Goal 40

The ultimate booster for slow learner's

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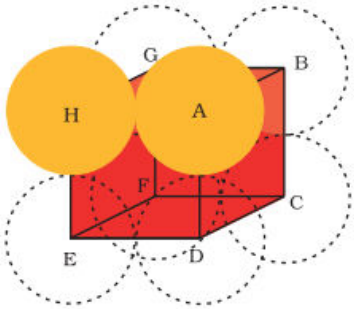
UNIT 1: SOLIDS

1. Calculate the packing efficiency in simple cubic unit cell

Let the edge length $= a$

Let the radius each particle or sphere $= r$



Volume of particle or sphere $= \frac{4}{3}\pi r^3$

Volume of cube $= a^3 = (2r)^3 == 8r^3$

$$\% \text{ packing efficiency} = \frac{volume\ of\ one\ sphere}{volume\ of\ cube} \times 100$$

$$\% \text{ packing efficiency} = \frac{\frac{4}{3}\pi r^3}{8r^3} \times 100 = \frac{4}{3} \times \frac{22}{7} \times \frac{1}{8} \times 100 = 52.4$$

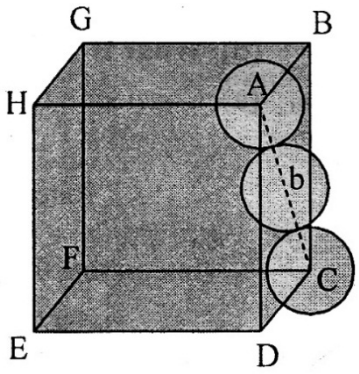
2. Calculate the packing efficiency in a unit cell of cubic close packing (CCP) structure. Or Calculate the packing efficiency in face centered cubic (FCC) lattice Or Calculate the packing efficiency in a unit cell of hexagonal close packing (HCP) structure.

In ΔABC, $AC^2 = BC^2 + AB^2$

$b^2 = a^2 + a^2$ $\qquad b^2 = 2a^2$

$\therefore\ b = \sqrt{2}\ a$ $\qquad ---(1)$

We know that $b = 4r$ $\qquad ----(2)$



Equating (1) and (2) we get

$$\sqrt{2}\ a = 4r \qquad \Rightarrow a = \frac{4r}{\sqrt{2}} \qquad \Rightarrow a = 2\sqrt{2}\ r$$

The volume of four atoms (four spheres)

$$= 4 \times \frac{4}{3}\pi r^3 = \frac{16}{3}\pi r^3$$

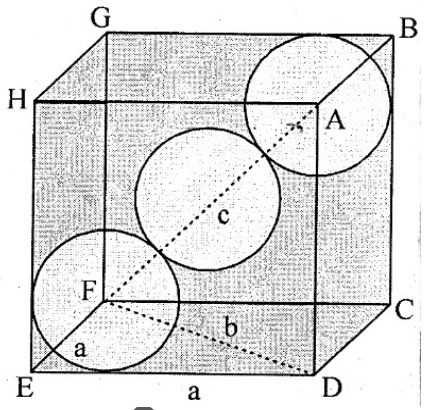
The volume of the cubic unit cell $= a^3 = \left(2\sqrt{2}r\right)^3$

$$\% \text{ packing efficiency} = \frac{\text{Volume of four spheres}}{\text{Volume of the unit cell}} \times 100$$

$$\% \text{ packing efficiency} = \frac{\frac{16}{3} \times \frac{22}{7} r^3}{8\left(\sqrt{2}\right)^3 r^3} \times 100$$

$$\% \text{ packing efficiency } = \frac{\frac{16}{3}\times\frac{22}{7}}{8\left(\sqrt{2}\right)^3}\times 100 = 74$$

3. Calculate the packing efficiency in body centered cubic unit cell.



In Δ *EFD*

$FD^2 = EF^2 + ED^2$

$b^2 = a^2 + a^2 = 2a^2$

$b = \sqrt{2}a$

In Δ *AFD*

$AF^2 = AD^2 + FD^2$

$c^2 = a^2 + b^2 = a^2 + 2a^2 = 3a^2$

$c = \sqrt{3}\,a$ ------(1)

We know that $c = 4r$ ------(2)

Equating (1) and (2)

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

The volume of two atoms (two spheres) $= 2\times\frac{4}{3}\pi r^3 = \frac{8}{3}\pi r^3$

Volume of the unit cell $= a^3 = \left(\frac{4r}{\sqrt{3}}\right)^3$

$$\% \text{ packing efficiency} = \frac{Volume\ of\ two\ atoms\ (\ two\ spheres\ )\ in\ unit\ cell}{Volume\ of\ the\ unit\ cell}\times 100$$

$$\% \text{ packing efficiency} = \frac{2\times\frac{4}{3}\pi r^3}{\left(\frac{4r}{\sqrt{3}}\right)^3}\times 100 = \frac{\frac{8}{3}\pi r^3}{\frac{64}{3\sqrt{3}}r^3}\times 100 = \frac{\sqrt{3}\,\pi}{8}\times 100 = 68$$

4. What is Frenkel defect? How does it affect the density of a crystal?

It is a point defect, in which smaller ion (usually cation) leave the lattice point and occupy interstitial site. Ex- AgBr, AgCl

Density remains constant.

5. What is Schottky defects? Give an example

It is a point defect, in which equal number of cations and anions are missing from the lattice point.

Ex: NaCl, KCl, AgBr

6. Write any two differences between Crystalline and Amorphous solid.

Crystalline	Amorphous
1. Anisotropic 2. It has ordered arrangement of particles. Ex: NaCl	1. Isotropic 2. It has non-ordered arrangement of particle. Ex: Rubber

7. Write any two differences between Schottky and Frenkel defect.

Schottky	Frenkel
1. Density decreases 2. Vacancy defect Ex: NaCl, KCl	1. Density remains constant 2. Interstitial defect Ex: AgBr, AgCl

8. Give two differences between p-type & n-type semiconductors.

p-type	n-type
1. Doped with trivalent atoms 2. Holes contribute to conduction.	1. Doped with pentavalent atoms. 2. Negative charges (electrons) contribute to conduction.

9. Calculate the number of particles per unit cell in FCC.

Ans:

Contribution of corner particle = 1/8

Contribution of a face centre particle = 1/2

Number of particles per unit cell of FCC =

$$\left(\frac{1}{8}\times 8\,Corners\right)+\left(\frac{1}{2}\times 6\,face\,centre\right)=1+3=4$$

10. Calculate the number of particles per unit cell in BCC.

Ans:

Contribution of corner particle = 1/8

Contribution of a body centre particle = 1

Number of particles per unit cell of BCC =

$$\left(\frac{1}{8}\times 8\,Corners\right)+\left(1\times 1\,body\,centre\right)=1+1=2$$

11. Calculate the number of particles per unit cell in SCC.

Ans:

Contribution of corner particle = 1/8

Number of particles per unit cell of $SCC = \left(\frac{1}{8} \times 8\, Corners\right) = 1$

UNIT: 3 CHEMICAL KINETICS

1. Derive the integrated rate equation for the rate constant of a first order reaction.

Ans:

Consider a first order reaction $R \rightarrow P$

Rate equation: $\text{rate} = k[R]$

Differential equation: $-\frac{d[R]}{dt} = k[R]$

Rearanging the equation: $\frac{d[R]}{[R]} = -kdt$

Integrating the equation on both sides $\ln[R] = -kdt + I \quad ------ \quad (1)$

To find I, When t=0, $[R] = [R]_0$

Substituting in (1)

$\ln[R]_0 = I$

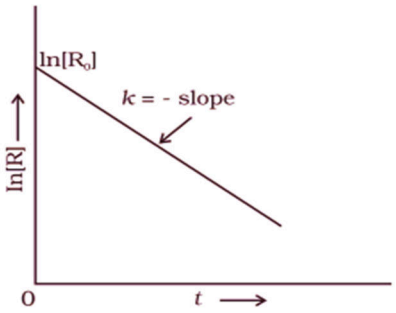
Substituting I value in (1), we get

$\ln[R] = -kt + \ln[R]_0$

Rearranging the equation, we get

$kt = \ln[R]_0 - \ln[R]$

$k = \frac{1}{t} \ln \frac{[R]_0}{[R]}$ Or $k = \frac{2.303}{t} \log \frac{[R]_0}{[R]}$



2. Derive an integrated rate equation for the rate constant of zero order reaction.

Consider a zero order reaction $R \rightarrow P$

Rate equation: $rate = k[R]^0 \qquad rate = k$

Differential equation: $-\frac{d[R]}{dt} = k$

Rearanging the equation: $d[R] = -kdt$

Integrating the equation on both sides $[R] = -kdt + I \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$

To find I, when $t = 0$, $[R] = [R]_0$

$[R]_0 = -k \times 0 + 1 \qquad I = [R]_0$

Substituting I value in equation (1), we get $[R] = -kt + [R]_0$

Rearranging the equation, we get $kt = [R]_0 - [R]$ Or $k = \frac{[R]_0 - [R]}{t}$

3. Derive an expression for half-life of zero order reaction Or Show that half-life period for a zero order reaction is directly proportional to initial concentration.

We know that $t = \frac{[R]_0 - [R]}{k}$

When $t = t_{1/2}$, $[R] = \frac{[R]_0}{2}$

Substituting the values, $t_{1/2} = \frac{[R]_0 - \frac{[R]_0}{2}}{k}$

$\therefore t_{1/2} = \frac{[R]_0}{2k}$

4. Show that half-life period of first order reaction is independent of the initial concentration of the reactant Or Derive an expression for half-life period of a first order reaction.

We know that $t = \frac{2.303}{k} \log \frac{[R_0]}{[R]}$

When $t = t_{1/2}$, $[R] = \frac{[R]_0}{2}$

Substituting the values,

$t_{1/2} = \frac{2.303}{k} \log \frac{[R]_0}{\frac{[R]_0}{2}}$

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

$t_{1/2} = \frac{2.303 \times 0.3011}{k}$

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

$\therefore t_{1/2}$ of a first reaction is independent of initial concentration of a reactant.

5. What are the two criteria for effective collision according to collision theory? Or what are the two factors that lead to effective collisions?
Ans:

- Sufficient kinetic energy
- Proper orientation of reactans.

6. Give any two differences between order and molecularity of reaction.
Ans:

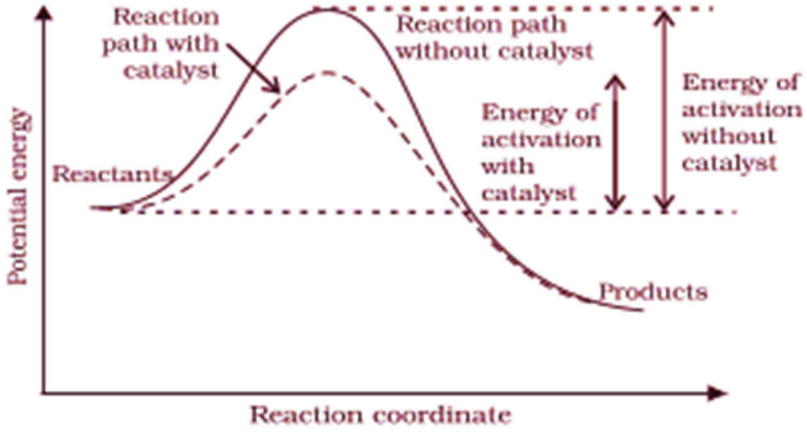
Molecularity	Order of a reaction
1. Theoretical value	1. Experimental value
2. It is always a whole number	2. It can be whole number or fractional or even zero.

7. Define collision frequency.
Ans:
Number of collisions per unit time per unit volume of a reaction mixture.

8. Write the Arrhenius equation and mention what each term stands for?
Ans:
Arrhenius equation $k = Ae^{-E_a/RT}$
$k =$ Rate constant
$E_a =$ Activation energy
$R =$ Gas constant
$A =$ Arrhenius constant
$T =$ Temperature

9. Draw a potential energy versus reaction coordinate to show the effect of catalyst on activation energy. Or explain the effect of catalyst on activation energy of a reaction with graph.
Ans:

- Catalyst provides an alternate pathway or mechanism by lowering the activation energy between reactants and products.
- Catalyst lower the potential energy barrier and increases the rate of the reaction.
- Lower the value of activation energy faster will be the rate of a reaction.



10. Mention any two factors which affects the rate of a reaction.

Ans:

1. Concentration of reactants
2. Catalyst
3. Temperature

11. What is pseudo first order reaction? Give an example

Order of reaction is one and molecularity is two or more than two are called pseudo first order reaction Or It is a higher order reaction made to behave like lower order reaction when all the reactants are present in excess except one.

Ex: Inversion of cane sugar is another pseudo first order reaction.

$$\underset{\text{Cane sugar}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{H^+} \underset{\text{Glucose}}{C_6H_{12}O_6} + \underset{\text{Fructose}}{C_6H_{12}O_6}$$

UNIT 5: SURFACE CHEMISTRY

1. Write any two differences between lyophilic and lyophobic sols.

Ans:

Lyophilic sols	Lyophobic sols
1. More stable	1. Less stable
2. Reversible	2. Irreversible
3. Cannot be easily coagulated	3. Can be easily coagulated

2. Write any two differences between physisorption and chemisorption?

Ans:

Physisorption	Chemisorption
1. Reversible	1. Irreversible
2. Non-specific	2. Highly specific
3. Low temperatures is preferred	3. High temperature is preferred

3. Among Physisorption or chemisorption which one has higher enthalpy of adsorption?

Chemisorption.

4. Write any two characteristics of physisorption.

- Reversible
- Non-specific

- Low temperatures is preferred for physisorption.

5. Write any two characteristics of chemisorption.

- Irreversible
- Highly specific
- High temperature is preferred for chemisorption.

6. What is the change in enthalpy (ΔH), entropy (ΔS) & Gibbs free energy (ΔG) for adsorption.

Change in enthalpy (ΔH) =Negative
Change in entropy (ΔS) = Negative
Change in Gibb's free energy (ΔG) = Negative.

7. Mention two applications of adsorption.

- In gas masks
- In Control of humidity

8. Give an expression for Freundlish adsorption isotherm.

$\frac{X}{m} = k\,p^{1/n}$ Or $log\ \frac{x}{m} = log\ k + \frac{1}{n}\ log\ p$

9. What is homogeneous catalysis? Give an example.

It is a catalysis in which both reactants and the catalyst are present in the same phase.

$$2SO_2(g) + O_2(g) \xrightarrow{NO(g)} 2SO_3(g)$$

10. What is heterogeneous catalysis? Give an example.

It is a catalysis in which reactants and the catalyst are present in the different phase.

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

11. Define Shape selective catalysis.

The catalytic reaction that depends upon the pore structure of the catalyst and the size of the reactant and product molecules is called shape-selective catalysis.

12. Name the Zeolite catalyst used to convert alcohols to gasoline in petroleum industry.

ZSM-5.

13. What are zeolites?

These are microporous aluminosilicates with three dimensional network of silicates in which some silicon atoms are replaced by aluminium atoms giving Al–O–Si framework.

14. **What is meant by selectivity of catalyst?**
    The selectivity of a catalyst is its ability to direct a reaction to yield a particular product.

15. **Write the two steps involved in the mechanism of enzyme catalysed reaction.**
    Step 1: Binding of enzyme to substrate to form an activated complex.
    $E + S \longrightarrow ES^{\neq}$
    Step 2: Decomposition of the activated complex to form product
    $ES^{\neq} \longrightarrow E + S$

16. **Lyophilic colloids are more stable why?**
    - Charge
    - High Solvation energy.

17. **What are multi molecular colloid? Give an example**
    Colloids which are formed by aggregation of many small atoms or molecules, whose size is less than 1nm.
    Ex: Sulphur sol and gold sol etc.,

18. **What are macromolecular colloid? Give an example.**
    Colloids which are prepared by dissolving macromolecules in suitable solvent are called macromolecules.
    Ex: Starch, cellulose etc.,

19. **What are associated colloids? What are micelle?**
    Substances which behaves as strong electrolyte at lower concentration but at higher concentration it aggregates to reach colloidal range are called associated colloid or micelle.
    Ex: Soap in water.

20. **What is peptization? Give an example.**
    The process of converting a freshly prepared precipitate into colloidal particles by adding suitable electrolyte. The electrolyte used for this purpose is called peptizing agent.

21. **What is Brownian movement?**
    Zig-Zag moment of colloidal particles in a colloidal solution.

22. **What is the cause for Brownian movement?**
    Brownian movement is due continuous bombardment of the colloidal particles in colloidal solution.

23. **What is Tyndall effect?**
    Scattering of light by the colloidal particles is called tyndall effect**.**

24. **What is electrophoresis?**
Movement of colloidal particle either towards cathode or towards anode under applied electric field.
Use: It is used to find the charge of the colloid

25. **What is electro osmosis?**
Movement of dispersion medium in an electric field by preventing the movement of colloidal particles by suitable method is called electro osmosis.

26. **What is coagulation of colloids? Or what is coagulation of a sol? Name two methods by which lyophobic colloid can be coagulated?**
Process of conversion of colloidal particles into precipitate by suitable method is called coagulation.
Methods of Coagulation:
Boiling
Prolonged electrophoresis.

27. **State Hardy-Schulze rule.**
Greater the valency of the coagulating ion greater is its coagulating power.
For negatively charged colloid coagulating power of $Al^{3+} > Ba^{2+} > Na^{+}$.
For positively charged colloid coagulating power of
$[Fe(CN)_6]^{4-} > PO_4^{3-} > SO_4^{2-} > Cl^{-}$

28. **Between $AlCl_3$ and KCl which one is required in minimum concentration t coagulate the negatively charged As_2S_3 sol.**
$AlCl_3$.

29. **Between calcium sulphate and calcium phosphate which one is required in a maximum concentration to coagulate positively charged $Fe(OH)_3$.**
Calcium sulphate.

30. **What is colloidion?**
4% solution of nitrocellulose in a mixture of alcohol and ether.

31. **What are emulsions? Give an example for O/W emulsion.**
Liquid-liquid colloidal system are called emulsions
Ex: Milk, vanishing cream.

32. **Give an example for W/O emulsions.**
Butter and cream.

33. **Name the adsorbent used to remove the colouring matter from the solution.**
Animal charcoal or activated charcoal.

34. **Give an example for an emulsifying agent used for the water in oil type.**
Lampblack.

35. Give an example for an emulsifying agent used for the oil in water
Protein and gums.

36. Mention the role of alum in the purification of drinking water?
It coagulates the suspended impurities.

37. What is coagulating value of flocculating value?
the minimum concentration of an electrolyte in millimoles per litre required to cause precipitation of a sol in 2hrs.

UNIT 7: p-BLOCK ELEMENTS

1. Write the chemical reaction involved and mention the condition required in the manufacture of ammonia by Haber's process.
Ans:

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) \quad \Delta H = -46.1\ kJ\ mol^{-1}$

Conditions:

- **Temperatue:** 700 K
- **Pressure:** 200 atm
- **Catalyst:** FeO(Iron (II) oxide)
- **Catalytic promoter:** K_2O and Al_2O_3

2. Write the reactions that take place during the manufacture of nitric acid by Oswald process.
Ans:
Step-1: Oxidation of Ammonia

$4NH_3 + 5O_2 \xrightarrow[500\ K,\ 9\ bar]{Pt-Rh\ gauze} 4NO + 6H_2O$

Step-2: Oxidation of nitric oxide

$2NO(g) + O_2(g) \rightleftharpoons 2NO_2(g)$

Step-3: Preparation of nitric acid

$3NO_2 + H_2O \longrightarrow 2HNO_3 + NO$

3. Explain the preparation of sulphuric acid by Contact process.
Step-1: Oxidation of sulphur

$S + O_2 \longrightarrow SO_2$

Step-2: Conversion of SO_2 to SO_3

$SO_2 + O_2 \xrightarrow[2bar, 720K]{V_2O_5} SO_3$

Step-3: Absorption of SO_3 in H_2SO_4

$$SO_3 + H_2SO_4 \longrightarrow H_2S_2O_7$$

$$H_2S_2O_7 + H_2O \longrightarrow H_2SO_4$$

4. Give two reasons for the anomalous behavior of fluorine/Nitrogen Oxygen.

- Small size
- d-orbitals are absent
- Ionisation energy is high
- Electronegativity is high.

5. Write any two anomalous properties of Nitrogen/Oxygen/Fluorine

a. Bond dissociation enthalpy is high

b. Catenation is low

c. Covalency is four.

UNIT 8: d AND f BLOCK ELEMENTS

1. Explain the manufacture of Potassium dichromate from chromite ore.

Ans:

Step-1: Oxidation of Chromite ore with sodium carbonate in presence of excess of **air**

$$4FeCr_2O_4 + 8Na_2CO_3 + 7O_2 \longrightarrow 8Na_2CrO_4 + 2Fe_2O_3 + 8CO_2$$

Step-2: Acidification of sodium chromate

$$2Na_2CrO_4 + H_2SO_4 \longrightarrow Na_2Cr_2O_7 + Na_2SO_4 + H_2O$$

Step-3: Preparation of potassium dichromate

$$Na_2Cr_2O_7 + 2KCl \longrightarrow K_2Cr_2O_7 + 2NaCl$$

2. How is potassium permanganate prepared? Give equations

Ans:

Step 1: Oxidation of MnO_2 fused with KOH

$$2MnO_2 + 4KOH + O_2 \longrightarrow 2K_2MnO_4 + 2H_2O$$

Step 2: Disproportionation of manganate ion in acidic medium

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

3. Write the general electronic configuration of f-block elements?

$[Noble\ gas]\ (n-2)f^{1-14}(n-1)d^{0-1}ns^2$.

4. **Write the general electronic configuration lanthanides?**
   $[Xe]\ 4f^{1-14}5d^{0-1}6s^2$.

5. **Write the general electronic configuration actinides?**
   $[Rn]\ 5f^{1-14}6d^{0-1}7s^2$.

6. **What is the common oxidation number of lanthanides?**
   +3.

7. **What is the common oxidation number of actinides?**
   +3.

8. **Lanthanoids show variable oxidation state why?**
   Due to the comparable energies of 4f, 5d and 6s subshell.

9. **Actinoids show variable oxidation state why?**
   Due to the comparable energies of 5f, 6d and 7s subshell.

10. **Cerium (Ce) exhibits +4 oxidation state why?**
    It attains noble gas electronic configuration in +4 oxidation state.

11. **Europium (Eu) exhibits +2 oxidation state why?**
    It attains half-filled 4f subshell electronic configuration.

12. **Ytterbium (Yb) exhibits +2 oxidation state why?**
    It attains completely filled 4f subshell electronic configuration.

13. **Name the elements in the lanthanide series which exhibits +4 oxidation state?**
    Cerium (Ce).

14. **What is lanthanide contraction? Write its consequences?**
    The gradual decrease in atomic and ionic radii with increase in atomic number along lanthanide series is called lanthanide contraction.
    Consequences: The almost identical radii of (160 pm) and Hf (159 pm).

15. **Give reason: Hf (Hafnium) and Zr (Zirconium) have similar radii**
    It is due to lanthanide contraction.

16. **What is the cause for lanthanide contraction?**
    Poor shielding caused by the electrons present in the 4f subshell.

17. **What is actinide contraction?**
    The gradual decrease in atomic and ionic radii with increase in atomic number along actinide series is called actinide contraction

18. **What is the cause for actinide contraction?**
    Poor shielding caused by the electrons present in the 5f subshell

19. Actinide contraction is greater than lanthanide contraction why?

5f subshell causes very poor shielding effect than 4f subshell

20. Give any two differences between lanthanides and actinide

S. No	Lanthanide	Actinide
1	4f subshells are progressively filled	5f subshells are progressively filled
2	Less reactive	Highly reactive
3	Only Pm is radioactive	All are radioactive

21. What is misch metal?

Mischmetall which consists of a lanthanide metal (~ 95%) and iron (~ 5%) and traces of S, C, Ca and Al.

22. Which is more basic between $La(OH)_3$ and $Lu(OH)_3$? Give reason

$La(OH)_3$ is more basic. $La(OH)_3$ is more ionic than $Lu(OH)_3$ due to lanthanide contraction.

23. Study of actinides elements is difficult. Give reasons.

1. Actinides are available in very small quantity
2. Actinides are radioactive in nature.

24. Lanthanides are less reactive than actinides.

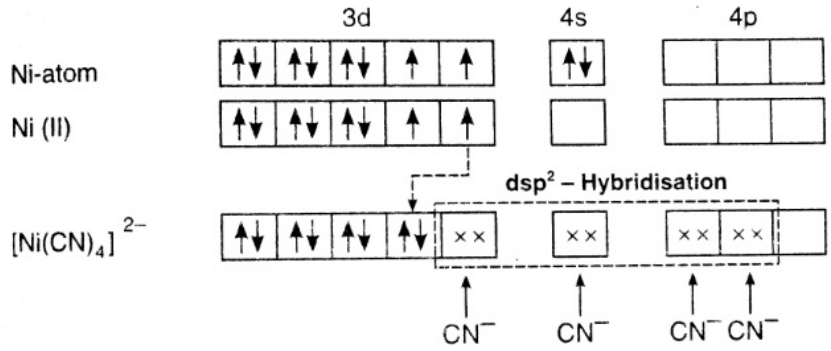
- Actinides are radioactive in nature
- Actinides have very short half life

UNIT 8: CO-ORDINATION COMPOUNDS

1. Using VBT account for the geometry, hybridisation and magnetic property of $\left[Ni(CN)_4 \right]^{2-}$.

Ans: Electronic Configuration of $Ni - \left[Ar \right] 3d^8 4s^2$

Electronic Configuration of $Ni^{2+} - \left[Ar \right] 3d^8 4s^0$

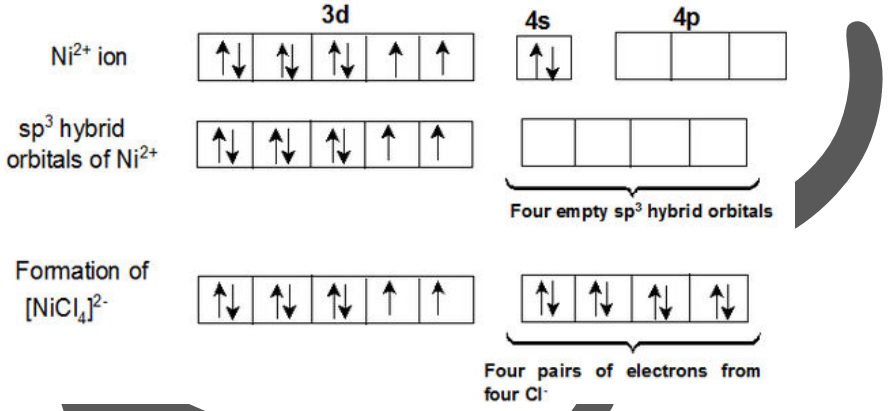


Hybridisation: dsp^2

Geometry: square planar

Magnetic property: Diamagnetic.

2. Using VBT account for the geometry, hybridisation and magnetic property of $\left[\mathbf{Ni\left(Cl\right)_4} \right]^{2-}$.



Hybrisisation: sp^3

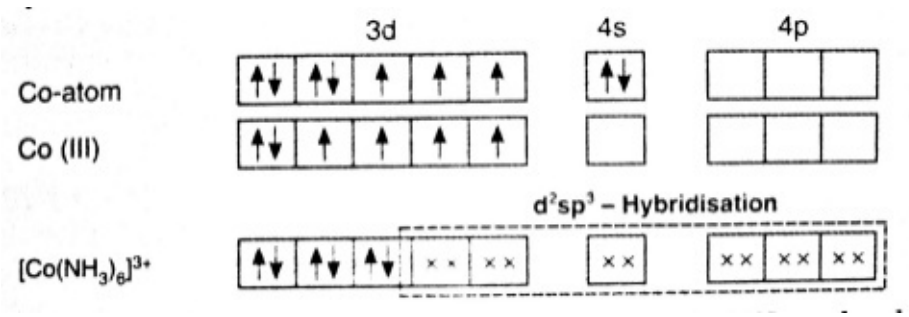
Geometry: Tetrahedral

Magnetic property: Paramagnetic.

3. Give the geometry, hybridization and magnetic property of $[Co\left(NH_3\right)_6]^{3+}$ based on VBT

Ans: Electronic Configuration of $Co - \left[Ar \right] 3d^7 4s^2$

Electronic Configuration of $Co^{3+} = \left[Ar \right] 3d^6\ 4s^0$



Hybridisation: d^2sp^3

Geometrical shape: Octahedral

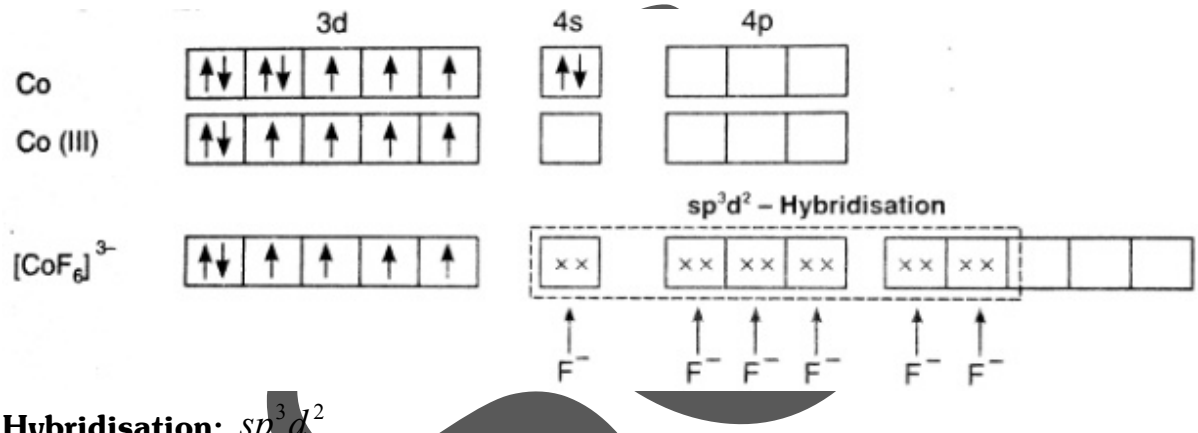
Magnetic property: Diamagnetic.

4. **Using VBT, explain the hybridization, geometry and magnetic property of $[CoF_6]^{3-}$ hexafluoridocobaltate(III) ion(Atomic number of Co=27).**

Ans:

Electronic Configuration of $Co - [Ar]3d^7 4s^2$

Electronic Configuration of $Co^{3+} = [Ar]3d^6 4s^0$



Hybridisation: sp^3d^2

Geometry: Octahedral

Magnetic property: paramagnetic.

5. **Write any three postulates of Werner's theory of complexes.**

Ans:

1. Coordination compounds have two types of valency

a) Primary valency b) Secondary valency

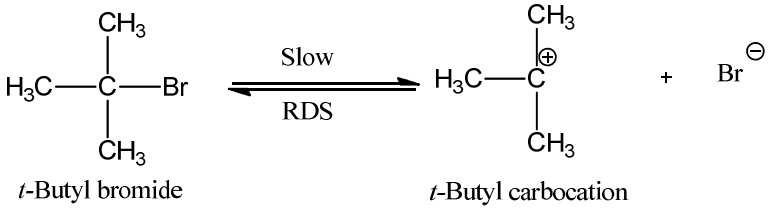
2. Primary valency is ionisable.

3. Secondary valencies are non-ionisable.

UNIT: 9 HALO ALKANES AND HALOARENES

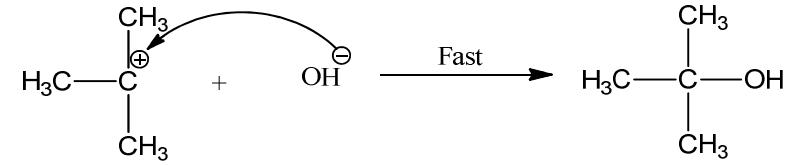
1. **Explain S_N1 mechanism by taking *tert*-butyl bromide as an example.**

Step 1: Formation of carbocation.



t-Butyl bromide *t*-Butyl carbocation

Step 2: Attack of Nucleophile OH^-



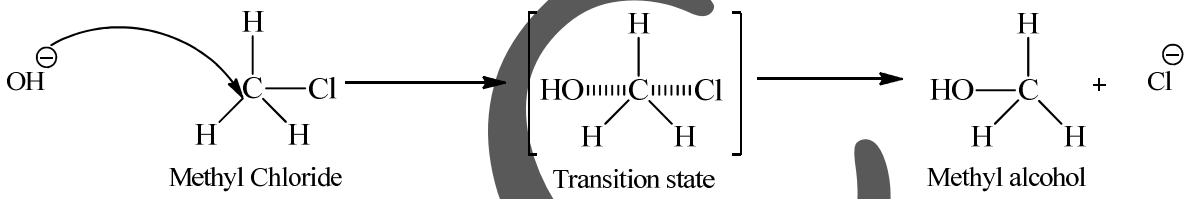
t-Butyl carbocation *t*-Butyl alcohol

When *tert*-Butyl bromide undergo for heterolysis it forms *tert*-butyl carbocation. It is symmetrical in nature and it is attached by hydroxide ion from both the side equally to give *tert*-Butyl alcohol.

$Rate \alpha [R-X]$, Hence it is a first order reaction.

2. Explain S_N2 mechanism with an example.

Ans:



Methyl Chloride Transition state Methyl alcohol

When methyl chloride reacts with nucleophile hydroxide ion, nucleophile attack the carbon from the back side to form transition state. Which undergo for decomposition to give methyl alcohol and chloride ion.

$Rate \alpha [R-X][OH^-]$

3. Differences between S_N1 and S_N2

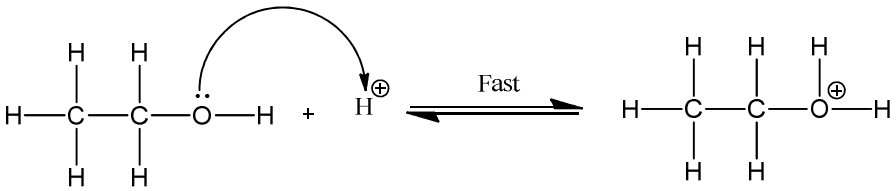
S_N1 Mechanism	S_N2 Mechanism
1. Follows First order kinetics	1. Follows Second order kinetics
2. Occurs in two step	2. Occurs in one step
3. Order of reactivity:$3^0>2^0>1^0$	3. Order of reactivity:$1^0>2^0>3^0$

UNIT: 10 Alcohols phenols and ethers

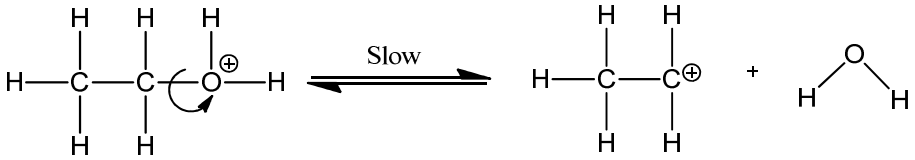
1. Explain the mechanism of acid catalysed dehydration of ethanol into ethene

Ans:

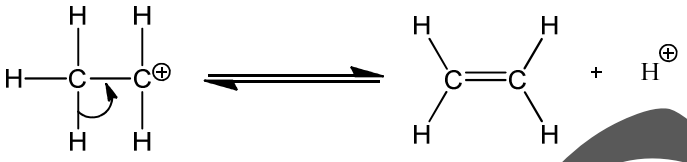
Step – 1: Protonation of alcohol



Step – 2: Formation of carbocation



Step – 3: Elimination of β-proton

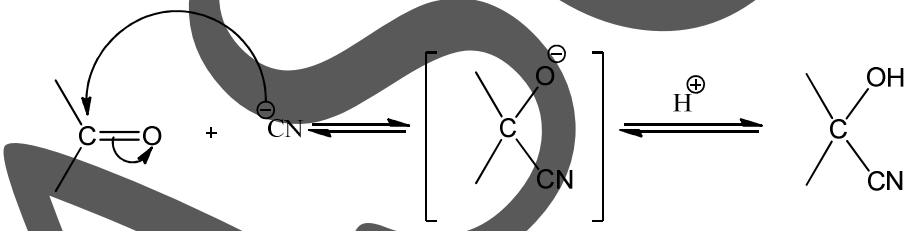


UNIT 14: ALDEHYDES KETONES AND CARBOXYLIC ACID

1. Explain the mechanism of addition of HCN to a carbonyl group in the presence of a base.

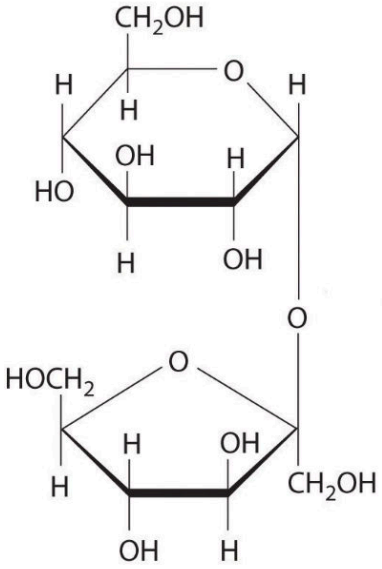
Ans:

$$HCN + OH^- \rightleftharpoons CN^- + H_2O$$

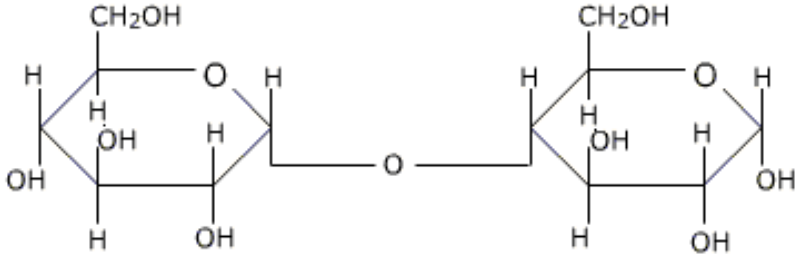


Aldehydes and ketones react with hydrogen cyanide (HCN) to yield cyanohydrins. It is catalysed by a base and the generated cyanide ion (CN^-) being a stronger nucleophile readily adds to carbonyl compounds to yield corresponding cyanohydrin.

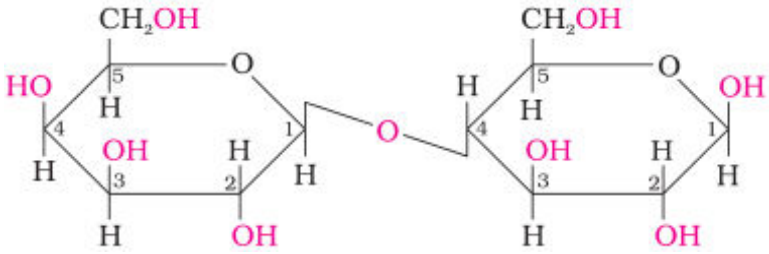
1. **Write the Haworth's structure of sucrose.**



2. **Write the Haworth's structure of maltose.**
   Ans:



3. **Write the Haworth's structure of lactose.**



4. **Reducing sugars:** These are the sugars which reduces Tollen's reagent or Fehling solution or Benedict reagent due to the presence of free aldehydic or ketonic group.
   Ex: glucose, fructose, maltose, lactose.

5. **Non-Reducing sugars:** These are the sugars which do not reduces Tollen's reagent or Fehling solution or Benedict's reagent due to the absence of free aldehydic or ketonic group.
   Ex: Sucrose

6. **What is the major component of starch?**
   Amylopectin.

7. **What is the water soluble component of starch?**
   Amylose.

8. **Give an example for optically inactive amino acid**
   Glycine.

9. **Give an example for optically acidic amino acid**
   Aspartic acid, Glutamic acid.

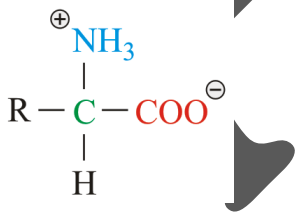
10. **Give an example for optically basic amino acid**
    Lysine, Arginine.

11. **What are non-essential amino acids?**
    Amino acids which can be synthesized by human body are called non-essential amino acids.
    Ex: Glycine.

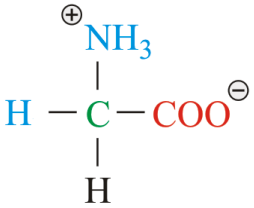
12. **What are essential amino acids?**
    Amino acids which can't be synthesized by human body and must be supplied through the diet are called essential amino acids.
    Ex: Methionine, Arginine, tryptophan, Threonine, valine, Isoleucine, leucine, phenyl alanine, histidine, lysine.

13. **What is Zwitter ion?**
    In aqueous solution of amino acid, the carboxyl group loses a proton and amino group accepts a proton, to form dipolar ion known as zwitter ion (i.e., both *+ve* and *−ve* charge).

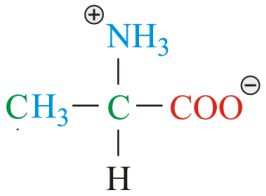
14. **Write the General structure of Zwitter-ionic form of an amino acid.**



15. **Write the structure of Zwitter-ionic form of glycine.**



16. Write the structure of Zwitter-ionic form of alanine.



17. What are Fibrous protein? Give an example

These proteins have thread like the structure and insoluble in water.

Ex: Keratin (present in hair, nails, skin)

Myosin (present in muscles).

18. What are Globular proteins? Give an example

These are proteins, which have spherical shape and soluble in water.

Eg: Insulin, Albumins, Hemoglobin

19. Name the nitrogenous base present only in DNA but not in RNA.

Thymine.

20. What is a peptide bond? How many peptide bonds are present in a tetra peptide?

Amide bond (-CO-NH-) formed between two amino acids molecules with the elimination of a water molecule is called as peptide bond.

21. How many peptide bonds are present in a tetra-peptide?

Three.

22. Vitamin-C cannot be stored in the body. Give reason.

Since vitamin-C is water soluble, excess of vitamin-C is excreted through urine.

23. Vitamins and deficiency diseases:

Vitamin	Deficiency disease
A	Night blindness
C	Scurvy
D	Rickets
E	Increased fragility of RBCs and muscular weakness
K	Increased blood clotting time
B_1	Beri-beri
B_2	Cheilosis
B_6	Convulsions
B_{12}	Pernicious anaemia

24. Name the hormone which regulates the blood sugar level.
Insulin or glucagon.

25. Name the hormone which is responsible for secondary sexual character in female.
Estrogen.

26. Name the hormone which is responsible for secondary sexual character in male.
Testosterone.

27. Name the hormone which Controls carbohydrate metabolism.
Glucocorticoids.

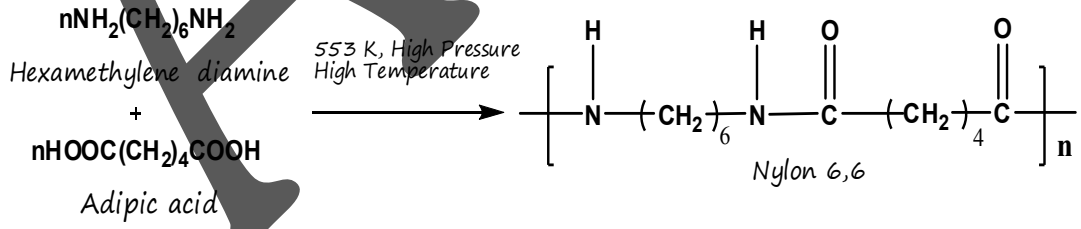
28. Name the hormone which Controls the level of excretion of water and salt by the kidney.
Mineralocorticoids.

29. Name the hormone containing iodine.
Thyroxine.

30. Name the hormone which is responsible for hypothyroidism, growth and development.
Thyroxine.

UNIT 15: POLYMERS

1. Explain the preparation of Nylon 6, 6.



It is made by condensing hexamethylenediamine with adipic acid under high pressure and at high temperature.

2. Explain the preparation of Buna-S with equation

$$nCH_2=CH-C=CH_2+nCH_2=\underset{\displaystyle C_6H_5}{\underset{|}{CH}}\longrightarrow-\left(CH_2-C=CH-CH_2-CH_2-\underset{\displaystyle C_6H_5}{\underset{|}{CH}}\right)_n-$$

When 1, 3-butadiene react with styrene it undergo addition polymerization to give Buna-S.

3. How is Buna-N prepared? Write the equation.

$$nCH_2 = CH - C = CH_2 + nCH_2 = \underset{\underset{CN}{|}}{CH} \longrightarrow -\left(CH_2 - C = CH - CH_2 - CH_2 - \underset{\underset{CN}{|}}{CH}\right)_n -$$

When 1 – 3 butadiene is heated with acrylonitrile it undergo for addition polymerization to give Buna-N

4. How is Neoprene prepared? Give equation.

$$nCH_2 = \underset{\underset{Cl}{|}}{CH} - CH = CH_2 \longrightarrow -\left(CH_2 = \underset{\underset{Cl}{|}}{CH} - CH = CH_2\right)_n -$$

When chloroprene undergo addition polymerization in presence of catalyst neoprene is formed.

5. What is vulcanization?

The process of heating raw rubber with elemental Sulphur to improve its property is called vulcanization.

6. Give the IUPAC of the monomer of natural rubber

2-methyl 1, 3 – butadiene

7. What are Biodegradable polymers? Give an example.

These are synthetic polymers which have functional group similar to biopolymers and get degraded in the environment easily are known as biodegradable polymers.
Ex: Nylon-2-nylon-6, PHBV.

8. Give one example for biodegradable polyester

PHBV,

9. Give one example for biodegradable polyamide

nylon-2-nylon-6.

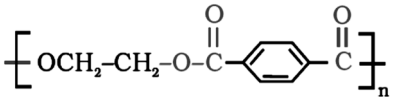
10. What are condensation polymers? Give an example.

These are polymers which are formed by repeated condensation between monomers having different bifunctional or trifunctional groups.
Ex: Nylon 6, 6.

11. Mention the monomers and write the partial structure of Dacron or terylene.

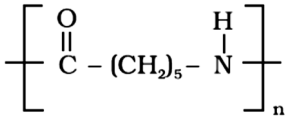
Monomers: Terephthalic acid and ethylene glycol.

Partial structure:



12. Name the monomer and write the partial structure of Nylon-6?

Monomer: Caprolactum

Partial structure: 

13. What is addition polymerization? Give examples

these are polymers which are formed by repeated addition of monomers having double bond and triple bond without eliminating a byproduct.

Ex: polythene, poly propene.

14. What are homo polymer? Give example

Addition polymers formed by the polymerization of one type of monomers are called homo polymer. Ex: Polythene (monomer unit in ethane).

15. What are co polymers? Give on example

These are polymers which are made up of more than one kind of monomer

Ex: Buna-N, Buna-S, Nylon-6,6.

16. What are elastomers? Give an example.

Elastomers are rubber like solid with elastic properties. In these the polymer chains are held by weakest intermolecular forces.

Ex: vulcanized rubber, Buna-S, Buna-N, neoprene etc

17. What are fibers? Give examples

Fibres are thread- like solids possessing high tensile strength and high modulus. Polymer chains are held together strong intermolecular forces like hydrogen bonding.

Ex: Nylon 6, 6, terylene, Nylon 6, silk etc

18. What are thermoplastic polymers? Give an example.

These are linear or slightly branched polymers which get soften on heating and harden on cooling.

Ex: Polyethene, PVC, Teflon, Styron etc.,

19. What are thermosetting polymers? Give an example.

These are cross linked or heavily branched polymer, on heating they undergo extensive cross linking and become hard and infusible.

Ex: Bakelite, melamine-formaldehyde resin, urea formaldehyde resin etc.,

20. Write any two differences between thermoplastic polymer and thermosetting polymers.

S.No	Thermoplastic polymer	Thermosetting polymer
1	These are linear or slightly branched polymers which get soften on heating	These are cross linked or heavily branched polymer, On heating they

	and harden on cooling.	undergo extensive cross linking and become hard and infusible.
2	It can be reused	It cannot be reused
	Ex: Polyethene, PVC, Teflon, Styron	Ex: Bakelite, melmac

UNIT 14: CHEMISTRY IN EVERYDAY LIFE

1. **What are antacids? Give an example.**
   Drug which controls excessive secretion of an acid
   Ex: Cemetidine and Ranitidine

2. **What are anti-histamines or anti-allergic drugs?**
   Drugs which are used to control allergies such as cold, fever, cough etc.,
   Ex: Brompheniramine(dimetapp) and terfenadine(seldane)

3. **What are tranquilizers or what are anti-depressant drugs?**
   Drugs which are used for the treatment of stress, and mild or severe mental diseases
   Ex: Iproniazid, phenelzine

4. **What are anti-pyritec drugs? Given an example.**
   Drugs used to reduce body temperature
   Ex: Aspirin, paracetamol

5. **What are analgesics?**
   Drugs used to relieve pain
   Ex: Aspirin

6. **Name the drug which acs as both analgesic and antipyretic.**
   Aspirin or Paracetamol.

7. **Name the types of analgesics? Give an example or write the differences between narcotic and non-narcotic analgesics**
   Non-narcotic analgesics
   a. Non-addictive drugs helps reducing fever and prevents platelet coagulation
   b. Overdose produces minimal Side effects
   Ex: Aspirin, Ibuprofen, Naproxen, Diclofenac Sodium
   Narcotic analgesics
   a. Addictive drugs used in post-operative pain
   b. Overdose produces stupor, coma, convulsions and ultimately death
   Ex: Morphine, codeine, heroine

8. Explain the classification antibiotics based on the effect on microbes?

Bactericidal	Bacteriostatic
Drugs that kills organisms	Drugs that inhibits growth of organisms
Examples: Penicillin, Aminoglycosides	Ex: Erythromycin, Chloramphenicol

9. Explain the classification of antibiotics on basis of its spectrum of action

Broad spectrum antibiotics

Kills or inhibits a wide range of Gram +ve and Gram -ve bacteria

Ex: Chloramphenicol, Vancomycin , ofloxacin, Ampicillin and Amoxycillin

Narrow spectrum antibiotics

Effective mainly against Gram-positive or Gram-negative bacteria

Ex: Penicillin G

Limited spectrum antibiotics

Effective against a single organism or disease

10. What are antiseptics? Give an example.

Chemical substances that kill or prevent the growth of microorganisms on living tissues such as wounds, cuts and diseased skin surfaces.

Ex: Furacine, soframicine, Dettol(mixture of chloroxylenol and terpeniol, iodine(tincture of iodine is a 2-3% solution of iodine mixture of water and alcohol), Iodoform, boric acid(antiseptic for eyes), Bithionol

11. What are disinfectants?

Chemical substances that kill or prevent the growth of microorganisms on floors, drainage system and instruments etc.,

Ex: Phenol(1% solution), chlorine in water(0.2 to 0.4 ppm), Sulphur dioxide in lower concentration.

12. What are antifertility Drugs?

Drugs which acts as birth controlling pills

Ex: Norethindrone, Novestrol

13. What are artificial sweeteners? Give an example

Compounds which are substitute for sugar in foods and doesn't add any calorie to the body

Ex: Saccharin (First popular artificial sweetening agent and it is also known as ortho-sulphobenzimide),

Aspartame(aspartame is limited to cold foods and soft drinks because it is unstable at cooking temperature),

Sucralose(It stable at cooking temperature, trichloro derivative of sucrose)

Alitame(2000 times sweeter than sugar).

14. **What are anti-oxidants? Give an example**
Compounds which retards the action of oxygen on food.
Ex: BHA (butylated hydroxyl anisole), BHT (butylated hydroxy toluene).

15. **What are food preservatives? Give an example**
Compounds which prevent the spoilage of food.
Ex: Salt , sugar, vegetable oil, sodium benzoate, salt of sorbic acid, propanoic acid

16. **What are soaps? Give an example**
Sodium or potassium salt of higher fatty acids
Ex: Sodium stearate, sodium oleate, potassium palmitate.

17. **Why soaps do doesn't work in a hard water?**
Hard water contains calcium and magnesium ions. These ions form insoluble calcium and magnesium soaps respectively when sodium or potassium soaps are dissolved in hard water.

$$\underset{\text{Soap}}{2C_{17}H_{35}COONa} + CaCl_2 \longrightarrow \underset{\text{Insoluble calcium stearate(Soap)}}{(C_{17}H_{35}COONa)_2Ca} + 2NaCl$$

These insoluble soaps separate as scum in water and are useless as cleansing agent

18. **What are anionic detergents? Give an example**
Anionic detergents are sodium salts of sulphonated long chain alcohols or hydrocarbons
Ex: Sodium lauryl sulphate, sodium dodecyl benzene sulphonate

19. **What are cationic detergents? Give an example?**
Cationic detergents are quaternary ammonium salts of amines with acetates, chlorides or bromides as anions
Ex: Cetyltrimethylammonium bromide.

20. **What is saponification or how are soaps prepared? Or explain saponification of oil/fats with equation**
Soaps are prepared by heating a fat or oil with aqueous NaOH or KOH solution. This reaction is called saponification.