



**DESIGN OF THE QUESTION PAPER**  
**CHEMISTRY CLASS - XII**

**Time : Three Hours**

**Max. Marks : 70**

The weightage of the distribution of marks over different dimensions of the question paper shall be as follows:

**A. Weightage to content/subject units**

<b>Unit</b>	<b>Title</b>	<b>Marks</b>
1.	Solid state	4
2.	Solutions	5
3.	Electrochemistry	5
4.	Chemical Kinetics	5
5.	Surface Chemistry	4
6.	General principles and process of Isolation of elements	3
7.	p-Block Elements	8
8.	d-and f-Block Elements	5
9.	Coordination Compounds	3
10.	Haloalkanes and Haloarenes	4
11.	Alcohols, Phenols and Ethers	4
12.	Aldehydes, Ketones and Carboxylic acids	6
13.	Organic Compounds containing Nitrogen	4
14.	Biomolecules	4
15.	Polymers	3
16.	Chemistry in Everyday life	3
<b>Total</b>		<b>70</b>

**B. Weightage to form of questions**

<b>S.No.</b>	<b>Form of Questions</b>	<b>Marks for each question</b>	<b>No. of questions</b>	<b>Total Marks</b>
1.	Long Answer Type (LA)	5	3	15
2.	Short Answer (SAI)	3	9	27
3.	Short Answer (SAII)	2	10	20
4.	Very Short Answer (VSA)	1	08	08
<b>Total</b>		<b>-</b>	<b>30</b>	<b>70</b>



**C. Scheme of Options**

1. There will be no overall option.
2. Internal choices (either/or type) in five questions has been given in questions testing higher mental abilities in the following types of questions :-
  - (i) One in two marks questions.
  - (ii) One in three marks questions.
  - (iii) All the three in five marks questions.

**D. Guidelines for Units 10-13 of syllabus.**

These units include questions on:

- ◆ Nomenclature : 2 marks
- ◆ Reasoning : 6 marks
- ◆ Distinguishing between compounds : 2 marks
- ◆ Name reactions : 2 marks
- ◆ Reaction Mechanism : 2 marks
- ◆ Word problems (conversions) covering Properties and reactions of functional groups : 5 marks

**E. Numericals :**

Weightage of 8 -10 marks in total has been assigned to numericals.

**F. Weightage to difficulty level of questions**

S.No.	Estimated difficulty level	Percentage
1.	Easy	15
2.	Average	70
3.	Difficult	15

A weightage of 20% has been assigned to questions which test higher order thinking skills of students.



**Class XII**  
**CHEMISTRY SAMPLE PAPER**

S.NO.	UNIT	VSA (1 Mark)	SAI (2 Marks)	SAII (3 Marks)	LA (5 Marks)	TOTAL
1.	Soild State	-	4 (2)	-	-	4 (2)
2.	Solutions	-	2(1)	3(1)	-	5(2)
3.	Electrochemistry	-	2(1)	3 (1)	-	5(2)
4.	Chemical Kinetics				5 (1)	5(1)
5.	Surface Chemistry	1(1)		3 (1)	-	4(2)
6.	General principles and processes of Isolation of Elements	-	-	3(1)		3(1)
7.	p-Block Elements	-	-	3 (1)	5 (1)	8 (2)
8.	d- and f-Block Elements	-	2(1)	3(1)	-	5(2)
9.	Coordination Compounds	1(1)	2 (1)	-	-	3(2)
10.	Haloalkanes and Haloarenes	-	4(2)	-	-	4(2)
11.	Alcohols, Phenols and Ethers	1 (1)	-	3 (1)	-	4 (2)
12.	Aldehydes, Ketones and Carboxylic Acids	1 (1)	-	-	5 (1)	6 (2)
13.	Organic Compounds Containing Nitrogen	1 (1)	-	3 (1)	-	4 (2)
14.	Biomolecules	1 (1)	-	3 (1)	-	4 (2)
15.	Polymers	1 (1)	2 (1)	-	-	3 (2)
16.	Chemistry in Everyday Life	1 (1)	2 (1)	-	-	3 (2)
	<b>Total</b>	<b>8(8)</b>	<b>20(10)</b>	<b>27(9)</b>	<b>15(3)</b>	<b>70(30)</b>

(132)



CHEMISTRY SAMPLE PAPER - I  
CLASS - XII

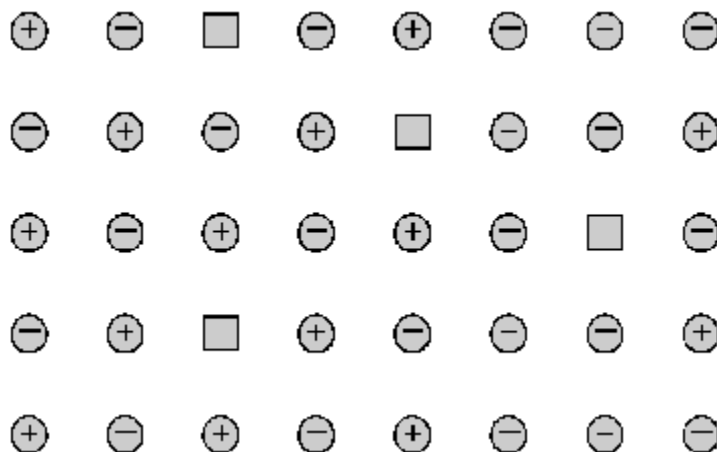
Time : Three Hours

Max. Marks : 70

**General Instructions**

1. All questions are compulsory.
2. Question nos. 1 to 8 are very short answer questions and carry 1 mark each.
3. Question nos. 9 to 18 are short answer questions and carry 2 marks each.
4. Question nos. 19 to 27 are also short answer questions and carry 3 marks each
5. Question nos. 28 to 30 are long answer questions and carry 5 marks each
6. Use log tables if necessary, use of calculators is not allowed.

- (1) Why is ferric chloride preferred over potassium chloride in case of a cut leading to bleeding? 1
- (2) Why does a tetrahedral complex of the type  $[MA_2B_2]$  not show geometrical isomerism? 1
- (3) How do you account for the miscibility of ethoxyethane with water. 1
- (4) Give the IUPAC name of the organic compound 1
- $$\begin{array}{c} (\text{CH}_3)_2\text{C} = \text{CH} - \underset{\text{O}}{\underset{\text{II}}{\text{C}}} - \text{CH}_3 \end{array}$$
- (5) Name the monomers of nylon 2 or nylon 6 polymer. 1
- (6) Give one example of an artificial sweetener used by the diabetic patients. 1
- (7) Direct nitration of aniline is not carried out. Explain why? 1
- (8) What type of linkage holds together the monomers of D.N.A.? 1
- (9) Examine the illustration of a portion of the defective crystal given below and answer the following questions.





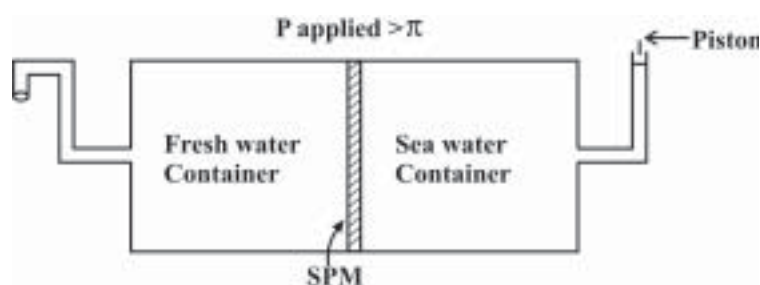
- (i) What are these type of vacancy defects called?
- (ii) How is the density of a crystal affected by these defects?
- (iii) Name one ionic compound which can show this type of defect in the crystalline state
- (iv) How is the stoichiometry of the compound affected? 2

10. Analysis shows that a metal oxide has the empirical formula  $M_{0.96}O_{1.00}$ . Calculate the percentage of  $M^{2+}$  and  $M^{3+}$  ions in this crystal? 2

**OR**

In an ionic compound the anion ( $N^-$ ) form cubic close type of packing. While the cation ( $M^+$ ) ions occupy one third of the tetrahedral voids. Deduce the empirical formula of the compound and the coordination number of ( $M^+$ ) ions. 2

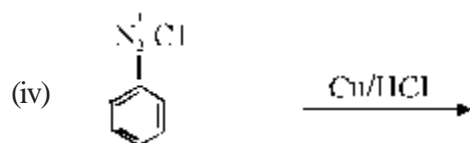
11. Given below is the sketch of a plant for carrying out a process.



- (i) Name the process occurring in the above plant.
  - (ii) To which container does the net flow of solvent take place?
  - (iii) Name one SPM which can be used in this plant.
  - (iv) Give one practical use of the plant. 2
12. Write the chemical equations for all the steps involved in the rusting of iron. Give any one method to prevent rusting of iron. 2
13. A metal ion  $M^{n+}$  having  $d^4$  valence electronic configuration combines with three didentate ligands to form a complex compound. Assuming  $\Delta_0 > P$
- (i) draw the diagram showing d orbital splitting during this complex formation.
  - (ii) write the electronic configuration of the valence electrons of the metal  $M^{n+}$  ion in terms of  $t_{2g}$  and  $e_g$ .
  - (iii) what type of hybridisation will  $M^{n+}$  ion have?
  - (iv) name the type of isomerism exhibited by this complex. 2
14. A mixed oxide of iron and chromium  $FeOCr_2O_3$  is fused with sodium carbonate in the presence of air to form a yellow coloured compound (A). On acidification the compound (A) forms an orange coloured compound (B), which is a strong oxidising agent. Identify
- (i) the compounds (A) and (B)
  - (ii) write balanced chemical equation for each step 2
15. An optically active compound having molecular formula  $C_7H_{15}Br$  reacts with aqueous KOH to give a racemic mixture of products. Write the mechanism involved for this reaction. 2



16. Write the formula of main product formed in the following chemical reactions.



2

17. Differentiate the following pair of polymers based on the property mentioned against each.

(i) Novolac and Bakelite (structure)

(ii) Buna-s and Terylene (intermolecular forces of attraction)

2

18. In order to wash clothes with water containing dissolved calcium hydrogencarbonate, which cleaning agent will you prefer and why: soaps or synthetic detergents? Give one advantage of soaps over synthetic detergents. 2

19. Heptane and octane form an ideal solution at 373 K, The vapour pressures of the pure liquids at this temperature are 105.2 KPa and 46.8 KPa respectively. If the solution contains 25g of heptane and 28.5g of octane, calculate

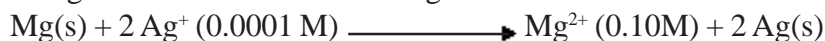
(i) vapour pressure exerted by heptane

(ii) vapour pressure exerted by solution

(iii) mole fraction of octane in the vapour phase.

3

20. The following chemical reaction is occurring in an electrochemical cell.



The  $E^0$  electrode values are

$$\text{Mg}^{2+} / \text{Mg} = -2.36 \text{ V}$$

$$\text{Ag}^+ / \text{Ag} = 0.81 \text{ V}$$

For this cell calculate / write

(a) (i)  $E^0$  value for the electrode  $2\text{Ag}^+ / 2\text{Ag}$

(ii) Standard cell potential  $E^0_{\text{cell}}$ .

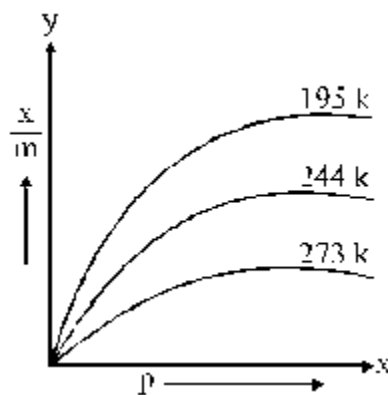
(b) Cell potential  $(E)_{\text{cell}}$

(c) (i) Symbolic representation of the above cell.

(ii) Will the above cell reaction be spontaneous?

3

21. Consider the adsorption isotherms given below and interpret the variation in the extent of adsorption ( $x/m$ ) when



(135)



- (a) (i) temperature increases at constant pressure  
(ii) pressure increases at constant temperature  
(b) Name the catalyst and the promoter used in Haber's process for manufacture of ammonia. 3

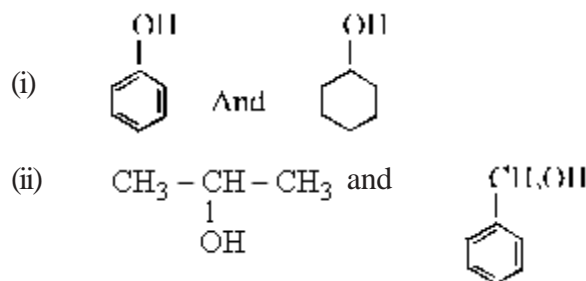
22. Account for the following facts

- (a) the reduction of a metal oxide is easier if the metal formed is in liquid state at the temperature of reduction.  
(b) the reduction of  $\text{Cr}_2\text{O}_3$  with Al is thermodynamically feasible, yet it does not occur at room temperature.  
(c) pine oil is used in froth floatation method. 3

23. Explain the following facts

- (a) transition metals act as catalysts.  
(b) chromium group elements have the highest melting points in their respective series.  
(c) transition metals form coloured complexes. 3

24. (a) Give a chemical test to distinguish between the following pairs of compounds.



- (b) Why is phenol more acidic than ethanol? 3

25. Account for the following observations

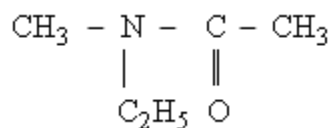
- (i) among the halogens  $\text{F}_2$  is the strongest oxidising agent?  
(ii) fluorine exhibits only -1 oxidation state whereas other halogens exhibit higher positive oxidation states also.  
(iii) acidity of oxo acid of chlorine is



26. (a) Give plausible explanation for each of the following.

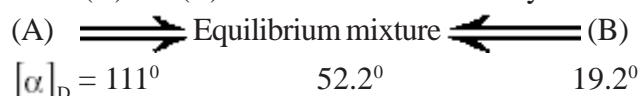
- (i) The presence of a base is needed in the ammonolysis of alkyl halides.  
(ii) Aromatic primary amines cannot be prepared by Gabriel phthalimide syntheses.

(b) Write the IUPAC name of



3

27. An optically active compound having molecular formula  $\text{C}_6\text{H}_{12}\text{O}_6$  is found in two isomeric forms (A) and (B) in nature. When (A) and (B) are dissolved in water they show the following equilibrium.



- (i) What are such isomers called?  
(ii) Can they be called enantiomers? Justify your answer.  
(iii) Draw the cyclic structure of isomer (A) 3

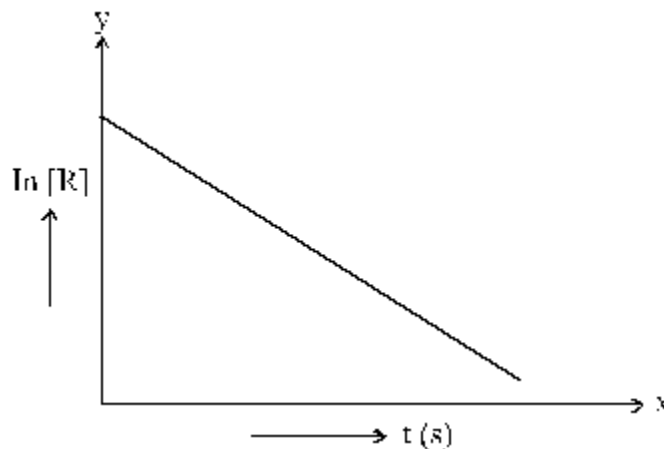


OR

An optically active amino acid (A) can exist in three forms depending on the pH of the medium. If the molecular formula of (A) is  $C_3H_7NO_2$  write

- structure of compound (A) in aqueous medium. What are such ions called?
  - In which medium will the cationic form of compound (A) exist?
  - In alkaline medium, towards which electrode will the compound (A) migrate in electric field?
- 3

28. For a certain chemical reaction variation in the concentration in  $[R]$  vs. time (s) plot is given below.



For this reaction write / draw

- what is the order of the reactions?
  - what are the units of rate constant  $k$ ?
  - give the relationship between  $k$  and  $t_{1/2}$  (half life period)
  - what does the slope of the above line indicate?
  - draw the plot  $\log [R]_0 / [R]$  vs time  $t(s)$
- 5

OR

For a certain chemical reaction



The experimentally obtained information is tabulated below.

Experiment	$[A]_0$	$[B]_0$	Initial rate of reaction
1	0.30	0.30	0.096
2	0.60	0.30	0.384
3	0.30	0.60	0.192
4	0.60	0.60	0.768

For this reaction

- derive the order of reaction w.r.t. both the reactants A and B.
  - write the rate law.
  - calculate the value of rate constant  $k$
  - write the expression for the rate of reaction in terms of A and C.
- 5



29. A translucent white waxy solid (A) on heating in an inert atmosphere is converted to its allotropic form (B). Allotrope (A) on reaction with very dilute aqueous KOH liberates a highly poisonous gas (C) having rotten fish smell. With excess of chlorine forms (D) which hydrolyses to compound (E). Identify compounds (A) to (E). 5

**OR**

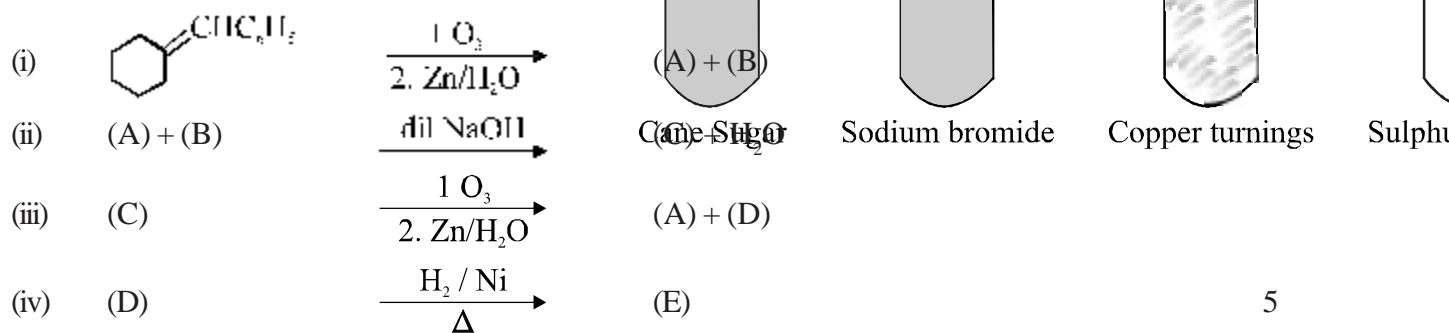
Concentrated sulphuric acid is added followed by heating to each of the following test tubes labelled (i) to (v)

- (i)                      (ii)                      (iii)                      (iv)                      (v)

Identify in which of the above test tube the following change will be observed. Support your answer with the help of a chemical equation.

- (a) formation of black substance  
 (b) evolution of brown gas  
 (c) evolution of colourless gas  
 (d) formation of brown substance which on dilution becomes blue.  
 (e) disappearance of yellow powder along with evolution of colourless gas.

30. Identify the unknown organic compounds (A) to (E) in the following series of chemical reactions.



**OR**

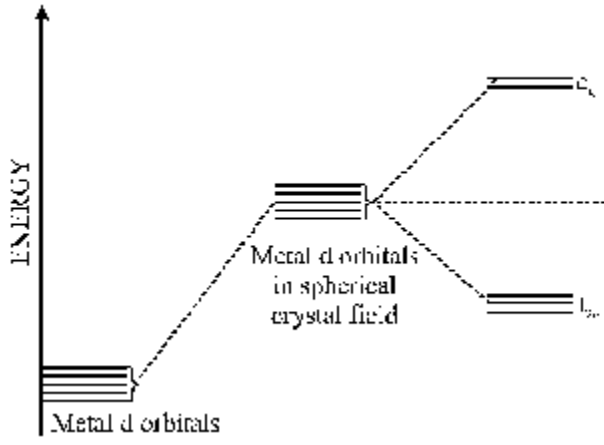
An organic compound (A) having molecular formula  $\text{C}_9\text{H}_{10}\text{O}$  forms an orange red precipitate (B) with 2, 4 - DNP reagent. Compound (A) gives a yellow precipitate (C) when heated in the presence of iodine and NaOH along with a colourless compound (D). (A) does not reduce Tollen's reagent or Fehling's solution nor does it decolorise bromine water. On drastic oxidation of (A) with chromic acid, a carboxylic acid (E) of molecular formula  $\text{C}_7\text{H}_6\text{O}_2$  is formed. Deduce the structures of the organic compounds (A) to (E). 5



**MARKING SCHEME**  
**CHEMISTRY SAMPLE PAPER - 1**  
**CLASS - XII**

Q.No.	Value Points	Marks
1.	Fe <sup>3+</sup> (ferric ion) is a better coagulating ion.	1
2.	Unidentate ligands are equidistant from each other.	1
3.	Because of intermolecular hydrogen bonding between ether and water molecule.	1
4.	4 - Methylpent – 3 – en – 2 – one	1
5.	Glycine and amino caproic acid	
OR		
	H <sub>2</sub> N – CH <sub>2</sub> – COOH and H <sub>2</sub> N – (CH <sub>2</sub> ) <sub>5</sub> COOH	1
6.	Saccharin / Aspartame	1
7.	Besides ortho, para substituted products : (i) oxidised tarry products and (ii) meta substituted products are formed	$\left. \begin{array}{l} \frac{1}{2} \\ \frac{1}{2} \end{array} \right\} 1$
8.	Phosphodiester linkages	1
9.	(i) schottky defects (ii) decreases (iii) Na <sup>+</sup> Cl <sup>-</sup> (or any other correct example) (iv) not affected	$\left. \begin{array}{l} \frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \end{array} \right\} 2$
10.	Let, the number of M <sup>2+</sup> ion = x then, the number of m <sup>3+</sup> ion will be = (0.96 – x) $2x + 3 (0.96 - x) = 0.88$ $\% \text{ of } M^{2+} \text{ ion} = \frac{0.88}{0.96} \times 100 = 91.67\%$ $\% \text{ of } M^{3+} \text{ ion} = \frac{0.08}{96} \times 100 = 8.33\%$	$\left. \begin{array}{l} 1 \\ \frac{1}{2} \\ \frac{1}{2} \end{array} \right\} 2$



Q.No.	Value Points	Marks
	<b>OR</b>	
	Number of N <sup>-</sup> ion in each F.C.C. unit cell = 4	1/2
	Number of tetrahedral voids = 2 x 4 = 8	1/2
	Fraction occupied tetrahedral voids = $\frac{1}{3} \times 8 = \frac{8}{3}$	1/2
	Empirical formula of compound = $M_{\frac{8}{3}} N_4$	1/2
	= $\frac{M_2 N_3}{4}$	1/2
	Coordination number of M <sup>+</sup> ions = 4	1/2
11.	(i) Reverse osmosis	1/2
	(ii) Fresh water container	1/2
	(iii) Cellulose acetate placed on a suitable support	1/2
	(iv) Desalination of sea water.	1/2
12.	Oxidation : Fe (s) $\longrightarrow$ Fe <sup>2+</sup> (aq) + 2e <sup>-</sup>	
	Reduction : O <sub>2</sub> (g) + 4H <sup>+</sup> (aq) + 4e <sup>-</sup> $\longrightarrow$ 2H <sub>2</sub> O	
	Atmospheric oxidation :	
	$2Fe^{2+} (aq) + 2H_2O(l) + \frac{1}{2} O_2(g) \rightarrow Fe_2O_3(s) + 4H^+(aq)$	1/2 x 3 = 1 1/2
	Prevention : Applying a coating of more reactive metal like Zn.	1/2
13.	(i)	
		1/2
	(ii) $t_{2g}^4 e_g^0$ or $t_{2g}^4$	1/2
	(iii) d <sup>2</sup> sp <sup>3</sup>	1/2
	(iv) optical isomerism	1/2



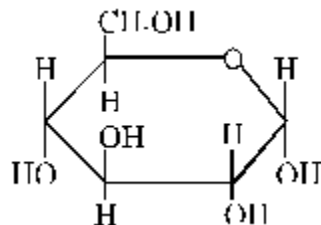
Q.No.	Value Points	Marks
14.	Compound (A) is sodium chromate or $\text{Na}_2\text{CrO}_4$ Compound (B) is sodium dichromate or $\text{Na}_2\text{Cr}_2\text{O}_7$ $4 \text{FeO} \cdot \text{Cr}_2\text{O}_3 + 8 \text{Na}_2\text{CO}_3 + 7 \text{O}_2 \longrightarrow 8 \text{Na}_2\text{CrO}_4 + 2\text{Fe}_2\text{O}_3 + 8 \text{CO}_2$ $2 \text{Na}_2\text{CrO}_4 + 2\text{H}^+ \longrightarrow \text{Na}_2\text{Cr}_2\text{O}_7 + 2\text{Na}^+ + \text{H}_2\text{O}$	$\left. \begin{array}{l} \frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \end{array} \right\} (2)$
15.	Undergoes $\text{S}_{\text{N}}1$ mechanism $  \begin{array}{ccc}  \begin{array}{c} \text{H}_3\text{C} \\   \\ \text{CH}_3\text{CH}_2\text{C} - \text{Br} \\   \\ \text{CH}_2\text{CH}_2\text{CH}_3 \\ \text{(optically active)} \end{array} & \xrightarrow[\text{EtO}^-]{\text{EtOH}} & \begin{array}{c} \text{H}_3\text{C} \\   \\ \text{C}^+ - \text{CH}_2\text{CH}_2\text{CH}_3 \\   \\ \text{CH}_2\text{CH}_3 \end{array} + \text{Br}^- \\  \end{array}  $ $  \begin{array}{ccc}  \begin{array}{c} \text{H}_3\text{C} \\   \\ \text{OH} - \text{C}^+ \\   \\ \text{CH}_2\text{CH}_2\text{CH}_3 \end{array} & \xrightarrow[\text{EtO}^-]{\text{EtOH}} & \begin{array}{c} \text{H}_3\text{C} \\   \\ \text{CH}_2\text{CH}_2 - \text{C} - \text{OH} \\   \\ \text{CH}_2\text{CH}_2\text{CH}_3 \\ 50\% \end{array} + \begin{array}{c} \text{H}_3\text{C} \\   \\ \text{OH} - \text{C} - \text{CH}_2\text{CH}_2\text{CH}_3 \\   \\ \text{CH}_2\text{CH}_2\text{CH}_3 \\ 50\% \end{array} \\  \end{array}  $ <p style="text-align: center;">Racemic mixture</p>	(2)
16.	(i) $(\text{CH}_3)_2\text{CH} - \text{CH} - (\text{CH}_3)_2$ (ii) $\text{CH}_3\text{F}$ (iii) $\text{CH}_3\text{CH}_2\text{I}$ (iv)	$\left. \begin{array}{l} \frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \\ \frac{1}{2} \end{array} \right\} (2)$
17.	(i) Novolac is a straight chain linear polymer but bakelite is cross linked. (ii) Buna-S is an elastomer having weak vander waal's intermolecular forces whereas terylene is a fibre having strong intermolecular hydrogen bonding.	$\left. \begin{array}{l} 1 \\ 1 \end{array} \right\} (2)$
18.	Calcium ions form insoluble calcium soaps which separate as scum in water, hence detergents preferred. Soaps are biodegradable, detergents are not easily biodegradable	$\left. \begin{array}{l} 1 \\ 1 \end{array} \right\} (2)$
19.	Moles of heptane = $\frac{\text{mass of heptane}}{\text{Molar mass of heptane}} = \frac{25\text{g}}{100\text{g mol}^{-1}} = 0.25 \text{ moles}$ moles of octane = $\frac{\text{mass of octane}}{\text{molar mass of octane}} = \frac{28.5\text{g}}{114\text{g mol}^{-1}} = 0.25 \text{ moles}$ Total moles = $0.25 + 0.25 = 0.50 \text{ moles}$	$(\frac{1}{2})$  $(\frac{1}{2})$



Q.No.	Value Points	Marks
	Mole fraction of heptane = $\frac{0.25}{0.50} = 0.5$	(1/2)
	Mole fraction of octane = $\frac{0.25}{0.50} = 0.5$	(1/2)
	partial pressure of heptane $p = P_{\text{heptane}}^0 \times X_{\text{heptane}}$ $= 105.2 \text{ K Pa} \times 0.5$ $= 52.6 \text{ K Pa}$	(1/2)
	partial pressure of octane $p = P_{\text{octane}}^0 \times X_{\text{octane}}$ $= 46.8 \text{ K Pa} \times 0.5$ $= 23.4 \text{ K Pa}$	(3)
	$P_{\text{solution}}$ = $P_{\text{heptane}} + P_{\text{octane}}$ $= 52.6 \text{ K Pa} + 23.4 \text{ K Pa}$ $= 86.0 \text{ K Pa}$	(1/2)
	mole fraction of octane in vapour phase = $\frac{P_{\text{octane}}}{P_{\text{solution}}} = \frac{23.4 \text{ K Pa}}{86.0 \text{ K Pa}}$ $= 0.272$	(1/2)
20.	(a) (i) 0.81 V	
	(ii) $E_{\text{cell}}^{\theta} = E_{\text{right}}^{\theta} - E_{\text{left}}^{\theta} = 0.81\text{V} - (-2.36 \text{ V})$ $= 3.17 \text{ V}$	(1/2) (1/2)
	(b) $E_{\text{cell}} = E_{\text{cell}}^{\theta} - \frac{0.0591}{n} \log \frac{[\text{Mg}^{2+}]}{[\text{Ag}^+]^2}$ $= 3.17\text{V} - \frac{0.0591}{2} \log \frac{(0.1)}{(0.0001)^2}$ $= 2.96 \text{ V}$	(3) (1)
	(c) (i) $\text{Mg}(s)   \text{Mg}^{2+} (0.10\text{M})    \text{Ag}^+ (0.0001\text{M})   \text{Ag}(s)$	(1/2)
	(ii) yes	(1/2)
21.	(a) (i) (x / m) extent of adsorption decreases (ii) (x / m) extent of adsorption increases	1 1
	(b) catalyst : iron promoter : molybdenum / $\text{Al}_2\text{O}_3$ / $\text{K}_2\text{O}$	1/2 1/2 (3)
22.	(a) In liquid state entropy is higher than the solid form, this makes $\Delta_r G$ more negative	(1)
	(b) By increasing temperature, fraction of activated molecules increase which help in crossing over the energy barriers.	(1)
	(c) Pine oil enhances non-wetting property of ore particles and acts as a froth collector.	(1) (3)

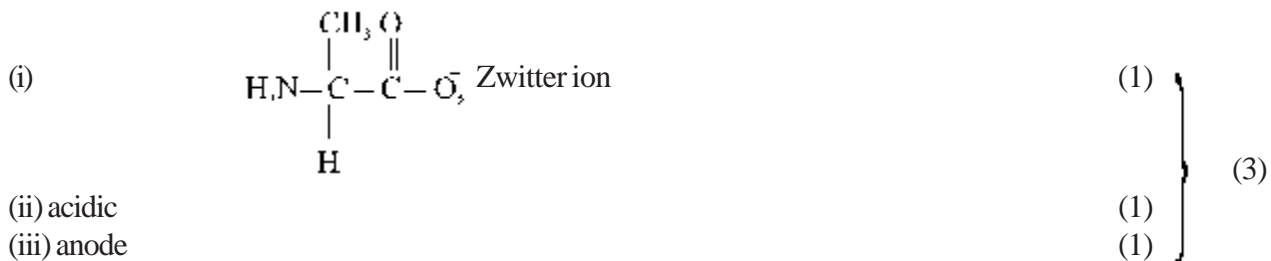


Q.No.	Value Points	Marks
23.	(a) Due to their abilities to show multiple oxidation states and form complexes.	(1)
	(b) Have maximum number of unpaired electrons in d orbitals because of which maximum d - d interactions.	(1)
	(c) d- d transitions.	(1)
		(3)
24.	(a) (i) Add bromine water to both the containers containing phenol and cyclohexanol. The container in which white precipitate is formed contains phenol while the container in which no precipitate is formed contains Cyclohexanol.	(1)
	(ii) Add iodine and sodium hydroxide to both the containers containing $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$ (isopropyl alcohol) and $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$ (benzyl alcohol). The container in which yellow precipitate is formed contains $\text{CH}_3\text{CH}_2\text{OH}$ , while the container in which no yellow precipitate is formed contains $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$ .	(3)
		(1)
25.	(i) Phenol has electron withdrawing phenyl group, but ethanol has electron releasing ethyl group, hence extent of forward reaction is higher in phenol in aqueous medium.	(1/2)
	(ii) Phenoxide ion is resonance stabilised, ethoxide ion is not resonance stabilised, hence extent of back direction is more in ethanol than phenol.	(1/2)
26.	(i) Low bond dissociation enthalpy and high hydration (solvation) enthalpy. or highest S.R.P. value among the halogens.	(1)
	(ii) Due to its high electronegativity.	(1)
	(iii) Higher the oxidation state of chlorine in oxo acid, stronger the acid.	(1)
		(3)
27.	(a) (i) To remove HX formed so that the reaction shifts in the forward direction.	(1)
	(ii) Aryl halides do not undergo nucleophilic substitution with the anion formed by phthalimide.	(1)
	(b) (iii) N - ethyl - N - methylethanamide.	(1)
27.	(i) anomers	(1)
	(ii) No, they are not enantiomers because stereo isomers related to each other as non super-imposable mirror images are enantiomers. Anomers differ only at $\text{C}_1$ configuration. (or carbonyl carbon)	(1)
		(3)
	(iii)	(1)

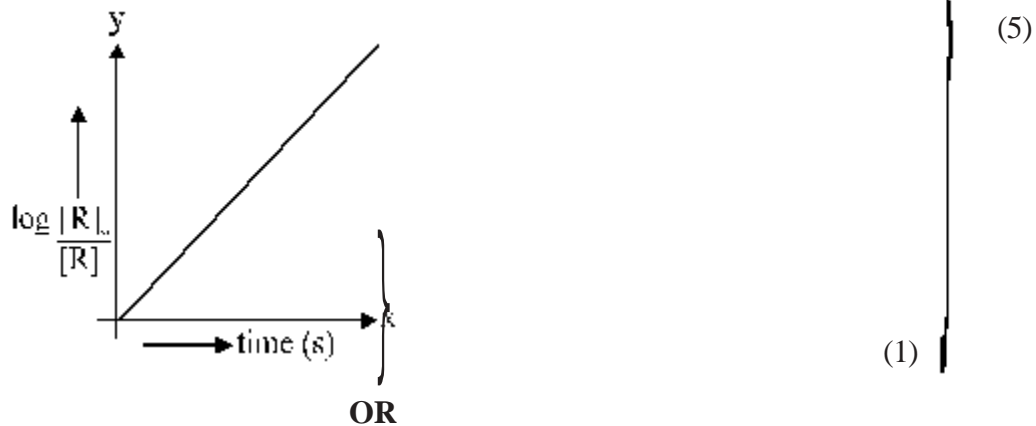




Q.No. Value Points OR Marks

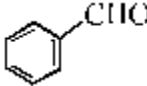

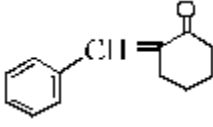
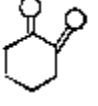
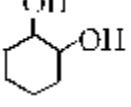
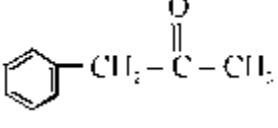
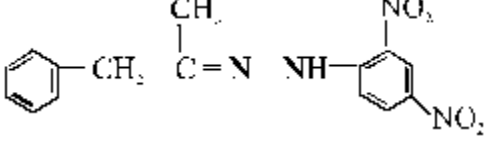
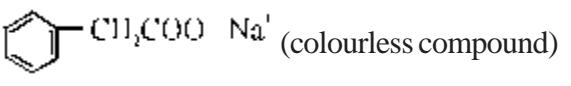
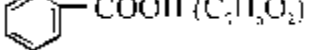


28. (i) First order (1)
- (ii)  $\text{time}^{-1} (\text{s}^{-1})$  (1)
- (iii)  $k = \frac{0.693}{t_{1/2}}$  (1)
- (iv) rate constant k of reaction (1)
- (v)



- (i) Rate =  $K [A]^x [B]^y$
- 0.096 =  $k (0.30)^x (0.30)^y$  -----(i)
- 0.384 =  $k (0.60)^x (0.30)^y$  -----(ii)
- dividing eqn. (ii) by (i), we get
- $\frac{x}{y} = \frac{2}{1}$  (1)
- 0.192 =  $k (0.30)^x (0.60)^y$  -----(iii)
- dividing eqn. (iii) by (i) we get
- $\frac{y}{x} = \frac{1}{2}$  (1)
- (ii) Rate =  $k [A]^2 [B]^1$  (1)
- (iii) 0.096 =  $k (0.30)^2 (0.30)^1$  (1)
- $k = 3.56$  (1)
- (iv) Rate of reaction =  $-\left\{ \frac{\Delta[A]}{\Delta t} \right\}$   $\frac{1}{2}$
- =  $\frac{1}{2} \left\{ \frac{(\Delta C)}{\Delta t} \right\}$   $\frac{1}{2}$  (1)
- (5)



Q.No.	Value Points	Marks
29.	(A) : white phosphorus	(1)
	(B) : red phosphorus	(1)
	(C) : phosphine or (PH <sub>3</sub> )	(1)
	(D) : phosphorus pentachloride or (PCl <sub>5</sub> )	(1)
	(E) : phosphoric acid or (H <sub>3</sub> PO <sub>4</sub> )	(1)
	<b>OR</b>	
(a)	(i) $C_{12}H_{22}O_{11}$ (white) $\longrightarrow$ 12 C + 11 H <sub>2</sub> O (black substance)	(1)
	(b) (ii) $2 NaBr + 2 H_2SO_4 \longrightarrow Br_2 \uparrow + Na_2SO_4 + SO_2 + 2 H_2O$ (Brown gas)	(1)
	(c) (v) $2 KCl + H_2SO_4 \longrightarrow 2 HCl \uparrow + K_2SO_4$ (colourless gas)	(1)
	(d) (iii) $Cu + 2 H_2SO_4 \longrightarrow CuSO_4 + SO_2 + 2 H_2O$	(1)
	(e) (iv) $3 S + 2 H_2SO_4 \longrightarrow 3 SO_2 \uparrow + 2 H_2O$ (colourless gas)	(1)
30.	(A) : 	(1)
	(B) : 	(1)
	(C) : 	(1)
	(D) : 	(1)
	(E) : 	(1)
	<b>OR</b>	
(A)	(A) : 	(1)
	(B) : 	(1)
	(C) : CHI <sub>3</sub> (yellow precipitate)	(1)
	(D) : 	(1)
	(E) : 	(1)



DECLASSIFIED

**Class XII**  
**CHEMISTRY SAMPLE PAPER**

S.NO.	UNIT	VSA (1 Mark)	SAI (2 Marks)	SAII (3 Marks)	LA (5 Marks)	TOTAL
1.	Soild State	1 (1)	-	3 (1)	-	4 (2)
2.	Solutions	1 (1)	4(2)	-	-	5(3)
3.	Electrochemistry	-	-	-	5 (1)	5(1)
4.	Chemical Kinetics	-	2 (1)	3 (1)	-	5(2)
5.	Surface Chemistry	1(1)	-	3 (1)	-	4(2)
6.	General principles and processes of Isolation of Elements	1 (1)	2 (1)	-	-	3(2)
7.	p-Block Elements	2(2)	-	6 (2)	-	8 (4)
8.	d- and f-Block Elements	-	-	-	5 (1)	5(1)
9.	Coordination Compounds	-	-	3 (1)	-	3(1)
10.	Haloalkanes and Haloarenes	1 (1)	-	3 (1)	-	4(2)
11.	Alcohols, Phenols and Ethers	-	4 (2)	-	-	4 (2)
12.	Aldehydes, Ketones and Carboxylic Acids	1 (1)	-	-	5 (1)	6 (2)
13.	Organic Compounds Containing Nitrogen	-	4 (2)	-	-	4 (2)
14.	Biomolecules	-	4 (2)	-	-	4 (2)
15.	Polymers	-	-	3 (1)	-	3 (1)
16.	Chemistry in Everyday Life	-	-	3 (1)	-	3 (1)
	<b>Total</b>	<b>8(8)</b>	<b>20(10)</b>	<b>27(9)</b>	<b>15(3)</b>	<b>70(30)</b>

(146)



CHEMISTRY SAMPLE PAPER - II  
CLASS - XII

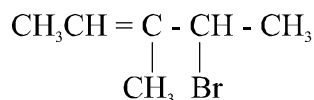
Time : Three Hours

Max. Marks : 70

General Instructions

1. All questions are compulsory.
2. Question nos. 1 to 8 are very short answer questions and carry one mark each.
3. Question nos. 9 to 18 are short answer questions and carry two marks each.
4. Question nos. 19 to 27 are also short answer questions and carry three marks each.
5. Question nos. 28 to 30 are long answer questions and carry five marks each.
6. Use log tables if necessary. Calculators are not allowed.

1. Give IUPAC name of the following organic compound



1

2. What are the physical states of dispersed phase and dispersion medium of froth?

1

3. Write the balanced equation for complete hydrolysis of  $\text{XeF}_6$

1

4. Write the structure of :

4 - methyl pent - 3 - en - 2 - one

1

5. A compound contains two types of atoms - X and Y. It crystallises in a cubic lattice with atom X at the corners of the unit cell and atoms Y at the body centres. What is the simplest possible formula of this compound?

1

6. What is the Van't Hoff factor for a compound which undergoes tetramerization in an organic solvent?

1

7. An ore sample of galena ( $\text{PbS}$ ) is contaminated with zinc blende ( $\text{ZnS}$ ). Name one chemical which can be used to concentrate galena selectively by froth floatation method.

1

8. Predict the shape of  $\text{ClF}_3$  on the basis of VSEPR theory.

1

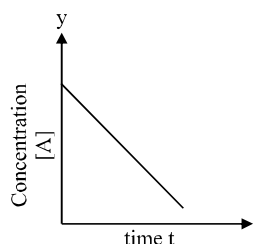
9. Ethylene glycol (molar mass =  $62 \text{ g mol}^{-1}$ ) is a common automobile antifreeze. Calculate the freezing point of a solution containing 12.4g of this substance in 100 g of water. Would it be advisable to keep this substance in the car radiator during summer?

Given :  $K_f$  for water =  $1.86 \text{ K kg/mol}$

$K_b$  for water =  $0.512 \text{ K kg/mol}$

2

10. Consider the reaction  $A \xrightarrow{k} P$ . The change in concentration of A with time is shown in the following plot:



(147)



- (i) Predict the order of the reaction.  
(ii) Derive the expression for the time required for the completion of the reaction.

11. Free energies of formation ( $\Delta_f G$ ) of MgO(s) and CO(g) at 1273 K and 2273K are given below

$$\Delta_f G (\text{MgO(s)}) = - 941 \text{ kJ/mol at } 1273\text{K}$$

$$\Delta_f G (\text{MgO(s)}) = - 314 \text{ kJ/mol at } 2273\text{K}$$

$$\Delta_f G (\text{CO(g)}) = - 439 \text{ kJ/mol at } 1273\text{K}$$

$$\Delta_f G (\text{CO(g)}) = - 628 \text{ kJ/mol at } 2273\text{K}$$

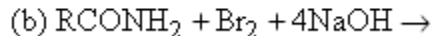
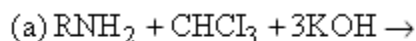
On the basis of above data, predict the temperature at which carbon can be used as a reducing agent for MgO(s). 2

12. Name the two components of starch. How do they differ from each other structurally? 2

13. (a) What changes occur in the nature of egg proteins on boiling?  
(b) Name the type of bonding which stabilizes  $\alpha$ -helix structure in proteins. 2

14. Describe the mechanism of the formation of diethyl ether from ethanol in the presence of concentrated sulphuric acid. 2

15. Complete and name the following reactions:



2

16. Give chemical tests to distinguish between compounds in each of the following pairs:

(i) Phenol and Benzyl alcohol

(ii) Butane-2-ol and 2 Methyl propan-2-ol

2

17. Predict, giving reasons, the order of basicity of the following compounds in (i) gaseous phase and (ii) in aqueous solutions  $(\text{CH}_3)_3\text{N}$ ,  $(\text{CH}_3)_2\text{NH}$ ,  $\text{CH}_3\text{NH}_2$ ,  $\text{NH}_3$  2

**OR**

Account for the following:

(a) Aniline does not undergo Friedel Crafts alkylation

(b) Although -NH<sub>2</sub> group is an ortho and para-directing group, nitration of aniline gives alongwith ortho & para-derivatives meta-derivative also.

18. Give reasons for the following :

(a) At higher altitudes, people suffer from a disease called anoxia. In this disease, they become weak and cannot think clearly.

(b) When mercuric iodide is added to an aqueous solution of KI, the freezing point is raised. 2

19. An element X with an atomic mass of 60g/mol has density of 6.23g cm<sup>-3</sup>. If the edge length of its cubic unit cell is 400 pm, identify the type of cubic unit cell. Calculate the radius of an atom of this element. 3



20. Write names of monomer/s of the following polymers and classify them as addition or condensation polymers.  
(a) Teflon  
(b) Bakelite  
(c) Natural Rubber 3
21. (a) Give the IUPAC name of :  
[Cr Cl<sub>2</sub> (H<sub>2</sub>O)<sub>4</sub>] Cl  
(b) Give the number of unpaired electrons in the following complex ions:  
[Fe F<sub>6</sub>]<sup>4-</sup> and [Fe (CN)<sub>6</sub>]<sup>4-</sup>  
(c) Name the isomerism exhibited by the following pair of coordination compounds:  
[Co(NH<sub>3</sub>)<sub>5</sub> Br] SO<sub>4</sub> and [Co(NH<sub>3</sub>)<sub>5</sub> SO<sub>4</sub>] Br  
Give one chemical test to distinguish between these two compounds. 3
22. Explain the following observations:  
(a) Ferric hydroxide sol gets coagulated on addition of sodium chloride solution  
(b) Cottrell's smoke precipitator is fitted at the mouth of the chimney used in factories.  
(c) Physical adsorption is multilayered, while chemisorption is monolayered. 3
23. Account for the following:  
(a) Chlorine water has both oxidizing and bleaching properties.  
(b) H<sub>3</sub>PO<sub>2</sub> and H<sub>3</sub>PO<sub>3</sub> act as as good reducing agents while H<sub>3</sub>PO<sub>4</sub> does not.  
(c) On addition of ozone gas to KI solution, violet vapours are obtained. 3
24. The decomposition of N<sub>2</sub>O<sub>5</sub>(g) is a first order reaction with a rate constant of 5 x 10<sup>-4</sup> sec<sup>-1</sup> at 45° C. i.e. 2N<sub>2</sub>O<sub>5</sub> (g) → 4NO<sub>2</sub> (g) + O<sub>2</sub> (g). If initial concentration of N<sub>2</sub>O<sub>5</sub> is 0.25M, calculate its concentration after 2 min. Also calculate half life for decomposition of N<sub>2</sub>O<sub>5</sub> (g).  
(b) For an elementary reaction  
2A + B → 3C  
the rate of appearance of C at time 't' is 1.3 x 10<sup>-4</sup> mol l<sup>-1</sup> s<sup>-1</sup>.  
Calculate at this time  
(i) rate of the reaction.  
(ii) Rate of disappearance of A. 3
25. (a) Which of the following two compounds would react faster by S<sub>N</sub><sup>2</sup> path way : 1 - bromobutane or 2 - bromobutane and why.?  
(b) Allyl chloride is more reactive than n - propyl chloride towards nucleophilic substitution reaction. Explain why?  
(c) Haloalkanes react with KCN to give alkyl cyanide as main product while with AgCN they form isocyanide as main product. Give reason. 3
26. Give reasons for the following:  
(a) CN<sup>-</sup> ion is known but CP<sup>-</sup> ion is not known.  
(b) NO<sub>2</sub> dimerises to form N<sub>2</sub>O<sub>4</sub>  
(c) ICl is more reactive than I<sub>2</sub> 3



OR

An element 'A' exists as a yellow solid in standard state. It forms a volatile hydride 'B' which is a foul smelling gas and is extensively used in qualitative analysis of salts. When treated with oxygen, 'B' forms an oxide 'C' which is a colourless, pungent smelling gas. This gas when passed through acidified  $\text{KMnO}_4$  solution, decolourises it. 'C' gets oxidized to another oxide 'D' in the presence of a heterogeneous catalyst. Identify A,B,C,D, and also give the chemical equation of reaction of 'C' with acidified  $\text{KMnO}_4$  solution and for conversion of 'C' to 'D'.

27. Account for the following:

- (a) Aspirin drug helps in the prevention of heart attack.
- (b) Diabetic patients are advised to take artificial sweetners instead of natural sweetners.
- (c) Detergents are non-biodegradable while soaps are biodegradable.

3

28. (a) An organic compound 'A' with molecular formula  $\text{C}_5\text{H}_8\text{O}_2$  is reduced to n-pentane on treatment with Zn-Hg/HCl. 'A' forms a dioxime with hydroxylamine and gives a positive Iodoform test and Tollen's test. Identify the compound A and deduce its structure.

(b) Write the chemical equations for the following conversions:

(not more than 2 steps)

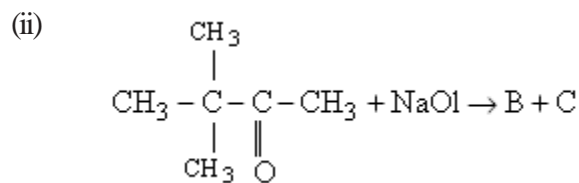
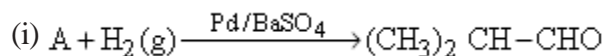
- (i) Ethyl benzene to benzene
- (ii) Acetaldehyde to butane - 1, 3 - diol
- (iii) Acetone to propene

5

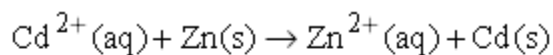
OR

(a) An organic compound 'A' with molecular formula  $\text{C}_8\text{H}_8\text{O}$  gives positive DNP and iodoform tests. It does not reduce Tollen's or fehling's reagent and does not decolourise bromine water also. On oxidation with chromic acid ( $\text{H}_2\text{CrO}_4$ ), it gives a carboxylic acid (B) with molecular formula  $\text{C}_7\text{H}_6\text{O}_2$ . Deduce the structures of A and B.

(b) Complete the following reactions by identifying A, B and C



29. (a) Calculate the equilibrium constant for the reaction

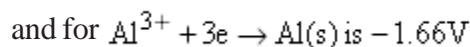
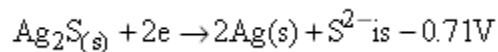


$$\text{If } E^0_{\text{Cd}^{2+}/\text{Cd}} = -0.403 \text{ V}$$

$$E^0_{\text{Zn}^{2+}/\text{Zn}} = -0.763 \text{ V}$$

(b) When a current of 0.75A is passed through a  $\text{CuSO}_4$  solution for 25 min, 0.369 g of copper is deposited at the cathode. Calculate the atomic mass of copper.

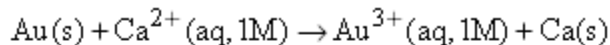
(c) Tarnished silver contains  $\text{Ag}_2\text{S}$ . Can this tarnish be removed by placing tarnished silver ware in an aluminium pan containing an inert electrolytic solution such as NaCl. The standard electrode potential for half reaction :



5

**OR**

(a) Calculate the standard free energy change for the following reaction at  $25^\circ\text{C}$



$$E^0_{\text{Au}^{3+}|\text{Au}} = +1.50\text{V}$$

$$E^0_{\text{Ca}^{2+}|\text{Ca}} = -2.87\text{V}$$

Predict whether the reaction will be spontaneous or not at  $25^\circ\text{C}$ . Which of the above two half cells will act as an oxidizing agent and which one will be a reducing agent?

(b) The conductivity of  $0.001\text{M}$  acetic acid is  $4 \times 10^{-5}\text{S/cm}$ . Calculate the dissociation constant of acetic acid, if

$$\Lambda_m^0 \text{ for acetic acid is } 390.5\text{S cm}^2/\text{mol}.$$

30. (a) A blackish brown coloured solid 'A' when fused with alkali metal hydroxides in presence of air, produces a dark green coloured compound 'B', which on electrolytic oxidation in alkaline medium gives a dark purple coloured compound C. Identify A, B and C and write the reactions involved.

(b) What happens when an acidic solution of the green compound (B) is allowed to stand for some time? Give the equation involved. What is this type of reaction called? (3 + 2 = 5)

**OR**

Give reasons for the following:

(a) Transition metals have high enthalpies of atomization.

(b) Among the lanthanoids, Ce(III) is easily oxidised to Ce(IV).

(c)  $\text{Fe}^{3+}|\text{Fe}^{2+}$  redox couple has less positive electrode potential than  $\text{Mn}^{3+}|\text{Mn}^{2+}$  couple.

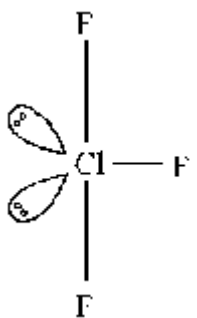
(d) Copper (I) has  $d^{10}$  configuration, while copper (II) has  $d^9$  configuration, still copper (II) is more stable in aqueous solution than copper (I).

(e) The second and third transition series elements have almost similar atomic radii.

5



MARKING SCHEME  
CHEMISTRY SAMPLE PAPER - II  
CLASS - XII

Q.No.	Value Points	Marks
1.	4-Bromo-3-methyl pent-2-ene.	(1)
2.	Dispersed phase : gas Dispersion medium : liquid	(½) (½)
3.	$\text{XeF}_6 + 3\text{H}_2\text{O} \rightarrow \text{XeO}_3 + 6\text{HF}$	(1)
4.	$\begin{array}{ccccccc} \text{H}_3\text{C} & - & \text{C} & = & \text{CH} & - & \text{C} & - & \text{CH}_3 \\ & &   & & & &   & & \\ & & \text{CH}_3 & & & & \text{O} & & \end{array}$	(1)
5.	XY	(1)
6.	$i = \frac{1}{4}$	(1)
7.	NaCN, Sodium cyanide, used as a depressant.	(1)
8.	 <p>T - shape</p>	(1)
9.	$\begin{aligned} \Delta T_f &= K_f \times \frac{w_B}{m_B} \times \frac{1000}{w_A} \\ &= 1.86 \times \frac{12.4}{62} \times \frac{1000}{100} \\ &= 3.76\text{K} \end{aligned}$ <p>since water freezes at <math>0^\circ\text{C}</math>, so freezing point of the solution containing ethylene glycol will be <u><math>-3.76^\circ\text{C}</math></u> (1)</p>	



Q.No.	Value Points	Marks
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$$\begin{aligned} \Delta T_b &= K_b \times \frac{w_B}{M_B} \times \frac{1000}{w_A} \\ &= 0.512 \times \frac{12.4}{62} \times \frac{1000}{100} \\ &= 1.024\text{K} \end{aligned}$$

since water boils at 100°C, so a solution containing ethylene glycol will boil at 101.024 °C, so it is advisable to keep this substance in car radiator during summer. (1)

10. (i) The reaction  $A \rightarrow P$  is a zero order reaction.

(ii) For the reaction  $A \xrightarrow{k} P$  (1/2)

$$\text{rate} = \frac{-d[A]}{dt} = k[A]^0 \quad (1/2)$$

$$-d[A] = k dt$$

integrating both the sides :

$$[A] = kt + C \quad \text{-----}(i)$$

where C = constant of integration

$$\text{at } t = 0, [A] = [A]_0$$

Substituting this in equation (i)

$$C = [A]_0$$

Substituting the value of 'C' in equation (i)

$$[A] = -kt + [A]_0$$

$$kt = [A]_0 - [A]$$

$$t = \frac{[A]_0 - [A]}{k} \quad (1)$$

11. The reaction for reducing action of carbon is :



$$\Delta_r G = \Delta_f G(\text{CO}) - \Delta_f G(\text{MgO})$$

$$= \frac{\Delta H}{-T} - (-314)$$

$$= -314 \text{ kJ/mol at } 2273\text{k} \quad (1/2)$$

$$\text{At } 1273\text{k}$$

$$\Delta_r G = -439 - (-941)$$

$$= +502 \text{ kJ/mol at } 1273\text{k} \quad (1/2)$$

So carbon can be used as reducing agent with MgO(s) at 2273k. (1/2)

12. The two components of starch are:

(a) Amylose (1/2)

(b) Amylopectin (1/2)

Amylose is a straight chain polymer of  $\alpha$ -D-(+) glucose, while amylopectin is a branched chain polymer of  $\alpha$ -D-glucose. (1)



Q.No.	Value Points	Marks
13.	(a) On boiling protein of egg gets denatured or coagulated and water of egg get absorbed in it. (b) Hydrogen bonding between $\begin{array}{c} -C- \\    \\ O \end{array}$ and $-NH-$ groups of peptide bond.	(1) (1)
14.	$2CH_3CH_2\ddot{O}H \xrightarrow[H_2SO_4]{Conc} CH_3CH_2\ddot{O}CH_2CH_3$  mechanism: (i) $CH_3CH_2\ddot{O}H + H^+ \rightarrow CH_3CH_2\overset{\oplus}{O}H_2$ (ii) $CH_3CH_2\ddot{O}H + CH_3CH_2\overset{\oplus}{O}H_2 \rightarrow CH_3CH_2\overset{\oplus}{O}H_2-CH_2CH_3 + H_2\ddot{O}$ (iii) $CH_3CH_2\overset{\oplus}{O}H_2-CH_2CH_3 \rightarrow CH_3CH_2-O-CH_2CH_3 + H^+$	(1/2) (1/2) (1/2)
15.	(a) $RNH_2 + CHCl_3 + 3KOH \rightarrow RNC + 3KCl + 3H_2O$ Carbylamine reaction (b) $RCO NH_2 + Br_2 + 4NaOH \rightarrow RNH_2 + Na_2CO_3 + 2NaBr + 2H_2O$ Hoffmann bromamide degradation reaction	(1/2) (1/2) (1/2) (1/2)
16.	(a) Addition of <u>neutral ferric chloride solution</u> to phenol will give a violet colouration, while no such colouration will be observed in case of benzyl alcohol. (b) On addition of <u>Luca's reagent</u> (a mixture of concentrated hydrochloric acid and anhydrous zinc chloride) to 2-methyl-2-propanol will give a white turbidity immediately while 2-Butanol will give turbidity after five minutes.	(1) (1)
17.	In gaseous phase, basic character of amines increases with increase in number of electron releasing alkyl groups, due to +I effect, so trend of basic character is $3^0 > 2^0 > 1^0$	(1)



- | Q.No. | Value Points  | Marks          |
|-------|---|----------------|
|       | but in aqueous phase, solvation of ammonium cation occurs by water molecules, greater the size of ion, lesser will be the solvation, and lesser will be the stability of ion, so on combining + I effect and solvation effect, in aqueous phase trend changes to $2^0 > 3^0 > 1^0$ .      | (1)            |
|       | <b>OR</b>   |                |
|       | (a) During Friedel-Crafts alkylation, aluminium chloride acts as a catalyst, as well as a Lewis acid, it forms salt with -NH <sub>2</sub> group of aniline, so that -NH <sub>2</sub> group acquires a positive charge, and acts as a deactivating group, so aniline does not undergo FCA. | (1)            |
|       | (b) During nitration, in strongly acidic medium aniline is protonated to form anilinium ion, which is a meta directing group, so along with o- & p- isomers, meta isomer is also obtained.  | (1)            |
| 18.   | (a) At higher altitudes, partial pressure of oxygen is less than that at ground level, so that oxygen concentration becomes less in blood or tissues. Hence people suffer from anoxia.  | (1)            |
|       | (b) Due to the formation of complex K <sub>2</sub> (HgI <sub>4</sub> ), number of particles in the solution decreases and hence the freezing point is raised.   | (1)            |
| 19.   | $\delta = \frac{Z \times M}{a^3 \times N_A}$  | (1/2)          |
|       | $6.23 = \frac{Z \times 60}{(400)^3 \times 10^{-30} \times 6.023 \times 10^{23}}$  |                |
|       | Z = 4   | (1)            |
|       | The unit cell is <u>face centered cubic</u>   | (1/2)          |
|       | radius 'r' = $\frac{a}{2\sqrt{2}}$  |                |
|       | = $\frac{400}{2\sqrt{2}}$   |                |
|       | = 141.4 pm.   | (1)            |
| 20.   | (a) Tetra fluoro ethene addition polymer  | (1/2)<br>(1/2) |
|       | (b) Phenol and formaldehyde Condensation polymer  | (1/2)<br>(1/2) |
|       | (c) Isoprene addition polymer   | (1/2)<br>(1/2) |
| 21.   | (a) tetraquadichloro chromium (III) chloride.   | (1)            |
|       | (b) [FeF <sub>6</sub> ] <sup>4+</sup> has <u>4 unpaired electron</u> as F <sup>-</sup> is a weak field ligand   | (1/2)          |
|       | [Fe(CN) <sub>6</sub> ] <sup>4+</sup> has zero unpaired electron as CN <sup>-</sup> is a strong field ligand.  | (1/2)          |



Q.No.	Value Points	Marks
	(c) Ionisation isomerism. on addition of dilute HCl followed by aqueous $\text{BaCl}_2$ , $[\text{Co}(\text{NH}_3)_5] \text{SO}_4$ will give a white precipitate while the other coordination compound will not give any white precipitate.	(1/2)  (1/2)
22.	(a) As ferric hydroxide, $\text{Fe}(\text{OH})_3$ is a positively charged sol, so it gets coagulated by chloride ions, $\text{Cl}^-$ , released by NaCl solution.  (b) Cottrell's smoke precipitator, neutraliser the charge on unburnt carbon particles, coming out of chimney and they get precipitated and settle down at the floor of the chamber.  (c) As physical adsorption, involves only weak vander waal's force of interaction, so many layers of adsorbate get attached, while chemisorption involves chemical bond formation between adsorbate and adsorbent, so monolayer is formed.	(1)  (1)  (1)
23.	(a) Chlorine water produces nascent oxygen which is responsible for bleaching action and oxidation: $\text{Cl}_2 + \text{H}_2\text{O} \rightarrow 2\text{HCl} + [\text{O}]$  (b) Both $\text{H}_3\text{PO}_2$ and $\text{H}_3\text{PO}_3$ have P- H bonds, so they act as reducing agents, but $\text{H}_3\text{PO}_4$ , has no P-H bond but has O-H bonds, so it cannot act as a reducing agent.  (c) Ozone gas acts as a strong oxidising agent, so it oxidises iodide ions to Iodine $2\text{I}^-_{(\text{aq})} + \text{H}_2\text{O}(\text{l}) + \text{O}_3(\text{g}) \rightarrow 2\text{OH}^-_{(\text{aq})} + \text{I}_2(\text{g}) + \text{O}_2(\text{g})$ $\text{I}_2$ Vapours evolved have violet colour.	(1)  (1)  (1)
24.	For first order reaction (a) $k = \frac{2.303}{t} \log \frac{[\text{R}]_0}{[\text{R}]_t}$ $5 \times 10^{-4} = \frac{2.303}{2 \times 60} \log \frac{0.25}{[\text{R}]_t}$ $[\text{R}]_t = 0.23 \text{ M}$ $t_{1/2} = \frac{0.693}{5 \times 10^{-4}} \text{ sec}$ $= 1386 \text{ sec}$  (b) (i) $\text{Rate} = \frac{1}{3} \frac{d[\text{C}]}{dt}$ $= \frac{1}{3} \times 1.3 \times 10^{-4}$ $= 0.43 \times 10^{-4} \text{ mol L}^{-1} \text{ sec}^{-1}$	(1)  (1)



Q.No.	Value Points	Marks
(ii)	$= \frac{-d[A]}{dt} = \frac{2}{3} \times \frac{d[C]}{dt}$ $= 0.86 \times 10^{-4} \text{ mol L}^{-1} \text{ sec}^{-1}$	(½)
25.	<p>(a) 1- Bromo butone, being a primary alkyl halide would react faster by <math>S_N^2</math> pathway, due to less steric hinderance. (1)</p> <p>(b) In allyl chloride, <math>\text{CH}_2 = \text{CH} - \text{CH}_2\text{Cl}</math>, the carbocation <math>\text{C}^+\text{H}_2 = \text{CH} - \text{CH}_2</math> formed is stabilised due to resonance while the carbocation formed from n - propyl chloride i.e. <math>\text{CH}_3\text{CH}_2\text{C}^+\text{H}_2</math> is less stable, so allyl chloride is more reactive towards nucleophilic substitution reaction. (1)</p> <p>(c) KCN, being ionic, <math>\ominus\text{CN}</math> ions liberated reacts with halo alkanes forming alkyl cyanides but in <math>\text{AgCN}</math>, being covalent, does not release <math>\ominus\text{CN}</math> ion but lone pair on nitrogen acts as a nucleophile, resulting in formation of iso cyanides. (1)</p>	
26.	<p>(a) Nitrogen being smaller in size forms <math>\text{p}\pi - \text{p}\pi</math> multiple bonding with carbon, So <math>\ominus\text{CN}</math> ion is known, but phosphorus does not form <math>\text{p}\pi - \text{p}\pi</math> bond as it is larger in size. (1)</p> <p>(b) <math>\therefore \text{NO}_2</math> is an odd electron molecule and therefore gets dimerised to stable <math>\text{N}_2\text{O}_4</math>. (1)</p> <p>(c) Because ICl has less bond dissociation enthalpy than <math>\text{I}_2</math></p> <p style="text-align: center;"><b>OR</b></p> <p>'A' = Sulphur (½)            B = <math>\text{H}_2\text{S}</math> gas (½)            C = <math>\text{SO}_2</math> gas (½)            D = <math>\text{SO}_3</math> gas (½)</p> <p><math>5\text{SO}_2(\text{g}) + 2\text{MnO}_4^- + 2\text{H}_2\text{O} \rightarrow 5\text{SO}_4^{2-} + 4\text{H}^+ + 2\text{Mn}^{2+}</math> (½)</p> <p><math>2\text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \xrightarrow{\text{V}_2\text{O}_5} 2\text{SO}_3(\text{g})</math> (½)</p>	
27.	<p>(a) Due to antiblood clotting action, aspirin is used for prevention of heart attacks. (1)</p> <p>(b) As artificial sweetners provide less calories than natural sweetners. (1)</p> <p>(c) Detergents have highly branched hydrocarbon chain, which can not be degraded by bacteria, so they get accumulated while soap containing straight hydrocarbon chain can be degraded easily (1)</p>	
28.	<p>(a) As 'A' gives positive iodo form test, so it has <math>\text{CH}_3 - \overset{\text{O}}{\underset{\text{O}}{\text{C}}} - \text{group}</math> (½)</p>	

Q.No.

ValuePoints

Marks

as 'A' gives positive tollen's test, so it must have – CHO group

(½)

So A is

(1)

(b) (i)

(½)

(½)

(ii)

Acetaldehyde

(½)

Butane - 1, 3 -diol

(½)

(iii)

Acetone

(½)

(½)

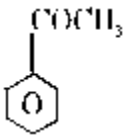
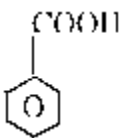
OR

(a) As 'A' does not give Fehling's or Tollen's test, so it does not have – CHO group but it gives positive iodoform

test and DNP test so it has            group

(1)

(158)

Q.No.	Value Points	Marks
So 'A' is :	 <p style="text-align: center;"><u>Acetophenone</u></p>	(1)
	B is carboxylic acid obtained by oxidation of A with $H_2CrO_4$ .	
So 'B' is	 <p style="text-align: center;"><u>Benzoic acid</u></p>	(1)
(b) A =	$(CH_3)_2CH - \overset{\overset{O}{\parallel}}{C} - Cl$	(1)
	B = $CH_2 - \overset{\overset{CH_3}{ }}{C} - COONa$ $\quad \quad \quad  $ $\quad \quad \quad CH_3$	(1/2)
	C = $CHI_3$	(1/2)
29. (a)	$E_{cell}^{\circ} = E_c^{\circ} - E_a^{\circ} = -0.403 - (-0.763) = 0.360V$ $As \log K_c = \left( \frac{nE_{cell}^{\circ}}{0.059} \right)$ $= \left( \frac{2 \times 0.360}{0.059} \right)$ $= \left( \frac{0.720}{0.059} \right) = 12.20$ $K_c = \text{antilog}(12.20)$ $= 1.585 \times 10^{12}$	(1)
(b)	$M = Z I t$ $0.369 = \frac{x}{2 \times 96500} \times 0.75 \times 25 \times 60 \quad (x = \text{molar mass of copper})$ $x = 63.3 \text{ g/mol.}$	(1)
(c)	$E_{cell}^{\circ} \text{ for reaction of tarnished silver ware with aluminium pan is}$ $(-0.71 V) - (-1.66 V) \text{ i.e. } +0.95 V$ <p style="text-align: center;">Tarnished silver ware, therefore, can be cleaned by placing it in an aluminium pan as <math>E_{cell}^{\circ}</math> is positive.</p>	(1)



Q.No.	Value Points	Marks
	It is called disproportionation reaction.	(1/2)
	<b>OR</b>	
	(a) Due to strong interatomic interaction between unpaired valence electrons.	(1)
	(b) Because Cr(IV) has extra stability due to empty $f^0$ orbital	(1)
	(c) In $Mn^{2+}d^5$ configuration leads to extra stability of half filled configuration, so $Mn^{3+}/Mn^{2+} (d^4)$ tends to get converted to stable $d^5$ , configuration of $Mn^{2+}$ , by accepting an electron so $Mn^{3+}/Mn^{2+}$ redox couple has more positive potential than $Fe^{3+}/Fe^{2+}$ couple	(1)
	$\begin{matrix} Fe^{3+} & / & Fe^{2+} \\ (d^5) & & (d^4) \end{matrix}$	
	(d) Due to more negative enthalpy of hydration of $Cu^{2+}(aq)$ than $Cu^+(aq)$ which compensates for second ionisation enthalpy of copper.	(1)
	(e) In the third transition series after lanthanum there is lanthanoid contraction, due to ineffective shielding by intervening $f$ - orbital electrons and hence second and third transition series elements have similar atomic radii.	(1)

**CHEMISTRY SAMPLE PAPER**

S.NO.	UNIT	VSA (1 Mark)	SAI (2 Marks)	SAII (3 Marks)	LA (5 Marks)	TOTAL
1.	Soild State	2 (2)	2 (1)	-	-	4 (3)
2.	Solutions	-	-	-	5(1)	5(1)
3.	Electrochemistry	-	2(1)	3 (1)	-	5(2)
4.	Chemical Kinetics	2 (2)	-	3 (1)	-	5(3)
5.	Surface Chemistry	-	4 (2)	-	-	4(2)
6.	General principles and processes of Isolation of Elements	-	-	3 (1)	-	3(1)
7.	p -Block Elements	1(1)	4 (2)	3 (1)	-	8 (3)
8.	d- and f-Block Elements	-	-	-	5 (1)	5(1)
9.	Coordination Compounds	-	-	3 (1)	-	3(1)
10.	Haloalkanes and Haloarenes	1 (1)	-	3 (1)	-	4(2)
11.	Alcohols, Phenols and Ethers	-	4 (2)	-	-	4 (2)
12.	Aldehydes, Ketones and Carboxylic Acids	1 (1)	-	-	5 (1)	6 (2)
13.	Organic Compounds Containing Nitrogen	-	4 (2)	-	-	4 (2)
14.	Biomolecules	1 (1)	-	3 (1)	-	4 (2)
15.	Polymers	-	-	3 (1)	-	3 (1)
16.	Chemistry in Everyday Life	-	-	3 (1)	-	3 (1)
	<b>Total</b>	<b>8(8)</b>	<b>20(10)</b>	<b>27(9)</b>	<b>15(3)</b>	<b>70(30)</b>

(162)

## CHEMISTRY SAMPLE PAPER - III

### CLASS - XII

Time : Three Hours

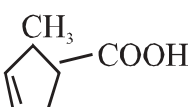
Max. Marks : 70


#### General Instructions


1. All questions are compulsory.
2. Question nos. 1 to 8 are very short answer questions and carry 1 mark each.
3. Question nos. 9 to 18 are short answer questions and carry 2 marks each.
4. Question nos. 19 to 27 are also short answer questions and carry 3 marks each.
5. Question nos. 28 to 30 are long answer questions and carry 5 marks each.
6. Use log tables if necessary, use of calculators is not allowed.

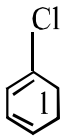
1. Name the type of point defect that occurs in a crystal of zinc sulphide. 1
  
2. The decomposition reaction of ammonia gas on platinum surface has a rate constant  $k = 2.5 \times 10^{-4} \text{ mol L}^{-1} \text{ S}^{-1}$ . What is the order of the reaction? 1
  
3. Give the IUPAC name of the following compound 1
  
4. How many octahedral voids are there in 1 mole of a compound having cubic close packed structure? 1
  
5. What is the molecularity of the reaction? 1  

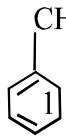
$$\text{Cl} \rightarrow \frac{1}{2} \text{Cl}_2(\text{g})$$


  
6. In each of the following pairs of organic compounds, identify the compound which will undergo  $\text{SN}^1$  reaction faster? 1
  - (a)
 

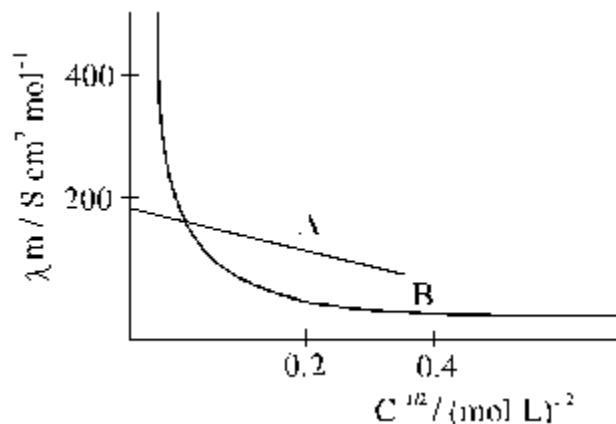



  - (b)
 

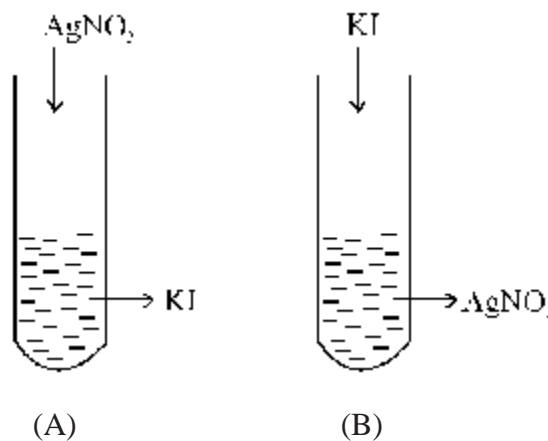



  
7. In the ring test for identification of nitrate ion, what is the formula of the compound responsible for the brown ring formed at the interface of two liquids? 1
  
8. Except for vitamin  $\text{B}_{12}$ , all other vitamins of group B, should be supplied regularly in diet. Why? 1
  
9. An element E crystallizes in body centred cubic structure. If the edge length of the cell is  $1.469 \times 10^{-10} \text{ m}$  and the density is  $19.3 \text{ g cm}^{-3}$ , calculate the atomic mass of this element. Also calculate the radius of an atom of this element. 2

10. The following curve is obtained when molar conductivity  $\lambda_m$  (y-axis) is plotted against the square root of concentration  $C^{1/2}$  (x-axis) for two electrolytes A and B.



- (a) What can you say about the nature of the two electrolytes A and B?  
 (b) How do you account for the increase in molar conductivity  $\lambda_m$  for the electrolytes A and B on dilution? 2
- 11 (a) Adsorption of a gas on the surface of solid is generally accompanied by a decrease in entropy. Still it is a spontaneous process. Explain.  
 (b) How does an increase in temperature affect both physical as well as chemical adsorption? 2
12. A colloidal solution of AgI is prepared by two different methods shown below:-



- (i) What is the charge of AgI colloidal particles in the two test tubes (A) and (B)?  
 (ii) Give reasons for the origin of charge. 2
13. (a) What is the covalence of nitrogen in  $N_2O_5$ ?  
 (b) Explain why both N and Bi do not form pentahalides while phosphorus does. 2

**OR**

When conc.  $\text{H}_2\text{SO}_4$  was added into an unknown salt present in a test tube, a brown gas (A) was evolved. This gas intensified when copper turnings were also added into this test-tube. On cooling, the gas (A) changed into a colourless gas (B).

- (a) Identify the gases A and B.  
(b) Write the equations for the reactions involved.

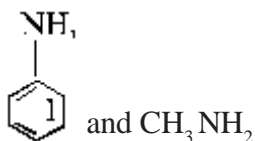
14. Which is a stronger acid - Phenol or Cresol? Explain. 2

15. (a) How can you convert an amide into an amine having one carbon less - than the starting compound?  
(b) Name the reaction.  
(c) Give the IUPAC name and structure of the amine obtained by the above method if the amide is 3-chlorobutanamide. 2

16. (a) Why does chlorine water lose its yellow colour on standing?  
(b) What happens when  $\text{Cl}_2$  reacts with cold dilute solution of sodium hydroxide? Write equation only. 2

17. How will you distinguish between:

(a)



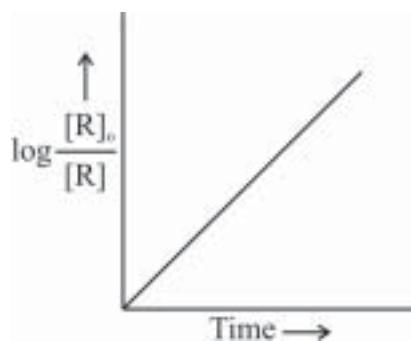
(b)  $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_2-\text{N}-\text{H} \\ | \\ \text{CH}_3 \end{array}$  and  $(\text{CH}_3)_3\text{N}$  2

18. Give mechanism of preparation of ethoxyethane from ethanol. 2

19. (a) A current of 1.50 amp was passed through an electrolytic cell containing  $\text{AgNO}_3$  solution with inert electrodes. The weight of Ag deposited was 1.50g. How long did the current flow?

(b) Write the reactions taking place at the anode and cathode in the above cell.  
(c) Give reactions taking place at the two electrodes if these are made up of Ag. 3

20. (i)



Answer the following questions on the basis of the above curve for a first order reaction  $\text{A} \rightarrow \text{P}$  :-

- (a) What is the relation between slope of this line and rate constant? (1)  
(b) Calculate the rate constant of the above reaction if the slope is  $2 \times 10^{-4} \text{ s}^{-1}$

- (ii) Derive the relationship between half life of a first order reaction and its rate constant. 3
21. (a) Name the method used for refining of  
 (i) Nickel  
 (ii) Zirconium  
 (b) The extraction of Au by leaching with NaCN involves both oxidation and reduction. Justify giving equations. 3
22. Write down the equations for hydrolysis of  $X F_4$  and  $XeF_6$ . Which of these two reactions is a Redox reaction? 3
23. Give the electronic configuration of the  
 (a) d- orbitals of Ti in  $[Ti(H_2O)_6]^{3+}$  ion in an octahedral crystal field.  
 (b) Why is this complex coloured? Explain on the basis of distribution of electrons in the d- orbitals.  
 (c) How does the colour change on heating  $[Ti(H_2O)_6]^{3+}$  ion? 3
24. (a) Which will have a higher boiling point?  
 1 - Chloro ethane      or      - 2 methyl -2- chlorobutane  
 Give reasons  
 (b) p - nitro chlorobenzene undergoes nucleophilic substitution faster than chlorobenzene. Explain giving the resonating structures as well. 3
25. Despite having an aldehyde group  
 (a) Glucose does not give 2,4 - DNP test. What does this indicate?  
 (b) Draw the Haworth structure of  $\alpha - D - (+) - \text{Glucopyranose}$ .  
 (c) What is the significance of D and (+) here? 3
26. (a) What is the role of Benzoyl peroxide in polymerisation of ethene?  
 (b) What are LDPE and HDPE? How are they prepared? 3
27. Classify synthetic detergents giving an example in each case.

**OR**

- What are antihistamines? Give two examples. Explain how they act on the human body. 3
28. (a) Derive the relationship between relative lowering of vapour pressure and mole fraction of the volatile liquid.  
 (b) (i) Benzoic acid completely dimerises in benzene. What will be the vapour pressure of a solution containing 61g of benzoic acid per 500g benzene when the vapour pressure of pure benzene at the temperature of experiment is 66.6 torr?  
 (ii) What would have been the vapour pressure in the absence of dimerisation?  
 (iii) Derive a relationship between mole fraction and vapour pressure of a component of an ideal solution in the liquid phase and vapour phase. 5

**OR**

28. (a) Which aqueous solution has higher concentration -1 molar or 1 molal solution of the same solute? Give reason.  
(b) 0.5g KCl was dissolved in 100g water and the solution originally at 20°C, froze at -0.24°C. Calculate the percentage ionization of salt.  $K_f$  per 1000g of water = 1.86K.
29. (a) Out of  $\text{Ag}_2\text{SO}_4$ ,  $\text{CuF}_2$ ,  $\text{MgF}_2$  and  $\text{CuCl}$ , which compound will be coloured and why?  
(b) Explain :  
(i)  $\text{CrO}_4^{2-}$  is a strong oxidizing agent while  $\text{MnO}_4^{2-}$  is not.  
(ii)  $Z_r$  and  $H_f$  have identical sizes.  
(iii) The lowest oxidation state of manganese is basic while the highest is acidic.  
(iv) Mn (II) shows maximum paramagnetic character amongst the divalent ions of the first transition series. 5


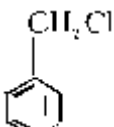
**OR**

- (a) In the titration of  $\text{FeSO}_4$  with  $\text{KMnO}_4$  in the acidic medium, why is dil  $\text{H}_2\text{SO}_4$  used instead of dil HCl?  
(b) Give reasons:  
(i) Among transition metals, the highest oxidation state is exhibited in oxoanions of a metal.  
(ii)  $\text{Ce}^{4+}$  is used as an oxidizing agent in volumetric analysis.  
(iii) Transition metals form a number of interstitial compounds.  
(iv)  $\text{Zn}^{2+}$  salts are white while  $\text{Cu}^{2+}$  salts are blue.
30. An unknown Aldehyde 'A' on reacting with alkali gives a  $\beta$ -hydroxy -aldehyde, which loses water to form an unsaturated aldehyde, 2- butenal. Another aldehyde 'B' undergoes disproportionation reaction in the presence of conc. alkali to form products C and D. C is an arylalcohol with the formula  $\text{C}_7\text{H}_8\text{O}$ .  
(i) Identify A and B.  
(ii) Write the sequence of reactions involved.  
(iii) Name the product, when 'B' reacts with Zinc amalgum and hydrochloric acid. 5

**OR**

- A compound 'X' ( $\text{C}_2\text{H}_4\text{O}$ ) on oxidation gives 'Y' ( $\text{C}_2\text{H}_4\text{O}_2$ ). 'X' undergoes haloform reaction. On treatment with HCN 'X' forms a product 'Z' which on hydrolysis gives 2- hydroxy propanoic acid.  
(i) Write down structures of 'X' and 'Y'.  
(ii) Name the product when 'X' reacts with dil NaOH.  
(iii) Write down the equations for the reactions involved.

**MARKING SCHEME**  
**CHEMISTRY SAMPLE PAPER - III**  
**CLASS - XII**

Q. No.	Value Points	Marks
1.	Frenkel defect	1
2.	Zero order reaction	1
3.	2-Methylcyclopent-3-enecarboxylic acid	1
4.	1 Mole or $6.02 \times 10^{23}$	1
5.	One	1
6.	(a) 	½
	(b) 	½
7.	$[\text{Fe}(\text{H}_2\text{O})_5\text{NO}]^{2+}$	1
8.	Except for B <sub>12</sub> , no other vitamin of group B can be stored in the body and is readily excreted in urine.	1
9.	$P = \frac{ZM}{a^3 N_0} \quad \text{g cm}^{-3} \quad a = 1.469 \times 10^{-10} \text{ m}$ $= 146.9 \times 10^{-10} \text{ cm}$ $M = \frac{Pa^3 N_0}{Z} \text{ g}$ $= \frac{19.3 \times (146.9 \times 10^{-10})^3 \times 6.02 \times 10^{23}}{2}$ $= 19.3 \times 3.17 \times 3.01 = 183.5 \text{ g}$ $r = \frac{\sqrt{3}}{4} a = \frac{\sqrt{3}}{4} \times 1.469 \times 10^{-8} \text{ cm}$ $r = 0.634 \times 10^{-8} \text{ cm}$	          ½ ½ ½ ½

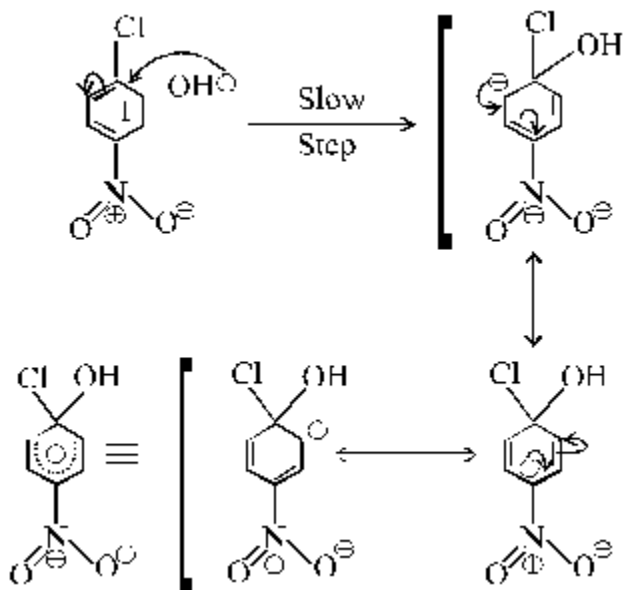
Q. No.	Value Points	Marks
10. (a) A is a strong electrolyte B is a weak electrolyte		1/2 1/2
(b) Molar conductivity of a strong electrolyte increases with dilution as ionic mobility increases.		1/2
In a weak electrolyte molar conductivity increases steeply with dilution as degree of dissociation increases.		1/2
11. (a) According to the equation $\Delta G = \Delta H - T\Delta S$ for a process to be spontaneous $\Delta G$ should be negative. Even though $\Delta S$ is negative here, $\Delta G$ is negative because reaction is <u>highly exothermic</u> i.e. $\Delta H$ is negative.		1
(b) On increasing temperature desorption occurs in physical adsorption. Chemical adsorption increases first and then decreases with increase in temperature.		1/2 1/2
12. Test tube (A) has negative charge.		1/2
(i) Test tube (B) positive charge on the colloidal particles.		1/2
(ii) In test, tube (A) $I^-$ is adsorbed on AgI. [or AgI / $I^-$ is formed]		1/2
In test tube (B) $Ag^+$ is adsorbed on AgI. [ or AgI / $Ag^+$ is formed]		1/2
13. (a) 4		1
(b) unlike P, N has no vacant d-orbitals in its valence shell. Bi prefers +3 oxidation state due to inert pair effect.		1/2 1/2
<b>OR</b>		
(a) A is $NO_2$ gas B is $N_2O_4$ gas		1/2 1/2
$MnO_3 + H_2SO_4 \rightarrow MnHSO_4 + HNO_3$		
$Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2H_2O + 2NO_2$		1/2
$2NO \rightleftharpoons N_2O_4$		1/2
Brown gas	Colourless gas	
14. Phenol is a stronger acid, Methyl group due to +I effect concentrates the negative charge on the oxygen, thus destabilizing the intermediate phenoxide ion in cresol.		1
15. (a) By reacting it with NaOH and $Br_2$ .		1/2
(b) Hoffmann bromamide degradation reaction.		1/2
(c)		1/2
$CH_3 - \overset{\overset{Cl}{ }}{CH} - CH_2 NH_2$		
2-Chloropropanamine		1/2

Q. No.	Value Points	Marks
16. (a)	Chlorine water loses its yellow colour on standing due to the formation of HCl and HClO. $\text{Cl}_2 + \text{H}_2\text{O} = \text{HCl} + \text{HClO}$	1
(b)	$\text{Cl}_2 + 2\text{NaOH} \rightarrow \text{NaCl} + \text{NaClO} + \text{H}_2\text{O}$ (cold & dilute)	1
17. (a)	By reacting with $\text{NaNO}_2$ and HCl or $\text{HNO}_2$ at temperature $0-5^\circ\text{C}$ . Aniline will form diazonium salt $\text{CH}_3\text{NH}_2$ will form methanol and bubbles of $\text{N}_2$ gas will come out of the solution.	1
(b)	By using Hinsberg's reagent. $\text{C}_6\text{H}_5\text{SO}_2\text{Cl}$ $(\text{CH}_3)_3\text{N}$ will not react. $(\text{CH}_3)_2\text{NH}$ will form a product insoluble in alkali.	1
18. (i)	$\text{CH}_3-\text{CH}_2-\overset{\ominus}{\text{O}}\text{H} + \text{H}^{\oplus} \rightarrow \text{CH}_3\text{CH}_2-\overset{\text{H}}{\underset{\text{O}}{\text{O}}}-\text{H}$	½
(ii)	$\text{CH}_3-\text{CH}_2-\overset{\ominus}{\text{O}}\text{H} + \text{CH}_3-\text{CH}_2-\overset{\oplus}{\text{O}}\text{H} \rightarrow \text{CH}_3-\text{CH}_2-\overset{\ominus}{\text{O}}-\overset{\text{H}}{\text{O}}-\text{CH}_2-\text{CH}_3 + \text{H}_2\text{O}$	1
(iii)	$\text{CH}_3-\text{CH}_2-\overset{\ominus}{\text{O}}\text{H} + \text{H}^{\oplus} \rightarrow \text{CH}_3\text{CH}_2-\overset{\text{H}}{\text{O}}-\text{H}$	½
19. (a)	According to Faraday's first law, charge required to deposit 1.50 g	
	$\text{Ag} = \frac{96500}{108} \times 1.50 = 1331.70 \text{ Coulombs}$	
	$\text{Time taken} = \frac{1331.70}{1.50} = 887.15 \text{ sec}$	1
(b)	Inert electrodes	
	Anode $2\text{H}_2\text{O}(\text{l}) \rightarrow \text{O}_2(\text{g}) + 4\text{H}^+(\text{aq}) + 4\text{e}^-$	
	Cathode $\text{Ag}^+(\text{aq}) + \text{e}^- \rightarrow \text{Ag}(\text{s})$	1
(c)	Ag electrodes	
	Anode : $\text{Ag}(\text{s}) \rightarrow \text{Ag}^+(\text{aq}) + \text{e}^-$	
	Cathode : $\text{Ag}^+(\text{aq}) + \text{e}^- \rightarrow \text{Ag}(\text{s})$	1
20. (a)	Slope = $\frac{k}{2.303}$	½
(b)	As slope = $2 \times 10^{-4} \text{ S}^{-1}$ $\therefore k = 2.303 \times 2 \times 10^{-4} \text{ S}^{-1}$ $k = 4.606 \times 10^{-4} \text{ S}^{-1}$	1



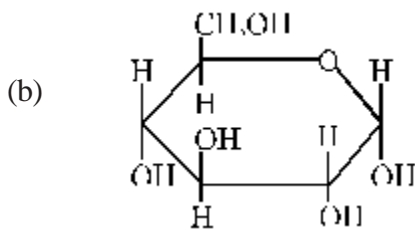
Q. No.	Value Points	Marks
(c)	For a first order reaction	
	$t = \frac{2.303}{K} \log \frac{[R]_0}{[R]}$	1/2
	At $t_{1/2}, [R] = \frac{[R]_0}{2}$	
	$t_{1/2} = \frac{2.303}{K} \log \frac{[R]_0}{\frac{[R]_0}{2}}$	
	$= \frac{2.303}{K} \log 2$	
	$t_{1/2} = \frac{0.693}{K}$	1
21.	(a) (i) Mond Process	1/2
	(ii) Van Arkel Method	1/2
	(b) $4 \text{Au}_{(s)} + 8\text{CN}^-_{(aq)} + 2\text{H}_2\text{O}_{(aq)} + \text{O}_{2(g)} \rightarrow 4[\text{Au}(\text{CN})_2]^-_{(aq)} + 4\text{OH}^-_{(aq)}$	1/2
	$2[\text{Au}(\text{CN})_2]^-_{(aq)} + \text{Zn}_{(s)} \rightarrow 2\text{Au}_{(s)} + [\text{Zn}(\text{CN})_4]^{2-}_{(aq)}$	1/2
	In the first reaction Au charges into $\text{Au}^+$ i.e. its oxidation takes place. In the second case	
	$\text{Au}^+ \rightarrow \text{Au}^0$	
	i.e. reduction takes place.	1
22.	$6\text{XeF}_4 + 12\text{H}_2\text{O} \rightarrow 4\text{Xe} + 2\text{XeO}_3 + 24\text{HF} + 3\text{O}_2$	1
	$\text{XeF}_6 + 3\text{H}_2\text{O} \rightarrow \text{XeO}_3 + 6\text{HF}$	1
	Hydrolysis of $\text{XeF}_4$ is a Redox reaction. Here $\text{Xe}^{4+}$ is changing into Xe and $\text{Xe}^{6+}$ .	1
	$\text{Xe}^{4+} \rightarrow \text{Xe}^0 + \text{Xe}^{6+}$	
23.	(a) In $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ ion Ti is in $3^+$ oxidation state. There is only 1 electron in the d-orbital and its configuration is	
	$t_{2g}^1 e_g^0$ .	1
	(b) due to d-d transition, configuration becomes $t_{2g}^0 e_g^1$ .	1
	(c) On heating $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ ion becomes colourless as there is no ligand ( $\text{H}_2\text{O}$ ) left in heating.	1
	In the absence of ligand, crystal field splitting does not occur.	

- | Q. No.   | Value Points   | Marks |
|--|--|-------|
| 24. (a) 1-chloro pentane                                 | Surface area and hence Van der Waal's forces of attraction decreases on branching. | 1     |
| (b) In this reaction a carbanion intermediate is formed. | This is stabilized by Resonance as shown below in p-nitrochloro benzene.           | ½     |



The -I effect of nitro group further stabilizes the intermediate.  
Hence p- nitrochlorobenzene reacts faster than chloro benzene.

- |         |  |   |
|---------|--|---|
| 25. (a) | This indicates that the aldehyde group in glucose is not free. | 1 |
|---------|--|---|

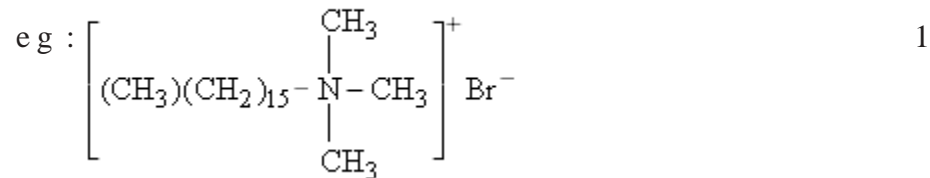


$\alpha$ -D-(+)-Glucopyranose

- (c) 'D' gives the configuration i.e. the -OH gp at carbon 5 is on the right hand side.  
(+) indicates that the isomer is dextro rotatory.

- |         |   |   |
|---------|---|---|
| 26. (a) | Benzoyl peroxide is initiator.<br>It forms a free radical.  | 1 |
| (b)     | <u>LDPE</u> :- <u>Low Density Polyethylene</u><br>LDPE is obtained by the polymerisation of ethene under high pressure of 1000 to 2000 Atm at 350K to 570 <u>K</u> temperature in the presence of an initiator. | ½ |
|         | <u>HDPE</u> <u>High Density Polyethylene</u><br>It is obtained when polymerisation is done in the presence of <u>Ziegler Natta Catalyst</u> at <u>333 K to 343 K</u> under 6 - 7 Atm pressure.                  | ½ |
| 27.     | Anionic detergents : These are sodium salts of sulphonated long chain alcohols or hydrocarbons.   | ½ |

Q. No.	Value Points	Marks
	Eg : Sodium Salt of alkyl benzene sulphonates.	1
	Cationic detergents : These are quarternary ammonium salts of amines with acetates, chlorides or bromides as anions.	



Non-ionic detergents : They do not contain any ion in them.  
eg : Ester of stearic acid and polyethylene glycol 1

**OR**

Antihistamines are drugs that interfere with the natural action of histamines.  
eg : (1) Bromopheniramine 1  
(2) Terfenadine 1

They interfere with the natural action of histamine by competing with histamine binding sites of receptor where histamine exerts its effect. 1

28. (a)  $\frac{\Delta P}{P^0} = i X_B$

$i = \frac{1}{2}$

$$X_B = \frac{n_B}{n_A + n_B} = \frac{61/122}{61/122 + \frac{500}{78}}$$

$$= \frac{0.5}{0.5 + 6.41} = \frac{0.5}{6.91}$$

1

$$\frac{\Delta P}{66.6} = \frac{1}{2} \cdot \frac{50}{691}$$

$$\Delta P = \frac{50 \times 66.6}{691 \times 2} = 2.41$$

1/2

$P^0 - P = 2.41$   
 $P = 66.6 - 2.40$   
 $= 64.20 \text{ torr}$

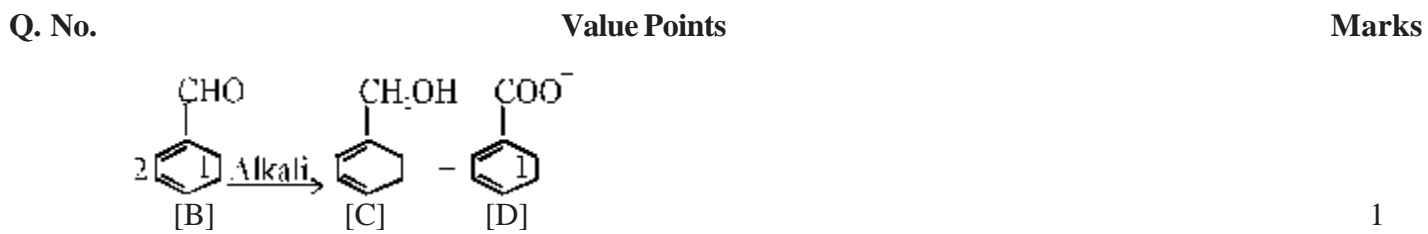
1/2

(b) In the absence of dimerisation



Q. No.	Value Points	Marks
	$i = 1$ $\frac{\Delta P}{P^{\circ}} = X_B$ $\Delta P = \frac{50}{691} \times 66.6 = 4.82$ $P = 66.6 - 4.82 = 61.78 \text{ torr}$	1
(c)	From Raoult's law $P_1 = x_1 P_1^{\circ}$ $x_1 =$ mole fraction of liquid 1 $P_2 = x_2 P_2^{\circ}$ $x_2 =$ mole fraction of liquid 2	
	$y_1 =$ Mole fraction of component -1 in vapour phase. $y_2 =$ Mole fraction of component - 2 in vapour phase.	
	$y_1 = \frac{P_1}{P_{\text{total}}} = \frac{P_1}{P_1 + P_2}$	1/2
	$y_2 = \frac{P_2}{P_{\text{total}}} = \frac{P_2}{P_1 + P_2}$	1/2
	$y_1 = \frac{x_1 P_1^{\circ}}{x_1 P_1^{\circ} + x_2 P_2^{\circ}} = \frac{x_1 P_1^{\circ}}{x_1 P_1^{\circ} + (1 - x_1) P_2^{\circ}}$	
	$y_2 = \frac{x_2 P_2^{\circ}}{x_1 P_1^{\circ} + x_2 P_2^{\circ}}$	1
<b>OR</b>		
28. (a)	1 M has higher concentration than 1m. 1 m solution = 1 mole in 1000 g solvent	1/2
	<b>or</b>	
	1 mole in 1000 cm <sup>3</sup> of solvent if $d = 1 \text{ g / cm}^3$ But 1 M solution = 1 mole in 1000 cm <sup>3</sup> of solution i.e. solvent is less here,	1
(b)	$\Delta T_f = 0 - (-0.24) = +0.24^{\circ}\text{C}$	1/2
	$M_2 = \frac{1000 K_f w_2}{\Delta T_f w_1}$ $= \frac{1000 \times 1.86 \times 5}{0.24 \times 100} \text{ g mol}^{-1}$ $= 38.75 \text{ g mol}^{-1}$	1/2
	Theoretical mol mass of KCl $= 39 + 35.5 = 74.5 \text{ g mol}^{-1}$	1/2
	$i = \frac{\text{calculated mol mass}}{\text{Theoretical mol mass}} = \frac{74.5}{38.75}$ $= 1.92$	1/2

Q. No.	Value Points	Marks
$\text{KCl} \rightleftharpoons \text{K}^+ + \text{Cl}^-$		
Initial moles	1 mole      0      0	
After dissociation	$1 - \alpha$ $\alpha$ $\alpha$	
Total no. of moles after dissociation	$= 1 - \alpha + \alpha + \alpha = 1 + \alpha$	
	$i = \frac{1 + \alpha}{1}$	
	$\alpha = i - 1 = 1.92 - 1 = 0.92$	1/2
	Percentage dissociation = 92%	1/2
29. (a)	$\text{CuF}_2$ In $\text{CuF}_2$ , $\text{Cu}^{2+}$ (3 d <sup>9</sup> ) has an unpaired electron.	1/2
(b) (i)	Oxidation state of Cr in $\text{CrO}_4^{2-}$ is 6+. This is its maximum oxidation state and it can only gain electrons.	1/2
	Oxidation state of Mn in $\text{MnO}_4^{2-}$ is 6+. Mn can further lose electron to become 7+ which is its highest oxidation state.	1/2
	(ii) This is due to lanthanoid contraction.	1
	(iii) In its highest oxidation state manganese can only accept electrons and so is acidic in behaviour. Similarly in its lowest oxidation state, it can donate electrons and hence is basic.	1
	(iv) Mn (II) has maximum number of unpaired electrons i.e. 3d <sup>5</sup> .	1
<b>OR</b>		
30. (a)	Dil $\text{H}_2\text{SO}_4$ is an oxidising agent and oxidizes $\text{FeSO}_4$ to $\text{Fe}_2(\text{SO}_4)_3$ . Dil HCl is a reducing agent and liberates chlorine on reacting with $\text{KMnO}_4$ solution. Thus, part of the oxygen produced from $\text{KMnO}_4$ is used up by HCl.	1
(b) (i)	In these oxoanions the oxygen atoms are directly bonded to the transition metal. Since oxygen is highly electronegative, the oxoanions bring out the highest oxidation state of the metal.	1
	(ii) $\text{Ce}^{4+}$ has the tendency to attain +3 oxidation state and so it is used as an oxidizing agent in volumetric analysis.	1
	(iii) This is due to the presence of voids of appropriate sizes in their crystal lattices.	1
	(iv) $\text{Zn}^{2+}$ ion has all its orbitals completely filled whereas in $\text{Cu}^{2+}$ ion there is one half-filled 3d-orbital. It therefore has a tendency to form coloured salts whereas $\text{Zn}^{2+}$ has no such tendency.	1
31. (i)	A is $\text{CH}_3\text{CHO}$ or ethanal B is $\text{C}_6\text{H}_5\text{CHO}$ or benzaldehyde.	1/2
(ii)	$  \begin{array}{c}  \text{OH} \\    \\  \text{CH}_3 - \text{CH} - \text{CH}_2\text{CHO} \\  \leftarrow \text{NaOH} \quad \leftarrow \\  \text{2CH}_3\text{CHO} \\  \text{[A]} \\  \downarrow - \text{H}_2\text{O} \\  \text{CH}_3 - \text{CH} - \text{CH} - \text{CHO} \\  \text{2 Butanal}  \end{array}  $	(2)

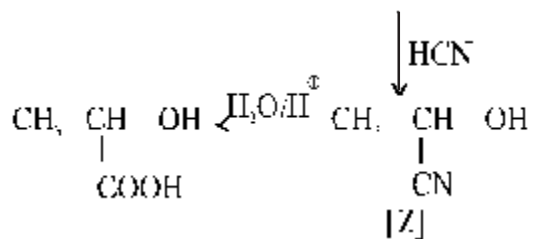
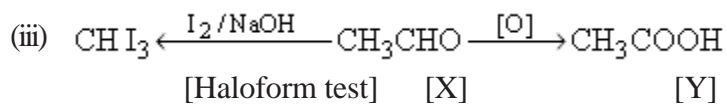


(iii) Toluene 1

**OR**

(i) X is  $\text{CH}_3\text{CHO}$  Y is  $\text{CH}_3\text{COOH}$  1

(ii) 3 - Hydroxybutanal. 1



(3)