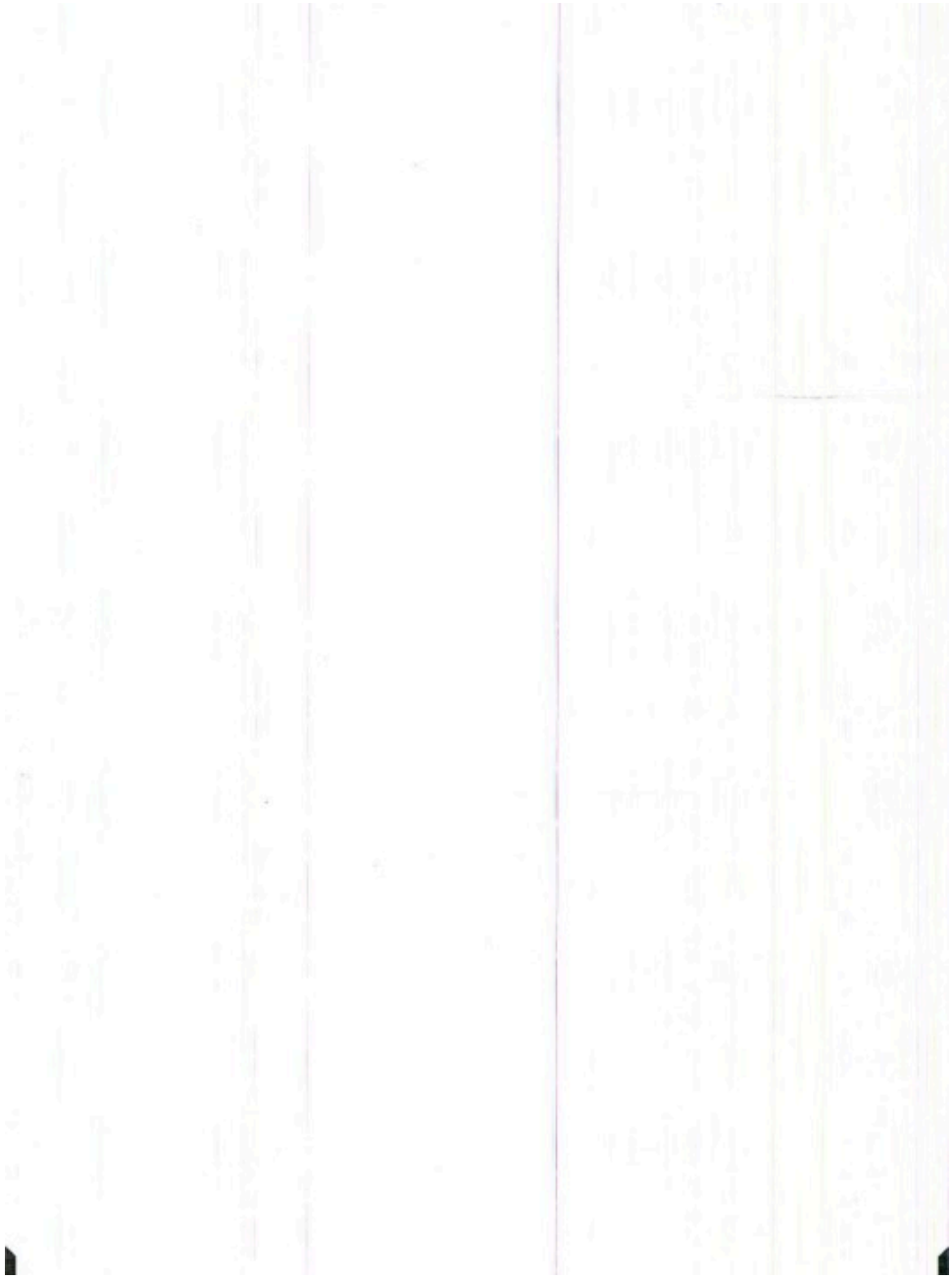
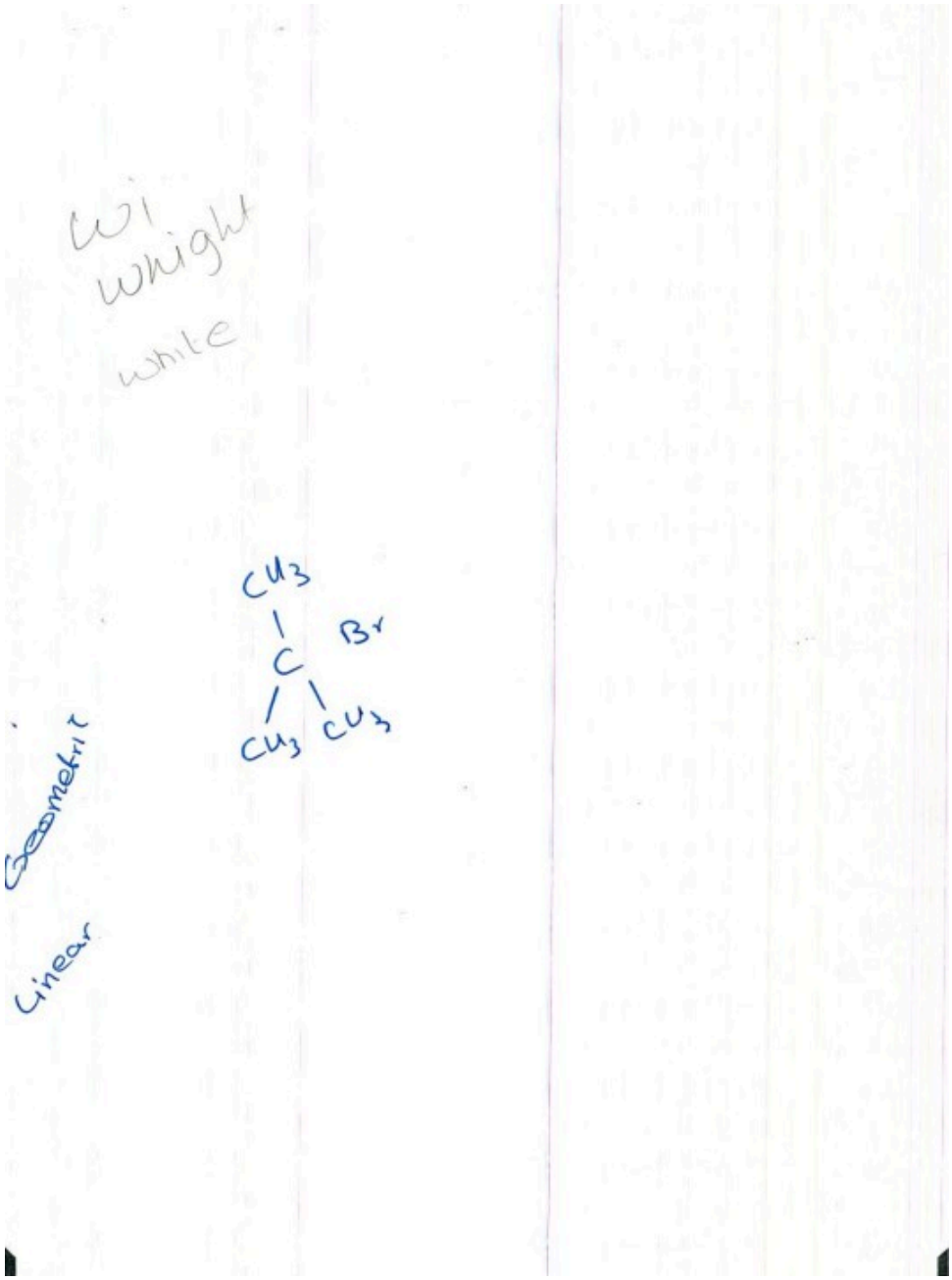





white
Geometrical
Linear

(Section B)

Q. No. 2 Part (i) **Feasibility of the Reaction:**

In the given reaction. $Fe + Pb^{+2} \longrightarrow Fe^{+2} + Pb$

$Fe^{0} \longrightarrow Fe^{+2}$ oxidation occurs (anode)

$Pb^{+2} \longrightarrow Pb^{0}$ reduction occurs (cathode)

$Fe \longrightarrow Fe^{+2} + 2e^{-}$

$Pb^{+2} + 2e^{-} \longrightarrow Pb$

$Fe + Pb^{+2} \longrightarrow Fe^{+2} + Pb$

$E^{\circ}_{cell} = E^{\circ}_{cathode} - E^{\circ}_{anode}$

$E^{\circ}_{cell} = -0.13V - (-0.44)$

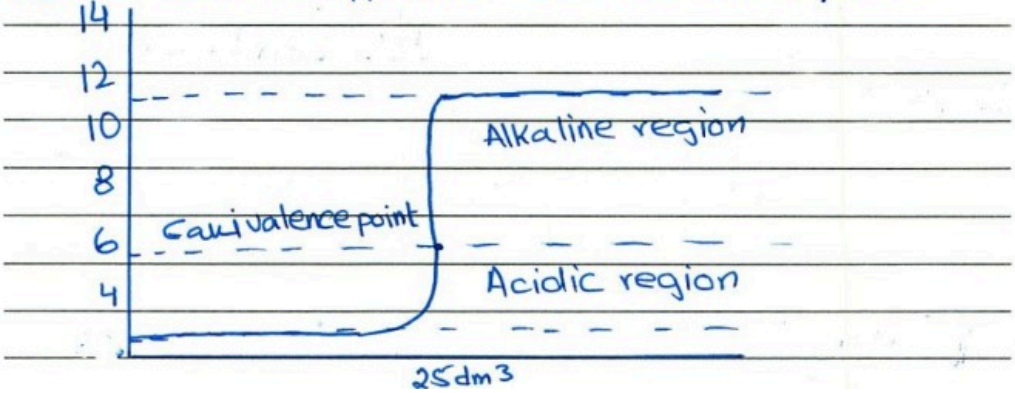
$E^{\circ}_{cell} = 0.31V$

Since E°_{cell} is positive so the reaction is spontaneous and feasible. The electrons move from Fe to Pb

---

Q. No. 2 Part (ii) **Titration Curve**

HCl is the conical flask that (pH=5-2) contains only H^{+} ions initiall which reacts with the ~~weak~~ base NH_3 (pH=10-11). The pH slitly changes when H reacts with NH_3 to form $[NH_4]^{+}$ which is a strong acid. The volumn will increase pH until it reached the equivalence point. The pH surges quickly. futher adding NH_3 will increase the pH ~~The equivalence point/pH is not neutral it's acidic~~ pH=5-5



(Section B)

Q. No. 2 Part (iii) Anode and cathode of molten NaCl

In electrolysis, molten NaCl gives anode and cathode in the following

At anode = $2Cl^- \longrightarrow Cl_2 + 2e^-$

At cathode = $2Na^+ + 2e^- \longrightarrow 2Na$

net reaction = $2Cl^- + 2Na^+ \longrightarrow Cl_2 + 2Na$

Here Cl^- ions are oxidized to Cl_2 at anode and Na^+ are reduced to Na at cathode during electrolysis of molten NaCl.

Q. No. 2 Part (iv) Cooridination number

$[Ag(NH_3)_2]^+$

This compound complex has **Linear shape** and shows Linear complex having the **cooridination number of 2**. It is the least common Geometric complex in the transitional metals and it is the most unstable complex. **It's bond angle is 180°**

$[NH_3 - Ag - \ddot{N}H_3]^+$

It can have monodenate Ligands or didentate Ligands attacted to the central metal ion

Some other examples are:

$[CuCl_2]^-$ which also have cooridination number 2.

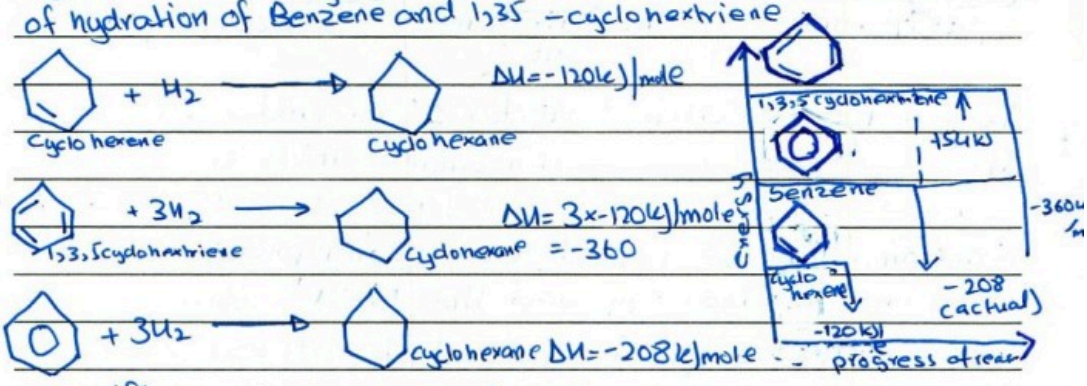
(Section B)

Q. No. 2 Part (v) **Transitional elements with d^{10} configuration:**

Transitional elements with $3d^{10}$ configuration such as $[Zn(H_2O)_6]^{+2}$ that has electronic configuration of $[Ar]3d^{10}$ which is relativily stable as compared to un-filled 3d or half-filled configuration. When white Light passes through the transitional metal ion such as $[Cu(H_2O)_6]^{+2}$ that has electronic configuration of $[Ar]3d^9$ it shows colour because it hase unpaired electrons in it's configuration: It absorbs orange colour from white light and gives off blue. Element with filled-3d shell remains stable and does not show colour after absorbing the white light.

Q. No. 2 Part (vi) **Benzene and 1,3,5-Cyclohextriene.**

The difference in the energy of benzene and 1,3,5 cyclohextriene is resonance energy. This energy indicates the stability of benzene due to π-electron system in the ring of benzene. We will compore the enthalpy of hydration of Benzene and 1,3,5 -cyclohextriene

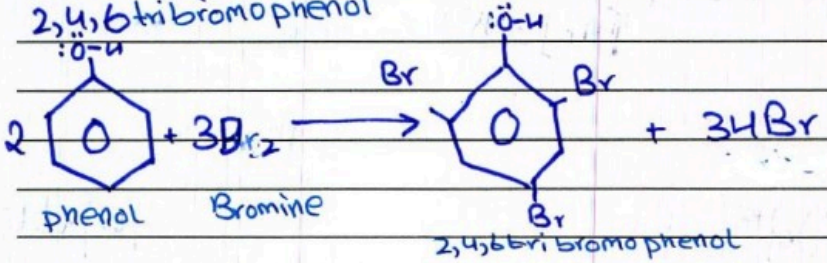


The difference in benzene and 1,3,5 cyclohextriene is -152 kJ/mole

(Section B)

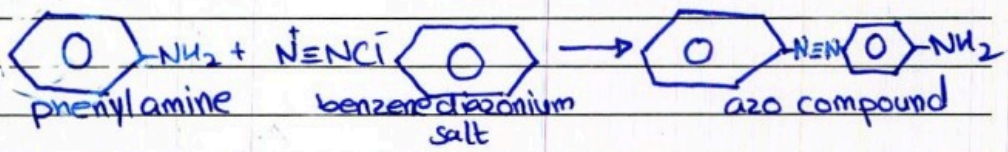
Q. No. 2 Part (vii) **Phenol with bromine**

phenol reacts with bromine water at room temperature which dissolves the red-browish colour of bromine and is replaced by white precipitates of 2,4,6 tribromophenol



phenol reacts with bromine water at room temperature because it is less stable in benzene at can undergo reactions at milder conditions due to it's OH group which is an electron-donating group.

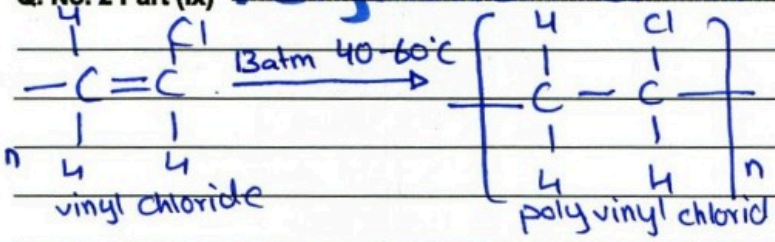
Q. No. 2 Part (viii) **Benzenediazonium chloride with phenyl amine.**



The reaction is carried under 1° or under 5°. This is because benzenediazonium salt decomposes quickly above 10° and forms phenol so The benzene diazonium salt must be cooled down with phenylamine to make the azo compound The N≡N shows azo group which is present in almost all azo dyes

(Section B)

Q. No. 2 Part (ix) **Polymerization of PVC**



This polymerization is addition polymerization. Which occurs only in Alkenes. Vinyl Chloride is obtained from Acetylene with the help of a catalyst ($HgCl_2$) that reacts with HCl.

$$CH \equiv CH + HCl \xrightarrow{HgCl_2} CH_2 = CH - Cl$$

Acetylene → vinyl chloride

Polyvinyl chloride is used for the manufacture of artifical leather, floor covering and gramophone.

Q. No. 2 Part (x)

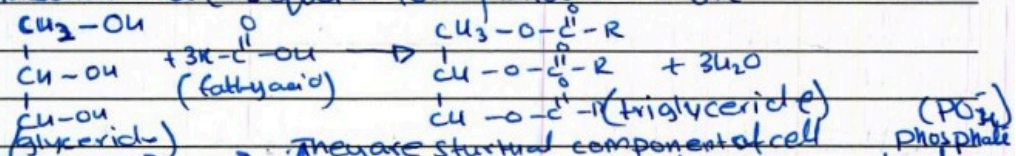
Addition polymerization	Condensation polymerization
Addition polymerization is the addition of Alkene monomers	Condensation polymerization is the addition of diamine group and dicarboxylic group to form amide $\overset{O}{\overset{\|}{C}}-N_H$.
- Addition polymerization back bone is made up of carbon atoms Nothing is lost all carbon are added to each other.	· It removes a molecules which is mostly H_2O · It eliminates H_2O from the reaction.
For example vinyl chloride undergoes addition polymerization to form polyvinyl Chloride	For example adipic acid reacts with hexamethyl diamine to form Nylon 6,6 and eliminate H_2O.

(Section B)

Q. No. 2 Part (xi) **Lipids**

Lipids can be classified into:

1. **Simple Lipids: Triglyceride** = oil and butter are made from two molecules glyceride and fatty acids. Three fatty acids with glyceride forms triglyceride which is a building block of lipid. It can be saturated (solid form) known as butter or unsaturated (liquid form) known as oil.



2. **Phospholipid** = They are structural component of cell Are esters of glyceride, two fatty acid and group (PO_4^{3-}) Phosphate
3. **Isopreneoid** = Consist of isoprene units (5-carbon unit) known as terepenes for example chlorophyll, vitimin A

Q. No. 2 Part (xii) **Number of Carbon-atoms**

$$\text{No of carbon atoms} = \frac{100 \times \text{abundance of } [M+1]}{1.1 \quad \text{abundance of } [M^+]}$$

So $[M+1] = 5.5\%$

$[M^+] = 100\%$

$$\text{no of carbon atoms} = \frac{100 \times 5.5}{1.1 \times 100}$$

Carbon atoms = 5

The molecules have 5 carbon atoms.

(Section B)

Q. No. 2 Part (xiii) **Chromatography:**

Chromatography consist of stationary phase and solvent front which are used to show the separation of components of a compound.

Stationary phase:

Stationary phase is the non-movable part of the Chromatography where mobile phase moves up to the stationary phase. Stationary phase is inert stable, for example glass or paper can be stationary phase for the chromatography.

Solvent front.

When the solvent moves to the maximum height from the baseline where there are components are different height at the stationary phase. below solvent front.

Q. No. 2 Part (xiv) **Pesticides:**

Pesticides are chemicals that kill or control pest, weed, rodent e.t.c that damages crop are reduce it's yield. Different Pesticides show different mechanism of action to increase the crop yield and quality.

Disadvantages:

1. Pesticides are neurotoxic and carcinogic that has a adverse effect of farmers, consumers and co-workers.
2. Pesticides can contaminate land and water and can kill benefical micro organism that benefit the crop yield and quality. beneficial animals as well such as bee.

(Section C)

Q. No. 3 (Page 1)

SN1-Mechanism

SN1 is a unimolecular reaction mechanism which involves two steps. First substrate ionizes reversibly to carbonium ion and Bromide ion. It is a slow and rate-determining step

$CH_3-Br \xrightarrow[\text{Rate determining step}]{\text{slow}}$

Numerical:

I = 3.0A

t = 45 × 60s = 2700s

(a) Chemical equation of Cu at cathode

At cathode:

$Cu^{+2} + 2e^- \longrightarrow Cu$

(b) Total Charge:

Q = I × t

= 3.0 × 2700s

= 8100s C

By faradays

By Molar Ratio

faraday : Coulomb.

(Section C)

Q. No. 3 (Page 2)

F : C
1 : 96500
x : 8100s

(b) Charge faraday of Cu = 0.083

F : Cu
2 : 1
0.083 : x
2x : 0.083

x = 0.0415 g/mole.

(C) Molecular mass:

Mass = mole × molar mass
= 0.0415 × 63.5
mass = 2.6g

2.6g of copper is deposited.

(Section C)

Q. No. 3 (Page 3)

(Section C)

Q. No. 4 (Page 1)

Basic Strength

	pK_b
Ammonia	4.7
Ethyl amine	3.3
phenyl amine	9.4

Basic strength of amines are by made by the two factors.

1. How easily the ion takes proton
2. The stability of the ion After taking the proton

Ammonia has a pK_b value of 4.7. Initially we can say that lower the pK_b value stronger the acid Here Ethylamine has the lowest pK_b value so it's the strongest amine. The the least basic is phenyl amine. and Ammonia is more basic then phenyl amine.

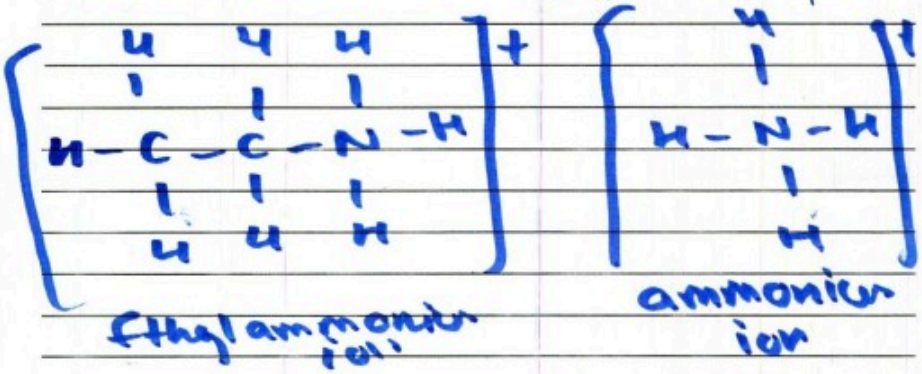
. The Alkyl group of Ethyl amine is a electron-donating group which increases the charge density of N of Ethyl amine making it more electronesitive and it easily attacks Hydrogen atom.

The Ethyl ammonium ion that is formed is

(Section C)

Q. No. 4 (Page 2) more stable then Ammonium ion of Ammonia $(NH_4)^+$ Because Ethyl ammonium ion reduces it POSITIVE charge.

Phenyl amine has aromatic ring attached to the amine which make it more stable due to the presence of π-electron system in it's aromatic ring. The lone-pair of amine in phenylamine is bonded to the ring giving partial-double bond character. So, it is the most stable among Ethylamine and ammonia and the least basic. It does not readily of take $[H^+]$ ion

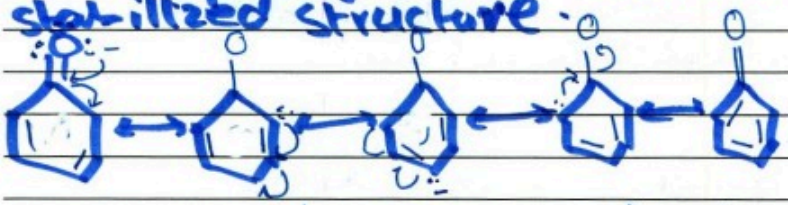


Ethylammonium ion

ammonium ion

(Section C)

Q. No. 4 (Page 3) Phenylamine resonance stabilized structure.



The basity of phenylamine & Ammonic and ethylamine is

Ethylamine > Ammonia > phenylamine

The given order of basity is the conjugate acids order which goes as

phenylamine > Ammonia > Ethylamine

(Section C)

Q. No. 5 (Page 1)

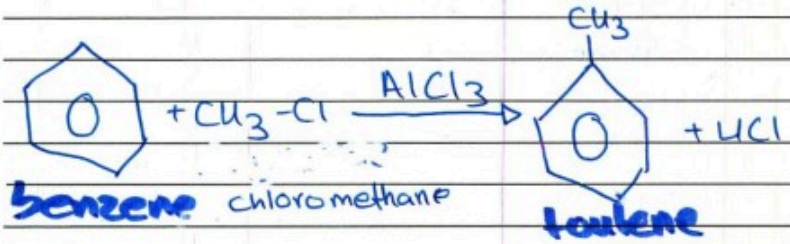
Friedal-Crafts

Friedal Crafts was made by Charles Friedal and James Crafts.

Alkylation.

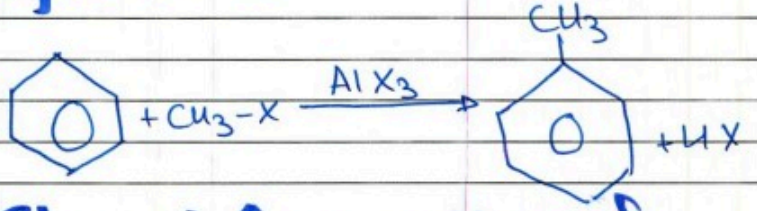
Alkylation is a type of electrophic substitution reaction in which Alkyl halide is used with benzene ring with the help of a catalyst known as $AlCl_3$.

For Example:



benzene chloromethane toluene

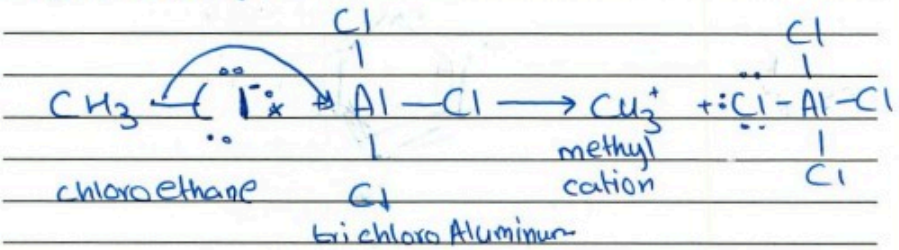
By formula:



Step:1 Generation of Electrophile ion

(Section C)

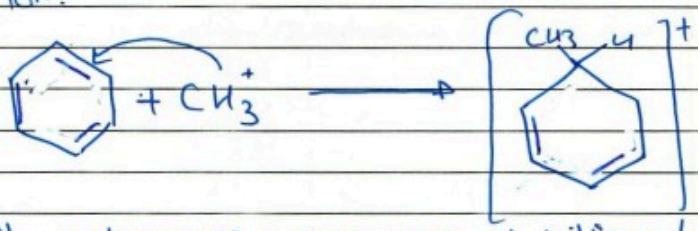
Q. No. 5 (Page 2) First the (alkyl halide) chloro ethane reacts with the tri chloro Aluminum ($AlCl_3$) which is a catalyst.



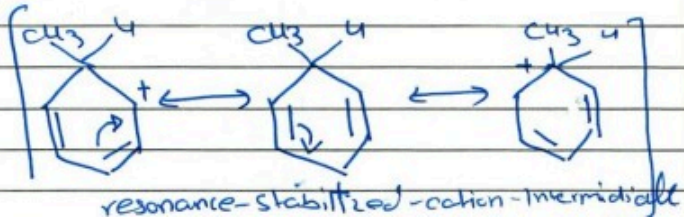
Cl of chloro ethane attacks the catalyst which forms $AlCl_4$ and the formation of methyl cation

Generation of Arenium ion

methyl cation attacks the benzene ring destabilizing the ring and forming arenium ion.



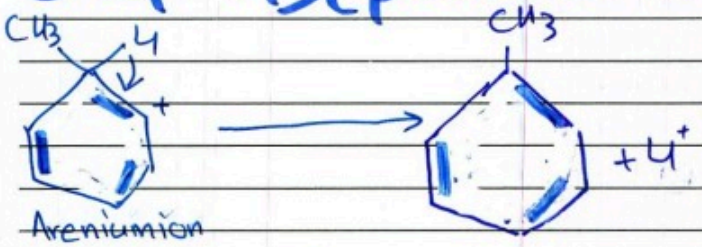
It undergoes resonance-stabilized cation intermediate



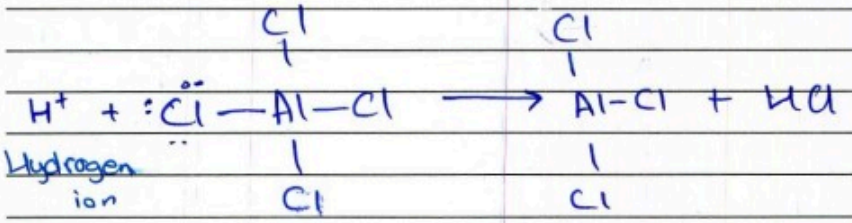
(Section C)

Q. No. 5 (Page 3)

Step 4 Deprotonation:



Arenium ion



H^+ ion is removed from the Arenium ion and forms toulene or Methyl benzen The H^+ then binds to $AlCl_4$ which take Cl from $(AlCl_4)^-$ to make it to $AlCl_3$ So the catalysts can be reused again. The resonance-structure of benzene ring is stabilized again.

(Section C)

Q. No. 6 (Page 1) **Hydrolysis**

Acyl-Chloride:

In Acyl-chloride, carbonyl group is attached to two electronegitive atoms (O) and (Cl) which are highly ~~El~~ electronegiti and pulls electrons away. carbonyl carbon is electron deficient. Because of the carbon electron deficiency the nucleophile So, nucleophile attacks the carbon easily So, hydrolysis occurs easily.

$CH_3-\overset{O}{\overset{\|}{C}}-Cl^-$

Acyl chloride

Alkyl Chloride:

In Alkyl Chloride" in which the carbon is attached to only one electronegitive atom (Cl) which pulls electron away from the electro deficient carbon. The nucleophile attacks the alkyl chloride only if it is a strong nucleophile. So, Hydrolysis occurs only if a strong nucleophile attacks it.

$CH_3-CH_2-Cl^-$

Aryl Chloride:

(Section C)

Q. No. 6 (Page 2)

Aryl chloride has a aromatic ring attached to it which is a benzene ring Aryl chloride is the most stable among the other Because The electronegitive chlorine is attached to the benzene ring due to pi electron system in the benzene ring So, it make partial double bond. It also undergoes resonance-stabilized structure. The nucleophile can not attack it So, hydrolysis does not occur. The order of hydrolysis is, Aryl Chloride ~~Aryl Chloride~~ Alkyl Chloride > Aryl Chloride.

(Section C)

Q. No. 6 (Page 3)