N CONTAINING COMPOUNDS

AMINE

NH_2

PRIMARY

C - N - H
        |
        H

SECONDARY

C - N - C
        |
        H

TERTIARY

C - N - C
        |
        C

H_2O Sol.	BOILING POIN	ACID/BASE
↑ * polar * H-bond	↑ H bond	sec > primary > Tert.

REACTIONS

① NH_3 + Alkyl Halide → primary Amine + HCl

$NH_3 + C\text{-}C\text{-}Cl \xrightarrow{S_N} C\text{-}C\text{-}NH_2 + HCl$

② Primary amin + Alkyl Halide → secondary Amine

$C\text{-}C\text{-}NH_2 + C\text{-}Br \xrightarrow{S_N} C\text{-}C\text{-}\underset{H}{N}\text{-}C + HBr$

③ secondary Amine + Alkyl Halide → Tertiary Amie

$C\text{-}C\text{-}\underset{H}{N}\text{-}C + C\text{-}C\text{-}C\text{-}I \xrightarrow{S_N} C\text{-}C\text{-}N(C)\text{-}C + HI$ (C)

④ Alcohol + Ammonia → primary Amine

$C\text{-}C\text{-}OH + NH_3 \xrightarrow{S_N} C\text{-}C\text{-}\underset{H}{N}\text{-}H + H_2O$

Synthesis of Amine:

- Amine Synthesis can be done by S_N reaction with Alkyl Halide.

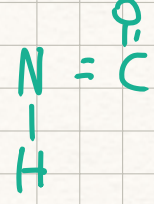
Ammonia + Alkyl Halide = primary Amine

Primary Amine + Alkyl Halide = Secondary Amine

secondary Amine + Alkyl Halide = Tertiary Amine

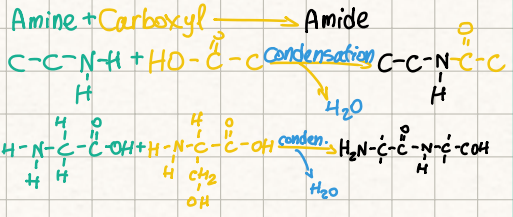
Alcohol + Ammonia = primary Amine

AMIDE



AMIDE SYNTHESIS

Amine + Carboxyl → Amide



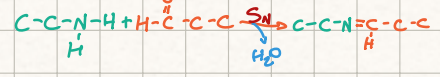
reaction between Amine & Carboxyl. AKA peptide bond

IMINE

N = C

IMINE SYNTHESIS

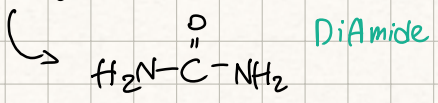
Amine + Aldehyde → Imine (H_2O)



condensation reaction between Amine & Aldehyde.

N WASTE PRODUCTS

* Ammonia
* Urea



DiAmide

* Uric Acid : Purine

TRANSAMINATION

Amino Acid → (CO_2) Biogen Amine

Histidine → (CO_2) Histamine → inflamatory mediator.

Tyrosine → (OH) Dopa → (CO_2) Dopamine

** decarboxylation of Amino Acid creates Biogen Amine.
↳ Biologicaly active molecule.

TRANSAMINASE ENZYME:

Amino Acide → (NH_2) keto Acid

α-keto Glutarate + NH_2 → Glutamate

DeAMINATION

Glutamete → (NH_2 to Urea formation) α-keto Glutarate

** IN BODY: during Urea cycle, 2 important enzymatic reactions takes place in order to avoid free Ammonia in the blood.

① Transamination - transfer of Amine group from one organic molecule to another by transaminase. amino acid becomes keto acid. the Amin is transferred to α-keto glutarate and becomes glutamate.

② Deamination - removal of Amine from organic molecule by deaminase. glutamate lose the amine group to the favor of UREA & becomes again α-keto glutarate.

S CONTAINING COMPOUNDS

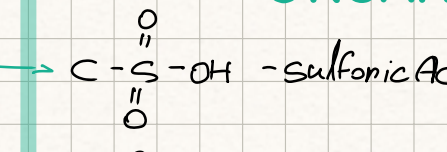
INORGANIC

H_2SO_4 - Sulfuric Acid

H_2SO_3 - Sulfurous Acid

H_2S Dihydrogen sulfide

ORGANIC



C-SH - THIOL

C-C-SH - ThioEthane

H_2O solubility

* polar

* soluble

Boiling point

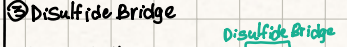
* Dipole/Dipole * relative High

Acid/Base

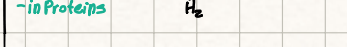
* acidic molecules

REACTIONS

① Thiol + Carboxyl $\xrightarrow{cond.}$ THIOESTER



② Thiol + Alcohol $\xrightarrow{cond.}$ THIOETHER

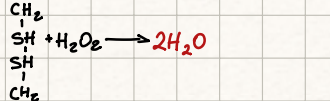


③ Disulfide Bridge

- in Proteins

Glutathion - Antiotioant

Glutamate - Cystein - Glysine



Glutarate - Cystein - Glycine

NADPH: ppp = pentose phosphate pathway

XR G6PD

↳ sexual Recessive

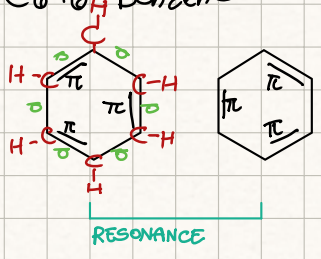
Disulfied Bridge:
- oxidation of 2 thiols, for example; in the tertiary structure of proteins by cystein aminoAcids.
Glutathion: tri-peptide molecule made of glutamate-cysteine & Glycine.
Glutathione is antioxidant, especially RBC.
2 Glutathione reacts with H_2O_2 & convert it to water molecules. the 2 glutathions will undergo reduction by NADPH.

NAPH is produced by PPP. in G6PD(XR), missing enzyme in the PPP lead to deficiency in NADPH. low NADPH result in accumulation of radicals in RBC & may cause hemolysis.

AROMATIC COMPOUNDS

Cyclic molecule with delocalization of pi bonds, follows Huckles Rule

C_6H_6 - Benzene



$\sigma = 154 \cdot 10^{-12} M$

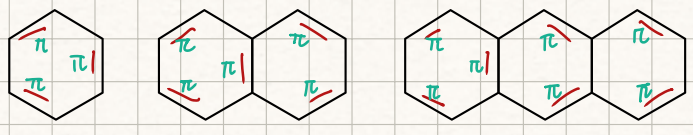
$\pi = 134 \cdot 10^{-12} M$

HUCKLE'S RULE

$\pi_{e^-} = 4 \cdot n + 2$ (n = number of C rings)

$\pi = 4 \cdot 1 + 2 = 6e^-$

EXAMPLES:



Benzene $\pi = 4 \cdot 1 + 2 = 6e^-$

Naphtalene $\pi = 4 \cdot 2 + 2 = 10e^-$

Anthrancene $\pi = 4 \cdot 3 + 2 = 14e^-$

Huckles Rule differentiates beetween aromatic molecules & non-Aromatic (Aliphatic) molecules. according this rule, the number of electrons in π bonds must be equal to 4 time the number of C rings + 2. aromatic are stable due to the delocalization of π bonds electrons & exist in 2 equal resonance - same molecule, different arrangment of electrons.

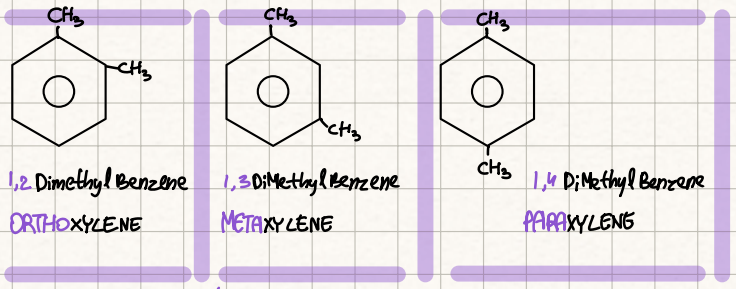
- in Aromatic, the sigma bonds ($154 \cdot 10^{-12}$) are longer than π bonds ($134 \cdot 10^{-12}$).

3 common arenes (cyclic aromatic hydrocarbons): benzene, naphtalene & anthracene.

CHARACTERISTICS

1. Non-Polar = ↓ H_2O solubility, ↓ Boiling Point.
2. Flat
3. Highly stable
4. never pass Addition
5. Possible Redox
6. Most common reaction - SE
7. Aromatic (Smell)

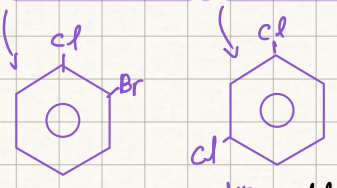
ISOMERS



1,2 Dimethyl Benzene
ORTHOXYLENE

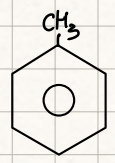
1,3 DiMethyl Benzene
METAXYLENE

1,4 DiMethyl Benzene
PARAXYLENE

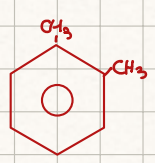


ORTHO Bromo chloro Benzene

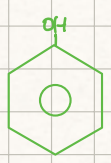
META Dichloro Benzene



METHYL BENZENE



O-XYLENE



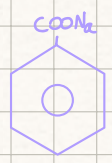
PHENOL

BENZOIC ACID

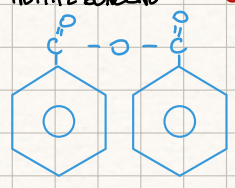
ANILINE

NITRO BENZENE

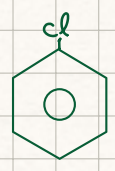
DIPHENYL



SODIUM BENZOATE



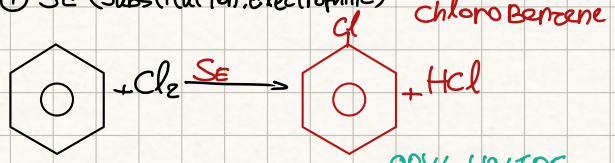
BENZOIC ANHYDRIDE



ARYL HALIDE

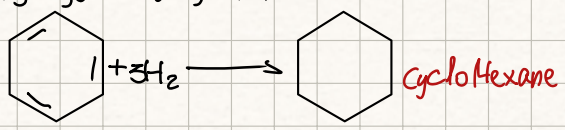
REACTIONS

1. SE (Substitution. Electrophilic)



halogenation of Benzene creates ARYL HALIDE. the reaction is Electrophilic since the π bonds electrons create negativity on the carbons.

2. Hydrogenation to cyclohexane



3. "oxidation"