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

Unit	Title	Marks
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
	Total	**70**

B. Weightage to form of questions

S.No.	Form of Questions	Marks for each question	No. of questions	Total Marks
1.	Long Anwer 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
	Total	-	**30**	**70**

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.

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BLUE-PRINT II
Class XII
CHEMISTRY SAMPLE PAPER

S.NO.	UNIT	VSA (1 Mark)	SA I (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)
	Total	**8(8)**	**20(10)**	**27(9)**	**15(3)**	**70(30)**

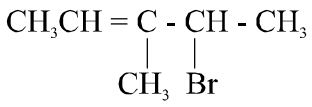
CHEMISTRY SAMPLE PAPER - II
CLASS - XII

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 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 crytallises in a cubic lattice with atom X at the corners of the unit cell and atomsY at the body centres. What is the simplest possible formula of this compound? 1

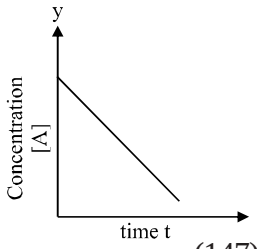
6. What is the Van't Hoff factor for a compound which undergoes tetramerization in an organic solvent? 1

7. An ore sample of galena (PbS) is contaminated with zinc blende (ZnS). Name one chemical which can be used to concentrate galena selectively by froth floatation method. 1

8. Predict the shape of ClF_3 on the basis of VSEPR theory. 1

9. Ethylene glycol (molar mass = 62 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 = 1.86K kg/mol
K_b for water = 0.512K 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:



(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

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

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

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

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

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 α-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:

(a) $RNH_2 + CHCl_3 + 3KOH \rightarrow$

(b) $RCONH_2 + Br_2 + 4NaOH \rightarrow$ 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 $(CH_3)_3N, (CH_3)_2NH, CH_3NH_2, NH_3$ 2

OR

Account for the following:
(a) Aniline does not undergo Friedel Crafts alkylation
(b) Although - NH_2 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^{-3}. 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 :
$[Cr\ Cl_2\ (H_2O)_4]\ Cl$
(b) Give the number of unpaired electrons in the following complex ions:
$[Fe\ F_6]^{4-}$ and $[Fe\ (CN)_6]^{4-}$
(c) Name the isomerism exhibited by the following pair of coordination compounds:
$[Co(NH_3)_5\ Br]\ SO_4$ and $[Co(NH_3)_5\ SO_4]Br$
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_3PO_2 and H_3PO_3 act as as good reducing agents while H_3PO_4 does not.
(c) On addition of ozone gas to KI solution, violet vapours are obtained. 3

24. The decomposition of $N_2O_5(g)$ is a first order reaction with a rate constant of 5×10^{-4} sec^{-1} at 45° C. i.e. $2N_2O_5\ (g) \rightarrow 4NO_2\ (g) + O_2\ (g)$. If initial concentration of N_2O_5 is 0.25M, calculate its concentration after 2 min. Also calculate half life for decomposition of $N_2O_5\ (g)$.

(b) For an elementary reaction
$2A + B \rightarrow 3C$
the rate of appearance of C at time 't' is 1.3×10^{-4} mol l^{-1} s^{-1}.
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_N^2 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^- ion is known but CP^- ion is not known.
(b) NO_2 demerises to form N_2O_4
(c) ICl is more reactive than I_2 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 $KMnO_4$ 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 $KMnO_4$ 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 $C_5H_8O_2$ is reduced to n-pentane on treatment with Zn-Hg/ HCI. 'A' forms a dioxime with hydroxylamine and gives a positive lodoform 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

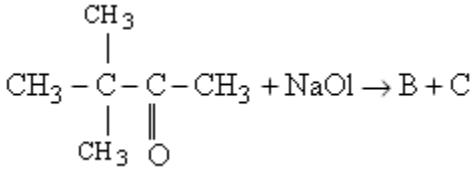
OR

(a) An organic compound 'A' with molecular formula C_8H_8O 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 (H_2CrO_4), it gives a carboxylic acid (B) with molecular formula $C_7H_6O_2$. Deduce the structures of A and B.

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

(i) $A + H_2(g) \xrightarrow{Pd/BaSO_4} (CH_3)_2\,CH-CHO$

(ii)



$$CH_3-\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}-\overset{\displaystyle O}{\overset{\|}{C}}-CH_3 + NaOl \rightarrow B + C$$

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

$$Cd^{2+}(aq) + Zn(s) \rightarrow Zn^{2+}(aq) + Cd(s)$$

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

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

(b) When a current of 0.75A is passed through a $CuSO_4$ solution for 25 min, 0.369 g of copper is deposited at the cathode. Calculate the atomic mass of copper.

(c) Tarnished silver contains Ag_2S. 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 :

$Ag_2S_{(s)} + 2e \rightarrow 2Ag(s) + S^{2-}$ is $-0.71V$

and for $Al^{3+} + 3e \rightarrow Al(s)$ is $-1.66V$ 5

OR

(a) Calculate the standard free energy change for the following reaction at 25^0C

$$Au(s) + Ca^{2+}(aq, 1M) \rightarrow Au^{3+}(aq, 1M) + Ca(s)$$

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

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

Predict whether the reaction will be spontaneous or not at 25^0C. 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 0.001M acetic acid is 4×10^{-5} S / cm. Calculate the dissociation constant of acetic acid, if Λ_m^o for acetic acid is 390. 5S cm^2/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.

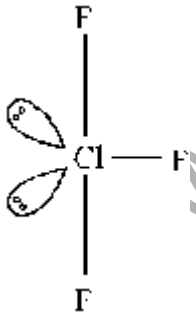
(b) Among the lanthanoids, Ce(III) is easily oxidised to Ce(IV).

(c) $Fe^{3+}|Fe^{2+}$ redox couple has less positive electrode potential than $Mn^{3+}|Mn^{2+}$ 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.	$XeF_6 + 3H_2O \rightarrow XeO_3 + 6HF$	(1)
4.	$H_3C-\underset{\underset{CH_3}{|}}{C}=CH-\underset{\underset{O}{||}}{C}-CH_3$	(1)
5.	XY	(1)
6.	$i = \frac{1}{4}$	(1)
7.	NaCN, Sodium cyanide, used as a depressant.	(1)
8.	 T - shape	(1)
9.	$\Delta T_f = K_f x \frac{w_B}{m_B} x \frac{1000}{w_A}$ $= 1.86 x \frac{12.4}{62} x \frac{1000}{100}$ $= 3.76K$	

since water freezes at o^0C, so freezing point of the solution containing ethylene glycol will be $\underline{-3.76^0\,C}$ (1)

Q.No. **Value Points** **Marks**

$$\Delta Tb = K_b \times \frac{w_B}{M_B} \times \frac{1000}{w_A}$$
$$= 0.512 \times \frac{12.4}{62} \times \frac{1000}{100}$$
$$= 1.024K$$

since water boils at 100^0C, so a solution containing ethylene glycol will boil at 101.024 ^{0}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 $A \xrightarrow{k} P$ (½)

$$\text{rate} = \frac{-d[A]}{dt} = k[A]^0 \quad (½)$$

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

integrating both the sides :

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

where C = constant of integration

at t = o, $[A] = [A]_o$

Substituting this in equation (i)

$$C = [A]_o$$

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

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

11. The reaction for reducing action of carbon is :

$$MgO(s) + C(s) \rightarrow Mg(s) + CO(g) \quad (½)$$

$$\Delta_r G = \Delta_f G(CO) - \Delta_f G(MgO)$$
$$= \frac{\text{At } 2273k}{-628} - (-314)$$
$$= -314 kJ/\text{mol at } 2273k \quad (½)$$

$$\text{At } 1273k$$

$$\Delta_r G = -439 - (-941)$$
$$= +502 \text{ kJ/mol at } 1273 \text{ k} \quad (½)$$

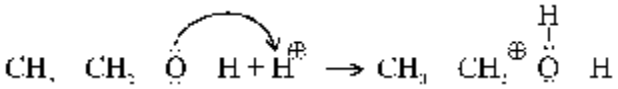
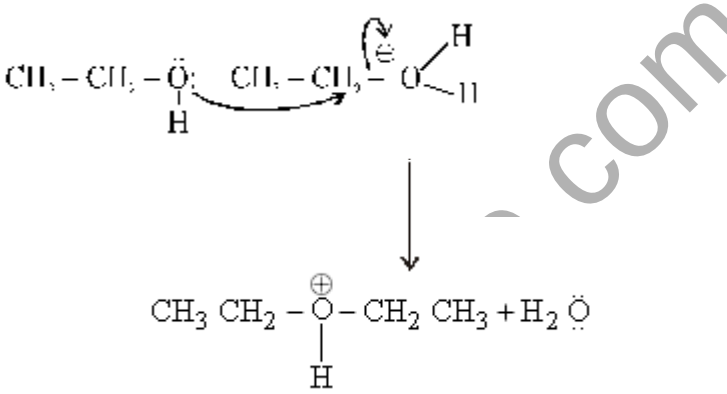
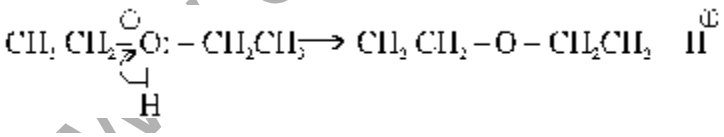
So carbon can be used as reducing agent with MgO(s) at 2273k. (½)

12. The two components of starch are:

(a) Amylose (½)

(b) Amylopectin (½)

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.	(1)
	(b) Hydrogen bonding between $-\overset{\overset{O}{\|}}{C}-$ and - NH- groups of peptide bond.	(1)
14.	$2CH_3CH_2\ddot{O}H \xrightarrow[H_2SO_4]{Conc} CH_3CH_2\ddot{O}CH_2CH_3$	
	mechanism :	
	(i) 	(½)
	(ii) 	(½) (½)
	(iii) 	(½)
15.	(a) $RNH_2 + CHCl_3 + 3KOH \rightarrow RNC + 3KCl + 3H_2O$	(½)
	Carbylamine reaction	(½)
	(b) $RCONH_2 + Br_2 + 4NaOH \rightarrow RNH_2 + Na_2CO_3 + 2NaBr + 2H_2O$	(½)
	Hoffmann bromamide degradation reaction	(½)
16.	(a) Addition of neutral ferric chloride solution to phenol will give a violet colouration, while no such colouration will be observed in case of benzyl alcohol.	(1)
	(b) On addition of Luca's reagent (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)
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 aqveous 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)

OR

(a) During friedal craft's alkylation, aluminium chloride acts as a catalyst, as well as a Lewis acid, it forms salt with - NH_2 group of aniline, so that - NH_2 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 fomation of complex K_2 (Hg I_4), number of particles in the solution decreases and hence the freezing point is raised. (1)

19. $$\delta = \frac{Z \times M}{a^3 \times N_A}$$ (½)

$$6.23 = \frac{Z \times 60}{(400)^3 \times 10^{-30} \times 6.023 \times 10^{23}}$$

Z = 4 (1)

The unit cell is face centered cubic (½)

radius 'r' = $\frac{a}{2\sqrt{2}}$

$= \frac{400}{2\sqrt{2}}$

= 141.4 pm. (1)

20. (a) Tetra flouro ethene (½)
addition polymer (½)
(b) Phenol and formaldehyde (½)
Condensation polymer (½)
(c) Isoprene (½)
addition polymer (½)

21. (a) tetraquadichloro chromium (III) chloride. (1)
(b) $[FeF_6]^{4-}$ has 4 unpaired electron as I^- is a weak field ligand (½)
$[Fe(CN)6]^{4-}$ has zero unpaired electron as CN^- is a strong field ligand. (½)

Q.No.	Value Points	Marks

(c) Ionisation isomerism. (½)

on addition of dilute HCl followed by aqueous $BaCl_2$, $[Co(NH_3)_5]SO_4$ will give a white precipitate while the other coordination compound will not give any white precipitate. (½)

22. (a) As ferric hydroxide, $Fe(OH)_3$ is a positively charged sol, so it gets coagulated by chloride ions, Cl^-, released by NaCl solution. (1)

(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. (1)

(c) As physical adsorption, involves only weak vander woal'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)

23. (a) Chlorine water produces nascent oxygen which is responsible for bleaching action and oxidation:

$$Cl_2 + H_2O \rightarrow 2HCl + [O]$$ (1)

(b) Both H_3PO_2 and H_3PO_3 have P- H bonds, so they act as reducing agents, but H_3PO_4, has no P-H bond but has O-H bonds, so it cannot act as a reducing agent. (1)

(c) Ozone gas acts as a strong oxidising agent, so it oxidises iodide ions to Iodine

$$2I^{\ominus}_{(aq)} + H_2O(l) + O_3(g) \rightarrow 2^{\ominus}OH(aq) + I_2(g) + O_2(g)$$

I_2 Vapours evolved have violet colour. (1)

24. For first order reaction

(a) $$k = \frac{2.303}{t}\log\frac{[R]_o}{[R]_t}$$

$$5x10^{-4} = \frac{2.303}{2 \text{ x } 60}\log\frac{0.25}{[R]_t}$$

[R]t = 0.23 M (1)

$$t_{1/2} = \frac{0.693}{5x10^{-4}}\text{sec}$$

$$= 1386\,\text{sec}$$ (1)

(b) (i) $$\text{Rate} = \frac{1}{3}\frac{d[C]}{dt}$$

$$= \frac{1}{3} \text{ x } 1.3 \text{ x } 10^{-4}$$

$$= 0.43 \text{ x } 10^{-4}\ \text{mol L}^{-1}\ \text{sec}^{-1}$$ (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. (a) 1- Bromo butone, being a primary alkyl halide would react faster by S_N^2 pathway, due to less steric hinderance. (1)

(b) In allyl chloride, $CH_2 = CH - CH_2Cl$, the carbocation $CH_2 = CH - \overset{\oplus}{C}H_2$ formed is stabilised due to resonance while the carbocation formed form n - propyl chloride i.e. $CH_3CH_2\overset{\oplus}{C}H_2$ is less stable, so allyl chloride is more reactive towards nucleophilic substitution reaction. (1)

(c) KCN, being ionic, $^{\ominus}CN$ ions liberated reacts with halo alkanes forming alkyl cyanides but in Ag $C\ddot{N}$, being covalent, does not release $^{\ominus}CN$ ion but lone pair on nitrogen acts as a nucleophile, resulting in formation of iso cyanides. (1)

26. (a) Nitrogen being smaller is size forms $P\Pi - P\Pi$ multiple bonding with carbon, So $^{\ominus}CN$ ion is known, but phosphorus does not form $P\Pi - P\Pi$ bond as it is larger in size. (1)

(b) $\because$ NO_2 is an odd electron molecule and there fore gets dimerised to stable N_2O_4. (1)

(c) Because ICl has less bond dissociation enthalpy than I_2

OR

'A' = Sulphur (½)
B = H_2S gas (½)
C = SO_2 gas (½)
D = SO_3 gas (½)

$5SO_2(g) + 2MnO_4^- + 2H_2O \rightarrow 5SO_4^{2-} + 4H^+ + 2Mn^{2+}$ (½)

$2SO_2(g) + O_2(g) \xrightarrow{V_2O_5} 2SO_3(g)$ (½)

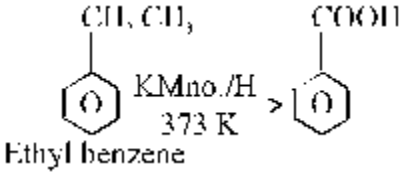
27. (a) Due to antiblood clotting action, aspirin is used for prevention of heart attacks. (1)
(b) As artificial sweetners provide less calories than natural sweetners. (1)
(c) Detergents have highly branched hydrocarbon chain, which can not be degraded by bacteria, so they get accumulated while soap containing straight hydrocarbon chain can be degraded easily (1)

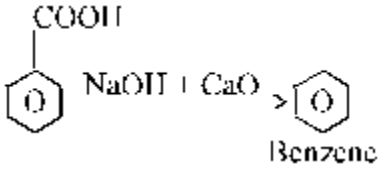
28. (a) As 'A' gives positive iodo form test, so it has $CH_3 - \underset{\underset{O}{\|}}{C} - \text{group}$ (½)

Q.No.	Value Points	Marks

as 'A' gives positive tollen's test, so it must have – CHO group (½)

So A is $CH_3 - \underset{\underset{O}{\|}}{C} - CH_2\ CH_2\ CHO$ (1)

(b) (i) 



(½)

(ii) $2CH_3CHO \xrightarrow[NaOH]{dilute} CH_3\underset{\underset{OH}{|}}{CH} - CH_2CHO$ (½)

Acetaldehyde

$CH_3\underset{\underset{OH}{|}}{CH} - CH_2CHO \xrightarrow{NaBH_4} CH_3\underset{\underset{O}{|}}{CH} - CH_2\underset{\underset{OH}{|}}{CH_2}$

Butane - 1, 3 -diol (½)

(iii) $CH_3 - \underset{\underset{OH}{\|}}{C} - CH_3 \xrightarrow{NaBH_4} CH_3\underset{\underset{OH}{|}}{CH} - CH_3$

Acetone (½)

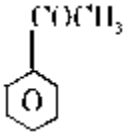
$CH_3 - \underset{\underset{OH}{|}}{C} - CH_3 \xrightarrow{Conc.H_2SO_4} CH_3CH = CH_2$ (½)

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 $CH_3 - \underset{\underset{O}{\|}}{C}$ group (1)

Q.No.	Value Points	Marks

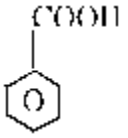
So 'A' is :



Acetophenone (1)

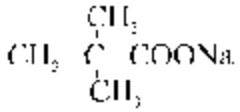
B is carboxylic acid obtained by oxidation of A with H_2CrO_4.

So 'B' is



Benzoic acid (1)

(b) A = $(CH_3)_2CH - \underset{\underset{O}{\|}}{C} - Cl$ (1)

B =  (½)

C = CHI_3 (½)

29. (a) $E^\circ_{cell} = E^\circ_c - E^\circ_a = -0.403 - (-0.763) = 0.360V$

$$\text{As } \log Kc = \left(\frac{nE^\circ_{cell}}{0.059}\right)$$

$$= \left(\frac{2 \times 0.360}{0.059}\right)$$

$$= \left(\frac{0.720}{0.059}\right) = 12.20$$ (1)

K_c = antilog (12.20)

= 1.585×10^{12} (1)

(b) M = Z I t (½)

$0.369 = \frac{x}{2 \times 96500} \times 0.75 \times 25 \times 60$ (x = molar mass of copper)

x = 63.3 g/mol. (1)

(c) E°_{cell} for reaction of tarnished silver ware with aluminium pan is

(– 0.71 V) – (– 1.66 V) i.e. + 0.95 V (1)

Tarnished silver ware, therefore, can be cleaned by placing it in an aluminium pan as E°_{cell} is positive. (½)

Q.No.	Value Points	Marks

OR

(a) E^{o}_{cell} = (–2.87 V) – (1.50 V)

= - 4.37 V (½)

ΔG^{o}_{cell} = - 6 x 96500 x - 4.37 V

= + 2350.230 kJ/mol (½)

Since $\Delta_r G^{o}$ is positive, reaction is non spontaneous. (1)

Au^{3+}/Au half cell will be a reducing agent Ca^{2+}/Ca half cell will be an oxidising agent (½)

(b) $\Lambda^{c}_{m} = K \times \frac{1000}{\text{molarity}}$ (½)

K = specific conductance

$= \frac{4 \times 10^{-5}\ s/cm \times 1000}{.001}$

= 40 $Scm^2\ mol^{-1}$ (½)

$\alpha = \frac{\Lambda m}{\Lambda^{o}_{m}}$

$\alpha = \frac{40}{390.5}$

$= 0.103$ (½)

$K_c = \frac{C\alpha^2}{1-\alpha}$

$= \frac{0.001 \times (.103)^2}{1-.103}$

$= \underline{1.19 \times 10^{-5}}$ (½)

30. A = MnO_2 (½)

B = $K_2 MnO_4$ (½)

C = $KMnO_4$ (½)

$2MnO_2 + 4KOH + O_2 \rightarrow 2K_2MnO_4 + 2H_2O$ (1)

$MnO_4^{2-} \xrightarrow[\text{oxidation in alkaline solution}]{\text{electrotyt ic}} MnO_4^-$ (½)

(b) In acidic medium medium $K_2 MnO_4$ changes to give purple coloured compound along with black precipitate.

$3MnO_4^{2-} + \xrightarrow{4H^+} 2MnO_4^- + MnO_2 + 2H_2O$

Green compound — purple compound — Black (1½)

Q.No.	Value Points	Marks

It is called dispropostionation reaction. (½)

OR

(a) Due to strong interatomic interaction between unpaired valence electrons. (1)

(b) Because Cl(IV) has extrastability due to empty f^0 orbital (1)

(c) In Mn^{2+} d^5 configuration leads to extrastability 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 $\underset{(d^5)}{Fe^{3+}}/\underset{(d^4)}{Fe^{2+}}$ couple (1)

(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)