

CHEMISTRY

VOLUME - I & II

12th Standard



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- March 2020 Question Paper with Answer Key.



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Monthly	Mid Term	Revision	PTA Book	Centum	<u>Creative</u>
<u>Q&A</u>	<u>Q&A</u>	<u>Q&A</u>	<u>Q&A</u>	Questions	Questions
Quarterly	Half Yearly	Dublic Even	NEET		
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Standard

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VOLUME - I

UNIT 1

METALLURGY

CHAPTER SNAPSHOT

1.1	Occurrence	of	meta	als

- **1.2** Concentration of ores
- **1.3** Extraction of crude metal
- **1.4** Thermodynamic principle of metallurgy
- **1.5** Electrochemical principle of metallurgy
- **1.6** Refining process
- **1.7** Application of metals

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PTA MODEL QUESTIONS AND ANSWERS

CHOOSE THE CORRECT ANSWER

- Sulphide ores of metals are usually 1. concentrated by froath floatation process. Which one of the following sulphide ore offers an exception and is concentrated by chemical leaching.
 - a) Argentite
- b) galena
- c) Copper pyrites
- d) Sphalerite [Ans. (a) Argentite]
- 2. Which method of purification represented by the equation? [PTA - 5]

$$Ti(impure) + 2l_2 \xrightarrow{550K} Til_4$$
$$\xrightarrow{1800K} Ti(pure) + 2I_2$$

- a) Cupellation
- b) Zone refining
- c) Van Arkel method
- d) Mond's process

[Ans. (c) Van - Arkel method]

3. The process of converting hydrated aluminia into anhydrous alumina is called.

[PTA - 6]

- a) Roasting
- b) Smelting
- c) Auto-reduction
- d) Calcination

[Ans. (d) Calcination]

Answer The Questions

2 MARKS

- What is the role of depressing agent in froath 1. floatation process? [PTA - 1]
- Ans. When impurities such as ZnS is present in galena (PbS), sodium cyanide (NaCN) is added to depresses the flotation property of ZnS by forming a layer of zinc complex Na₂[Zn(CN)₄] on the surface of zinc sulphide.
- Describe the underlying principle of froth floatation process.
- **Ans.** Froth floatation process is based on the principle that the ore particles are wetted by oil and the gangue particles by water. This is used for the concentration of sulphide ores.

1 MARK ANSWER THE QUESTIONS

3 MARKS

- What is the role of graphite rods in the electro metallurgy of aluminium? [PTA - 1]
- Graphite rods act as anode during electrolytic reduction of alumina.
 - At anode, O2 gas is produced which react with the carbon of anode (rods) to produce CO₂ gas.
 - (iii) So these graphite rods are consumed slowly and need to be replaced from time to time.

2. Define roasting.

[PTA - 4]

Ans. In roasting, the concentrated ore is oxidised by heating it with excess of oxygen in a suitable furnace below the melting point of the metal.

$$2Pbs + 3O_2 \xrightarrow{\Delta} 2PbO + 2SO_2 \uparrow$$

Explain calcination with an example.

- Ans. (i) Calcination is the process in which the concentrated ore is strongly heated in the absence of air.
 - During this process, the water of crystallisation present in the hydrated oxide escapes as moisture.
 - (iii) Any organic matter (if present) also get expelled leaving behind a porous ore.
 - This method can also be carried out with a limited supply of air.
 - During calcination of carbonate ore, carbon dioxide is expelled

$$PbCO_3 \xrightarrow{\Delta} PbO + CO_2 \uparrow$$

ANSWER THE QUESTIONS

5 MARKS

Explain electrolytic refining of silver.

[PTA - 5]

Electrolytic refining of silver as an example. Ans. (i)

Cathode: Pure silver

Anode: Impure silver rods

Electrolyte: Acidified aqueous solution of silver nitrate.

When a current is passed through the electrodes the following reactions will take place

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- Consequently when an impure molten metal is cooled, crystals of the pure metal are solidified and the impurities remain behind the remaining metal.
- 19. Give reason: Extraction of copper directly from sulphide ores is less favourable than that from its oxide ores through reduction.
- Ans. (i) The standard free energy for the formation of CuFeS, (copper pyrites) is greater than those of CS₂ and H₂S.
 - Hence, CuFeS2 cannot be reduced by carbon or hydrogen.
 - (iii) However, the free energy of copper oxide is less than that of CO_2 .
 - That is the reason, extraction of copper is easier from its oxide ores through reduction.

SHORT ANSWER

3 MARKS

- What is gravity separation? (or) **Explain hydraulic washing?**
- In gravity separation method, the ore having high specific gravity is separated from the gangue that has low specific gravity by washing with running water.
 - Ore is crushed to a finely powdered form and treated with rapidly flowing current of
 - During this process the lighter gangue particles are washed away by the running
 - This method is generally applied to concentrate the native ore such as gold and oxide ores such as haematite (Fe2O3), tin stone (SnO₂) etc.
- 2. Explain alkali leaching in the extraction of aluminum.
- In this method, the ore is treated with Ans. (i) aqueous alkali to form a soluble complex.
 - Bauxite, an important ore of aluminum is heated with a solution of sodium hydroxde or sodium carbonate in the temperature range 470 - 520 K at 35 atm to form soluble sodium meta-aluminate leaving behind the impurities, iron oxide and titanium oxide.

$$\text{Al}_2\text{O}_{3(s)} + 2\text{NaOH}_{(aq)} + 3\text{H}_2\text{O}_{(l)} \longrightarrow 2\text{Na}[\text{Al}(\text{OH})_4]_{(aq)}$$

(iii) The hot solution is decanted, cooled, and diluted. This solution is neutralised by passing CO₂ gas, to the form hydrated Al₂O₃ precipitate.

$$\begin{split} 2\text{Na}[\text{Al}(\text{OH})_4]_{(aq)} + 2\text{CO}_{2(g)} & \longrightarrow \\ \text{Al}_2\text{O}_3.3\text{H}_2\text{O}_{(s)} + 2\text{Na}\text{HCO}_{3(aq)} \end{split}$$

The precipitate is filtered off and heated around 1670 K to get pure alumina Al₂O₃.

- What is cementation?
- Ans. (i) Gold can be recovered by reacting the deoxygenated leached solution with zinc.
 - In this process the gold is reduced to its (ii) elemental state (zero oxidation sate) and the process is called **cementation**.

$$Zn_{(s)} + 2[Au(CN)_2]^-_{(aq)} \longrightarrow$$

 $[Zn(CN)_4]^{-2}_{(aq)} + 2Au_{(s)}$

- What is meant by ammonia leaching?
- When a crushed ore containing nickel, copper and cobalt is treated with aqueous ammonia under suitable pressure.
 - Ammonia selectively leaches these metals by forming their soluble complexes viz. $[Ni(NH_3)_6]^{2+}$, $[Cu(NH_3)_4]^{2+}$, and $[Co(NH_3)_5H_2O]^{3+}$ respectively from the ore leaving behind the gangue, iron(III) oxides/hydroxides and aluminosilicate.
- How is acid leaching done for the sulphide ores?
- Ans. (i) Leaching of sulphide ores such as ZnS, PbS etc., can be done by treating them with hot aqueous sulphuric acid.

$$\begin{split} 2\mathsf{ZnS}_{(s)} + 2\mathsf{H}_2\mathsf{SO}_{4(aq)} + 2\mathsf{O}_2 & \longrightarrow \\ 2\mathsf{ZnSO}_{4(aq)} + 2\mathsf{S}_{(s)} + 4\mathsf{H}_2\mathsf{O} \end{split}$$

In this process the insoluble sulphide is converted into soluble sulphate and elemental sulphur.

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PTA MODEL QUESTIONS AND ANSWERS

CHOOSE THE CORRECT ANSWER

1 MARK ₹ 2.

- Elements like silicon and Germanium to be 1. used as a semiconductor is purified by
 - a) heating under vaccum

[PTA - 1]

- b) Van Arkel method
- c) Zone refining
- d) Electrolysis

[Ans. (c) Zone refining]

2. The basicity of hypophosphorus acid is

[PTA - 2]

- a) 1
- b) 2
- c) 3
- d) 4

[Ans. (a) 1]

- 3. Ortho boric acid on dehydration at 373 K produces mainly [PTA - 3]
 - a) metaboric acid
 - b) boric anhydride
 - c) Boron metal and Oxygen
 - d) tetraboric acid. [Ans. (a) metaboric acid]
- On hydrolysis BF, gives Boric acid and converted to fluroboric acid. The fluoroboric acid contains the species.

[PTA - 6]

- a) $H^+, F^- \& BF_3$
- b) H⁺ & [BF₄]⁻
- c) [H BF₂]⁺ & F⁻
- d) H+, B³⁺ & F-

[Ans. (b) $H^+ \& [BF_A]^-$]

Answer The Questions

2 MARK

- Nitrogen does not form any penta halides 1. like phosphorus. why? [PTA - 4]
- Ans. Nitrogen does not form penta halides because it cannot extend its valency upto 5 due to unavailability of d-orbitals.

What is water gas equilibrium? [PTA - 5]

Ans. The equilibrium involved in the reaction between carbon dioxide and hydrogen, has many industrial applications and is called water gas equilibrium.

$$CO_2 + H_2 \longrightarrow CO + H_2O$$
Water gas

- 3. Why formic acid act as strong reducing agent? Give one equation to show its reducing property. [PTA - 6]
- Ans. (i) Formic acid (HCOOH) is unique because it contains both an aldehyde group and carboxyl group also.
 - (ii) Hence it can act as a reducing agent. It reduces Fehling's solution Tollen's reagent and decolourises pink coloured KMnO, solution.
 - (iii) Whereas in acetic acid, there is no aldehyde group and it cannot act as reducing agent.
 - Formic acid reduces ammoniacal silver nitrate solution (Tollen's reagent) to metallic silver.

 $HCOOH + Ag_2O \longrightarrow H_2O + CO_2 + 2Ag \downarrow \text{ (metallic silver)}$

Formic acid reduces Fehling's solution. It reduces blue coloured cupric ions to red coloured cuprous ions.

$$HCOO^{-} + 2Cu^{2+} + 5OH^{-} \longrightarrow CO_{3}^{2-} + Cu_{2}O + 3H_{2}O$$
(blue) (red)

Answer The Questions

3 MARKS

- AlCl₃ is more stable where as TlCl₃ is highly unstable. Why?
- Aluminium(III)chloride is stable whereas Ans. (i) thallium(III)chloride is highly unstable and disproportionates to thallium(I) chloride and chlorine gas.

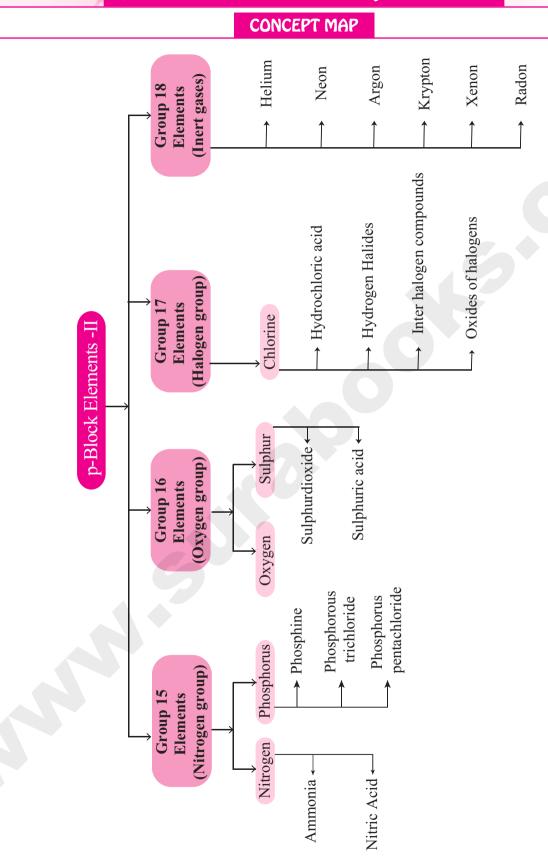


P-BLOCK ELEMENTS - II

3.1	Group	15 (Nitrogen group) elements		Group	16 (Oxygen group) element
	3.1.1	Occurrence	3.2	Oxyge:	n
	3.1.2	Physical properties		3.2.1	Allotrophic forms of sulphur
	3.1.3	Nitrogen		3.2.2	Sulphur dioxide
	3.1.4	Ammonia (NH ₃)		3.2.3	Sulphuric acid: (H ₂ SO ₄)
	3.1.5	Nitric acid	3.3	Group	17 (Halogen group) elements
	3.1.6	Oxides and oxoacids of		3.3.1	Chlorine
	5.1.0				Manufacture of chlorine
		nitrogen		3.3.2	Hydrochloric acid
	3.1.7	Allotropic forms of		3.3.3	Trends in physical and
		phosphorus			chemical properties of
	3.1.8	Properties of phosphorus			hydrogen halides
	3.1.9	Phosphine (PH ₃)		3.3.4	Interhalogen compounds
		Phosphorous trichloride and		3.3.5	Oxides of halogen
	011110	pentachloride		3.3.6	Oxoacids of halogens
	3.1.11	Structure of oxides and	3.4	Group	18 (Inert gases) elements
		oxoacids of phosphorus		3.4.1	Occurrence

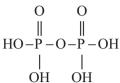
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(iii) pyro phosphoric acid:



Answer The Questions

5 MARKS

What are the properties of inter halogen compounds? [PTA - 2; OY 2019]

Ans. Properties of inter halogen compounds:

- The central atom will be the larger one.
- It can be formed only between two halogen and not more than two halogens.
- (iii) Fluorine can't act as a central metal atom being the smallest one.
- Due to high electronegativity with small size fluorine helps the central atom to attain high coordination number.
- They can undergo the auto ionization.
- They are strong oxidising agents be included.

$$2ICI \Longrightarrow I^+ + ICI_2^-$$

$$2\operatorname{ICI}_{3} \rightleftharpoons \operatorname{ICI}_{2}^{+} + \operatorname{ICI}_{4}^{-}$$

2. 0.1 M Solution of HF is weak acid. But 5M solution of HF is strongest acid. Why?

[PTA - 5]

Ans. 0.1 M solution of HF is weak acid because it is only 10% ionised. But at higher conceatration like 5M, the equilibrium involves the removal of fluoride ions which affects the dissociation of hydrogen.

$$HF + H_2O \longrightarrow H_3O^+ + F^-$$

 $HF + F^- \longrightarrow HF_2^-$

List any five compounds of xenon and **3**. mention the type of hybridization and Structure of the compounds.

Ans.

Compound	Hybridisation	Shape / Structure
XeF	sp ³ d	Linear
XeF ₄	$\mathrm{sp}^{3}\mathrm{d}^{2}$	Square planar
XeF ₆	sp ³ d ³	Distorted octahedron
XeOF ₂	sp³d	T Shaped
XeOF ₄	sp ³ d ²	Square pyramidal
XeO ₃	sp^3	Pyramidal

GOVERNMENT EXAM QUESTIONS AND ANSWERS

CHOOSE THE CORRECT ANSWER 1 MARK

- The shape of XeOF₄ is 1. [Govt.MQP 2019]
 - a) T Shaped
- b) Pyramidal
- c) Square planar
- d) Square pyramidal

[Ans. (d) Square pyramidal]

- 2. The type of isomerism exhibited by [Pt(NH₃),Cl₂]? [Govt.MQP 2019]
 - a) coordination isomerism
 - b) linkage isomerism
 - optical isomerism
 - geometrical isomerism

[Ans. (a) coordination isomerism]

The compound used in smoke screen is

- a) PH,

 - b) NH₂ c) AsH₂ d) BiH₂ [Ans. (a) PH₂]
- The metal used to prevent rusting of Iron and Steel is [QY 2019]
 - a) Au
- b) Zn
- c) Ag
- d) All of these

[Ans. (b) Zn]

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MUST KNOW DEFINITIONS

Transition metals	:	IUPAC defines transition metal as an element whose atom has an
		incomplete d sub shell or which can give rise to cations with an incomplete
		'd' sub shell.
Lanthanoid contraction	:	The atomic and ionic radii of lanthanoids show gradual decrease with
		increase in atomic number. This decrease in ionic size is called lanthanoid
		contraction.
Alloy	:	An alloy is formed by blending a metal with one or more other elements.
Diamagnetic materials	:	Materials with no elementary magnetic dipoles are diamagnetic.
Paramagnetic materials	:	Paramagnetic solids having unpaired electrons possess magnetic dipoles
		which are isolated from one another.
Ferromagnetic materials	:	Ferromagnetic meterials have domain structure and in each domain the
		magnetic dipoles are arranged
Reducing agent	:	The substance which is oxdised is a reducing agent
Oxidising agent	:	The substance which is reduced is an oxidising agent.
Non-metal	:	A non-metal is a chemical element that mostly lacks the characteristics
		of metal
Metal	:	A solid material which is typically hard, shiny, malleable, fusible and
		ductile, with good electrical and thermal conductivity.
Actinoids	:	The fourteen elements following actinium, i.e. from Thorium (Th) to
		Lawrenctium (Lr) are called actinoids. It is previously called actinides.
Lanthanoids	:	Lanthanoid series consists of fourteen elements from Cerium (58Cr) to
		Lutetium ($_{71}$ Lu) following Lanthanum ($_{57}$ La).
Electronic Configuration	$\ddot{\cdot}$	The electron configuration is the distribution of electrons of an atom or
		molecule.
Standard electrode	:	Standard electrode potential is the value of the standard emf of a cell
potential		in which molecular hydrogen under standard pressure (1 atm) and
		temperature (273 K) is oxidised to solvated protons at the electrode.
Redox reaction	:	Redox reactions involve transfer of electrons from one reactant to another.

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ANSWER THE QUESTIONS

5 MARKS

What are transition elements? Write two characteristics of the transition elements?

Ans. The metallic elements that have incompletely filled d or f sub shell in the neutral or cationic state are called transition elements. This includes lanthanoids and actinoids.

Characteristics:

- All the transition elements are metals which are good conductors of heat and electricity.
- Ionization energy of transition element is intermediate between those of s and p block elements.

GOVERNMENT EXAM QUESTIONS AND ANSWERS

CHOOSE THE CORRECT ANSWER

1 MARK

- The magnetic moment of Cr^{3+} is [OY 2019]
 - a) 1.73 BM
- b) 2.73 BM
- c) 3.87 BM
- d) 4.90 BM

[Ans. (c) 3.87 BM]

- Equivalent weight of KMnO₄ in neutral medium is [HY 2019]
 - a) 31.6
- b) 52.67
- c) 158
- d) 52.76

[Ans. (b) 52.67]

ANSWER THE QUESTIONS

3 MARKS

What is chromyl chloride test? Give equations.

[Govt.MQP 2019]

- When potassium dichromate is heated Ans. (i) with any chloride salt in the presence of Conc. H₂SO₄, orange red vapours of chromyl chloride (CrO₂Cl₂) is evolved.
 - This reaction is used to confirm the (ii) presence of chloride ion in inorganic qualitative analysis.

$$\begin{aligned} & \text{K}_2\text{Cr}_2\text{O}_7 + 4\text{NaCl} + 6\text{H}_2\text{SO}_4 & \longrightarrow \\ & 2\text{KHSO}_4 + 4\text{NaHSO}_4 + 2\text{CrO}_2\text{Cl}_2 \uparrow + 3\text{H}_2\text{O} \\ & \text{Chromyl chloride} \end{aligned}$$

(iii) The chromyl chloride vapours are dissolved in sodium hydroxide solution and then acidified with acetic acid and treated with lead acetate. A yellow precipitate of lead chromate is obtained.

$$\text{CrO}_2\text{Cl}_2 + 4\text{NaOH} \longrightarrow \\ \text{Na}_2\text{CrO}_4 + 2\text{NaCl} + 2\text{H}_2\text{O}$$

$$Na_2CrO_4 + (CH_3COO)_2 Pb \longrightarrow$$
 $PbCrO_4 \downarrow + 2CH_3COONa$
 $CAUTH = CAUTH = CAUT$

Explain the preparation of potassium permanganate from pyrolusite.

(or)

Explain the preparation of KMnO₄.

[Govt.MQP 2019]

- Ans. Potassium permanganate is prepared from pyrolusite (MnO₂) ore. The preparation involves the following steps.
 - Conversion of MnO₂ to potassium manganate: Powdered ore is fused with KOH in the presence of air or oxidising agents like KNO3 or KClO3. A green coloured potassium manganate is formed.

 $2 MnO_2 + 4 KOH + O_2 \longrightarrow 2 K_2 MnO_4 + 2 H_2 O$ potassium manganate (Green)

- Oxidation of potassium manganate to potassium permanganate: Potassium manganate thus obtained can be oxidised in two ways, either by chemical oxidation or electrolytic oxidation.
- 3. Do transition elements form complex co-ordinate compounds? (or) Why do d-block elements readily form coordination compounds? [QY 2019]
- Transition elements have a tendency to form Ans. (i) coordination compounds with a species that has an ability to donate an electron pair to form a co-ordinate covalent bond.

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25. What is Bayer's reagent? Give its use.

Ans. Cold dilute alkaline KMnO₁ is known as Bayer's reagent. It is used to oxidise alkenes into diols.

$$CH_{2} = CH_{2} \xrightarrow{\text{Cold alk KMnO}_{4}} CH_{2} - CH$$

$$| \qquad \qquad | \qquad \qquad |$$

$$OH \quad OH$$
(Ethylene) (Glycol)

SHORT ANSWER

3 MARKS

What is meant by lanthanoid contraction?

Ans. The steady decrease in the atomic/ionic radius from La3+ to Lu3+ is called lanthanoid contraction.

Write chemical equations for the reactions involved in the manufacture of potassium permanganate from pyrolusite ore.

Ans. (i)
$$2\text{MnO}_2 + 4\text{KOH} + \text{O}_2 \xrightarrow{\Delta} 2\text{K}_2\text{MnO}_4 + 2\text{H}_2\text{O}$$

(ii) $\text{MnO}_4^{2-} \xrightarrow{\text{Electrolysis}} \text{MnO}_4^{-} + \text{e}^{-}$
Purple

- Discuss the general characteristic of the 3d series of the transition elements with special reference to their
 - (i) Atomic size
 - (ii) **Enthalpies of atomisation**
- Ans. (i) Atomic size: The atomic size in 3d transition series decrease from Sc to Mn and then Fe, CO, Ni have almost same atomic size while copper has bigger size. It is because number of unpaired electrons in d- orbitals increase in the beginning till Mn. Therefore effective nuclear charge increases hence atomic size decreases then pairing of electrons in d- orbitals takes place, so the atomic size remains the same and finally it increases due to repulsion between paired electrons in d- orbitals which leads to decrease in effective nuclear
 - They have high enthalpy of atomisation due to strong metallic bonds and additional covalent bonding due to the presence of unpaired electrons in d– orbitals.

- 4. What are the general properties of f-block elements? (Lanthanides and Actinides)
 - Electronic configuration
 - (ii) Oxidation state
 - (iii) Radii of tripositive ions.

Ans.

Properties	Lanthanides	Actinides
Electronic configuration	$[_{54}$ Xe] $4f^{1-14}$ $5d^16s^2$	[Rn] $5 f^{0,1-14}$ $6d^{0,1-2} 7s^2$
Oxidation state	Common: +3 Uncommon: +2, +4	Common: +4 Uncommon: +2, +3, +5, +6
Radii	M ³⁺ gradually decrease in size on moving from La to Lu. Lanthanide contraction	M ³⁺ and M ⁴⁺ ions decrease in size on moving from Ac to Lr. Actinide contraction

Complete the following equations.

(i)
$$Cr_2O_7^{2-} + 14H^+ + 6e^- \longrightarrow$$

(i)
$$Cr_2O_7^{2-} + 14H^+ + 6e^- \longrightarrow$$

Ans. (i) $Cr_2O_7^{2-} + 14H^+ + 6e^- \longrightarrow Cr^{3+} + 7H_2O$

(ii)
$$MnO_4^- + 4H^+ + 3e^- \longrightarrow$$

Ans. (ii)
$$MnO_4^- + 4H^+ + 3e^- \longrightarrow MnO_2 + 2H_2O$$

- Explain why oxidation states of transition elements increases first from Sc to Mn and then decrease?
- Ans. (i) The use of 3d electron for formation of bond increases from Sc to Mn, causing the increase in oxidation state upto +7.
 - The reason for Mn having highest oxidation state of +7 is due to the presence of 7 unpaired electrons in its atom.
 - (iii) As the number of unpaired electrons decrease from Fe to Cu. So there is the decrease in oxidation state.

Account for the following:

The d^1 configuration is very unstable in ions.

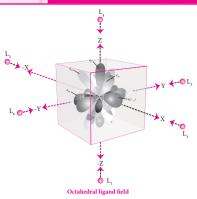
Ans. Ions of transition metals with d^1 configuration tend to lose one electron to acquire d^0 configuration that is quite stable. Therefore, such ions (with d^1) undergo either oxidation or disproportionation, hence unstable.

Co-ordination Chemistry

CHAPTER SNAPSHOT

5.1	Coordination compounds and		5.5.1 Structural isomers
	double salts		5.5.2 Stereoisomers
5.2	Werner's theory of coordination		5.5.3 Optical Isomerism
	compounds	5.5	Theories of coordination
	5.2.1 Limitations of Werner's		compound
	theory		5.5.1 Valence Bond Theory
5.3	Definition of important terms		5.5.2 Crystal Field Theory
	pertaining to co-ordination compounds	5.6	Stability of metal complexes
	5.3.1 Coordination entity		5.6.1 Stepwise formation
	5.3.2 Central atom/ion		constants and overall
	5.3.3 Ligands		formation constants
5.4	Nomenclature of coordination	5.7	Importance and applications of
	compounds		coordination complexes
5.5	Isomerism in coordination		
	compounds		

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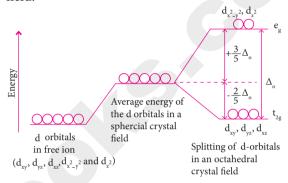


As shown in the figure, the orbitals lying along the axes dx^2-y^2 and dz^2 orbitals will experience strong repulsion and raise in energy to a greater extent than the orbitals with lobes directed between the axes $(d_{xy}, d_{yz} \text{ and } d_{zx})$. Thus the degenerate d orbitals now split into two sets and the process is called crystal field splitting.

Step 3: Up to this point the complex formation would not be favoured. However, when the ligands approach further, there will be an attraction between the negatively charged electron and the positively charged metal ion, that results in a net decrease in energy. This decrease in energy is the driving force for the complex formation.

Crystal field splitting in octahedral complexes:

During crystal field splitting in octahedral field, in order to maintain the average energy of the orbitals (barycentre) constant, the energy of the orbitals $d_x 2 - v_y 2$ and $d_z 2$ (represented as e_{σ} orbitals) will increase by $3/5\Delta_0$ while that of the other three orbitals d_{xy} , d_{yz} and d_{zx} (represented as $\mathbf{t}_{2\mathbf{g}}$ orbitals) decrease by $2/5\Delta_0$. Here, Δ_0 represents the crystal field splitting energy in the octahedral field.



Additional Questions and Answers

CHOOSE THE CORRECT ANSWER

- 1 MARK
- Identify the ambidentate ligand among the following.
 - a) NH₂
- b) C₂O₄²⁻ d) SCN⁻
- c) NO₂-

[Ans. (d) SCN-]

- An aqueous solution of (PdCl), 4NH, when treated with excess of AgNO₃ precipitated 2 moles of AgCl. Predict the secondary valency of the compound.
 - a) 2
- b) 3
- c) 4
- d) 6 [Ans. (c) 4]
- The total number of electrons donated by ligands to platinum ion in [Pt(en), Cl,] is
 - a) 8
- b) 10
- c) 12
- d) 14
- [Ans. (c) 12]

- Primary and secondary valencies of Cu in $[Cu(NH_3)_4]SO_4$ is
 - a) 4,4
- b) 2,4
- c) 4,1
- d) 4,2 [Ans. (b) 2,4]
- Structural formula of tetra aquadichlorideo Chromium (III) chloride.
 - a) $[Cr(H_2O)_4Cl_2]Cl_2$
 - b) $[Cr(H_2O)_4Cl_3]$
 - c) $[(H_2O)_4Cl_2Cr]Cl_2$
 - d) $[Cl_2(H_2O)_4Cr]Cl_3$

[Ans. (a) $[Cr(H_2O)_4Cl_2]Cl_2$]

- Which of the following octahedral complexes do not show geometrical isomerism?
 - a) $[Co(NH_3)_3Cl_3]$
 - b) $[PtCl_2(NH_3)_4]$
 - c) $[Pt(NH_3)_2Cl_2]$
 - d) $[Co(en)_3]^{3+}$

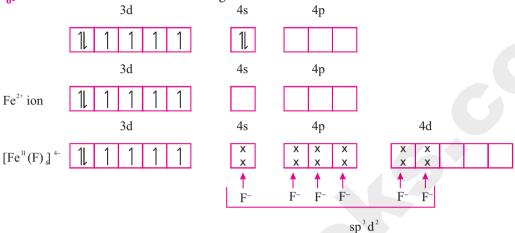
[Ans. (d) $[Co(en)_3]^{3+}$]

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LONG ANSWER 5 MARKS

Mention the type of hybridisation and magnetic property of the following complexes using VB theory a) $[FeF_6]^{4-}$ b) $[Fe(CN)_6]^{4-}$

Ans. a) $[FeF_6]^{4-}$: Fe atom - outer electronic configuration $3d^64s^2$



F⁻ is weak field ligand

In $[FeF_6]^{4-}$ the hybridisation take place is sp^3d^2

The number of unpaired electrons = 4.

$$\therefore \mu_s = \sqrt{4(4+2)} = \sqrt{24} = 4.90 \text{ BM}$$

The molecule is **paramagnetic** due to the presence of unpaired electrons.

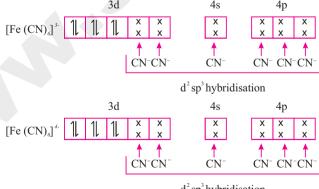
The geometry of the molecule is octahedral.

[Fe(CN)₆]⁴⁻ b)

			3d			4s		4p	
Fe ²⁺ ion	1	1	1	1	1				

In $[Fe(CN)_6]^{4-}$ complex, the CN⁻ ligand is a powerful ligand, it forces the unpaired electrons in the 3d level to pair up inside.

Hence the species has **no unpaired electron** after hybridisation. So the molecule is **diamagnetic**.



d² sp³ hybridisation

The geometry of the molecule is **octahedral**

UNIT 6

SOLID STATE

CHAPTER SNAPSHOT

6.1	Gener	al characteristics of solids	6.6	Packin	ng in crystals
6.2	Classif	fication of solids		6.6.1	Linear arrangement of
6.3	Classif	fication of crystalline solids			spheres in one direction
	6.3.1	Ionic solids		6.6.2	Two dimensional close
	6.3.2	Covalent solids	1 		packing
	6.3.3	Molecular solids		6.6.3	Simple cubic arrangement
	6.3.4	Metallic solids	 	6.6.4	Body centered cubic
6.4	Crysta	l lattice and unit cell			arrangement
6.5	Primit	ive and non-primitive		6.6.5	The hexagonal and face
	unit co				centered cubic arrangement
	6.5.1	Primitive (or) simple cubic	6.7	Imper	fection in solids
		unit cell (SC)	 	6.7.1	Schottky defect
	6.5.2	Body centered cubic unit cell (BCC)	 	6.7.2	Frenkel defect
	6.5.3	Face centered cubic unit	 	6.7.3	Metal excess defect
	0.5.5	cell (FCC)	 	6.7.4	Metal deficiency defect
	6.5.4	Calculations involving unit cell dimensions		6.7.5	Impurity defect
	6.5.5	Calculation of density			

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- (ii) It is also given that the atoms of y are present at the body centre.
 - \therefore No. of atoms of y in one unit cell = 1 Hence the formula of the compound is xy.
- 23. Sodium metal crystallizes in bcc structure with the edge length of the unit cell 4.3×10^{-8} cm. calculate the radius of sodium atom. $[QY_2019]$
- *Ans.* In a body centered cubic lattic atom touch along the body diagonal of the cube. Thus

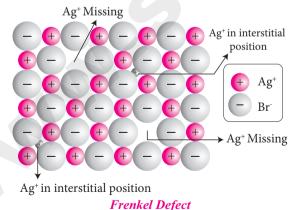
$$4r = \sqrt{3}a$$

$$r = \frac{\sqrt{3}}{4}a$$

$$= \left(\frac{\sqrt{3}}{4}\right)(4.3 \times 10^{-8})$$

$$= 1.86 \times 10^{-8} \text{ cm} = 1.86\text{Å}$$

- **24.** Write a note on Frenkel defect. [PTA 4]
- Ans. (i) Frenkel defect arises due to the dislocation of ions from its crystal lattice.
 - (ii) The ion which is missing from the lattice point occupies an interstitial position.
 - (iii) This defect is shown by ionic solids in which cation and anion differ in size. Unlike Schottky defect, this defect does not affect the density of the crystal.
 - (iv) For example AgBr, in this case, small Ag⁺ ion leaves its normal site and occupies an interstitial position as shown in the figure.



Evaluate Yourself

1. An element has a face centered cubic unit cell with a length of 352.4 pm along an edge. The density of the element is 8.9 gcm⁻³. How many atoms are present in 100 g of an element?

Ans. Given:

Density = 8.9 gcm^{-3}

Number of Atom in unit cell of fcc = 4

1 pico meter, $pm = 10^{-10}$ cm

:. Edge length = 352.4 pm = 352.4×10^{-10} cm

Avogadro's number = $6.023 \times 10^{23} \text{ mol}^{-1}$ Mass of element = 100g

$$\rho = \frac{Z \times M}{N_A \times a^3}$$

8.9 g cm⁻³ =
$$\frac{4 \times M}{(6.02 \times 10^{23} \text{mol}^{-1}) \times (352.4 \times 10^{-10} \text{cm})^3}$$

M = 58.6 g/mole.

Moles of element $= \frac{\text{Mass of element}}{\text{Molar mass of element}}$ $= \frac{100\text{g}}{58.6 \text{ g/mol}}$ = 1.7 moles.

As, 1 mole contains 6.023×10^{23} number of atoms.

So, 1.7 mole contains, = $1.7 \times (6.023 \times 10^{23})$ = 10.23×10^{23} number of

 \therefore The number of atoms present in 100 g of element is 10.23×10^{23} .

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UNIT TEST

Time: 40 min Marks: 25

- CHOOSE THE CORRECT ANSWER
- The ratio of close packed atoms to tetrahedral hole in cubic packing is
 - a) 1:1
- b) 1:2
- c) 2:1
- d) 1:4
- The yellow colour in NaCl crystal is due to
 - a) excitation of electrons in F centers
 - b) reflection of light from Cl⁻ ion on the surface
 - c) refraction of light from Na⁺ ion
 - d) all of the above
- Potassium has a bcc structure with nearest neighbor distance 4.52 A⁰. Its atomic weight is 39. its density will be
 - a) 915 kg m^{-3}
- b) 2142 kg m^{-3}
- c) 452 kg m^{-3}
- d) 390 kg m^{-3}
- The vacant space in bcc lattice unit cell is
 - a) 48%
- b) 23%
- c) 32%
- d) 26%
- **Assertion**: Monoclinic sulphur is example of monoclinic crystal system

: For a monoclinic system, a≠b≠c and $\alpha = \gamma = 90^{\circ}$, $\beta \neq 90^{\circ}$

- a) Both assertion and reason are true and reason is the correct explanation of assertion.
- b) Both assertion and reason are true but reason is not the correct explanation of assertion.
- c) Assertion is true but reason is false.
- d) Both assertion and reason are false.
- **SHORT ANSWER**

 $(2 \times 2 = 4)$

- Classify the following solids
- b. Brass
- Diamond C.
- d. NaCl
- **Iodine**
- Explain Schottky defect.

$(5 \times 1 = 5)$ III. Answer In Paragraph

 $(2 \times 3 = 6)$

- Distinguish between hexagonal close packing and cubic close packing.
- 2. Why ionic crystals are hard and brittle?

IV. LONG ANSWER

 $(2 \times 5 = 10)$

- KF crystallizes in fcc structure like sodium 1. chloride. calculate the distance between K+ and F- in KF. (Given : density of KF is 2.48 g cm^{-3}
 - Explain the following: Similarities and differences between metallic



Answer Key

- **1.** b) 1:2
 - **2.** a) excitation of electrons in F centers
 - 3. a) 915 kg m^{-3}

and ionic crystals.

- **4.** c) 32%
- 5. a) Both assertion and reason are true and reason is the correct explanation of assertion.
- 1. Refer Sura's Guide Book Back, Q.No. 4.
 - 2. Refer Sura's Guide Book Back, Q.No. 9.
- III. 1. Refer Sura's Guide Book Back, Q.No. 6.
 - 2. Refer Sura's Guide Book Back, Q.No. 13.
- IV. 1. Refer Sura's Guide Book Back, Q.No. 21.
 - 2. Refer Sura's Guide Additional 5 Marks, Q.No. 7.





CHEMICAL KINETICS

CHAPTER SNAPSHOT

7.1	Rate	of a	chemical	reaction

- **7.1.1** Stoichiometry and Rate of a reaction
- **7.1.2** Average and Instantaneous rate
- **7.3** Rate law and rate constant
- **7.4** Molecularity
- 7.5 The Integrated rate equation
 - **7.5.1** Integrated rate law for a first order reaction
 - **7.5.2** Integrated rate law for a zero order reaction
- **7.6** Half life period of a reaction
- **7.7** Collision theory
- **7.8** Arrhenius equation The effect of temperature on reaction rate
- **7.9** Factors affecting the reaction rate
 - **7.9.1** Nature and state of the reactant
 - **7.9.2** Concentration of the reactants

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b)
$$k = \left(\frac{2.303}{t}\right) \log\left(\frac{2P_0}{P_0 - P}\right)$$

c)
$$k = \left(\frac{2.303}{t}\right) \log\left(\frac{3P_0 - P}{2P_0}\right)$$

d)
$$k = \left(\frac{2.303}{t}\right) \log\left(\frac{2P_0}{3P_0 - 2P_0}\right)$$

[Ans. (a)
$$k = \left(\frac{2.303}{t}\right) \log\left(\frac{2P_0}{3P_0 - P}\right)$$
]

- 22. If 75% of a first order reaction was completed in 60 minutes, 50% of the same reaction under the same conditions would be completed in
 - a) 20 minutes
- b) 30 minutes
- c) 35 minutes
- d) 75 minutes

[*Ans.* (b) 30 minutes]

- 23. The half life period of a radioactive element is 140 days. After 560 days, 1 g of element will be reduced to [Govt.MQP 2019]

- d) $\left(\frac{1}{16}\right)g$

[Ans. (d) $\frac{1}{1}$

- 24. The correct difference between first and second order reactions is that
 - A first order reaction can be catalysed; a second order reaction cannot be catalysed.
 - b) The half life of a first order reaction does not depend on $[A_0]$; the half life of a second order reaction does depend on $[A_0]$.
 - The rate of a first order reaction does not depend on reactant concentrations; the rate of a second order reaction does depend on reactant concentrations.
 - The rate of a first order reaction does depend on reactant concentrations; the rate of a second order reaction does not depend on reactant concentrations.

[Ans. (b) The half life of a first order reaction does not depend on [A₀]; the half life of a second order reaction does depend on $[A_0]$

25. After 2 hours, a radioactive substance becomes $\left(\frac{1}{16}\right)^{th}$ of original amount. Then

the half life (in min) is

- 60 minutes
- b) 120 minutes
- 30 minutes
- d) 15 minutes

[Ans. (c) 30 minutes]

Answer the $\mathbf F$ ollowing **U**UESTIONS

- Define average rate and instantaneous rate.
- Ans. Average rate of chemical reaction:

It may be defined as the change in concentration of a reaction or product of a chemical in a given interval of time.

Average rate of reaction =

Change in concentration of reactants or products

Time interval

Instantaneous rate of reaction:

It may be defined as the rate of a reaction of a particular instant. Instantaneous reaction

 $\frac{d[l_2]}{dl_2}$ where, $d(l_2)$ = small change in concentration.

d+ = small change in time

Define Rate law and Rate constant. 2.

Ans. Rate law:

- It is the expression which relates the rates of reaction with concentration of the reactants.
- (ii) Inratelaw, the rate of the reaction is expressed as function of the concentration of reactant and products present in the reaction $A + B \rightarrow C$, For a reaction rate law = K[A] [B]

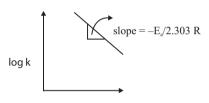
Rate constant: When the concentration of reactants is unity, then the rate of reaction is known as rate constant. It is also called specific reaction rate.

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HOTS

- 1. Explain how will you find activation energy of a reaction by graphical method. (or) Draw the graph between log k vs $\frac{1}{T}$. What is the relationship between its slope and acitivation energy.
- Ans. (i) A plot of log k against $\frac{1}{T}$ values gives a straight line with slope value equal to $-E_a/2.303R$ and intercept value equals to log A.



- (ii) The plot gives a negative slope straight line also.
- (iii) From the slope of straight line E_a can be calculated.
- 2. How will you determine the rate constant for the decomposition of nitrogen pentaoxide in CCl_4 .

Decomposition of nitrogen pentoxide in CCl₄.

Ans.
$$N_2O_5 \xrightarrow{k_1} 2NO_2 + \frac{1}{2}O_2$$

- (i) At time t = 0, the volume of oxygen liberated is zero.
- (ii) Let V_t and V_{∞} be the measured volumes of oxygen liberated after the reactant has reacted in 't' time and at completion $(t = \infty)$.
- (iii) Initial concentration of N_2O_5 is proportional to total volume of oxygen liberated (i.e.,) (V_{∞}) .
- (iv) $(V_{\infty} V_t)$ is proportional to undecomposed N_2O_5 at time 't'.

NUMERICAL PROBLEMS

1. For the reaction R - P, the concentration of a reactant changes from 0.03 M to 0.02 M in 25 minutes. Calculate the average rate of reaction using units of time both in minutes and second.

Ans. Average rate = $-\frac{\Delta(R)}{\Delta t} = -\frac{[R]_2 - [R]_1}{t_2 - t_1}$ = $-\frac{0.02 \,\text{M} - 0.03 \,\text{M}}{25 \,\text{min}} = \frac{-0.01 \,\text{M}}{25 \,\text{min}}$ = $4 \times 10^{-4} \,\text{M min}^{-1}$ and $-\frac{-0.01 \,\text{m}}{25 \times 60} = 6.66 \times 10^{-6} \,\text{Ms}^{-1}$

2. The conversion of molecules x to y follows second order kinetics. It concentration of x is increased to three times how will it affect the rate of formation of y?

For the reaction $x \longrightarrow y$ as it follows second order kinetics wherefore the rate of formation of y?

Ans. Rate =
$$k[x]^2 = ka^2$$

[x] = a mol⁻¹

If the concentration of x is incress three time, then

$$(x) = 3a \text{ mol } L^{-1}$$

Rate =
$$R(3a)^2 = 9 ka^2$$

Hence, the rate of formation will increase by 9 times.

3. A first order reaction laws on rate constant 1.15×10^{-3} s⁻¹. How long will 5 g of this reactant take to reduce to 3g?

Ans.
$$[R]_0 = 5g$$
, $[R] = 3g$

$$K = 1.15 \times 10^{-3} \text{ s}^{-1}$$
.

As the reaction is of first order

$$K = \frac{2.303}{t} \log \frac{[R]_0}{[R]}$$

$$t = \frac{2.303}{1.15 \times 10^{-3} \,\mathrm{s}^{-1}} \log \frac{5g}{3g}$$

VOLUME - II

TINU 8

IONIC EQUILIBRIUM

CHAPTER SNAPSHOT

	8.1.1	Arrhenius Concept
	8.1.2	Lowry - Bronsted Theory
	8.1.3	Lewis concept
8.2	Strengt	h of Acids and Bases
8.3	Ionisati	on of water
8.4	The pH	scale
	8.4.1	Relation between pH and
		рОН
8.5	Ionisati	on of weak acids
	8.5.1	Ostwald's dilution law
8.6	Commo	on Ion Effect
8.7	Buffer S	Solution
	8.7.1	Buffer action

Acids and bases

	8.7.2	Buffer capacity and buffer
		index
	8.7.3	Henderson – Hasselbalch
		equation
8	Salt Hyo	drolysis
	8.8.1	Salts of strong acid and a
		strong base
	8.8.2	Hydrolysis of Salt of strong
		base and weak acid.
	8.8.3	Hydrolysis of salt of strong
		acid and weak base
	8.8.4	Hydrolysis of Salt of weak
		acid and weak base
9	Solubili	ty Product
	8.9.1	Determination of solubility
		product from molar
		solubility



MUST KNOW DEFINITIONS

Lowry - Bronsted **Theory**

According to Lowry - Bronsted concept, an acid is defined as a substance that has a tendency to donate a proton to another substance and base is a substance that has a tendency to accept a proton form other substance. In other words, an acid is a proton donor and a base is a proton acceptor.

Lewis concept

According to Lewis concept, an acid is a species that accepts an electron pair while base is a species that donates an electron pair.

Ionisation of water

The ionic product of water at 25°C is

$$K_{w} = [H_{3}O]^{+} [OH^{-}]$$

 $K_{w} = (1 \times 10^{-7}) (1 \times 10^{-7})$
 $= 1 \times 10^{-14}$

pH scale

pH of a solution is defined as the negative logarithm of base 10 of the molar concentration of the hydronium ions present in the solution.

$$pH = -\log_{10} [H_3O^+]$$

 $pOH = -\log_{10} [OH^-]$
 $pH + pOH = 14$

Degree of dissociation

Degree of dissociation (α) is the fraction of the total number of moles of a substance that dissociates at equilibrium.

$$\alpha = \frac{Number of moles dissociated}{total number of moles}$$

Ostwald's dilution law

 $k_a = \frac{\alpha^2 C}{1 - \alpha}$ is known as Ostwald's dilution law.

$$\alpha = \sqrt{\frac{k_a}{C}}$$

Common ion effect

The dissociation of a weak acid (CH₃COOH) is suppressed in the presence of a salt (CH₃COONa) containing an ion common to the weak electrolyte. It is called the common ion effect.

Buffer

Buffer is a solution which consists of a mixture of a weak acid and its conjugate base (or) a weak base and its conjugate acid.

Buffer action

This buffer solution resists drastic changes in its pH upon addition of a small quantities of acids (or) bases, and this ability is called buffer action.

Acidic buffer solution

A solution containing a weak acid and its salt.

Example: solution containing acetic acid and sodium acetate

Basic buffer solution A solution containing a weak base and its salt.

Example : Solution containing NH₄OH and NH₄Cl

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$$[Pb^{2+}][Cl^{-}]^{2} = (0.06)(0.08)$$

= 3.84×10^{-4}

Since ionic product $[Pb^{2+}][Cl^{-}]^{2} > K_{sp}$, $PbCl_{2}$ is precipitated.

27. K_{sp} of Al(OH)₃ is 1×10^{-15} M. At what pH does 1.0×10^{-3} M Al³⁺ precipitate on the addition of buffer of NH₄Cl and NH₄OH solution?

Ans.
$$Al(OH)_3 \Longrightarrow Al_{(aq)}^{3+} + 3OH_{(aq)}^{-}$$

$$K_{sp} = [Al^{3+}][OH^{-}]^{3}$$

Al(OH)₃ precipitates when

$$[Al^{3+}][OH^{-}]^{3} > K_{sp}$$

 $[1 \times 10^{-3}][OH^{-}]^{3} > 1 \times 10^{-15}$

$$[OH]^3 > 1 \times 10^{-12}$$

$$[OH^{-}] > 1 \times 10^{-4} \,\mathrm{M}$$

$$[OH^{-}] = 1 \times 10^{-4} M$$

POH =
$$-\log_{10} [OH^{-}]$$

= $-\log [1 \times 10^{-4}] = 4$

$$PH = 14 - 4 = 10$$

Thus, $Al(OH)_3$ precipitates at a pH of 10.

(ii) $H_2SO_4 + H_2O \rightleftharpoons H_3O^+ + HSO_4^$ acid 2 base 1 base 2 acid 1 (iii) CH₃COOH + H₂O ⇌ H₃O⁺ + CH₃COO acid 1 base 2 acid 2 base 1

Identify the Lewis acid and the Lewis base in the following reactions.

i.
$$CaO + CO_2 \longrightarrow CaCO_3$$

ii.
$$CH_3 = O - CH_3 + AICI_3$$

H₃BO₃ accepts hydroxide ion from water as

Predict the nature of H₃BO₃ using Lewis

- Ans. (i) CaO Lewis base; CO₂ Lewis acid
 - $_{\rm H_3C}$ Lewis base AlCl₃ - Lewis acid

shown below

- Evaluate Yourself Classify the following as acid (or) base using
- Arrhenius concept HNO₃
- ii) Ba(OH),
- iii) H₃PO₄
- iv) CH₃COOH

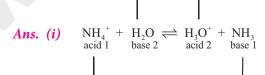
Ans. acid:

- HNO_3
- iii) H₃PO₄
- iv) CH₃COOH

Base: ii) Ba(OH),

- Write a balanced equation for the dissociation of the following in water and identify the conjugate acid -base pairs.

 - i) NH₄ ii) H₂SO₄ iii) CH₃COOH.



concept. Ans. HO B OH; electron pair acceptor - Lewis acid

 $H_3BO_3(aq) + H_2O(l) B(OH)_4^- + H^+$

At a particular temperature, the K_w of a neutral solution was equal to 4×10^{-14} . Calculate the concentration of [H₃O⁺] and |OH⁻|.

Ans. Given solution is neutral

$$\therefore [H_3O^+] = [OH^-]$$

Let $[H_3O^+] = x$; then $[OH^+] = x$

$$K_{w} = [H_{3}O^{+}][OH^{-}]$$

$$4 \times 10^{-14} = x.x$$

$$x^2 = 4 \times 10^{-14}$$

$$x = \sqrt{4 \times 10^{-14}} = 2 \times 10^{-7}$$

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It means that there is no hydrolysis. In such cases $[H^+] = [OH^-]$ pH is maintained and, therefore, the solution is neutral.

7. Derive an expression for the hydrolysis constant for the hydrolysis of salt of weak acid and weak base.

Ans. Let us consider the hydrolysis of ammonium acetate.

$$CH_{3}COONH_{4(aq)} \longrightarrow CH_{3}COO_{(aq)}^{-} + NH_{4(aq)}^{+}$$

In this case, both the cation (NH_4^+) and anion $(CH_3COO\ 3^-)$ have the tendency to react with water

$$CH_3COO^- + H_2O \Longrightarrow CH_3COOH + OH^-$$

 $NH_4^+ + H_2O \Longrightarrow NH_4OH + H^+$

The nature of the solution depends on the strength of acid (or) base i.e, if $K_a > K_b$; then the solution is acidic and pH < 7, if $K_a < K_b$; then the solution is basic and pH > 7, if $K_a = K_b$; then the solution is neutral.

The relation between the dissociation constant (K_a, K_b) and the hydrolysis constant is given by the following expression.

$$K_a \cdot K_b \cdot K_h = K_w$$

pH of the solution

pH of the solution can be calculated using the following expression,

$$pH = 7 + \frac{1}{2}pK_a - \frac{1}{2}pK_b$$

8. Derive the hydrolysis constant for the hydrolysis of salt of strong base and weak acid. Deduce its pH.

Ans. Let us find a relation between the equilibrium constant for the hydrolysis reaction (hydrolysis constant) and the dissociation constant of the acid.

$$K_{h} = \frac{[\text{CH}_{3}\text{COOH}][\text{OH}^{-}]}{[\text{CH}_{3}\text{COO}^{-}][\text{H}_{2}\text{O}]}$$

$$K_{h} = \frac{[\text{CH}_{3}\text{COOH}][\text{OH}^{-}]}{[\text{CH}_{3}\text{COO}^{-}]} \qquad \qquad \dots \dots (1)$$

$$CH_{3}\text{COOH}_{(aq)} \rightleftharpoons CH_{3}\text{COO}_{(aq)}^{-} + H_{(aq)}^{+}$$

$$K_{a} = \frac{\left[CH_{3}COO^{-}\right]\left[H^{+}\right]}{\left[CH_{3}COOH\right]} \qquad(2)$$

$(1) \times (2)$

$$\Rightarrow$$
 K_b . K_a = [H⁺][OH⁻]
we know that [H⁺][OH⁻] = K_w

$$K_h \cdot K_a = K_w$$

 K_h value in terms of degree of hydrolysis (h) and the concentration of salt (C) for the equilibrium can be obtained as in the case of Ostwald's dilution law. $K_h = h^2C$. and i.e $\left[OH^-\right] = \sqrt{K_h.C}$ pH of salt solution in terms of K_a and the concentration of the electrolyte.

$$pH + pOH = 14$$

 $pH = 14 - pOH = 14 - \{-log [OH^{-}]\}$
 $= 14 + log [OH^{-}]$

$$\therefore pH = 14 + \log(K_hC)^{\frac{1}{2}}$$

$$pH = 14 + \log\left(\frac{K_w C}{K_a}\right)^{\frac{1}{2}}$$

$$pH = 14 + \left(\frac{1}{2}\log K_w + \frac{1}{2}\log C - \frac{1}{2}\log K_a\right)$$

$$[:: K_{W} = 10^{-14}]$$

$$pH = 14 - 7 + \frac{1}{2} \log C + \frac{1}{2} pK_a$$

$$\frac{1}{2}\log K_{w} = \frac{1}{2} \times \log 10^{-14} = \frac{-14}{2}(1) = -7$$

$$pH = 7 + \frac{1}{2}pK_a + \frac{1}{2}logC$$
 $[-log K_a = pK_a]$

PROBLEMS FOR PRACTICE

1. The hydrogen ion concentration of a fruit juice is 3.3×10^{-2} M. What is the pH of the juice? Is it acidic or basic?

Ans. The definition of pH is

We are given $[H^+] = 3.3 \times 10^{-2}$

Substituting into the definition of pH, we get

$$pH = -\log(3.3 \times 10^{-2})$$

$$= -(-1.48) = 1.48$$

Since the pH is less than 7.00, the solution is acidic.

UNIT

ELECTRO CHEMISTRY

CHAPTER SNAPSHO

	9.1.1	Moiar conductivity
	9.1.2	Equivalent conductance
	9.1.3	Factors affecting electrolytic
		conductance
	9.1.4	Measurement of
		conductivity of ionic
		solutions
9.2	Variati	on of molar conductivity with
	concen	tration
	0.2.1	Dahya Hualial and Oncagan
	9.2.1	Debye - Huckel and Onsagar

equation

Kohlraush's law

9.2.2

Conductivity of electrolytic solution

9.3	Electro	chemical Cell
	9.3.1	Galvanic cell
	9.3.2	Galvanic cell notation
	9.3.3	Emf of a Cell
	9.3.4	Measurement of electrode
		potential
9.4	Thermo	odynamics of cell reactions
	9.4.1	Nernst equation
	9.4.2	Electrolytic cell and
		electrolysis
	9.4.3	Electrochemical series



EVALUATION

Choose The Correct

- The number of electrons that have a total charge of 9650 coulombs is
 - a) 6.22×10^{23}
- b) 6.022×10^{24}
- c) 6.022×10^{22}
- d) 6.022×10^{-34}

[Ans. (c) 6.022×10^{22}]

2. Consider the following half cell reactions:

$$Mn^{2+} + 2e^- \longrightarrow Mn E^\circ = -1.18V$$

$$Mn^{2+} \longrightarrow Mn^{3+} + e^{-} E^{\circ} = -1.51V$$

The E° for the reaction

 $3Mn^{2+} \longrightarrow Mn + 2Mn^{3+}$, and the possibility of the forward reaction are respectively.

- a) 2.69V and spontaneous
- b) -2.69 and non spontaneous
- c) 0.33V and Spontaneous
- d) 4.18V and non spontaneous

[Ans. (b) -2.69 and non spontaneous]

3. The button cell used in watches function as follows

$$Zn(s) + Ag_2O(s) + H_2O(l) \rightleftharpoons$$

 $2Ag(s) + Zn^{2+}(aq) + 2OH^-(aq)$

the half cell potentials are

$$Ag_2O(s) + H_2O(l) + 2e^- \longrightarrow$$

$$2Ag(s) + 2OH^{-}(aq)$$

 $E^{\circ} = 0.34V$. The cell potential will be

- a) 0.84V b) 1.34V c) 1.10V d) 0.42V
 - [Ans. (c) 1.10V]
- The molar conductivity of a 0.5 mol dm⁻³ solution of AgNO₃ with 9 electrolytic conductivity of $5.76 \times 10^{-3} \, \text{S cm}^{-1}$ at 298 K is
 - a) 2.88 S cm² mol⁻¹ b) 11.52 S cm²mol⁻¹
 - c) 0.086 S cm²mol⁻¹ d) 28.8 S cm² mol⁻¹

[Ans. (b) $11.52 \text{ S cm}^2\text{mol}^{-1}$]

Electrolyte	KCl	KNO ₃	HCl	NaOAC	NaCl
Λ_{-} (S cm ² mol ⁻¹)	149.9	145.0	426.2	91.0	126.5

Calculate Λ°_{HoAC} using appropriate molar conductances of the electrolytes listed above at infinite dilution in water at 25°C.

- a) 517.2 b) 552.7 c) 390.7 d) 217.5

[Ans. (c) 390.7]

- Faradays constant is defined as [PTA - 4]
 - a) charge carried by 1 electron
 - b) charge carried by one mole of electrons
 - c) charge required to deposit one mole of substance
 - d) charge carried by 6.22×10^{10} electrons.

[Ans. (b) charge carried by one mole of electrons

How many faradays of electricity are required for the following reaction to occur

 $MnO_4^- \longrightarrow Mn^{2+}$

- a) 5F
- b) 3F
- c) 1F
- d) 7F [Ans. (a) 5F]
- A current strength of 3.86 A was passed through molten Calcium oxide 41minutes and 40 seconds. The mass of Calcium in grams deposited at the cathode is (atomic mass of Ca is 40 g / mol and 1F = 96500C).
 - a) 4
- b) 2
- c) 8
- d) 6 [Ans. (b) 2]
- During electrolysis of molten sodium chloride, the time required to produce 0.1 mol of chlorine gas using a current of 3A is [Govt.MQP 2019]
 - a) 55 minutes
- b) 107.2 minutes
- c) 220 minutes
- d) 330 minutes
- [*Ans.* (b) 107.2 minutes]

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The electrochemical cell reaction of the 7. Daniel cell is

 $Zn_{(s)} + Cu^{2+}{}_{(aq)} \longrightarrow Zn^{2+}{}_{(aq)} + Cu_{(s)}$ What is the change in the cell voltage on increasing the ion concentration in the anode compartment by a factor 10?

Ans.
$$Zn_{(s)} + Cu^{2+}_{(aq)} \longrightarrow Zn^{2+}_{(aq)} + Cu_{(s)}$$

$$E_{cell} = E^{\circ} - \frac{0.0591}{n} log \frac{[Zn^{2+}]}{[Cu^{2+}]}$$

If the concentration of Zn²⁺ is increased, the second term on the RHS becomes more negative. This lowers the value of E_{cell} , so E_{cell} value will decrease if the ion concentration in the anode compartment is increased.

A solution of a salt of metal was electrolysed for 15 minutes with a current of 0.15 amperes. The mass of the metal deposited at the cathode is 0.783 g. Calculate the equivalent mass of the metal.

I = 0.15 amperes Ans.

time t =
$$15 \times 60 \text{ s} = 900 \text{ s}$$

$$mass m = 0.783 g$$

$$m = ZIt$$

$$z = \frac{111}{It}$$

$$m = \frac{Eq. mass}{F} \times I \times t$$
; Eq. mass = $\frac{m \times F}{I \times t}$

$$= \frac{0.783 \times 96500}{0.15 \times 150 \times 60} = \frac{75559.5}{1350}$$

$$m = 55.97 \text{ g. equiv}^{-1}.$$

PTA MODEL QUESTIONS AND ANSWERS

CHOOSE THE CORRECT ANSWER

1 MARK

Assertion: A small piece of Zinc dissolved in dilute nitric acid but hydrogen gas is not evolved [PTA - 3]

: HNO, is an oxidising agent and Reason this oxidizes hydrogen

- a) Both assertion and reason are true and reason is the correct explanation of assertion
- b) Both assertion and reason are true but reason is not the correct explanation of assertion
- c) Assertion is true but reason is false
- d) Both assertion and reason are false

[Ans. (a) Both assertion and reason are true and reason is the correct explanation of assertion]

- Which of the following statement is not correct with respect to electrolytic conductance?
 - a) Conductivity increases with the decrease in Viscosity
 - b) Conductivity increases with increase in temperature
 - Molar conductance of a solution decreses with increase in dilution

d) Conductance decrease with increase in temperature

[Ans. (c) Molar conductance of a solution decreses with increase in dilution]

Which of the following is Secondary Cell?

- a) Laclanche cell
- b) Lithium ion battery
- c) Mercury button cell
- d) both (a) and (c) [Ans. (d) both (a) and (c)]
- 3. The general representation of a fuel cell is [PTA - 6]
 - a) Fuel / Electrode / Electrolyte / Electrode / Oxidant
 - b) Oxidant / Electrode / Electrolyte / Electrode
 - c) Fuel / Electrode / Electrolyte / Electrode / Reductant
 - d) Oxidant / Electrode / Electrolyte / Electrode / Reductant

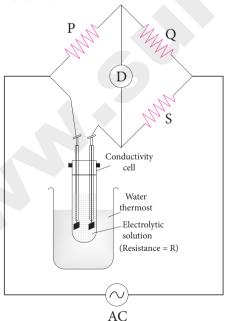
[Ans. (a) Fuel / Electrode / Electrolyte / **Electrode / Oxidantl**

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Long Answer

5 MARKS

- How will you determine the conductivity of an electrolytic solution using a wheatstone bridge?
- Ans. (i) The conductivity of an electrolytic solution is determined by using a wheatstone bridge arrangement in which one resistance is replaced by a conductivity cell filled with the electrolytic solution of unknown conductivity.
 - In the measurement of specific resistance of a metallic wire, a DC power supply is used. Here, if we apply DC current through the conductivity cell, it will lead to the electrolysis of the solution taken in the cell. So, AC current is used for this measurement to prevent electrolysis.
 - (iii) A wheatstone bridge is constituted using known resistances P, Q, a variable resistance S and conductivity cell (Let the resistance of the electrolytic solution taken in it be R) as shown in the figure. An AC source (550 Hz to 5 KHz) is connected between the junctions A and C. Connect a suitable detector (Such as the telephone ear piece detector) between the junctions 'B' and 'D'.



Schematic diagram of a conductivity cell in a wheatstone bridge circuit

(iv)The variable resistance 'S' is adjusted until the bridge is balanced and in this conditions there is no current flow through the detector.

Under balanced condition,

$$\frac{P}{Q} = \frac{R}{S}$$

$$\therefore R = \frac{P}{Q} \times S$$

- The resistance of the electrolytic solution (v) (R) is calculated from the known resistance values P, Q and the measured 'S' value under balanced condition using the above expression.
- How will you calculate solubility product of AgCl which is a sparingly soluble salt?
- Ans. Substances like AgCl, PbSO₄ etc., are sparingly soluble in water. The solubility product of such substances can be determined using conductivity measurements.

Let us consider AgCl as an example

$$AgCl_{(s)} \stackrel{\longrightarrow}{\longleftarrow} Ag^+ + Cl^-$$

$$K_{sp} = [Ag^+][Cl^-]$$

Let the concentration of $[Ag^+]$ be 'C' mol L^{-1} .

As per the stoichiometry, if $[Ag^+] = C$, then $[Cl^-]$ also equal to 'C' mol L^{-1} .

$$K_{sp} = C.C$$

 $\Rightarrow K = C^2$

We know that the concentration (in mol dm⁻³) is related to the molar and sepcific conductance by the following expressions

$$\Lambda_0 = \frac{\kappa \times 10^{-3}}{\text{C(in mol L}^{-1})}$$
(or)
$$C = \frac{\kappa \times 10^{-3}}{\Lambda}$$

Substitute the concentration value in the relation $K_{sp} = C^2$

$$K_{sp} = \left(\frac{\kappa \times 10^{-3}}{\Lambda}\right)^2$$

UNIT 10

Surface Chemistry

CHAPTER SNAPSHOT

10.1	Adsor	ption	and	Abso	orption
------	-------	-------	-----	------	---------

- **10.1.1** Types of adsorption
- **10.1.2** Factors affecting adsorption
- **10.1.3** Adsorption isotherms and isobars
- **10.1.4** Applications of adsorption
- 10.2 Catalysis
 - **10.2.1** Characteristics of catalysts
 - **10.2.2** Theories of Catalysis
- **10.3** Enzyme Catalysis
 - **10.3.1** Mechanism of enzyme catalysed reaction

- **10.4** Colloid, Dispersion phase and dispersion medium
 - **10.4.1** Classifications of Colloidal solution
 - **10.4.2** Preparation of Colloids
 - **10.4.3** Purification of colloids
 - **10.4.4** Properties of Colloids
- 10.5 Emulsions
 - **10.5.1** Deemulsification
- **10.6** Various application of colloids

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UNIT TEST

Time: 40 min Marks: 25

- I. Choose the Correct Answer $(5 \times 1 = 5)$
- 1. Assertion: Coagulation power of Al³⁺ is more than Na⁺.
 - Reason: Greater the valency of the flocculating ion added, greater is its power to cause precipitation
 - a) if both assertion and reason are true and reason is the correct explanation of assertion.
 - b) if both assertion and reason are true but reason is not the correct explanation of assertion
 - c) assertion is true but reason is false
 - d) both assertion and reason are false.
- 2. Adsorption of a gas on solid metal surface is spontaneous and exothermic, then
 - a) ΔH increases
- b) ΔS increases
- c) ΔG increases
- d) ΔS decreases
- **3.** Fog is colloidal solution of
 - a) solid in gas
- b) gas in gas
- c) liquid in gas
- d) gas in liquid
- 4. The phenomenon of Tyndall's effect is not observed in
 - a) emulsion
- b) colloidal solution
- c) true solution
- d) none
- 5. Which type of colloid is a sol?
 - a) Solid in liquid
- b) Liquid in solid
- c) Soild in solid
- d) Gas in solid

II. VERY SHORT ANSWER

 $(2\times 2=4)$

- **1.** Give two important characteristics of physisorption.
- **2.** What are the methods by which colloids are prepared?
- III. SHORT ANSWER

 $(2\times3=6)$

- 1. Write a note on electro-osmosis.
- **2.** Explain the advantages of using nano catalyst.
- IV. Long Answer

 $(2 \times 5 = 10)$

- 1. Differentiate physisorption and chemisorption.
- **2.** Describe adsorption theory of catalysis.

Answer Key

- I. 1. a) Both assertion and reason are true and reason is the correct explanation of assertion.
 - **2.** d) ΔS decreases
 - **3.** c) liquid in gas
 - **4.** c) true solution
 - **5.** a) Solid in liquid
- II. 1. Refer Sura's Guide Book back Q.No. 1.
 - 2. Refer Sura's Guide Additional 2 marks Q.No. 9.
- III. 1. Refer Sura's Guide Book back Q.No. 21.
 - 2. Refer Sura's Guide Additional 3 marks Q.No. 5.
- IV. 1. Refer Sura's Guide Book back Q.No. 2.
 - 2. Refer Sura's Guide Book back Q.No. 25.



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HYDROXY COMPOUNDS AND ETHERS

CHAPTER SNAPSHOT

- 11.1 Classification of alcohols
- 11.2 IUPAC Nomenclature
- 11.3 Structure of the functional group of alcohol
- 11.4 Alcohols
- 11.5 Phenols
- 11.6 Ethers

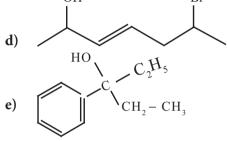
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Evaluate Yourself

Classify the following alcohols as 1°, 2°, and 3° and give their IUPAC Names.

Br

- $CH_3 CH_2 CH(OH) CH_2 C(CH_3)_2$
- b) $(C_2H_5)_3COH$
- $CH_2 = C(CI) CH (OH) CH_3$ c)



- 2° alcohol Ans. (a)
 - 5 bromo 5 methyl hexan 3 ol
 - $(C_2H_5)_3 C OH$

$$\begin{array}{c} C_2H_5\\ |\\ C_2H_5-C-OH\rightarrow 3^{\circ} alcohol\\ |\\ C_2H_5 \end{array}$$

- 3 ethyl pentan 3 ol
- 2° alcohol (c)
 - 3 chloro but 3 ene 2 ol
- (d) 2° alcohol
 - 6 bromo Hept 3 ene 2 ol

(e)
$$C - C_2H_5 \longrightarrow 3^{\circ} \text{ alcohol}$$

$$CH_2CH_3$$

3 - phenyl - 3 - pentanol

Write all the possible isomers of an alcohol having the molecular formula C₅H₁₂O and give their IUPAC names.

Ans.

S.NO	Structure	IUPAC NAMES
1.	CH ₃ -CH ₂ -CH ₂ -CH ₂ -CH ₂ -OH	pentan 1 ol
2.	$\begin{array}{c} \operatorname{CH_3} - \operatorname{CH_2} - \operatorname{CH_2} - \operatorname{CH} - \operatorname{CH_3} \\ \\ \operatorname{OH} \end{array}$	pentan 2 ol
3.	$\begin{array}{c} \operatorname{CH_3} - \operatorname{CH_2} - \operatorname{CH} - \operatorname{CH_2} - \operatorname{CH_3} \\ \\ \operatorname{OH} \end{array}$	pentan 3 ol
4.	$ \begin{array}{c} 4 \\ CH_3 - CH - CH_2 - CH_2 - OH \\ CH_3 \end{array} $	3 methyl butan 1 ol
5.	4 3 2 1 CH ₃ - CH - CH - CH ₃ CH ₃ OH	3 methyl butan 2 ol
6.	$ \begin{array}{c} OH \\ CH_3 - CH_2 - C - CH_3 \\ CH_3 - CH_3 \end{array} $	2 methyl butan 2 ol
7.	$ \begin{array}{c} 4 \\ CH_3 - CH_2 - CH - CH_2 - OH \\ CH_3 \end{array} $	2 methyl butan 1 ol
8.	CH_3 CH_3 $CH_3 - C - CH_2 - OH$ CH_3	2,2 dimethyl propan 1 ol

- Suggest a suitable carbonyl compound for the preparation of pent-2-en-1-ol using LiAlH₄.
- Ans. The suitable carbonyl compound for the preparation Pent-2-en-1-ol using LiAlH₄.

2-methylpropan-1-ene — H₂SO₄/H₂O →?

Ans.
$$CH_3 - C = CH_2 + H_2O \xrightarrow{H_2SO_4} CH_3 - C - CH_3$$

$$CH_3 \qquad CH_3$$
2 - methyl propan - 1 - ene
$$2 - methyl propan - 2 - ol$$

It follows Markownikoff's addition.

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82 .	The functional	l isomer	of CH ₃	CH ₂	CH ₂ OH is
-------------	----------------	----------	--------------------	-----------------	-----------------------

- (a) CH₃-O-CH₂-CH₃ (b) CH₃CH₂CHO
- (c) CH₂-CO-CH₂ (d) CH₂CHO

[Ans. (a) CH_3 -O- CH_2 - CH_3]

83.
$$CH_3$$
 - CH_2 - O - CH_2CH_3 and CH_3

 $CH_3 - O - CH - CH_3$ are examples isomerism.

- (a) functional
- (b) chain
- (c) position
- (d) metamerism

[Ans. (d) metamerism]

- 84. Lower halogenated ethers can be converted into higher ethers by using _____ reagent.
 - (a) Grignard
- (b) Tollen's
- (c) Fehling's
- (d) none of the above

[Ans. (a) Grignard]

- ____ cannot be prepared by using Grignard reagent.
 - (a) $CH_3 OC_2H_5$
- (b) CH₃ OCH₃
- (c) $C_2H_5 O C_2H_5$
- (d) CH₃ OCH₂CH₂CH₃

[Ans. (b) $CH_2 - OCH_2$]

- 86. Ether oxygen is capable of forming bonds with electron deficient species.
 - (a) covalent
- (b) ionic
- (c) coordinate covalent (d) hydrogen

[Ans. (c) coordinate covalent]

- **87.** On heating, peroxides are _
 - (a) stable
- (b) unstable
- (c) decomposes violently
- (d) both (b) and (c)

[Ans. (d) both (b) and (c)]

- 88. Anisole on bromination yields ___
 - (a) m-bromo anisole (b) o-bromo anisole
 - (c) o- & p-bromo anisole
 - (d) benzoic acid

[Ans. (c) o- & p-bromo anisole]

Assertion & Reason:

Direction: In each of the following questions a statement of assertion (A) is given and a corresponding statement of reason (R) is given just below it. Mark the correct

- (A) and (R) are true and (R) is the correct explanation
- Both (A) and (R) are true but (R) does not explain (A)
- (A) is true but (R) is false
- d) Both (A) and (R) are false
- 1. **Assertion (A):** Pentan-2-ol and pentan-3-ol are both secondary
 - : Both give blue colouration Reason (R) with Victor Meyer's test

[Ans. (b) Both (A) and (R) are true but (R) does not explain (A)

- 2. **Assertion** (A): Phenol is more acidic than aliphatic alcohols
 - Reason (R) The increased acidity is due to the stability of the phenoxide ion due to resonance.

[Ans. (a) (A) and (R) are true and (R) is the correct explanation of (A)

- 3. Assertion (A): Alcohols have higher boiling points than ethers of comparable molecular
 - : Alcohols and ethers are Reason (R) functional isomers.

[Ans. (b) Both (A) and (R) are true but (R) does not explain (A)

- 4. **Assertion (A):** Reduction of crotonaldehyde is preferably carried in the presence of LiAlH₄.
 - LiAlH₄ does not reduce Reason (R) carbon-cabon double bond in the carbonyl compound

[Ans. (a) (A) and (R) are true and (R) is the correct explanation of (A)

UNIT **12**

CARBONYL COMPOUND

CHAPTER SNAPSHOT

12.1	Nomenclature of Aldehydes and	12.5	Carboxylic Acids
	ketones	12.6	Acid Halide
12.2	Structure of carbonyl group	12.7	Acid anhydride
12.3	Preparation of aldehydes and ketones	12.8	Esters
		12.9	Acid Amides
		12.10	Uses of carboxylic acid

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Why acid anhydride are preferred to acyl chloride for carrying out acylation reactions?

Ans. Acetic anhydride is preferred for acylation due to

- Its ease of availability and cheap compared to acetyl chloride.
- when acylation is carried out with acetyl chloride, the by product is HCl which is a strong acid and has the potential for unwanted reactions whereas with acetic anhydride, the by product is only acetic acid.
- (iii) Acetyl chloride is more reactive and hence more liable to undergo side reaction. Therefore acetic anhydride is preferred for acylation.

PTA MODEL QUESTIONS AND ANSWERS

CHOOSE THE CORRECT ANSWER

1 MARK 7 2.

- The general order of reactivity of carbonyl compounds towards nucleophilic addition reaction is [PTA - 1]
 - a) $HCHO > RCHO > C_6H_5CHO > R_2CO >$
 - b) HCHO > CH₂CHO > C₆H₅CHO > $CH_3COCH_3 > C_6H_5COCH_3$
 - c) $C_6H_5COC_6H_5 > CH_3COCH_3 > C_6H_5CHO >$ CH₃CHO > HCHO
 - d) $HCHO > CH_3COCH_3 > C_6H_5COC_6H_5 >$ $CH_3CHO > C_6H_5CHO$

[Ans. (b) HCHO > $CH_3CHO > C_6H_5CHO >$ $CH_3COCH_3 > C_6H_5COCH_3$

2. Which one of the following pairs is not correctly matched? [PTA - 3]

Reducing agent	Name of the reaction
a) Zn / Hg / ConHCl	Clemension reduction
b) LiAlH ₄	Wolf - Kishner's reduction
c) Pd / BaSO ₄	Rosenmund's reduction
d) SnCl ₂ /ConHCl	Stephen's reduction
FA (I) TIAITY TAT I	C 771 1 1 1 1 1

[Ans. (b) LiAlH₄ - Wolf - Kishner's reduction]

ANSWER THE QUESTIONS

2 MARKS

- 1. Write two tests of carboxylic acid. [PTA 2]
- Aqueous solution of carboxylic acids turn Ans. (i) blue litmus into red colour.
 - Carboxylic acids give brisk effervescence with sodium bicarbonate due to the evolution of CO₂.

- Name the ester which had the following flavour? [PTA - 6]
 - (1) Banana
 - (2) Orange
 - (3) Pineapple
 - (4) Apricot
- Ans. (1) Banana Amyl acetate
 - Orange Octyl acetate (2)
 - Pineapple Ethyl butyrate (3)
 - Apricot Amyl butyrate

ANSWER THE QUESTIONS

3 MARKS

- Write a note on Etard reaction? [PTA - 4]
- Ans. When chromylchloride is used as an oxidising agent, toluene gives benzaldehyde. This reaction is called Etard reaction. Acetic anhydride and CrO₃ can also be used for this reaction.

$$\begin{array}{c} \text{CH}_{3} \\ \text{ } + \text{CrO}_{2}\text{Cl}_{2} \\ \text{methylbenzene} \end{array} \begin{array}{c} \text{CH (OCrOHCl}_{2})_{2} \\ \text{ } \\ \text{$$

Answer The Questions

5 MARKS

- 1. What happens when ethanoic acid reacts with ethonal in the presence of con H₂SO₄. Give its complete mechanism. [PTA - 6]
- **Ans.** When carboxylic acids are heated with alcohols in the presence of conc. H₂SO₄ or dry HCl gas, esters are formed. The reaction is reversible and is called esterification.

O
$$\parallel$$
 $C_6H_5 - C - OH + C_2H_5OH \xrightarrow{Con} C_6H_5 - C - OC_2H_5 + H_2OG_4$
Benzoic acid

O
 \parallel
 $C_6H_5 - C - OH + C_2H_5OH \xrightarrow{Con} C_6H_5 - C - OC_2H_5 + H_2OG_4$
ethyl benzoate

Sura's 🛶 XII Std - Chemistry 🛶 Volume - II

PROBLEMS FOR PRACTICE

An organic compound A (C₇H₆O) reduces Tollen's reagent. On treating with an alkali compound A forms B and C. B on treating with sodalime forms benzene and $C(C_7H_8O)$ is an antiseptic. Identify compounds A, B and C. Explain the reactions.

Ans. Solution:

From the molecular formula compound (i) (A) is identified as Benzaldehyde C₆H₅CHO and it reduces Tollen's reagent.

$$C_6H_5CHO + Ag_2O \longrightarrow 2Ag + C_6H_5COOH$$

Tollen's reagent Silver mirror

Benzaldehyde on treatment with alkali undergoes Cannizzaro reaction to give benzoic acid (B) and benzyl alcohol (C).

$$C_6H_5CHO + C_6H_5CHO \xrightarrow{NaOH}$$
(A)
$$C_6H_5COOH + C_6H_5CH_2OH$$

(iii) Benzoic acid on treatment with sodalime gives benzene.

$$\begin{array}{c} {\rm C_6H_5COOH} \xrightarrow{\quad {\rm NaOH} \quad } {\rm C_6H_6 + CO_2} \\ {\rm (B)} & {\rm Benzene} \end{array}$$

(iv) Benzyl alcohol acts as an antiseptic.

Compound	Compound Name	Formula				
A	Benzaldehyde	C ₆ H ₅ CHO				
В	Benzoic acid	C ₆ H ₅ COOH				
С	Benzyl alcohol	C ₆ H ₅ CH ₂ OH				

2. An organic compound A (C,H6O) forms a bisulphite. A when treated with alcoholic KCN forms B $(C_{14}H_{12}O_2)$ and A on refluxing with sodium acetate and acetic anhydride forms an acid C (C₀H₈O₂). Identify A, B and C. Explain the conversion of A to B and C.

Ans. Solution:

An organic compound (A) with formula C₇H₆O form bisulphite means it must be benzaldehyde C₆H₅CHO.

(ii) Benzaldehyde on treatment with KCN form benzoin.

$$\begin{array}{c} C_6H_5CHO+C_6H_5CHO \xrightarrow{KCN} C_6H_5-CH-C-C_6H_5\\ \mid \quad \mid \quad \mid \\ HO \quad O \\ (A) \end{array}$$

(iii) Benzaldehyde on treatment with sodium acetate and acetic anhydride form an acid, cinnamic acid it is (C).

$$C_6H_5CHO + (CH_3CO)_2O \xrightarrow{CH_3COONa}$$

(A) $C_6H_5CH = CH - COOH + CH_3COOH$

(C)

Compound	Compound Name	Formula
A	Benzaldehyde	C ₆ H ₅ CHO
В	Benzoin	C ₆ H ₅ -CH-OHCO-C ₆ H ₅
C	Cinnamic acid	C ₆ H ₅ CH=CHCOOH

3. An aromatic aldehyde (A) of molecular formula C₇H₆O which has the smell of bitter almonds on treatment with (CH2CO)2O and CH₂COONa to give compound (B) which is an aromatic unsaturated acid. (A) also reacts with (A) in the presence of alc. KCN to give dimer (C). Identify (A), (B) and (C). Explain the reactions.

Ans. Solution:

- An organic compound which has the smell of bitter almonds is benzaldehyde C_6H_5CHO and it is (A).
- Benzaldehyde reacts with acetic anhydride in the presence of sodium acetate gives Cinnamic acid.

$$C_6H_5CHO + (CH_3CO)_2O \xrightarrow{CH_3COONa}$$
(A)
$$C_6H_5CH = CHCOOH + CH_3COOH$$

(iii) Benzaldehyde on treatment with alcoholic KCN gives **Benzoin** a dimer and it is (C).

$$C_6H_5CHO + C_6H_5CHO \xrightarrow{Alcoholic KCN}$$

$$\begin{array}{c|c} C_6H_5-CH-C-C_6H_5\\ & \parallel\\ OH & O\\ (C) \end{array}$$



EVALUATION

Choose The Correct

- Which of the following reagent can be used to convert nitrobenzene to aniline
 - a) Sn / HCl
- b) ZnHg/NaOH
- c) LiAlH₄
- d) All of these

[Ans. \star (a) and (c)]

- The method by which aniline cannot be 2. prepared is
 - degradation of benzamide with Br₂ / NaOH
 - potassium salt of phthalimide treated with chlorobenzene followed by hydrolysis with aqueous NaOH solution.
 - c) Hydrolysis of phenylcyanide with acidic solution
 - d) reduction of nitrobenzene by Sn / HCl.

[Ans. (b) potassium salt of phthalimide treated with chlorobenzene followed by hydrolysis with aqueous NaOH solution

- Which one of the following will not undergo Hofmann bromamide reaction
 - a) CH₂CONHCH₂
- b) CH₂CH₂CONH₂
- c) CH₃CONH,
- d) $C_6H_5CONH_2$

Ans. (a) CH₃CONHCH₃

Assertion: Acetamide on reaction with KOH and bromine gives acetic acid

: Bromine catalyses hydrolysis of Reason acetamide.

- if both assertion and reason are true and reason is the correct explanation of assertion.
- b) if both assertion and reason are true but reason is not the correct explanation of assertion.
- c) assertion is true but reason is false
- d) both assertion and reason are false.

[Ans. (d) both assertion and reason are false]

5.
$$CH_3CH_2Br \xrightarrow{aq NaOH} A \xrightarrow{KMnO_4/H^+} A \xrightarrow{\Delta} D$$

$$B \xrightarrow{NH_3} C \xrightarrow{Br_2/NaOH} D$$

'D' is

- bromomethane
- b) α bromo sodium acetate
- methanamine
- d) acetamide

[Ans. (c) methanamine]

- Which one of the following nitro compounds does not react with nitrous acid
 - a) CH₃ CH₂ CH₃ NO₃
 - b) (CH₃)₂ CH CH₂NO₂
 - c) (CH₃)₃ C NO₅
 - d) $CH_3 C CH NO_2$ O CH_3 [Ans. (c) $(CH_3)_3 C NO_2$]
- Aniline + benzoylchloride $\xrightarrow{\text{NaOH}}$ C₆H₅ - NH - COC₆H₅ this reaction is known as
 - a) Friedel crafts reaction
 - b) HVZ reaction
 - c) Schotten Baumann reaction
 - d) None of these

[Ans. (c) Schotten – Baumann reaction]

- The product formed by the reaction an aldehyde with a primary amine (NEET) [HY 2019]
 - a) carboxylic acid
- b) aromatic acid
- c) schiff's base
- d) ketone

[Ans. (c) schiff's base]

- Which of the following reaction is not correct.
 - $CH_3CH_2NH_2 \xrightarrow{HNO_2} CH_3CH_2OH + N_2$

b)
$$(CH_3)_2 N$$
 $NaNO_2 / HCI / (CH_3)_2 N$ $N = NC$

- $CH_3CONH_2 \xrightarrow{Br_2/NaOH} CH_3NH_2$
- none of these

[Ans. (b)
$$(CH_3)_2 N \longrightarrow \frac{NaNO_2 / HC1}{(CH_3)_2 N} N = NC1$$

10. When aniline reacts with acetic anhydride the product formed is

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- a) o aminoacetophenone
- b) m-aminoacetophenone
- c) p aminoacetophenone
- d) acetanilide

[Ans. (d) acetanilide]

👣 Sura's → XII Std - Chemistry → Volume - II

17. What are different types of RNA which are 19. What are the functions of lipids in living found in cell?

- Ans. RNA molecules are classified according to their | Ans. Biological importance of lipids: structure and function into three major types,
 - Ribosomal RNA (rRNA)
 - (ii) Messenger RNA (mRNA)
 - (iii) Transfer RNA (tRNA)

18. Write a note on formation of α -helix.

[PTA - 6]

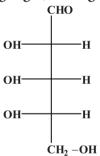
Ans. The amino acids in the polypeptide chain forms highly regular shapes (sub-structures) through the hydrogen bond between the carbonyl oxygen (-C=O) and the neighbouring amine hydrogen (-NH) of the main chain. α -Helix and β -strands or sheets are two most common sub structures formed by proteins.

α-Helix:

- In the α -helix sub-structure, the amino acids are arranged in a right handed helical (spiral) structure and are stabilised by the hydrogen bond between the carbonyl oxygen one amino acid (nth residue) with amino hydrogen of the fifth residue $(n + 4^{th} residue)$.
- The side chains of the residues protrude (ii) outside of the helix.
- (iii) Each turn of an α -helix contains about 3.6 residues and is about 5.4 A long.
- The amino acid proline produces a kink in the helical structure and often called as a helix breaker due to its rigid cyclic Ans. L-Sugar. structure.

organism?

- Lipids are the integral component of cell membrane. They are necessary of structural integrity of the cell.
- The main function of triglycerides in animals is as an energy reserve. They yield more energy than carbohydrates and proteins.
- (iii) They act as protective coating in aquatic organisms.
- (iv) Lipids of connective tissue give protection to internal organs.
- Lipids help in the absorption and transport of fat soluble vitamins.
- (vi) They are essential for activation of enzymes such as lipases.
- (vii) Lipids act as emulsifier in fat metabolism.
- **20.** Is the following sugar, D sugar or L sugar?



PTA MODEL QUESTIONS AND ANSWERS

CHOOSE THE CORRECT ANSWER

1 mark **■ 2.**

- 1. Which of the following statement is incorrect? [PTA - 2]
 - a) Nucleoside + Phosphate \rightarrow Nucleotide
 - b) Nucleoside + Base → Nucleotide
 - c) Sugar + Base \rightarrow Nucleoside
 - d) nNucleotide \rightarrow Polynucleotide

[Ans. (b) Nucleoside + Base \rightarrow Nucleotide]

Assertion: Thymine pairs with Adenine wheareas Cytosine pairs with Guanine in DNA molecule.

: The hydrogen bonding between Reason bases of two strands is highly specific. [PTA - 5]

- a) Both assertion and reason are true and reason is the correct explanation of assertion
- b) Both assertion and reason are true but reason is not the correct explanation of assertion
- c) Assertion is true but reason is false
- d) Both assertion and reason are false

[Ans. (a) Both assertion and reason are true and reason is the correct

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CHEMISTRY IN EVERYDAY LIFE

CHAPTER SNAPSHO

15	(1)	Drug
- 1) . I	ולו עצ

- **15.1.1** Classification of drugs
- **15.1.2** Drug-target Interaction
- **15.2** Food additives
 - **15.2.1** Important categories of food additives
 - 15.2.2 Preservatives
 - 15.2.3 Antioxidants
 - **15.2.4** Sugar Substituents
 - **15.2.5** Artificial sweetening agents
- 15.3 Cleansing agents
 - 15.3.1 Soaps
 - 15.3.2 Detergents

15.4 Polymers

- **15.4.1** Classification of Polymers
- **15.4.2** Types of polymerisation
- **15.4.3** Preparation of some important addition polymers
- 15.4.4 Co-polymers
- **15.4.5** Natural and Synthetic rubbers
- **15.4.6** Biodegradable Polymers
- 15.4.7 Co-polymers

GOVERNMENT EXAM QUESTIONS AND ANSWERS

Answer The Questions

2 MARKS

Write the preparation of Teflon and Give its use.

[HY 2019]

Ans. The monomer is tetrafluroethylene. When the monomer is heated with oxygen (or) ammonium persulphate under high pressure, Teflon is obtained.

$$n \text{ CF}_2 = \text{CF}_2 \xrightarrow{\Delta} \text{---} \text{CF}_2 - \text{---} \text{CF}_2 \xrightarrow{n}$$

It is used for for coating articles and preparing non-stick utensils.

2. Give an example and use of antihistamine.

[HY 2019]

Ans. Antihistamine: Examples - Cetirizine, levocetirizine, desloratadine, brompheniramine, Terfenadine.

Uses: To provide relief from the allergic effects.

Answer The Questions

3 MARKS

Write a short note on Antioxidants.

[Govt.MQP 2019]

- Ans. (i) Antioxidants are substances which retard the oxidative deteriorations of food.
 - Food containing fats and oils is easily oxidised and turn rancid. (ii)
 - (iii) To prevent the oxidation of the fats and oils, chemical BHT(butylhydroxy toluene), BHA(Butylated hydroxy anisole) are added as food additives.
 - (iv) They are generally called antioxidants. These materials readily undergo oxidation by reacting with free radicals generated by the oxidation of oils, thereby stop the chain reaction of oxidation of food.

2. How is Nylon - 6,6 prepared? Give it use.

[Govt.MQP 2019]

Ans. Nylon – 6,6 can be prepared by mixing equimolar adipic acid and hexamethylene – diamine to form a nylon salt which on heating eliminate a water molecule to form amide bonds.

It is used in textiles, manufacture of cards etc...



Based Questions

NEET BASED QUESTIONS

- 1. Rutherford's alpha-particle scattering 5. experiment eventually led to the conclusion that
 - (A) Mass and energy are related
 - (B) Electron occupy space around the nucleus
 - (C) Neutrons are buried deep in the nucleus
 - (D) The point of impact with matter can be precisely determined
- 2. The number of α and β -particles emitted in the nuclear reaction

$$_{90}$$
 Th²²⁸ \longrightarrow 83 Bi²¹²

- (A) Four alpha and one beta
- (B) Three alpha and seven beta
- (C) Eight alpha and one beta
- (D) One alpha and four beta
- 3. Principal quantum number determines
 - (A) Size of the electron wave and energy of electron
 - (B) Orbital angular momentum
 - (C) Shape of the electron cloud
 - (D) Configuration of orbitals in space
- 4. Correct electronic configuration of Cr is
 - (A) $1s^2 2s^2 2p^6 3s^2 3p^{10} 3d^5 4s^1$
 - (B) $1s^2 2s^2 2p^6 3s^2$, $3d^8 4s^0$
 - (C) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$
 - (D) $1s^2 2p^2 2p^6 3p^0 3d^5 4s^1$

- The bond order of individual carbon-carbon bond in benzene is-
 - (A) 1
- (B) 2
- (C) Between 1 and 2 (D) 1 and 2, alternatively
- **6.** Hybridisation of sulphur in SO₂ is
 - (A) sp (B)
- (B) sp^3
- (C) sp^2
- (D) dsp^2
- 7. Hybridisation states of carbon in diamond, graphite and acetylene respectively, are
 - (A) sp^2 , sp, sp^3
- (B) sp, sp^2, sp^3
- (C) sp^3 , sp^2 , sp
- (D) sp, sp^3, sp
- 8. NaHCO₃ decompose as

- (A) 0.2704
- (B) 2.704
- (C) 27.04
- (D) 270.4
- 9. For the reaction

$$H_{2(g)} + l_{2(g)} \Longrightarrow 2Hl_{(g)}$$

Kc = 66.9 at 350°C and 50.0 at 448°C. The reaction has-

- (A) $\Delta H + ve$
- (B) $\Delta H = -ve$
- (C) $\Delta H = zero$
- (D) None of these

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EXPLANATORY ANSWERS

1.	(D)	2 .	(A)	3.	(A)	4.	(C)	5 .	(C)	6.	(C)	7.	(C)	8.	(A)	9.	(B)	10. (B)
11.	(B)	12 .	(C)	13.	(B)	14.	(C)	15 .	(A)	16.	(C)	17 .	(B)	18.	(A)	19.	(A)	20 . (A)
21.	(A)	22 .	(D)	23 .	(A)	24 .	(A)	25 .	(D)	26 .	(B)	27 .	(A)	28 .	(D)	29.	(B)	30. (A)
31.	(D)	32 .	(C)	33 .	(C)	34.	(B)	35 .	(C)	36 .	(A)	37 .	(B)	38 .	(A)	39 .	(D)	40. (B)
41.	(C)	42 .	(C)	43 .	(C)	44.	(C)	45 .	(B)	46.	(A)	47 .	(D)	48 .	(D)	49 .	(C)	50 . (C)
51 .	(C)	52 .	(D)	53 .	(C)	54 .	(A)	55 .	(C)	56 .	(B)	57 .	(D)	58 .	(D)	59 .	(D)	60. (C)
61.	(C)	62 .	(A)	63 .	(D)	64.	(B)	65 .	(D)	66.	(D)	67 .	(B)	68 .	(D)	69.	(D)	70 . (C)
71 .	(A)	72 .	(C)	73 .	(B)	74 .	(D)	75 .	(B)	76 .	(D)	77 .	(B)	78 .	(D)	79 .	(C)	80. (A)
81.	(A)	82 .	(C)	83.	(C)	84.	(D)	85 .	(D)	86.	(A)	87 .	(A)	88.	(C)	89.	(C)	90. (C)
91.	(D)	92 .	(A)	93.	(C)	94.	(C)	95 .	(D)	96.	(C)	97 .	(C)	98.	(B)	99.	(B)	100 .(D)

EXPLANATORY NOTES

EXPLANATORY NOTES

8.
$$Kp = p_{CO_{2}(g)}.p_{H_{2}O(g)}$$

$$p_{CO_{2}(g)} + p_{H_{2}O(g)} = 1.04$$

$$p_{CO_{2}(g)} = p_{H_{2}O(g)}$$

$$p_{CO_{2}(g)} = \frac{1.04}{2} = 0.52$$

$$Kp = 0.52 \times 0.52 = 0.27$$

$$Kp = 0.52 \times 0.52 = 0.2704.$$

- 9. The reaction is exothermic because, with the increase in temperature Kc decreases $\Delta H = -ve$.
- $2SO_{2(g)} + O_{2(g)} \rightleftharpoons 2SO_{3(g)}$ has the expression for Kc 10.

$$Kc = \frac{[SO_3]^2}{[SO_2]^2[O_2]}$$

$$[SO_3] = [SO_2]$$

$$Kc = \frac{1}{[O_2]}$$

$$[O_2] = \frac{1}{K_c} = \frac{1}{100} = 0.01 \text{ mole/litre}$$

Moles of O_2 in 10 litre = $0.01 \times 10 = 0.1$

$$= \stackrel{\frown}{0} 01 \times 10 = 0.1$$

11.
$$Kp = \frac{P_{CO}^2}{P_{CO_2}}$$

$$= \frac{4 \times 4}{2} = 8$$

12.
$$K = \frac{[H_2]^2[S_2]}{[H_2S]^2}$$
$$= \frac{0.1 \times 0.1 \times 0.4}{0.5 \times 0.5}$$
$$= 0.016 \text{ mole/litre.}$$

13. The molecularity can never be zero.

14.
$$t_{0.5} = \frac{0.693}{K_2}$$

$$t_{0.75} = \frac{2 \times 0.693}{K_1}$$

Hence $t_{0.75}$: $t_{0.5} = 2:1$.

16.
$$[H^+] \propto \frac{1}{\sqrt{C}}$$

$$pH \propto \frac{1}{[H^+]} \propto \sqrt{C}$$

where C = conc. of the salt. Hence, minimum the concentration, minimum is the pH.

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Govt. Model Question Paper - 2019-20

CHEMISTRY (With Answers)

TIME ALLOWED: 15 MINUTES 3.00 HRS MAXIMUM MARKS: 70

Instructions:

- 1. Check the question paper for fairness of printing. It there is any lack of fairness, inform the Hall Supervisor immediately.
- 2. Use Blue or Black ink to write and underline and pencil to draw diagrams:

Note: Draw a diagrams and write equations wherever necessary.

PART - I

 $(15 \times 1 = 15)$ 7. **Note** : (i) Answer all the questions:

- Choose the most suitable answer from the (ii) given four alternatives and write the option code and the corresponding answer.
- Which one of the following ore is best concentrated by froath - floatation method?
 - a) Magnetite
- b) Haematite
- c) Galena
- d) Cassiterite
- 2. Which compound is used as flux in metallurgy?
 - a) Boric acid
- b) Borax
- c) Diborane
- d) BF₃
- The shape of XeOF₄ is
 - a) T Shaped
- b) Pyramidal
- c) Square planar
- d) Square pyramidal
- How many moles of acidified KMn04 required to oxidise one mole of oxalic acid?
 - a) 5
- c) 1.5 b) 0.6
- d) 0.4
- The type of isomerism exhibited by $[Pt(NH_3),Cl_3]$?
 - a) coordination isomerism
 - b) linkage isomerism
 - c) optical isomerism
 - d) geometrical isomerism
- The fraction of the total volume occupied by the atoms in a fcc is

- b) $\frac{\pi}{3\sqrt{2}}$ c) $\frac{\pi}{4}$ d) $\frac{\sqrt{3}\pi}{8}$

- The half life period of a radioactive element is 140 days. After 280 days 1g of element will be reduced to which amount of the following?

 - a) $\frac{1}{4}$ b) $\frac{1}{16}$ c) $\frac{1}{8}$ d) $\frac{1}{2}$
- 8. Which is not a Lewis base?
 - a) BF₂
- b) PF₂
- c) CO
- 9. During electrolysis of molten copper chloride, the time required to produce 0.2 mole of chlorine gas using a current of 2A is
 - a) 32.66 min
- b) 321 .66 min
- c) 378 min
- d) 260 min
- 10. Smoke is a colloidal solution of
 - a) Solid in gas
- b) Gas in gas
- c) liquid in gas
- d) Gas in liquid
- 11. Iso propyl benzene on oxidation in presence of air and dilute acid gives
 - a) C₆H₅COOH
- b) C₆H₅COCH₃
- c) $C_6H_5COC_6H_5$
- d) C₆H₅OH
- **12.** But 2 ene on ozonolyis followed by subsequent cleavage with Zn and water gives
 - a) ethanal b) Propanal
 - c) Propanone d)
- Methanal
- **13.** Aniline + benzoyl chloride C₆H₅NH-OC-C₆H₅. This reaction is known as
 - a) Friedal craft's reaction
 - b) HVZ reaction
 - c) Schotten Baumann reaction
 - d) Cannizaro reaction

HALF YEARLY Examination

2019 - 2020

TIME ALLOWED: 3.00 HRS

CHEMISTRY

MAXIMUM MARKS: 70

Instructions:

- 1. Check the question paper for fairness of printing. It there is any lack of fairness, inform the Hall Supervisor immediately.
- 2. Use Blue or Black ink to write and underline and pencil to draw diagrams:

Note:

Draw a diagrams and write equations wherever necessary.

PART - I

Note : (i) Answer all the questions: $(15 \times 1 = 15)$

- Choose the most suitable answer from the given four alternatives and write the option code and the corresponding answer.
- 1. Bauxite has the composition
 - a) Al_2O_3
- b) Al₂O₃.nH₂O
- Fe₂O₃.2H₂O
- d) None of these
- 2. All the elements of group 17 and 18 are:
 - metalloids
- b) metals
- non-metals c)
- d) both (a) and (b)
- Which is true regarding nitrogen?
 - a) least electronegative element
 - b) has low ionisation enthalpy than oxygen
 - d- orbitals available
 - ability to form $p\pi p\pi$ bonds with itself
- Common isotope of iodine is:
- b) I³⁵
- c) I⁷⁹
- d) I¹²⁷
- Equivalent weight of KMnO₄ in neutral medium is
- b) 52.67
- c) 158
- d) 52.76
- Which type of isomerism is exhibited by [Pt(NH₃), Cl_2]?
 - a) Coordination isomerism
 - Linkage isomerism c) Optical isomerism b)
 - Geometrical isomerism
- In Naphthalene, constituent molecules are held together by:
 - a) Electrostatic attraction
 - b) London forces
 - Hydrogen bond c)
 - Strong dipole dipole interaction

rate of reaction doubles when the Assertion concentration of the reactant is doubles if it is a first order reaction.

: rate constant also doubles

- Both assertion and reason are true and reason is the correct explanation of assertion.
- Both assertion and reason are true but reason is not the correct explanation of assertion.
- Assertion is true but reason is false.
- Both assertion and reason are false.
- 9. Match the following:

(1)	Lewis acids	i)	Gives H+ in water
(2)	Lowry – Bronsted Theory	ii)	$K_a = \alpha_2 C$
(3)	Arrhenius Concept	iii)	Carbonium ion
(4)	Ostwald's dilution law	iv)	Has a tendency to donate proton

- a) (1)-(iii), (2)-(iv), (3)-(i), (4)-(ii)
- b) (1)-(iv), (2)-(iii), (3)-(ii), (4)-(i)
- (1)-(ii), (2)-(iv), (3)-(i), (4)-(iii)
- (1)-(i), (2)-(iv), (3)-(iii), (4)-(ii)
- 10. Collodion is a 4% solution of which one of the following compounds in alcohol - ether mixture?
 - Nitroglycerine
- b) Cellulose acetate
- Glycoldinitrate
- d) Nitrocellulose
- 11. The oxidising agent used in swern oxidation is:
 - fenton's reagent
- b) dimethyl sulfoxide
- alkaline KMnO₄
- d) periodic acid

12. The IUPAC name of \neq

- a) but 3- enoic acid
- but 1- ene-4-oic acid
- but 2- ene-1-oic acid
- but -3-ene-1-oic acid