

**12<sup>th</sup>  
STD**



**CHEMISTRY**



# 12 - CHEMISTRY SPECIAL GUIDE

## KRISHNAGIRI DISTRICT 2025-26

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## 12-ஆம் வகுப்பு

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**+2 CHEMISTRY – SPECIAL GUIDE****UNIT 1. METALLURGY****2,3 MARK QUESTIONS**

1. What are the difference between minerals and ores?

Mineral	Ore
Metal present in low percentage.	Metal present in high percentage.
Separation is difficult.	Separation is easy.
All minerals are not ores Ex. Chinaclay	All ores are minerals. Ex. Bauxite.

2. Which type of ores can be concentrated by froth flotation method? Give two examples?

- Sulphide ores.
- Ex. Galena, Zinc blende.

3. What are the various steps involved in extraction of pure metals from their ores?

- Concentration of the ore.
- Extraction of the crude metal.
- Refining of the crude metal.

4. Explain the gravity separation or hydraulic wash process?

- The ore is finely powdered and washed with a current of water.
- The lighter gangue particles are washed away by water.
- Ex. Oxide ores – Haematite.

5. Define slag?

- Flux + gangue  $\longrightarrow$  slag.
- $\text{CaO} + \text{SiO}_2 \longrightarrow \text{CaSiO}_3$

6. Define gangue?

- Non metallic impurity silicon impurity and rock present in the ore is called gangue.

7. Define concentration?

- The process of removal of the gangue from the impure ore is called concentration.

8. What is the role of sodium cyanide in froth floatation method?

- Sodium cyanide act as a depressing agent which prevents other metal sulphide from coming with the froth.

**9. What is the role of cryolite in the extraction of aluminium?**

- It helps to lower the melting point of the mixture.

**10. What is the role of limestone in the extraction of iron from its oxide  $\text{Fe}_2\text{O}_3$ ?**

- Limestone acts as a flux.
- It combines with silica and converted into calcium silicate as slag.
- $\text{CaO} + \text{SiO}_2 \longrightarrow \text{CaSiO}_3$

**11. What is the role of Silica in the extraction of copper?**

- Silica act as a flux.
- It combines with ferrous oxide and removed as ferrous silicate called as slag.
- $\text{FeO} + \text{SiO}_2 \longrightarrow \text{FeSiO}_3$

**12. Describe a method for refining Nickel by Mond's process?**

- $\text{Ni} + 4 \text{CO} \xrightarrow{350\text{K}} \text{Ni}(\text{CO})_4$
- $\text{Ni}(\text{CO})_4 \xrightarrow{460\text{K}} \text{Ni} + 4 \text{CO}$

**13. How titanium is refined by the Van Arkal method?**

- $\text{Ti} + 2 \text{I}_2 \xrightarrow{550\text{K}} \text{TiI}_4$
- $\text{TiI}_4 \xrightarrow{1800\text{K}} \text{Ti} + 2 \text{I}_2$

**14. Give the limitations of elingham diagram?**

- It does not explain the rate of the reaction.
- It does not explain the possibility of other reactions.
- When the reactants and the products are in equilibrium the value of  $\Delta G$  is not true value.

**15. Give the uses of zinc?**

- Zinc is used in coated on iron to prevent rusting.
- Zinc is used in electrical industries.
- Zinc oxide is used in pharmaceuticals.

**16. Define Auto reduction reaction?**

- $\text{HgS} + \text{O}_2 \longrightarrow \text{Hg} + \text{SO}_2$

**17. Define Calcination.**

- The ore is strongly heated in the absence of air.
- $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$

**18. Explain the principle of electrolytic refining with an example.**

- Anode – Impure Silver
- Cathode – Pure Silver
- Electrolyte – Silver Nitrate + Nitric Acid
- Pure Silver is deposited at the cathode.

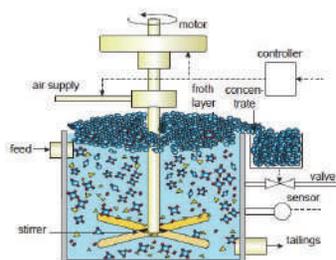
### 19. What are the conditions for vapour phase refining?

- The metal should form a Volatile compound with the reagent.
- The volatile compound decomposes to give the pure metal.

### 5 MARK QUESTIONS

#### 1. Explain the froth flotation process?

- Sulphide ores - Galena
- Floating agent - Pine oil
- Collector - Sodium ethyl xanthate
- Depressing agent - Sodium cyanide.
- The ore is finely powdered and mixed with water and pine oil.
- When air is passed it produces froth.
- The ore particles rise to the surface and collected separately.
- The impurities settled at the bottom.

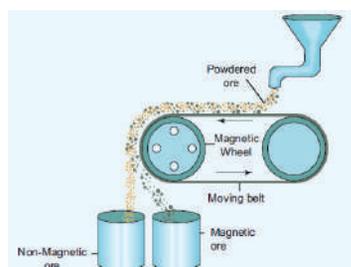


#### 2. Explain zone refining process?

- This method is based on fractional crystallization.
- The impure metal is taken in the form of a rod.
- When the metal rod is heated with a heater, the metal melts.
- The heater is slowly moved from one end to the other end.
- The impurity dissolves in the molten zone.
- This process is repeated again and again to get the pure metal.
- Ex. Silicon and Germanium.

#### 3. Explain the magnetic separation process. (How ferromagnetic ores or concentrated?)

- This method is used to concentrate ferromagnetic ores.
- Ex. Tin stone.
- The powdered ore is added on an electro magnet containing a moving belt on a magnetic rollers.
- The magnetic ores fall near the magnet. Non-magnetic ores fall away from the magnet.
- The non magnetic parts fall away from the magnet.



**4. Electro chemical extraction of aluminium by Hall-Heroult process?**

- Anode – Carbon rod
- Cathode - Iron tank coated with carbon.
- Electrolyte – Calcium chloride, Alumina.
- Temperature – 1270K
- Pure Aluminium is deposited at cathode
- $\text{Al}_2\text{O}_3 \longrightarrow 2 \text{Al}^{3+} + 3 \text{O}^{2-}$
- $2 \text{O}^{2-} \longrightarrow \text{O}_2 + 4 \text{e}^-$
- $\text{Al}^{3+} + 3 \text{e}^- \longrightarrow \text{Al}$

**UNIT 2. P - BLOCK ELEMENTS - I****2,3 MARK QUESTIONS**

**1. The first element of p-block show anomalous properties. Give reason (or) write reason for anomalous behaviour of Nitrogen.**

- Small size.
- High ionisation enthalpy and high electronegativity.
- Absence of d orbitals in the valence shell.

**2. Give the uses of silicones.**

- Making water proof clothes.
- Used as insulating material in electrical motor.
- Used in high temperature oil baths and in vacuum pumps.

**3. Give the uses of Borax (or) Boric acid.**

- Used to prepare Enamels and Glass.
- Used as preservative.

**4. What are the uses of potash alum.**

- Used for purification of water.
- Used in dyeing and paper industries.
- Used to arrest bleeding.

**5. Write a note on fisher Tropsch synthesis.**

- Carbon monoxide reacts with hydrogen at 500 k and 50 atm to give hydro carbons.
- $n \text{CO} + 2 n \text{H}_2 \rightarrow \text{C}_n \text{H}_{2n} + n \text{H}_2\text{O}$

**6. How will you identify borate radical? (or) What is Ethyl Borate test?**

- Boric acid + Ethyl alcohol + conc. Sulphuric acid  $\longrightarrow$  triethyl borate (green flame)
- $\text{H}_3\text{BO}_3 + 3 \text{C}_2\text{H}_5\text{OH} \xrightarrow{\text{conc. H}_2\text{SO}_4} \text{B}(\text{OC}_2\text{H}_5)_3 + 3 \text{H}_2\text{O}$

**7. What is catenation? Write the condition for catenation property of Carbon.**

- Catenation is ability of an element to form chain of atoms.
- Valence is greater than two.
- Element should have ability to bond with itself.
- Self bond should be a strong bond.

**8. Describe allotropism in p-block elements with reference to carbon.**

- Some elements have different crystalline forms but same physical state.
- Ex. Carbon exists as diamond and graphite.

**9. CO (carbon Monoxide) is a reducing agent. Explain.**



**10. How will you convert boric acid to boron nitride?**

- Boric acid + ammonia  $\xrightarrow{800 - 1200\text{K}}$  Boron nitride + Water
- $\text{H}_3\text{BO}_3 + \text{NH}_3 \xrightarrow{800-1200\text{K}}$   $\text{BN} + 3 \text{H}_2\text{O}$

**11. Give one example for each of the following?**

**(i) Icosagens (ii) tetragen (iii) Pnictogen (iv) chalcogen.**

- (i) Boron, B
- (ii) Carbon, C
- (iii) Nitrogen, N
- (iv) Oxygen, O

**12. Explain Hydro Boration**

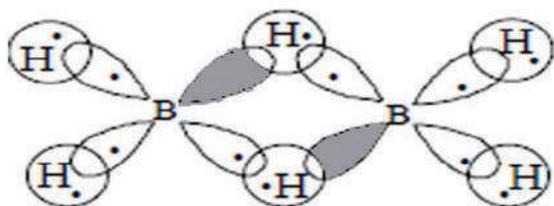
- The addition of Diborane with alkenes in the presence of Ether at room temperature is called as Hydro Boration.
- $\text{B}_2\text{H}_6 + 6\text{RCH}=\text{CHR} \rightarrow 2\text{B}(\text{RCH}-\text{CH}_2\text{R})_3$

**5 MARK QUESTIONS**

1. What are the difference between graphite and diamond?

S.No	Graphite	Diamond
1.	It is soft	It is hard
2.	Sp <sup>2</sup> hybridised	Sp <sup>3</sup> hybridised
3.	Conduct electricity	Do not conduct electricity
4.	It has free electrons	It has no free electrons
5.	Hexagonal sheet shape	Tetrahedron shape.

2. Explain the structure of Diborane.



- The two BH<sub>2</sub> units are linked by two Hydrogen Bridges.
- It has Eight B-H bonds and 12 Valence electrons.
- The Four B-H bonds are normal covalent bonds. (2c-2e- bond)
- Remaining four electrons are used to form two Bridge B-H-B bonds.
- It is called as 3c-2e- bond bond.
- The Boron atom is sp<sup>3</sup> hybridised.

3. Write a note on Zeolites.

- They are three dimensional crystalline solids.
- Contain Al, Si and oxygen.
- They are Sodium alumina Silicates.
- They have porous structure where sodium ions and water molecules are loosely held.
- They have honey comb structure with tunnels and cages.

**UNIT 3. P- BLOCK ELEMENTS - II****2,3 MARK QUESTIONS**

1. What is inert pair effect?

- In p-block, the outer s-electrons become chemical inert and do not take part in bonding. This is called inert pair effect.

**2. Give the uses of Helium.**

- Helium Oxygen mixture is used to prevent Bends during deep sea diving.
- Helium is used in filling balloons.
- Helium is used in low temperature science.

**3. Give the uses of argon.**

- Prevents oxidation of hot filament.
- Increase the life of bulbs.

**4. List the uses of Krypton.**

- Used in Flash bulbs
- Krypton lamps pass through dense fog so used in Airports.

**5. List the uses of Radon.**

- Used as source for Gamma rays
- Radon capsules destroy cancer cells.

**6. List the uses of Xenon.**

- Used in Flashbulbs and Lasers
- Used in Flash bulbs by Photographers.

**7. List the uses of Neon.**

- Used in advertisement as Neon signs with brilliant red colour

**8. Give the uses of phosphine.**

- Used as smoke screen.
- Used as Holmes signal.

**9. Give the uses of sulphuric acid.**

- Used to prepare fertilizers.
- Used as drying agent.
- Used to prepare pigments.

**10. Give a reason to support that Sulphuric acid is a dehydrating agent.****11. Explain why fluorine always exhibit an oxidation state of -1?**

- Small Size
- High electronegativity
- High electron affinity

**12. What are interhalogen compounds? Give examples.**

- Each halogen combines with other halogens to form interhalogen compounds.
- Ex.  $\text{IF}_5$ ,  $\text{IF}_7$

**13. Why fluorine is more reactive than other halogens?**

- F - F bond energy is very low.
- Small size.
- High electro negativity and high electron affinity

**14. What is the hybridisation of iodine in  $\text{IF}_7$  ? Give its structure.**

- Hybridisation is  $\text{Sp}^3\text{d}^3$ .
- Shape is pentagonal bipyramidal.

**15. Why HF is a weak acid but other acids are strong acids?**

- H-F bond energy is very high.
- Fluorine has high electro negativity and high electron affinity

**16. What happens when  $\text{PCl}_5$  is heated?****17. How is bleaching powder prepared?**

- Calcium hydroxide + Chlorine gas  $\rightarrow$  bleaching powder + Water
- $\text{Ca}(\text{OH})_2 + \text{Cl}_2 \rightarrow \text{CaOCl}_2 + \text{H}_2\text{O}$

**18. Write a test for sulphate or Sulphuric acid.****19. What is the hybridisation and structure of Inter halogen compounds?**

Type	Hybridisation	Structure
AX	$\text{Sp}^3$	Linear
$\text{AX}_3$	$\text{Sp}^3\text{d}$	T Shaped
$\text{AX}_5$	$\text{Sp}^3\text{d}^2$	Square pyramidal
$\text{AX}_7$	$\text{Sp}^3\text{d}^3$	Pentagonal bi pyramidal

20. Find the Oxidation states of the Halogen in the following.

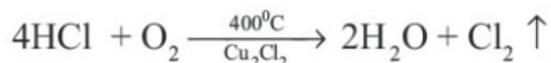
$$\begin{aligned} \text{a) OF}_2 & \quad (+2) + 2F = 0 \\ & \quad F = -2/2 \\ & \quad = -1 \end{aligned}$$

$$\begin{aligned} \text{b) O}_2\text{F}_2 & \quad (+1 \times 2) + 2f = 0 \\ & \quad 2x = -2 \\ & \quad F = -2/2 \\ & \quad = -1 \end{aligned}$$

$$\begin{aligned} \text{c) Cl}_2\text{O}_3 & \quad (-2 \times 3) + 2x = 0 \\ & \quad 2x = 6 \\ & \quad X = 6/2 \\ & \quad = +3 \end{aligned}$$

$$\begin{aligned} \text{d) I}_2\text{O}_4 & \quad (-2 \times 4) + 2x = 0 \\ & \quad 2x = 8 \\ & \quad X = 8/2 \\ & \quad = +4 \end{aligned}$$

20. Explain Deacon's process for manufacture of Chlorine.



21. Chalcogens belongs to p-block. Give reason.

- Last electron enters into p subshell  $ns^2 np^4$

### 5 MARK QUESTIONS

1. What are the differences between white phosphorus and red phosphorus.

S.No.	White Phosphorus	Red Phosphorus
1.	Poisonous	Non – poisonous
2.	Garlic Smell	No smell
3.	Glow in dark. (Phosphorescence)	No Phosphorescence.
4.	Tetrahedral Structure	Linear Polymeric Structure
5.	Burn at low temperature.	Not burn at low temperature.

2. What are the Properties of inter halogen Compounds.

- The central atom must be large.
- Formed only between two halogens.
- Fluorine cannot act as central atom.
- Undergo auto ionization
- Strong oxidizing agents.

**UNIT 4. TRANSITION AND INNER-TRANSITION ELEMENTS****2,3 MARK QUESTIONS****1. What are transition metals. Give examples.**

- Elements from group 3 -12.
- Ex. Gold, Silver.

**2. d-block elements show variable oxidation states. Why?**

- Energy difference between (n-1)d and ns orbital is very small.

**3. Transition metals show high melting points. why?**

- Strong inter atomic attraction.
- Strong metallic bonds.

**4. Why transition metals form alloys?**

- They are similar in size.
- One metal atom can easily replace the crystal lattice of another metal atom.
- Ex. Au – Cu alloy.

**5. Explain the Hume – Rothery rules for the formation of alloy.**

- The difference between the atomic radius of solvent and solute is less than 15%.
- The difference in the electronegativity must be zero.
- They should have same crystalline structure and valence.

**6. Why transition metals form complexes?**

- Smaller size.
- High positive charge.
- Vacant (n-1)d orbitals.

**7. What are interstitial compounds?**

- When atoms like hydrogen, nitrogen are trapped in the interstitial holes of the metal lattice are called interstitial compounds.
- Ex. TiC

**8. Give the characteristics of interstitial compounds?**

- They are hard.
- They have good electrical and thermal conductivity
- They have high melting point.

**9. Write the electronic configuration of Cr and Cu.**

- ${}_{24}\text{Cr}$  -  $[\text{Ar}] 3d^5 4s^1$
- ${}_{29}\text{Cu}$  -  $[\text{Ar}] 3d^{10}4s^1$

**10. Why  $\text{Cu}^{2+}$  is coloured but  $\text{Zn}^{2+}$  is colourless?**

- $\text{Zn}^{2+}$  -  $[\text{Ar}] 3d^{10}$  - No unpaired electron - No d-d transition - colourless.
- $\text{Cu}^{2+}$  -  $[\text{Ar}] 3d^9$  - Has unpaired electron - d-d transition - coloured.

**11. Which is a strong reducing agent.  $\text{Cr}^{2+}$  or  $\text{Fe}^{2+}$  ?**

- $E^\circ$  of  $\text{Cr}^{2+} = -0.91 \text{ V}$
- $E^\circ$  of  $\text{Fe}^{2+} = -0.44 \text{ V}$
- $E^\circ$  value is greater negative the metal is a powerful reducing agent. So  $\text{Cr}^{2+}$  is a strong reducing agent.

**12. Which is stable  $\text{Fe}^{2+}$  or  $\text{Fe}^{3+}$  ?**

- $\text{Fe}^{2+}$  :  $[\text{Ar}] 3d^6$
- $\text{Fe}^{3+}$  :  $[\text{Ar}] 3d^5$
- $\text{Fe}^{3+}$  is more stable. It has half filled  $3d^5$  electronic configuration.

**13. What are actinides, give examples.**

- 5 f block elements.
- The 14 elements from Th to Lr.  
Ex. Th, Lr, U

**14. Explain the oxidation states of Lanthanides and actinides.**

oxidation states	Lanthanide	Actinide
Common oxidation state	+3	+3
Other oxidation states	+2, +4	+4, +5, +6, +7

**15. Explain the chromyl chloride test.**

- Potassium di chromate + chloride salt + conc. sulphuric acid  $\rightarrow$  Chromyl Chloride (Red orange vapour).

**16. Out of  $\text{Lu}(\text{OH})_3$  and  $\text{La}(\text{OH})_3$  which is more basic. Why?**

- $\text{La}^{+3}$  ion is larger than  $\text{Lu}^{+3}$ , due to Lanthanide contraction.
- When the ionic radius increases, the basic character also increases.
- So  $\text{La}(\text{OH})_3$  is more basic.

**17. Why Zirconium and Hafnium is have similar properties?**

- Because of Lanthanide contraction

**5 MARK QUESTIONS****1. Compare Lanthanides and Actinides.**

S.No.	Lanthanides	Actinides
1.	Last electron enter in the 4f orbitals.	Last electron enter in the 5f orbitals.
2.	Binding energy of 4f orbital is high.	Binding energy of 5f orbital is low.
3.	Less tendency to form complexes	More tendency to form complexes
4.	Most of them colourless	Most of them coloured
5.	They do not form oxocation.	They form oxocation.

**2. Explain Lanthanide contraction.**

**Lanthanide contraction :**

- The ionic radius of  $M^{3+}$  ions from La to Lu decreases.

**Reason :**

- Shielding effect of 4f electrons is poor.

**Causes :**

- Basicity decreases and covalent character increases.
- They have similar chemical properties
- The second and third transition series have similar properties.

**UNIT 5. CO-ORDINATION CHEMISTRY****2,3 MARK QUESTIONS****1. Differentiate double salt and Co-ordination compounds.**

S.No.	Double Salt	Co-ordination compounds
1.	It dissociate into simple ions.	It never dissociates into simple ions.
2.	The ions loses its identify.	The ions does not lose its identify.
3.	It contains cation and anion.	It consists of a complete ion.
4.	Ex. FAS	Ex. $K_4 [Fe(CN)_6]$

**2. Classify the following ligand based on the number of donor atoms.**

(a)  $NH_3$  (b) en (c)  $OX^{2-}$  (d) Pyridine

Ligand	Number of donor atoms	Type of Ligand
$NH_3$	1	Monodentate
En	2	Bidentate
$OX^{2-}$	2	Bidentate
Pyridine	1	Monodentate

**3. What are the limitations of Werner's theory.**

- It fails to explain the colour and magnetic properties.

**4. What are the limitations of valence bond (VB) theory.**

- It fails to explain the colour of the complex.
- It fails to explain the inner orbital and the outer orbital complexes of the same metal.
- It considers only the spin of the magnetic moments, does not consider the other components.

**5. Define crystal field stabilisation Energy (CFSE)**

- The energy difference between the electronic configuration of the ligand field and the bary center.

**6.  $[Ti(H_2O)_6]^{3+}$  is coloured white  $[Sc(H_2O)_6]^{3+}$  is colourless. Why?**

- $Sc^{3+} - 3d^0$ - No unpaired electron – No d-d transition – colourless
- $Ti^{3+} - 3d^1$ - Has unpaired electron- d-d transition – coloured.

**7. Write down the uses of Co-ordination complexes medicinal use?**

- Cis - platin - To cure cancer
- Haemoglobin -  $Fe^{2+}$  - Porphyrin complex carrier  $O_2$  from lungs to tissues.
- Chlorophyll -  $Mg^{2+}$  - Porphyrin complex helps in photo synthesis.

**5 MARK QUESTIONS**

**1.Explain werners theory of co-ordination Compounds.**

- There are two types of Valency of metal ions.

Primary Valency	Secondary Valency
Oxidation number of the metal atom.	Co-ordination number of the metal atom.
Ionisable	Non-ionisable
Non-directional	Directional
Satisfied only by negative ions.	Satisfied by positive, negative ions and neutral molecules.

- The inner sphere is called Co-ordination sphere. The groups present in this sphere are firmly attached to the metal.
- The outer sphere is called Ionisation sphere. The groups present in this sphere are loosely attached to the metal.

**2. What are the assumptions of Valance bond theory (VBT)**

- The ligand –metal bond is a covalent bond .
- The central metal atom contains vacant d-orbitals.
- The hybridised vacant metal orbital overlap with the filled ligand orbitals to form metal ligand co-ordinate covalent bonds.
- The hybridised orbitals are directional in space.

- Co-ordination No.2 - sp Hybridisation – Linear.
- Central metal atom with unpaired electrons- paramagnetic. paired electrons – diamagnetic
- In octahedral, (n-1)d Orbital - low spin complex, nd Orbital - high spin complex.

### 3. Define structural isomerism and its types?

#### Linkage Isomerism :

- When an ambidentate ligand is bonded by two different donor atoms to the central metal are called linkage isomerism.
- $[\text{Cr}(\text{H}_2\text{O})_5\text{NO}_2] \text{Br}$  and  $[\text{Cr}(\text{H}_2\text{O})_5 \text{ONO}] \text{Br}$

#### Co-ordination Isomerism :

- The interchange of one or more ligands between the cationic and the anionic complex.
- $[\text{Co}(\text{NH}_3)_6] [\text{Cr}(\text{CN})_6]$  and  $[\text{Cr}(\text{NH}_3)_6] [\text{Co}(\text{CN})_6]$

#### Ionisation Isomerism :

- When a simple ion acts as a ligand and exchanges with one or more ligand present in the co-ordination sphere is called ionisation isomerism.
- $[\text{Co}(\text{H}_2\text{O})_5\text{Cl}] \text{Br}$  and  $[\text{Co}(\text{H}_2\text{O})_5 \text{Br}] \text{Cl}$

#### Solvate or Hydrate isomerism :

- When solvent molecules like water are exchanged by the ligands in the co-ordination compounds is called as solvate isomerism.
- $[(\text{Cr}(\text{H}_2\text{O})_6) \text{Cl}_3]$  and  $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}] \text{Cl}_2 \cdot \text{H}_2\text{O}$

## UNIT 6. SOLID STATE

### 2,3 MARK QUESTIONS

#### 1. Define Unit Cell.

- The basic repeating Structural unit of a crystal is called Unit cell.

#### 2. What are the characteristic of ionic Crystals?

- They are hard.
- They do not conduct electricity in the solid state.
- They conduct electricity in the molten state.
- They have high melting points.

#### 3. What are the different types of Primitive Unit cells.

- (i) Cubic (ii) Tetragonal (iii) Orthorhombic (iv) Hexagonal (v) Mono clinic (vi) Triclinic (vii) Rhombohedral.

#### 4. Define coordination number of a crystal. What is the coordination number of atoms in BCC?

- The number of nearest neighbours that is surrounding an ion in a crystal is called as coordination number.
- For BCC it is 8.

#### 5. Define molecular crystals.

- The neutral molecule occupies in the lattice point of crystal.
- They have vander waals forces.
- Ex. Ice.

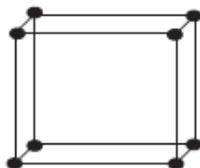
#### 6. Explain the types of molecular crystals?

- Non-polar molecular crystals –Weak London forces – Ex. Naphthalene
- Polar molecular crystals –Dipole- Dipole interactions -Ex. Solid CO<sub>2</sub>
- Hydrogen bonded molecular crystals –Hydrogen bonds - Ex. Ice

#### 7. Draw the structures of the following.

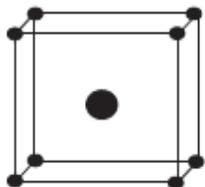
##### 1.SC:

- Total No of atoms in SC: 1



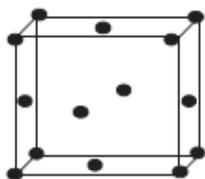
##### 2.BCC:

- Total No of atoms in BCC : 2



##### 3.FCC:

- Total No of atoms in FCC : 4



**8. What is Braggs equation?**

- $n\lambda = 2d\sin\theta$
- n = order of reflection
- $\lambda$  = wavelength of X-rays
- $\theta$  = angle of reflection
- d = inter planar distance.

**9. Differentiate Isotropy and Anisotropy.**

Isotropy	Anisotropy
When the physical properties are identical in all directions. Ex. Rubber	When the physical properties are not identical in all directions. Ex. NaCl

**10. Define packing efficiency?**

- Packing efficiency =  $\frac{\text{Total volume occupied by the spheres}}{\text{Volume of the unit cell}} \times 100\%$

**11. Define crystal lattice.**

- The regular arrangement of the ions in a crystal is called as crystal lattice.

**12. What are point defects?**

- A defect in a crystal caused by dislocation or excess number or unfilled atoms.

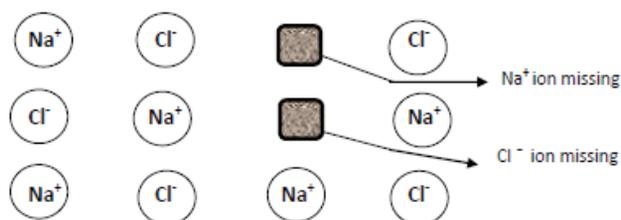
**5 MARK QUESTIONS****1. Give the different between crystalline and Amorphous solids.**

S.No.	Crystalline solids	Amorphous solids
1.	Orderly arrangement of atoms	Random arrangement of atoms
2.	Definite shape	Irregular shape.
3.	Anisotropic	Isotropic
4.	True solids	Super cooled liquids
5.	Definite heat of fusion	Heat of fusion is not definite
6.	Ex : NaCl, Diamond	Ex ; Rubber, Glass

**2. Explain the schottly defect and frenkel defect ;****Schottly defect :**

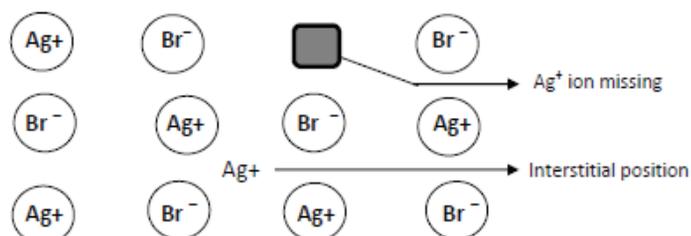
- It takes place due to the missing of equal number of Anion and cation from the crystal lattice. Ex. NaCl
- The cation and anion should be similar in size.
- Schottky defect will decrease the density of the crystal.

- This effect does not change the stoichiometry.



### Frenkel defect:

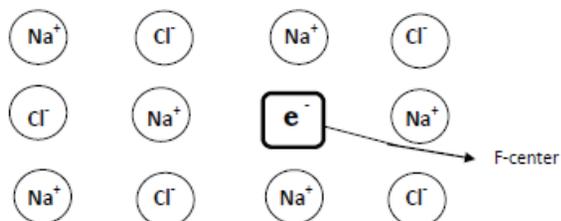
- It takes place due to the dislocation of ions from the crystal lattice. Ex. AgBr
- The cation and the anion should be different in size.
- Frenkel defect does not decrease the density of the crystal.
- This effect does not change the stoichiometry.



### 3. Explain the metal excess and metal deficiency defect .

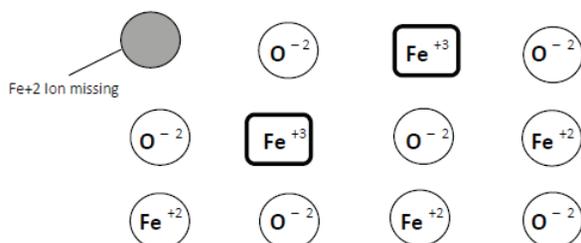
#### Metal excess defect:

- When the metal ions present more than the anions. Ex. NaCl
- The electrical neutrality is maintained by the presence of a extra electron in the interstitial position.



#### Metal deficiency defect :

- When the metal ions present lesser than the anions. Ex. FeO
- Fe<sup>2+</sup> is missing from the crystal lattice.
- To maintain electrical neutrality two Fe<sup>2+</sup> ion oxidises to Fe<sup>3+</sup> ion.



**UNIT 7. CHEMICAL KINETICS****2,3 MARK QUESTIONS****1. Define Rate Law.**

- It relates the rate, the rate constant and the concentration of the reactants.

**3. Define Average rate.**

- The change in concentration of reactants at a given interval of time in a chemical reaction.

**3. Define Instantaneous rate.**

- The rate of reaction at a particular instant during the reaction.

**4. Define Elementary reaction.**

- Each and every single step in a reaction mechanism is called Elementary reaction.

**5. Give some examples for first order reaction.**

- Decomposition of  $N_2O_5$ .
- Decomposition of  $SO_2Cl_2$ .
- Decomposition of  $H_2O_2$ .

**6. Differentiate rate of a reaction and rate constant.**

S.No.	Rate of a reaction	Rate constant
1.	It is the speed at which the reactants are converted into products.	It is equal to the rate of the reaction. When the concentration of the reactants is unity.
2.	It is measured as the decrease in the concentration of the reactant	It is a Proportionality constant.
3.	It depends on the initial concentration of the reactant	It does not depend on the initial concentration of the reactant.

**7. Differentiate order of a reaction and molecularity.**

S.No.	Order of a reaction	Molecularity
1.	It is the sum of the powers of the concentration terms present in the rate law.	It is the total number of reactants present in the elementary step.
2.	Its value can be zero, fraction or a integer.	Its value is always a whole number and cannot be zero.
3.	It assigned for the overall reaction.	It assigned for each elementary step of the mechanism.

**8. Define Pseudo first order reaction Give Example.**

- By taking one of the reactant concentration in excess, a second order reaction can be converted to first order reaction.
- Ex. Acid hydrolysis of Ester.

**9. Give some examples for zero order reaction.**

- Decomposition of Nitrous oxide in the presence of platinum.
- Photo chemical reaction between  $H_2$  and  $I_2$ .
- Iodination of acetone in acid medium.

**10. Define Half life period.**

- The time required to convert the initial reactant concentration by one half is called half life period.
- $t_{1/2} = \frac{0.693}{k}$  sec.

**11. Define Activation energy.**

- The minimum energy required by the molecules to react and form the products is called Activation energy.

**12. Write the Arrhenius equation.**

- $K = Ae^{-E_a/RT}$
- K = Rate constant
- $E_a$  - Activation energy
- A = frequency factor
- R - Gas constant
- T = Temperature.

**13. Define Order of a reaction.**

- It is the sum of the powers of the concentration terms present in the rate law.

**14. Define Molecularity.**

- It is the total number of reactants present in the elementary step.

**15. Define Rate of a reaction.**

- The change in the concentration of the reactant in a chemical reaction per unit time.

**16. Define Rate constant.**

- It is equal to the rate of the reaction when the concentration of the reactants are unity.

17. The rate constant for a first order reaction is  $1.54 \times 10^{-3} \text{ s}^{-1}$ . Calculate its half life time.

- $t_{1/2} = \frac{0.693}{k}$
- $= \frac{0.693}{1.54 \times 10^{-3}}$
- $= 450 \text{ sec.}$

18. Derive half life period for a first order reaction.

$$k = \frac{2.303}{t} \log \frac{[A_0]}{[A]}$$

$$\text{at } t = t_{1/2} ; [A] = \frac{[A_0]}{2}$$

$$k = \frac{2.303}{t_{1/2}} \log \frac{[A_0]}{[A_0]/2}$$

$$k = \frac{2.303}{t_{1/2}} \log 2$$

$$k = \frac{2.303 \times 0.3010}{t_{1/2}}$$

$$t_{1/2} = \frac{0.6932}{k}$$

19. Derive half life period for a zero order reaction.

$$k = \frac{[A_0] - [A]}{t}$$

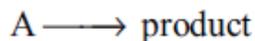
$$\text{at } t = t_{1/2} ; [A] = \frac{[A_0]}{2}$$

$$k = \frac{[A_0] - [A_0]/2}{t_{1/2}}$$

$$t_{1/2} = \frac{[A_0]}{2k}$$

**5 MARK QUESTIONS**

1. Derive integrated rate law for a first order reaction.



$$\text{Rate} = k [A]^1$$

$$\frac{-d[A]}{dt} = k [A]^1$$

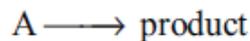
$$\int_{[A_0]}^{[A]} \frac{-d[A]}{[A]} = k \int_0^t dt$$

$$(-\ln[A])_{[A_0]}^{[A]} = k(t)_0^t$$

$$\ln\left(\frac{[A_0]}{[A]}\right) = kt$$

$$k = \frac{2.303}{t} \log\left(\frac{[A_0]}{[A]}\right)$$

2. Derive integrated rate law for a zero order reaction.



$$\text{Rate} = k [A]^0$$

$$\frac{-d[A]}{dt} = k \quad (1)$$

$$-\int_{[A_0]}^{[A]} d[A] = k \int_0^t dt$$

$$-[A]_{[A_0]}^{[A]} = k(t)_0^t$$

$$[A_0] - [A] = kt$$

$$k = \frac{[A_0] - [A]}{t}$$

**UNIT 8. IONIC EQUILIBRIUM****2,3 MARK QUESTIONS**

1. Explain the Arrhenius concept of acids and bases?

- An acid dissociates to give hydrogen ions in water. Ex. HCl
- A base dissociates to give hydroxyl ions in water. Ex. NaOH

2. Limitations of Arrhenius concept?

- It fails to explain the behaviour of acids and bases in non aqueous solution like acetone.
- It fails to explain the basicity of ammonia.

3. What are Lewis acids and bases? Give two examples?

- Acid – electron pair acceptors. Ex.  $\text{BF}_3$ ,  $\text{AlCl}_3$
- Base - electron pair donors. Ex.  $\text{NH}_3$ ,  $\text{H}_2\text{O}$

4. Discuss the lowry bronsted concept of acids and bases?

- Acid - proton donors. Ex. HCl
- Base - proton acceptor. Ex.  $\text{NH}_3$

**5. Define conjugate acid – base pairs?**

- Chemical species that differ only by a proton are called conjugate acid-base pairs.

**6. List the difference between Lewis acid and Lewis base Lewis base?**

S.No.	Lewis acid	Lewis base
1.	Electron deficient molecules	Molecules with lone pairs of electrons.
2.	All metal ions	All anions.
3.	They contain polar double bonds.	They contain carbon carbon double bond.
4.	Ex. $\text{BF}_3$ , $\text{AlCl}_3$	Ex. $\text{NH}_3$ , $\text{H}_2\text{O}$

**7. Explain common ion effect? Write examples?**

- When a salt of weak acid is added to the acid, the dissociation of the weak acid decreases.
- Ex. Sodium acetate is added to acetic acid the dissociation of acetic acid decreases.

**8. Define Ostwald dilution law?**

- It relates the dissociation constant of weak acid with its degree of dissociation and the concentration of the weak acid.
- $$K_a = \frac{\alpha^2 C}{1-\alpha}$$

**9. Define a buffer solution?**

- A mixture of weak acid and its conjugate base or
- A mixture of weak base and its conjugate acid.
- Ex. 1. Acetic acid + Sodium acetate  
2. Ammonium hydroxide + Ammonium chloride.

**10. What is ionic product of water of water and give its value at room temperature?**

- The products of molar concentration of hydronium and hydroxyl ions in pure water.
- At  $25^\circ\text{C}$
- $K_w = [\text{H}_3\text{O}^+] [\text{OH}^-]$
- $K_w = 1 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$

**11. Define  $p^H$ ?**

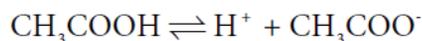
- The negative logarithm of base 10 of the molar concentration of the hydronium ions present in the solution.
- $p^H = -\log [\text{H}_3\text{O}^+]$

**12. What is the relation between  $p^H$  and  $p^{OH}$ ?**

- $p^H = -\log_{10} [\text{H}_3\text{O}^+]$
- $p^{OH} = -\log_{10} [\text{OH}^-]$
- $p^H + p^{OH} = -\log_{10} [\text{H}_3\text{O}^+] - \log_{10} [\text{OH}^-]$
- $p^H + p^{OH} = 14$

**13. Define solubility product?**

- Solubility product is the product of the molar concentration of the ions raised to the power of its stoichiometric coefficient in a balanced equilibrium equation.

**5 MARK QUESTIONS****1. Drive and expression for Ostwald dilution law?**

$$k_a = \frac{[\text{H}^+][\text{CH}_3\text{COO}^-]}{[\text{CH}_3\text{COOH}]}$$

$$k_a = \frac{(\alpha C)(\alpha C)}{(1-\alpha)C}$$

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

$$K_a = \alpha^2 C$$

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

$$[\text{H}^+] = \alpha C \quad [\text{H}^+] = \sqrt{K_a C}$$

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

**2. Derive the Handerson Hasselbalc equation?**

$$[\text{H}_3\text{O}^+] = K_a \frac{[\text{acid}]_i}{[\text{base}]_i}$$

$$[\text{H}_3\text{O}^+] = K_a \frac{[\text{acid}]}{[\text{salt}]}$$

$$-\log [\text{H}_3\text{O}^+] = -\log K_a - \log \frac{[\text{acid}]}{[\text{salt}]}$$

$$\text{pH} = -\log [\text{H}_3\text{O}^+] \text{ and } \text{p}K_a = -\log K_a$$

$$\Rightarrow \text{pH} = \text{p}K_a - \log \frac{[\text{acid}]}{[\text{salt}]}$$

$$\Rightarrow \text{pH} = \text{p}K_a + \log \frac{[\text{salt}]}{[\text{acid}]}$$

**UNIT 9. ELECTRO CHEMISTRY****2,3 MARK QUESTIONS****1. Define Specific Conductance.**

- The conductance of a 1 meter cube of an electrolytic solution.

**2. Define molar Conductance.**

- The conductance of one mole of an electrolytic solution.  $\text{Sm}^2 \cdot \text{mol}^{-1}$
- $\Lambda_m = k \times \frac{10^{-3}}{M} \text{ Sm}^2 \text{ mol}^{-1}$

**3. Define Equivalent conductance.**

- The conductance of one gram equivalent of an electrolytic solution.
- $\Lambda = k \times \frac{10^{-3}}{N} \text{ Sm}^2 \text{ g.eq}^{-1}$

**4. State Kohlraush law.**

- At infinite dilution the limiting Molar conductivity of an electrolyte is equal to the sum of the limiting molar conductance of its constituent ions.

**5. What are the applications of Kohlraush law.**

- To calculate the molar conductance of a weak electrolyte at infinite dilution.
- To calculate the degree of dissociation of weak electrolyte.
- To calculate the solubility of sparingly soluble salts.

**6.State Faraday's laws of electrolysis.****First law:**

- The mass of the substance liberated at electrode is directly proportional to the quantity of charge passed.
- $m \propto Q$

**Second law:**

- When the same amount of current is passed through the different electrolytes, the mass of substance liberated at electrode are directly proportional to their electrochemical equivalence.
- $m \propto z$

**7. Define electrochemical equivalent**

- The mass of substance deposited by a charge of 1 coulomb.

**8. Write a note on sacrificial protection.**

- Sacrificial anode : Zinc
- Cathode : Iron
- Zinc is corroded and Iron is protected.

**9. Explain the factors affecting electrolytic conductance.**

- Temperature increases, conductance will increases.
- Dilution increases, the molar conductance also increases.
- Viscosity decreases, conductance will increases.

**10. Define anode and cathode.**

S.No.	Anode	Cathode
1.	Oxidation takes place	Reduction takes place
2.	Donates electrons	Accepts electrons
3.	Negative end	Positive end

**11. Why does conductivity of a solution decrease on dilution of the solution?**

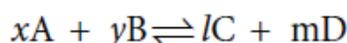
- On dilution the number of ions per  $1\text{cm}^3$  decreases.

**12. Why is AC current used instead of DC in measuring the electrolytic conductance?**

- AC Current is used to prevent Electrolysis of the solution.

**5 MARK QUESTIONS****1. Explain the Galvanic cell notation.**

- Single vertical bar represents a phase boundary and double vertical bar represents the salt bridge.
- The anode half cell is written on the left and the cathode half cell is written on the right side of the salt bridge.
- The anode written on the extreme left and cathode written on the extreme right.
- The emf of the cell is written on the right side after cell diagram.

**2. Derive an expression for Nernst equation.**

$$Q = \frac{[C]^x [D]^m}{[A]^x [B]^y}$$

$$\Delta G = \Delta G^\circ + RT \ln Q$$

$$\Delta G = -nFE_{\text{cell}} \quad ; \quad \Delta G^\circ = -nFE_{\text{cell}}^\circ$$

$$-nFE_{\text{cell}} = -nFE_{\text{cell}}^\circ + RT \ln \frac{[C]^x [D]^m}{[A]^x [B]^y}$$

$$E_{\text{cell}} = E_{\text{cell}}^\circ - \frac{2.303RT}{nF} \log \frac{[C]^x [D]^m}{[A]^x [B]^y}$$

**3. Explain the function of  $\text{H}_2$  -  $\text{O}_2$  fuel cell.**

- Fuel / Electrode / Electrolyte / Electrode / Oxidant
- Fuel : Hydrogen
- Oxidant : Oxygen
- Electrolyte : aqueous KOH
- Inert electrode : Graphite with Ni and NiO
- Anode:  $2\text{H}_2 + 4\text{OH}^- \longrightarrow 4\text{H}_2\text{O} + 4\text{e}^-$
- Cathode :  $\text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^- \longrightarrow 4\text{OH}^-$
- Overall reaction :  $2\text{H}_2 + \text{O}_2 \longrightarrow 2\text{H}_2\text{O}$ .

## UNIT 10. SURFACE CHEMISTRY

### 2,3 MARK QUESTIONS

#### 1. What is Positive Catalyst? Give an example.

- A Catalyst which increases the rate of reaction.
- Ex. In Haber process of the manufacture of  $\text{NH}_3$ , Fe act as a positive catalyst.

#### 2. What is Negative Catalyst ? give an example.

- A Catalyst which decreases the rate of reaction.
- Ex. In the decomposition of  $\text{H}_2\text{O}_2$ , glycerol act as a negative catalysts.

#### 3. What are Auto Catalyst? Give an example.

- When the product formed acts as a catalyst.
- Ex. In the decomposition of  $\text{AsH}_3$ , As act as a auto catalyst.

#### 4. What are promoters? Give an example.

- The substance which increases the activity of a catalyst.
- Ex. In Haber process of the manufacture of  $\text{NH}_3$ , Mo acts as a promoter.

#### 5. What are catalytic poisons? Give an examples.

- The substance which decreases the activity of a catalyst.
- Ex. In Haber process of the manufacture of  $\text{NH}_3$ ,  $\text{H}_2\text{S}$  acts as catalytic poison.

#### 6. What are lyophilic colloids? Give an examples.

- Definite attractive force exists between dispersed phase and dispersion Medium.
- Ex. Sol of starch.

#### 7. Where are lyophobic colloids? Give an example.

- No attractive force exists between dispersed phase and dispersion Medium.
- Ex. Sol of Gold.

#### 8. What is Peptization? Give an example.

- By addition of suitable electrolytes, precipitated particles can be brought into colloidal state.
- Ex.  $\text{AgCl}$  (Precipitate)  $\xrightarrow{\text{HCl}}$   $\text{AgCl}$  (Colloid)

#### 9. What is Tyndall effect?

- The scattering of light by the sol particle is called Tyndall effect.

#### 10. What is Brownian Moment?

- The colloidal particles move in a zig zag, random, ceaseless motion is called brownian moment.

**11. What is electrophoresis?**

- The movement of sol particles under the influence of electric field is called electrophoresis.

**12. What is electro Osmosis?**

- The movement of dispersed medium under the influence of electric field is called electro osmosis.

**13. What is coagulation?**

- The flocculation and setting down of the sol particles in called Coagulation.

**14. What are Emulsions? Give an examples.**

- Emulsions are colloidal solution in which a liquid is dispersed in an another liquid.
- Ex. Milk

**15. Write the Medicinal uses of Colloids.**

- Colloidal Gold and Calcium - tonics
- Milk of Magnesia - stomach troubles
- Silver sol (Argyrol) - Eye lotion

**16. What happens when a colloidal sol of  $\text{Fe}(\text{OH})_3$  and  $\text{As}_2\text{S}_3$  are mixed?**

- On mixing positive sol  $\text{Fe}(\text{OH})_3$  and a negative sol  $\text{As}_2\text{S}_3$  mutual coagulation occurs and cause precipitation

**17. What is the difference between a sol and a gel?**

S.No	Sol	Gel
1.	Phase – solid	Phase – liquid
2.	Medium – liquid	Medium – solid
3	Ex. Ink	Ex. Butter

**18. Addition of Alum purifies water. why?**

- The  $\text{Al}^{3+}$  ions present in the alum forms coagulation of suspended impurities.

**5 MARK QUESTIONS****1. Differentiate Physisorption and Chemisorption.**

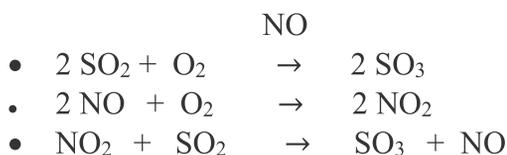
S.No	Physical adsorption	Chemical adsorption
1.	It is instantaneous	It is very slow
2.	It is non-specific	It is very specific
3.	Multilayer adsorbate is formed.	Monolayer adsorbate is formed.
4.	Heat of adsorption is low	Heat of adsorption is high
5.	No transfer of electrons.	transfer of electrons.

## 2. Describe Characteristics of Catalysts.

- Catalyst is needed in small quantity.
- Catalyst cannot start a reaction.
- Specific in nature.
- Highly effective at the optimum temperature.
- More effective in a finely divided form.

## 3. Explain intermediate compound formation theory of Catalysis?

- Reactant + catalyst  $\longrightarrow$  intermediate compound.
- Intermediate compound + Reactant  $\longrightarrow$  Product + Catalyst.



## 4. Explain adsorption theory of catalysis.

- Reactant molecules diffuse from bulk to the Catalyst surface.
- The reactants are adsorbed on the surface of the catalyst.
- The adsorbed reactants form activated complex which is decomposed to form the products.
- The product molecules are desorbed.
- The products diffuse away from the surface of the Catalyst.

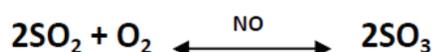
## 5. Explain the Preparation of colloids by condensation method (Chemical method)?

- Oxidation
- Reduction
- Hydrolysis
- Double decomposition
- Decomposition

## 6. Define Homogeneous and Heterogeneous catalysis.

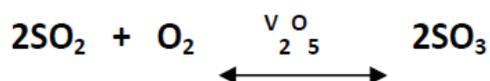
### Homogeneous catalysis:

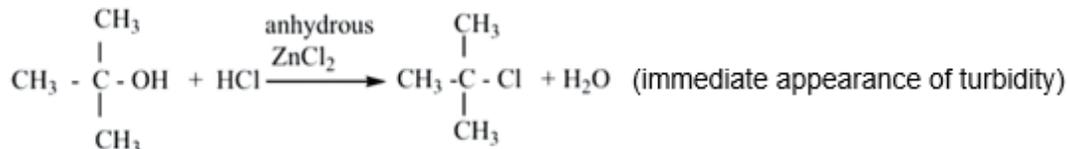
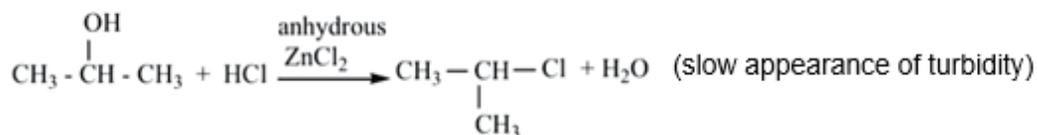
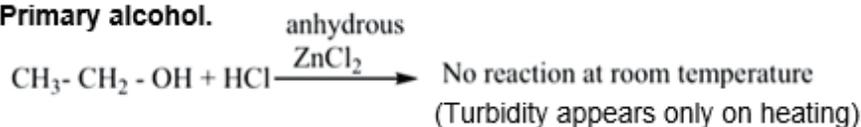
- when the catalyst, reactant and products are in the same phase.



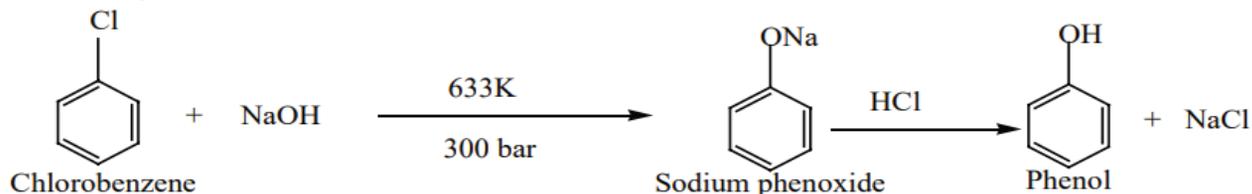
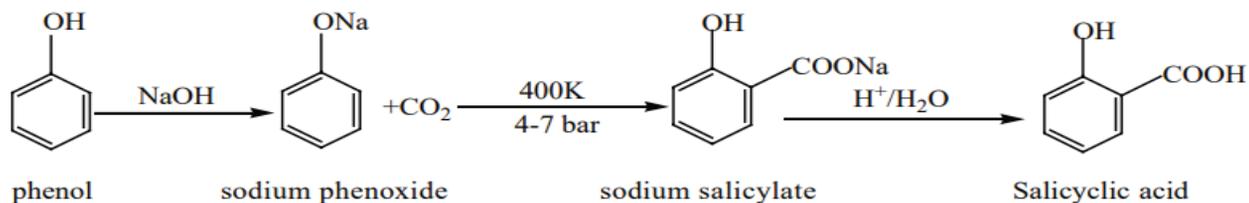
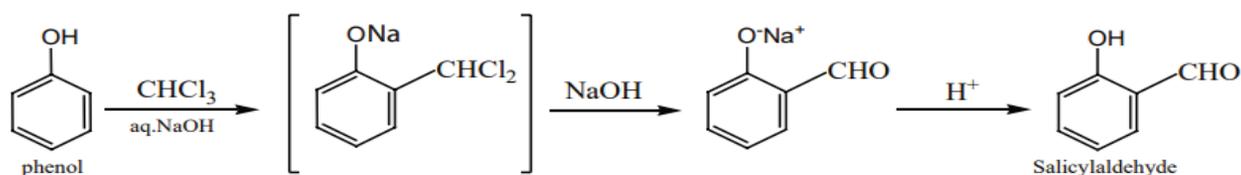
### Heterogeneous catalysis:

- when the catalyst, reactant and products are in the different phase

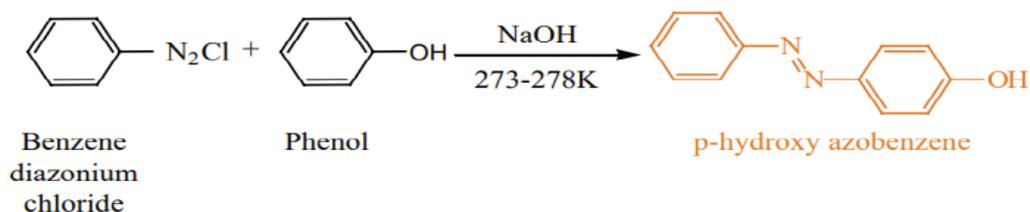


**UNIT 11. HYDROXY COMPOUNDS AND ETHERS****2,3 MARK QUESTIONS****1. Lucas test.****Tertiary alcohol.****Secondary alcohol.****Primary alcohol.****2. Victor mayer's test.**

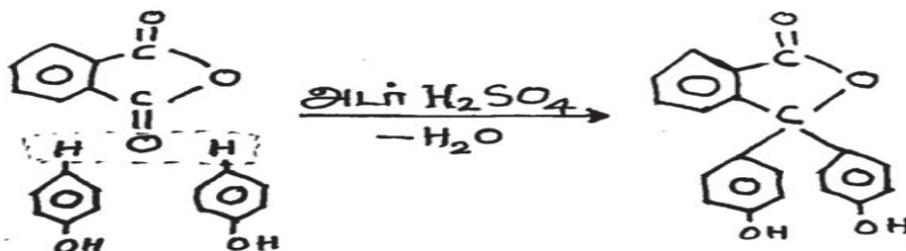
- Tertiary alcohol  $\longrightarrow$  No colouration
- Secondary alcohol  $\longrightarrow$  Blue colour
- Primary alcohol  $\longrightarrow$  Red colour

**3. Dows process.****4. Kolbe's (or) Kolbe's Schmit reaction.****5. Riemer – Tiemann Reaction.**

## 6. Coupling reaction.



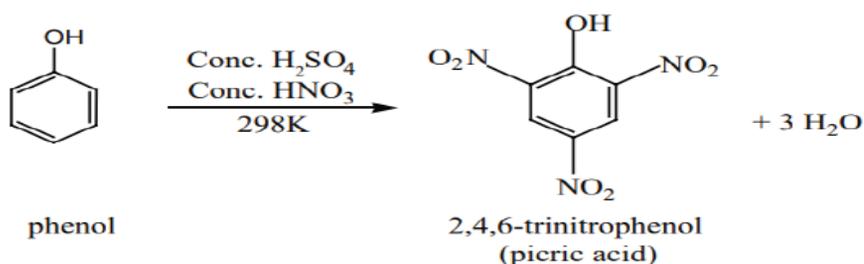
## 7. How will you prepare Phenolphthalein from Phenol.



## 8. Test to differentiate alcohol and phenols.

Test	Phenol	Alcohol
1, With neutral $\text{FeCl}_3$	Purple colouration	No reaction
2, With Benzene diazonium chloride	To form a red orange dye	No reaction
3, With $\text{NaOH}$	To give sodium phenoxide	No reaction

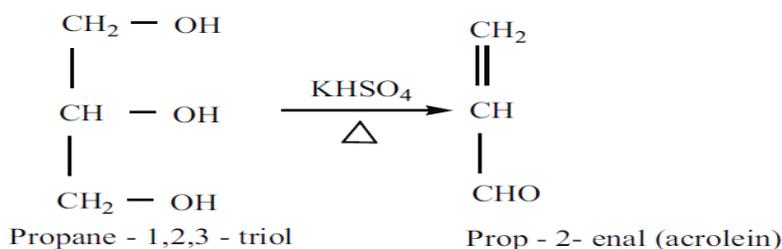
## 9. Convert Phenol to Picric acid (2,4,6-trinitrophenol).

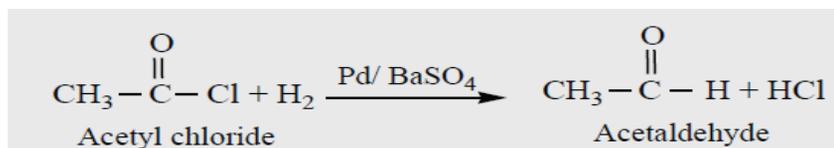
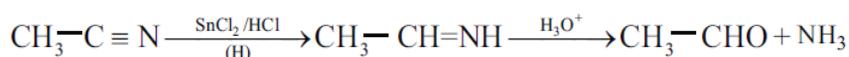
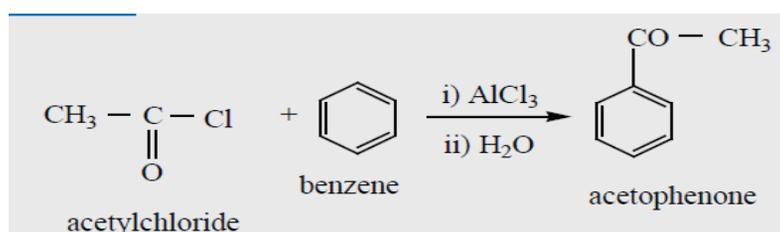


## 10. Uses of Diethyl ether.

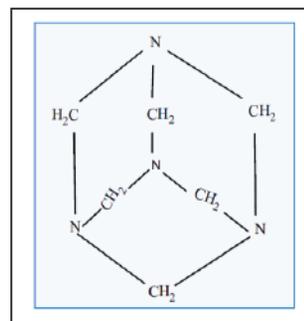
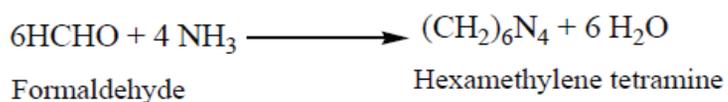
- Surgical anesthetic agent in surgery
- Good solvent for organic reactions
- Used as a refrigerant.

## 11. Preparation of Acrolein.

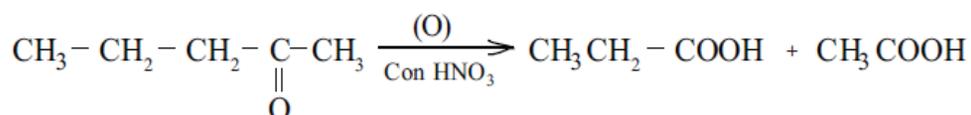
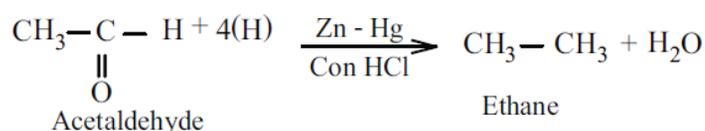


**12. CARBONYL COMPOUNDS AND CARBOXYLIC ACIDS****2,3 MARK QUESTIONS****1. Rosenmund reduction.****2. Stephen's reaction.****3. Friedal Crafts acylation.****4. Write the preparation of Urotropine.**

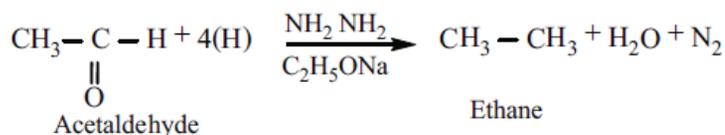
- Used as medicine for Urinary infection.

**5. Popoff's rule.**

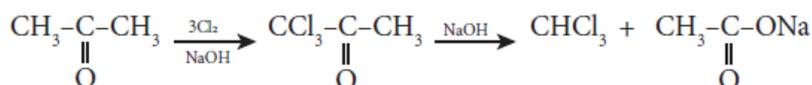
- Unsymmetrical ketone, a (C-CO) bond is cleaved in such a way that the keto group stays with the smaller alkyl group.

**6. Clemmensen reduction.**

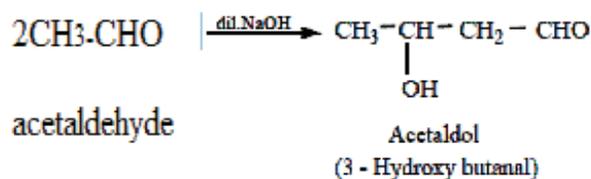
## 7. Wolf Kishner reduction.



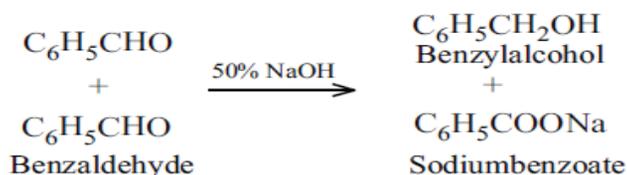
## 8. Haloform reaction.



## 9. Write a note on Aldol condensation.



## 10. Cannizaro reaction.



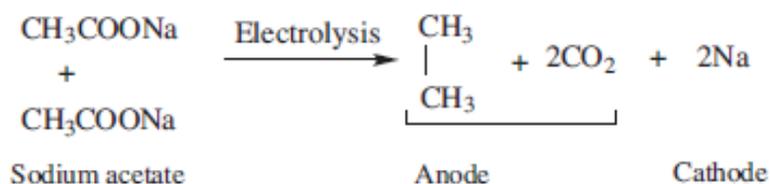
## 11. Uses of formaldehyde.

- It is used for preserving biological specimens.
- It is used for tanning.

## 12. What is formalin? Give the uses of formalin.

- 40% aqueous solution of formaldehyde is called formalin.
- **Uses** : used for preserving biological specimens.

## 13. Kolbe's electrolytic decarboxylation.



**14. HVZ reaction.****15. Reducing action of Formic acid.**

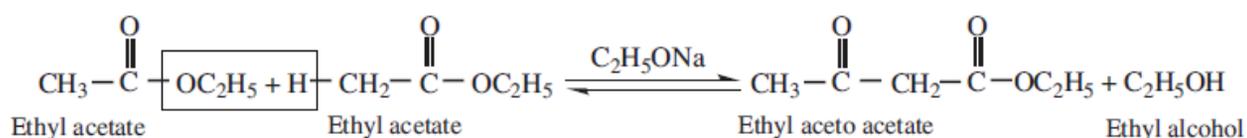
- Formic acid contains both an aldehyde as well as an acid group.
- Like other aldehydes, formic acid can easily be oxidised and therefore acts as a strong reducing agent.
- $\text{HCOO}^- + 2\text{Ag}^+ + 3\text{OH}^- \rightarrow 2\text{Ag} + \text{CO}_3^{2-} + 2\text{H}_2\text{O}$

**16. Test for Aldehydes**

- Reduces Tollens reagent to metallic Silver.
- Reduces Fehling's Solution to Red colour cuprous oxide.
- Reduces Benedict's Solution to Red colour cuprous oxide

**17. Test for Carboxylic acid**

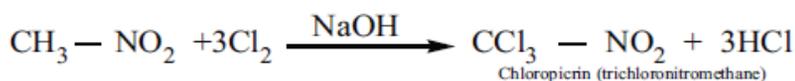
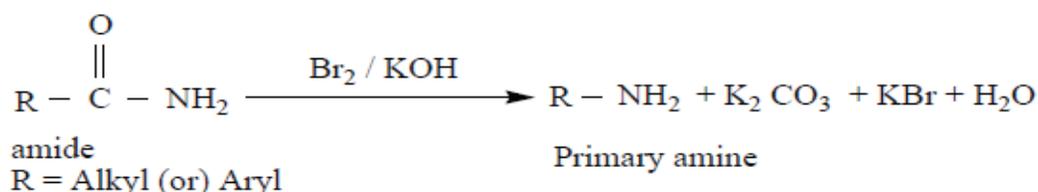
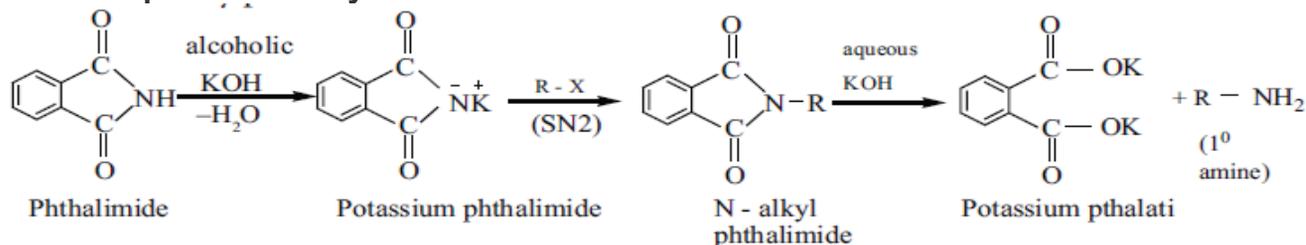
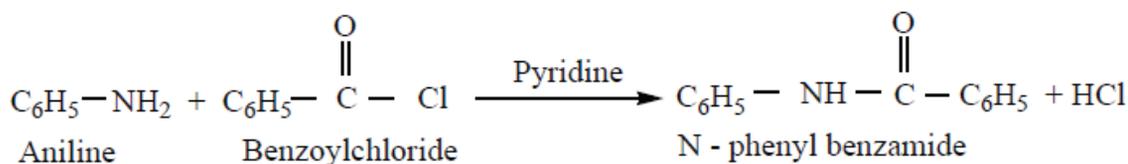
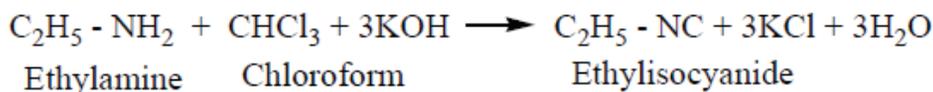
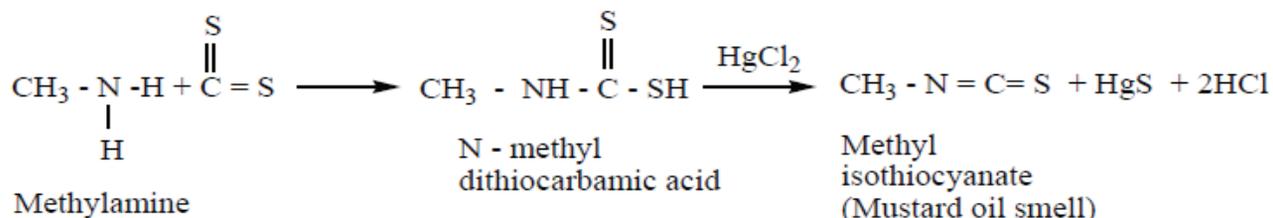
- In aqueous solution it turns blue litmus red.
- It gives brisk effervescence with sodium bicarbonate due to the evolution of carbon-dioxide.
- When carboxylic acid is warmed with alcohol and  $\text{Con H}_2\text{SO}_4$  it forms an ester.

**18. Claisen Condensation****19. Uses of Formic acid.**

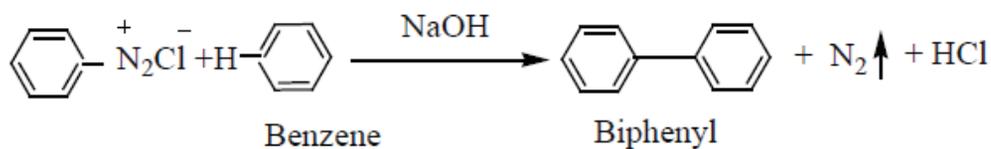
- Used as a coagulating agent for rubber latex
- In medicine for treatment of gout
- Used in preservation of fruit juice.

**20. Uses of Benzoic acid.**

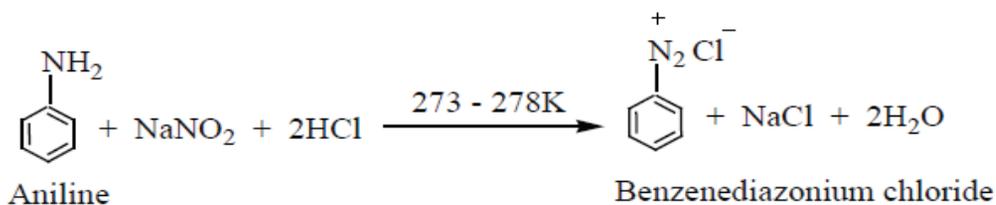
- Used as food preservative.
- Used in medicine as an urinary antiseptic.
- Used for manufacture of dyes.

**UNIT 13. ORGANIC NITROGEN COMPOUNDS****2,3 MARK QUESTIONS****1. Chloropicrin.****2. Hoffmann's degradation reaction.****3. Gabriel phthalimide synthesis.****4. Schotten – Baumann reaction.****5. Carbylamine reaction.****6. Mustard oil reaction.**

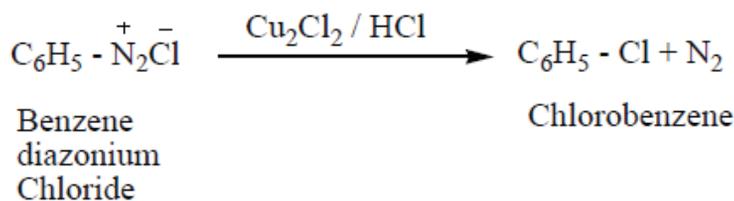
## 7. Gomberg reaction.



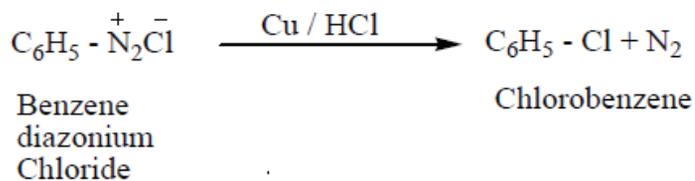
## 8. Diazotization.



## 9. Sandmeyer reaction.



## 10. Gattermann reaction.

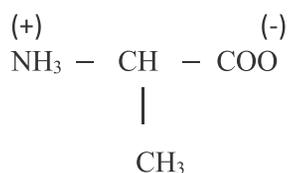


11. Differentiate of primary, secondary, tertiary amines.

Distinction between primary, secondary and tertiary amines		
Primary amine $\text{RNH}_2$	Secondary amine $\text{R}_2\text{NH}$	Tertiary amine $\text{R}_3\text{N}$
1. With $\text{HNO}_2$ forms alcohol.	forms N-nitroso amine.	forms salt.
2. With $\text{CHCl}_3/\text{KOH}$ forms carbylamine	No reaction.	No reaction
3. With acetyl chloride forms N-alkyl acetamide.	form N,N-dialkyl acetamide.	No reaction
4. With $\text{CS}_2$ and $\text{HgCl}_2$ alkyl isothiocyanate is formed.	No reaction	No reaction
5. With Diethyl oxalate dialkyl oxamide, a solid at room temperature is formed.	Forms N,N-dialkyl oxamic ester, a liquid.	No reaction

### UNIT 14. BIO MOLECULES 2,3 MARK QUESTIONS

1. Draw the zwitter ion structure of alanine.



2. How are vitamins Classified ?

- Water soluble vitamins. Ex. Vitamins B & C.
- Fat soluble vitamins Ex. Vitamins A, D, E & K.

3. Define enzymes.

- Enzymes are special proteins called as Bio-catalyst.
- Ex. Invertase.

**4. What are Hormones?**

- Hormones are organic substance secreted in our tissues.
- Ex. Insulin

**5. What are the different types of RNA?**

- (i) m-RNA      (ii) t-RNA      (iii) r-RNA

**6. Why Carbohydrates are optically active?**

- Due to the presence of chiral carbons.

**7. What is isoelectric points?**

- At a specific  $p^H$  the net charge of the amino acid is neutral is called iso electric point.

**8. Name the vitamins which caused rickets and scurvy.**

- Vitamin - D -- Rickets
- Vitamin - C -- Scurvy.

**9. Give the difference between primary and Secondary structure of proteins.**

Primary structure of proteins.	Secondary structure of proteins
It explains the arrangement of Amino acids in the polypeptide chain.	It explains the $\alpha$ - helix and the $\beta$ -strand structure of the protein.

**10. Differentiate Hormones and Vitamins.**

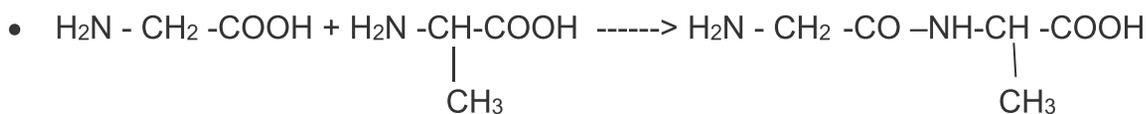
Hormones	Vitamins
Harmones are organic substance secreted in our tissues.	Vitamins are organic substance not secreted in our body.
They are essential to maintain the blood pressure, digestion. Ex. Insulin	They are essential for certain functions and its deficiency caused disease. Ex : Vitamins A, B, C & D

**11. What is denaturation of Proteins?**

- The loss of three dimensional structure without losing its primary structure.

**12. Explain the peptide bond.**

- The COOH group of one amino acid reacts with NH<sub>2</sub> group of the second amino acid to form an amide bond called as peptide bond.



**12. Define Anomers.**

- The conversion of achiral aldehyde carbon into chiral carbon leads to form two isomers.
- Ex.  $\alpha$  and  $\beta$  glucose

**13. Define Epimers.**

- Sugars differ in the configuration of an asymmetric carbon.
- Ex. Galactose and glucose.

**14. Explain the functions of Lipids in living organisms?**

- Used to transport the fat soluble vitamins
- Act as emulsifier for fat metabolism
- Lipids are the component of cell membrane.

**5 MARK QUESTIONS****1. Explain the types of RNA.****Ribosomal RNA (r- RNA):**

- It is found in cytoplasm and in ribosomes. It contains 60% RNA & 40% Proteins.

**Transfer RNA (t-RNA):**

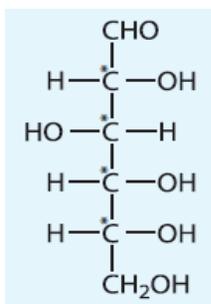
- Its function is to carry the amino acids to the ribosomes for protein synthesis.

**Messenger RNA (m-RNA):**

- It carries the genetic information from the DNA to the ribosomes for protein synthesis. This is called as transcription.

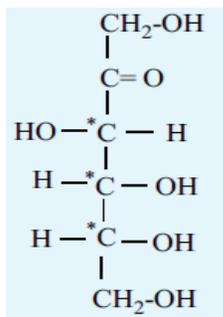
**2. Explain the structure of Glucose.**

- Molecular formula  $C_6H_{12}O_6$
- Glucose + P/HI at 373K  $\longrightarrow$  n-hexane. 6 carbon atoms are bonded linearly.
- Glucose + HCN  $\longrightarrow$  cyanohydrins. presence of carbonyl group.
- Glucose + acetic anhydride + pyridine  $\longrightarrow$  penta acetate. It contains 5 OH groups.
- Glucose + Tollens reagent  $\longrightarrow$  Reduction to metallic silver. Presence of Aldehyde group.



**3. Explain the structure of Fructose.**

- Molecular formula  $C_6H_{12}O_6$ .
- Fructose + P/HI at 373K  $\longrightarrow$  n-hexane. 6 carbon atoms are bonded linearly.
- Fructose + HCN  $\longrightarrow$  cyanohydrins. presence of carbonyl group.
- Fructose + acetic anhydride + pyridine  $\longrightarrow$  penta acetate. It contains 5 OH groups.
- Fructose + cone. $HNO_3$   $\longrightarrow$  Glycollic acid + Tartaric acid. Presence of keto group in the C-2 Position.

**4. Differentiate DNA and RNA.**

S.No	DNA	RNA
1.	It contains deoxyribose sugar.	It contains ribose sugar.
2.	Double Stranded.	Single Stranded.
3.	Life time is high.	Life time is short.
4.	It can replicate itself.	It cannot replicate itself.
5.	It is present in nucleus.	It is present in ribosomes.

**UNIT 15. CHEMISTRY IN EVERYDAY LIFE**  
**2,3 MARK QUESTIONS**

**1. What are antibiotics?**

- The medicines that have the ability to kill the pathogenic bacteria.
- Ex. Amoxicillin.

**2. Name the substance which can act as both analgesic and antipyretic.**

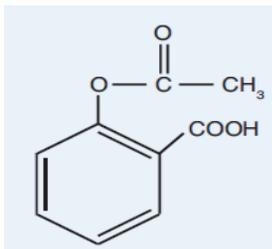
- Aspirin, Paracetamol.

**3. What are food preservatives?**

- Preservatives are used to reduce growth of microorganisms and reduce fermentation, and the decomposition of the food.
- Ex. Acetic Acid.

**4. Write the structural formula of aspirin.**

- Acetyl Salicylic acid

**5. What are Bio degradable polymers? Give examples.**

- The polymers which are decomposed by micro organisms in the environment.
- Ex. PHB, PHBV

**6. What are Antifertility drugs? Give examples.**

- Synthetic Hormones that suppresses Ovulation (or) fertilization.
- Ex. Menstranol.

**7. What are narcotic and non-narcotic drugs? Give examples.****Narcotic drugs:**

- Relieve pain and produce sleep. These drugs are addictive.
- Ex. Morphine.

**Non-narcotic drugs:**

- Analgesics reduce the pain without causing impairments of consciousness.
- Ex. Paracetamol.

**8. How do antiseptics differ from disinfectants?**

S.No.	Antiseptics	Disinfectants
1.	Stop the growth of microorganisms	Stop the growth of microorganisms
2.	Applied on a living tissue.	It is used on inanimate objects.
3.	Ex. Hydrogen peroxide.	Ex. Hydrogen peroxide.

**9. What is Antacids? Give examples.**

- These are used to relieve the burning sensation in the stomach.
- Ex. Milk of Magnesia.

**10. What is Antioxidants?**

- Antioxidants are substances which prevents the oxidative deteriorations of food.
- Ex. BHA, BHT.

**11. What are Artificial sweetening agents?**

- Synthetic compounds which gives sweet sensation and have no nutritional value.
- Ex. Saccharin.

**12. What are sugar substituents? Give examples.**

- Compounds that are used like sugars for sweetening. But metabolised without the influence of insulin.
- Ex. Sorbitol.

**5 MARK QUESTIONS****1. What are Anaesthetics? Explain its types.**

- The drugs which produce loss of sensation.

**General Anaesthetics:**

- It Cause reversible loss of consciousness by affecting central nervous system.
- Ex. propofol.

**Local anaesthetics:**

- It causes loss of sensation, in the area in which it is applied without losing consciousness.
  - Ex. procaine.
-

**+2 CHEMISTRY BOOK BACK ONE MARK****QUESTIONS****1.METALLURGY**

- Bauxite has the composition
  - $\text{Al}_2\text{O}_3$
  - $\text{Al}_2\text{O}_3 \cdot n\text{H}_2\text{O}$
  - $\text{Fe}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$
  - none of these
- Roasting of sulphide ore gives the gas (A). (A) is a colourless gas. Aqueous solution of (A) is acidic. The gas (A) is
  - $\text{CO}_2$
  - $\text{SO}_3$
  - $\text{SO}_2$
  - $\text{H}_2\text{S}$
- Which one of the following reaction represents calcinations?
  - $2\text{Zn} + \text{O}_2 \rightarrow 2\text{ZnO}$
  - $2\text{ZnS} + 3\text{O}_2 \rightarrow 2\text{ZnO} + 2\text{SO}_2$
  - $\text{MgCO}_3 \rightarrow \text{MgO} + \text{CO}_2$
  - (a) and (c)
- The metal oxide which cannot be reduced to metal by carbon is
  - $\text{PbO}$
  - $\text{Al}_2\text{O}_3$
  - $\text{ZnO}$
  - $\text{FeO}$
- Which of the metal is extracted by Hall-Heroult process?
  - Al
  - Ni
  - Cu
  - Zn
- Which of the following statements, about the advantage of roasting of sulphide ore before reduction is not true?
  - $\Delta G_f^0$  of sulphide is greater than those for  $\text{CS}_2$  and  $\text{H}_2\text{S}$
  - $\Delta G_r^0$  is negative for roasting of sulphide ore to oxide
  - Roasting of the sulphide to its oxide is thermodynamically feasible.
  - Carbon and hydrogen are suitable reducing agents for metal sulphides
- Match items in column -I with the items of column II and assign the correct code.

Column-I		Column-II	
A	Cyanide process	(i)	Ultrapure Ge
B	Froth floatation process	(ii)	Dressing of ZnS
C	Electrolytic reduction	(iii)	Extraction of Al
D	Zone refining	(iv)	Extraction of Au
		(v)	Purification of Ni

	A	B	C	D
(a)	(i)	(ii)	(iii)	(iv)
(b)	(ii)	(iv)	(v)	(i)
(c)	(iv)	(ii)	(iii)	(i)
(d)	(i)	(iii)	(i)	(v)

- Wolframite ore is separated from tinstone by the process of
  - Smelting
  - Calcination
  - Roasting
  - Electromagnetic separation
- Which one of the following is not feasible.
  - $\text{Zn(s)} + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Cu(s)} + \text{Zn}^{2+}(\text{aq})$
  - $\text{Cu(s)} + \text{Zn}^{2+}(\text{aq}) \rightarrow \text{Zn(s)} + \text{Cu}^{2+}(\text{aq})$
  - $\text{Cu(s)} + 2\text{Ag}^+(\text{aq}) \rightarrow 2\text{Ag(s)} + \text{Cu}^{2+}(\text{aq})$
  - $\text{Fe(s)} + \text{Cu}^{2+}(\text{aq}) \rightarrow \text{Cu(s)} + \text{Fe}^{2+}(\text{aq})$
- Electrochemical process is used to extract
  - Iron
  - Lead
  - Sodium
  - silver
- Flux is a substance which is used to convert
  - Mineral into silicate
  - Infusible impurities to soluble impurities



**2. p - BLOCK ELEMENTS - I**

- An aqueous solution of borax is
  - neutral
  - acidic
  - basic
  - amphoteric
- Boric acid is an acid because its molecule (NEET)
  - contains replaceable  $H^+$  ion
  - gives up a proton
  - combines with proton to form water molecule
  - accepts  $OH^-$  from water, releasing proton.
- Which among the following is not a borane?
  - $B_2H_6$
  - $B_3H_6$
  - $B_4H_{10}$
  - none of these
- Which of the following metals has the largest abundance in the earth's crust?
  - Aluminium
  - calcium
  - Magnesium
  - sodium
- In diborane, the number of electrons that accounts for banana bonds is
  - six
  - two
  - four
  - three
- The element that does not show catenation among the following p-block elements is
  - Carbon
  - silicon
  - Lead
  - germanium
- Carbon atoms in fullerene with formula  $C_{60}$  have
  - $Sp^3$  hybridised
  - $Sp$  hybridised
  - $Sp^2$  hybridised
  - partially  $Sp^2$  and partially  $Sp^3$  hybridised
- Oxidation state of carbon in its hydrides
  - +4
  - 4
  - +3
  - +2
- The basic structural unit of silicates is (NEET)
  - $(SiO_3)^{2-}$
  - $(SiO_4)^{2-}$
  - $(SiO)^-$
  - $(SiO_4)^{4-}$
- The repeating unit in silicone is
  - $SiO_2$
  - $$\begin{array}{c} R \\ | \\ -Si-O- \\ | \\ R \end{array}$$
  - $$\begin{array}{c} | \\ R-O-Si-O \\ | \\ R \end{array}$$
  - $$\begin{array}{c} | \\ R-O-Si-O \\ | \\ R \end{array}$$
- Which of these is not a monomer for a high molecular mass silicone polymer?
  - $Me_3SiCl$
  - $PhSiCl_3$
  - $MeSiCl_3$
  - $Me_2SiCl_2$
- Which of the following is not  $sp^2$  hybridised?
  - Graphite
  - graphene
  - Fullerene
  - dry ice
- The geometry at which carbon atom in diamond are bonded to each other is
  - Tetrahedral
  - hexagonal
  - Octahedral
  - none of these
- Which of the following statements is not correct?
  - Beryl is a cyclic silicate
  - $MgSiO_4$  is an orthosilicate
  - $[SiO_4]^{4-}$  is the basic structural unit of silicates
  - Feldspar is not aluminosilicate

15. Match items in column - I with the items of column - II and assign the correct code.

Column-I		Column-II	
A	Borazole	1	$B(OH)_3$
B	Boric acid	2	$B_3N_3H_6$
C	Quartz	3	$Na_2[B_4O_5(OH)_4] \cdot 8H_2O$
D	Borax	4	$SiO_2$

	A	B	C	D
(a)	2	1	4	3
(b)	1	2	4	3
(c)	1	2	4	3
(d)	none of these			

16. Duralumin is an alloy of

- a) Cu, Mn                      b) Cu, Al, Mg                      c) Al, Mn                      d) Al, Cu, Mn, Mg

17. The compound that is used in nuclear reactors as protective shields and control rods is

- a) Metal borides              b) metal oxides                      c) Metal carbonates              d) metal carbide

18. The stability of +1 oxidation state increases in the sequence

- a)  $Al < Ga < In < Tl$               b)  $Tl < In < Ga < Al$                       c)  $In < Tl < Ga < Al$                       d)  $Ga < In < Al < Tl$

### 3.p – BLOCK ELEMENTS-II

1. In which of the following,  $NH_3$  is not used?

- a) Nessler's reagent  
 b) Reagent for the analysis of IV group basic radical  
 c) Reagent for the analysis of III group basic radical                      d) Tollen's reagent

2. Which is true regarding nitrogen?

- a) least electronegative element                      b) has low ionisation enthalpy than oxygen  
 b) c) d- orbitals available                      d) ability to form  $P\pi-P\pi$  bonds with itself

3. An element belongs to group 15 and 3 rd period of the periodic table, its electronic configuration would be

- a)  $1s^2 2s^2 2p^4$                       b)  $1s^2 2s^2 2p^3$                       c)  $1s^2 2s^2 2p^6 3s^2 3p^2$                       d)  $1s^2 2s^2 2p^6 3s^2 3p^3$

4. Solid (A) reacts with strong aqueous NaOH liberating a foul smelling gas(B) which spontaneously burn in air giving smoky rings. A and B are respectively a)  $P_4$  (red) and  $PH_3$  b)  $P_4$  (white) and  $PH_3$  c)  $S_8$  and  $H_2S$  d)  $P_4$  (white) and  $H_2S$

- a)  $P_4$ (red) and  $PH_3$                       b)  $P_4$ (white) and  $PH_3$   
 c)  $S_8$  and  $H_2S$                       d)  $P_4$ (white) and  $H_2S$

5. On hydrolysis,  $PCl_3$  gives

- a)  $H_3PO_3$                       b)  $PH_3$                       c)  $H_3PO_4$                       d)  $POCl_3$

6.  $P_4O_6$  reacts with cold water to give

- a)  $H_3PO_3$                       b)  $H_4P_2O_7$                       c)  $HPO_3$                       d)  $H_3PO_4$

7. The basicity of pyrophosphorous acid ( $H_4P_2O_5$ ) is

- a) 4                      b) 2                      c) 3                      d) 5

8. The molarity of given orthophosphoric acid solution is 2M. its normality is

- a) 6N                      b) 4N                      c) 2N                      d) none of these

9. Assertion : bond dissociation energy of fluorine is greater than chlorine gas  
Reason : chlorine has more electronic repulsion than fluorine
- 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.
10. Among the following, which is the strongest oxidizing agent?  
a)  $\text{Cl}_2$                       b)  $\text{F}_2$                       c)  $\text{Br}_2$                       d)  $\text{I}_2$
11. The correct order of the thermal stability of hydrogen halide is  
a)  $\text{HI} > \text{HBr} > \text{HCl} > \text{HF}$                       b)  $\text{HF} > \text{HCl} > \text{HBr} > \text{HI}$   
c)  $\text{HCl} > \text{HF} > \text{HBr} > \text{HI}$                       d)  $\text{HI} > \text{HCl} > \text{HF} > \text{HBr}$
12. Which one of the following compounds is not formed?  
a)  $\text{XeOF}_4$                       b)  $\text{XeO}_3$                       c)  $\text{XeF}_2$                       d)  $\text{NeF}_2$
13. Most easily liquefiable gas is  
a) Ar                      b) Ne                      c) He                      d) Kr
14.  $\text{XeF}_6$  on complete hydrolysis produces  
a)  $\text{XeOF}_4$                       b)  $\text{XeO}_2\text{F}_2$                       c)  $\text{XeO}_3$                       d)  $\text{XeO}_2$
15. Which of the following is strongest acid among all?  
a) HI                      b) HF                      c) HBr                      d) HCl
16. Which one of the following orders is correct for the bond dissociation enthalpy of halogen molecules? (NEET)  
a)  $\text{Br}_2 > \text{I}_2 > \text{F}_2 > \text{Cl}_2$                       b)  $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$                       c)  $\text{I}_2 > \text{Br}_2 > \text{Cl}_2 > \text{F}_2$                       d)  $\text{Cl}_2 > \text{Br}_2 > \text{F}_2 > \text{I}_2$
17. Among the following the correct order of acidity is (NEET)  
a)  $\text{HClO}_2 < \text{HClO} < \text{HClO}_3 < \text{HClO}_4$                       b)  $\text{HClO}_4 < \text{HClO}_2 < \text{HClO} < \text{HClO}_3$   
c)  $\text{HClO}_3 < \text{HClO}_4 < \text{HClO}_2 < \text{HClO}$                       d)  $\text{HClO} < \text{HClO}_2 < \text{HClO}_3 < \text{HClO}_4$
18. When copper is heated with conc  $\text{HNO}_3$  it produces  
a)  $\text{Cu}(\text{NO}_3)_2$ , NO and  $\text{NO}_2$                       b)  $\text{Cu}(\text{NO}_3)_2$  and  $\text{N}_2\text{O}$   
c)  $\text{Cu}(\text{NO}_3)_2$  and  $\text{NO}_2$                       d)  $\text{Cu}(\text{NO}_3)_2$  and NO

#### 4. TRANSITION AND INNER TRANSITION ELEMENTS

1. Sc ( $Z=21$ ) is a transition element but Zinc ( $Z=30$ ) is not because  
a) both  $\text{Sc}^{3+}$  and  $\text{Zn}^{2+}$  ions are colourless and form white compounds.  
b) in case of Sc, 3d orbital are partially filled but in Zn these are completely filled  
c) last electron as assumed to be added to 4s level in case of zinc  
d) both Sc and Zn do not exhibit variable oxidation states
2. Which of the following d block element has half filled penultimate d sub shell as well as half filled valence sub shell?  
a) Cr                      b) Pd                      c) Pt                      d) none of these
3. Among the transition metals of 3d series, the one that has highest negative ( $M^{2+}/M$ ) standard electrode potential is  
a) Ti                      b) Cu                      c) Mn                      d) Zn

4. Which one of the following ions has the same number of unpaired electrons as present in  $V^{3+}$ ?  
 a)  $Ti^{3+}$                       b)  $Fe^{3+}$                       c)  $Ni^{2+}$                       d)  $Cr^{3+}$
5. The magnetic moment of  $Mn^{2+}$  ion is  
 a) 5.92 BM                      b) 2.80 BM                      c) 8.95 BM                      d) 3.90 BM
6. The catalytic behaviour of transition metals and their compounds is ascribed mainly due to  
 a) their magnetic behaviour                      b) their unfilled d orbitals  
 c) their ability to adopt variable oxidation states  
 d) their chemical reactivity
7. The correct order of increasing oxidizing power in the series  
 a)  $VO_2^+ < Cr_2O_7^{2-} < MnO_4^-$                       b)  $Cr_2O_7^{2-} < VO_2^+ < MnO_4^-$   
 c)  $Cr_2O_7^{2-} < MnO_4^- < VO_2^+$                       d)  $MnO_4^- < Cr_2O_7^{2-} < VO_2^+$
8. In acid medium, potassium permanganate oxidizes oxalic acid to  
 a) oxalate                      b) Carbon dioxide                      c) acetate                      d) acetic acid
9. Which of the following statements is not true?  
 a) on passing  $H_2S$ , through acidified  $K_2Cr_2O_7$  solution, a milky colour is observed.  
 b)  $Na_2Cr_2O_7$  is preferred over  $K_2Cr_2O_7$  in volumetric analysis  
 c)  $K_2Cr_2O_7$  solution in acidic medium is orange in colour  
 d)  $K_2Cr_2O_7$  solution becomes yellow on increasing the pH beyond 7
10. Permanganate ion changes to \_\_\_\_\_ in acidic medium  
 a)  $MnO_4^{2-}$                       b)  $Mn^{2+}$                       c)  $Mn^{3+}$                       d)  $MnO_2$
11. How many moles of  $I_2$  are liberated when 1 mole of potassium dichromate react with potassium iodide?  
 a) 1                      b) 2                      c) 3                      d) 4
12. The number of moles of acidified  $KMnO_4$  required to oxidize 1 mole of ferrous oxalate ( $FeC_2O_4$ ) is  
 a) 5                      b) 3                      c) 0.6                      d) 1.5
13. Which one of the following statements related to lanthanons is incorrect?  
 a) Europium shows +2 oxidation state.  
 b) The basicity decreases as the ionic radius decreases from Pr to Lu.  
 c) All the lanthanons are much more reactive than aluminium.  
 d)  $Ce^{4+}$  solutions are widely used as oxidising agents in volumetric analysis.
14. Which of the following lanthanoid ions is diamagnetic?  
 a)  $Eu^{2+}$                       b)  $Yb^{2+}$                       c)  $Ce^{2+}$                       d)  $Sm^{2+}$
15. Which of the following oxidation states is most common among the lanthanoids?  
 a) 4                      b) 2                      c) 5                      d) 3
16. Assertion :  $Ce^{4+}$  is used as an oxidizing agent in volumetric analysis.  
 Reason :  $Ce^{4+}$  has the tendency of attaining +3 oxidation state.
- 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.

17. The most common oxidation state of actinoids is  
 a) +2                      b) +3                      c) +4                      d) +6
18. The actinoid elements which show the highest oxidation state of +7 are  
 a) Np, Pu, Am              b) U, Fm, Th              c) U, Th, Md              d) Es, No, Lr
19. Which one of the following is not correct?  
 a)  $\text{La}(\text{OH})_3$  is less basic than  $\text{Lu}(\text{OH})_3$   
 b) In lanthanoid series ionic radius of  $\text{Ln}^{3+}$  ions decreases  
 c) La is actually an element of transition metal series rather than lanthanide series  
 d) Atomic radii of Zr and Hf are same because of lanthanide contraction

### 5. COORDINATION CHEMISTRY

1. The sum of primary valence and secondary valence of the metal M in the complex  $[\text{M}(\text{en})_2(\text{Ox})\text{Cl}]$  is  
 a) 3                      b) 6                      c) -3                      d) 9
2. An excess of silver nitrate is added to 100ml of a 0.01 M solution of pentaquachloridochromium(III) chloride. The number of moles of AgCl precipitated would be  
 a) 0.02                      b) 0.002                      c) 0.01                      d) 0.2
3. A complex has a molecular formula  $\text{MSO}_4\text{Cl}\cdot 6\text{H}_2\text{O}$ . The aqueous solution of it gives white precipitate with Barium chloride solution and no precipitate is obtained when it is treated with silver nitrate solution. If the secondary valence of the metal is six, which one of the following correctly represents the complex?  
 a)  $[\text{M}(\text{H}_2\text{O})_4\text{Cl}]\text{SO}_4\cdot 2\text{H}_2\text{O}$                       b)  $[\text{M}(\text{H}_2\text{O})_6]\text{SO}_4$   
 c)  $[\text{M}(\text{H}_2\text{O})_5\text{Cl}]\text{SO}_4\cdot \text{H}_2\text{O}$                       d)  $[\text{M}(\text{H}_2\text{O})_3\text{Cl}]\text{SO}_4\cdot 3\text{H}_2\text{O}$
4. Oxidation state of Iron and the charge on the ligand NO in  $[\text{Fe}(\text{H}_2\text{O})_5\text{NO}]\text{SO}_4$  are  
 a) +2 and 0 respectively                      b) +3 and 0 respectively  
 c) +3 and -1 respectively                      d) +1 and -1 respectively
5. As per IUPAC guidelines, the name of the complex  $[\text{Co}(\text{en})_2(\text{ONO})\text{Cl}]\text{Cl}$  is  
 a) chlorobisethylenediaminenitritocobalt(III) chloride  
 b) chloridobis(ethane-1,2-diamine)nitro -k-O cobaltate (III) chloride  
 c) chloridobis(ethane-1,2-diammine)nitrito -k-O cobalt(II) chloride  
 d) chloridobis(ethane-1,2-diammine)nitrito-k-O cobalt(III) chloride
6. IUPAC name of the complex  $\text{K}_3[\text{Al}(\text{C}_2\text{O}_4)_3]$  is  
 a) potassiumtrioxalatoaluminium(III)                      b) potassiumtrioxalatoaluminate(II)  
 c) potassiumtrisoxalatoaluminate(III)                      d) potassiumtrioxalatoaluminate(III)
7. A magnetic moment of 1.73 BM will be shown by one among the following (NEET)  
 a)  $\text{TiCl}_4$                       b)  $[\text{CoCl}_6]^{4+}$                       c)  $[\text{Cu}(\text{NH}_3)_4]^{2+}$                       d)  $[\text{Ni}(\text{CN})_4]^{2-}$
8. Crystal field stabilization energy for high spin  $d^5$  octahedral complex is  
 a)  $-0.6 \Delta_0$                       b) 0                      c)  $2(P - \Delta_0)$                       d)  $2(P + \Delta_0)$
9. In which of the following coordination entities the magnitude of  $\Delta_0$  will be maximum?  
 a)  $[\text{Co}(\text{CN})_6]^{3-}$                       b)  $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$                       c)  $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$                       d)  $[\text{Co}(\text{NH}_3)_6]^{3+}$
10. Which one of the following will give a pair of enantiomorphs?  
 a)  $[\text{Cr}(\text{NH}_3)_6][\text{Co}(\text{CN})_6]$                       b)  $[\text{Co}(\text{en})_2\text{Cl}_2]\text{Cl}$

- c)  $[\text{Pt}(\text{NH}_3)_4][\text{PtCl}_4]$  d)  $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]\text{NO}_2$
11. Which type of isomerism is exhibited by  $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$ ?
- a) Coordination isomerism b) Linkage isomerism  
c) Optical isomerism d) Geometrical isomerism
12. How many geometrical isomers are possible for  $[\text{Pt}(\text{Py})(\text{NH}_3)(\text{Br})(\text{Cl})]$ ?
- a) 3 b) 4 c) 0 d) 15
13. Which one of the following pairs represents linkage isomers?
- a)  $[\text{Cu}(\text{NH}_3)_4][\text{PtCl}_4]$  and  $[\text{Pt}(\text{NH}_3)_4][\text{CuCl}_4]$   
b)  $[\text{Co}(\text{NH}_3)_5(\text{NO}_2)]\text{SO}_4$  and  $[\text{Co}(\text{NH}_3)_5(\text{ONO})]$   
c)  $[\text{Co}(\text{NH}_3)_4(\text{NCS})_2]\text{Cl}$  and  $[\text{Co}(\text{NH}_3)_4(\text{SCN})_2]\text{Cl}$   
d) both (b) and (c)
14. Which kind of isomerism is possible for a complex  $[\text{Co}(\text{NH}_3)_4\text{Br}_2]\text{Cl}$ ?
- a) geometrical and ionization b) geometrical and optical  
c) optical and ionization d) geometrical only
15. Which one of the following complexes is not expected to exhibit isomerism?
- a)  $[\text{Ni}(\text{NH}_3)_4(\text{H}_2\text{O})_2]^{2+}$  b)  $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$   
c)  $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{Cl}$  d)  $[\text{FeCl}_6]^{3-}$
16. A complex in which the oxidation number of the metal is zero is
- a)  $\text{K}_4[\text{Fe}(\text{CN})_6]$  b)  $[\text{Fe}(\text{CN})_3(\text{NH}_3)_3]$   
c)  $[\text{Fe}(\text{CO})_5]$  d) both (b) and (c)
17. Formula of tris(ethane-1,2-diamine)iron II phosphate
- a)  $[\text{Fe}(\text{CH}_3\text{-CH}(\text{NH}_2)_2)_3](\text{PO}_4)_3$  b)  $[\text{Fe}(\text{H}_2\text{N-CH}_2\text{-CH}_2\text{-NH}_2)_3](\text{PO}_4)$   
c)  $[\text{Fe}(\text{H}_2\text{N-CH}_2\text{-CH}_2\text{-NH}_2)_3](\text{PO}_4)_2$  d)  $[\text{Fe}(\text{H}_2\text{N-CH}_2\text{-CH}_2\text{-NH}_2)_3](\text{PO}_4)_2$
18. Which of the following is paramagnetic in nature?
- a)  $[\text{Zn}(\text{NH}_3)_4]^{2+}$  b)  $[\text{Co}(\text{NH}_3)_6]^{3+}$  c)  $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$  d)  $[\text{Ni}(\text{CN})_4]^{2-}$
19. Fac-mer isomerism is shown by
- a)  $[\text{Co}(\text{en})_3]^{3+}$  b)  $[\text{Co}(\text{NH}_3)_4(\text{Cl})_2]^+$  c)  $[\text{Co}(\text{NH}_3)_3(\text{Cl})_3]$  d)  $[\text{Co}(\text{NH}_3)_5\text{Cl}]\text{SO}_4$
20. Choose the correct statement.
- a) Square planar complexes are more stable than octahedral complexes  
b) The spin only magnetic moment of  $[\text{Cu}(\text{Cl})_4]^{2-}$  is 1.732 BM and it has square planar structure.  
c) Crystal field splitting energy ( $\Delta_0$ ) of  $[\text{FeF}_6]^{4-}$  is higher than the ( $\Delta_0$ ) of  $[\text{Fe}(\text{CN})_6]^{4-}$   
d) crystal field stabilization energy of  $[\text{V}(\text{H}_2\text{O})_6]^{2+}$  is higher than the crystal field stabilization of  $[\text{Ti}(\text{H}_2\text{O})_6]^{2+}$

## 6. SOLID STATE

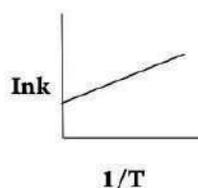
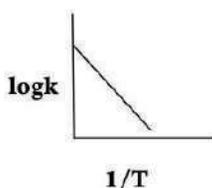
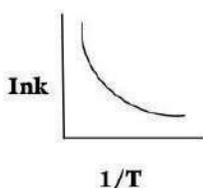
1. Graphite and diamond are
- a) Covalent and molecular crystals b) ionic and covalent crystals  
c) both covalent crystals d) both molecular crystals
2. An ionic compound  $\text{A}_x\text{B}_y$  crystallizes in fcc type crystal structure with B ions at the centre of each face and A ion occupying corners of the cube. the correct formula of  $\text{A}_x\text{B}_y$  is
- a) AB b)  $\text{AB}_3$  c)  $\text{A}_3\text{B}$  d)  $\text{A}_8\text{B}_6$
3. 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

4. Solid  $\text{CO}_2$  is an example of  
 a) Covalent solid    b) metallic solid    c) molecular solid    d) ionic solid
5. Assertion : monoclinic sulphur is an example of monoclinic crystal system  
 Reason: for a monoclinic system,  $a \neq b \neq c$  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.
6. In calcium fluoride, having the fluorite structure the coordination number of  $\text{Ca}^{2+}$  ion and  $\text{F}^-$  Ion are (NEET)  
 a) 4 and 2    b) 6 and 6    c) 8 and 4    d) 4 and 8
7. The number of unit cells in 8 gm of an element X ( atomic mass 40) which crystallizes in bcc pattern is (NA is the Avogadro number)  
 a)  $6.023 \times 10^{23}$     b)  $6.023 \times 10^{22}$     c)  $60.23 \times 10^{23}$     d)  $[6.023 \times 10^{23} / 8 \times 40]$
8. In a solid atom M occupies ccp lattice and  $(\frac{1}{3})$  of tetrahedral voids are occupied by atom N. find the formula of solid formed by M and N.  
 a) MN    b)  $\text{M}_3\text{N}$     c)  $\text{MN}_3$     d)  $\text{M}_3\text{N}_2$
9. The ionic radii of  $\text{A}^+$  and  $\text{B}^-$  are  $0.98 \times 10^{-10} \text{ m}$  and  $1.81 \times 10^{-10} \text{ m}$  . the coordination number of each ion in AB is  
 a) 8    b) 2    c) 6    d) 4
10. CsCl has bcc arrangement, its unit cell edge length is 400pm, its inter atomic distance is  
 a) 400pm    b) 800pm    c)  $\sqrt{3} \times 100 \text{ pm}$     d)  $\left(\frac{\sqrt{3}}{2}\right) \times 400 \text{ pm}$
11. A solid compound XY has NaCl structure. if the radius of the cation is 100pm , the radius of the anion will be  
 a)  $\left(\frac{100}{0.414}\right)$     b)  $\left(\frac{0.732}{100}\right)$     c)  $100 \times 0.414$     d)  $\left(\frac{0.414}{100}\right)$
12. The vacant space in bcc lattice unit cell is  
 a) 48%    b) 23%    c) 32%    d) 26%
13. The radius of an atom is 300pm, if it crystallizes in a face centered cubic lattice, the length of the edge of the unit cell is  
 a) 488.5pm    b) 848.5pm    c) 884.5pm    d) 484.5pm
14. The fraction of total volume occupied by the atoms in a simple cubic is  
 a)  $\left(\frac{\pi}{4\sqrt{2}}\right)$     b)  $\left(\frac{\pi}{6}\right)$     c)  $\left(\frac{\pi}{4}\right)$     d)  $\left(\frac{\pi}{3\sqrt{2}}\right)$
15. The yellow colour in NaCl crystal is due to  
 a) excitation of electrons in F centers    b) reflection of light from  $\text{Cl}^-$  ion on the surface  
 c) refraction of light from  $\text{Na}^+$  ion    d) all of the above
16. If 'a' stands for the edge length of the cubic system; sc , bcc, and fcc. Then the ratio of radii of spheres in these systems will be respectively



### 7. CHEMICAL KINETICS

- For a first order reaction  $A \rightarrow B$  the rate constant is  $x \text{ min}^{-1}$ . If the initial concentration of A is  $0.01M$ , the concentration of A after one hour is given by the expression.
  - $0.01e^{-x}$
  - $1 \times 10^{-2} (1 - e^{-60x})$
  - $(1 \times 10^{-2}) e^{-60x}$
  - none of these
- A zero order reaction  $X \rightarrow \text{Product}$ , with an initial concentration  $0.02M$  has a half life of 10 min. if one starts with concentration  $0.04M$ , then the half life is
  - 10 s
  - 5 min
  - 20 min
  - cannot be predicted using the given information
- Among the following graphs showing variation of rate constant with temperature (T) for a reaction, the one that exhibits Arrhenius behavior over the entire temperature range is
  - 
  - 
  - 
  - both (b) and (c)



- For a first order reaction  $A \rightarrow p \text{ product}$  with initial concentration  $x \text{ mol L}^{-1}$ , has a half life period of 2.5 hours. For the same reaction with initial concentration  $\left(\frac{x}{2}\right) \text{ mol L}^{-1}$  the half life is
  - $(2.5 \times 2)$  hours
  - $\left(\frac{2.5}{2}\right)$  hours
  - 2.5 hours
  - Without knowing the rate constant,  $t_{1/2}$  cannot be determined from the given data
- For the reaction,  $2\text{NH}_3 \rightarrow \text{N}_2 + 3\text{H}_2$ , if  $\frac{-d[\text{NH}_3]}{dt} = k_1[\text{NH}_3]$ ,  $\frac{d[\text{N}_2]}{dt} = k_2[\text{NH}_3]$ ,  $\frac{d[\text{H}_2]}{dt} = k_3[\text{NH}_3]$  then the relation between  $K_1$ ,  $K_2$  and  $K_3$ 
  - $k_1 = k_2 = k_3$
  - $k_1 = 3k_2 = 2k_3$
  - $1.5k_1 = 3k_2 = k_3$
  - $2k_1 = k_2 = 3k_3$
- The decomposition of phosphine ( $\text{PH}_3$ ) on tungsten at low pressure is a first order reaction. It is because the (NEET)
  - rate is proportional to the surface coverage
  - rate is inversely proportional to the surface coverage
  - rate is independent of the surface coverage
  - rate of decomposition is slow
- For a reaction  $\text{Rate} = K [\text{acetone}]^{3/2}$  then unit of rate constant and rate of reaction respectively is
  - $(\text{mol L}^{-1} \text{ s}^{-1})$ ,  $(\text{mol}^{-1/2} \text{ L}^{1/2} \text{ s}^{-1})$
  - $(\text{mol}^{-1/2} \text{ L}^{1/2} \text{ s}^{-1})$ ,  $(\text{mol L}^{-1} \text{ s}^{-1})$
  - $(\text{mol}^{1/2} \text{ L}^{1/2} \text{ s}^{-1})$ ,  $(\text{mol L}^{-1} \text{ s}^{-1})$
  - $(\text{mol L s}^{-1})$ ,  $(\text{mol}^{1/2} \text{ L}^{1/2} \text{ s})$
- The addition of a catalyst during a chemical reaction alters which of the following quantities? (NEET)

- a) Enthalpy      b) Activation energy      c) Entropy      d) Internal energy

9. Consider the following statements :

- (i) increase in concentration of the reactant increases the rate of a zero order reaction.  
 (ii) rate constant  $k$  is equal to collision frequency  $A$  if  $E_a = 0$   
 (iii) rate constant  $k$  is equal to collision frequency  $A$  if  $E_a = \infty$   
 (iv) a plot of  $\ln \ln(k)$  vs  $T$  is a straight line.  
 (v) a plot of  $\ln \ln(k)$  vs  $(1/T)$  is a straight line with a positive slope.

Correct statements are

- a) (ii) only      b) (ii) and (iv)      c) (ii) and (v)      d) (i), (ii) and (v)
10. In a reversible reaction, the enthalpy change and the activation energy in the forward direction are respectively  $-x \text{ kJ mol}^{-1}$  and  $y \text{ kJ mol}^{-1}$ . Therefore, the energy of activation in the backward direction is  
 a)  $(y-x) \text{ kJ mol}^{-1}$       b)  $(x+y) \text{ J mol}^{-1}$       c)  $(x-y) \text{ kJ mol}^{-1}$       d)  $(x+y) \times 10^3 \text{ J mol}^{-1}$
11. What is the activation energy for a reaction if its rate doubles when the temperature is raised from 200K to 400K? ( $R=8.314 \text{ JK}^{-1} \text{ mol}^{-1}$ )  
 a)  $234.65 \text{ kJ mol}^{-1}$       b)  $434.65 \text{ kJ mol}^{-1}$       c)  $2.305 \text{ kJ mol}^{-1}$       d)  $334.65 \text{ J mol}^{-1}$

12. ; This reaction follows first order kinetics. The rate constant at particular temperature is  $2.303 \times 10^{-2} \text{ hour}^{-1}$ . The initial concentration of cyclopropane is 0.25 M. What will be the concentration of cyclopropane after 1806 minutes? ( $\log 2 = 0.3010$ )

- a) 0.125 M      b) 0.215 M      c)  $0.25 \times 2.303 \text{ M}$       d) 0.05 M
13. For a first order reaction, the rate constant is  $0.6909 \text{ min}^{-1}$ . the time taken for 75% conversion in minutes is

- a)  $\left(\frac{3}{2}\right) \log 2$       b)  $\left(\frac{2}{3}\right) \log 2$       c)  $\left(\frac{3}{2}\right) \log \left(\frac{3}{4}\right)$       d)  $\left(\frac{2}{3}\right) \log \left(\frac{4}{3}\right)$
14. In a first order reaction  $x \rightarrow y$ ; if  $k$  is the rate constant and the initial concentration of the reactant  $x$  is 0.1M, then, the half life is

- a)  $\left(\frac{\log 2}{k}\right)$       b)  $\left(\frac{0.693}{(0.1)k}\right)$       c)  $\left(\frac{\ln 2}{k}\right)$       d) none of these

15. Predict the rate law of the following reaction based on the data given below  $2A + B \rightarrow C + 3D$

Reaction number	[A] (min)	[B] (min)	Initial rate ( $\text{M s}^{-1}$ )
1	0.1	0.1	$x$
2	0.2	0.1	$2x$
3	0.1	0.2	$4x$
4	0.2	0.2	$8x$

- a) rate =  $k[A]^2[B]$       b) rate =  $k[A][B]^2$       c) rate =  $k[A][B]$       d) rate =  $k[A]^{1/2}[B]^{3/2}$
16. Assertion: rate of reaction doubles when the concentration of the reactant is doubles if it is a first order reaction. Reason: rate constant also doubles

- 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.
17. The rate constant of a reaction is  $5.8 \times 10^{-2} \text{ s}^{-1}$ . The order of the reaction is  
 a) First order      b) zero order      c) Second order      d) Third order
18. For the reaction  $\text{N}_2\text{O}_5(\text{g}) \rightarrow 2\text{NO}_2(\text{g}) + \frac{1}{2} \text{O}_2(\text{g})$ , the value of rate of disappearance of  $\text{N}_2\text{O}_5$  is given as  $6.5 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1}$ . The rate of formation of  $\text{NO}_2$  and  $\text{O}_2$  is given respectively as  
 a)  $(3.25 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1})$  and  $(1.3 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1})$   
 b)  $(1.3 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1})$  and  $(3.25 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1})$   
 c)  $(1.3 \times 10^{-1} \text{ mol L}^{-1} \text{ s}^{-1})$  and  $(3.25 \times 10^{-2} \text{ mol L}^{-1} \text{ s}^{-1})$       d) None of these
19. During the decomposition of  $\text{H}_2\text{O}_2$  to give dioxygen, 48 g  $\text{O}_2$  is formed per minute at certain point of time. The rate of formation of water at this point is  
 a)  $0.75 \text{ mol min}^{-1}$     b)  $1.5 \text{ mol min}^{-1}$       c)  $2.25 \text{ mol min}^{-1}$       d)  $3.0 \text{ mol min}^{-1}$
20. If the initial concentration of the reactant is doubled, the time for half reaction is also doubled. Then the order of the reaction is  
 a) Zero      b) one      c) Fraction      d) none
21. In a homogeneous reaction  $\text{A} \rightarrow \text{B} + \text{C} + \text{D}$ , the initial pressure was  $P_0$  and after time  $t$  it was  $P$ . Expression for rate constant in terms of  $P_0$ ,  $P$  and  $t$  will  
 a)  $k = \left( \frac{2.303}{t} \right) \log \left( \frac{2P_0}{3P_0 - P} \right)$       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)  $k = \left( \frac{2.303}{t} \right) \log \left( \frac{2P_0}{3P_0 - 2P} \right)$
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
23. The half life period of a radioactive element is 140 days. After 560 days, 1 g of element will be reduced to  
 a)  $\left( \frac{1}{2} \right) \text{g}$       b)  $\left( \frac{1}{4} \right) \text{g}$       c)  $\left( \frac{1}{8} \right) \text{g}$       d)  $\left( \frac{1}{16} \right) \text{g}$
24. The correct difference between first and second order reactions is that (NEET)  
 a) 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  $[\text{A}_0]$ ; the half life of a second order reaction does depend on  $[\text{A}_0]$ .  
 c) 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.  
 d) 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.
25. After 2 hours, a radioactive substance becomes  $\left( \frac{1}{16} \right)^{\text{th}}$  of original amount. Then the half life (in min) is  
 a) 60 minutes    b) 120 minutes      c) 30 minutes      d) 15 minutes

**8. IONIC EQUILIBRIUM**

- Concentration of the  $\text{Ag}^+$  ions in a saturated solution of  $\text{Ag}_2\text{C}_2\text{O}_4$  is  $2.24 \times 10^{-4} \text{ mol L}^{-1}$  solubility product of  $\text{Ag}_2\text{C}_2\text{O}_4$  is (NEET - 2017)
  - $2.42 \times 10^{-8} \text{ mol}^3 \text{ L}^{-3}$
  - $2.66 \times 10^{-12} \text{ mol}^3 \text{ L}^{-3}$
  - $4.5 \times 10^{-11} \text{ mol}^3 \text{ L}^{-3}$
  - $5.619 \times 10^{-12} \text{ mol}^3 \text{ L}^{-3}$
- Following solutions were prepared by mixing different volumes of NaOH of HCl different concentrations. (NEET - 2018)
  - $60 \text{ ml } \frac{\text{M}}{10} \text{ HCl} + 40 \text{ ml } \frac{\text{M}}{10} \text{ NaOH}$
  - $55 \text{ ml } \frac{\text{M}}{10} \text{ HCl} + 45 \text{ ml } \frac{\text{M}}{10} \text{ NaOH}$
  - $75 \text{ ml } \frac{\text{M}}{5} \text{ HCl} + 25 \text{ ml } \frac{\text{M}}{5} \text{ NaOH}$
  - $100 \text{ ml } \frac{\text{M}}{10} \text{ HCl} + 100 \text{ ml } \frac{\text{M}}{10} \text{ NaOH}$

pH of which one of them will be equal to 1?

  - iv
  - i
  - ii
  - iii
- The solubility of  $\text{BaSO}_4$  in water is  $2.42 \times 10^{-3} \text{ g L}^{-1}$  at 298K. The value of its solubility product ( $K_{sp}$ ) will be (NEET -2018). (( $\text{BaSO}_4$  Given molar mass of  $=233 \text{ g mol}^{-1}$  )
  - $1.08 \times 10^{-14} \text{ mol}^2 \text{ L}^{-2}$
  - $1.08 \times 10^{-12} \text{ mol}^2 \text{ L}^{-2}$
  - $1.08 \times 10^{-10} \text{ mol}^2 \text{ L}^{-2}$
  - $1.08 \times 10^{-8} \text{ mol}^2 \text{ L}^{-2}$
- pH of a saturated solution of  $\text{Ca}(\text{OH})_2$  is 9. The Solubility product ( $K_{sp}$ ) of  $\text{Ca}(\text{OH})_2$ 
  - $0.5 \times 10^{-15}$
  - $0.25 \times 10^{-10}$
  - $0.125 \times 10^{-15}$
  - $0.5 \times 10^{-10}$
- Conjugate base for Bronsted acids  $\text{H}_2\text{O}$  and  $\text{HF}$  are
  - $\text{OH}^-$  and  $\text{H}_2\text{FH}^+$  respectively
  - $\text{H}_3\text{O}^+$  and  $\text{F}^-$  respectively
  - $\text{OH}^-$  and  $\text{F}^-$  respectively
  - $\text{H}_3\text{O}^+$  and  $\text{H}_2\text{F}^+$  respectively
- Which will make basic buffer?
  - 50 mL of 0.1M NaOH + 25mL of 0.1M  $\text{CH}_3\text{COOH}$
  - 100 mL of 0.1M  $\text{CH}_3\text{COOH}$  + 100mL of 0.1M  $\text{NH}_4\text{OH}$
  - 100 mL of 0.1M HCl + 200mL of 0.1M  $\text{NH}_4\text{OH}$
  - 100 mL of 0.1M HCl + 100mL of 0.1M NaOH
- Which of the following fluoro compounds is most likely to behave as a Lewis base?
  - $\text{BF}_3$
  - $\text{PF}_3$
  - $\text{CF}_4$
  - $\text{SiF}_4$
- Which of these is not likely to act as Lewis base?
  - $\text{BF}_3$
  - $\text{PF}_3$
  - CO
  - $\text{F}^-$
- The aqueous solutions of sodium formate, anilinium chloride and potassium cyanide are Respectively
  - acidic, acidic, basic
  - basic, acidic, basic
  - basic, neutral, basic
  - none of these

10. The percentage of pyridine ( $C_5H_5N$ ) that forms pyridinium ion ( $C_5H_5NH$ ) in a 0.10M aqueous pyridine solution ( $K_b$  for  $C_5H_5N = 1.7 \times 10^{-9}$ ) is  
 a) 0.006%      b) 0.013%      c) 0.77%      d) 1.6%
11. Equal volumes of three acid solutions of pH 1,2 and 3 are mixed in a vessel. What will be the  $H^+$  ion concentration in the mixture?  
 a)  $3.7 \times 10^{-2}$       b)  $10^{-6}$       c) 0.111      d) none of these
12. The solubility of  $AgCl(s)$  with solubility product  $1.6 \times 10^{-10}$  in 0.1M NaCl solution would be  
 a)  $1.26 \times 10^{-5} M$       b)  $1.6 \times 10^{-9} M$       c)  $1.6 \times 10^{-11} M$       d) Zero
13. If the solubility product of lead iodide is  $3.2 \times 10^{-8}$ , its solubility will be  
 a)  $2 \times 10^{-3} M$       b)  $4 \times 10^{-4} M$       c)  $1.6 \times 10^{-5} M$       d)  $1.8 \times 10^{-5} M$
14. MY and NY<sub>3</sub>, are insoluble salts and have the same  $K_{sp}$  values of  $6.2 \times 10^{-13}$  at room temperature. Which statement would be true with regard to MY and NY ?  
 a) The salts MY and NY<sub>3</sub> are more soluble in 0.5M KY than in pure water  
 b) The addition of the salt of KY to the suspension of MY and NY<sub>3</sub> will have no effect on their solubility's  
 c) The molar solubilities of MY and NY<sub>3</sub> in water are identical  
 d) The molar solubility of MY in water is less than that of NY<sub>3</sub>
15. What is the pH of the resulting solution when equal volumes of 0.1M NaOH and 0.01MHCl are mixed?  
 a) 2.0      b) 3      c) 7.0      d) 12.65
16. The dissociation constant of a weak acid is  $1 \times 10^{-3}$ . In order to prepare a buffer solution with a pH=4, the  $[Acid]/[Salt]$   
 a) 4:3      b) 3:4      c) 10:1      d) 1:10
17. The pH of  $10^{-5} M$  KOH solution will be  
 a) 9      b) 5      c) 19      d) none of these
18.  $H_2PO_4^-$  the conjugate base of  
 a)  $PO_4^{3-}$       b)  $P_2O_5$       c)  $H_3PO_4$       d)  $HPO_4^{2-}$
19. Which of the following can act as Lowry – Bronsted acid as well as base?  
 a) HCl      b)  $SO_4^{2-}$       c)  $HPO_4^{2-}$       d)  $Br^-$
20. The pH of an aqueous solution is Zero. The solution is  
 a) slightly acidic      b) strongly acidic      c) neutral      d) basic
21. The hydrogen ion concentration of a buffer solution consisting of a weak acid and its salts is given by  
 a)  $[H^+] = \frac{K_a [acid]}{[salt]}$       b)  $[H^+] = K_a [salt]$   
 c)  $[H^+] = K_a [acid]$       d)  $[H^+] = \frac{K_a [salt]}{[acid]}$

22. Which of the following relation is correct for degree of hydrolysis of ammonium acetate?

- a)  $h = \sqrt{\frac{K_h}{C}}$       b)  $h = \sqrt{\frac{K_a}{K_b}}$       c)  $h = \sqrt{\frac{K_w}{K_a \cdot K_b}}$       d)  $h = \sqrt{\frac{K_a \cdot K_b}{K_w}}$

23. Dissociation constant of  $\text{NH}_4\text{OH}$  is  $1.8 \times 10^{-5}$  the hydrolysis constant of  $\text{NH}_4\text{Cl}$  would be

- a)  $1.8 \times 10^{-19}$       b)  $5.55 \times 10^{-10}$       c)  $5.55 \times 10^{-5}$       d)  $1.80 \times 10^{-5}$

### 9. ELECTRO CHEMISTRY

1. The number of electrons that have a total charge of 9650 coulombs is

- a)  $6.22 \times 10^{23}$       b)  $6.022 \times 10^{24}$       c)  $6.022 \times 10^{22}$       d)  $6.022 \times 10^{-34}$

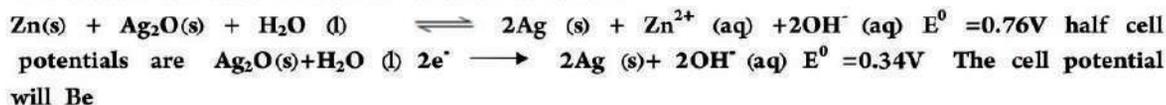
2. Consider the following half cell reactions:



The  $E^0$  for the reaction  $3\text{Mn}^{2+} \rightarrow \text{Mn} + 2\text{Mn}^{3+}$ , 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

3. The button cell used in watches function as follows



- a) 0.84V      b) 1.34V      c) 1.10V      d) 0.42V

4. The molar conductivity of a  $0.5 \text{ mol dm}^{-3}$  solution of  $\text{AgNO}_3$  with electrolytic conductivity of  $5.76 \times 10^{-3} \text{ S cm}^{-1}$  at 298 K is

- a)  $2.88 \text{ Scm}^2\text{mol}^{-1}$       b)  $11.52 \text{ Scm}^2\text{mol}^{-1}$       c)  $0.086 \text{ Scm}^2\text{mol}^{-1}$       d)  $28.8 \text{ Scm}^2\text{mol}^{-1}$

5.

Electrolyte	KCl	KNO <sub>3</sub>	HCl	NaOAC	NaCl
$\Lambda_{\infty}$ ( $\text{Scm}^2\text{mol}^{-1}$ )	149.9	145	426.2	91	126.5

Calculate  $\Lambda_{\infty}^{\text{HOAC}}$  using appropriate molar conductances of the electrolytes listed above at infinite dilution in water at  $25^\circ\text{C}$ .

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

6. Faradays constant is defined as

- 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  $6.22 \times 10^{10}$  electrons.

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



- a) 5F      b) 3F      c) 1F      d) 7F

8. A current strength of 3.86 A was passed through molten Calcium oxide for 41 minutes 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
9. During electrolysis of molten sodium chloride, the time required to produce 0.1 mole of chlorine gas using a current of 3A is
- a) 55 minutes              b) 107.2 minutes              c) 220 minutes              d) 330 minutes
10. The number of electrons delivered at the cathode during electrolysis by a current of 1A in 60 seconds is (charge of electron =  $1.6 \times 10^{-19} C$ )
- a)  $6.22 \times 10^{23}$               b)  $6.022 \times 10^{20}$               c)  $3.75 \times 10^{20}$               d)  $7.48 \times 10^{23}$
11. Which of the following electrolytic solution has the least specific conductance
- a) 2N                      b) 0.002N                      c) 0.02N                      d) 0.2N
12. While charging lead storage battery
- a)  $PbSO_4$  on cathode is reduced to Pb              b)  $PbSO_4$  on anode is oxidised to  $PbO_2$
- c)  $PbSO_4$  on anode is reduced to Pb              d)  $PbSO_4$  on cathode is oxidised to Pb
13. Among the following cells
- I) Leclanche cell              II) Nickel – Cadmium cell              III) Lead storage battery              IV) Mercury cell
- Primary cells are
- a) I and IV              b) I and III              c) III and IV              d) II and III
14. Zinc can be coated on iron to produce galvanized iron but the reverse is not possible. It is because
- a) Zinc is lighter than iron              b) Zinc has lower melting point than iron
- c) Zinc has lower negative electrode potential than iron
- d) Zinc has higher negative electrode potential than iron
15. Assertion : pure iron when heated in dry air is converted with a layer of rust.  
Reason : Rust has the composition  $Fe_3O_4$
- 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.
16. In  $H_2-O_2$  cell the reaction occurs at cathode is
- a)  $O_2(g) + 2H_2O(l) + 4e^- \longrightarrow 4OH^-(aq)$
- b)  $H^+(aq) + OH^-(aq) \longrightarrow H_2O(l)$
- c)  $2H_2(g) + O_2(g) \longrightarrow 2H_2O(g)$
- d)  $H^+ + e^- \longrightarrow \frac{1}{2} H_2$
17. The equivalent conductance of M/36 solution of a weak monobasic acid is  $6 \text{ mho cm}^2 \text{equiv}^{-1}$  and at infinite dilution is  $400 \text{ mho cm}^2 \text{equiv}^{-1}$ . The dissociation constant of this acid is
- a)  $1.25 \times 10^{-6}$               b)  $6.25 \times 10^{-6}$               c)  $1.25 \times 10^{-4}$               d)  $6.25 \times 10^{-5}$

18. A conductivity cell has been calibrated with a 0.01M, 1:1 electrolytic solution (specific conductance  $(\kappa=1.25 \times 10^{-3} \text{ Scm}^{-1})$ ) in the cell and the measured resistance was  $800 \Omega$  at  $25^\circ \text{C}$ . The cell constant is,  
 a)  $10^{-1} \text{ cm}^{-1}$     b)  $10^1 \text{ cm}^{-1}$     c)  $1 \text{ cm}^{-1}$     d)  $5.7 \times 10^{-12}$
19. Conductivity of a saturated solution of a sparingly soluble salt AB (1:1 electrolyte) at 298K is  $1.85 \times 10^{-5} \text{ S m}^{-1}$ . Solubility product of the salt AB at 298K  $(\Lambda_m^0)_{AB} = 14 \times 10^{-3} \text{ S m}^2 \text{ mol}^{-1}$ .  
 a)  $5.7 \times 10^{-12}$     b)  $1.32 \times 10^{-12}$     c)  $7.5 \times 10^{-12}$     d)  $1.74 \times 10^{-12}$
20. In the electrochemical cell:  $\text{Zn}|\text{ZnSO}_4(0.01\text{M})||\text{CuSO}_4(1.0\text{M})|\text{Cu}$ , the emf of this Daniel cell is  $E_1$ . When the concentration of  $\text{ZnSO}_4$  is changed to 1.0 M and that  $\text{CuSO}_4$  changed to 0.01M, the emf changes to  $E_2$ . From the above, which one is the relationship between  $E_1$  and  $E_2$ ?  
 a)  $E_1 < E_2$     b)  $E_1 > E_2$     c)  $E_1 \geq E_2$     d)  $E_1 = E_2$
21. Consider the change in oxidation state of Bromine corresponding to different emf values as shown in the diagram below
- $$\text{BrO}_4^- \xrightarrow{1.82\text{V}} \text{BrO}_3^- \xrightarrow{1.5\text{V}} \text{HBrO} \xrightarrow{1.595\text{V}} \text{Br}_2 \xrightarrow{1.0652\text{V}} \text{Br}^-$$
- Then the species undergoing disproportionation is  
 a)  $\text{Br}_2$     b)  $\text{BrO}_4^-$     c)  $\text{BrO}_3^-$     d)  $\text{HBrO}$
22. For the cell reaction  
 $2\text{Fe}^{3+}(\text{aq}) + 2\text{I}^-(\text{aq}) \longrightarrow 2\text{Fe}^{2+}(\text{aq}) + \text{I}_2(\text{aq})$   $E^\circ_{\text{cell}} = 0.24\text{V}$  at 298K. The standard Gibbs energy ( $\Delta G^\circ$ ) of the cell reactions is :  
 a)  $-46.32 \text{ KJ mol}^{-1}$     b)  $-23.16 \text{ KJ mol}^{-1}$     c)  $46.32 \text{ KJ mol}^{-1}$     d)  $23.16 \text{ KJ mol}^{-1}$
23. A certain current liberated 0.504 gm of hydrogen in 2 hours. How many grams of copper can be liberated by the same current flowing for the same time through copper sulphate solution  
 a) 31.75    b) 15.8    c) 7.5    d) 63.5
24. A gas X at 1 atm is bubbled through a solution containing a mixture of  $\text{IMY}^-$  and  $\text{IMZ}^-$  at  $25^\circ \text{C}$ . If the reduction potential of  $\text{Z} > \text{Y} > \text{X}$ , then  
 a) Y will oxidize X and not Z    b) Y will oxidize Z and not X  
 c) Y will oxidize both X and Z    d) Y will reduce both X and Z
25. Cell equation :  $\text{A} + 2\text{B}^- \longrightarrow \text{A}^{2+} + 2\text{B}$ ;  $\text{A}^{2+} + 2\text{e}^- \longrightarrow \text{A}$   $E^\circ = +0.34\text{V}$  and  $\log_{10}K = 15.6$  at 300K for cell reactions find  $E^\circ$  for  $\text{B}^+ + \text{e}^- \longrightarrow \text{B}$  (AIIMS - 2018)  
 a) 0.80    b) 1.26    c) -0.54    d) -10.94

### 10. SURFACE CHEMISTRY

1. For Freundlich isotherm a graph of  $\text{Log } X/m$  is plotted against  $\text{log } p$ . The slope of the line and its y - axis intercept respectively corresponds to  
 a)  $1/n$ , k    b)  $\text{log } 1/n$ , k    c)  $1/n$ ,  $\text{log } k$     d)  $\text{log } 1/n$ ,  $\text{log } k$
2. Which of the following is incorrect for physisorption?  
 a) reversible    b) increases with increase in temperature  
 c) low heat of adsorption    d) increases with increase in surface area
3. Which one of the following characteristics are associated with adsorption? (NEET)  
 a)  $\Delta G$  and  $\Delta H$  are negative but  $\Delta S$  is positive    b)  $\Delta G$  and  $\Delta S$  are negative but  $\Delta H$  is positive

- c)  $\Delta G$  is negative but  $\Delta H$  and  $\Delta S$  are positive d)  $\Delta G$ ,  $\Delta H$  and  $\Delta S$  all are negative.
4. Fog is colloidal solution of  
 a) solid in gas      b) gas in gas      c) liquid in gas      d) gas in liquid
5. Assertion : Coagulation power of  $\text{Al}^{3+}$  is more than  $\text{Na}^+$ .  
 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.
6. Statement : To stop bleeding from an injury, ferric chloride can be applied. Which comment about the statement is justified?  
 a) It is not true, ferric chloride is a poison.  
 b) It is true,  $\text{Fe}^{3+}$  ions coagulate blood which is a negatively charged sol  
 c) It is not true; ferric chloride is ionic and gets into the blood stream.  
 d) It is true, coagulation takes place because of formation of negatively charged sol with  $\text{Cl}^-$
7. Hair cream is  
 a) gel      b) emulsion      c) solid sol      d) sol.
8. Which one of the following is correctly matched?
- |                  |   |        |
|------------------|---|--------|
| a) Emulsion      | - | Smoke  |
| b) Gel           | - | butter |
| c) foam          | - | Mist   |
| d) whipped cream | - | sol    |
9. The most effective electrolyte for the coagulation of  $\text{As}_2\text{S}_3$  Sol is  
 a)  $\text{NaCl}$       b)  $\text{Ba}(\text{NO}_3)_2$       c)  $\text{K}_3[\text{Fe}(\text{CN})_6]$       d)  $\text{Al}_2(\text{SO}_4)_3$
10. Which one of the is not a surfactant?  
 a)  $\text{CH}_3-(\text{CH}_2)_{15}-\text{N}^+(\text{CH}_3)_2-\text{CH}_2\text{Br}$       b)  $\text{CH}_3-(\text{CH}_2)_{15}-\text{NH}_2$   
 c)  $\text{CH}_3-(\text{CH}_2)_{16}-\text{CH}_2-\text{OSO}_2^- \text{Na}^+$       d)  $\text{OHC}-(\text{CH}_2)_{14}-\text{CH}_2-\text{COO}^- \text{Na}^+$
11. The phenomenon observed when a beam of light is passed through a colloidal solution is  
 a) Cataphoresis      b) Electrophoresis      c) Coagulation      d) Tyndall effect
12. In an electrical field, the particles of a colloidal system move towards cathode. The coagulation of the same sol is studied using (i)  $\text{K}_2\text{SO}_4$  (ii)  $\text{Na}_3\text{PO}_4$  (iii)  $\text{K}_4[\text{Fe}(\text{CN})_6]$  and (iv)  $\text{NaCl}$  Their coagulating power should be  
 a) II > I > IV > III      b) III > II > I > IV  
 c) I > II > III > IV      d) none of these

13. Collodion is a 4% solution of which one of the following compounds in alcohol – ether mixture?

- a) Nitroglycerine      b) Cellulose acetate      c) Glycoldinitrate      d) Nitrocellulose

14. Which one of the following is an example for homogeneous catalysis?

- a) manufacture of ammonia by Haber's process  
 b) manufacture of sulphuric acid by contact process  
 c) hydrogenation of oil      d) Hydrolysis of sucrose in presence of dil HCl

15. Match the following

A) $V_2O_5$	i) High density polyethylene
B) Ziegler – Natta	ii) PAN
C) Peroxide	iii) $NH_3$
D) Finely divided Fe	iv) $H_2SO_4$

	A	B	C	D
(a)	(iv)	(i)	(ii)	(iii)
(b)	(i)	(ii)	(iv)	(iii)
(c)	(ii)	(iii)	(iv)	(i)
(d)	(iii)	(iv)	(ii)	(i)

16. The coagulation values in millimoles per litre of the electrolytes used for the coagulation of  $As_2S_3$  are given below

I)  $NaCl=52$     II)  $BaCl_2 = 0.69$     III)  $MgSO_4 = 0.22$  The correct order of their coagulating

power is

- a) III > II > I      b) I > II > III      c) I > III > II      d) II > III > I

17. Adsorption of a gas on solid metal surface is spontaneous and exothermic, then

- a)  $\Delta H$  increases      b)  $\Delta S$  increases      c)  $\Delta G$  increases      d)  $\Delta S$  decreases

18. If  $x$  is the amount of adsorbate and  $m$  is the amount of adsorbent, which of the following relations is not related to adsorption process?

- a)  $x/m = f(P)$  at constant T      b)  $x/m = f(T)$  at constant P  
 c)  $P = f(T)$  at constant  $x/m$       d)  $x/m = PT$

19. On which of the following properties does the coagulating power of an ion depend ?

(NEET – 2018)

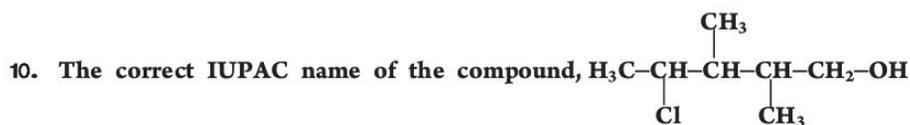
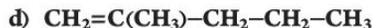
- a) Both magnitude and sign of the charge on the ion.  
 b) Size of the ion alone  
 c) The magnitude of the charge on the ion alone  
 d) The sign of charge on the ion alone.

20. Match the following

A) Pure nitrogen	-	i) Chlorine
B) Haber process	-	ii) Sulphuric acid
C) Contact process	-	iii) Ammonia
D) Deacons Process	-	iv) sodium azide (or) Barium azide

	A	B	C	D
(a)	(i)	(ii)	(iii)	(iv)
(b)	(ii)	(iv)	(i)	(iii)
(c)	(iii)	(iv)	(ii)	(i)
(d)	(iv)	(iii)	(ii)	(i)





- a) 4-chloro-2,3-dimethyl pentan-1-ol  
 c) 2,3,4-trimethyl-4-chlorobutan-1-ol

- b) 2,3-dimethyl-4-chloropentan-1-ol  
 d) 4-chloro-2,3,4-trimethyl pentan-1-ol

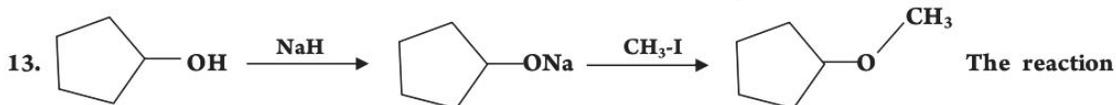
11. Assertion : Phenol is more acidic than ethanol

Reason: Phenoxide ion is resonance stabilized

- 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.

12. In the reaction Ethanol  $\xrightarrow{\text{PCl}_5}$  X  $\xrightarrow{\text{alc KOH}}$  Y  $\xrightarrow[298\text{K}]{\text{H}_2\text{SO}_4/\text{H}_2\text{O}}$  Z. The 'Z' is

- a) ethane  
 b) ethoxyethane  
 c) ethylbisulphite  
 d) ethanol



Can be classified as

- a) dehydration  
 b) Williamson alcohol synthesis  
 c) Williamson ether synthesis  
 d) dehydrogenation of alcohol

14. Isopropylbenzene on air oxidation in the presence of dilute acid gives

- a)  $\text{C}_6\text{H}_5\text{COOH}$   
 b)  $\text{C}_6\text{H}_5\text{COCH}_3$   
 c)  $\text{C}_6\text{H}_5\text{CO C}_6\text{H}_5$   
 d)  $\text{C}_6\text{H}_5\text{OH}$

15. Assertion : Phenol is more reactive than benzene towards electrophilic substitution reaction

Reason : In the case of phenol, the intermediate arenium ion is more stabilized by resonance.

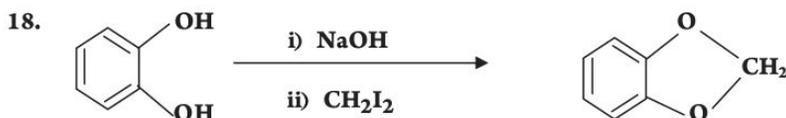
- a) if both assertion and reason are true and reason is the correct explanation of assertion.  
 b) if both assertion and reason are true but reason is not the correct explanation of assertion.  
 c) assertion is true but reason is false  
 d) both assertion and reason are false.

16.  $\text{HO}-\text{CH}_2\text{CH}_2-\text{OH}$  on heating with periodic acid gives

- a) methanoic acid  
 b) Glyoxal  
 c) methanal  
 d)  $\text{CO}_2$

17. Which of the following compound can be used as antifreeze in automobile radiators?

- a) methanol  
 b) ethanol  
 c) Neopentyl alcohol  
 d) ethan-1, 2-diol



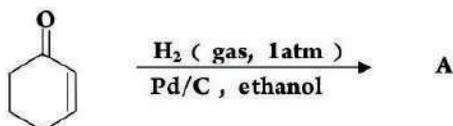
The reactions is an example of

- a) Wurtz reaction  
 b) cyclic reaction  
 c) Williamson reaction  
 d) Kolbe reactions

19. One mole of an organic compound (A) with the formula  $C_3H_8O$  reacts completely with two moles of HI to form X and Y. When Y is boiled with aqueous alkali it forms Z. Z answers the iodoform test. The compound (A) is  
 a) propan - 2-ol      b) propan -1-ol      c) ethoxy ethane      d) methoxy ethane
20. Among the following ethers which one will produce methyl alcohol on treatment with hot HI?  
 a)  $(H_3C)_3C-O-CH_3$       b)  $(CH_3)_2-CH-CH_2-O-CH_3$   
 c)  $CH_3-(CH_2)_3-O-CH_3$       d)  $CH_3-CH_2-\underset{\text{CH}_3}{\text{CH}}-O-CH_3$
21. Williamson synthesis of preparing dimethyl ether is  
 a)  $S_N1$  reactions      b)  $S_N2$  reaction  
 c) electrophilic addition      d) electrophilic substitution
22. On reacting with neutral ferric chloride, phenol gives  
 a) red colour      b) violet colour      c) dark green colour      d) no colouration.

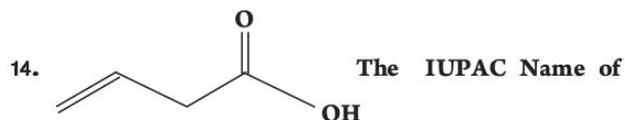
## 12. CARBONYL COMPOUNDS AND CARBOXYLIC ACIDS

1. The correct structure of the product 'A' formed in the reaction (NEET)

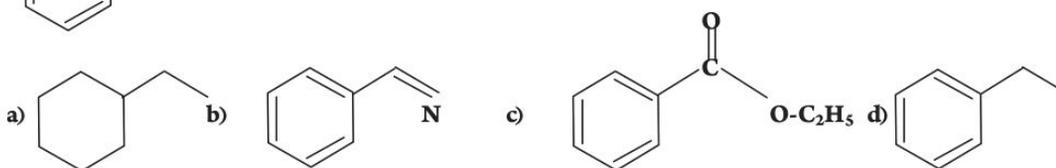
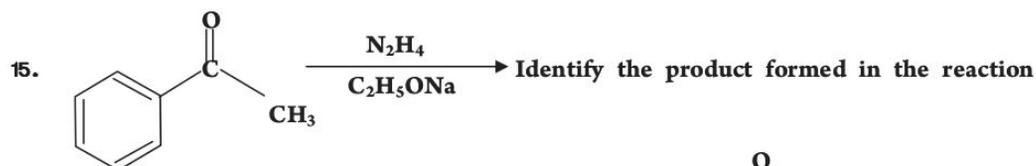


2. The formation of cyanohydrin from acetone is an example of  
 a) nucleophilic substitution      b) electrophilic substitution  
 c) electrophilic addition      d) Nucleophilic addition
3. Reaction of acetone with one of the following reagents involves nucleophilic addition followed by elimination of water. The reagent is  
 a) Grignard reagent      b)  $\text{Sn} / \text{HCl}$   
 c) hydrazine in presence of slightly acidic solution      d) hydrocyanic acid
4. In the following reaction,  
 $\text{HC} \equiv \text{CH} \xrightarrow[\text{HgSO}_4]{\text{H}_2\text{SO}_4} \text{X}$  Product 'X' will not give  
 a) Tollen's test      b) Victor meyer test      c) Iodoform test      d) Fehling solution test
5.  $\text{CH}_2=\text{CH}_2 \xrightarrow[\text{ii) Zn/H}_2\text{O}]{\text{i) O}_3} \text{X} \xrightarrow{\text{NH}_3} \text{Y}$ . 'Y' is  
 a) Formaldehyde      b) di acetone ammonia

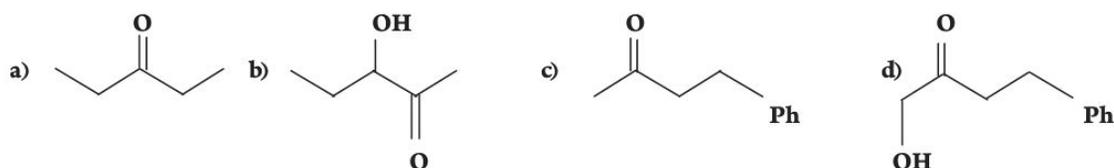




- a) but - 3- enoicacid  
 b) but - 1- ene-4-oicacid  
 c) but - 2- ene-1-oic acid  
 d) but -3-ene-1-oicacid



16. In which case chiral carbon is not generated by reaction with HCN



17. Assertion : p - N, N - dimethyl aminobenzaldehyde undergoes benzoin condensation

Reason : The aldehydic (-CHO) group is meta directing

- 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.
18. Which one of the following reaction is an example of disproportionation reaction  
 a) Aldol condensation  
 b) cannizaro reaction  
 c) Benzoin condensation  
 d) none of these
19. Which one of the following undergoes reaction with 50% sodium hydroxide solution to give the corresponding alcohol and acid  
 a) Phenylmethanal  
 b) ethanal  
 c) ethanol  
 d) methanol
20. The reagent used to distinguish between acetaldehyde and benzaldehyde is  
 a) Tollens reagent  
 b) Fehling's solution  
 c) 2,4 - dinitrophenyl hydrazine  
 d) semicarbazide
21. Phenyl methanal is reacted with concentrated NaOH to give two products X and Y. X reacts with metallic sodium to liberate hydrogen X and Y are  
 a) sodiumbenzoate and phenol  
 b) Sodium benzoate and phenyl methanol  
 c) phenyl methanol and sodium benzoate  
 d) none of these

22. In which of the following reactions new carbon – carbon bond is not formed?
- Aldol condensation
  - Friedel craft reaction
  - Kolbe's reaction
  - Wolf kishner reduction
23. An alkene "A" on reaction with  $O_3$  and  $Zn - H_2O$  gives propanone and ethanol in equimolar ratio. Addition of  $HCl$  to alkene "A" gives "B" as the major product. The structure of product "B" is
- $Cl-CH_2-CH_2-\overset{\overset{CH_3}{|}}{CH}-CH_3$
  - $H_3C-CH_2-\overset{\overset{CH_2Cl}{|}}{CH}-CH_3$
  - $H_3C-CH_2-\overset{\overset{CH_3}{|}}{C}-CH_3$   
 $\quad \quad \quad |$   
 $\quad \quad \quad Cl$
  - $H_3C-CH_2-\overset{\overset{CH_3}{|}}{CH}-Cl$
24. Carboxylic acids have higher boiling points than aldehydes, ketones and even alcohols of comparable molecular mass. It is due to their (NEET)
- more extensive association of carboxylic acid via van der Waals force of attraction
  - formation of carboxylate ion
  - formation of intramolecular H-bonding
  - formation of intermolecular H – bonding

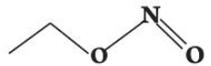
### 13. ORGANIC NITROGEN COMPOUNDS

- Which of the following reagent can be used to convert nitrobenzene to aniline
  - $Sn/HCl$
  - $Zn-Hg/NaOH$
  - $LiAlH_4$
  - All of these
- The method by which aniline cannot be prepared is
  - degradation of benzamide with  $Br_2/NaOH$
  - potassium salt of phthalimide treated with chlorobenzene followed by hydrolysis with aqueous  $NaOH$  solution.
  - reduction of Nitrobenzene with  $LiAlH_4$
  - reduction of Nitrobenzene by  $Sn/HCl$  .
- Which one of the following will not undergo Hofmann bromamide reaction
  - $CH_3CONHCH_3$
  - $CH_3CH_2CONH_2$
  - $CH_3CONH_2$
  - $C_6H_5CONH_2$
- Assertion : Acetamide on reaction with  $KOH$  and bromine gives acetic acid  
Reason : Bromine catalyses hydrolysis of acetamide.
  - if both assertion and reason are true and reason is the correct explanation of assertion.
  - if 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.
- $CH_3CH_2Br \xrightarrow[\Delta]{aq\ NaOH} A \xrightarrow[\Delta]{KMnO_4/H^+} B \xrightarrow[\Delta]{NH_3} C \xrightarrow{Br_2/NaOH} D$ . 'D' is
  - bromomethane
  - $\alpha$  -bromo sodium acetate
  - methanamine
  - acetamide
- Which one of the following nitro compounds does not react with nitrous acid
  - $CH_3-CH_2-CH_2-NO_2$
  - $(CH_3)_2-CH-CH_2NO_2$



c) 2,4 - dinitroaniline

d) 2,4 - dibromoaniline

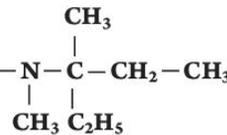
19.  When is reduced with Sn/HCl the pair of compound formed are

a) Ethanol, hydroxylamine hydrochloride

b) Ethanol, ammonium hydroxide

c) Ethanol, NH<sub>2</sub>OH

d) C<sub>3</sub>H<sub>5</sub>NH<sub>2</sub>, H<sub>2</sub>O

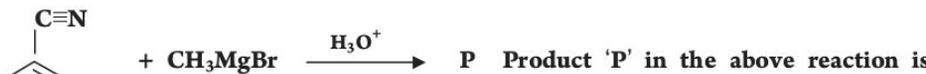
20.  IUPAC name for the amine

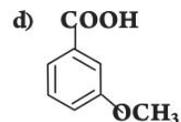
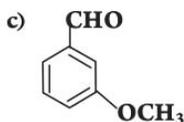
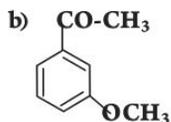
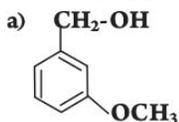
a) 3 - Dimethylamino - 3 - methyl pentane

b) 3 (N,N - Triethyl) - 3- amino pentane

c) 3 - N,N - trimethyl pentanamine

d) N,N - dimethyl - 3- methyl - pentan - 3 amine

21.  Product 'P' in the above reaction is



22. Ammonium salt of benzoic acid is heated strongly with P<sub>2</sub>O<sub>5</sub> and the product so formed is reduced and then treated with NaNO<sub>2</sub>/HCl at low temperature. The final compound formed is

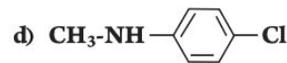
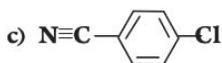
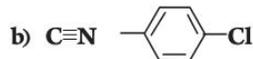
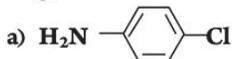
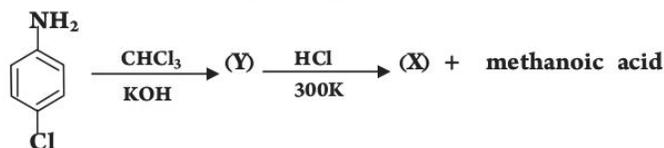
a) Benzene diazonium chloride

b) Benzyl alcohol

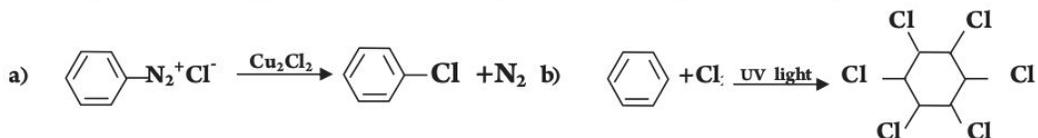
c) Phenol

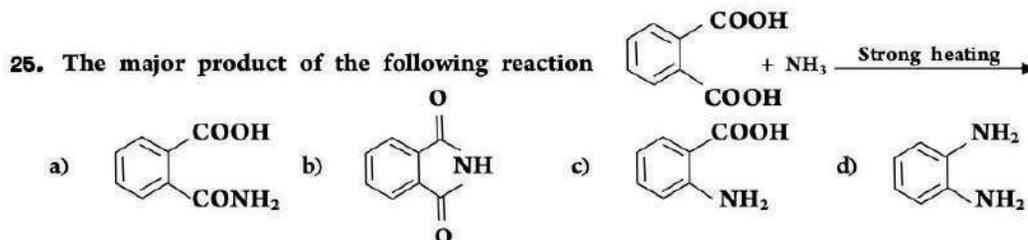
d) Nitrosobenzene

23. Identify X in the sequence given below.



24. Among the following, the reaction that proceeds through an electrophilic substitution, is :





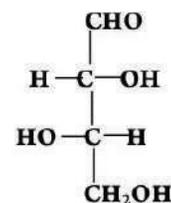
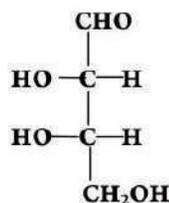
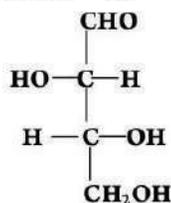
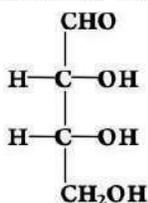
### 14. BIO MOLECULES

1. Which one of the following rotates the plane polarized light towards left?

(NEET Phase - II)

- a) D(+) Glucose    b) L(+) Glucose    c) D(-) Fructose    d) D(+) Galactose

2. The correct corresponding order of names of four aldoses with configuration given below Respectively is, (NEET Phase - I)



- a) L-Erythrose, L-Threose, L-Erythrose, D-Threose  
 b) D-Threose, D-Erythrose, L-Threose, L-Erythrose,  
 c) L-Erythrose, L-Threose, D-Erythrose, D-Threose  
 d) D-Erythrose, D-Threose, L-Erythrose, L-Threose

3. Which one given below is a non-reducing sugar? (NEET Phase - I)

- a) Glucose    b) Sucrose    c) maltose    d) Lactose.

4. Glucose  $\xrightarrow{(\text{HCN})}$  Product  $\xrightarrow{(\text{Hydrolysis})}$  Product  $\xrightarrow{(\text{HI}+\text{Heat})}$  A, the compound A is

- a) Heptanoic acid    b) 2-Iodohexane    c) Heptane    d) Heptanol

5. Assertion: A solution of sucrose in water is dextrorotatory. But on hydrolysis in the presence of little hydrochloric acid, it becomes levorotatory. (AIIMS)

Reason : Sucrose hydrolysis gives equal amounts of glucose and fructose. As a result of this change in sign of rotation is observed.

- 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) If assertion is true but reason is false.    d) if both assertion and reason are false.

6. The central dogma of molecular genetics states that the genetic information flows from (NEET Phase - II)

- a) Amino acids  $\longrightarrow$  Protein  $\longrightarrow$  DNA  
 b) DNA  $\longrightarrow$  Carbohydrates  $\longrightarrow$  Proteins  
 c) DNA  $\longrightarrow$  RNA  $\longrightarrow$  Proteins  
 d) DNA  $\longrightarrow$  RNA  $\longrightarrow$  Carbohydrates

7. In a protein, various amino acids linked together by (NEET Phase - D)

- a) Peptide bond    b) Dative bond    c)  $\alpha$  - Glycosidic bond    d)  $\beta$  - Glycosidic bond

8. Among the following the achiral amino acid is (AIIMS)

- a) 2-ethylalanine    b) 2-methylglycine    c) 2-hydroxymethylserine    d) Tryptophan

9. The correct statement regarding RNA and DNA respectively is (NEET Phase - D)

- a) The sugar component in RNA is an arabinos and the sugar component in DNA is ribose  
 b) The sugar component in RNA is 2'-deoxyribose and the sugar component in DNA is arabinose  
 c) The sugar component in RNA is an arabinose and the sugar component in DNA is 2'-deoxyribose  
 d) The sugar component in RNA is ribose and the sugar component in DNA is 2'-deoxyribose

10. In aqueous solution of amino acids mostly exists in,

- a)  $\text{NH}_2\text{-CH(R)-COOH}$     b)  $\text{NH}_2\text{-CH(R)-COO}^-$   
 c)  $\text{H}_3\text{N}^+\text{-CH(R)-COOH}$     d)  $\text{H}_3\text{N}^+\text{-CH(R)-COO}^-$

11. Which one of the following is not produced by body?

- a) DNA    b) Enzymes    c) Harmones    d) Vitamins

12. The number of  $\text{sp}^2$  and  $\text{sp}^3$  hybridised carbon in fructose are respectively

- a) 1 and 4    b) 4 and 2    c) 5 and 1    d) 1 and 5

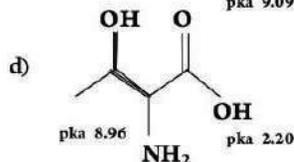
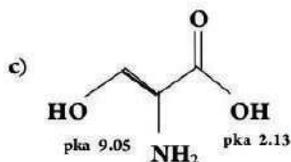
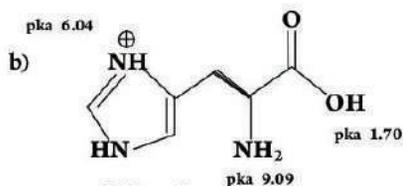
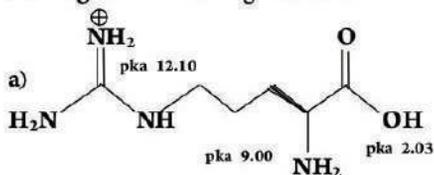
13. Vitamin B2 is also known as

- a) Riboflavin    b) Thiamine    c) Nicotinamide    d) Pyridoxine

14. The pyrimidine bases present in DNA are

- a) Cytosine and Adenine    b) Cytosine and Guanine  
 c) Cytosine and Thiamine    d) Cytosine and Uracil

15. Among the following L-serine is

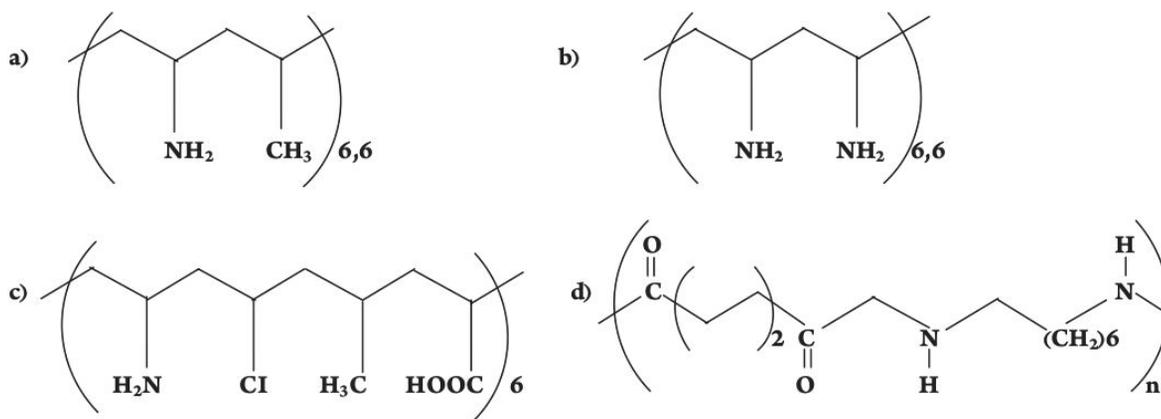


16. The secondary structure of a protein refers to  
 a) fixed configuration of the polypeptide backbone    b) hydrophobic interaction  
 c) sequence of  $\alpha$ -amino acids    d)  $\alpha$ -helical backbone.
17. Which of the following vitamins is water soluble?  
 a) Vitamin E    b) Vitamin K    c) Vitamin A    d) Vitamin B
18. Complete hydrolysis of cellulose gives  
 a) L-Glucose    b) D-Fructose    c) D-Ribose    d) D-Glucose
19. Which of the following statement is not correct?  
 a) Ovalbumin is a simple food reserve in egg-white  
 b) Blood proteins thrombin and fibrinogen are involved in blood clotting  
 c) Denaturation makes protein more active  
 d) Insulin maintains the sugar level of in the human body.
20. Glucose is an aldose. Which one of the following reactions is not expected with glucose?  
 a) It does not form oxime    b) It does not react with Grignard reagent  
 c) It does not form osazones    d) It does not reduce tollens reagent
21. If one strand of the DNA has the sequence 'ATGCTTGA', then the sequence of complementary strand would be  
 a) TACGAACT    b) TCCGAACT    c) TACGTACT    d) TACGRAGT
22. Insulin, a hormone chemically is  
 a) Fat    b) Steroid    c) Protein    d) Carbohydrates
23.  $\alpha$ -D (+) Glucose and  $\beta$ -D (+) glucose are  
 a) Epimers    b) Anomers  
 c) Enantiomers    d) Conformational isomers
24. Which of the following are epimers  
 a) D(+)-Glucose and D(+)-Galactose    b) D(+)-Glucose and D(+)-Mannose  
 c) Neither (a) nor (b)    d) Both (a) and (b)
25. Which of the following amino acids are achiral?  
 a) Alanine    b) Leucine    c) Proline    d) Glycine

### 15. CHEMISTRY IN EVERYDAY LIFE

1. Which of the following is an analgesic?  
 a) Streptomycin    b) Chloromycetin    c) Asprin    d) Penicillin
2. Antiseptics and disinfectants either kill or prevent growth of microorganisms. Identify which of the following statement is not true.  
 a) dilute solutions of boric acid and hydrogen peroxide are strong antiseptics.  
 b) Disinfectants harm the living tissues.  
 c) A 0.2% solution of phenol is an antiseptic while 1% solution acts as a disinfectant.  
 d) Chlorine and iodine are used as strong disinfectants.
3. Drugs that bind to the receptor site and inhibit its natural function are called  
 a) antagonists    b) agonists    c) enzymes    d) molecular targets
4. Aspirin is a/an  
 a) acetylsalicylic acid    b) benzoyl salicylic acid  
 c) chlorobenzoic acid    d) anthranilic acid

5. Which one of the following structures represents nylon 6,6 polymer?



6. Natural rubber has

- a) alternate cis- and trans-configuration  
 b) random cis- and trans-configuration  
 c) all cis-configuration  
 d) all trans-configuration

7. Nylon is an example of

- a) polyamide  
 b) polythene  
 c) polyester  
 d) poly saccharide

8. Terylene is an example of

- a) Polyamide  
 b) polythene  
 c) polyester  
 d) polysaccharide

9. Which is the monomer of neoprene in the following?

- a)  $\text{CH}_2-\underset{\text{Cl}}{\text{C}}-\text{CH}=\text{CH}_2$   
 b)  $\text{CH}_2-\text{CH}-\text{C}\equiv\text{CH}$   
 c)  $\text{CH}_2=\text{CH}-\text{CH}=\text{CH}_2$   
 d)  $\text{CH}_2=\underset{\text{CH}_3}{\text{C}}-\text{CH}=\text{CH}_2$

10. Which one of the following is a bio-degradable polymer?

- a) HDPE  
 b) PVC  
 c) Nylon 6  
 d) PHBV

11. Non stick cook wares generally have a coating of a polymer, whose monomer is

- a) ethane  
 b) prop-2-enitrile  
 c) chloroethene  
 d) 1,1,2,2-tetrafluoroethane

12. Assertion: 2-methyl-1,3-butadiene is the monomer of natural rubber

Reason: Natural rubber is formed through anionic addition polymerisation.

- 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.

13. Which of the following is a co-polymer?

- a) Orlon  
 b) PVC  
 c) Teflon  
 d) PHBV

14. The polymer used in making blankets (artificial wool) is

- a) polystyrene  
 b) PAN  
 c) polyester  
 d) polythene

15. Regarding cross-linked or network polymers, which of the following statement is incorrect?

(NEET)

- a) Examples are Bakelite and melamine  
 b) They are formed from bi and tri-functional monomers  
 c) They contain covalent bonds between various linear polymer chains  
 d) They contain strong covalent bonds in their polymer chain