jeeinfo
Your JEE Guide

CBSE Class XII · Chemistry (043)

Sample Question Paper 1 · Session 2026-27

Time allowed: 3 hours **Maximum marks: 70**

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission.
This is an original practice paper written to the official CBSE 2026-27 design; it is not issued by CBSE.

General instructions:

1. There are 33 questions in this question paper with internal choice.
2. Section A consists of 16 multiple-choice questions carrying 1 mark each.
3. Section B consists of 5 very short answer questions carrying 2 marks each.
4. Section C consists of 7 short answer questions carrying 3 marks each.
5. Section D consists of 2 case-based questions carrying 4 marks each.
6. Section E consists of 3 long answer questions carrying 5 marks each.
7. All questions are compulsory.
8. Use of log tables and calculators is not allowed.

Section A

1.	Which of the following is a colligative property? (A) vapour pressure (B) osmotic pressure (C) viscosity (D) boiling point	1
2.	The van't Hoff factor for K_2SO_4, assuming complete dissociation, is: (A) 3 (B) 4 (C) 1 (D) 2	1
3.	The unit of the rate constant of a first-order reaction is: (A) mol^{-1} L s (B) mol L^{-1} s^{-1} (C) L mol^{-1} s^{-1} (D) s^{-1}	1
4.	The SI-derived unit commonly used for molar conductivity is: (A) Ω cm (B) S cm^{-1} (C) S cm^2 mol^{-1} (D) S mol^{-1}	1
5.	Which of the following ions is colourless in aqueous solution? (A) Zn^{2+} (B) Cu^{2+} (C) Fe^{3+} (D) Ti^{3+}	1
6.	Lanthanoid contraction is due to: (A) increase in atomic mass (B) imperfect shielding by 4f electrons (C) perfect shielding by 4f electrons (D) filling of 5d orbitals	1

7.	The IUPAC name of $[Co(NH_3)_4Cl_2]Cl$ is: (A) tetraamminedichlorocobalt(II) chloride (B) dichloridotetraamminecobalt(II) chloride (C) tetraamminedichloridocobalt(III) chloride (D) cobalt tetraammine dichloride	1
8.	Which bromide reacts fastest by the SN2 mechanism? (A) $(CH_3)_2CHBr$ (B) CH_3CH_2Br (C) $(CH_3)_3CBr$ (D) CH_3Br	1
9.	Phenol is more acidic than ethanol because: (A) ethanol is a gas (B) the phenoxide ion is stabilised by resonance (C) phenol has more hydrogen atoms (D) phenol forms stronger hydrogen bonds with itself	1
10.	Which of the following gives a positive iodoform test? (A) HCHO (B) C_6H_5CHO (C) CH_3COCH_3 (D) $CH_3CH_2CH_2CHO$	1
11.	Hinsberg's reagent is: (A) benzenesulphonyl chloride (B) acetyl chloride (C) chloroform and KOH (D) nitrous acid	1
12.	Which of these vitamins is water-soluble? (A) vitamin D (B) vitamin K (C) vitamin A (D) vitamin C	1
13.	**Assertion (A):** The molarity of a solution changes with temperature. **Reason (R):** The volume of a solution changes with temperature. (A) Both A and R are true, and R is the correct explanation of A. (B) Both A and R are true, and R is not the correct explanation of A. (C) A is true but R is false. (D) A is false but R is true.	1
14.	**Assertion (A):** Cu^+ salts are generally colourless. **Reason (R):** Copper is a transition element. (A) Both A and R are true, and R is the correct explanation of A. (B) Both A and R are true, and R is not the correct explanation of A. (C) A is true but R is false. (D) A is false but R is true.	1
15.	**Assertion (A):** Aniline does not undergo Friedel–Crafts reactions. **Reason (R):** Aniline forms a salt with the Lewis acid $AlCl_3$, which deactivates the ring. (A) Both A and R are true, and R is the correct explanation of A. (B) Both A and R are true, and R is not the correct explanation of A. (C) A is true but R is false. (D) A is false but R is true.	1

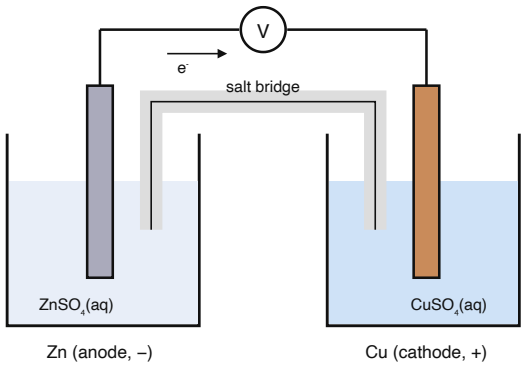
© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CBSE paper.

16.	**Assertion (A):** Sucrose is a reducing sugar. **Reason (R):** In sucrose, the glycosidic linkage joins the reducing groups of both glucose and fructose. (A) Both A and R are true, and R is the correct explanation of A. (B) Both A and R are true, and R is not the correct explanation of A. (C) A is true but R is false. (D) A is false but R is true.	1

Section B

17.	18 g of glucose is dissolved in 178.2 g of water. Find the vapour pressure of water over the solution at 100 °C. **OR** What are azeotropes? Give one example each of a minimum-boiling and a maximum-boiling azeotrope.	2
18.	The limiting molar conductivities of HCl, NaCl and CH_3COONa are 425.9, 126.4 and 91.0 S cm^2 mol^{-1}. Find Λ°_m for CH_3COOH. Which law do you use?	2
19.	The half-life of a first-order reaction is 69.3 s. Find its rate constant and the time taken for 90% completion.	2
20.	Cr^{2+} is reducing while Mn^{3+} is oxidising, although both have the d^4 configuration. Explain.	2
21.	Write the main product of each reaction: (i) $CH_3CH_2Br + KCN$ (alcoholic) →; (ii) $C_6H_5ONa + C_2H_5Cl$ →. Name reaction (ii).	2

Section C

22.	200 cm^3 of an aqueous solution containing 1.26 g of a protein has an osmotic pressure of 2.57×10^{-3} bar at 300 K. Find the molar mass of the protein (R = 0.083 L bar mol^{-1} K^{-1}).	3
23.	For the cell Zn | Zn^{2+}(0.1 M) || Cu^{2+}(0.01 M) | Cu, E°cell = 1.10 V. Find E_{cell} at 298 K and ΔG. (F = 96 500 C mol^{-1})  	3

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CBSE paper.

24.	The rate of a reaction doubles when the temperature rises from 298 K to 308 K. Find the activation energy (R = 8.314 J K^{-1} mol^{-1}).	3
25.	Using valence bond theory, compare $[Fe(CN)_6]^{3-}$ and $[FeF_6]^{3-}$ with respect to hybridisation and magnetic behaviour. Show the splitting of d orbitals in an octahedral field.	3
26.	Give three differences between SN1 and SN2 reactions. Which will react faster by SN1: $(CH_3)_3CBr$ or $CH_3CH_2CH_2CH_2Br$?	3
27.	How will you convert (i) propene to propan-2-ol, (ii) phenol to salicylic acid, (iii) ethanol to ethanal? Write the reactions. **OR** Give reasons: (i) o-nitrophenol is steam-volatile but p-nitrophenol is not; (ii) ethanol has a higher boiling point than methoxymethane; (iii) phenol is more acidic than ethanol.	3
28.	Arrange $C_6H_5NH_2$, CH_3NH_2 and $(CH_3)_2NH$ in increasing order of basic strength in aqueous solution, giving reasons. Why can Gabriel phthalimide synthesis not be used to prepare aniline?	3

Section D

29.	**Case study.** A student followed the decomposition of a substance A at constant temperature and recorded its concentration: t (min): 0	10	20	30 [A] (mol L^{-1}): 0.80	0.40	0.20	0.10 (i) The order of the reaction is: (A) zero (B) first (C) second (D) third *[1]* (ii) What is the half-life of the reaction? *[1]* (iii) Find the rate constant, and the time at which [A] becomes 0.05 mol L^{-1}. *[2]* **OR** (iii) What graph would give a straight line for this reaction, and what would its slope be? *[2]*	4

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CBSE paper.

30.	**Case study.** Proteins are polymers of α-amino acids joined by peptide bonds. The sequence of amino acids is the primary structure; regular folding such as the α-helix and β-pleated sheet is the secondary structure. When an egg is boiled, the clear albumin turns white and solid. (i) The bond joining two amino acids in a protein is: (A) glycosidic (B) peptide (C) phosphodiester (D) hydrogen *[1]* (ii) Which bonds mainly hold the α-helix in shape? *[1]* (iii) What happens to the protein when an egg is boiled? Is the primary structure affected? *[2]* **OR** (iii) Give two differences between fibrous and globular proteins. *[2]*	4

Section E

31.	(a) Write equations for (i) Tollens' test with an aldehyde, (ii) aldol condensation of ethanal, (iii) the Cannizzaro reaction of methanal. (b) Give a simple chemical test to distinguish ethanal from propanal. **OR** (a) Arrange in increasing order of acid strength, with reasons: CH_3COOH, $ClCH_2COOH$, $Cl_2CHCOOH$. (b) Write the Hell–Volhard–Zelinsky reaction of ethanoic acid. (c) What happens when sodium ethanoate is heated with soda lime?	5
32.	(a) Write the general electronic configuration of d-block elements. Why do transition metals form complexes readily? (b) How is potassium permanganate prepared from pyrolusite? Write the equations. (c) Give two differences between lanthanoids and actinoids. **OR** (a) $CoCl_3 \cdot 6NH_3$ gives three moles of AgCl per mole with excess $AgNO_3$. Write the formula and IUPAC name of the complex. (b) Draw the geometrical isomers of $[Pt(NH_3)_2Cl_2]$. (c) Why are tetrahedral complexes almost always high-spin?	5
33.	(a) Draw the graph of molar conductivity against $\sqrt{c}$ for a strong and a weak electrolyte, and explain the difference. (b) How much charge is needed to reduce 1 mol of $Cr_2O_7^{2-}$ to Cr^{3+}? (c) Write the electrode reactions of a hydrogen–oxygen fuel cell. **OR** (a) State Henry's law and give two of its applications. (b) 18 g of glucose is dissolved in 1 kg of water. Find the boiling point of the solution (Kb = 0.52 K kg mol^{-1}). (c) What is reverse osmosis? Give one use.	5

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CBSE paper.

Answers and Marking Scheme

Marks for each step are shown in brackets. Any correct alternative method gets full credit.

Section A

1. **(B)** osmotic pressure. *Working:* It depends only on the number of solute particles.

2. **(A)** 3. *Working:* $K_2SO_4 \rightarrow 2K^+ + SO_4^{2-}$.

3. **(D)** s^{-1}. *Working:* Rate = k[A] gives k in s^{-1}.

4. **(C)** S cm^2 mol^{-1}. *Working:* $\Lambda_m = \frac{\kappa}{c}$.

5. **(A)** Zn^{2+}. *Working:* Zn^{2+} has a $3d^{10}$ configuration, so no d–d transition is possible.

6. **(B)** imperfect shielding by 4f electrons. *Working:* The 4f electrons shield the increasing nuclear charge poorly.

7. **(C)** tetraamminedichloridocobalt(III) chloride. *Working:* Ligands alphabetically; x + 0 − 2 = +1, so Co is +3.

8. **(D)** CH_3Br. *Working:* Least steric hindrance.

9. **(B)** the phenoxide ion is stabilised by resonance. *Working:* The negative charge in phenoxide is delocalised over the ring.

10. **(C)** CH_3COCH_3. *Working:* It has the $CH_3CO–$ group.

11. **(A)** benzenesulphonyl chloride. *Working:* $C_6H_5SO_2Cl$ distinguishes 1°, 2° and 3° amines.

12. **(D)** vitamin C. *Working:* B-group vitamins and vitamin C are water-soluble.

13. **(A)** Both A and R are true, and R is the correct explanation of A. *Working:* Molarity is moles per litre of solution, so it depends on volume.

14. **(B)** Both A and R are true, and R is not the correct explanation of A. *Working:* Both are true, but Cu^+ is colourless because its $3d^{10}$ configuration allows no d–d transition.

15. **(A)** Both A and R are true, and R is the correct explanation of A. *Working:* The $–NH_2$ group donates its lone pair to $AlCl_3$, putting a positive charge next to the ring.

16. **(D)** A is false but R is true. *Working:* A is false: sucrose is non-reducing, and R explains why.

Section B

17. n(glucose) = 0.1 mol, n(water) = 9.9 mol, so x(water) = 0.99 (1). p = 0.99 × 760 = 752.4 mm Hg (1).

OR Liquid mixtures that boil at a constant temperature with the same composition in liquid and vapour (1). Minimum boiling: about 95% ethanol in water; maximum boiling: about 68% nitric acid in water (1).

18. Kohlrausch's law of independent migration of ions (½). $\Lambda°(CH_3COOH) = \Lambda°(HCl) + \Lambda°(CH_3COONa) – \Lambda°(NaCl)$ (½) = 425.9 + 91.0 − 126.4 = 390.5 S cm^2 mol^{-1} (1).

19. k = 0.693/69.3 = 0.01 s^{-1} (1). $t = \frac{2.303}{k} \log \frac{100}{10} = 230.3$ s (1).

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CBSE paper.

20. $Cr^{2+} \rightarrow Cr^{3+}$ gives the stable half-filled t_2g^3 (d^3) configuration, so Cr^{2+} readily loses an electron (1). $Mn^{3+} \rightarrow Mn^{2+}$ gives the stable half-filled d^5 configuration, so Mn^{3+} readily gains an electron (1).

21. (i) CH_3CH_2CN, propanenitrile (1). (ii) $C_6H_5OC_2H_5$, ethoxybenzene; Williamson synthesis (1).

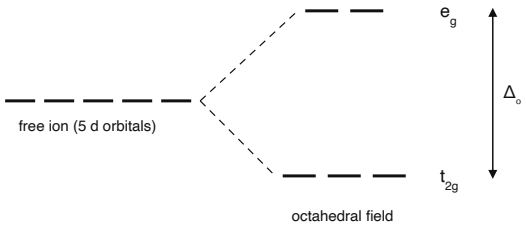
Section C

22. $\pi V = \frac{w}{M}RT$, so $M = \frac{wRT}{\pi V}$ (1). $M = \frac{1.26 \times 0.083 \times 300}{2.57 \times 10^{-3} \times 0.200}$ (1) ≈ 6.1 × 10^4 g mol^{-1} (1).

23. $E = E^\circ - \frac{0.059}{2}\log\frac{[Zn^{2+}]}{[Cu^{2+}]} = 1.10 - 0.0295\log 10$ (1) ≈ 1.07 V (1). ΔG = –nFE = –2 × 96 500 × 1.07 ≈ –206.6 kJ mol^{-1} (1).

24. $\log\frac{k_2}{k_1} = \frac{E_a}{2.303R}\left(\frac{T_2 - T_1}{T_1T_2}\right)$ (1). $0.301 = \frac{E_a}{2.303 \times 8.314} \times \frac{10}{298 \times 308}$ (1). E_a ≈ 52.9 kJ mol^{-1} (1).

25. Fe^{3+} is $3d^5$. CN^- is strong field: electrons pair up, d^2sp^3 (inner orbital), one unpaired electron, paramagnetic (low spin) (1). F^- is weak field: sp^3d^2 (outer orbital), five unpaired electrons, strongly paramagnetic (high spin) (1). Splitting (1):



26. SN1: two steps via a carbocation; rate depends only on [substrate]; racemisation. SN2: one step; rate depends on [substrate] and [nucleophile]; inversion of configuration (2). $(CH_3)_3CBr$, as it forms the stable tertiary carbocation (1).

27. (i) Acid-catalysed hydration (Markovnikov): $CH_3CH{=}CH_2 + H_2O \rightarrow CH_3CH(OH)CH_3$ (1). (ii) Kolbe's reaction: sodium phenoxide + CO_2 (4–7 atm, 400 K), then H^+ (1). (iii) Oxidation with PCC, or dehydrogenation over Cu at 573 K: $CH_3CH_2OH \rightarrow CH_3CHO$ (1).

OR (i) o-Nitrophenol has intramolecular hydrogen bonding; p-nitrophenol is associated by intermolecular hydrogen bonds (1). (ii) Ethanol molecules are hydrogen-bonded; the ether cannot form hydrogen bonds with itself (1). (iii) The phenoxide ion is resonance-stabilised; ethoxide is not (1).

28. $C_6H_5NH_2 < CH_3NH_2 < (CH_3)_2NH$ (1). In aniline the lone pair is delocalised into the ring; alkyl groups increase electron density on N, and the dimethylammonium ion is well stabilised by hydration (1). Aryl halides do not undergo nucleophilic substitution with the phthalimide anion (1).

Section D

29. (i) (B) first: the concentration halves in equal time intervals.
(ii) 10 min.
(iii) k = 0.693/10 = 0.0693 min^{-1}; 0.05 is reached after four half-lives, i.e. 40 min. **OR** A plot of ln[A] against t is a straight line with slope –k = –0.0693 min^{-1}.

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CBSE paper.

30. (i) (B) peptide (–CO–NH–).
(ii) Hydrogen bonds between –C=O and –NH groups of the chain.
(iii) The protein is denatured: heat breaks the hydrogen bonds, so the secondary and tertiary structures unfold and the protein coagulates. The primary structure (sequence of amino acids) is not changed. **OR** Fibrous proteins have long parallel chains, are insoluble in water and are structural (keratin, myosin); globular proteins are folded into spheres, are water-soluble and often have biological activity (insulin, albumin).

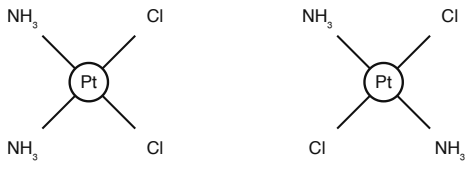
Section E

31. (a) (i) $RCHO + 2[Ag(NH_3)_2]^+ + 3OH^- \rightarrow RCOO^- + 2Ag$ (silver mirror) $+ 4NH_3 + 2H_2O$ (1). (ii) $2CH_3CHO$ (dil. NaOH) $\rightarrow CH_3CH(OH)CH_2CHO$, which on heating gives $CH_3CH{=}CHCHO$ (1). (iii) $2HCHO$ + conc. KOH $\rightarrow CH_3OH + HCOOK$ (1). (b) Iodoform test: ethanal (CH_3CHO) gives a yellow precipitate of CHI_3 with I_2/NaOH; propanal does not (2).

OR (a) $CH_3COOH < ClCH_2COOH < Cl_2CHCOOH$; electron-withdrawing Cl stabilises the carboxylate ion, more so with two Cl (2). (b) $CH_3COOH + Cl_2$ (red P) $\rightarrow ClCH_2COOH + HCl$ (1½). (c) Decarboxylation: $CH_3COONa + NaOH$ (CaO) $\rightarrow CH_4 + Na_2CO_3$ (1½).

32. (a) $(n-1)d^{1\text{-}10}ns^{1\text{-}2}$ (½). They have small, highly charged ions with vacant d orbitals that can accept lone pairs (1). (b) $2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$; then the manganate is oxidised: $3MnO_4^{2-} + 4H^+ \rightarrow 2MnO_4^- + MnO_2 + 2H_2O$ (or electrolytically) (1½). (c) Actinoids show a wider range of oxidation states; most actinoids are radioactive; actinoid contraction is greater (any two) (2).

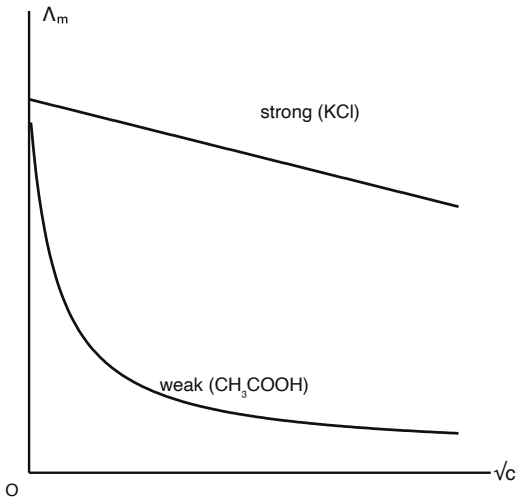
OR (a) $[Co(NH_3)_6]Cl_3$, hexaamminecobalt(III) chloride (1½). (b) cis and trans isomers (2):



(c) The tetrahedral splitting $\Delta t \approx (4/9)\Delta o$ is small, usually less than the pairing energy, so electrons do not pair (1½).

33. (a) Graph (1):

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CBSE paper.



For a strong electrolyte Λ_m falls slightly and linearly with $\sqrt{c}$ because of interionic attraction; for a weak electrolyte Λ_m rises steeply on dilution because the degree of dissociation increases (1). (b) $Cr_2O_7^{2-} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H_2O$, so $6F = 6 \times 96\,500 = 5.79 \times 10^5$ C (1½). (c) Anode: $2H_2 + 4OH^- \rightarrow 4H_2O + 4e^-$; cathode: $O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$ (1½).

OR (a) The partial pressure of a gas over a solution is proportional to its mole fraction in the solution, $p = K_H x$ (1). Uses: sealing CO_2 in soft drinks under high pressure; scuba divers breathing air diluted with helium (1). (b) m = 0.1 mol kg^{-1}; $\Delta Tb = 0.52 \times 0.1 = 0.052$ K, so bp = 373.20 K (2). (c) Applying pressure greater than the osmotic pressure forces solvent from the solution through a semipermeable membrane; used for desalination of sea water (1).

© 2026 JEEInfo (www.jeeinfo.in). Free for personal study only. Do not copy, sell or republish without written permission. Not an official CBSE paper.