

WAY TO PASS

1. What is the difference between minerals and ores?

	Minerals	Ores
1	Metal cannot be easily separated	Metal can be easily separated
2	All minerals are not ore	All ore are minerals
3	e.g Bauxite, China clay	e.g Bauxite

2. 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.

3. What is Flux? What is the role of Limestone in the extraction of Iron from its oxide Fe_2O_3 ?

- ❖ Material or substance that is added to molten metals in order to bind with easily removable impurities.
- ❖ Limestone act as a Flux.

4. Which type of ores can be concentrated by froth floatation method and Gravity separation?

Give two examples for such ores.

- ❖ froth floatation method - Sulphide ores. (eg) Galena (PbS), Zinc blende (ZnS)
- ❖ Gravity separation method – Oxide ores (e.g) Haematite(Fe_2O_3), Tinstone (SnO_2)

5. Define Gangue

- ❖ The non-metallic impurities, rocky materials and siliceous matter present in the ores are called gangue.

Eg : SiO_2

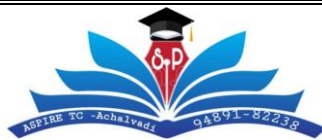
6. Define Slag

- ❖ Slag is a fusible chemical substance formed by the reaction of gangue with a flux.



7. Explain zone refining process with an example

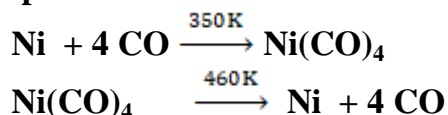
- ❖ The principle is fractional crystallisation.
- ❖ When an impure metal is melted and allowed to solidify, the impurities will prefer to remain in the molten region. ie; impurities are more soluble in the melt than in the solid state metal.
- ❖ In this process the impure metal is taken in the form of a rod. One end of the rod is heated using a mobile induction heater, melting the metal on that portion of the rod.
- ❖ When the heater is slowly moved to the other end pure metal crystallises while impurities will move on to the adjacent molten zone formed due to the movement of the heater.
- ❖ As the heater moves further away, the molten zone containing impurities also moves along with it.
- ❖ This process is repeated several times by moving the heater in the same direction again and again to achieve the desired purity level.



- ❖ This process is carried out in an inert gas atmosphere to prevent the oxidation of metals.
- ❖ E.g Germanium, Silicon and Gallium which are used as semiconductor are refined by this process.

8. Describe Mond process for refining Nickel.

Mond process



9. Give the uses of Borax.

- ❖ identification of coloured metal ions.
- ❖ It is used as a flux in metallurgy.
- ❖ It act as a preservative

10. Give the uses of silicones.

- ❖ It is used for low temperature lubrication.
- ❖ It is used for making water proofing clothes.
- ❖ It is used as insulating material in electric motor

11. What is inert pair effect?

In heavier post transition metals, the outer s-electrons (ns) have a tendency to remain inert and show reluctance to take part in the bonding .

12. Why fluorine always exhibit an oxidation state of -1?

- ❖ Small Size
- ❖ It is the most electronegative element.
- ❖ It can form hydrogen bonds

13. Why fluorine is more reactive than other halogens?

- ❖ Small Size
- ❖ It is the most electronegative element.
- ❖ Due to the minimum value of F-F bond dissociation energy

14. What are interhalogen compounds? Give examples.

- ❖ Each halogen combines with other halogen to form a series of compounds.
- ❖ E.g : $\text{Cl}_2 + \text{F}_2 \rightarrow 2\text{ClF}$

15. Give the uses of Helium.

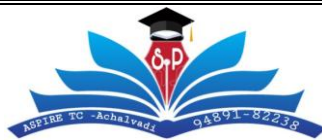
- ❖ Used for filling air balloons.
- ❖ It has lowest boiling point hence used in cryogenics.
- ❖ He-O₂ Mixture is used by diver in place of air oxygen mixture.

16. Give the uses of Neon.

- ❖ It is used in advertisement as neon sign and the brilliant red glow is caused by passing electric current through neon gas under low pressure.

17. Give the uses of Argon.

- ❖ prevents the oxidation of hot filament.
- ❖ prolongs the life in filament bulbs



18. Which is more stable? Fe^{3+} or Fe^{2+} - explain

Fe^{3+} $[Ar] 3d^5$ are stable due to half filled d-orbitals.

19. Compare lanthanides and actinides.

	lanthanides	actinides.
1	Most of the lanthanoids are colourless	Most of the actinides are colour
2	They do not form oxo cations	They do form oxo cations
3	They show less tendency to form complexes	They show greater tendency to form complexes
4	Binding energy of 4f orbitals are higher	Binding energy of 5f orbitals are lower
5	electron enters in 4f orbital	electron enters in 5f orbital

20. Give the difference between double salts and coordination compounds.

	double salts	coordination compounds
1.	They dissociate into ions in aqueous solution	They dissociate into simple ions and complex ions.
2.	They lose their identity in solution	They don't completely lose their identity in solution.
3.	Mohr's salt	$K_4[Fe(CN)_6]$

21. What is linkage isomerism? Explain with an example.

- ❖ when an ambidentate ligand is bonded to the central metal atom/ion through either of its two different donor atoms.



22. Write the postulates of Werner's theory.

Most of the elements exhibit, two types of valence

primary valence	secondary valence
It is referred as the oxidation state of the metal atom	It is referred as the coordination number
It is an ionisable valence	It is a non ionisable valence
Non directional nature	directional nature
They are always satisfied by negative ions	It is satisfied by negative ions, neutral molecules, positive ions

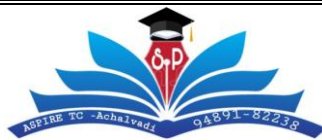
Limitations

- ❖ it does not explain their colour and the magnetic properties

23. What are hydrate isomers? Explain with an example.

- ❖ The exchange of free solvent molecules such as water, ammonia, alcohol etc.. in the crystal lattice with a ligand in the coordination entity will give different isomers..





24. What are the limitations of VB theory?

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

25. Define unit cell.

A basic repeating structural unit of a crystalline solid is called a unit cell.

26. What are the characteristics of ionic crystals.

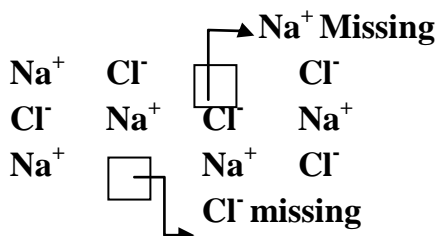
- ❖ High melting points.
- ❖ Do not conduct electricity in solid state.
- ❖ Conduct electricity in molten state (or) when dissolved in water.
- ❖ They are hard and brittle

27. Differentiate crystalline solids and amorphous solids.

CRYSTALLINE SOLIDS	AMORPHOUS SOLIDS
Long range orderly arrangement of constituents	Short range random arrangement of constituents
Definite shape	Irregular shape
Anisotropic in nature	Isotropic in nature
They are true solids	They are pseudo solids .
Definite Heat of fusion	Heat of fusion is not definite
They have sharp melting points	They do not have sharp melting points
Examples: NaCl , diamond etc.,	Examples: Rubber, plastics, glass etc

28. Explain Schottky defect.

- ❖ This defect arises due to the missing of equal number of cations and anions from the crystal lattice.
- ❖ The size of the cation and anion are of almost of similar.
- ❖ Presence of large number of schottky defects in a crystal lowers its density
- ❖ Example: NaCl.



29. Write a note on Frenkel defect.

- ❖ Frenkel defect arises due to the dislocation of ions from its crystal lattice.
- ❖ The ion which is missing from the lattice point occupies an interstitial position.
- ❖ This defect occurs when cation and anion differ in size.
- ❖ Unlike Schottky defect, this defect does not affect the density of the crystal.
- ❖ Ex: AgBr



30. Define rate law

Rate is given in terms of molar concentration of reactants raised to the power which may or may not equal to stoichiometric coefficient.

$$\text{rate} = k[A]^m[B]^n$$

31. Define rate constant.

Rate constant is same as rate of reaction when concentration of all the reactants is unity.

$$\text{Rate} = k[A]^m[B]^n$$

$$[A] = [B] = 1 \text{mole}$$

$$\text{Rate constant} = k$$

32. Define half life period.

Time required for the reactant concentration to reach one half its of initial value .

$$t_{1/2} = \frac{0.693}{k}$$

33. Write Arrhenius equation and explains the terms involved.

$$K = Ae^{-E_a/RT}$$

K = rate constant

E_a = Activation energy

A = Frequency factor

R = gas constant

T = Temperature

34. Define Activation energy.

In order to react, the colliding molecules must possess a minimum energy

35. Explain pseudo first order reaction with an example.

- ❖ A second order reaction can be altered to a first order reaction by taking one of the reactants in large excess, such reaction is called pseudo first order reaction.

Example

Acid hydrolysis of ester

36. Discuss the Arrhenius concept of acids and bases

- ❖ acid is a substance that dissociates to give hydrogen ion in water.

Ex: HCl, H₂SO₄

- ❖ base is a substance that dissociates to give hydroxyl ion in water.

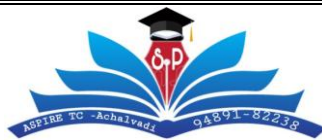
Ex: NaOH, KOH

37. Discuss the Lowry – Bronsted concept of acids and bases.

- ❖ An acid is a proton donar
- ❖ A base is a proton acceptor.

Limitations

- ❖ Substance like BF₃, AlCl₃ do not have a proton but they are acids.



38. What are Lewis acids and bases? Give two example for each.

Lewis Acids	Lewis Bases
Species that accepts an electron pair	Species that donates an electron pair
Carbonium ion	Carbanion
BF ₃ , AlCl ₃	NH ₃ , H ₂ O

39. Define pH

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

40. Define pOH

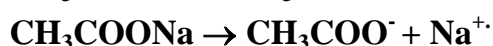
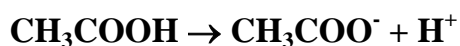
$$\text{pOH} = -\log_{10}[\text{OH}^-]$$

41. What are common ion effect? Give an example

- ❖ When the salt of the weak acid is added to the acid, the dissociation of the weak acid decreases. This is known as common ion effect.

Ex.

When sodium acetate is added to acetic acid, the dissociation of acetic acid decreases



- ❖ CH₃COO⁻ - common ion

42. Derive an expression for Ostwald's dilution law

- ❖ Ostwald's dilution law relates the dissociation constant of the weak acid (K_a) with its degree of dissociation (α) and the concentration (C)

. α = Number of moles dissociated / Total number of moles



	CH ₃ COOH	H ⁺	CH ₃ COO ⁻
Initial number of moles	1		
Degree of dissociation of CH ₃ COOH	α		
Number of moles at equilibrium	1 - α	α	α
Equilibrium concentration	(1 - α)C	αC	αC

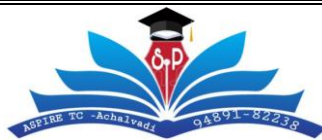
$$K_a = \frac{[\text{H}^+][\text{CH}_3\text{COO}^-]}{[\text{CH}_3\text{COOH}]}$$

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

$$K_a = \alpha^2 C$$

$$\alpha^2 = K_a / C$$

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



43. Derive Henderson – Hasselbalch equation

$$[\text{H}_3\text{O}^+] = K_a \frac{[\text{Acid}]}{[\text{Salt}]}$$

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

$$\text{pH} = \text{p}K_a - \log \frac{[\text{Acid}]}{[\text{Salt}]}$$

$$\text{pH} = \text{p}K_a + \log \frac{[\text{Salt}]}{[\text{Acid}]}$$

$$\text{pOH} = \text{p}K_b + \log \frac{[\text{Salt}]}{[\text{Base}]}$$

44. State Faraday's Laws of electrolysis

1st law

- ❖ The mass of the substance (m) liberated at an electrode during electrolysis is directly proportional to the quantity of charge (Q) passed through the cell.

$$m \propto Q$$

2nd law

- ❖ When the same quantity of charge is passed through the solutions of different electrolytes, the amount of substances liberated at the respective electrodes are directly proportional to their electrochemical equivalents

45. State Kohlrausch Law.

- ❖ At infinite dilution, the limiting molar conductivity of an electrolyte is equal to the sum of the limiting molar conductivities of its constituent ions.

46. Derive an expression for Nernst equation

relates the cell potential and the concentration of the species involved in an electrochemical reaction



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

$$\Delta G = \Delta G^0 + RT \ln Q$$

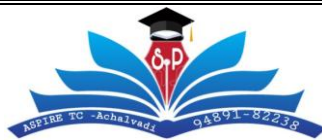
$$\Delta G = -nFE_{\text{cell}}; \Delta G^0 = -nFE^0_{\text{cell}}$$

$$-nFE_{\text{cell}} = -nFE^0_{\text{cell}} + RT \ln \frac{[\text{C}]^l[\text{D}]^m}{[\text{A}]^x[\text{B}]^y}$$

$$\square -nF$$

$$E_{\text{cell}} = E^0_{\text{cell}} - \frac{RT}{nF} \ln \frac{[\text{C}]^l[\text{D}]^m}{[\text{A}]^x[\text{B}]^y}$$

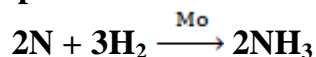
$$E_{\text{cell}} = E^0_{\text{cell}} - \frac{2.303 RT}{nF} \log \frac{[\text{C}]^l[\text{D}]^m}{[\text{A}]^x[\text{B}]^y}$$



47. What are the promoters and catalytic poison give an suitable example

❖ In a catalysed reaction the presence of a certain substance increases the activity of a catalyst. Such a substance is called a promoter.

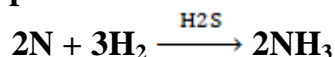
e.g : Haber's process of manufacture of ammonia



Molybdenum (Mo) - promoter

❖ certain substances when added to a catalysed reaction decreases or completely destroys the activity of catalyst and they are often known as catalytic poisons.

e.g: Haber's process of manufacture of ammonia



H₂S - catalytic poison

48. What is Tyndall effect?

❖ when light passes through colloidal solution, it is scattered in all directions

49. What is Brownian movement?

❖ The colloidal sol particles are continuously bombard with the molecules of the dispersion medium and hence they follow a zigzag, random, continuous movement.

50. Difference between DNA and RNA

DNA	RNA
It contains deoxyribose sugar	It contains ribose sugar
Base pair A = T & G ≡ C	Base pair A = U G ≡ C
Double stranded molecules	Single stranded molecules
It's life time is high	It is short lived
It is stable	It is unstable
It can replicate itself	It cannot replicate itself

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