CHEMISTRY

CLASS XII

DESIGN OF THE QUESTION PAPER

Time : 3 Hrs. **Max. Marks : 70**

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

1. Weightage to Learning Outcomes

S.NO.	OBJECTIVE	MARKS	PERCENTAGE
1.	Knowledge (K)	21	30
2.	Understanding (U)	35	50
3.	Application and skill (A&S)	14	20
	TOTAL	**70**	**100**

2. Weightage to Content/Subject units

	UNIT	MARKS
I.	Atomic Structure and Chemical Bonding	5
II.	The Solid state	4
III.	Solutions	4
IV.	Thermodynamics	4
V.	Electrochemistry	5
VI.	Chemical Kinetics	4
VII.	Surface Chemistry	3
VIII.	p-Block Elements	7
IX.	d-and f - Block elements	3
X.	Coordination Compounds and Organomentallics	3
XI.	Nuclear Chemistry	3

	UNIT	MARKS
XII.	Stereo Chemistry	2
XIII.	Organic Compounds with Functional Groups containing Oxygen -I	2
XIV.	Organic Compounds with Functional Groups containing Oxygen - II	4
XV.	Organic Compounds with Functional Groups containing Nitrogen	4
XVI.	Polymers	2
XVII.	Biomolecules	5
XVIII.	Chemistry in everyday life	3
	Total	**70**

3. Weightage to form of questions

S.No.	Form of questions	Marks for each question	No. of questions	Total marks
1.	Long Answer Type Qs.(LA)	5	3	15
2.	Short Answer Qs. II (SAII)	3	12	36
3.	Short Answer Qs. I (SAI)	2	7	14
4.	Very Short Answer Type Qs. (VSA)	1	5	5
	Total	–	**27**	**70**

Note : The expected length of answer and time taken under different forms of questions shall be as follows :

S.NO.	Form of Question	Expected Length	Expected time for each question	Total Expected time
1.	VSA Type	One word to one sentence	2 Minutes	10 Minutes
2.	SA-I Type	20 to 30 words	5 Minutes	35 Minutes
3.	SA-II Type	30 to 40 words	7 Minutes	84 Minutes
4.	E/LA Type	70 to 80 words	15 Minutes	45 Minutes
			Total Time	**174 Minutes**

This is only an approximation. Though the students are advised to be as near the approximation as possible the actual length, however, may vary. As the total time is calculated on the basis of the number of questions required to be answered and the lengths of their anticipated answers, it would therefore, be advisable for the candidates to manage their time properly by avoiding details not required.

4. **Scheme of Options**

(1) There will be no overall choice

(2) Internal choice (either/or type) in five questions is to given in questions testing higher mental abilities in the following types of questions :-

(i) One in two marks questions (SA-I Type)

(ii) One in three marks questions (SA-II Type)

(iii) All the three in five marks questions (E/LA Type)

5. **Guidelines for evaluation in organic chemistry units and numericals.**

i) **Organic Chemistry Units :**

a. **Two conversions** involving not more than 2 steps each — 2 marks

OR

One application question on conversions involving four unknown compounds

b.	Two distinctions	2 marks
c.	IUPAC nomenclature	1 marks
d.	Reasoning questions	2 marks
e.	Mechanism	1 marks
f.	Name Reactions	2 marks
g.	Stereochemistry	2 marks
		12 marks

ii) Numericals :

Weightage of about 12 marks in total has been assigned to numericals.

6. Weightage to difficulty level of questions

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

A question may vary in difficulty level from individual to individual. As such, the approximation in respect of each question will be made by the paper setter on the basis of general expectation from the group as a whole taking the examination. This provision is only to make the paper balanced in nature rather than to determine the pattern of marking at any stage.

BLUE PRINT–I

CHEMISTRY – CLASS XII

Time : 3 Hours **Max Marks : 70**

Objectives ⟶	Knowledge				Understanding				Application				Total
Unit ↓	VSA(1)	SAI(2)	SAII(3)	LA(5)	VSA(I)	SAI(2)	SAII(3)	LA(5)	VSA(1)	SAI(2)	SAII(3)	LA(5)	
1. Atomic structure						2(1)	3(1)						5(2)
2. Solid State	1(1)						3(1)						4(2)
3. Solutions					1(1)		3(1)						4(2)
4. Thermodynamics										2(1)	3(1)		5(2)
5. Electrochem.								5(1)					5(1)
6. Chem. kinetics							3(1)		1(1)				4(2)
7. Surface Chem.			3(1)										3(1)
8. p-block elements		2(1)		5(1)									7(2)
9. d and f block elements.								5(1)					5(1)
10. Coord. Compounds											3(1)		3(1)
11. NuclearChem.			3(1)										3(1)
12. Stereo Chem.		2(1)											2(1)
13. Org comp.-O-I										2(1)			2(1)
14. Org comp.-O-II					1(1)		3(1)						5(1)
15. Org. Ncomp.					1(1)						3(1)		4(2)
16. Polymers						2(1)							2(1)
17. Biomolecules		2(1)	3(1)										5(2)
18. Chemistry in Everyday life							3(1)						3(1)
Total		21 (8)					35 (13)			14 (6)			70 (27)

SAMPLE QUESTION PAPER –I

CHEMISTRY

CLASS XII

Time : 3 Hours **Max. Marks : 70**

General Instructions :

(i) All questions are compulsory

(ii) Marks for each question are indicated against it.

(iii) Question numbers 1 to 5 are very short-answer question, each of one mark. Answer these in one word or about one sentence each.

(iv) Question numbers 6 to 12 are short answer questions of two marks each. Answer these in about 30 words each.

(v) Question numbers 13 to 24 are short answer questions of 3 marks each. Answer these in about 40 words each.

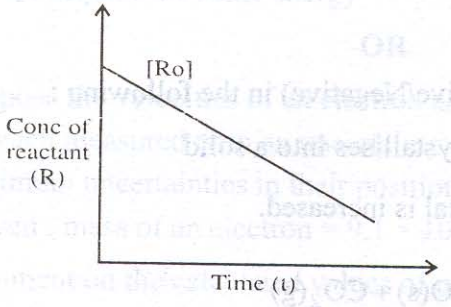
(vi) Question numbers 25 to 27 are Long-answer questions of 5 marks each. Answer these in about 70 words each.

(vii) Use log tables if necessary. Calculators are not permitted.

1 How many effective sodium ions are located at the centres of edges of a unit cell in a sodium chloride crystal? 1

2 A reaction :

Reactant $\longrightarrow$ Product is represented by



Predict (i) the order of the reaction in this case 1

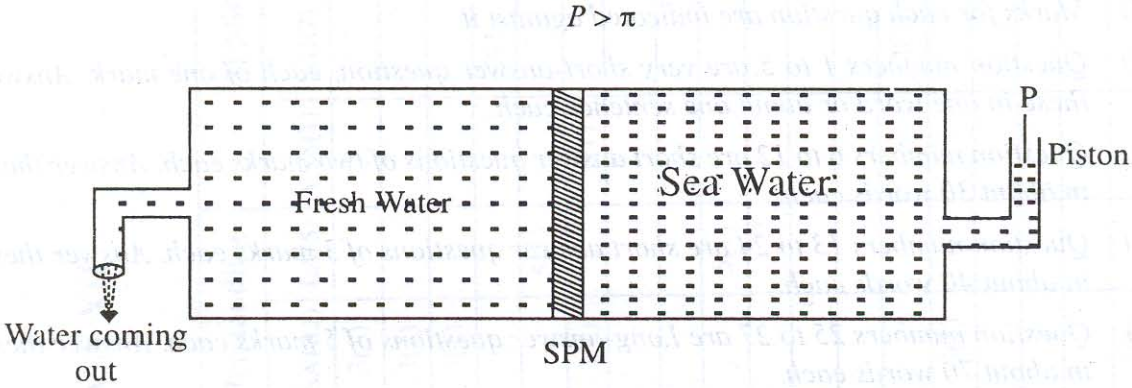
(ii) what does the slope of the graph represent.

3 Propose the mechanism for the following reaction :

$$CH_3CHO + HCN \xrightarrow{H^+} H_3C - \underset{\displaystyle OH}{\underset{|}{CH}} - CN$$ 1

4 Write the IUPAC name of the compound 1

5 Carefully examine the diagram and name the process involved : 1



6 Identify the type of inter-molecular forces that exist between the following pairs :

(i) Na^+ ion and water molecules

(ii) Ag^+ ion and I^- ion 2

(iii) Argon and Argon

(iv) HF and H_2O

7 Predict the entropy change (Positive/Negative) in the following : 2

(i) A liquid substance crystallises into a solid

(ii) Temperature of crystal is increased.

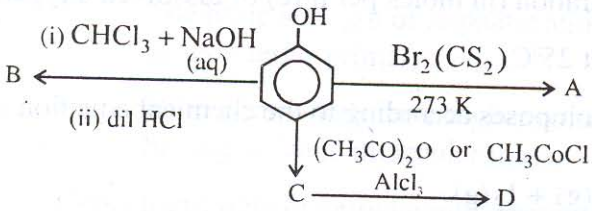
(iii) $CaCO_3(s) \longrightarrow CaO(s) + CO_2(g)$

(iv) $N_2(g)(1atm) \longrightarrow N_2(g)(0.5atm)$

8 How is $\left[(CH_3)_2SiO\right]_n$ prepared? Write its two applications. 2

9 What is a stereospecific reaction? Give one example of this reaction. 2

10 Identify A, B, C and D in the following reactions.



2

OR

Write the reactions and conditions involved in the following conversions?

(i) Acetic acid into ethyl alcohol

(ii) Cumene into phenol 2

11 " The presence of benzoquinone inhibits the free rodical polymerisation of a Vinyl derivative" Explain. 2

12. What are anomers? How many anomers of glucose are known? Name them. 2

13. (a) Calculate the energy of photon which is necessary to raise an electron in hydrogen atom from n=1 to n=3 energy level? (Given the ionization energy of hydrogen atom is $1.312 \times 10^3 \times$ Jmol^{-1} and $N_A = 6.02 \times 10^{23}$ mol^{-1}).

(b) Which of the following excitations requires maximum energy? 2

$n_1 \longrightarrow n_2$

$n_2 \longrightarrow n_3$

$n_3 \longrightarrow n_4$

or – all require the same energy 1

OR

(a) Suppose the velocities of an electron and a rifle bullet of mass 0.03kg are each measured with an uncertainty of $\Delta v = 10^{-3}$ ms^{-1} calculate the minimum uncertainties in their positions.
(Given : mass of an electron = 9.1×10^{-31} kg) 2

(b) Comment on the calculated values of uncertainties in positions in the two cases. 1

14. Explain the following terms with suitable examples :

(i) Ferrimagnetism

(ii) n – type semiconductor

(iii) forbidden zone 3

Q.15 The Henry law constant for oxygen dissolved in water is 4.34×10^4 atm at 25^0C. If the partial pressure of oxygen in air is 0.2 atm. under ordinary atmospheric conditions. Calculate the concentration (in moles per litre) of dissolved oxygen in water in equilibrium with air at 25^0C. 3

Q.16 At elevated temperatures, HI decomposes according to the chemical equation :

$$2HI(g) \longrightarrow H_2(g) + I_2(g)$$

at 443^0C. The rate of the reaction increases with concentration of HI, as shown in the following table :

	1	2	3
HI (mol L^{-1})	0.005	0.01	0.02
Rate (mol L^{-1} s^{-1})	7.5×10^{-4}	3.0×10^{-3}	1.2×10^{-2}

(a) Determine (i) order of this reaction and (ii) write the rate expression. 3

(b) Calculate the rate constant and give its units.

Q.17 (a) Among the iron complexes, $K_3[Fe(CN)_6]$ in weakly Paramagnetic whereas $K_3[FeF_6]$ is highly paramagnetic, explain.

(b) Define crystal field orbital splitting energy.

(c) Write the shape of $Fe(CO)_5$ molecule.

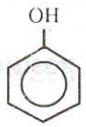
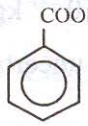
Q.18 Represent the following using a nuclear equation each : 3

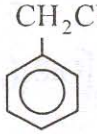
(i) Production of C-14 in nature

(ii) β - emission

(iii) K - capture

Q.19 Write chemical tests to distinguish between the following pair of compounds :

(a) (i)  and 

(ii)  and CH_3COCH_3

(b) Write a chemical equation examplifying Clemmensen reduction. 3

Q.20 Give reasons for the following : 3

(a) (i) The basic strength of aliphatic amines in solution is of the order of sec> tert > primary.

(ii) Nitro compounds have higher boiling point than hydrocarbons having $\approx$ same molecular mass.

(b) Give an example of carbylamine reaction.

Q.21 (a) Which bonds in the back bone of a peptide can rotate freely and which cannot? Give reasons.

(b) Write one difference between parallel and antiparallel β pleated sheets. Give one example of parallel β pleated sheet. 3

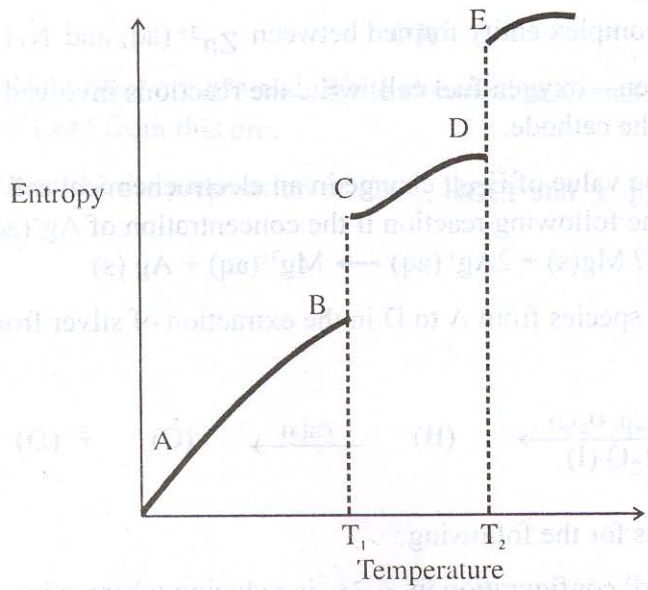
Q.22 Answer the following :

(a) " An unknown fibre (A) is stronger than steel, stiffer than titanium and lighter than aluminium". What could the fibre (A) be?

(b) Why are liquid propellants favoured over solid propellants?

(c) What type of medicines are Omeprazole and Lansoprazole? 3

23. The change in entropy with respect to temperature in case of a sample is graphically represented below :



Carefully analyse the graph and answer the following : 3

(i) What does T_1 and T_2 indicate ?

(ii) What does AB Curve show ?

(iii) What does BC curve show ? Why temperature does not change?

24. Describe the following giving one example each :

(a) Mechanism of heterogeneous catalysis

(b) Hardy Schulze Rule (1½ + 1½)

25. (a) Write the reactions occurring during the electrolysis of :

(i) Sulphuric acid at the anode.

(ii) Aqueous Silver Nitrate solution using silver electrodes.

(iii) Aqueous sodium chloride Solution.

(b) (i) Write the anodic and cathodic reactions involved during the discharging of lead storage battery.

(ii) How many Faradays of electric charge is involved per mole of H_2SO_4 consumed. when the lead storage battery is in use? (3,2)

OR

(a) In a Leclanche cell, write the following :

(i) The chemical equations involved at the cathode.

(ii) Change in the Oxidation state of Mn.

(iii) The complex entity formed between Zn^{2+} (aq) and NH_3 (g) (1, ½, ½)

(b) In a hydrogen – oxygen fuel cell, write the reactions involved at the anode and the cathode. (1)

(c) How will the value of Ecell change in an electrochemical cell involving the following reaction if the concentration of Ag^+(aq) is increased? $Mg(s) + 2Ag^+(aq) \longrightarrow Mg^{2+}(aq) + Ag(s)$ (2)

26 (a) Identify the species from A to D in the extraction of silver from its ore (A)

$$(A) \xrightarrow[H_2O\ (l)]{CN(aq),\ O_2(g)} (B) \xrightarrow{Zn(s)} (C) + (D)$$ (2)

(b) Give reasons for the following :

(i) With d^4 configuration in Cr^{2+} is reducing whereas in Mn^{3+} is oxidising.

(ii) Interstitial compounds are well known for transition metals.

(iii) The highest oxidation state of a metal is exhibited in oxides and fluorides. (3)

OR

Answer the following

(a) $K_2Cr_2O_7$ is orange in colour but turns yellow in an alkaline medium, why?

(b) Draw the structure of dichromate and chromate ion.

(c) Name metals extracted from the ores (i) cinnabar (ii) Proustite.

(d) Transitonal elements have high heat of atomisation why?

(e) Silver halides dissolve in thiosulphate solution. Write chemical reaction and the structure of silver complex formed in the reaction.

27. Account for the following :-

i) All the bonds in PCl_5 are not equivalent.

ii) Sulphur in vapour state exhibits paramagnetism.

iii) Fluorine is the strongest oxidant amongst the halogens.

iv) Among the noble gases, only xenon is known to form true chemical compounds.

v) PbO_2 is a stonger oxidising agent than SnO_2. (5)

OR

(i) Name chief ore of Lead. Write chemical reactions involving the extraction of Lead from this ore.

(ii) Describe the preparation of ClO_2, HOCl and XeF_4.

MARKING SCHEME–I

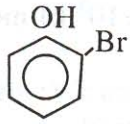
SAMPLE QUESTION PAPER-I

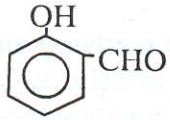
CHEMISTRY

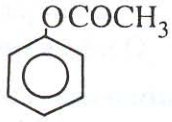
Note : The marking scheme given here does not include complete detailed answers for all the questions. At few places, the actual answer is too obvious and therefore, only the scheme of distribution of marks has been indicated. Students are advised to write complete answers in the actual examination.

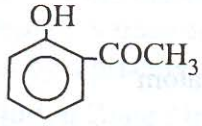
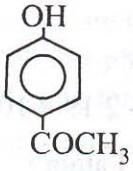
Q.No.	Value Points	Marks	T. Marks
1.	3	1	1
2.	(*i*) Zero order reaction	½	1
	(*ii*) Slope = – K	½	
3.	$CH_3-C(=O)-H \underset{H^+}{\overset{CN^-}{\rightleftharpoons}} CH_3-\underset{H}{\underset{\vert}{C}}(O^-)-CN \overset{H^+}{\rightleftharpoons} CH_3-\underset{OH}{\underset{\vert}{C}}(OH)-CN$	1	1
4.	4–Methyl nitrobenzene **OR** 4–Nitro toluene	1	1
5.	Reverse Osmosis	1	1
6.	(*i*) ion – dipole attraction	½	2
	(*ii*) ion–ion attraction	½	
	(*iii*) Dispersion forces	½	
	(*iv*) H-bonding	½	
7.	(*i*) decreases	½	2
	(*ii*) increases	½	
	(*iii*) increases	½	
	(*iv*) increases as the volume increases	½	
8.	$2CH_3Cl + Si \xrightarrow[370K]{Cu} (CH_3)_2SiCl_2 \xrightarrow{H_2O} [(CH_3)_2SiO]_n$	1	
	Uses : (1) Electrical insulators	½	2
	(2) Greases		
	or any other uses	½	
9.	A reaction is stereospecific when a particular stereoisomeric form of the starting material reacts in such a way that it gives streoisomeric form of the product.	1	1

Example : Addition of halogens to alkenes or any other suitable example.

10. A =  or  ½

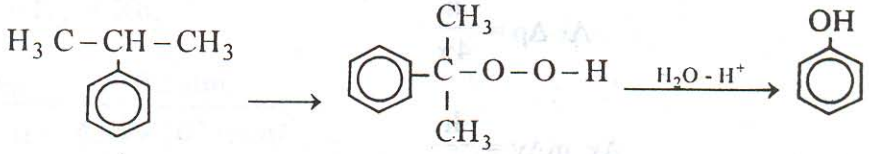
B =  ½

C =  ½ 2

D =  or 

OR

(i) $CH_3COOH \xrightarrow[(ii)\ H_2O]{(i)\ LiAlH_4} CH_3CH_2OH$ ½

(i)  ½

11. Benzo quinone traps the radial intermediate to form a non reactive radical. which is highly stabilised by resonance : Because of the lack of reactivity of this intermediate, further progress of the chain reaction is interrupted and the reaction stops 2

12. Isomers which differ in streochemistry at C_1 in cyclic structure ½

Two anomers : ½

α–D–glucose ½ } 2

β–D–gucose ½

Q.No.	Value Points	Marks	T. Marks

13. (*a*) $E_n = \dfrac{-IE}{n^2}$ ½

Energy of the electron in the first shell = $\dfrac{-IE}{1^2} = -1.312 \times 10^3 \text{ kJ mol}^{-1}$

$$= \frac{-1.312 \times 10^6 \text{ J mol}^{-1}}{6.02 \times 10^{23} \text{ atoms mol}^{-1}} = -0.219 \times 10^{-17} \text{ J atom}^{-1}$$ 3

$$= -2.19 \times 10^{18} \text{ J atom}^{-1}$$ ½

Energy of the electron in the third shell = $\dfrac{-IE}{(3)^2}$

$$= \frac{-2.19 \times 10^{-18}}{9} \text{ J atom}^{-1}$$ ½

$$= -0.244 \times 10^{-18} \text{ J atom}^{-1}$$

$\Delta E = E_3 - E_1 = [-0.244 \times 10^{-18} - (-2.19 \times 10^{-18})] \text{ J atom}^{-1}$

$$= 1.95 \times 10^{-18} \text{ J atom}^{-1}$$

Energy of photon = 1.95×10^{-18} J. ½

(*b*) $n_1 \rightarrow n_2$ 1

OR

$$\Delta x \, \Delta p = \frac{h}{4\pi}$$ ½

$$\Delta x . \, m\Delta v = \frac{h}{4\pi}$$

$$\Delta x = \frac{h}{4\pi \, m \, \Delta v}$$

$$\Delta x \text{ for electron} = \frac{6.625 \times 10^{-34}}{4 \times 3.14 \times 9.1 \times 10^{-31} \times 10^{-3}}$$ 3

$$= 0.05796 \text{m}$$ 1

$$\cong 0.058 \text{m}$$

$$\Delta x \text{ for bullet} = \frac{6.625 \times 10^{-34}}{4 \times 3.14 \times 0.03 \times 10^{-3}}$$

$$= 1.76 \times 10^{-30} \text{ m} \quad 1$$

Comments : We can approximately measure macroscopic object's position as the error calculated is neglible but not microscopic object's position. ½

14. (i) **Ferrimagnetism :** When magnetic moments (electron spins) in a substance align in parallel and antiparallel directions in unequal numbers so that there is net dipole moment, the substance is ferrimagnetic. ½

Example : Fe_3O_4, $M_2^+ Fe_2O_4$ where M = Mg. Cu, Zn (any one) ½

(ii) **n-type semiconductor :** It is formed when impurity atom containing more valency electrons than the parent insulator atom is introduced into it. The unbounded electrons are the current carriers. ½

Example : A trace amount of phosphorus on adding to extremely pure silicon by a process called doping forms an n - type semiconductor. ½

(iii) **Forbidden Zone :** In case of insulators, the energy gap between valence band and the conduction band is so great that electrons cannot easily jump from valence band to conduction band hence practically no electrical conductivity is observed.

Example : Silicon and Germanium (any one)

15. Mole fraction of oxygen in the solution :

$$p_{O_2} = K_H \times X_{O_2}$$

$$X_{O_2} = \frac{p_{O2}}{k_{-H}} = \frac{0.2 \text{ atm}}{4.34 \times 10^4 \text{ (atm)}}$$

$$= 4.6 \times 10^{-6} \quad ½$$

changing from mole fraction to molarity

$$n_{H_2O} = \frac{1000}{18} = 55.5 \text{ moles}$$

$\because$ x_{O_2} is very small as compared to X_{H_2O}

$$n_{O_2} + n_{H_2O} \approx n_{H_2O}$$

$$x_{O_2} = \frac{n_{O_2}}{n_{H_2O}} \quad ½ \quad 3$$

$$x_{O_2} \times n_{H_2O} = n_{O_2}$$

$4.6 \times 10^{-6} \times 55.5 = n_{O_2} = 2.6 \times 10^{-4}$ moles ½

Molarity = $\mathbf{2.6 \times 10^{-4}\ M}$ 1 3

16. $r_1 = k\,[HI]^n$ ...(1)

$r_2 = k\,[HI]^n$ ...(2)

(a) $\dfrac{r_1}{r_2} = \dfrac{K[HI]^n}{K[HI]^n}$

$= \dfrac{3.0 \times 10^{-3}}{7.5 \times 10^{-4}} = \dfrac{(0.01)^n}{(.005)^n} \Rightarrow 4 = 2^n \Rightarrow n = 2$

$\therefore$ Order of Reaction = 2 1 3

Rate Expression : Rate = $k[HI]^2$

(b) Rate = $k[HI]^2$

$7.5 \times 10^{-4} = k\,[0.005]^2$

$\Rightarrow k = \dfrac{7.5 \times 10^{-4}}{(0.005)^2} = 30$ L mol^{-1} s^{-1} 1

17. (a) Since F^- ion is a weak ligand, **d** - electrons remain unpaired whereas CN^- ion is a strong ligand and electrons get paired up. 1

(b) The energy difference (Δ) between the lower and higher orbitals obtained as a result of spliting of **d** - orbitals in a crystal field is known as spliting energy. 1 3

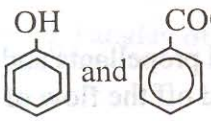
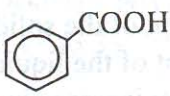
(c) Trigonal bipyramidal. 1

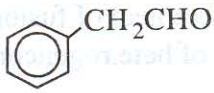
18. (i) $^{14}_{7}N + {}^{1}_{0}n \longrightarrow {}^{14}_{6}C + {}^{1}_{1}H$ 1

(ii) $^{234}_{90}Th \longrightarrow {}^{234}_{91}Pa + \beta$ 1

(iii) $^{133}_{56}Ba + e^- \longrightarrow {}^{133}_{57}Cs + X\text{-ray}$ 1

Q.No.	Value Points	Marks	T. Marks

19. (a) (i)  and can be chemically distinguished by adding $NaHCO_3$ to both the containers. Evolution of $CO_2(g)$ i.e. effervescence indicates presence of  Or any other suitable test. 1

(ii) Add Tollen's reagent to both the containers, the container in which silver mirror is formed indicates  or any other suitable test. 1

(b) Clemmensen reduction : $>C=O \xrightarrow[HCl]{Zn-Hg} >CH_2 + H_2O$ 1

3

20.(a) (i) Basic character of Amines is due to the electron density on the N atom. Alkyl group is an electron releasing group which increases the electron density on the N atom. Hence electron density will be the greatest on N atom in the tertiary amines. But because of steric hidrance, the capture of proton H^+ is obstructed and hence the given order. 1

(ii) Due to polar nature, the boiling points of nitro compounds are usually high in comparison with hydrocarbons having ≈ same molecular mass. 1

(b) Carbylamine reaction :

$$RNH_2 + CHCl_3 + 3KOH \longrightarrow RNC + 3KCl + 3H_2O$$ 1

21. (a) Due to the partial double bond character of C - N bond on the peptide linkage, the amide part ie $-\overset{\overset{O}{\|}}{C}-N-$ is planar and rigid ie no free rotation about this bond is possible.

∴ No free rotation around peptide (amide) bond. 1½

∴ Free rotation around the bonds connecting to amide bond to α -carbons.

(b) The N terminals are aligned head to head ie. on the same side in the parallel β pleated sheet conformation and are aligned head to tail ie N - terminal of one chain and C– terminals of another chain are on the same side in antiparallel β – pleated sheet is parallel in keratin 1½

Q.No.	Value Points	Marks	T. Marks
22.	(a) Carbon fibre	1	
	(b) Liquid propellants give higher thrusts than solid propellants and the thrust can be controlled by switching on and off the flow of the propellant.	1	3
	(c) Antacids.	1	
23.	(i) T_1 indicates m.pt of the solid.	½	
	T_2 indicates b.pt of the liquid.	½	
	(ii) AB curve shows increase in entropy of solid with increase in temperature.	1	3
	(iii) BC curve shows change of solid $\longrightarrow$ Liquid $\because$ of latent heat of fusion	½	
24.	An example of hete.rogeneons catalysis :		
	(a) $CH_2 = CH_2\ (g) + H_2(g) \xrightarrow{Ni/Pt/pd} CH_3 - CH_3\ (g)$		
	Machanism : Steps involved		
	(i) Chemical adsorpton of C_2H_4 and H_2 onto the surface of metals.		
	(ii) H_2 splits into H atoms which get chemically bound to the solid catalyst i.e. metal atom (M) $H - H(g) + 2M(s) \rightleftharpoons 2\,M - H$ This step is the rate determining step in the overall process.		
	(iii) The H atoms migrate over the surface of the metal and enventually collide with an adsorbed C_2H_4 molecule and the reaction takes place. $C_2H_4(g) + 2M - H \rightleftharpoons C_2H_6(g) + 2M(s)$	1½	
	(b) Hardy - Schulze Rule :		
	(i) The ions carrying charge opposite to that of sol particles are effective in causing the coagulation of the Sol	½	3
	(ii) Coagulating power of an electrolyte is directly proportional the fourth power of the valency of the ions causing coagulation.	½	
	Example : For the coagulation of Sols carrying negative charge (like As_2S_3 Sol) Fe^{3+} ions are more effective than Ba^{2+} or Na^+ ions.	½	
25.	(i) $2H_2O\ (l) \longrightarrow O_2(g) + 4H^+\ (ag) + 4e^-$ (in dilute solution)	½	
	$2SO_4^{2-}(aq) \longrightarrow S_2O_8^{2-}(aq) + 2e^-$ (In Conc. Solution)	½	
	(ii) at anode : $Ag(s) \longrightarrow Ag^+(aq) + e^-$	½	
	at cathode : $Ag^+(aq) + e^- \longrightarrow Ag(s)$	½	
	(iii) at anode : $2Cl^-(aq) \longrightarrow Cl_2(g) + 2e$	½	5
	at cathode : $2H_2O + 2e^-(aq) \longrightarrow H_2(g) + 2OH^-_{(aq)}$		
	(b) (i) at anode : $Pb_{(s)} + SO_4^{2-}{}_{(aq)} \longrightarrow PbSO_4(s) + 2e^-$	½	
	at cathode : $PbO_2 + SO_4^{2-}{}_{(aq)} + 4H^+_{(aq)} + 2\bar{e} \longrightarrow PbSO_{4(s)} + 2H_2O_{(l)}$	½	

Q.No.	Value Points	Marks	T. Marks

(ii) 1 Faraday of electric charge per mole of H_2SO_4 is consumed 1

OR

(a) (i) $MnO_2 + NH_4^+ + e^- \longrightarrow MnO(OH) + NH_3$ 1

(ii) Change in oxidation state is from 4+ to 3+ ½

(iii) $[Zn\ (NH_3)_4]^{2+}$ ½

(b) at anode $2H_{2(g)} + 4\overline{OH}_{(aq)} \longrightarrow 4H_2O + 4\bar{e}$ ½ 5

at cathode : $O_2 + 2H_2O + 4e^- \longrightarrow 4OH^-$ ½

(c) The cell potential remains constant during its life in low current devices. since $E_{cell} = E^0_{cell} - \frac{0.0591}{2} \log \frac{[Mg^{2+}]}{[Ag^+]^2}$ 2

26. (a) $A \longrightarrow Ag_2S$ ½

$B \longrightarrow [Ag(CN)_2]^-$ ½ 5

$C \longrightarrow [Zn(CN)_4]^{2-}$ ½

$D \longrightarrow Ag$

(b) (i) The third ionization energy is relatively low as it results in d^3 configuragion which is more stable than d^4 whereas in the case of Mn, the third lonisation energy is very high as the third electron is to be removed from an extra stable d^5 configuration. 1

(ii) Because small atoms like H, N and C can enter into the voids sites between the packed atoms of the crystalline metal. 1

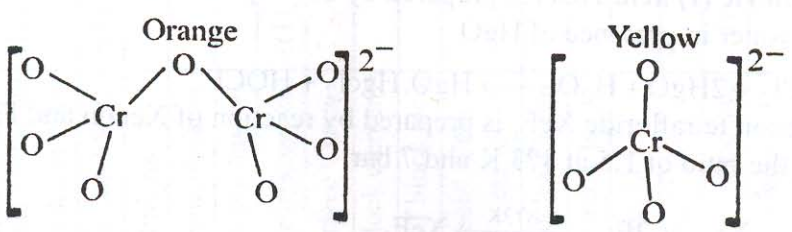
(iii) Because of small size of thier atoms O and F they can form strong bonds which may also facilitate the multiple bonding. 1

OR

(a) Chromate and dichromate are inter convertible in aqueus solution depending on PH of the solution. ½+½

$Cr_2O_7^{2-} + 2\overline{OH} \longrightarrow 2CrO_4^{2-} + H_2O$

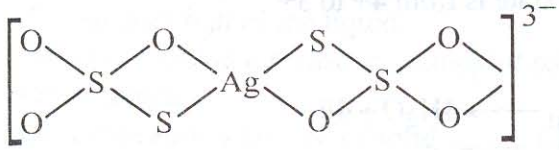
(b)



(c) (i) Cinnabar :- mercury (ii) Proustite :— Silver ½+½

(d) due to strong interatomic attraction in d-orbitals (n–1) d electrons.

(e) $AgBr + 2Na_2S_2O_3 \longrightarrow Na_3[Ag(S_2O_3)_2] + NaBr$ 1



27. (i) There are two axial and three equatorial bonds in PCl_5 molecule as a result of sp^3 d hybridisation. There is repulsive force between the electrons in the axial plane and equitorial plane which results in the axial elongation of bonds. 1

(ii) Sulphur in vapour state forms some S_2 molecules which like O_2 molecules contain unpaired electrons and hence paramagnetic in nature. 1 5

(iii) Because of the lower bond energy of F-F bond and higher hydration energy of F^- ions. 1

(iv) Xenon has the lowest ionisation energy among the noble gases

(v) The lower oxidation state gets stablished with increase in atomic number in the same group of p-block elements (inert pair effect), hence PbO_2 is a stronger oxidant than SnO_2 1

OR

27. (i) Chief are of Lead in Galena Pbs. ½+½

Reactions occuring in blast furance are

$$2PbS + 3O_2 \longrightarrow 2PbO + 2SO_2$$ ½

$$PbS_{(s)} + 2PbO_{(s)} \longrightarrow 3Pb_{(Cl)} + SO_{2(g)}$$ ½

(ii) Chlolrine dioxide ClO_2 as prepared by reduction of ClO_3^- with SO_2 in strongly acidic medium.

$$2NaClO_{3(aq)} + SO_{2(g)} \xrightarrow{\text{acid}} 2ClO_{2(g)} + Na_2SO_{4(aq)}$$

Chloric (I) acid HOcl is prepared by disproportionation of chlorine in water in presence of HgO

$$2Cl_2 + 2HgO + H_2O \longrightarrow HgO.Hgcl_2 + HOCl$$

Xenon tetrafluride XeF_4 is prepared by reaction of Xenon and F_2 in the ratio of 1:5 at 873 K and 7 bar.

$$Xe_{(g)} + 2F_{2(g)} \xrightarrow[7bar]{873K} XeF_4$$ 1

BLUE PRINT–II
CHEMISTRY
CLASS XII

Time : 3 Hours **Max Marks : 70**

Objectives →	Knowledge				Understanding				Application				Total
Units ↓	VSA(1)	SAI(2)	SAII(3)	LA(5)	VSA(I)	SAI(2)	SAII(3)	LA(5)	VSA(1)	SAI(2)	SAII(3)	LA(5)	
1. Atomic Structure & Chemical Bonding	1(1)					2(1)	3(1)						5(2)
2. The Solid State	1(1)						3(1)						4(2)
3. Solutions							3(1)						4(2)
4.Thermodynamics						2(1)					3(1)		5(2)
5. Electrochmistry						2(1)					3(1)		5(2)
6. Chem. kinetics	1(1)						3(1)		1(1)		3(1)		4(2)
7. Surface Chem.			3(1)										3(1)
8.p-block elements				5(1)		2(1)							7(2)
9.d & f block elem								5(1)					5(1)
10. Coord. Com. Orig. metalics			3(1)								3(1)		3(1)
11. NuclearChem.			3(1)										3(1)
12. Stereo Chem.						2(1)							2(1)
13. Org.-O-I						2(1)							2(1)
14. Org-O-II							3(1)		1(1)				4(2)
15. Org.compounds	1(1)						3(1)		1(1)				4(2)
16. Polymers						2(1)							2(1)
17. Biomolecules				5(1)									5(1)
18. Chemistry in Everyday life			3(1)										3(1)
Total	1(3)	2	3(2)	5(2)	–	2(6)	3 (6)	5(1)	1(2)	–	3(4)		70 (27)
			21				35				14		

SAMPLE QUESTION PAPER–II

CHEMISTRY

Class – XII

Time : 3 Hours **Max. Marks : 70**

General Instructions :

(i) *All questions are compulsory*

(ii) *Marks for each question are indicated against it.*

(iii) *Question numbers 1 to 5 are very short-answer questions each of one mark. Answer these in one word or about one sentence each.*

(iv) *Question numbers 6 to 12 are short answer questions of two marks each. Answer these in about 30 words each.*

(v) *Question numbers 13 to 24 are short answer questions of 3 marks each. Answer these in about 40 words each.*

(vi) *Question numbers 25 to 27 are Long-answer questions of 5 marks each. Answer these in about 70 words each.*

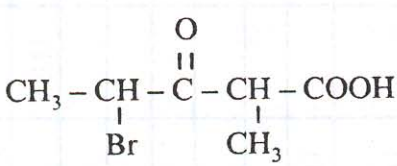
(vii) *Use log tables if necessary. Calculators are not permitted.*

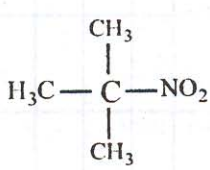
1. Give one example of Peizoelectric substance. 1

2. What type of azeotrope is formed on mixing nitric acid and water? 1

3. State the unit of 'rate constant' in a zero order reaction. 1

4. Write IUPAC name of : 1



5. Write the reaction for the preparation of  1

6. Write the MO configuration of diatomic molecule of the element with atomic number 9. Calculate its bond order and predict its magnetic behaviour. 2

7. $N_2(g) + O_2(g) \longrightarrow 2NO(g)$ is an endothermic reaction yet it is spontaneous. Explain the reason. 2

8. With the help of a diagram explain the difference in the variation of molar conductivity with concentration for strong and weak electrolytes. 2

9. Aluminium is significantly electropositive metal still it is used as a structural material. Explain the properties of Aluminium which make it suitable for this use. 2

10. Optically active 2-iodobutane on tretment with NaI in acetone gives a product which does not show optical activity. Explain. 2

11. Write the steps and conditions to carry out the following conversions : 2

(i) Phenol to Salicylic Acid

(ii) 2 - Methyl - 1 pentene to 2 - Methyl 2- pentan-2-ol

OR

An organic compound A (molecular formula C_4H_8O when reduced with $NaBH_4$ gives compound B which reacts with HBr to form compound C (optically active). Identify A,B,C, and write the two enantiomers of compound C.

12. Write the (i) names and (ii) structures of monomers present in the followingpolymers 3

(i) PMMA (ii) Buna – N

13. Calculate (i) frequence and (ii) wave number of the radiations required for the excitation of the electron in hydrogen atom from second to third energy level. Ionization energy of hydrogen atom is 1.312×10^3kJ mol^{-1}. 3

14. An element has a face centred cubic (f.c.c) structure with a cell edge of 0.2nm Calculate its density in g cm^{-3} if 400g of this element contains $48 \times 10^{2.3}$ atoms take $N_A = 6\times10^{23}$ Mol^{-1} 3

15. Explain with suitable examples in each case why the molar masses of some substances determined with the help of colligative properties are (i) higher (ii) lower than actual values. 3

16. (a) The standard gibbs energies of formation ($\Delta f G^0$) of SO_2 (g) and SO_3 (g) are – 300.0 and – 371.1 kJ mol^{-1} at 300K respectively
Calculate Δ G and equilibrium constant for the following reaction at 300K.

$$2SO_2(g)+O_2(g) \rightleftharpoons 2SO_3(g)$$

(b) Explain why entropy of a perfectly crystaline substance is less than that of its imperfect crystals. 3

17. (a) How many coulombs of electric charge must be passed through a solution of silver nitrate to coat a copper sheet of area 100 cm^2 on both the sides with a 0.005 mm thick layer. Density of silver is 10.5 g cm^{-3}. Relative atomic mass of silver is 108. 2,1

(b) Three Iron sheets have been coated separately with three metals (A,B and C) whose standard electrode potentials are given below :

Metal	A	B	C	Iron
E^0 values	– .46V	–0.66V	–0.20V	0.44V

Identify in which case rusting will take place faster when coating is damaged.

18. (a) The following initial rate date were obtained at 300 K for the reactions : 2,1

$2A+B \longrightarrow C + D$

	[A] mol L^{-1}	[B] mol L^{-1}	Rate mol $L^{-1}S^{-1}$
I	0 .2	0.1	6.0×10^{-2}
II	0.4	0.1	2.4×10^{-1}
III	0.2	0.2	1.2×10^{-1}

Deduce the rate law.

(b) If half life of a reaction is inversely proportional to intital concentration of the reactant, what is the order of the reaction?

19. Gives reasons for the following : 1,1,1

(a) Enzyme catalysts are highly specific in their action.

(b) The path of light becomes visible when it is passed through As_2O_3sol. in water.

(c) The enthalpy in case of chemisorption is usually higher than that of physisorption.

20. (a) Give the IUPAC name of $[PtCl(NH_2CH_3)_5(NH_3)_2]Cl$ 1,1,1

(b) Write the name of linkage isomer of $[Co(ONO)(NH_3)5]^{2+}$

(c) Though CO is a weak lewis base yet it forms a number of stable metal carbonyls. Explain

21. (a) Complete the following nuclear reactions 1,1,

(i) $^{27}_{13}Al,(\alpha, n) \longrightarrow$

(ii) $..... \longrightarrow (\alpha, 2n)^{211}_{85}At$

(b) What is meant by K–electron capture?

(c) Which of the two type of reactions, fission or fusion is currently found useful in harnessing energy and why?

22. Give reasons

(a) Ketones are less reactive towards nucleophiles than aldehydes 1½

(b) Benzoic acid is a stronger acid than ethanoic acid. 1½

23. (a) Explain the following with the help of suitable examples 2,1

(i) coupling reaction.

(ii) Hofmann's bromamide reaction

(b) Give one chemical test to distinguish between

$CH_3CH_2NH_2$ and $C_6H_5NH_2$

OR

(a) Describe the following with the help of suitable examples :

(i) Clemmensen reaction

(ii) Cannizzaro's reaction

(b) Give one chemical reaction that can distinguish 2 - pentanone from 3 - pentanone (2,1)

24. Describe the following giving one example of each

(a) Vat dyes 1,1

(b) Tranquilizers

(c) Hybrid rocket propellants. 2

25. (a) Discribe the steps involved in the contact process for the manufacture of sulphuric acid. 2

(b) What are silicones? How are they prepared? 2,2,1

(c) Predict the probable structure of BrF_3 on the basis of VSEPR theory.

OR

(i) (a) SF_6 in not hydrolysed by water where as SF_4 is. 2

(b) $AlCl_3$ is used as a catalyst in organic reactions.

(ii) Complete the following reactions : 2

(a) $Ca_3P_2 + H_2O \longrightarrow$

(b) $Pb_3O_4 + HNO_3 \longrightarrow$

(iii) Arrange the following in the increasing order of their acidic strength. 1

$HOClO_2$, $HOCl$, $HOClO$, $HOClO_3$ 2

1

26. (a) State the probable oxidation states of the transition metals with the following configuration in their ground states:

(i) $3d^2$ (ii) $3d^5$ (iii) $3d^6$ (iii) $3d^7$ 1

(b) What happens when (write balanced chemical equations):

(i) Acidified potassium permangnate solution reacts with aqueous potassium iodide solution. Write the colour change taking place, if any. 3

(ii) Acidified solution of potassium dichromate reacts with aqueous solution of Sn(II) chloride. Write the colour change taking place, if any.

OR

(a) Name the chief ore of iron. Write balanced chemical reactions involved in its extraction. 3

(b) Compare the chemistry of Actinoids and lanthanoids with special reference to 2

(i) Electronic configurations

(ii) Oxidation states

27. (a) Write two differences between vitamins and hormones. Give one example of each. 2

(b) List four biological functions of proteins. 2

(c) Name two diseases which are caused by the deficiency of vitamin A and B. 1

OR

(a) Name the nitrogen bases which are present in RNA and DNA 1

(b) What is the difference between α-D glucose and β-D glucose? 1

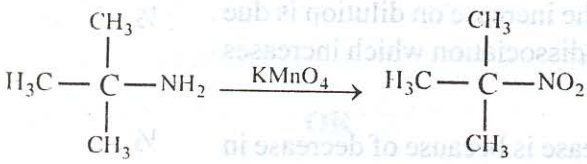
(c) Write the chemical reaction for commercial preparation of glucose. 1

(d) What are fibrous and globular proteins? Give one example of each. 1

(e) Name the disease caused by the deficiency of insulin where in human system insulin is secreted. 1

MARKING SCHEME–II
SAMPLE QUESTION PAPER – II
CHEMISTRY

Time : 3 Hours **Max. Marks : 70**

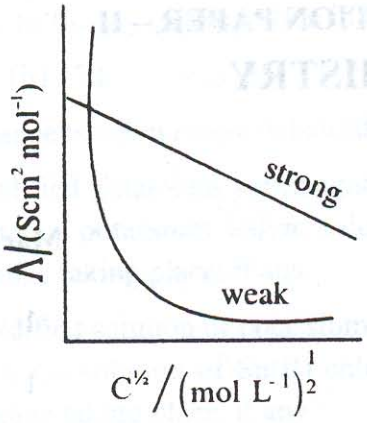
Q.No.	Value Points	Marks	Total
1.	Lead zirconate or **any other example.**	1	1
2.	Maximum Boiling Azeotrope	1	1
3.	mol L^{-1} S^{-1}	1	1
4.	4 – Bromo-2-methyl – 3 – Oxopentonoic acid	1	1
5.		1	1

OR

6.	$\sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \sigma 2p_z^2 \ \pi 2p_x^2 \ \pi 2p_y^2 \ \pi^* 2p_x^2 \ \pi^* 2p_y^2$	1	
	$N_B = 10, \ N_A = 8$		
	Bond order $= \frac{1}{2}(N_B - N_A)$	½	2
	$= \frac{1}{2}(10-8) = 1$	½	
	Diamagnetic as all the electrons are paired		
7.	$N_2 + O_2 \longrightarrow 2NO$	½	
	As the reaction is spontaneous, ΔG is –ve	½	
	$\Delta G = \Delta H - T\Delta S$		
	Endothermic reaction therefore, ΔH is positive for ΔG to be negative :		2
	(i) ΔS should be positive and	½	
	(ii) numerical value of $T\Delta S > \Delta H$	½	

Q.No.	Value Points	Marks	Total

8.



1 2

In both cases, molar conductivity increases with dilution.

Reason : In weak electolytes, the increase on dilution is due to the increase in the degree of dissociation which increases the number of ions. ½

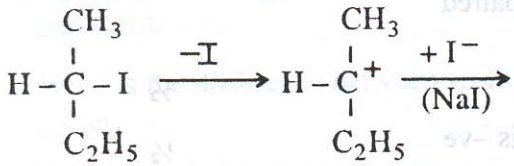
In strong electrolytes, the increase is because of decrease in the inter ionic hindrance towards mobility of ions. ½

9. Aluminium is used as a structural material because

(i) It is light weight and has high tensile strength. 1 2

(ii) Being highly eletropositive it reacts with oxygen of air to form a hard protective layer of Al_2O_3 which makes it passive. 1

10. In the reaction with NaI, C–I bond first cleaves and then reforms. This leads to the formation of a racemic mixture which is optically inactive. 1



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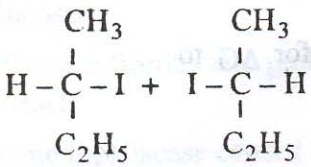
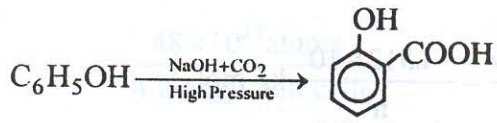
1



racemic mixture

Q.No.	Value Points	Marks	Total

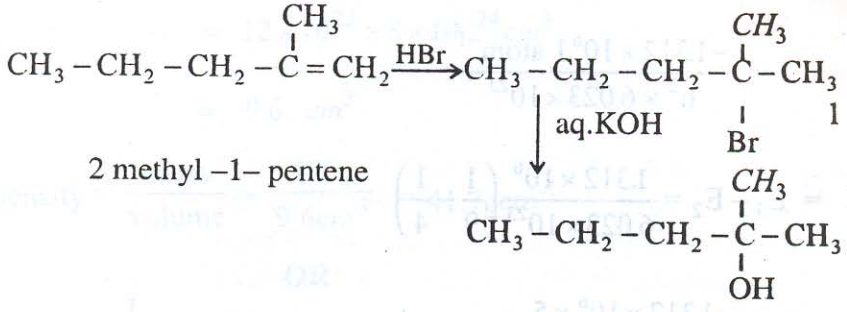
11. (i)



Salicylic acid — 1

2

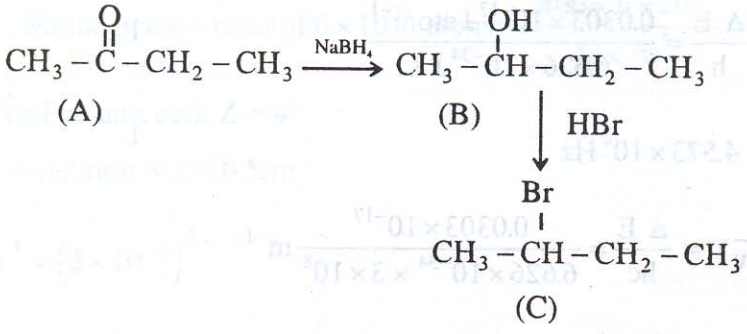
(ii)



2 methyl –1– pentene

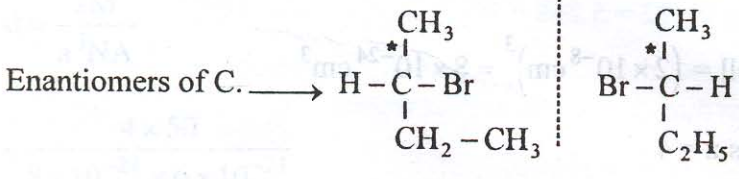
2 – methyl – 2 – pentanol — 1

OR



(A) (B) (C)

Mirror



Enantiomers of C. — ½ + ½

2

12. (i) Methyl methacrylate $H_2C = \underset{\displaystyle CH_3}{\underset{|}{C}} - COOCH_3$ — ½

(ii) Butadiene $H_2C = CH - CH = CH_2$ and acrylonitrite $NC - CH_2 = CH_2$

2

$$= \frac{48 \times 10^{23} \text{ atoms}}{4 \text{ atoms / unit cell}}$$ ½

$$= 12 \times 10^{23} \text{ Unit cells}$$ 3

Volume of substance=No.of unit cells x Volume of unit cell

$$= 12 \times 10^{23} \times 8 \times 10^{-24} cm^3$$

$$= 9.6 \ cm^3$$ 1

$$\text{Density} = \frac{\text{mass}}{\text{volume}} = \frac{400\text{g}}{9.6\text{cm}^3} = 41.7\text{gcm}^{-1}$$ ½

OR

Calculation of molar mass

Mass of 48×10^{23} atoms = 400g.

$$\therefore \text{Molar mass} = \text{mass of } 6 \times 10^{23} \text{ atoms} = \frac{400 \times 6 \times 10^{23}}{48 \times 10^{23}} = 50\text{gmol}^{-1}$$

For Fcc unit cell, Z = 4

a = 0.2 mm = 2×10^{-8}cm

$$a^3 = \left(2 \times 10^{-8}\right)^3$$

$$= 8 \times 10^{-24} \text{cm}^3$$

$$d = \frac{2M}{a^3 N A}$$

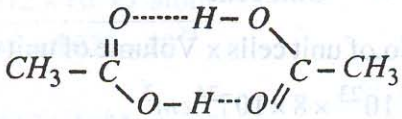
$$= \frac{4 \times 50}{8 \times 10^{-24} \times 6 \times 10^{-23}}$$

$$= 41.7\text{g cm}^{-3}$$

15. The relation for determination of molar masses using colligative properties is based on the assumption that the solutions formed are ideal and there is no change in the number of particles. ½ 3

Q.No.	Value Points	Marks	Tot

In some cases molecules associate. Thus the effective number of solute particles becomes less and the molar mass so obtained is more than the calculated molar mass. For example, ethanoic acid dimerises in non-polar

solvents to give 

Molar mass of ethanoic acid is 60 whereas that determined by colligative properties is 120. 2 3

In case of ionic solutes, the dissociation of solute into ions increases the effective number of particles. Thus the volume of colligative property increases and molar mass decreases. For example, in KCl which dissociates as $KCl \rightleftharpoons K^+ + Cl^-$, the calculated molar mass is 74.5 whereas that determined by colligative properties gives the value 37.25.

16. (a) $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$ ½

$\Delta_r G^0 = [2(-371) - 2(-300)]$ kJ mol^{-1} ½

$= -742 + 600 = -142$ kJ mol^{-1}

$$\log k = \frac{\Delta_r G^0}{-2.303\ RT}$$

$$= \frac{142000}{2.303 \times 8.314 \times 300}$$ 1

$= 24.72$

$k = \text{antilog } 24.72 = 5.248 \times 10^{24}$

(b) In imperfect crystal, there is more disorder, therfore its entropy is more than that of the perfect crystal. 1

17. (a) Volume of silver to be deposited

$= 100\text{cm}^2 \times 0.0005\text{cm} \times 2 \text{ sides}$

$= 0.1\text{cm}^3$ 1

Mass $= 10.5 \times 0.1$g

$= 1.05$ g

Q.No.	Value Points	Marks	Total
	108g Ag (1mol) is deposited by 96500C.	1	3
	0.5g Ag is deposited by		
	$\frac{96500C}{108g} \times 1.05g = 938.2\ C$		
	(b) When the coating is damaged, rusting would be faster when the metal is less eletropositive that iron. Therefore, sheat coated with metal C whose standard electrode potential (– 0.20) is more than that of iron (–0.44), would corrode faster.	1	
18.	(a) Let the rate law be as follows		
	$rate = k\,[A]^x\,[B]^y$	½	
	$\frac{r_{II}}{r_I} = \frac{2.4 \times 10^{-1}}{6.0 \times 10^{-2}} = \frac{k'[0.4]^x \times [0.1]^y}{k'[0.2]^x \times [0.1]^y}$		
	$4 = \left(\frac{0.4}{0.2}\right)^x$		
	$4 = 2^x$		
	$\therefore \quad x = 2$		
	$\frac{r_{III}}{r_I} = \frac{1.2 \times 10^{-1}}{6.0 \times 10^{-2}} = \frac{k[0.2]^x \times [0.2]^y}{k[0.2]^x \times [0.1]^y}$	½	
	$2 = 2^x$		
	$\therefore \quad y = 1$	½	
	Thus, rate law is		
	$rate = k[A]^2\,[B]$	½	
		½	

Q.No.	Value Points	Marks	Total
	(b) $t_{½} \alpha \frac{1}{[Ro]^{n-1}}$	½	
	Given that $t_{½} \alpha \frac{1}{[R_o]}$. Hence, n – 1 = 1	1	
	Therefore n = 2 or it is second order.	1	3
19.	(a) Each enzyme has a specific active site on which only a specific substrate can bind.		
	(b) It is because of Tyndall effect caused by scattering of light by colloidal particles	1	
	(c) Chemisorption involves the formation of a chemical bond between adsorbent and adsorbate which involves high energy changes while in physisorption adsorbate and adsorbent are held by weak van der Waals interactions.	1 1	
20.	(a) Diamminechloro(methylamine) platinum(II) chloride.	1	3
	(b) Pentaaminenitrito – N – cobalt(III) cation	1	
	(c) CO is a weak donar and still metal carbonyls are stable compounds because of back bonding resulting from delocalisation of electrons from filled d orbitals of metal into the empty orbitals of CO ligands.	1	3
21.	(a) (i) $^{30}_{15}P$ (ii) $^{209}_{83}Bi$	1	
	(b) The capture of electrons from the K shell by the necleus of a nuclide.		
	(c) Nuclear fission, because the reaction can be controlled.		
22.	(a) Ketones are less reactive than aldehydes towards nucleophilic addition reactions because (i) they have two electron - donating alkyl groups which reduce the residual positive charge on carbonyl carbon, and	1½	3
	(ii) the tetrahedral intermediate is more crowded in case of ketones.	½	
	(b) Benzoic acid is a stronger acid than ethanoic acid because		

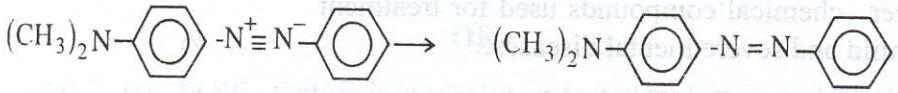
Q.No.	Value Points	Marks	Total

(i) benzene ring is electron withdrawing and facilitates the release of H^+ ion, and e^-

(ii) the resulting carboxylate anion is stabilized by resonance.

In ethanic acid, CH_3 – group increases the electron density on coo group and makes the release of H^+ difficult. Also the resulting carboxylate anion cannot stabilize by resonance.

23. (a) **Coupling reaction :** Reaction of an aromatic diazonium salt with phenol / aromatic amines at low temperature to give coloured azo compounds. 1½ 3



azo compound ½

OR

any other suitable example

(ii) **Hofmann Bromamide reaction :** Primary amides react with bromine in presence of an alkali to give a primary amine having one carbon atom less than the amide

$$R-CONH_2 \xrightarrow[OH^-]{Br_2} R-NH_2$$

(b) Aniline decolorizes bromine water and $CH_3CH_2NH_2$ does not or aniline gives azodye test while $CH_3CH_2NH_2$ doesn't. 1

OR

(a) (i) **Clemmensen reduction :** Aldehydes or ketones get reduced to hydrocarbons on treatment with zink amalgam and conc. HCl

$$>C=O \xrightarrow[HCl]{Zn-Hg} >CH_2 + H_2O$$

(ii) **Cannizzaro reaction :** Aldehydes having no α - hydrogen undergo disproportionation with concentrated alkali to give an alchohol and the salt of cerboxylic acid. 1 3

1

Q.No.	Value Points	Marks	Total

$$2\ RCHO \xrightarrow{-OH} RCH_2OH + RCOO^- Na^+$$

(b) 2–Pentanone would give positive iodoform test in which the compound is heated with alcoholic NaOH and I_2 to give a yellow coloured solid with characteristic smell.

3 - Pentanone would not give iodoform test.

24. (a) Vat dyes – insoluble in water. They are applied as aqueous solution of the leuco form. On re-oxidation, the original dye is formed on the fabric. ½ 1 3

Example - Indigo or any other suitable example ½

(b) Tranquilizer –chemical compounds used for treatment of stress, mild and severe mental diseases. ½

Example–veronal or any other suitable example ½

(c) Hybrid rocket propellant – consists of solid fuel and liquid oxidant example acrylic rubber + liquid N_2O_4. ½

25. (a) The steps involve three stages : ½

(i) Sulphur or sulphide ore is burnt in air to form SO_2 gas. ½ 3

(ii) SO_2 is converted to SO_3 by reaction with oxygen in in the presence of a catalyst.

$$2SO_2(g) + O_2(g) \xrightarrow{V_2O_5} 2SO_3(g)\ \Delta_r H^0 = 196.6 kJ\ mol^{-1}$$

In practice the plant is operated at a pressure of 2 bar and a temprature of 720K. The SO_3 gas from the catalytic converter is absorbed in conc H_2SO_4 to form oleum $H_2S_2O_7$ which on dilution with water gives H_2SO_4 of desired concentration. ½

$$SO_3 + H_2SO_4 \longrightarrow H_2S_2O_7$$

$$H_2S_2O_7 + H_2O \longrightarrow 2H_2SO_4$$

(b) Silicones are the polymers, which contain R_2SiO repeating units. The empirical formula is analogous to that of a ketone R_2CO, hence these materials are named as silicones. 1

Q.No.	Value Points	Marks	Total
	They are prepared by the hydrolysis of $R_2SiCl_2[R = Me \text{ or } Ph]$	1	

$$R_2SiCl_2 \xrightarrow[-HCl]{H_2O} -O-\underset{\underset{R}{|}}{\overset{\overset{R}{|}}{Si}}-O-\underset{\underset{R}{|}}{\overset{\overset{R}{|}}{Si}}-O-\underset{\underset{R}{|}}{\overset{\overset{R}{|}}{Si}}-O$$

(c) BrF_3 has T shaped structure. The central Br atom has 7 valence electrons. Out of these 3 electrons form bonds with F atoms. Two lone pairs occupy the equitonial positions along with one F atom. The remaining two F atoms occupy the axial positions to form a T shaped structure. — 1

OR

(a) (i) In SF_6, S atom is sterically protected by F atoms which does not allow thermodynamically favourable reactions like hydrolysis to take place. — 2

SF_4 is less sterically hindered and undergo hydrosysis easily — 2

(b) (i) $AlCl_3$ is a strong Lewis acid and acts as a catalyst in organic reactions. — 1

(ii) (a) $Ca_3P_2 + 6H_2O \longrightarrow 3Ca(OH)_2 + 2PH_3$

(b) $Pb_3O_4 + 4HNO_3 \longrightarrow 2Pb(NO_3)_2 + PbO_2 + 2H_2O$

(iii) $HOCl < HOClO < HOClO_2 < HOClO_3$

26. (a) (i) Ti = + 2, + 3, + 4

(ii) Cr = +2, +3, +4, +5, +6 — 1

Mn = +2, +3, + 4, +5, +6, +7

(iii) Fe = +2, +3, +4, +6 — 4×½ = 2

(iv) Co = +2, +3

(b) (i) I_2 is liberated and pink colour of $KMnO_4$ solution disappears. — 1

$2MnO_4 + 16H^+ + 10I^- \longrightarrow 2Mn^{2+} + 8H_2O + 5I_2$ — 5

(ii) Tin (II) chloride is oxidised to tin (IV) chloride and the — 1

orange colour of $K_2Cr_2O_7$ Solution turns to green. ½

$$Cr_2O_7^{2-} + 14H^+ + 3Sn^{2+} \longrightarrow 3Sn^{4+} + 2Cr^{3+} + 7H_2O$$

OR

(a) Heamatite. Fc_2O_3 1½

$3Fc_2O_3 + CO \longrightarrow 2Fc_3O_4 + CO_2$ upper part of

$Fc_3O_4 + 4CO \longrightarrow 3Fe + 4CO_2$ blast furnace

$F_2O_3 + CO \longrightarrow 2FeO + CO_2$ Lower part of

$FeO + C \longrightarrow Fe + CO$ Blast furnace 1

(b)		Lanthanoids	Actinoids
(i)	Electronic configuration	$4f^{0-14}\ 5d^{0-1}\ 6s^2$	$7s^2\ 6d^{0-1}\ 5f^{0-14}$
(ii)	Oxidation states	The principal oxidation state is +3 although +4 and +2 oxidation states are also exhibited by some occasionally	In general +3. The element in the first half of the sources frequently exhibit higher oxidation states of Th = +4 Pa = +5 U = +6, Np = +7

5

2

½

27. (a)

Harmones	Vitamins
Molecules that transfer information from one group of cells to distant tissue or organ.	(i) These are essential dietary factors required by an organism in minute quantities.
(ii) These are synthesised by the body's own glands.	(ii) Supplied to the body chiefly from the food eaten.

2

Examples : Harmones : Estrogens
Vitamins : Vitamin D
or any other suitable example.

5

(b) **Functions :**

1. For transport mechanism as oxygen by heamoglobin
2. For maintainance of fluid balance.
3. For regulation of metabolism.
4. Connective tissues.
   or any other functions

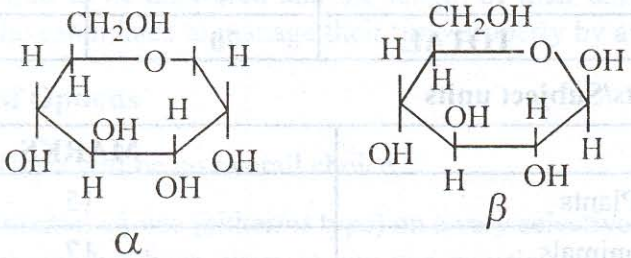
(c) The deficiency of the Vitamin A causes Xerophathalmia disease.

Deficiency of Vitamin B_1 causes Beri-beri disease.

OR

(a) Adenine, Guanine, Cytosine

(b)



(c) Commercially, glucose is obtained by the hydrolysis of starch, by boiling it with dil H_2SO_4 at 393K under pressure

$$(C_6H_{10}O_5)_n + nH_2O \xrightarrow[4393K.2-3Bar]{H_2SO} nC_6H_{12}O_6 .$$

(d) Fibrous proteins have large helical content and have rod like rigid shape and are insoluble in water e.g. silk in globular protein polypeptide chain consists of partly helical section, which are folded about the random cuts to give it a spherical shape e.g. globins.

(e) Diabetes mellitus,

Insulin is secreted by islets of langerhans.

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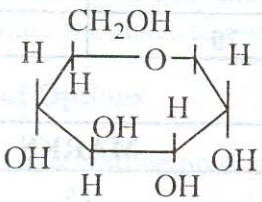
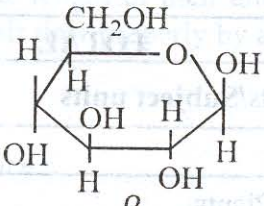


α



β

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