20% of the total energy consumption. Fat should contribute not more than 21-27% of the total energy consumption. In simple words, 50% of the plate should consist of fruits and green vegetables, 25% carbohydrates, 25% food rich in protein. Type 1 diabetes is due to deficiency of insulin.

Answer the following questions :

Write any two functions of carbohydrates.

29(b). What are monosaccharides ?

29(c). Write the name of the deficiency diseases caused due to the lack of Vitamin D.

OR

29(c). Name the hormone which maintains the glucose level within narrow limit in the blood.

30(a). One of the most distinctive properties of transition metal complexes is their wide range of colours. This means that some of the visible spectrum is being removed from white light as it passes through the sample, so the light that emerges is no longer white. The colour of the complex is complementary to that which is absorbed. The complementary colour is the colour generated from the wavelength left over. If green light is absorbed by the complex, it appears red. Table given below, gives the relationship between different wavelengths of the light absorbed and the colour observed.

Coordination Entity	Wavelength of light absorbed (nm)	Colour of light absorbed	Colour of coordination entity
$[\text{CoCl}(\text{NH}_3)_5]^{2+}$	535	Yellow	Violet
$[\text{Co}(\text{NH}_3)_5(\text{H}_2\text{O})]^{3+}$	500	Blue-green	Red
$[\text{Co}(\text{NH}_3)_6]^{3+}$	475	Blue	Yellow-orange
$[\text{Co}(\text{CN})_6]^{3-}$	310	Ultra-Violet (U.V.)	Pale Yellow
$[\text{Cu}(\text{H}_2\text{O})_4]^{2+}$	600	Red	Blue
$[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$	498	Blue-green	Violet

Answer the following questions :

What is spectrochemical series ? Write the relationship between Δ_t and Δ_o .

30(b). Arrange $[\text{Co}(\text{CN})_6]^{3-}$, $[\text{Co}(\text{NH}_3)_6]^{3+}$ and $[\text{Cu}(\text{H}_2\text{O})_4]^{2+}$ in increasing order of wavelength of light absorbed.

OR

30(b). On the basis of crystal field theory, write the electronic configuration of d^5 ion if $\Delta_o < P$.

30(c). Define crystal field splitting energy.

Section E

31(a)(i). An organic compound 'P' ($C_8H_{10}O$) on oxidation gave compound 'Q'. The compound 'Q' can also be obtained from a reaction of benzene with acetyl chloride in the presence of anhydrous $AlCl_3$. 'Q' on treatment with I_2 in aq. NaOH gave 'R' and a yellow compound 'S'. Identify 'P', 'Q', 'R' and 'S'.

31(a)(ii). Give the structure(s) of the product(s) when benzaldehyde is heated in the presence of conc. KOH.

OR

31(b)(i). Carry out the following conversions :

- (I) Propanone to Propane
- (II) Acetophenone to Benzoic acid
- (III) Benzyl chloride to Phenylethanoic acid

31(b)(ii). Give a simple chemical test to distinguish between the following pairs of compounds :

- (I) Benzaldehyde and Phenol
- (II) Butanal and Butan-2-one

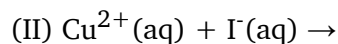
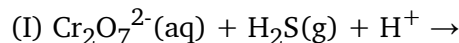
32(a). (i) Write the chemical equations involved in the preparation of potassium permanganate from pyrolusite ore (MnO_2).

(ii) Give reasons for the following :

- (I) Sc (Atomic No. 21) salts are white.
- (II) $E^\circ_{Cu^{2+}/Cu}$ is positive whereas $E^\circ_{Mn^{2+}/Mn}$ is negative.
- (III) Transition metals have high enthalpies of atomisation.

OR

32(b). (i) Complete and balance the following chemical equations :



(ii) Give reasons :

- (I) Separation of mixture of lanthanoids is difficult.
- (II) Chromium has higher melting point than manganese.
- (III) It is difficult to obtain oxidation state greater than two for Zn.

33(a). (i) Define osmotic pressure. Why is it considered as a colligative property ?

(ii) The vapour pressure of two pure liquids A and B at 400 K are 450 and 700 mmHg respectively. Find out the composition of liquid mixture if the total vapour pressure of mixture is 600 mmHg.

OR

33(b). (i) What type of deviation from Raoult's law is expected when phenol and aniline are mixed with each other ? What change in the net volume of the mixture and enthalpy is expected ?

(ii) Boiling point of water at 750 mmHg is $99.48^\circ C$. How much sucrose ($M = 342 \text{ g mol}^{-1}$) is to be added to 500 g of water such that it boils at $100^\circ C$? [K_b for water = $0.52 \text{ K kg mol}^{-1}$]

- End of Question Paper -