CHAPTER 7 : CHEMICAL KINETICS

1. Define Rate of a chemical reaction.

In a chemical reaction, the change in concentration of the species involved per unit time the rate of a reaction.

$$\text{Rate} = \frac{\text{Change in the concetration of the reactant}}{\text{Change in time}}$$

2. Write the unit of rate of the reaction.

$$\text{Unit of Rate of reaction} = \frac{\text{Unit of the concetration of the reactant}}{\text{Unit of time}} = \frac{molL^{-1}}{s}$$

Unit: $molL^{-1}s^{-1}$

3. What is average rate of a chemical reaction?

Average rate: The change in concentration of a reactant (or product) of a chemical reaction in a given interval of time is called as an average rate.

$$\text{Average Rate} = \frac{-\Delta[A]}{\Delta t}$$

4. What is Instantaneous rate of a chemical reaction?

The change in concentration of a reactant or product of a chemical reaction at a given instant is called an instantaneous rate.

$$\text{Instantaneous Rate} = \frac{-d[A]}{dt}$$

5 Differentiate between rate and rate constant of a reaction.

Sl.	Rate of a reaction	Rate constant of a reaction
1	It represents the speed in which the reactants are converted into products at any instant.	It is a proportional constant.
2	It is measured as decrease in the concentration of the reactants or increase in the concentration of products.	It is equal to the rate of reaction, when the concentration of each of the reactants in unity.
3	It depends on the initial concentration of reactants.	It does not depend on the initial concentration of reactants.

6. Define Rate Law.

Rate law is the expression which relates the rate, the rate constant and the concentration of the reactants. $xA + yB \longrightarrow$ Product Rate = $K[A]^x [B]^y$

7. Define Rate constant.

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Rate constant is equal to the rate of reaction, when the concentration of each of the reactants in unity. $xA + yB \longrightarrow$ **Product**

Rate = $K[A]^x [B]^y$ **When [A] = [B] = 1 Rate = K**

8. Define Elementary reaction.

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

9. Define molecularity.

It is the total number of reactant species that are involved in an elementary step is called molecularity of that particular step.

10. Define order.

It is the sum of the powers of concentration terms involved in the experimentally determined rate law.

11. Give the differences between order and molecularity of a reaction.

Sl.	Order of the reaction	Molecularity of a reaction
1	It is the sum of the powers of concentration terms involved in the experimentally determined rate law.	It is the total number of reactant species that are involved in an elementary step.
2	It can be zero (or) fractional (or)integer.	It always a whole number, cannot be zero or fractional.
3	It is assigned for an overall reaction.	It is assigned for each elementary step of mechanism.

12. Give any three examples for the first order reaction.

i. **Decomposition of dinitrogen pentoxide**
ii. **Decomposition of Thionyl chloride**
iii. **Decomposition of the Hydrogen peroxide in aqueous solution**

13. What are pseudo first order reactions? Give an example.

"In a second order reaction, when one of the reactants concentration is in excess of the other then the reaction follows a first order kinetics, such reactions are called Pseudo first order reactions. Example: Acid hydrolysis of an ester.

14. What are zero order reactions?

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

15. Give any three examples for the zero order reaction.

i. Photochemical reaction between $H_2$and I_2
ii. Decomposition of N_2O on hot platinum surface

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iii. Iodination of acetone in acid medium is zero order with respect to iodine.

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

$$A \rightarrow \text{Product}$$

$$\text{Rate of the reaction} = \frac{-dA}{dt}$$

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

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

$$\frac{-d[A]}{A} = K\,.dt$$

When time changes from $(t = 0) \Rightarrow (t = t)$
Concentration changes from $[A_0] \Rightarrow [A]$
On Integrating the above equation within these limits

$$\int_{[A_0]}^{[A]} \frac{-d[A]}{A} = K \int_{t_0}^{t} dt$$

$$[-\ln[A]]_{[A_0]}^{[A]} = K\,[t]_{t_0}^{t}$$

$$[-\ln[A]] - [-\ln[A_0]] = K\,[t - 0]$$

$$Kt = \ln\frac{[A_0]}{[A]}$$

$$K = \frac{1}{t} \ln \frac{[A_0]}{[A]} \qquad \ln = 2.303 \log$$

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

17. Write Arrhenius equation and explains the terms involved.

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

A -Frequency factor ; R -Gas constant ;
Ea- Activation Energy ; T -Temperature (in K)

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18. Define Fraction of effective collisions

$$f = e^{\frac{-E_a}{RT}}$$

f - Fraction of effective collision ; E_a - Activation Energy;

R – Gas constant ; T – Temperature (in K)

19. Define Collision Rate.

The number of Collisions taking place per second per litre of the reactant.

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

$$A \rightarrow \text{Product}$$

$$\text{Rate} = \frac{-dA}{dt}$$

$$\frac{-d[A]}{dt} \alpha [A]^0$$

$$\frac{-d[A]}{dt} = K[A]^0$$

$$-d[A] = K\,.dt$$

When time changes from $(t = 0) \Rightarrow (t = t)$
Concentration changes from $[A_0] \Rightarrow [A]$
On Integrating the above equation within these limits

$$\int_{[A_0]}^{[A]} -d[A] = K \int_{t_0}^{t} dt \quad .$$

$$[-[A]]_{[A_0]}^{[A]} = K\,[t]_{t_0}^{t}$$

$$[-[A]] - [-[A_0]] = K\,[t - 0]$$

$$Kt = [A_0] - [A]$$

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

21. Define Half-Life period.

The half-life of a reaction is defined as the time required for the reactant concentration to reach one half its initial value.

22. Derive the half-life period for first order reaction.

For any first order reaction

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

When $[A] = \frac{[A_0]}{2}$; $t = t_{½}$.

$$K = \frac{2.303}{t_{½}} \log \frac{[A_0]}{\frac{[A_0]}{2}}$$

$$t_{½} = \frac{2.303}{K} \log \frac{[A_0] \times 2}{[A_0]}$$

$$t_{½} = \frac{2.303}{K} \times 0.3010$$

$$t_{½} = \frac{0.6932}{K}$$

23. Derive an equation for the half-life period of a zero order reaction.

A $\rightarrow$ product

$$K = \frac{[A_0] - [A]}{t} \quad \ldots\ldots (1)$$

When $[A] = \frac{[A_0]}{2}$; $t = t_{½}$.

$$K = \frac{[A_0] - \frac{[A_0]}{2}}{t_{½}}$$

$$t_{½} = \frac{\frac{[A_0]}{2}}{K}$$

$$t_{½} = \frac{[A_0]}{2K}$$

24. Define Activation energy .

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

25. What is Steric factor?

The fraction of effective collisions (f) having proper orientation is given by the steric factor (p). $\Rightarrow$ Rate = p x f x collision rate

26. Write a note on Frequency factor.

The frequency factor (A) is related to the frequency of collisions (number of collisions per second) between the reactant molecules.

27. List the factors affecting reaction rate.

- **Nature and state of the reactant**
- **Concentration of the reactant**

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- **Surface area of the reactant**
- **Temperature of the system**
- **Presence of a catalyst**

28. How do nature of the reactant influence rate of reaction?

- **The net energy involved in a reaction depends on the nature of the reactant and hence the rates are different for different reactants.**
- **The oxidation of oxalate ion by $KMnO_4$ is relatively slow compared to the reaction between $KMnO_4$ and Fe^{2+} ion.**

29. How do concentrations of the reactant influence the rate of reaction?

Higher the concentration, greater is the possibility for collision and hence the rate.

30. How do surface area of the reactant influence the rate of reaction?

- **For a given mass of a reactant, when the particle size decreases surface area increases.**
- **Increase in surface area of reactant leads to, more collisions per litre per second, and hence rate of reaction is increased.**

31. Explain the effect of catalyst on reaction rate.

A catalyst is substance which alters the rate of a reaction without itself undergoing any permanent chemical change. Catalyst increases the rate of reaction.

32. Write about the graphical representation of first order reaction.

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

$$\ln[A_0] - \ln[A] = kt$$
$$\ln[A] = \ln[A_0] - kt$$
$$\Rightarrow y = c + mx$$

By measuring the concentration of the reactants at regular time interval‘t’, a plot of ln[A] against ‘t’ yields a straight line with a negative slope. From this, the rate constant is calculated.

33. Write the rate law for the following reactions.

(a) A reaction that is 3/2 order in x and zero order in y.

Ans : Rate Law = $k[x]^{3/2}\ [y]^0$ Rate Law = = $k[x]^{3/2}$

(b) A reaction that is second order in NO and first order in Br_2 .

Ans : Rate Law = $k[NO]^2\ [Br_2]^1$

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34 . For a reaction x + y + z → products the rate law is given by rate = $k[x]^{3/2}\ [y]^{1/2}$ What is the overall order of the reaction and what is the order of the reaction with respect to z.

Overall order of the reaction = $3/2 + 1/2 = 2$

Order of the reaction with respect to z = 0

35 . Identify the order for the following reactions

(i) Rusting of Iron ***Order = Not determined***

(ii) Radioactive disintegration of $_{92}U^{238}$ ***Order = 1***

(iii $2A + 3B \rightarrow$ **products ; Ans : rate =** $k[A]^{1/2}\ [B]^{2}$ ***Order*** $= 1/2 + 2 = 5/2$

36. **The rate law for a reaction of A, B and C has been found to be rate =** $k\ [A]^2\ [B]\ [L]^{3/2}$ **How would the rate of reaction change when ,**

(i) Concentration of [L] is quadrupled

Ans : Rate of reaction increases 8 times.

(ii) Concentration of both [A] and [B] are doubled

Ans : Rate of reaction increases 8 times.

(iii) Concentration of [A] is halve

Ans : Rate of reaction increases 1/4 times.

(iv) Concentration of [A] is reduced to (1/3) and concentration of [L] is quadrupled.

Ans : Rate of reaction increases 8/9 times.

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CLASS 12 **CHAPTER 7 : CHEMICAL KINETICS** SUBJECT : CHEMISTRY

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CHAPTER 8 . IONIC EQUILLIBRIUM

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

Lewis Acids : Species that accepts an electron pair Ex: BF_3, $AlCl_3$
Lewis Bases : Electron Rich. Ex: NH_3, H_2O

2. Write note on Lowry – Bronsted concept of acids and bases.
An acid is a proton donar. $HCl + H_2O \rightleftharpoons H_3O^+ + Cl^-$
A base is a proton acceptor. $NH_3 + H_2O \rightleftharpoons NH4^+ + O^-$

3. Identify the conjugate acid base pair for the following reaction in aqueous solution

i) $HS^-(aq) + HF \rightleftharpoons F^-(aq) + H_2S(aq)$

.

conjugate acid – base pair

$HS^-_{(aq)}$ + HF ⇋ $F^-_{(aq)}$ + $H_2S_{(aq)}$
(Base2) (acid1) (Base1) (acid2)

conjugate acid – base pair

ii) $HPO_4^{2-} + SO_3^{2-} \rightleftharpoons PO_4^{3-} + HSO_3^-$

conjugate acid – base pair

HPO_4^{2-} + SO_3^{2-} ⇋ PO_4^{3-} + HSO_3^-
(acid 1) (Base 2) (Base1) (acid2)

conjugate acid – base pair

iii) $NH_4^+ + CO_3^{2-} \rightleftharpoons NH_3 + HCO_3^-$

. conjugate acid – base pair

NH_4^+ + CO_3^{2-} ⇋ NH_3 + HCO_3^-
(acid 1) (Base 2) (Base1) (acid2)

conjugate acid – base pair

4. Account for the acidic nature of $HClO_4$ in terms of Bronsted – Lowry theory, identify its conjugate base.
$HClO_4 + H_2O \rightleftharpoons H_3O^+ + ClO_4^-$
The conjugate base of $HClO_4$ is ClO_4^- .
When oxidation number of an element in an oxy acid increases then its acidic nature increases.

5. When aqueous ammonia is added to CuSO4 solution, the solution turns deep blue due to the formation of tetramminecopper (II) complex
$[Cu(H_2O)_4]^{2+}_{(aq)} + 4NH_3(aq) \rightleftharpoons [Cu(NH_3)_4]^{2+}_{(aq)}$, among H_2O and NH_3 ***Which is stronger Lewis base?***
In the above equation, NH_3 replaces H_2O molecule to form the deep blue complex, so NH_3 is the strong Lewis base.

6. Define Solubility Product.

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The solubility product of a compound is defined as the product of the molar concentration of the constituent ions, each raised to the power of its stoichiometric co–efficient in a balanced equilibrium equation.

$$X_mY_n \rightleftharpoons mX^{n+} + nY^{m-}$$

$$K_{sp} = [X^{n+}]^m [Y^{m-}]^n$$

7. Define Ionic product of water. Give its value at room temperature.

The product of concentration of hydrogen ion and hydroxyl ion of pure water is known as ionic product of water(Kw).

$K_w = [H_3O^+][OH^-]$

$K_w = 1 \times 10^{-7} \times 1 \times 10^{-7}$

$K_w = 1 \times 10^{-14} mol^2 dm^{-6}$

K_w = Ionic product of water

8. What is known as Common ion effect? Give 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. Here CH3COO– is the common ion present.**

9. . Define pH

pH is defined as the negative logarithm of base 10 of the molar concentration of the hydronium ions present in the solutions . $p^H = -\log_{10}[H_3O^+]$

10. Give the difference between acids and bases.

Reagent	Acids	Bases
1, Taste	Sour taste	Bitter taste
2, With litmus paper	It turns blue litmus paper Red.	It turns red litmus paper blue.
3, With metal	Liberates hydrogen gas with zinc metal.	No hydrogen gas is liberated with metals.

11. Explain the Arrhenius concept of acid and bases.

An acid dissociates to give H+ ions in water.

Ex. $HCl \xrightarrow{H_2O} H^+ + Cl^-$

A base dissociates to give OH^- ions in water.

Ex. $NaOH \xrightarrow{H_2O} Na^+ + OH^-$

12. Distinguish between Lewis Acid and Lewis Base.

Sl.No	Lewis Acid	Lewis Base
1.	Electron Deficient. Ex. BF_3	Electron Rich. Ex. NH_3
2.	All metal ions. Ex. Fe^{+2}	All anions. Ex.OH^-
3.	They contain Polar double bonds. Ex: CO_2	They contain carbon-carbon double Bond. Ex: Ethylene.
4.	They are CarboCation.	They are Carbanion. Ex.CH_3^-
5.	They contain empty D-orbitals.And can expand its octet. Ex:SF_4.	All metal oxides. Ex.CaO

13. Write a notes on Buffer solution..

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

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

14. What are the types of buffer solution

- **Acidic buffer solution : a solution containing a weak acid and its salt. Eg: a solution containing CH_3-COOH + CH_3COONa**
- **Basic buffer solution : a solution containing a weak base and its salt. Eg: a solution containing NH_4OH + NH_4Cl**

15. What is Buffer capacity ?

It is defined as the number of gram equivalents of acid or base added to 1 litre of the buffersolution to change its pH by unity.

$\beta = \frac{d[B]}{d[pH]}$ **dB = number of gram equivalents of acid / base added to one litre of buffer solution.**
d(pH) = The change in the pH after the addition of acid / base.

16. What is salt hydrolysis?

Salts completely dissociate in aqueous solutions to give their constituent ions. The ions so produced are hydrated in water. In certain cases, the cation, anion or both react with water and the reaction is called salt hydrolysis.

17. Derive Henderson – Hasselbalch equation to calculate pH of acidic buffer.

Let as consider dissociation of weak acid

$$HA + H_2O \rightleftharpoons H_3O^+ + A^-$$

The concentration of hydronium ion in an acidic buffer solution depends on the ratio of theconcentration of the weak acid tothe concentration of its conjugate base present in the solution.

The dissociation constant of weak acid $(K_a) = \frac{[H_3O^+][A^-]}{[HA]}$ .....(1) [HA]= [Acid];

$$K_a = \frac{[H_3O^+][Salt]}{[Acid]} .....(2) \qquad [A^-] = [Salt]$$

$$[H_3O^+] = K_a\frac{[Acid]}{[Salt]} .....(3)$$

Taking log on both sides of the equation⇒

$$\log[H_3O^+] = \log K_a + \log\frac{[Acid]}{[Salt]} .....(4)$$

Reverse the sign on both sides⇒

$$-\log[H_3O^+] = -\log K_a - \log\frac{[Acid]}{[Salt]} .....(5)$$

$$P^H = p^{Ka} - \log\frac{[Acid]}{[Salt]}$$

$$\mathbf{P^H = -p^{Ka} + \log\frac{[Salt]}{[Acid]}} .....(6)$$

For Basic buffer solution ⇒

$$\mathbf{P^{OH} = -p^{Kb} + \log\frac{[Salt]}{[Base]}} .....(7)$$

Equations (6) and (7) are Henderson – Hasselbalch equations.

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18. Derive the relationship between pH and pOH.

$$p^H = -\log_{10}[H_3O^+]$$
$$p^{OH} = -\log_{10}[OH^-]$$
$$K_w = [H_3O^+][OH^-] = 10^{-14}$$

Taking log on both sides of the equation

$$\log K_w = \log[H_3O^+] + \log[OH^-] = \log 10^{-14}$$

Reverse the sign on both sides

$$-\log K_w = -\log[H_3O^+] + (-\log[OH^-]) = -\log 10^{-14}$$
$$p^{Kw} = p^H + p^{OH} = 14$$

$$p^H + p^{OH} = 14$$

19. *State Ostwald's dilution law.*

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

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

20. Define degree of dissociation (α)

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

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

21. 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).

$$\text{Degree of dissociation } (\alpha) = \frac{\text{Number of moles dissiciation}}{\text{Total no.of moles}}$$

$$CH_3COOH \rightleftharpoons H^+ + CH_3COO^-$$

Dissociation constant of Acetic acid is

$$K_a = \frac{[H^+][CH3COO^-]}{[CH3COOH]} \quad \text{---- (1)}$$

Content	CH_3COOH	H^+	CH_3COO^-
initial number of moles	1		
Number of moles Ionized	α		
Number of moles remaining	(1 - α)	α	α
Equilibrium concentration	C(1 - α)	Cα	Cα

Substitute the value in equation (1)

$$K_a = \frac{C\alpha \cdot C\alpha}{C(1-\alpha)}$$
$$K_a = \frac{C\alpha^2}{(1-\alpha)} \quad \text{---- (2)}$$

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When $1 >> \alpha$ the denominator is neglected so $(1 - \alpha) \approx 1$

$$K_a = C\alpha^2$$

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

Degree of dissociation $\alpha = \sqrt{K_a / C}$

Concentration of acid $[H^+] = C\alpha$

$$= C \sqrt{K_a / C}$$

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

22. Write an expression for the hydrolysis constant and degree of hydrolysis of salt of strong base and weak acid.

Hydrolysis of Salt of strong base and weak acid

$K_h . K_a = K_w$

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

23. Write an expression for the hydrolysis constant and degree of hydrolysis of salt of strong acid and weak base.

Hydrolysis of Salt of strong base and weak acid

$K_h . K_a = K_w$

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

24. Write an expression for the hydrolysis constant and degree of hydrolysis of salt of weak acid and weak base.

Hydrolysis of Salt of weak acid and weak base

$K_a . K_b . K_h = K_w$

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

25. What are the limitations of Arrhenius concept ?

- **Does not explain the behaviour of acids and bases in non aqueous solvents such as acetone, Tetrahydrofuran etc...**
- **Does not account for the basic nature of the substances like ammonia (NH_3) which do not possess hydroxyl group.**

26. Write the limitations of Lowry-Bronsted concept of acid and base.

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- **Substances like BF_3 , $AlCl_3$ etc., that do not donate protons are known to behave as acids.**

27. Establish a relationship between the solubility product and molar solubility for the following.

a) $BaSO_4$

$$BaSO_4(s) \underset{}{\overset{H_2O}{\rightleftharpoons}} Ba^{2+}(aq)+SO_4^{2-}(aq)$$

$$K_{sp}=[Ba^{2+}][SO_4^{2-}]$$

$$=(s)\ (s)$$

$$K_{sp}=S^2$$

b) $Ag_2(CrO_4)$

$$Ag_2CrO_4(s) \underset{}{\overset{H_2O}{\rightleftharpoons}} 2Ag^+(aq)+CrO_4^{2-}(aq)$$

$$K_{sp}=[Ag^+]^2[CrO_4^{2-}]$$

$$=(2s)^2(s)$$

$$K_{sp}=4s^3$$

c) $Ca_3(PO_4)_2$

$$Ca_3(PO_4)_2 \rightleftharpoons \underset{3s}{3Ca^{2+}} + \underset{2s}{2PO_4^{3-}}$$

$$K_{sp}=[Ca^{2+}]^3[PO_4^{3-}]^2$$

$$K_{sp}=(3s)^3(2s)^2$$

$$K_{sp}=27s^3.4s^2$$

$$K_{sp}=108s^5$$

d) Hg_2Cl_2.

$$Hg_2Cl_2 \rightleftharpoons \underset{s}{Hg_2^{2+}} + \underset{2s}{2Cl^-}$$

$$K_{sp}=[Hg_2^{2+}][Cl^-]^2$$

$$=(s)(2s)^2$$

$$K_{sp}=4s^3$$

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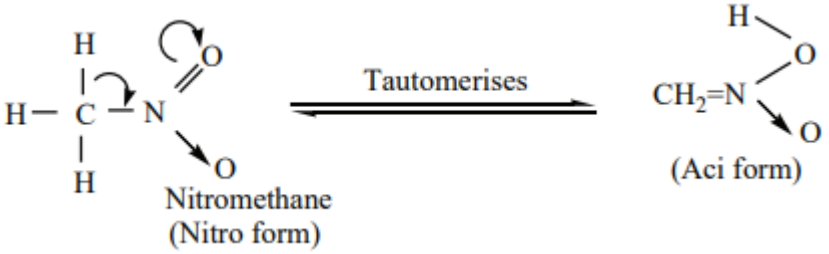
CHAPTER 13. ORGANIC NITROGEN COMPOUNDS

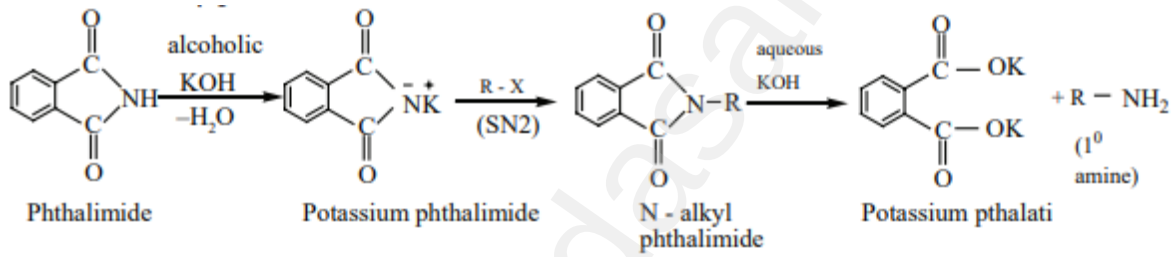
1. There are two isomers with the formula CH_3NO_2 . How will you distinguish them?

Tautomerism : CH_3NO_2 exists as an equilibrium mixture of two tautomers, namely Nitro and Aci – form.

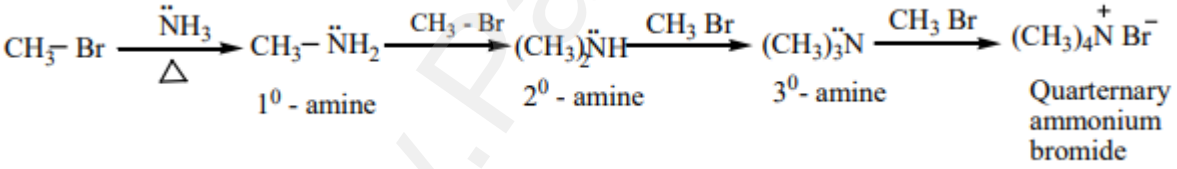


Nitro form	Aci form
1, Less Acidic	1, More acidic
2, Dissolves in NaOH slowly	2, Instantly.
3, decolourless $FeCl_3$ solution.	3, Gives Reddish Brown colour.
4, Electrical conductivity is low.	4, High.

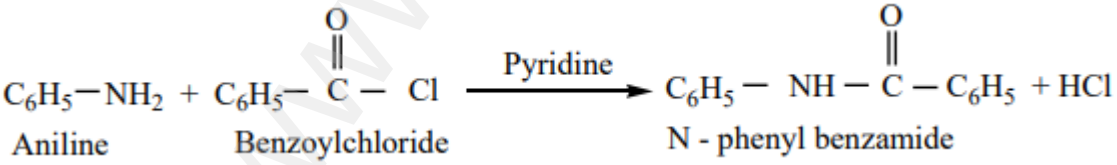
2. Write a note on Gabriel Phthalimide Synthesis.



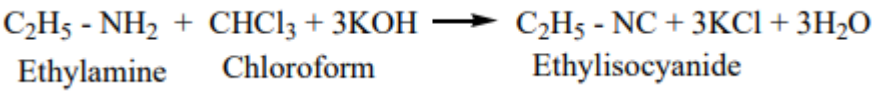
3. Write note on Hoffmann's Ammonolysis.



4. Write a note on Schottan – Baumann Reaction.



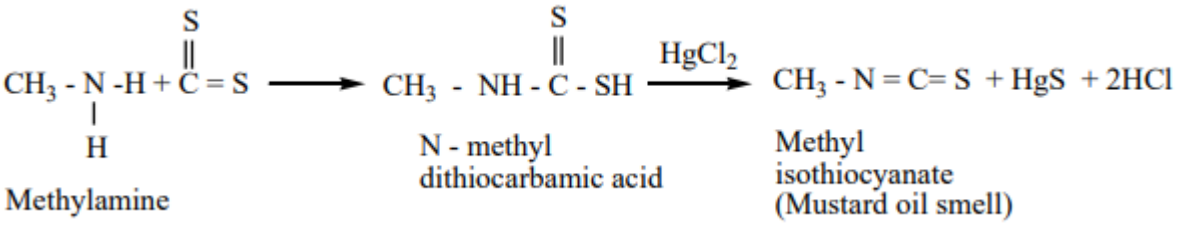
5. Write a note on Carbylamine reaction.



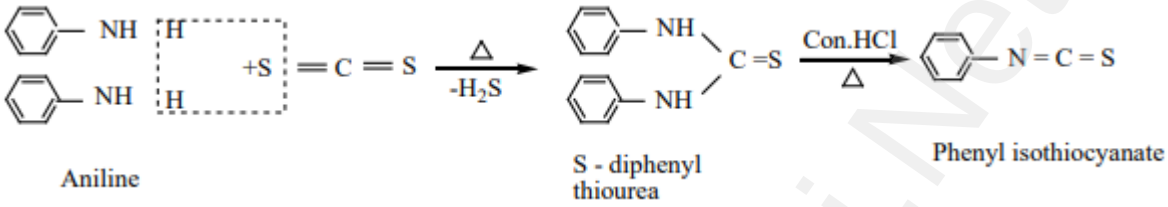
6. . *Aniline does not undergo Fridel – Craft's Reaction. Why?*

Aniline is basic in nature and it donates its pair to the Leis acid AlCl3 to form an adduct which inhibits further the electrophilic substitution reaction.

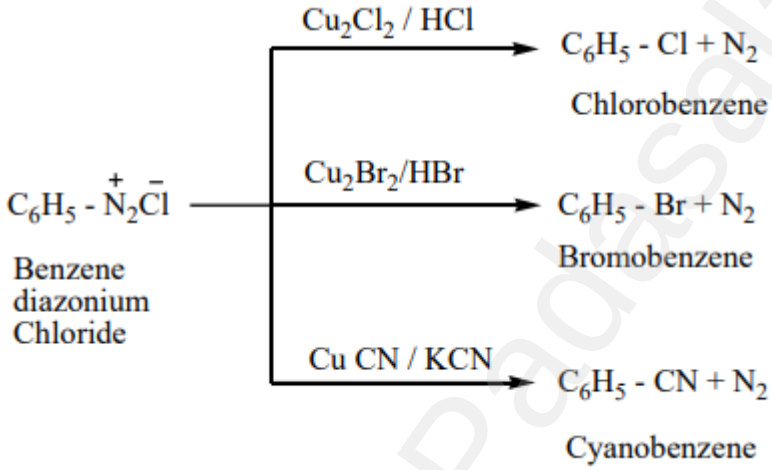
7. Write a note on Mustard Oil reaction.



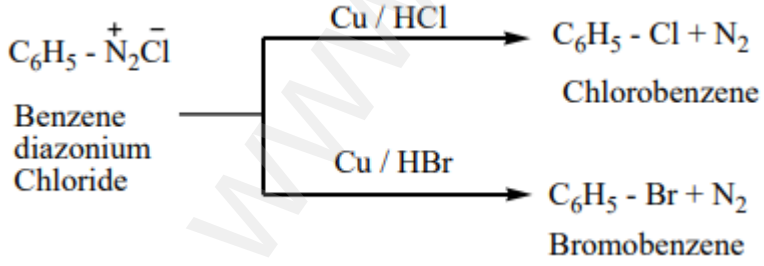
8. Write a note on Hoffmann's Mustard oil reaction.



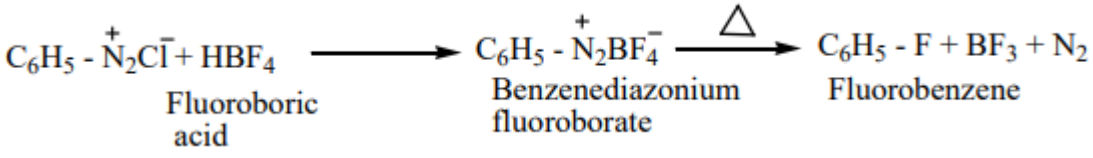
9. Write a note on Sandmeyer reaction.



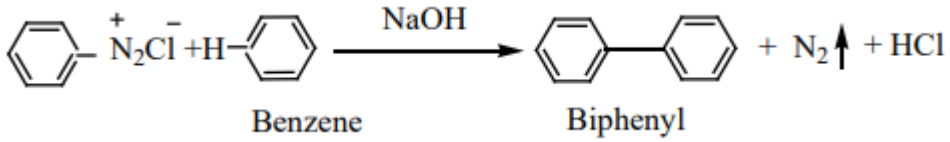
10. Write a note on Gattermann reaction.



11. Write a note on Baltz – schiemann reaction.



12. Write a note on Gomberg Reaction.



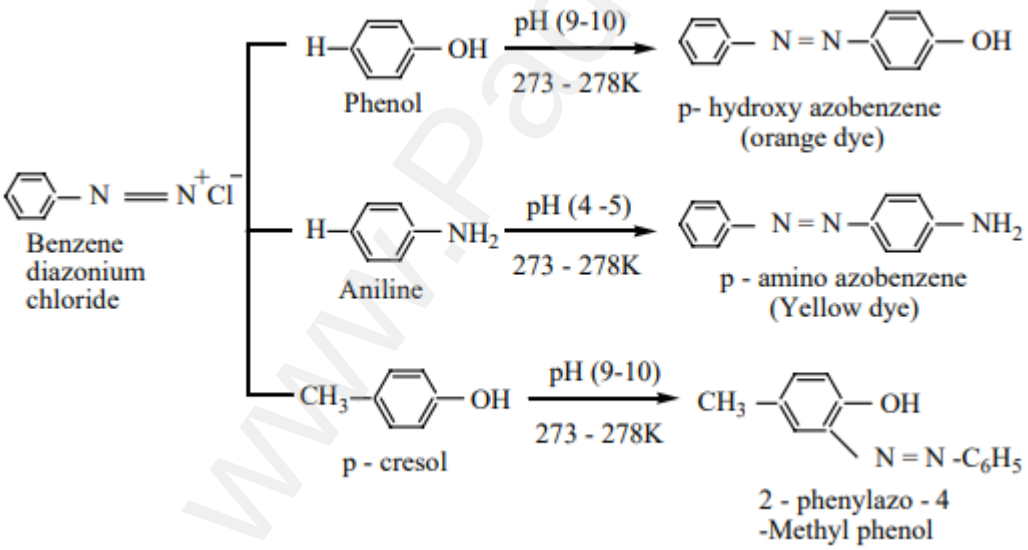
13.. Ethyl amine is soluble in water whereas aniline is not Why ?

- **When Ethyl amine is added to water, it forms intermolecular H – bond with water.**
- **But Aniline does not form H – bond with water to a large extent due to the presence of a large hydrophobic (C_6H_5 -) group .**
- **Hence Aniline is insoluble in water.**

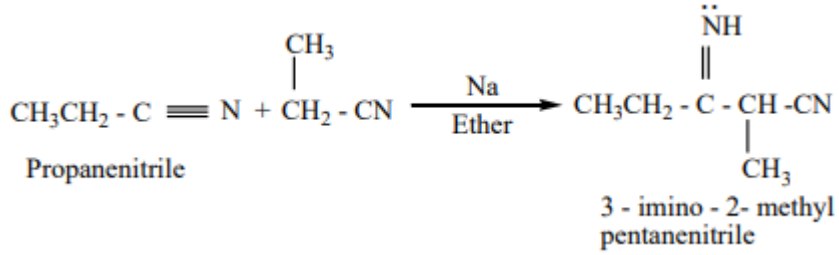
14. Amines are more basic than amide. Why?

- **In Amines, +I groups like $–CH_3$ is attached to the nitrogen increase the electron density on Nitrogen which makes the electron pair readily available for protonation.**
- **In Amides, the lone pair of electrons on an oxide are delocalized between Nitrogen and Oxygen ($– CONH_2$) through resonance.**
- **This makes amides much less basic compared to alkyl amines.**

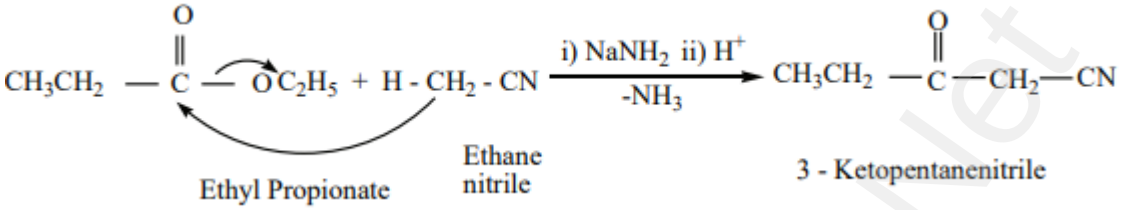
15. Write a note on Coupling reaction.



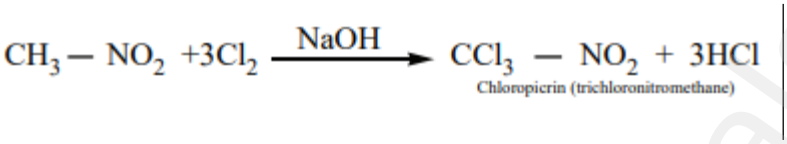
16. Write a note on Thorpe nitrile condensation



17. Write a note on Levine and Hauser acetylation.

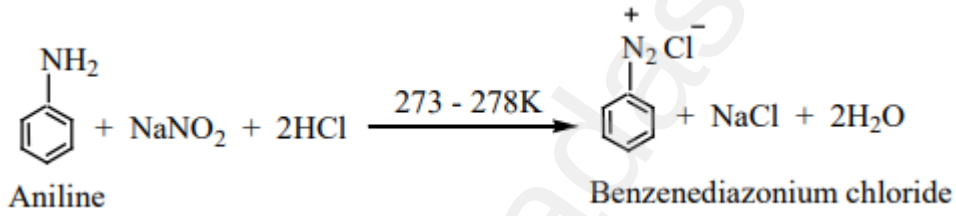


18. How is Chloropicrin prepared and mention its use ?



Uses : - Sterilizing agent

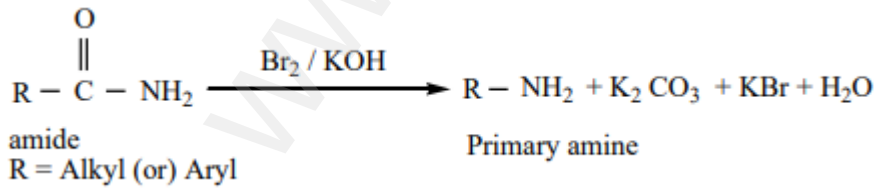
19. Write a note on Diazotization Reaction.



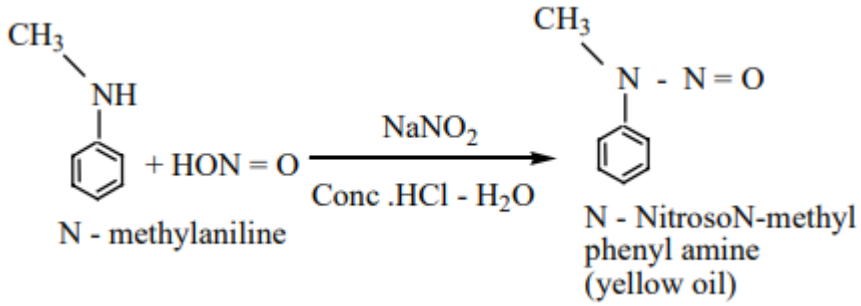
20. Write the uses of Nitroalkanes

- **Nitromethane -- as a Fuel for cars.**
- **Chloropicrin – as an Sterilizing agent.**
- **Nitroethane – as a Fuel additive and precursor to explosive.**

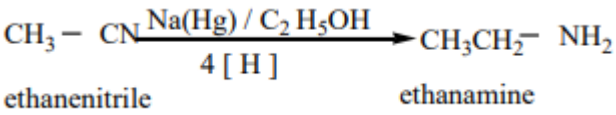
21. Write a note on Hoffmann's degradation Reaction.



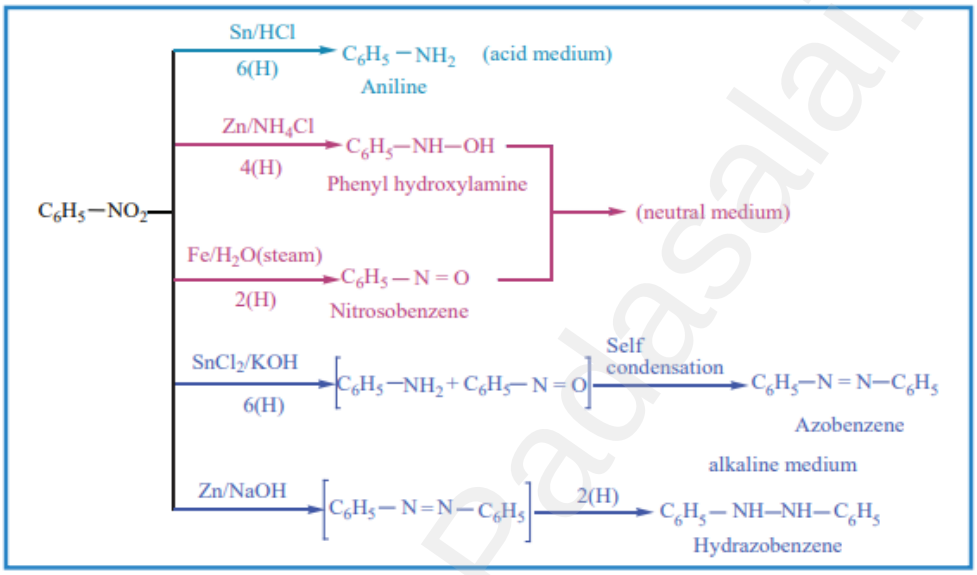
22. Write a note on Libermann's nitroso test.



23. Write a note on Mendius reaction



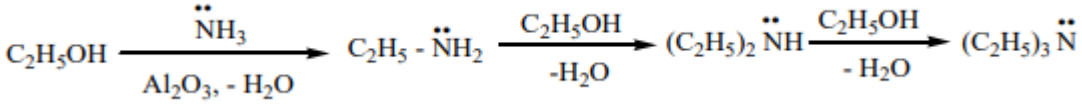
24. Write a note on the reduction of Nitro benzene under different conditions.



25. How will you distinguish between Primary, Secondary and Tertiary aliphatic amines?

Reagent	Primary amine	Secondary amine	Tertiary amine
1, With Nitrous acid	Forms Alcohol	Forms **N – Nitroso amine.**	Forms salt.
2, With $CHCl_3$ / alcoholic KOH	Forms Carbylamine.	No reaction.	No reaction.
3, With Acetyl chloride	Forms N-alkyl acetmide	Forms N,N-di alkyl acetamide	No reaction.
4, With **CS_2** and **$HgCl_2$**	Forms alkyl isothiocyanate	No reaction.	No reaction.
5, With diethyl oxalate at room temperature	Solid dialkyl oxamide is formed.	Liquid N,N-di alkyl oxamic ester is formed.	No reaction.
6, With Alkyl halides.	Three molecules of alkyl halide, quarternary ammonium salt is formed.	Two molecules of alkyl halide, quarternary ammonium salt is formed.	One molecule of alkyl halide, quarternary ammonium salt is formed.

26. Write short note on Sebastier – Moili reation



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