



TECHNO INDIA GROUP PUBLIC SCHOOL

MOCK TEST-4 (2025-2026)

CLASS-XII

Subject Code **043**

Roll No.

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Candidates must write the code on the title page of the answer-book.

CHEMISTRY

Time allowed : 3 hours

Maximum Marks : 70

General Instruction:

Read the following instructions carefully and follow them :

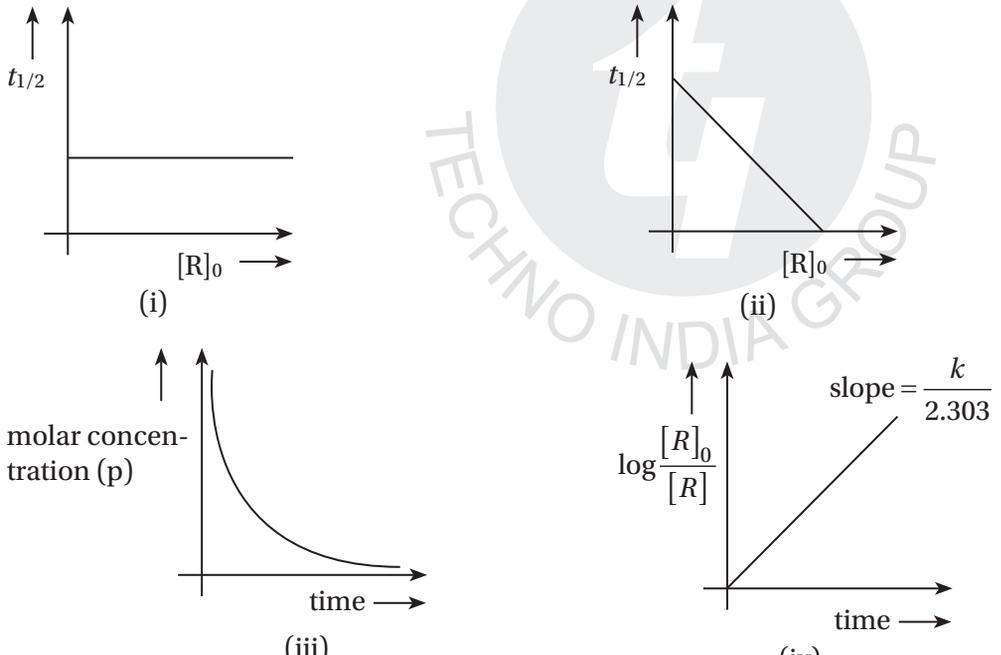
1. There are 33 questions in this question paper with internal choice.
2. SECTION A consists of 16 multiple-choice questions carrying 1 mark each.
3. SECTION B consists of 5 short answer questions carrying 2 marks each
4. SECTION C consist of 7 short answer questions carrying 3 marks each.
5. SECTION 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 are not allowed.
9. Draw neat figures wherever required. Take $\pi = 22/7$ wherever required if not stated.

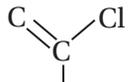
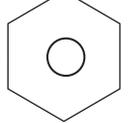
SECTION A

Section A: Question 1 to 16 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to those questions

1. Electrode potential for Mg electrode varies according to the equation. $E_{\text{Mg}^{2+}/\text{Mg}} = E_{\text{Mg}^{2+}/\text{Mg}}^0 - \frac{0.059}{2} \log_{10} \frac{1}{[\text{Mg}^{2+}]}$ The graph of $E_{\text{Mg}^{2+}/\text{Mg}}$ vs $\log_{10} [\text{Mg}^{2+}]$ is	[1]
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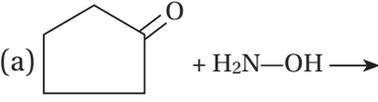
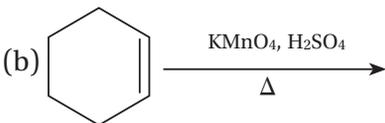
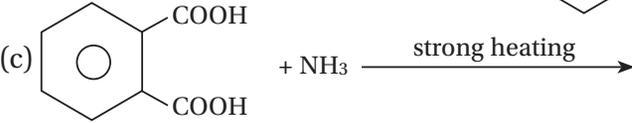
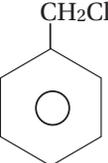
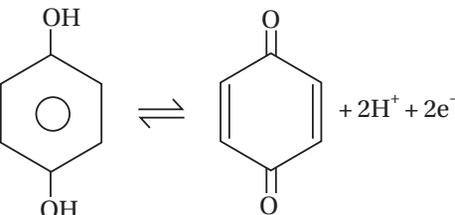
	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>(A) $E_{\text{Mg}^{2+}/\text{Mg}}$</p> <p>$\log_{10}[\text{Mg}^{2+}]$</p> </div> <div style="text-align: center;"> <p>(B) $E_{\text{Mg}^{2+}/\text{Mg}}$</p> <p>$\log_{10}[\text{Mg}^{2+}]$</p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;"> <p>(C) $E_{\text{Mg}^{2+}/\text{Mg}}$</p> <p>$\log_{10}[\text{Mg}^{2+}]$</p> </div> <div style="text-align: center;"> <p>(D) $\log \text{Mg}^{2+} / \text{Mg}$</p> <p>$\log_{10}[\text{Mg}^{2+}]$</p> </div> </div>	
2.	<p>Which of the following compound is most reactive towards nucleophilic addition reaction?</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>(A) $\text{CH}_3-\overset{\text{O}}{\parallel}{\text{C}}-\text{H}$</p> </div> <div style="text-align: center;"> <p>(B) $\text{H}_3\text{C}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$</p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: flex-start; margin-top: 20px;"> <div style="text-align: center;"> <p>(C) $\text{C}_6\text{H}_5-\overset{\text{O}}{\parallel}{\text{C}}-\text{H}$</p> </div> <div style="text-align: center;"> <p>(D) $\text{C}_6\text{H}_5-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3$</p> </div> </div>	[1]
3.	<p>The correct order of increasing acidic strength is:</p> <p>(A) Phenol < ethanol < chloroacetic acid < acetic acid (B) ethanol < phenol < chloroacetic acid < acetic acid (C) ethanol < phenol < acetic acid < chloroacetic acid (D) chloroacetic acid < acetic acid < phenol < ethanol</p>	[1]
4.	<p>The order of reactivity of following alcohols with halogen acids is _____</p> <p>(a) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$</p> <p>(b) $\text{CH}_3\text{CH}_2-\underset{\text{CH}_3}{\text{CH}}-\text{OH}$</p> <p>(c) $\text{CH}_3-\text{CH}_2-\underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}}-\text{OH}$</p> <p>(A) $a > c > b$ (B) $c > b > a$ (C) $b > a > c$ (D) $a > b > c$</p>	[1]
5.	<p>DNA finger printing means the</p> <p>(A) sequencing the nucleotides in DNA (B) sequencing the bases present in double helix (C) information regarding the unique sequence of bases on DNA for a person (D) information regarding the unique inprints on the fingertip for a person</p>	[1]

6.	One mole of an organic compound 'A' with the formula C_3H_8O reacts completely with two moles of HI to form 'X' and Y, when 'Y' is boiled with aqueous alkali forms Z, Z answers the iodoform test. The compound 'A' is _____ (A) methoxyethane (B) ethoxyethane (C) propan-2-ol (D) propan-1-ol	[1]
7.	The common name of pentanedioic acid is: (A) succinic acid (B) pimelic acid (C) oxalic acid (D) glutaric acid	[1]
8.	If 75% of a first order reacting was completed in 32 mins, then 50% of the reaction was completed in _____ (A) 24 mins (B) 4 mins (C) 16 mins (D) 8 mins	[1]
9.	Among the following, which bivalent ion of the first transition series shows a maximum magnetic moment? (A) Co^{2+} (B) Ni^{2+} (C) Mn^{2+} (D) Fe^{2+}	[1]
10.	Which of the following graphs represents a first order reaction?  <p>(i) $t_{1/2}$ vs $[R]_0$: A horizontal line, indicating constant half-life independent of initial concentration.</p> <p>(ii) $t_{1/2}$ vs $[R]_0$: A straight line with a negative slope, indicating half-life decreases as initial concentration increases.</p> <p>(iii) molar concentration (p) vs time: An exponential decay curve, characteristic of a first-order reaction.</p> <p>(iv) $\log \frac{[R]_0}{[R]}$ vs time: A straight line with a positive slope, where the slope is given as $\frac{k}{2.303}$, characteristic of a first-order reaction.</p> <p>(A) (i, ii) (B) (ii, iii) (C) (iii, iv) (D) (i, iv)</p>	[1]
11.	Among the ligands NH_3 , en, CN^- and CO the correct order of their increasing field strength is: (A) $CO < NH_3 < en < CN^-$ (B) $NH_3 < en < CN^- < CO$ (C) $CN^- < NH_3 < CO < en$ (D) $en < CN^- < NH_3 < CO$	[1]

18.	Identify the reaction and write the I.U.P.A.C name of the product formed. (A) $\text{CH}_3\text{CH}_2\text{COOH} \xrightarrow{\text{Br}_2/\text{Red phosphorous}}$  (B)  $\xrightarrow[\text{pd/Baso}_4]{\text{H}_2}$	[2]
OR		
Write the structures and I.U.P.A.C names of the cross aldol condensation products only of ethanal and propanal.		
19.	Using the valence bond approach, deduce the shape and magnetic behaviour of $[\text{Cr}(\text{NH}_3)_6]^{3+}$ ion. [Atomic number of Cr = 24]	
20.	Why is Cr^{2+} reducing and Mn^{3+} oxidising when both have d^4 configuration?	[2]
21.	(A) On the basis of the standard electrode potential values stated for acid solutions, predict whether Ti^{4+} species may be used to oxidise Fe (II) to Fe (III) $\text{Ti}^{4+} + e^- \longrightarrow \text{Ti}^{3+}; E_0 = 0.01 \text{ v}$ $\text{Fe}^{3+} + e^- \longrightarrow \text{Fe}^{2+}; E_0 = 0.77 \text{ v}$ (B) Based on the data arrange Fe^{2+} , Mn^{2+} and Cr^{2+} in the increasing order of stability of +2 oxidation state. (Give a brief reason) $E_{\text{Cr}^{3+}/\text{Cr}^{2+}}^0 = -0.4 \text{ v}$ $E_{\text{Mn}^{3+}/\text{Mn}^{2+}}^0 = +1.5 \text{ v}$ $E_{\text{Fe}^{3+}/\text{Fe}^{2+}}^0 = 0.8 \text{ v}$	[2]

SECTION C**Question No. 22 to 28 are short answer questions, carrying 3 marks each**

22.	Give reasons for the following: A. When 2 g of benzoic acid is dissolved in 25 g of benzene; the experimentally determined molar mass is always greater than the true value. B. mixture of ethanol and acetone shows positive deviation from Raoult's Law. C. The preservation of fruits by adding concentrated sugar solution protects against bacterial action.	[3]
23.	The rate constant for a first order reaction is 60 s^{-1} . How much time will it taken to reduce the concentration of the reactant to $\frac{1}{10}$ th its initial value.	[3]
24.	Calculate the potential of hydrogen electrode in contact with a solution whose pH is 10.	[3]
25.	Give equation of the following reaction: (a) Bromine in CS_2 with phenol. (b) Dilute HNO_3 with phenol. (c) Treating phenol with chloroform in presence of aqueous NaOH.	[3]

	<p style="text-align: center;">OR</p> <p>Complete the following reaction:</p> <p>(a)  + $\text{H}_2\text{N}-\text{OH} \longrightarrow$</p> <p>(b)  $\xrightarrow[\Delta]{\text{KMnO}_4, \text{H}_2\text{SO}_4}$</p> <p>(c)  + $\text{NH}_3 \xrightarrow{\text{strong heating}}$</p>	
26.	<p>An alcohol A ($\text{C}_4\text{H}_{10}\text{O}$) on oxidation with acidified potassium dichromate gives acid B ($\text{C}_4\text{H}_8\text{O}_2$). Compound A when dehydrated with conc. H_2SO_4 at 443 K gives compound C. Treatment of C with aqueous H_2SO_4 gives compound D ($\text{C}_4\text{H}_{10}\text{O}$) which is an isomer of A. Compound 'D' is resistant to oxidation but compound A can be easily oxidised. Identify A, B, C and D. Name the type of isomerism exhibited by 'A' and 'D'.</p>	[3]
27.	<p>Which one of the following compounds will undergo faster hydrolysis reaction by $\text{S}_{\text{N}}1$ mechanism? Justify your answer.</p> <p> or $\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$</p> <p style="text-align: center;">OR</p> <p>A compound is formed by the substitution of two chlorine atoms for two hydrogen atoms in propane. Write the structures of the isomers possible. Give the I.U.P.A.C. name of the isomer which can exhibit enantiomerism.</p>	[3]
28.	<p>At $\text{pH} = 2$, $E_{\text{quinhydrone}}^0 = 1.30 \text{ v}$; what will be the value of $E_{\text{quinhydrone}}$:</p> <p> \rightleftharpoons  + $2\text{H}^+ + 2\text{e}^-$</p>	[3]

SECTION D

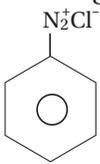
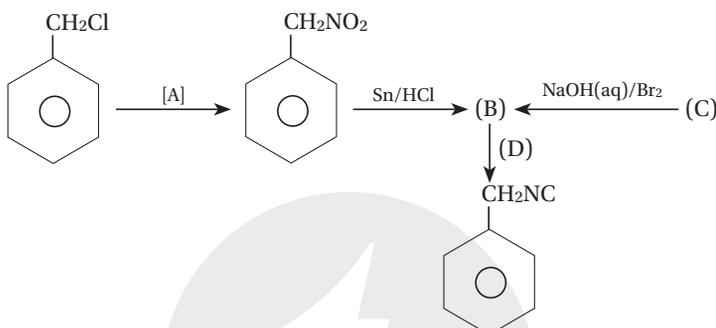
Question no. 29 and 30 are case based questions carrying 4 marks each

29.	<p>■ Case Study Based Questions (29–30)</p> <p>The colligative properties of electrolytes require a slightly different approach than the one used for the colligative properties of non-electrolytes. The electrolytes dissociate into ions in a solution. It is the number of solute particles that determines the colligative properties of a solution. The electrolyte solutions, therefore, show abnormal colligative properties. To account for this effect we define a quantity called the Van't Hoff's factor, given by :</p>	
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	<p>$i = \frac{\text{Actual number of particles in solution after dissociation}}{\text{Number of formula units initially dissolved in solution}}$</p> <p>$i = 1$ (for non-electrolytes) $i > 1$ (for electrolytes, undergoes dissociation) $i < 1$ (for solutes, undergoing association)</p> <p>Van't Hoff's factor depends on degree of dissociation or degree of association (α) as the case may be</p> <p>Answer the following</p> <p>(A) Give examples of a solution in which solute molecules undergo association in solution. [4]</p> <p style="text-align: center;">OR</p> <p>A substance trimerises when dissolved in water, what will be its Van't Hoff factor? [4]</p> <p>(B) Which of the following will have highest Van't Hoff factor? (Assume 100% dissociation) [4] $C_6H_{12}O_6$, NaCl, $CaCl_2$, $Ca_3(PO_4)_2$</p> <p>(C) 0.1 M $K_4[Fe(CN)_6]$ is 60% dissociated. Calculate its Van't Hoff factor. [4]</p>	
30.	<p>Molar conductivity can be expressed by an equation of type:</p> $\Lambda_m \text{ (Greek lambda)} = \frac{k}{c}$ <p>In the above equation, if k is expressed in Sm^{-1} and the concentration C in $mol\ m^{-3}$, then the units of Λ_m are in $Sm^2\ mole^{-1}$</p> <p>Conductivity changes can frequently be useful for studying the reactions of metal complexes in solution. Molar conductivities (Λ_m) are normally determined using 10^{-3} M solution of the complexes.</p> <p>The study of the effect of concentration and ionic size on the molar conductivities of electrolytes has been a concern to many researchers. Measurement of conductivity is an important electro-analytical method used to assess the performance of battery. This is because it reveals the extent of the ion-solvent interaction in the solution. Molar conductance, Λ_m, is known to be conducting power of all the ions produced by one mole of electrolyte in a given solution. It is well known that the flow of electricity through a solution of electrolytes is due to the migration of ions when potential difference is applied between the two electrodes. Molar conductance of solution are affected by ionic mobility, concentration, temperature and inter-ionic interactions. It is important to note that molar conductivity of both strong and weak electrolytes increases with the depletion in dilution. [4]</p> <p>Answer the following question: [4]</p> <p>(A) Why does the conductivity of a solution decreases with dilution? [4]</p> <p style="text-align: center;">OR</p> <p>How is the unit of molar conductivity arrived?</p> <p>(B) The molar conductivity of a 1.5 M solution of an electrolyte is found to be $138.9\ S\ cm^2\ (mole)^{-1}$. Calculate the conductivity of this solution. [4]</p> <p>(C) '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? [4]</p>	

SECTION E

Question no. 31 to 33 are long answer type question carrying 5 marks each

31.	Write the IUPAC names of the following co-ordination compounds. (i) $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$ (ii) $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{Cl}_2$ (iii) $\text{K}_3[\text{Fe}(\text{CN})_6]$ (iv) $\text{K}_3[\text{Fe}(\text{C}_2\text{O}_4)_3]$ (v) $\text{K}_2[\text{PdCl}_4]$	[5]
32.	<p>Write the major product(s) in the following reactions:</p> <p>(i) $\text{C}_6\text{H}_5\text{NO}_2 \xrightarrow{\text{Sn}/\text{HCl}}$ (ii)  $\xrightarrow{\text{Cu}_2\text{Cl}_2/\text{HCl}}$ (iii) $\text{CH}_3\text{CONO}_2 \xrightarrow{\text{Br}_2/\text{KOH}}$</p> <p style="text-align: center;">OR</p> <p>Identify A-D :</p> <p></p> <p style="text-align: center;">Name the reaction for the conversion C to B & B to D.</p>	[5]
33.	<p>An aromatic compound 'A' of molecular formula. $\text{C}_7\text{H}_6\text{ON}$ undergoes a series of reaction as shown below :</p> <p>Write the structures of A, B, C, D and E in the following reactions:</p> <p>$\text{C}_7\text{H}_7\text{ON} \xrightarrow{\text{Br}_2/\text{KOH}}$ $\text{C}_6\text{H}_5\text{NH}_2$ $\xrightarrow[273\text{ K}]{\text{NaNO}_2 + \text{HCl}}$ (B) $\xrightarrow{\text{C}_2\text{H}_5\text{OH}}$ (C)</p> <p style="margin-left: 150px;">(B) $\xrightarrow{\text{KI}}$ (E)</p> <p style="text-align: center;">OR</p> <p>(A) Account for the following: (i) CH_3NH_2 is more basic than $\text{C}_6\text{H}_5\text{NH}_2$ (ii) Aromatic diazonium Salts are more stable than aliphatic diazonium salt</p> <p>(B) Arrange the following in the (i) increasing order of their pkb values: $\text{C}_6\text{H}_5\text{NH}_2, \text{C}_2\text{H}_5\text{NH}_2, \text{C}_6\text{H}_5, \text{NHCH}_3$ (ii) increasing order of their boiling point. $\text{C}_2\text{H}_5\text{NH}_2, \text{C}_2\text{H}_5\text{OH}, (\text{CH}_3)_3\text{N}$</p>	[5]