

SAMPLE QUESTION PAPER

SUBJECT : CHEMISTRY

CLASS XII

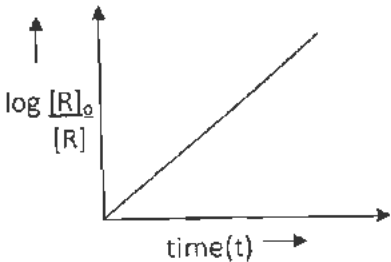
Time: 3 hours

Maximum marks: 70

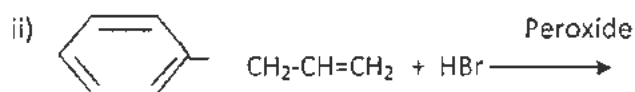
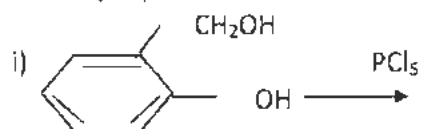
General instructions:

- a) All questions are compulsory.
- b) Questions 1 to 8 carry 1 mark each.
Questions 9 to 18 carry 2 marks each.
Questions 19 to 27 carry 3 marks each.
Questions 28 to 30 carry 5 marks each.

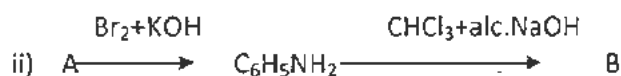
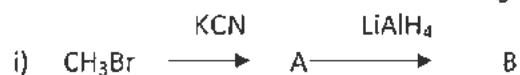
- Q1 Which of the following is a macromolecular colloid:
(a) Sulphur
(b) Gold sol
(c) Protein
(d) Soap 1
- Q2 The IUPAC name of compound $\text{CH}_3\text{-CH}(\text{OH})\text{-CH}_2\text{-CO-CH}_3$ is :
OH
(a) 4-oxopentan-2-ol
(b) 2-oxopentan-4-ol
(c) 4-hydroxypentan-2-one
(d) 2-hydroxypentan-4-one 1
- Q3 The helix structure of proteins is stabilized by :
(a) peptide bonds
(b) hydrogen bonds
(c) disulphide bonds
(d) van der Waals forces 1
- Q4 A mixed oxide has *ccp* arrangement in which the cations 'X' occupy $1/3^{\text{rd}}$ of octahedral voids and the cations 'Y' occupy $1/3^{\text{rd}}$ of tetrahedral voids. The formula of oxide is :
(a) $\text{X}_2\text{Y}_3\text{O}_2$
(b) XY_3O
(c) X_2YO_3
(d) XY_2O_3 1
- Q5 How is the presence of SO_2 gas detected ? 1
- Q6 Glucose on reaction with HI gives n-hexane. What information does it give for the structure of glucose ? 1
- Q7 What is the role of Benzoyl peroxide in the free radical polymerization of ethene? 1
- Q8 Why is 2-nitrophenol steam volatile whereas 4-nitrophenol is not? 1

Q9	<p>What kind of deviation from Raoult's law is shown by the solution of ethanol and cyclohexane ? Give reason.</p> <p style="text-align: center;">OR</p> <p>i) At the same temperature Gas A is more soluble in water than gas B . Which of them will have a higher value of K_H ? Give reason .</p> <p>ii) Why does boiling point of water increase on dissolving salt into it?</p>	2
Q10	<p>For a reaction $X \longrightarrow P$, following plot is observed:</p> <div style="text-align: center;">  </div> <p>i) Predict the order of reaction and write the unit of rate constant(k).</p> <p>ii) Write the expression for slope of the line in the plot.</p>	2
Q11	<p>i) What is the function of Sulphur in vulcanization of rubber?</p> <p>ii) Arrange the following polymers in the increasing order of their intermolecular forces: Buna-N, PVC, Nylon6,6</p>	2
Q12	<p>Write chemical reactions involved in the preparation of :</p> <p>i) K_2MnO_4 from MnO_2</p> <p>ii) $Na_2Cr_2O_7$ from Na_2CrO_4</p>	2
Q13	<p>Arrange the following in the increasing order of property indicated against each set :</p> <p>i) HF, HCl, HBr, HI - bond dissociation enthalpy</p> <p>ii) H_2O, H_2S, H_2Se, H_2Te - acidic character</p>	2
Q14	<p>Account for the following:</p> <p>i) Allyl halide is highly reactive towards S_N1 reaction.</p> <p>ii) C-Cl bond length in chlorobenzene is shorter as compared to C-Cl bond length in CH_3Cl.</p>	2

Q15 Draw structure of major product in each of the following reactions:



Q16 Write the structures of A and B in the following reactions:



Q17 Suggest the method for conversion of each of following in not more than two steps:

- Aniline to phenol
- Benzamide to N-phenylethanamide

Q18 i) Why do Amino acids behave like salts?

ii) What type of linkage is responsible for the formation of polynucleotides?

Q19 0.5 g of KCl ($M = 74.5 \text{ g mol}^{-1}$) was dissolved in 100 g of water to lower its freezing point by 0.24 K. Calculate the percentage ionization of KCl. (K_f for water = $1.86 \text{ K kg mol}^{-1}$)

Q20 The following data were obtained during the first order thermal decomposition of PCl_5 at a constant volume:



Experiment	Time/s-1	Total pressure/atm
1	0	0.4
2	100	0.7

Q21 Calculate the rate constant.

Write the role of

- NaCN in the extraction of Gold
- SiO_2 in the extraction of Copper
- I_2 in the refining of Zirconium

Q22	<p>i) Which of the following complexes is more stable and why? $[\text{Co}(\text{NH}_3)_6]^{3+}$ and $[\text{Co}(\text{en})_3]^{3+}$ (where 'en' is ethane-1,2-diamine)</p> <p>ii) Write the formula for the following complex: Pentaamminechloridocobalt(III) sulphate</p> <p>iii) Write the type of hybridization and magnetic character of the complex $[\text{Fe}(\text{CO})_5]$. [Atomic no. of Fe = 26]</p>	<p>1x3=3</p> <p>2+1=3</p>
Q23	<p>a) For the given Freundlich adsorption isotherm, $\frac{x}{m} = k p^{1/n}$, draw a plot between $\log(x/m)$ vs. $\log p$.</p> <p>b) Write two factors which are responsible for the stability of lyophilic sols.</p>	<p>1x3=3</p>
Q24	<p>Account for the following:</p> <p>i) Mn^{2+} state is more stable than Fe^{2+} towards oxidation to +3 state.</p> <p>ii) In 3d series, the enthalpy of atomization is lowest for Zinc.</p> <p>iii) Actinoids show wide range of oxidation states as compare to Lanthanoids.</p> <p style="text-align: center;">OR</p> <p>Assign reasons for the following:</p> <p>i) Actinoids show irregularities in their electronic configuration.</p> <p>ii) In 3d series, $E^0(\text{Cu}^{2+}/\text{Cu})$ has positive value.</p> <p>iii) Chromium metal is hard whereas Zinc metal is soft.</p>	<p>1x3=3</p>
Q25	<p>a) Write the mechanism involved in the following reaction:</p> $ \begin{array}{c} \text{CH}_3-\text{CH}-\text{CH}-\text{CH}_3 \\ \quad \\ \text{CH}_3 \quad \text{OH} \end{array} \xrightarrow{\text{HBr}} \begin{array}{c} \text{Br} \\ \\ -\text{CH}_3-\text{C}-\text{CH}_2\text{CH}_3 \\ \\ \text{CH}_3 \end{array} $	<p>2+1=3</p> <p>3</p>
Q26	<p>b) What product is formed when 3-methylphenol undergoes dinitration?</p> <p>An element with molar mass 64 g mol^{-1} and density 6.6 g cm^{-3} forms a cubic unit cell. The edge length of unit cell is $4 \times 10^{-8} \text{ cm}$. What is the type of cubic unit cell? (Given: $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$)</p>	<p>3</p>
Q27	<p>a) What are biodegradable detergents? Give an example.</p> <p>b) Why is Amoxicillin called a broad spectrum antibiotic?</p>	
Q28	<p>a) Following reactions may occur at cathode during the electrolysis of aqueous sodium chloride solution:</p> $ \text{Na}^+(\text{aq}) + e^- \longrightarrow \text{Na}(\text{s}) \quad E^0 = -2.71\text{V} $ $ \text{H}^+(\text{aq}) + e^- \longrightarrow 1/2\text{H}_2(\text{g}) \quad E^0 = 0.00\text{V} $ <p>On the basis of their standard electrode potential (E^0) values, which reaction is feasible at the cathode and why?</p>	<p>2+1+2</p>

b) Why does the cell potential of mercury cell remain constant throughout its life?

c) The resistance of a conductivity cell containing 0.001M KCl solution at 298K is 1500Ω. Calculate the cell constant if the conductivity of this cell is $0.15 \times 10^{-3} \text{ S cm}^{-1}$?

OR

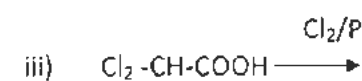
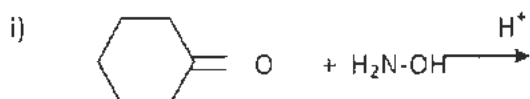
Calculate emf and $\Delta_r G$ of the following cell at 25°C:

Fe | Fe²⁺(0.001M) || H⁺(0.01M) | H₂(g)(1 bar) | Pt(s)

$$E^0(\text{Fe}^{2+} | \text{Fe}) = -0.44\text{V}$$

Q29

a) Write products of the following reactions:



b) Give simple chemical tests to distinguish between the following pairs of compounds:

- Ethanal and Propanal
- Phenol and Benzoic acid

OR

a) Account for the following:

- α -Hydrogen of ethanal is acidic in nature.
- Benzoic acid does not give Friedel-Crafts reaction.

b) Write the product formed when cyclohexanone reacts with following reagents:

- CH₃MgBr / H₃O⁺
- dilute NaOH

c) Distinguish between CH₂=CH-CO-CH₂-CH₃ and CH₂=CH-CH₂-CO-CH₃.

Q30

a) Account for the following:

- Interhalogens have higher boiling point than pure halogens.
- H₃PO₂ is stronger reducing agent than H₃PO₃.
- Reducing character decreases from SO₂ to TeO₂.

b) Draw structures of the following:

- H₄P₂O₇
- XeF₄

5

3

2

2,2,1

3,2

OR

a)

i) Which poisonous gas is evolved when white phosphorus is heated with conc. NaOH solution? Write chemical equation involved in the reaction.

ii) Among the noble gases, which one has the lowest boiling point?

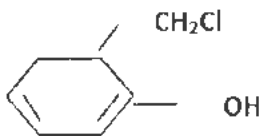
iii) Why is Fluorine stronger oxidizing agent than chlorine?

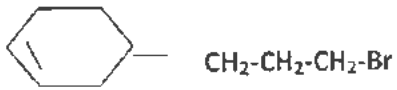
3,2

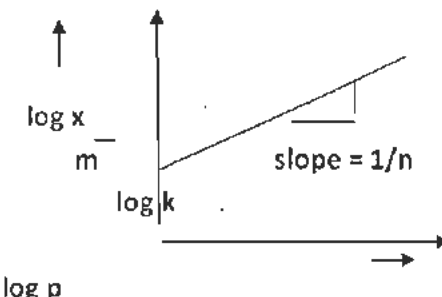
b) Draw structures of the following

i) $\text{H}_2\text{S}_2\text{O}_8$ ii) $(\text{HPO}_3)_3$

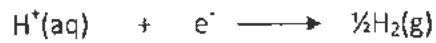
MARKING SCHEME (CHEMISTRY)
SAMPLE PAPER QUESTIONS

Q.no.	Answers	Marks
1	(c)	1
2	(c)	1
3	(b)	1
4	(d)	1
5	SO ₂ (g) on passing through KMnO ₄ decolourises its purple colour / SO ₂ (g) on passing through K ₂ Cr ₂ O ₇ changes its colour from orange to green. (Or any other suitable test)	1
6	It shows that all the six carbon atoms of glucose are in a straight chain.	1
7	It acts as an initiator.	1
8	Because of intramolecular hydrogen bonding in 2-nitrophenol whereas 4-nitrophenol is associated through intermolecular hydrogen bonding.	1
9	Positive deviation, Because of weaker interaction between ethanol and cyclohexane, the vapour pressure of solution becomes more than expected from ideal behaviour. OR i) Gas B, Because higher the K _H value, lower the solubility of gas in water. ii) Because addition of salt decreases the vapour pressure of water and therefore in order to boil the solution vapour pressure has to be increased which raise the boiling point.	1 1 ½, ½ 1
10	i) First order, unit of k: s ⁻¹ or min ⁻¹ ii) Slope = k / 2.303	½, ½ 1
11	i) Sulphur produces the cross-links at the reactive sites of vulcanized rubber and thereby improves its properties like hardness, tensile strength etc. ii) Buna-N < PVC < Nylon6,6	1 1
12	i) $2\text{MnO}_2 + 4\text{KOH} + \text{O}_2 \longrightarrow 2\text{K}_2\text{MnO}_4 + 2\text{H}_2\text{O}$ ii) $2\text{Na}_2\text{CrO}_4 + 2\text{H}^+ \longrightarrow \text{Na}_2\text{Cr}_2\text{O}_7 + 2\text{Na}^+ + \text{H}_2\text{O}$	1 1
13	i) HI < HBr < HCl < HF ii) H ₂ O < H ₂ S < H ₂ Se < H ₂ Te	1+1
14	i) Because of the resonance stabilization of allyl carbocation. ii) Because of resonance in chlorobenzene C-Cl bond acquires partial double bond character and hence shorter than C-Cl of CH ₃ -Cl where there is no resonance / or C of C-Cl in chlorobenzene is sp ² hybridized whereas of CH ₃ -Cl is sp ³ hybridized.	1 1
15	i) 	

	ii) 	1+1
16	(i) A = CH ₃ CN B = CH ₃ -CH ₂ NH ₂ (ii) A = C ₆ H ₅ CONH ₂ B = C ₆ H ₅ NC	½ + ½ ½ + ½
17	i) C ₆ H ₅ NH ₂ $\xrightarrow[273-278K]{NaNO_2 + HCl}$ C ₆ H ₅ N ₂ ⁺ Cl ⁻ $\xrightarrow{H_2O}$ C ₆ H ₅ -OH ii) C ₆ H ₅ CONH ₂ $\xrightarrow{Br_2 + KOH}$ C ₆ H ₅ NH ₂ $\xrightarrow[Pyridine]{CH_3COCl}$ C ₆ H ₅ NHCOCH ₃ (or by any other suitable method)	1+1
18	(i) Because it contains both acidic and basic groups in the same molecule. (ii) Phosphodiester linkage	1 1
19	$\Delta T_f = iK_f m$ $0.24 K = i \times 1.86 K kg mol^{-1} \times \frac{0.5 \times 1000 kg^{-1}}{74.5 g mol^{-1} 100}$ $i = 1.922$ $\alpha (\text{percentage ionization}) = \frac{i-1}{n-1}$ $= \frac{1.922-1}{2-1}$ $\alpha = 0.922 \text{ or } 92.2\%$	1 ½ ½ 1
20	$k = 2.303 \log \frac{p_t}{2p_t - p_t}$ $= \frac{2.303 \log 0.4}{100 \times 2 \times 0.4 - 0.7}$ $= \frac{2.303 \log 4}{100}$ $= \frac{2.303 \times 0.602}{100}$ $= 0.0138 atm^{-1}$	1 1 1

21	<p>(i) Role of NaCN in the extraction of gold is to do the leaching of gold ore in the presence of air from which the gold is obtained later by replacement.</p> $4\text{Au(s)} + 8\text{CN}^-(\text{aq}) + 2\text{H}_2\text{O} + \text{O}_2(\text{g}) \xrightarrow{\text{or}} 4[\text{Au(CN)}_2]^- + 4\text{OH}^-$ <p>(ii) SiO₂ is added in copper matte to convert the remaining FeS, FeO to slag.</p> $\text{FeO} + \text{SiO}_2 \xrightarrow{\text{or}} \text{FeSiO}_3(\text{slag})$ <p>(iii) Iodine is heated with Zirconium to form a volatile compound which on further heating decompose to give pure zirconium as shown:</p> $\text{Zr(impure)} + 2\text{I}_2 \longrightarrow \text{ZrI}_4$ $\text{ZrI}_4 \longrightarrow \text{Zr(pure)} + 2\text{I}_2$	1x3=3
22	<p>i) [Co(en)₃]³⁺, Because 'en' is a bidentate ligand and forms a chelate complex.</p> <p>ii) [Co(NH₃)₅Cl]SO₄</p> <p>iii) dsp³, Diamagnetic</p>	<p>½, ½</p> <p>1</p> <p>½, ½</p>
23	<p>i)</p>  <p>ii) Charge on sol and Solvent interaction</p>	<p>2</p> <p>1</p>
24	<p>i) Because of stable half filled 3d⁵ configuration whereas Fe²⁺ easily oxidizes to Fe³⁺ to achieve stable 3d⁵ configuration.</p> <p>ii) Because of no unpaired electrons in 3d orbital of Zn which causes weak metallic bonding.</p> <p>iii) Because of comparable energies of 5f, 6d and 7s orbitals.</p> <p style="text-align: center;">OR</p> <p>i) Because of varying stability of 5f⁰, 5f⁷ and 5f¹⁴ configurations.</p> <p>ii) Because of its low enthalpy of hydration and high enthalpy of atomization.</p> <p>iii) Because of the presence of unpaired electrons in 3d orbitals of Cr, strong metallic bonding makes it hard whereas no unpaired electrons in 3d orbitals of Zn makes it soft.</p>	<p>1x3=3</p> <p>1x3=3</p>

28 . (a)



reaction is feasible at cathode because reduction electrode potential of H^+/H_2 is more than Na^+/Na .

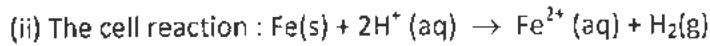
b). Because overall reaction of mercury cell does not contain any ions whose concentration is variable.

$$\text{c) } k = \frac{1}{R} \left(\frac{l}{A} \right)$$

$$0.15 \times 10^{-3} \text{ Scm}^{-1} = \frac{1}{1500 \text{ S}^{-1}} \left(\frac{l}{A} \right)$$

$$\begin{aligned} l/A &= 0.15 \times 10^{-3} \times 1500 \text{ cm}^{-1} \\ &= 0.225 \text{ cm}^{-1} \end{aligned}$$

OR



$$E_{\text{cell}}^{\circ} = E_{\text{c}}^{\circ} - E_{\text{a}}^{\circ}$$

$$= [0 - (-0.44)] \text{V} = +0.44 \text{V}$$

$$E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{0.059}{2} \log \frac{[\text{Fe}^{2+}]}{[\text{H}^+]^2}$$

$$E_{\text{cell}} = 0.44 \text{ V} - \frac{0.059}{2} \log \frac{(0.001)}{(0.01)^2}$$

$$= 0.44 \text{ V} - \frac{0.059}{2} \log (10)$$

$$\begin{aligned} &= 0.44 \text{ V} - 0.0295 \text{ V} \\ &= 0.410 \text{ V} \end{aligned}$$

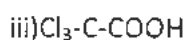
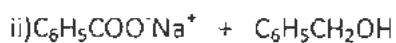
$$\Delta_r G = -nFE_{\text{cell}}$$

$$= -2 \times 96500 \text{ C mol}^{-1} \times 0.410 \text{V}$$

$$= -79130 \text{ Jmol}^{-1} \text{ or } -79.130 \text{ kJmol}^{-1}$$

29

(a)



1x3=3

(b)

i) *Ethanal and Propanal*

Iodoform test. Warm each compound with iodine and sodium hydroxide on a water bath.

Propanal (CH_3CH_2CHO) No yellow ppt formed

Ethanal (CH_3CHO) Yellow crystals of Iodoform are formed.

(Other relevant test can be accepted)

(ii) *Phenol and Benzoic acid.*

$FeCl_3$ test. Add a few drops of neutral $FeCl_3$ solution.

Phenol (C_6H_5OH), violet coloured ppt. is produced.

Benzoic acid (H_5C_6COOH), no ppt. is produced.

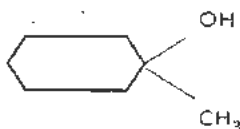
1+1

OR

a) i) Because of resonance stabilisation of its conjugate base (enolate anion).

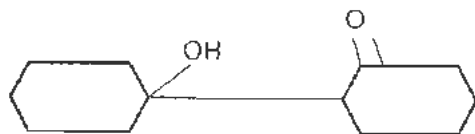
ii) Because the carboxyl group gets bonded to the catalyst anhyd. $AlCl_3$ (Lewis acid).

b) i)



1+1

ii)



c) **Iodoform test.** Warm each compound with iodine and sodium hydroxide on a water bath.

$(CH_2=CH_2-CO-CH_2-CH_3)$: No yellow ppt formed

$(CH_2=CH_2-CH-CO-CH_3)$: Yellow crystals of Iodoform are formed

1+1

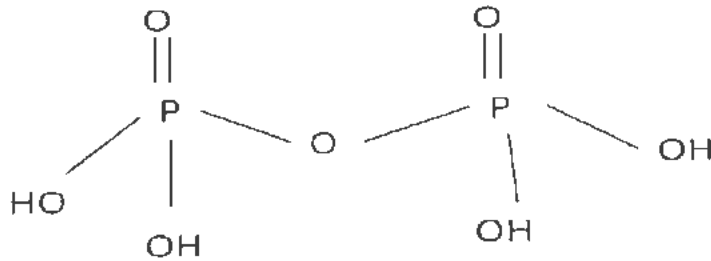
1

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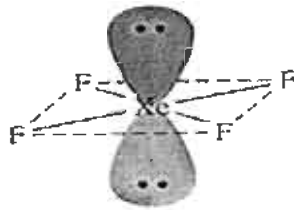
- (a)
 (i) Because interhalogens are polar due to electronegativity difference whereas pure halogens are non-polar.
 (ii) Because of the presence of two P-H bonds.
 (iii) Because the stability of +4 oxidation state increases from S to Te.

1x3=3

(b) i)



ii)

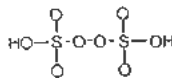


OR

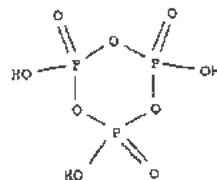
i) PH_3 gas

ii) Helium

iii) Because of low bond dissociation enthalpy and high hydration enthalpy.



b) i)



ii)

1+1

 $\frac{1}{2}$ $\frac{1}{2}$

1

1

1+1

