CBSE Class 12 Chemistry: Sample Paper 2

Based on NCERT · the board's 2026-27 pattern | Time: 3 hours · **Maximum marks: 70**

1. There are 33 questions in this question paper, with internal choice. All questions are compulsory.
2. Section A has 16 multiple-choice questions of 1 mark each, the last four of them assertion-reason. Section B has 5 very short answer questions of 2 marks, Section C 7 short answer questions of 3 marks, Section D 2 case-based questions of 4 marks and Section E 3 long answer questions of 5 marks.
3. Internal choice is given in one question in Section B, one in Section C, in a part of each case in Section D and in all three questions in Section E; attempt only one of the alternatives.
4. Log tables and calculators are not allowed.
5. For the assertion-reason questions, choose: (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 A (16 × 1 mark)

1. The IUPAC name of $HO{-}CH_2{-}CH(OH){-}CH_2{-}CH_3$ is [1]

(a) butan-1,2-diol
(b) butane-1,2-diol
(c) butane-3,4-diol
(d) 1,2-dihydroxybutane

2. The letter D in D-(+)-glucose tells us that [1]

(a) glucose is dextrorotatory
(b) the −OH on C-5, the lowest asymmetric carbon, is on the right in the Fischer projection, as in (+)-glyceraldehyde
(c) the −OH on C-2 is on the right in the Fischer projection
(d) every −OH in the Fischer projection is on the right

3. The oxidation state of iron in $Na_2[Fe(CN)_5(NH_3)]$ is [1]

(a) +2
(b) +3
(c) +5
(d) +1

4. Oxidation of 3-methylbutan-2-ol, $CH_3CH(OH)CH(CH_3)_2$, with acidified $K_2Cr_2O_7$ gives [1]

(a) 3-methylbutanal
(b) 3-methylbutan-2-one
(c) 3-methylbutanoic acid
(d) 2-methylbut-2-ene

5. For a salt X, $\Delta_{sol}H = +18$ kJ mol^{-1}. A nearly saturated solution of X is in contact with excess solid. When the temperature is raised, the solubility of X [1]

(a) first increases and then decreases
(b) decreases, since heat drives solute out of solution
(c) does not change, since solids are incompressible
(d) increases, since the equilibrium shifts in the endothermic direction

6. The IUPAC name of $CH_3CH_2CH_2{-}NH{-}CH_2CH_3$ is [1]

(a) N-propylethanamine
(b) N-ethylpropan-2-amine
(c) ethylpropylamine
(d) N-ethylpropan-1-amine

7. $CH_3CH_2CH_2CHCl_2$ is best described as [1]

(a) a vic-dihalide, 1,2-dichlorobutane
(b) a gem-dihalide, 1,1-dichlorobutane
(c) a gem-dihalide, 2,2-dichlorobutane
(d) a vic-dihalide, 1,1-dichlorobutane

8. The IUPAC name of $Na_2[Zn(CN)_4]$ is [1]

(a) tetracyanidozincate(II) sodium
(b) sodium tetracyanidozinc(II)
(c) sodium tetracyanidozincate(IV)
(d) sodium tetracyanidozincate(II)

9. A reaction goes by three elementary steps. Run on its own, step 1 is over in about 2 s, step 2 takes about 40 min and step 3 about 5 s. The overall rate of the reaction is decided by [1]

(a) step 2, because it is the slowest
(b) step 1, because it comes first
(c) step 3, because it gives the products
(d) the sum of the three rates

10. The IUPAC name of $CH_3–CH_2–CH(CH_3)–CH_2–CH_2–OH$ is [1]

(a) 3-methylpentan-1-ol
(b) 3-methylpentan-5-ol
(c) 3-ethylbutan-1-ol
(d) 1-hydroxy-3-methylpentane

11. In the cell notation Al(s) | Al^{3+}(aq) || Sn^{2+}(aq) | Sn(s), the double vertical line stands for [1]

(a) the boundary between a metal and its solution
(b) a platinum wire
(c) a salt bridge
(d) the voltmeter

12. A colourless sample of aniline turns brown after some weeks in a half-filled bottle. The change is due to [1]

(a) reaction with nitrogen of the air, giving an azo dye
(b) absorption of water, giving anilinium hydroxide
(c) oxidation by the air in the bottle
(d) conversion into nitrobenzene by light

13. Assertion (A): The amount of oxygen dissolved in a pond falls on a hot afternoon. Reason (R): Dissolution of a gas in a liquid is an exothermic process. [1]

(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): Propan-1-amine dissolves in water. Reason (R): Propan-1-amine gives a foul-smelling isocyanide when heated with chloroform and ethanolic KOH. [1]

(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): Phenol dissolves in aqueous sodium hydroxide, forming sodium phenoxide. Reason (R): Phenol is a stronger acid than water. [1]

(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): The time taken by a first order reaction to fall from 0.8 M to 0.4 M equals the time it takes to fall from 0.2 M to 0.1 M. Reason (R): For a first order reaction $t_{½} = 0.693/k$, which does not contain the initial concentration. [1]

(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 (5 × 2 marks)

17. Write the equation for the preparation of a Grignard reagent from 1-bromopropane, and the equation for its reaction with water. Which atom of the C–Mg bond carries the partial negative charge? [2]

Or *Bromocyclohexane is warmed with magnesium in dry ether and the product is then treated with methanol. Write the two equations and name the final organic product.*

18. Write the equation for the conversion of butanoic acid into 2-chlorobutanoic acid and name the reaction. [2]

19. Give two differences between the order and the molecularity of a reaction. [2]

20. Patient P's red blood cells are unusually fragile, and P has a loss of muscle strength. Patient Q has cheilosis and a burning sensation of the skin. Name the vitamin each patient lacks and state whether it is fat soluble or water soluble. [2]

21. What is meant by the denticity of a ligand? State the denticity of (i) the oxalate ion, $C_2O_4^{2-}$, and (ii) $N(CH_2CH_2NH_2)_3$. [2]

Section C (7 × 3 marks)

22. 2-Bromo-2-methylbutane is hydrolysed in water. Write the mechanism in two numbered steps with equations, the rate expression, and one reason why the reaction is fast. [3]

Or *3-Chloro-3-ethylpentane, $(C_2H_5)_3CCl$, is warmed in aqueous ethanol. Write the mechanism in two numbered steps with equations, the rate expression, and why a polar protic solvent helps.*

23. For the lead storage battery while it is being discharged, write (i) the anode reaction, (ii) the cathode reaction, and (iii) explain why the density of the electrolyte can be used to tell how far the battery has run down. [3]

24. 2-Methylpropan-2-ol is dehydrated by 20% H_3PO_4 at 358 K, whereas ethanol needs concentrated H_2SO_4 at 443 K. Write, as numbered steps, the mechanism of dehydration of 2-methylpropan-2-ol, and use it to explain the difference. [3]

25. Explain the role of a coordination compound in each of the following: (i) fixing a developed black-and-white photographic film, (ii) electroplating an article with silver, (iii) the hydrogenation of alkenes. [3]

26. Vanadium forms the oxides V_2O_3, V_2O_4 and V_2O_5. (i) State the acid–base nature of each. (ii) What does V_2O_4 give when it dissolves in acids? (iii) Why does the acidic character increase from V_2O_3 to V_2O_5? [3]

27. The concentration of a reactant in a zero order reaction falls from 0.50 mol L^{-1} to 0.38 mol L^{-1} in 30 min. Calculate (i) k, (ii) the time at which the reactant is used up completely, and (iii) the half-life for the initial concentration of 0.50 mol L^{-1}. [3]

28. Starting from 1-bromopropane: (a) write equations to prepare propan-1-amine free of secondary and tertiary amines; (b) state what heating 1-bromopropane with ethanolic ammonia in a sealed tube would give, and why. (c) To make the reaction in (b) go faster, would you replace 1-bromopropane by 1-chloropropane or by 1-iodopropane? Give the order of reactivity on which you decide. [3]

Section D (2 × 4 marks)

29. Read the passage and answer the questions that follow. [4]

A student is given five white carbohydrate samples, P to T. She tests each with Tollens' reagent and then hydrolyses it completely with dilute acid, identifying the monosaccharides formed. Sample T dissolves in hot water. Her teacher adds that T was separated from a natural mixture whose other, water-insoluble component also gives only glucose on hydrolysis but has a branched chain.

Sample	Tollens' reagent	Products of complete hydrolysis
P	silver mirror	not hydrolysed
Q	no change	glucose and fructose, equimolar
R	silver mirror	glucose only, two units per molecule
S	silver mirror	galactose and glucose
T	no change	glucose only, several hundred units in an unbranched chain

(a) Sample Q is [1]

(a) maltose (b) lactose
(c) sucrose (d) cellulose

(b) In sample R the two units are joined between [1]

(a) C1 of β-D-galactose and C4 of β-D-glucose (b) C1 of α-D-glucose and C2 of β-D-fructose
(c) C1 of one α-D-glucose and C4 of the other (d) C1 of one α-D-glucose and C6 of the other

(c) Explain why R gives a silver mirror with Tollens' reagent but Q does not. [2]

Or *Identify T and the water-insoluble component the teacher describes, and state how their chains differ.*

30. Read the passage and answer the questions that follow. [4]

A lighter flint is made of mischmetall, an alloy of about 95% lanthanoid metals with about 5% iron. The lanthanoids in it are so alike that separating them is difficult: all are reactive metals whose atoms share the $6s^2$ configuration while the number of 4f electrons changes along the series. Their compounds are mostly of the tripositive ions, many of which give coloured solutions with sharp absorption bands. A few lanthanoids also form compounds in which they show an oxidation state other than +3, and such compounds are useful as oxidising or reducing agents in the laboratory.

(a) Which of the following tripositive ions is colourless in aqueous solution? [1]

(a) Pr^{3+} (b) Nd^{3+}
(c) Sm^{3+} (d) Lu^{3+}

(b) On going from La^{3+} to Lu^{3+}, the ionic radius [1]

(a) increases regularly (b) decreases regularly
(c) stays the same (d) first increases, then decreases

(c) Eu^{2+} is a strong reducing agent while Tb^{4+} is an oxidising agent. Explain both, using their electronic configurations. [2]

Or *$E°(Ce^{4+}/Ce^{3+})$ is +1.74 V, enough in principle to oxidise water. Explain why cerium shows the +4 state, and why Ce(IV) is nevertheless a useful analytical reagent in aqueous solution.*

Section E (3 × 5 marks)

31. Liquids P and Q are mixed in equal numbers of moles at 300 K. Raoult's law predicts a total vapour pressure of 60 kPa over the mixture, but 72 kPa is measured. (a) Name the type of deviation shown. (b) Compare the P–Q interactions with the P–P and Q–Q interactions, and give the likely sign of Δmix H. (c) If the deviation is large, what kind of azeotrope may form, and how does its boiling point compare with those of the mixtures near it? (d) Name one pair of liquids from the chapter that behaves like P and Q, and give the reason at molecular level. [5]

Or *Liquids L and M are mixed in equal numbers of moles at 300 K. Raoult's law predicts a total vapour pressure of 50 kPa over the mixture, but 41 kPa is measured. (a) Name the type of deviation shown. (b) Compare the L–M interactions with the L–L and M–M interactions, and give the likely sign of Δmix H. (c) If the deviation is large, what kind of azeotrope may form? Name one such azeotrope with its approximate composition. (d) Name one pair of liquids from the chapter that behaves like L and M, and give the reason at molecular level.*

32. (a) Define the cell constant of a conductivity cell and say why it is found with a KCl solution rather than by measuring l and A. (b) A conductivity cell filled with 0.010 M KCl ($\kappa = 1.41 \times 10^{-3}$ S cm^{-1}) has a resistance of 1000 Ω at 298 K. Filled with 0.0050 M of a monobasic weak acid HX, the same cell has a resistance of 6000 Ω. Calculate the cell constant, the conductivity and molar conductivity of the acid solution, and, given $\Lambda^\circ_m(HX) = 390$ S cm^2 mol^{-1}, its dissociation constant. [5]

Or *(a) State the balance condition of the Wheatstone bridge used to measure the resistance of a conductivity cell, and how κ then follows from it. (b) A conductivity cell filled with 0.100 M KCl (κ = 0.0129 S cm^{-1}) has a resistance of 200 Ω at 298 K. Filled with 0.0020 M of a monobasic weak acid HY, its resistance is 5160 Ω. Calculate the cell constant, the conductivity and molar conductivity of the acid solution, and, given Λ°m(HY) = 400 S cm^2 mol^{-1}, its dissociation constant.*

33. (a) Benzoic acid is treated with ammonia and the salt formed is then heated strongly. Write the two equations and name the product of each. (b) Benzaldehyde is treated with conc. HNO_3 and conc. H_2SO_4 at 273–283 K. Write the structure and name of the product, and explain why the nitro group enters that position. (c) Benzoic acid gives no ketone when warmed with CH_3COCl and anhydrous $AlCl_3$. Give two reasons. [5]

Or *(a) Phthalic acid, $C_6H_4(COOH)_2$ (benzene-1,2-dicarboxylic acid), is treated with ammonia; the ammonium salt is heated to give P, and P on strong heating gives Q. Write the structures and names of P and Q. (b) Benzaldehyde and benzoic acid are each nitrated with conc. HNO_3 and conc. H_2SO_4. Name the two products and give the one reason that explains both. (c) Benzoic acid reacts with Br_2 in the presence of $FeBr_3$ but gives no product with CH_3Cl and anhydrous $AlCl_3$. Name the bromination product and explain the second observation.*