

Sri Venkateshwara Vidhyalayaa Higher Secondary School

Thasampalayam, Polavakkalipalayam (Po), Gobi – 638 476

HIGHER SECONDARY SECOND YEAR CHEMISTRY VOLUME - 1

- **1. Metallurgy**
- **2. P – Block Elements - I**
- **3. P – Block Elements – II**
- **4. Transition and Inner Transitions Elements**
- **5. Coordination Chemistry**
- **6. Solid State**
- **7. Chemical Kinetics**

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1. Metallurgy

2 Marks and 3 Marks

1. Define mineral

A Naturally occurring substance obtained by mining which contains the metal in free state (or) in the form of compounds like oxides sulphides is called mineral.

2. Define ore

The minerals that contains a high percentage of metal, from which it can be extracted conveniently and economically are called ores.

3. Why all the ores are minerals but all the minerals are not ore

- * China clay, bauxite, Both are minerals of aluminium
- * However aluminium can be commercially extracted from bauxite
- * While extraction from china clay is not a profitable one
- * Hence the mineral is an ore of the aluminium while china clay is not

4. List out the metallurgical process

- (i) Concentration of the ore
- (ii) Extraction of crude metal
- (iii) Refining of Crude metal

5. Define gangue (or) matrix

- * Generally the ores are associated with nonmetallic impurities, rocky materials and siliceous matter

Which are collectively known as gangue

6. Concentration of ore (or) ore dressing

The process of removal of gangue (clay, sand) from the powdered ore is called concentration of ore or ore dressing

7. Define gravity separation (or) Hydraulic wash

- * It used for ore having high specific gravity is separated from the gangue that has low specific gravity by simply washing with running water

Process

- * Ore is crushed to finely powder form and treated with rapidly flowing current of water
- * During this process lighter gangue particles are washed away by the running water

Example : Hematite and tinstone

8. Write about from flotation process (See diagram in book)

- * It is commonly used for sulphide ores (Pbs, ZnS)
- * Sulphide ore particles are only wetted by oil
- * Gangue, oxide particles are only wetted by water

Process

- * Powdered ore is mixed with frothing agent (Pine oil)
- * Small Quantity of sodium ethyl Xanthate – Collector
- * Froth is generated by blowing air through this mixture
- * Ore particles are attached on the froth remaining impurities settle down
- * The froth is skimmed off and dried to recover the concentrate ore

9. Define Leaching

- * Based on the solubility of ore in a suitable solvent and the reaction in aqueous solution
- * Powdered ore is allowed to dissolve in a suitable solvent
- * The metal present in the ore is converted to its soluble salt (or) complex
- * While the gangue remains insoluble

10. Define cementation

- * Gold can be recovered by reacting the deoxygenated leached solution with Zinc
- * In this process the gold is reduced to its elemental state (Zero oxidation state) and the process is called cementation



11. What are two steps used in extraction of metals

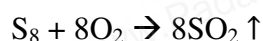
- Conversion the ore into oxides of the metal
- Reduction of metal oxides to elemental metals

12. Define roasting

- * It is used for the conversion of sulphide ores into their oxides
- * Ore is oxidised by heating it with excess of oxygen

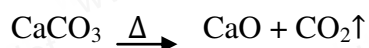


- * It also remove the impurities such as Arsenic sulphur, phosphorous by converting to Volatile oxides



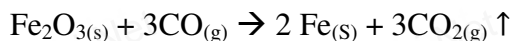
13. Define calcination

- * Concentrated ore is strongly heated in the absene of air
- * hydrated oxides escapes as moisture calcinations of carbonate ore, carbon dioxide expelled



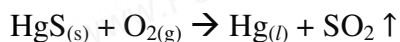
14. Define Smelting

Flux + reducing agent + concentrate ore $\xrightarrow{\Delta}$ in smelting furnace
(C, Co, Al) Elevated temperature



15. Define Auto – reduction

- * Simple roasting of some of the ores gives the crude metal
- * In Such case the use of the reducing agent is not necessary
- * Mercury obtained by roasting of its ore Cinnabar (HgS)



16. Write the application of Ellingham diagram

- * It used to select a suitable reducing agent and appropriate temperature range of reduction
- * We can infer the relative stability of different metal oxides at a given temperature
- * Some of the oxides (Ag₂O and HgO) are unstable at moderate temperature and will decompose on heating even in the absence of Reducing agent
- * It used to, predict the thermodynamic feasibility of reduction of oxides of one metal by another Metal
- * The carbon line cuts across the lines of many metal oxides and hence it can reduce all those metals oxides at sufficiently high temperature

17. Write the limitations of Ellingham diagram

- * It does not tell anything about rate of reaction
- * It does not give idea about the possibility of other reaction that might be taking place
- * The interpretation of ΔG is based on the assumption that the reactants are in equilibrium with the product which is not always true

18. Define Refining process

- * Generally the metal extracted from its ore contains some impurities such as unreacted oxide ore, non metals etc
- * Removal such impurities associated with isolated crude metal is called refining process

19. Define Distillation

- * It is used for low boiling volatile metal like Zn (B.P. – 1180K) and Hg (630K)
- * The impure metal is heated to evaporate and the vapours are condensed to get pure metal

20. Define liquation

This method is employed to remove the impurities with high melting points from metals having low melting point

- * Crude metal is heated to form fusible liquid and allowed to flow on sloping surface
- * The impure metal is placed on sloping hearth of reverberatory furnace
- * It is heated just above the melting point of the metal in the absence of air
- * The molten pure metal flows down and the impurities are left behind
The molten metal is collected and solidified

21. Define Electrolytic refining

- * The Crude metal is refined by electrolysis
- * Electrolytic cell containing aqueous solution of metal of interest
- * Impure metal anode, pure metal are cathode
- * The metal dissolves from the at anode pass into the solution
- * While same amount of metal ions from solution will be deposited at cathode
- * During electrolysis, the less electropositive impurities in the anode settle down at the bottom and removed as anode mud

22. Zone refining

- * Based on principles of fractional crystallisation
- impure metal is melted and allowed to solidify the impurities will prefer to be in the molten region
- * The impure metal is taken in the form of a rod
- * One end of rod is heated using a mobile induction heater
- * Which is result in the melting of metal on that portion of the rod
- * When the heater is slowly moved to other end the pure metal crystallizes
- * While the impurities will move on to the adjacent molten zone formed due to the movement of the Heater
- * As the heater is moves further away, the molten zone containing impurities also moves along with It

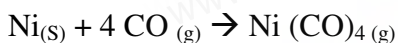
23. Define Vapour phase method Zr

Metal + Suitable reagent \rightarrow Volatile compound with metal

Decompose to give pure metal

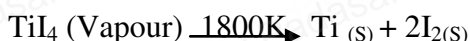
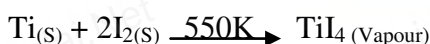
Mond process for refining of Nickel

impure Ni + CO $\xrightarrow[\text{(Steam)}]{350\text{K}}$ Nickel Tetra Carbonyl



24. Van – Arket method for refining Zirconium / Titanium

- * Thermal decomposition of metal compounds which lead to formation of pure metals



25. Write about Magnetic separation (See Diagram in book)

- * It is applicable ferromagnetic substance
 - * It is based on the difference in the magnetic properties of the ore
 - * Tinstone can be separated from wolframite impurities
 - * Chromite, pyrolusite have magnetic properties removed from non magnetic siliceous impurities
 - * The crushed ore is placed on the electromagnetic separator belt moving two roller
- Magnetic part fall near the magnetic roller non magnetic part fall away from the magnetic roller

26. Difference between ore and minerals

S.No	Ore	Mineral
1	The mineral from which the metal can be readily and profitably extracted is known as ore	The Natural material in which the metal and their compounds occur in earth is known as mineral
2	All the ores are mineral	All the minerals are not ores
3	Ex: Bauxite is an ore of aluminium	Ex: Clay is a mineral

27. Write about extraction of aluminium (Hall – herold process)

- * Iron tank line with C which act as a cathode
- * Carbon block immersed in electrolyte act as anode
- * 20% Alumina + 10% Calcium chloride (lower m.point of the mixture)
- * Temperature above 1270K

Ionisation of alumina $\text{Al}_2\text{O}_3 \rightarrow 2\text{Al}^{3+} + 3\text{O}_2^-$

Reaction at cathode ---- $2\text{Al}^{3+} (\text{melt}) + 3\text{e}^- \rightarrow \text{Al}_{(l)}$

Reaction at anode ----- $2\text{O}^{2-} (\text{melt}) \rightarrow \text{O}_2 + 3\text{e}^-$

Carbon act as anode following reaction takeplace

$\text{C}_{(s)} \rightarrow + \text{O}_2^{2-} (\text{melt}) \rightarrow \text{CO} + 2\text{e}^-$

$\text{C}_{(s)} \rightarrow + 2\text{O}^{2-} (\text{melt}) \rightarrow \text{CO}_2 + 4\text{e}^-$

The net electrolysis reaction

$4\text{Al}^{3+} (\text{melt}) + 6\text{O}^{2-} (\text{melt}) + 3\text{C}_{(s)} \rightarrow 4\text{Al}_{(l)} + 3\text{CO}_{2(g)}$

28. Write about aluminothermic process

- * Melt Oxide + Al Powder \rightarrow Metal + Al Oxide

(This reaction require ignition mixture for reaction carryout)

- * Ignition mixture (mg + Barium peroxide) \rightarrow Produce large amount of heat (2400°C)

$\text{BaO} + \text{Mg} \rightarrow \text{BaO} + \text{MgO}$

$\text{Cr}_2\text{O}_3 + 2\text{Al} \xrightarrow{\Delta} 2\text{Cr} + \text{Al}_2\text{O}_3$

“Life like chemistry
It has more expectation”

2. P-Block Elements

1. Define metallic character (or) electropositive character .

- * The tendency of an element to form a cation by losing electrons is known as metallic character (or) electropositive character.
- * It depends upon the ionization energy.
- * On descending a group the ionization energy decreases so metallic character increases.

2. Define metalloids with example.

The elements having properties intermediate between the metal and non metals Ex: Silicon and germanium.

3. What are factors responsible for P-block (first elements) Anomalous behavior.

- 1) Small size
- 2) High ionization energy High electronegativity
- 3) Absence of d orbital in their valence shell

4. Define catenation.

The carbon has greater tendency to form chain of bond with itself (or) with other atoms which is known as catenation.

Catenation property down in the group $C > Si > Ge \approx Sn > Pb$.

5. Define inert pair effect.

The heavier post – transition metal, the outer electrons (ns) have a tendency to remain inert and show reluctance to take part in the bonding which is known as inert pair effect.

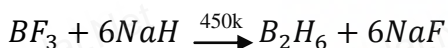
6. Write allotropism with example.

- * Some of the elements exist in more than one crystalline (or) molecular forms in same physical state.

This phenomenon is called allotropism Ex : Carbon and diamond.

- * The different form of element is called allotropes.

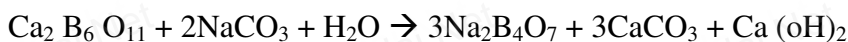
7. Give preparation of Diboranes.



8. Uses of Boron

- * $^{10}B_5$ used as moderator
- * Rocket fuel igniter
- * Washing powder, eye drops etc (compounds of Boron)

9. Give the preparation of Borax.



10. What is Prismatic form.

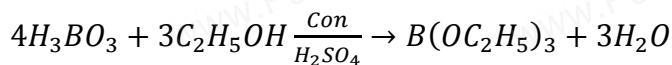
- * Borax is normally formulated $Na_2B_4O_7 \cdot 10H_2O$
- * But it contains tetra nuclear units $[B_4O_5(OH)_4]^{2-}$

This known as prismatic form

11. Uses of Borax.

- * Identification coloured metal ion.
- * Flux in metallurgy
- * Manufacture of optical and glazes for pottery.

12. How will you Identify the presence of Borate in a given compound.



The vapour of this ester burns with a green edged flame this reaction is used to identify the presence of Borate.

13. Uses of Boric acid

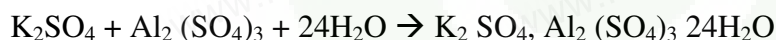
- * Manufacture of pottery glazes
- * Antiseptic, eye lotion
- * Food Preservative

14. Uses of Diborane

- * High energy fuel for propellant
- * Reducing agent in organic chemistry
- * Used in welding for ches

15. How is potash alum prepared

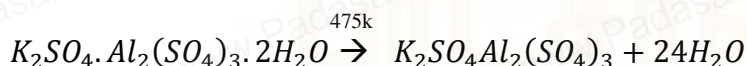
- * It is prepared from alum stone with excess of sulphuric
- * Aluminium hydroxide is converted into aluminium sulphate
- * Calculated amount of potassium sulphate added



16. Write about burn alum.

Aluminium sulphate it melts at 365k on heating. At 475k loses water of hydration and swells up.

The swollen mass is known as burn alum.



17. Write use of Alum

- * Purification of water, water proofing and textiles.
- * Arrest bleeding, paper and tannin industries.

18. What are condition are necessary for catenation.

- Valency of element is greater than (or) equal to two.
- Element should have an ability to bond with itself.
- Self bond must be strong as its bond with other elements
- Kinetic inertness of catenated compounds towards other molecules.

19. Write about graphite.

- * Most stable allotropic form of carbon at normal T and P.
- * Soft and conducts the electricity.
- * It composed of flat, two dimensional sheet of carbon atoms.
- * Each sheet is \emptyset hexagonal net of Sp^2 hybridised carbon atom.
- * C – C bond length 1.41 \AA , Each carbon atoms form three σ .
- * Bonds with 3 neighboring carbon atoms using three of its valence e^- .
- * The fourth e^- present in the hybridised P orbitals forms π bonds.
- * π electrons are delocalised over entire sheet. Which responsible for its electrical conductivity.
- * The successive carbon sheets are hold together by weak Vander waals force.
- * The Distance between successive sheet is 3.40 \AA .
- * Used as lubricant (or) graphite oil.

20. Write about Diamond.

- * Carbon atoms are Sp^3 hybridised and bonded to four neighbouring carbon atoms by σ bonds.
- * C – C bond length is 1.54 \AA .
- * Tetrahedral arrangement around the each carbon atom (NV)
- * Since all four valance electron involved in bonding no free electrons for conductivity.
- * Used for sharpening, hard tools, cutting glass etc.

21. Write about fullerenes.

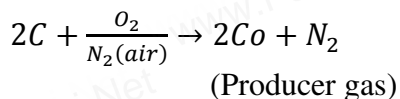
- * These allotropes are discrete molecules C_{32} , C_{50} , C_{60} etc.,
- * These molecule have cage like structure.
- * C_{60} molecules have a soccer ball like structure and is called buckminster fullerene (or) bucky balls.
- * It has a fused ring structure consist of 20 six membered rings and 12 five membered rings.
- * Each carbon atom is Sp^2 hybridised and forms the σ bonds and a delocalized π bonds giving aromatic character to these molecule.
- * The C – C bond distance is 1.44 \AA and C = C distance 1.38 \AA .

22. Write about carbon nanotubes.

- * Recently discovered allotropes have graphite like tubes with fullerene ends.
- * Along the axis these nanotubes are stronger than steel and conduct the electricity.
- * These have many applications in nanoscale electronics, catalysis, polymer and medicine.
- * Another allotropic form of carbon is graphene.
- * It has a single planar sheet of Sp^2 hybridised carbon atoms.
- * That are densely packed in a honey comb crystal lattice.

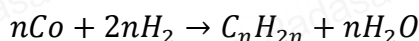
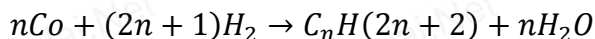
23. Write about producer gas.

- * The mixture of nitrogen and carbon monoxide is called producer gas.



24. Write about fischer tropesch synthesis

- * Carbon monoxide + Hydrogen $\xrightarrow[500-700k]{\text{less } 50atm}$ saturated and unsaturated metal catalyst Hydrocarbon

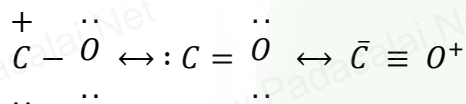


Carbon + transition metal \rightarrow transition metal complex (transition metal – zero oxidation state)

Example : Ni [CO]₄

25. Structure of carbon monoxide

- * Linear structure
- * 3 electrons pairs are shared between carbon and oxygen
- * C – O bond distance 1.128Å°
- * The resonance hybrid structure



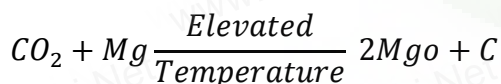
(NV)

Refer the Book

26. Uses of carbon monoxide.

- * Water gas, important industrial fuels producer gas
- * Good reducing agent, (Metal oxide to metal)
- * Form Carbonyl compounds with transition metals.

27. CO is a reducing agent justify with an example



28. CO is Acidic behavior justify with an example



29. Structure of carbon dioxide.

- * Linear structure
- * Equal bond distance for both C – O bonds.
- * There is one C – O sigma bond 3C – 4e bond covering all the three atoms.

Refer the Book for diagram.

30. Uses of carbon dioxide

- * Used for Photosynthesis
- * Make inert atmosphere for chemical processing
- * Fire extinguisher and propellant gas
- * Production of beverages.

31. Write the types of silicones

- (i) Linear Silicones (ii) Cyclic Silicones (iii) Cross Linked Silicones

32. Uses of Silicones.

- * Low temperature lubrication and high temperature oil bath etc
- * Making water proofing clothes
- * Mixed with paints (resist and toward high temperature, sun light etc)

33. Write about zeolites.

- * Three dimensional crystalline solid containing Si, Al, O in their regular three dimensional frame work.
- * They are hydrated sodium aluminium
- * General formula $\text{NaO} \cdot (\text{Al}_2\text{O}_3) \times (\text{SiO}_2)_y \text{H}_2\text{O} \left(\frac{x=2 \text{ to } 10}{y=2 \text{ to } 6} \right)$
- * Zeolite have porous structure in which the monovalent sodium ions and water molecules are loosely held.
- * The Si and Al atoms are tetrahedrally Co-Ordinated with each other through shared oxygen atom.
- * Zeolite are similar to clay minerals but they differ in their crystalline structure.
- * The pore / channel sizes are nearly uniform allowing crystal to act as molecular sieve.
- * Used for removing permanent hardness of water

34. Write the difference between CO and CO₂

Carbon Monoxide	Carbon - dioxide
* Linear Structure	Linear Structure
* C – O bond distance are 1.128Å°	C – O bond distance are equal 1.163Å°
3e ⁻ pairs shared between carbon and oxygen	3C – 4e ⁻ bond covering all the three atoms
Covalent bond as well as Co-Ordination	Covalent bond
Covalent bond	

35. Write about water gas equilibrium.

- * $\text{CO}_2 + \text{H}_2 \rightleftharpoons \text{CO} + \text{H}_2\text{O}$ (water gas)

36. AlCl₃ Lewis acid why?

- * It form addition compounds with ammonia, phosphine etc.. Eg AlCl₃ 6NH₃

37. Structure of Diborane.

- * In diborane two BH₂ units are linked by two bridged Hydrogens.
- * It has eight – B – H bonds.
- * Diborane has only 12 valance electrons and are not sufficient to form normal covalent bonds.
- * The four terminal B – H bonds are normal covalent Bonds (2c – 2e bond)
- * The remaining four electrons have to used for the bridged bonds
ie two three centred B – H – B bonds utilise two electrons each. Hence, these bonds are three centre electron bonds.

- * In diborane the boron sp^3 hybridised orbitals contains single electron and fourth orbital is empty.
- * Two of the half filled hybridised orbitals of each Boron overlap with two hydrogen to form two terminal $2C - 2e^-$ bonds.
- * Leaving one empty and one half hybridised orbitals on each boron.
- * B - H - B bond formation involves overlapping the half filled hybridised orbital of one boron.
- * The empty hybridised orbitals of then boron and the half filled 1s orbital of Hydrogen.

38. Write the Anomalous properties of the first element.

The group 13th elements.

- * Boron is metalloid while others are reactive metals
- * Diagonal relationship Boron with silicon (group - 14)
- * Both Boron and silicon form covalent Hydride
- * Easily Hydrolysed

The group 14th elements.

- * Carbon is non metal while others are metalloids
- * Carbon form multiple bond $C = C$ $C = O$ etc
- * Carbon form catenation. This is decrease in group $C > Si > Ge \approx Sn > Pb$

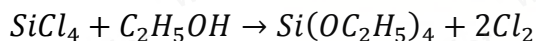
The group 15th elements.

- * Nitrogen differs from Rest of the elements of group
- * Nitrogen also form multiple bonds ($N = N$, $C = N$, $N = O$ etc)
- * Exists Diatomic gas in that group
- * Forms H - bonds due to its high electronegativity

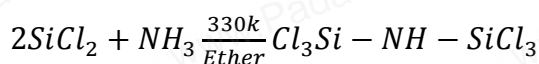
The group 17th elements.

- * Fluorine the most electronegative element differ from the rest of the elements of group
- * f has -1 oxidation state while other halogen have t1, t3, t5 and t7 oxidation state.
- * f is strong oxidising agent and most reactive element among the halogen.

39. Give the preparation of silicic ester (or) tetraethyl silane and chlorosilazanes.



Chlorosilazans



40. Deifference between graphite diamond and fullerenes.

	Graphite	Diamond	Fullerenes
Nature	1) Soft	1) Very hard	* Discrete molecule C_{50} , C_{60} ets
Conductivity	2) Conduct the electricity	2) No Conduct electricity	* C_{60} soccer ball like structure (fullerene (or) bucky ball)
Hybridisation	3) SP^2 Hybridisation	3) SP^3 Hybridisation	SP^2 Hybridisation
Bond length	4) C – C Bond length $1.41A^\circ$	4) C – C bond length $1.54A^\circ$	C – C bond distance $1.44A^\circ$
Uses	5) Lubricant oil (or) graphited oil	5) Rock drilling, cutting glasses	C – C bond distance $1.38A^\circ$ Catalyst, Polymer, Medicine

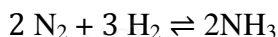
**Dilute your sorrows,
Evaporate Your Sorrows,
Filter your Mistakes,
Boil your ego ,
You will get crystals of Happiness.**

LITLIT6060

3. P. Block Elements

2 Marks and 3 Marks

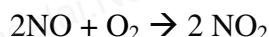
1. Write about synthesis of Ammonia (Haber's Process)



2. Write structure of ammonia

- * Pyramidal in Shape
- * N – H bond distance 1.016 \AA
- * H – H bond distance 1.645 \AA
- * Bond – angle 107°
- * Regarded as tetrahedral with one lone pair of e^- in one tetrahedral position hence it has a pyramid Shape

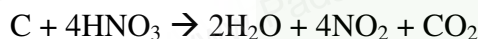
3. Write Ostwald process



Temperature – 1275 K

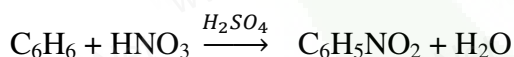


4. Prove the Nitric acid across oxidizing agent and nitrating agent



Nitrating agent (Nitration)

In Organic compound the replacement of $-\text{H}$ atom with NO_2 is called Nitration



5. Write the uses of Nitric acid

- * Used as nitrating and oxidizing agent
- * Preparation of aquaregia
- * Used in Photography

6. Write the difference between Red phosphorus and white phosphorus

S.No	White Phosphorus	Red Phosphorus
1	Colourless but becomes pale yellow due to formation of layer of red phosphorus	Red Phosphorus can be converted into back into white phosphorus
2	Poisonous Nature	Not Poisonous in Nature
3	Garlic Smell	No smell
4	Show the phosphorescence	Does not show phosphorescence
5	Ignition temperature low	Does not ignite at low temperature

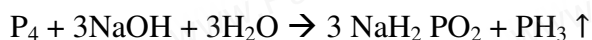
7. Define Phosphorescence

- * The white phosphorus glows in dark due to oxidation is called phosphorescence

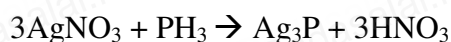
8. Write about the structure of phosphorous

- * The four atoms in phosphorus have polymeric structure with chain of P_4 linked tetrahedrally
- * $P \equiv P$ less stable than $P - P$ single bond
- * Hence phosphorous atoms are linked through single bond rather than triple bonds

9. Prove phosphorus is good reducing agent (preparation of phosphine)



10. Shows that phosphine is powerful reducing agent



12. Structure of phosphorus oxide

- * Phosphorous form tri, tetra, penta oxides of phosphorus
- * In Phosphorous trioxide four phosphorus atoms are lies at the corner of a tetrahedron and six oxygen atoms along the edges
- * $P - O$ bond distance 165.6 pm. Which is shorter than the single bond distance $P - O$ (184 pm)
- * It is due to $P\pi - d\pi$ bonding and result in the considerable double bond character

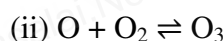
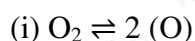
13. Write about the structure of oxo acids of phosphorous

- * In P_4O_{10} each P atoms form three bonds to oxygen atom and also additional coordinate bond with oxygen
- * The terminal coordinate $P - O$ bond length is 143 pm which is less than expected single bond distance
- * Due to the lateral overlap of filled p-orbitals of O_2 and empty d orbital of P

14. Define chalcogens (or) ore forming elements

- * The Elements belonging group 16 are called chalcogens (or) ore forming elements as most of the ores are oxides (or) Sulphides

15. Give the preparation of ozone



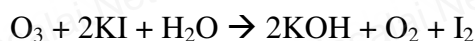
Prepared by electrical discharge of through the O_2 At potential 20,000V 10% oxygen converted to O_3

16. Structure of Ozone

- * Bent shape and symmetrical with delocalised bonding between with oxygen

Refer the Book

17. How will you estimate the Ozone

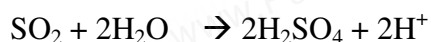


18. Define prismatic sulphur (Monoclinic sulphur)

- * Monoclinic sulphur also contains S_8 molecules in addition to small amount of S_6 molecules
- * It exists as a long needle like prism and also called as prismatic sulphur

19. Write about the bleaching action of sulphur dioxide

In the presence of water, SO₂ bleaches coloured wool, silk to colourless



Coloured Colourless

* If u stand in the colourless material became coloured because reoxidified. It is temporary action.

20. Write structure of sulphur dioxide

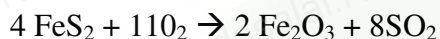
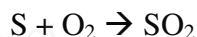
* Sulphur atoms undergoes SP² Hybridisation

* A double bond arises between S and O

* It is due to Pπ – dπ over tapping

21. Write about the Manufacture of sulphuric acid by contact process

1) Sulphur dioxide is produced by burning sulphur (or) iron pyrites in oxygen / air

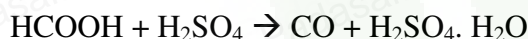


2) Sulphur dioxide $\xrightarrow[\text{Oxidation}]{\text{V}_2\text{O}_5}$ Sulphur trioxide

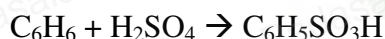


Condition for maximum yield 2bar pressure 96% pure 720K temperature form

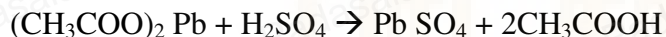
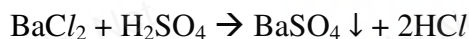
22. H₂SO₄ is good dehydrating agent prove it



23. Give the preparation Benzene sulphonic acid



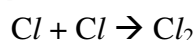
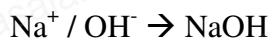
24. Give the test for sulphate (or) sulphuric acid



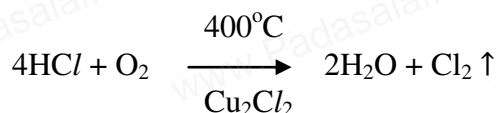
Lead sulphate (White PPT)

25. Write preparation of chlorine (Electrolytic process and Deacon's process)

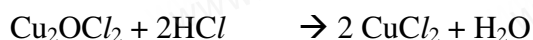
Electrolytic process



Decan's Process

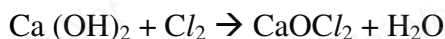


The catalyzed reaction given below



26. Give the preparation of Bleaching powder

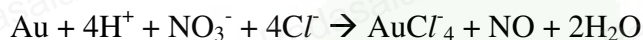
* Passing the chlorine gas through the slaked lime



27. Write about aquaregia (or) Royal water

3 Parts of Con.HCl and 1 parts of Con.HNO₃ → Royal water (Aquaregia)

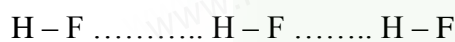
Used to dissolve the Au, Pt



28. Why the HF is liquid but other halides are gases

* HF – does not ionizes easily

* HF is a liquid because of intermolecular H – bonding



29. Justify HF is weak acid among the halogen acids

* It has greatest affinity for Hydrogen

* HF is associated due to Hydrogen bonding

30. HF show only negative oxidation state why

* Being strongly electronegative it can have only a negative oxidation state

31. Why HF have high M.Point and B.Point

* Presence of strong H – bonding

32. HF (Hydrofluoric acid) is stored in wax bottle and not in glass bottle. Why? (Etching on glass)

HF easily attack the silicates (or) Silica



33. Define Interhalogen compounds with example

* Each halogen combine with other halogens to form a series of compounds called interhalogen compounds IF₅

34. Write the properties of Interhalogen compounds

* Central atom will be large one

* Formed between two halogens

* Strong oxidizing agent

* Undergo the Auto oxidation

35. Why the Noble has have high Ionisation energy

- * They have completely filled orbitals in their outer most shell
- * They are extremely stable and have small tendency to gain (or) Lose electrons

36. Define Bends

The He and O₂ mixture is used by divers in the place of air oxygen mixture

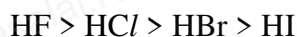
This prevents the painful dangerous condition is called bends

37. Write any three uses of Helium

- * Used in inflating aeroplane tyres
- * He – O₂ mixture used by deep – sea divers
- * Used in cryogenic (Low temperature science)
- * Used in electric arc welding of metals

38. Why HF is thermally stable compare to other hydrogen halides

The Bond – dissociation enthalpy order



Thermal stability order is directly proportional to Bond dissociation energy

39. Write about Rhombic sulphur

- * It also known as α – sulphur
- * thermodynamically stable
- * Yellow colour and Composed S₈ molecules

Life like a chemistry ,
Beautifully Designed with reactions,
To discover new relations.

LITLIT

4. Transition and Inner Transitions Elements

2 Marks and 3 Marks

1. What are transition element give examples

* In these element the last electrons enters the d orbitals of the penultimate shell

ie : Last electron goes to (n-1) d orbitals

* Because these represents a transition series from highly electro positive elements (metal) to least electro positive elements (Non metals)

* The Occupy the central position of the periodic table between S and P block elements

* So it is called as transition element Ex : Sc, Ti, V, Au, Ag

2. Why the melting point of transition metal first increase then decreases

* M. Point of transition metal first increase. The number of unpaired d electrons available for metallic bond increase reach the maximum value

* Decreases M.Point because the d electrons pair up and become less available for bonding
SC > Mg

3. How will findout the thermodynamic stability of transition metal complex

By comparing Ionisation energy required to form Ni^{+2} and Pt^{+} for

$$\begin{aligned}\text{Ni} &= \text{IE}_1 + \text{IE}_2 &= 737 + 1753 \\ & &= 2490 \text{ KJ mol}^{-1}\end{aligned}$$

$$\begin{aligned}\text{for Pt} &= \text{IE}_1 + \text{IE}_2 &= 864 + 1791 \\ & &= 2655 \text{ KJ mol}^{-1}\end{aligned}$$

Less ionization energy transition complex are Thermodynamically less stable

More ionisation energy transition complex are Thermodynamically more stable

4. Define oxidizing agent and reducing agent

* Redox reaction involves the transfer of electron from one reactant to another

* Such reactions are always coupled, which means that then one substance is oxidised another must be reduced

* The substance which is oxidified is a reducing agent

* The other substance is reduced is an oxidizing agent

* Oxidising and reducing power of an element is measured in terms of standard electrode potential

5. Define standard electrode potential

Standard the electrode potential is the value of standard emf of a cell in which molecular hydrogen under the standard pressure (1 atm) and temperature (273K) is oxidised to solvated protons at the electrode.

4. How will you classify the material based on the Magnetic properties?

- 1) Paramagnetic materials
- 2) Diamagnetic materials besides these
- 3) Ferromagnetic materials
- 4) Antiferromagnetic materials

5. Define Paramagnetic

- * Paramagnetic solids having unpaired electrons possess magnetic dipole which are isolated from one another
- * In the absence of external magnetic field, the dipoles are arranged at random and hence the solids show no net magnetism
- * But in the presence of magnetic field, the dipoles are aligned parallel to the direction of the applied field and therefore, they are attracted by an external magnetic field

7. Define Ferromagnetic

- * Ferromagnetic material have Domain structure and in each domain the magnetic dipoles are arranged
- * But the spin dipoles of the adjacent domains are randomly oriented
- * Some transition elements or ions with unpaired d electrons show ferromagnetism

8. Define Diamagnetic

- * Materials with no elementary magnetic dipoles are diamagnetic
- * The species with all paired electrons show diamagnetism
- * The kind of materials are repelled by magnetic field because of presence of external magnetic field

9. Write about Alloy formation of d block elements

- * Transition metals satisfying these mentioned conditions form alloys with each other because
- * Atomic sizes are similar and one metal can be replaced by another metal atom from its crystal lattice to form an alloy

Ex : Ferrous Alloys, Gold – Copper alloys

10. Most of the transition metals and their compounds have catalytic activity why?

- * Transition metal has energetically available d orbitals that can accept electrons from reactant molecule (or) metal can form bond with reactant molecule using its d electrons.
- * They show a variety of oxidation states and thereby can form intermediate products with various reactants

Ex : Catalytic hydrogenation of alkene catalyst Ni / H₂

Manufacture of sulphuric acid from SO₃ using V₂O₅ as catalyst.

12. Why do transition elements form complex

- * Transition metal small size and high positive charge density
- * Have low energy orbitals to accept in electron pair donated by other group
- * $[\text{Fe}(\text{CN})_6]^{4-}$ $[\text{Co}(\text{NH}_3)_6]^{3+}$

13. Write about chromyl chloride test

- * When a salt containing chloride is treated with $\text{V}_2\text{Cr}_2\text{O}_7$ and $\text{Con. H}_2\text{SO}_4$ reddish brown vapour of chromyl chloride is obtained



14. Write the uses of potassium dichromate

- * Used as strong oxidizing agent
- * Used in dyeing and printing
- * Used in the Estimation of iron compound and Iodides
- * Used in leather tanneries for chrome tanning

15. Write the uses of potassium permanganate

- * Used as strong oxidizing agent
- * Used in various skin infection and fungal infection of the foot
- * Used detecting the detection of unsaturation of an organic compound (Bayer reagent)
- * Used in Estimation of oxalates, H_2O_2 , Iodides etc

16. What are the types of inner transition elements

- 1) Lanthanoides (4f – block elements)
- 2) Actinoides (5f – block elements)

17. Write the position of Lanthanoides in the periodic table

- * It present in 3 group and 6th period
- * After the Lanthanum, the electrons are preferentially filled in inner 4f sub shell
- * The 14 elements following La show similar chemical properties
- * 14th g elements are groups together and placed at the bottom of the periodic table

This position can be justified as follows:-

- * Lanthanides have general electronic configuration $[\text{Xe}] 4f^{2-14} 5d^{0-1} 6s^2$
- * The common oxidation state of lanthanides +3
- * All these elements have similar physical and chemical properties

18. Write the position of actinoides in the periodic table

- * The fourteen elements following actinium Th to Lr resemble in their physical and chemical properties.
- * If we place these elements after Lanthanum in the periodic table below 4d series
- * The properties of the elements belong to a group would be different and it would affect proper structure of the periodic table.

19. Write about Lanthanoide Contraction and its causes

- * As we across 4f series, the atomic and ionic radii of Lanthanide show gradual decreases with increase in the atomic number.
- * This decrease in ionic size is called Lanthanoide contraction
- Cause of Lanthanoide contraction
- * The lanthanoide contraction due to imperfect(or) poor shielding of one 4f electrons by another same sub shell
- * The nuclear charge increased by one unit and an additional electrons is adde into same inner 4f sub shell
- * The effective nuclear change experienced by the 4f valence electron increases and size of Ln^{+3} ions decreases.

20. What are consequence of Lanthanoide Contraction

1. Basicity difference

- * As we move from Ce^{3+} to Lu^{3+} , the Basic character of Ln^{3+} decrease
- * Due to the decrees in the size of Ln^{3+} ionic character at $\text{Ln} - \text{OH}$ bond decrease (Covalent character increases) which result in the decrease in Basicity

2. Similarities among the lanthanoides

- * The complete f – series only 10pm decrease in atomic radii and 20pm decrease in ionic radii are observed.
- * Because of very small change in radii of lanthanoides their chemical properties are quite similar

21. Write about actinoides

- * Actinoides from Th to Lr (14 elements)
- * They are radioactive and short half lives
- * Few (U, Th) found in nature others are produced by nuclear reaction.

22. What are the difference between Lanthanoides and actinoide?

S.No	Lanthanoide	Actinoides
1	Differentiating the electrons enter in the 4f orbital	Differentiating the electron enters in 5f orbital
2	Binding energy of 4f orbitals are higher	Bindinding energy of 5f orbitals are lower
3	They show less tendency to form complexes	They show greater tendency to form complexes
4	Most of Lanthanoide are colourless	Most of actinoide are coloured for explain u^{3+} (red) u^{4+} (green)
5	They do not form oxocation	They do form oxocations UO_2^+ etc

23. Write about the formation of interstitial compounds

- * small atom (H, B, C, N) are trapped in the interstitial holes in the metal lattice

- * They are usually non-stoichiometric compounds

Ex:- TiC , Mn_4N etc

24. Write the properties of interstitial compounds

- * They are hard and show electrical and Thermal conductivity

- * They have high m.p. than those of the pure Metals

- * Transition metal Hydrides are used as powerful reducing agent

- * Metallic carbides are metallic inert .

25. Why the f Block elements are called as inner transition elements ?

- * The elements in which the extra electrons enter $(n-2f)$ orbitals are called f block elements

- * These elements are also called inner transition elements because they form a series within the transition elements

Chemistry states the more energy you put into a bond the harder it is to break .

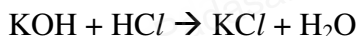
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5. Co – Ordination Chemistry

2 Marks and 3 Marks

1. Define simple salt? Give example

- * Simple salt is formed by neutralisation of an acid by base



- * The Solution of simple salts exhibits the properties of its component ions

2. What are double salt? Give one example

- * Which are formed by evaporation of solution containing two (or) more salts in stoichiometric Proportion.
- * They are dissociate in solution into its constituents ions in solution
- * They retain their properties only in solid state.

Example: Ferrous ammonium sulphate (mohr's salt)

3. In what way complex salt differ from double salt

Complex Salt	Double Salt
* A compound formed from a Lewis acid and Lewis base	The evaporation of solution containing two (or) more salts in stoichiometric proportions
* The Metal of the complex ion is not free in solution	The metal ion is free in solution
* The individual components lose their identity	It gives the test of all constituents ions in solution

4. Write the limitation of Werner's theory

- * Does not explain
 - (i) Colour properties of co – ordination compound
 - (ii) Magnetic properties co – ordination compound

5. Define Co – ordination entity

- * An ion (or) neutral molecule, composed of central atom, usually a metal and the array of other atoms (or) group of atoms (ligands) that are attached to it.
- * In the formula the co – ordination entity in square brackets.

Example : $\text{K}_4 [\text{Fe} (\text{CN})_6]$ The Co – ordination entity $[\text{Fe} (\text{CN})_6]^{4-}$

6. Define central atom / Ion with example

- * The central atom / Ion that occupies the central position in a co – ordination entity and binds other atoms (or) groups of atoms (ligands) to itself through co – ordination covalent bond

Ex : $\text{K}_4 [\text{Fe} (\text{CN})_6]$ the central metal atom is

- * It is referred to as Lewis acid

7. Define ligands with example

- * The atoms (or) group of atoms bonded to central atom / ions
- * Ligands is directly bond to the central metal atom is known by donar atom (Lewis base)

Ex : $K_4 [Fe (CN)_6]$ CN – is ligand

8. Define Co – ordination sphere and counter ion

* The complex ion of the co – ordination compound containing the central metal atom / ion and ligands attached to it is collectively called co – ordination sphere and usually enclosed in square brackets with net charge.

- * The other ionisable ions are written out side of the bracket are called counter ions

Ex : $K_4 [Fe (CN)_6]$

Co – Ordination sphere [$Fe (CN)_6$]⁻⁴ counter ion $\rightarrow K^+$

9. Define Co – ordination polyhedron

* The three dimensional special arrangement of ligand atom / ion that are directly attached to central atom is known as Co – ordination polyhetron (or) Polygon

- * Ex : $K_4 [Fe (CN)_6]$ – Octahetral

10. Define Co – ordination number with example

- * The number of ligands (donor atoms) bonded to central metal ions in a complex is called co – ordination number of metal.
- * Co – ordination number is equal to the number of σ bonds between the ligands and central metal atom

Ex : $K_4 [Fe (CN)_6]$ Co] – Ordination number is 6.

11. Define oxidation number (or) state

- * The charge it would bear if all the ligands were removed along with the electron pair that were shared with the central atom
- * It is represented by Roman numeral

Ex : $K_4 [Fe (CN)_6]$ ⁻⁴ oxidation state of Fe = II

12. Write Classification of co – ordination compound based on ligands

- * Central metal atom / ion is coordinate to only one kind of ligand is called homoleptic complex
 $[Co (NH_3)_6]^{3+}$
- * The central metal atom / ion is Co – Ordinated to more than one kind of ligand heteroleptic complex $[Co (NH_3)_5Cl]^{2+}$

13. Write Type of complex with example

- * Anionic complex (In which complex ion carries negative charge) $[Ag (CN)_2]^-$
- * Cationic complex (In which complex ion carries positive charge) $[Ag (NH_3)_2]^+$
- * Neutral complex (In which complex ion carries no net charge) $[Ni (CO)_4]$

14. Define isomerism

- * It is phenomenon in which more than one Co – Ordination compounds having same molecular formula
- * Different physical and chemical properties due to the different arrangement of ligands around the central metal atom.

15. Define structural isomer

- * The Co – Ordination compound have same formula but have different connections among their constituent atoms are called structural (or) constitutional isomers

16. Define linkage isomers

Linkage isomers occurs with ambidentate ligands which are capable of co – ordinating in more than oneway $\text{CO}(\text{NH}_3)_5 (\text{NO}_2)^{2+}$

Nitrate $(\text{NO}_2)^{2+}$ ions bond to central metal atom by N (or) by O

17. Define Co – Ordination isomers

Compound must have both anion and cataion as complex ions

- * Interchange of one or more ligands between cationic and anionic co – ordination entities result in different isomers

Ex : $[\text{Co} (\text{NH}_3)_6] [\text{Cr} (\text{CN})_6]$

$[\text{Cr} (\text{NH}_3)_6] [\text{Co} (\text{CN})_6]$

18. Define Ionisation isomers

Co – ordination compounds having the same molecular formula but forming different ions in solution are called ionisation isomer.

$[\text{Pt} (\text{en})_2 \text{Cl}_2] \text{Br}_2$ and $[\text{Pt} (\text{en})_2 \text{Br}_2] \text{Cl}_2$

19. Define solvated isomers

- * The exchange of free solvent molecules such as water ammonia, alcohol etc
- * In the crystal lattice with the a ligand in the Co – Ordination entity will give different isomer

Ex : $\text{CrCl}_3 \cdot 6 \text{H}_2\text{O}$ (i) $[\text{Cr} (\text{H}_2\text{O})_6] \text{Cl}_3$ (ii) $[\text{Cr} (\text{H}_2\text{O})_5 \text{Cl}] \text{Cl}_2 \cdot \text{H}_2\text{O}$

Voilet Colour Palegreen

(iii) $\text{Cr} [(\text{H}_2\text{O})_4 \text{Cl}_2] \text{Cl} \cdot 2\text{H}_2\text{O}$
(Dark Green)

20. Stereo isomerism

- * The compound containing the same ligand attached to the same central metal ion in different positions
- * Have same chemical formula and connectivity between the central metal atom and the ligand (NV)
But they are different in spatial arrangement of ligands in three dimensional space

21. Define geometrical isomers

- * In heteroleptic complex due to different possible three dimensional spatial arrangement of ligands Around central metal atom.

22. Define cis and trans isomers

- * Similar group present on the either same side (or) opposite side of central metal atom gives rise two different geometrical isomers they are called Cis and trans isomers respectively.

23. Define optical isomerism

- * Co – Ordination compound which possess chirality exhibit optical isomerism
- * The pair of two optically active isomers which are mirror image of each other called enantiomers
- * Their solution rotate the plane of polarised light clock wise called dextro rotatory ('d')
- * Their solution rotate the plane of polarised light anticlock wise called levo (l) rotatory

24. Write the Limitation of VBT

- * Does not explain the colour of the complex
- * It consider only the spin only magnetic moments does not consider other components of magnetic moments
- * It does not provide a quantitative explanation as to why certain complex are inner orbital complex and others are outer complex for same metal

25. Write about crystal field splitting energy

$$\Delta = h \gamma = \frac{hc}{\lambda} = hc \bar{\nu}$$

h – Plank's constant, c Velocity of light, γ is wave number of absorption maximum which is equal to $\frac{1}{\lambda}$

26. Define crystal field stabilization energy (CFSE)

- * The energy difference of electronic configurations in the ligand field (E_{LF}) and Isotropic field and Isotropic field / bary centre (E_{iso})
- $$CFSE (\Delta E_o) = \{E_{Lf}\} - \{E_{iso}\}$$

27. What is Reason for the colour of the complex

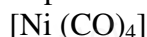
- * A substance exhibiting colour when it absorbs the light of a particular wavelength in visible region
- * Transmit the rest of visible light when this transmitted light enter our eyes. Our brain recognizes its colour.

28. Define d – d transition

The excitation of d electrons of central metal ion from the lower energy t_{2g} level to higher energy e_g level which is known as d – d transition.

29. Define mononuclear carbonyl and polynuclear carbonyl

- * These compounds contain only one metal atom and have comparatively simple structure



- * Polynuclear carbonyl

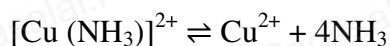
These compounds contain two (or) more metal atoms are called poly nuclear carbonyl

$$[Co_2(CO)_8]$$

30. Define labile and inert complex

- * Co – Ordination complex undergo rapid ligand substitution – labile complex
- * Co – Ordination complex undergo ligand substitution very slow – inert complex

31. Define dissociation equilibrium constant (or) Instability constant α (Refer the Chemistry Book)



$$\alpha = \frac{[\text{Cu}^{2+}][\text{NH}_3]^4}{[\text{Cu}(\text{NH}_3)]^{2+}}$$

32. Define the formation equilibrium constant (or) stability constant (β)

- * The reciprocal of dissociation equilibrium constant (α) is called formation equilibrium constant (or) stability constant (β)

$$\beta = \left(\frac{1}{\alpha}\right)$$

33. Write the significance of stability constant

- * Stability of complex measured by using stability constant (β)
- * Stability constant value α stability of complex

34. Define Mac – Arthur – forrest cyanide process

- * Co – Ordination complex used in extraction of silver and gold
- * They form soluble cyano complex
- * These cyano complex are reduce by Zn to yield metal This process is called Mac Arthur forrest cyanide process

35. Define Corrine ring

- * Chlorophyll a green pigment present in green plants and algae is a co – ordination complex containing Mg^{2+} as central metal ion surrounded by a modified porphyrin ligand is called Corrine ring

“ Think like a Proton
Always Positive”

6. Solid State

2 Marks and 3 Marks

1. What are general characteristics of solids

- * Have definite volume and shape
- * Rigid and incompressible
- * have strong cohesive forces
- * Have shorter inter atomic, ionic (or) molecular distance

2. Classification of solids

Crystalline Solid

Amorphous Solid

Ex : Glass

3. What are types of crystals

1. Ionic crystals (NaCl)
2. Covalent crystals (Diamond)
3. Molecular crystals (glucose)
4. Metallic crystal (Na, Ag)
5. Atomic Solid Ex : Frozen element of group 18

4. What are difference between crystalline and amorphous solids

	Crystalline Solid	Amorphous Solid
1	Long range orderly arrangement of constituents	* Short range (or) random arrangement of constituents
2	Definite Shape	* Irregular Shape
3	Anisotropic Nature	* Isotropic Nature
4	True Solids	* Pseudo Solids (or) Super cooled liquids
5	Definite Heat of fusion	* Heat of fusion not definite
6	Sharp M.Point	* No Sharp M.Point
7	Ex.NaCl, Diamond	* Ex. Rubber, Plastic

5. What are the difference between Isotropy and Anisotropy

	Isotropy	Anisotropy
1	Uniformity in all direction	Not Uniformity in all the direction
2	Same physical properties in all direction (refractive index, electrical conductance etc) Ex : amorphous Substance	Different physical properties in different direction Ex : A Crystalline solid
3	Randomly arrangement atoms (or) Ions	Regular arrangement of atoms (or) ions

6. Define long range order

- * The arrangement of ultimate particle (Via, molecules, atoms, ions) are arranged in definite pattern through out the crystal
- * The definite and ordered arrangement of molecules atoms (or, ions extends over a large distance This is termed as long range order)

7. Write about Ionic solids

- * It is consist of anions and cations
- * Two ions bound together by Strong electrostatic force
- * Cations are surround by many anions vice versa
- * have definite crystal structure

Ex : NaCl . Here Na^+ and Cl^- ions

8. What are the characteristics of ionic crystal

- * Have high M.Point
- * Do not conduct electricity in solid state (Ions are fixed in their lattice position)
- * They do conduct the electricity in molten state (free movement of ions)
- * They are hard as only strong external force can exchange the relative position of ions

9. Write about covalent solids

- * The constituents are bound together by covalent bond
- * They are very hard
- * They posses high M.Point
- * They are usually poor thermal and electrical conductor
- * Ex : Diamond, Silicon

10. Write about Molecular molecules

- * The constituents are neutral molecules
- * They are held together by Vanderwaals forces
- * They are soft
- * They donot conduct the electricity

11. What are the types of Molecular solids

1	Non – Polar molecular solid constituent molecules are held together by London forces	Polar molecular solid constituent molecules are held together by polar covalent bonds
2	Have low M.Point	Have high M.Point
3	Usually liquid (or) gaseous state at room temperature Ex : Naphthalene	Non – Polar molecular solid Ex : Solid CO_2 Solid NH_3

Hydrogen bonded molecular solid

The constituents are held together by H bond

- * They are soft solids under room temperature Ex : Glucose, Urea

12. Write about metallic solids

- * The lattice points are occupied by positive metal ions and cloud of electrons pervades the space
- * They are hard, have high M.P., pass bright luster
- * They have excellent electrical and thermal conductivity

Ex : Metal and Metal alloys (Cu, Cu - Zn)

13. Define Crystal lattice

- * Crystalline solid characterized by a definite orientation of atom, ions (or, molecules, relative to one another in three dimensional pattern)
- * The regular arrangement of these species throughout the crystal is called crystal lattice.

14. Define unit cell

A Basic repeating the structural unit of crystalline solid is called unit cell.

15. Define primitive and non – primitive unit cell

- * A unit cell contain only one lattice point is called a primitive unit cell
- * In non – primitive cell there are additional lattice point either on the face of the unit cell (or) within the unit cell

16. State Bragg's law

* This equation that gives a simple relation between the wave length of X rays λ , the inter planar distance in the crystal and angle of reflection θ is known as Bragg's equation

$$n\lambda = 2d \sin\theta$$

n = order of reflection λ = wave length of X – ray

d = interplanar distance in the crystal θ = angle of reflection

17. How will you calculate the density of unit cell

$$\text{Density of unit cell } \rho = \frac{\text{Mass of unit cell}}{\text{Volume of unit cell}}$$

Mass of the unit cell = Total number of atoms belongs to that unit cell (n) x mass of one atom

$$\text{Mass of one atom} = \frac{\text{Molar mass (g mol}^{-1}\text{)}}{\text{Avagadro number (mol}^{-1}\text{)}} \quad m = \frac{M}{N_A}$$

$$T = n \times \frac{M}{N_A}$$

18. Define packing efficiency (or) fraction

$$\text{Packing efficiency (or) fraction} = \frac{\text{Total volume occupied by spheres in a unit cell}}{\text{Volume of the unit cell}} \times 100$$

19. What are the types of crystal defect

- 1) Point defect
- 2) Line defect
- 3) Interfacial defect
- 4) Volume defect

20. Write about stoichiometric defect in the ionic solid Intrinsic (or) thermodynamic defect

* In Stoichiometric ionic crystals, the vacancy of one ion must be always be associated with either by absence of another oppositely charged ion (or) the presence of same charged ions in the interstitial position so as to maintain the electrical neutrality.

21. What is Schottky defect gives on Example

- * It is due to missing of equal number of cations and anions from the crystal lattice
- * This defect does not affect the stoichiometry of the crystal
- * In which the anion and cations are almost same size the crystal remains neutral
- * Number schottky defect affect crystal density
- * The presence of schottky defect in the crystal provides a simple way by which atoms (or) ions can move with in the crystal Ex : NaCl

22. What is Frenkel defect with example

- * It is due to dislocation of ions from its crystal lattice
- * The ion which is missing from the lattice point occupies an interested position
- * This defect found in ionic solids in which size of anion and cation differ
- * Does not affect the density of crystal Ex : AgBr (Br larger size)

23. Write about the defect impurity

- * A general method of introducing defects in ionic solid by adding impurity ions
- * If the impurity ions are in different valance state from that of host
- * Vacancies are created in the crystal lattice of the host
- * Ex : CdCl_2 is added to AgCl yields the solid solutions Ag^+
The divalent cation Cd^{2+} occupies the position of Ag^+
- * This will disturb the electrical neutrality of the crystal
- * In Order to maintain the same, proportional number of Ag^+ ions leaves the lattice
- * This produce a cation vacancy in the lattice, such kind of crystal defect are called impurity defect

24. Write about Metal excess defect

- * It is due to presence of more number of metal ions as compared to anions
- * The electrically neutrality by the presence of anionic vacancies equal to the excess metal ions (or) by the presence of extra cation and electron present in interstitial position.

Ex : * When NaCl crystal are heated in the presence of sodium vapour

- * Na^+ ions are formed and are deposited on the surface of the crystal
- * Cl^- ions diffuse to the surface from the lattice point and combine with Na^+ ion
- * The electron lost by the sodium vapour diffuse into the crystal lattice and occupie the vacancy created by Cl^- ions
- * Anionic Vacancies which are occupied by unpaired electrons are called F – Centers

25. What are metal deficient defect

- * It is defect arises due to the presence of less number of cations than the anions
- * In crystals the cations have variable oxidation state

Ex : * FeO Crystal some of Fe^{2+} ions are missing from the the crystal

- * To maintain the electrical neutrality, twice the number of other Fe^{2+} ions in the crystal is oxidized to Fe^{3+}
- * The over all the Fe^{2+} and Fe^{3+} ions are less than the O^{2-} ions.

7. Chemical Kinetics

2 Marks and 3 Marks

1. What are factors affecting the reaction rate

- i) Nature and state of reactant ii) concentration of reactant
- iii) Surface area of the reactant iv) Temperature of reaction
- v) Presence of catalyst

2. Arrhenius equation

$$K = Ae^{\frac{-E_a}{RT}}$$

A - Frequency factor

R - Gas constant

E_a - Activation energy of reaction

T - absolute temperature

3. Define activation energy

All the collision are not effective to lead to the reaction in order to react

The colliding molecule must possess a minimum energy is called activation energy

Activation energy = Threshold energy - Energy of colliding molecule

4. Define Half Life period (or) time $t_{1/2}$

- a) The time required for the reactant concentration to reach one half its initial value

$$t_{1/2} = \frac{0.693}{K} \text{ sec}$$

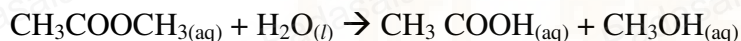
5. Zero order of the reaction

A reaction in which the rate is independent of the concentration of the reactant over the wide range of concentration is called as zero order reaction.



6. Define pseudo first order reaction with example

A second order reaction can be altered to a first order reaction by taking one the reactant in large excess such reaction is called as pseudo first order reaction.



7. Define first order reaction with example

A reaction whose rate depends on the reactant concentration raised to first power is called first order reaction.

Example :

- (i) $\text{H}_2\text{O}_{2(aq)} \rightarrow \text{H}_2\text{O}_{(l)} + \frac{1}{2} \text{O}_{2(g)}$
- (ii) Isomerisation of cyclopropane to propene

8. Difference between order and molecularity of reaction

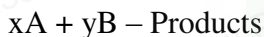
Order of Reaction		Molecularity of Reaction
(i)	It is the sum of the power of the concentration terms involved in experimentally determined rate law	It is the total number of reactant species that are involved in elementary step
(ii)	It can be zero (or) fractional (or) integer	It always whole number cannot be zero (or) fraction
(iii)	It is assigned for overall reaction	It is assigned for each elementary step of mechanism

9. Difference between Rate of reaction and rate constant of reaction

Rate of Reaction		Rate constant
(i)	It is represent the speed at which the reactants are converted into product at any instant	It is proportionality constant
(ii)	It is measured as decrease in the concentration of the reactant (or) increase in the concentration of the product.	It is equal to the rate of reaction when the concentration of each of the reactants in unity
(iii)	It depends on the initial concentration of the reactant	It doesnot depends on the initial concentration of reactant

10. Define rate law and rate constant

The rate of reaction is proportional to the product of the initial concentration of all the reactants with each reactant concentration raised to certain exponential power



$$\text{Rate} = K[\text{A}]^x [\text{B}]^y$$

Define Rate constant

* It is define as rate of the reaction when the concentration of each of the reactants is unity in the Reaction.

11. Define instantaneous rate

The rate of reaction at a particular instant during the reaction is called instantaneous rate

12. Write unit of the rate of reaction

$$\text{Unit of rate} = \frac{\text{Unit of concentration}}{\text{Unit of time}}$$

13. Define rate of chemical reaction

The change the concentration of the species involved in a chemical reaction per unit time

$$\text{Rate} : \frac{\text{Change in concentration of reactants (or) products}}{\text{Change in time}}$$

14. Define Rate determining Step

- * In a multistep reaction the experimentally determined rate corresponds to the rate of slowest step
- * The step which has the lowest rate value among the other step of reaction is called as rate determining step

15. Define average rate of reaction

$$\text{Average rate of reaction} : \frac{\text{Change in concentration of reactants (or) products}}{\text{Time Intervals}}$$

"Colors are the smiles of Nature"

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