Section: B

Question: 02

Short Questions:

(i)

Answer:

Ionization Energy:

The amount of energy required to remove the valance electron from the outermost shell of an isolated gaseous atom is called ionization energy.

$Mg \longrightarrow Mg^{+1} + e^-$ $I_E =$

$Na \longrightarrow Na^{+1} + e^-$

Trends:

Period: Ionization energy increase in period when we move from left to right

Group: As we move down the group

Ionization energy decrease b/c shells are added

Ionization energy of Phosphorus is higher than Sulphur:

Ionization energy of phosphorus is greater than sulphur because the phosphorus has stable electronic configuration and sulphur has unstable electronic configuration due to stable electronic configuration of phosphorus more energy will be required to remove the valance electron from phosphorus and due to unstable electronic configuration of sulphur low amount of energy will be required to remove valance electron from the outermost shell of sulphur.

$S^{16} = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$ → unstable

$P^{15} = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$ → stable due to half filled orbital.

(iv)

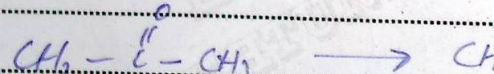
Answer:

Tautomerism:

The type of isomerism in which hetero difference is position of proton and pi bond

→ Molecular formula are same but structured formula is different.

Examples:



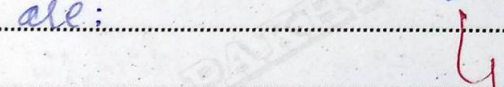
Metamerism:

The type of isomerism in which the organic compound have irregular distribution of carbon atom on either sides of functional group.

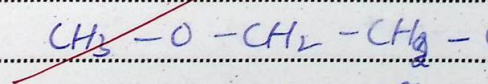
→ They have the same molecular formula.

Examples:

Examples of metamerism are:



Diethyl ether



propyl - methyl ether.

(vi)

Answer:

Tertiary alkyl halides follow SN_1 Mechanisms:

SN_1:

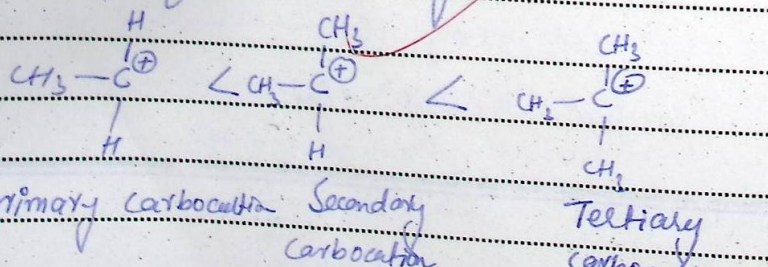
SN_1 represents Nucleophilic substitution monomolecular.

- SN_1 reaction is followed by tertiary alkyl halides.

Followed by tertiary alkyl halides:

As we know that the rate of reaction is directly proportional to stability.

As the stability of carbocation is followed by:



As tertiary carbocation is more stable due to which the reaction mechanism will be stable and will be more stable than primary carbocation and secondary carbocation.

So, due to more stability the SN_1 reaction rate will be more stable.

Conclusion:

So due to more stability of tertiary alkyl halides.

SN_1 mechanism is followed by tertiary alkyl halides in order to gain more stability.

(Vii)

Answer:

Lucas Test:

Lucas test is the test performed in order to find the reactivity of alcohol.

- It is used to find either the alcohol is primary, secondary or tertiary.

Lucas Reagent:

Lucas reagent can be prepared by the reaction of $ZnCl_2$ with HCl.

$$R\text{-}OH + HCl \xrightarrow{ZnCl_2} R\text{-}Cl + H_2O$$

Analysis:

Tertiary Alcohol:

Tertiary alcohol will react immediately with the Lucas Reagent.

Secondary Alcohol:

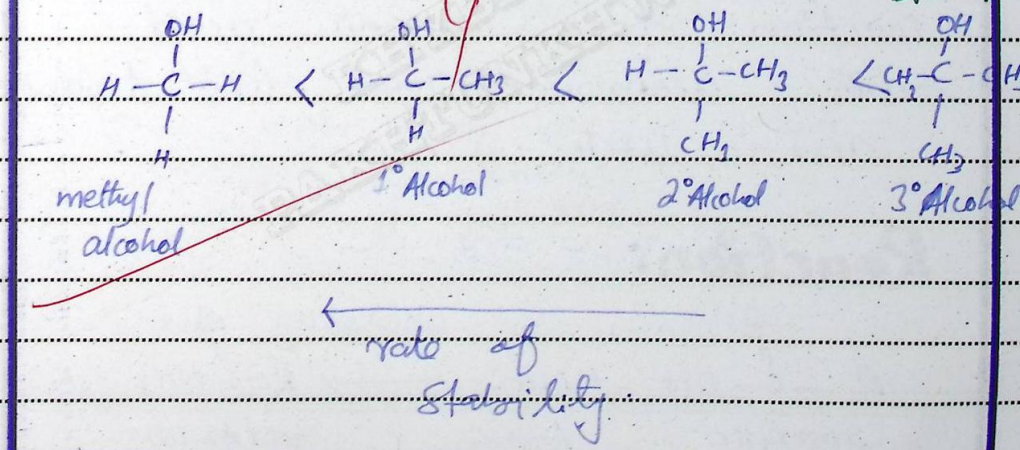
Secondary Alcohol will react with Lucas reagent after 4-5 minute.

Tertiary Alcohol:

Primary alcohol and methyl Alcohol doesn't react with Lucas reagent.

(3) Reaction not mentioned

Conclusion:



(ix)

Answer:

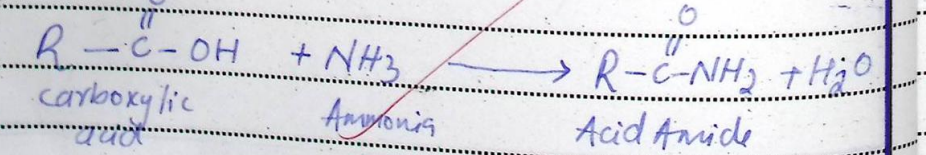
Conversion of Carboxylic Acid to Acid Amides and Acid Anhydrides:

To Acid Amides:

Ammonolysis of Carboxylic Acid:

Carboxylic acid can be converted to Acid Amide by the reaction of Carboxylic acid with ammonia toget Acid Amides and water.

Reaction:

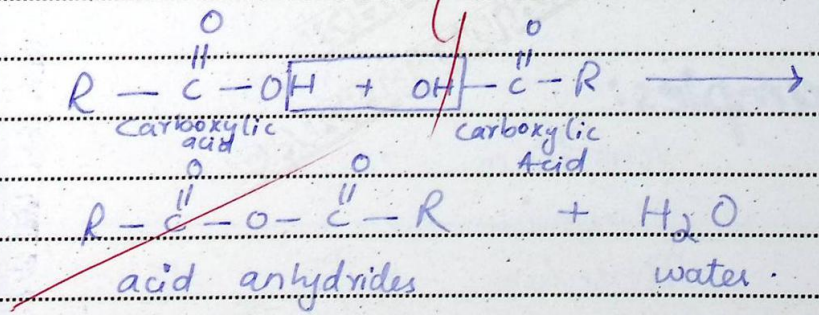


To acid Anhydrides:

Dehydration of Carboxylic Acid:

Acid Anhydrides can be obtained from carboxylic acid by the reaction of two carboxylic acid with the removal of water.

Reaction:



(ii)

Answer:

Typical transition Metals:

Those transition metals which follows the properties of transition metals.

because:

They have half filled d and f orbitals are called typical transition metals.

Examples:

Vandium → ^{23}V

Chromium → ^{24}Cr

Titanium → ^{73}Ta etc

Non Typical transition Metals:

Metals that donot follow the properties of transition metals

because:

They don't have half filled orbitals are called Non-typical transition metals.

Examples:

Zinc → ^{30}Zn

Cadmium → ^{48}Cd

Mercury → ^{80}Hg etc.

P.T.O

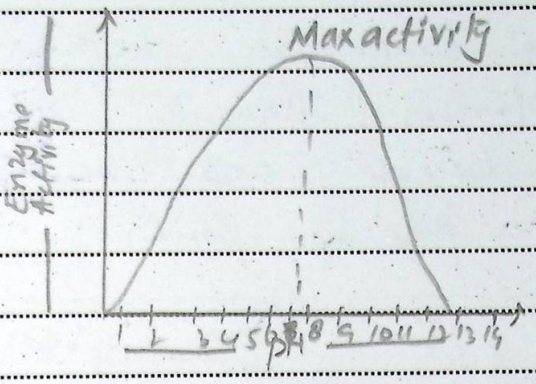
(X)

Answer:

Effect of pH on Enzyme activity:

The pH at which the activity of enzyme is maximum is known as optimum pH. The optimum pH for enzyme activity is 5-9 but just pepsin has optimum pH of 2.

- Increase is pH affect the activity of enzyme. Decrease in pH also decreases / affect the activity of enzyme.
- The pH at which the activity of enzyme stops is known as minimum pH.

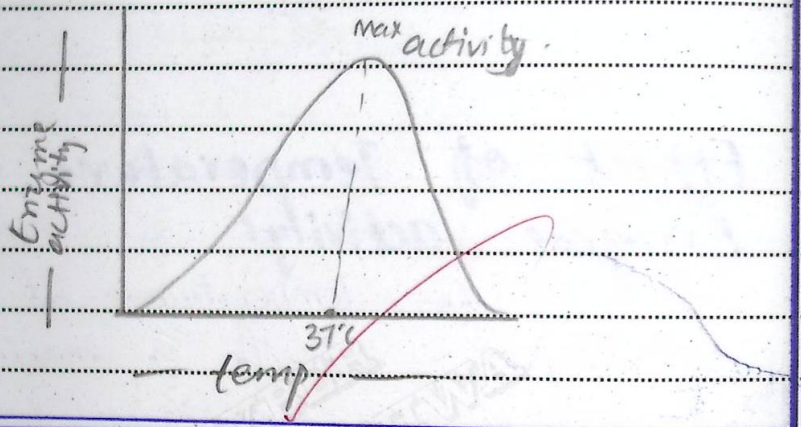


Effect of Temperature on Enzyme activity:

The temperature at which the enzyme activity is maximum is known as optimum temperature. The optimum temperature for human enzyme is 37°C and plants is 60°C.

As the temperature increases above the optimum temperature the rate of enzyme action decreases and become zero at 100°C.

As the temperature decrease beyond the optimum enzyme activity also decrease and became zero at 0°c freezing point.



(xi)

Answer:

Polyvinyl chloride:

These are the polymers of Vinyl Chloride and are used in many industrial processes.

USES :

Polyvinyl chloride is very useful in our daily life.

Following are its uses:

1) **Rexine:**

Polyvinyl chloride are used to make leather like compound called Rexine.

2- **Pipes:**

Polyvinyl chloride are used to make pipes for water supply.

3- **Shoes:**

These are used to make rexine shoes.

4- **Plastic Bags:**

These are also used to make plastic bags.

(viii)

Answer:

Tollen's test:

Tollen test is a kind of test which is used to identify aldehydes.

Tollen's Reagent:

Diamine Silver Hydroxide.

$2Ag(NH_2)_2OH$ is used as a tollen Reagent.

Process:

When the tollen reagent is mixed with aldehydes it can give white precipitate and Silver like substance attached to the wall of test tube that's why it is known as Silver mirror test.

→ Ketones doesnot react with tollen Reagent.

Importance:

Importance of tollen reagent is that it is used to identify Aldehydes.

(4) complete corrected ✓

Fehlings test:

Fehling test is a test used for identifying Aldehydes in a substance.

Fehling Reagent:

Fehling reagent will be made when Cu_2O reacts with tartaric acid.

Importance:

→ It is used to identify Aldehydes

Process:

Fehling reagent react with aldehydes to give red ppt. While Ketone doesnot give or even react with Fehling reagent.

(xiii)

Answer:

Important Applications of IR Spectroscopy:

Following are the important application of IR spectroscopy:

1- Determination of Functional Group:

IR spectroscopy is used to determine the functional group in Organic compounds.

2- Determination of Organic Compounds:

IR spectroscopy is used to find whether the compound is organic or inorganic.

3- To Find Impurities:

IR spectroscopy is used to determine impurities in organic compound mixtures.

4- Progress of Chemical Reaction:

IR spectroscopy is used to find the progress of chemical reaction at different progressing stages.

P.T.O

Section: C

Question: 05

Grignard Reagent:

→ Grignard Reagent are organo metallic compound

→ These are used in the preparation of many organic compounds.

Representation:

Grignard Reagent can be represented as:

$R-MgX$

Where R is the alkyl group
Mg is the metal and
-X is the halogen atom.

Prepared by:

Grignard reagent were first prepared by Grignard and won Noble prize in 1912.

Preparation:

Grignard reagent can be prepared by the reaction of Alkyl Halides with the freshly prepared Mg in ether solution.

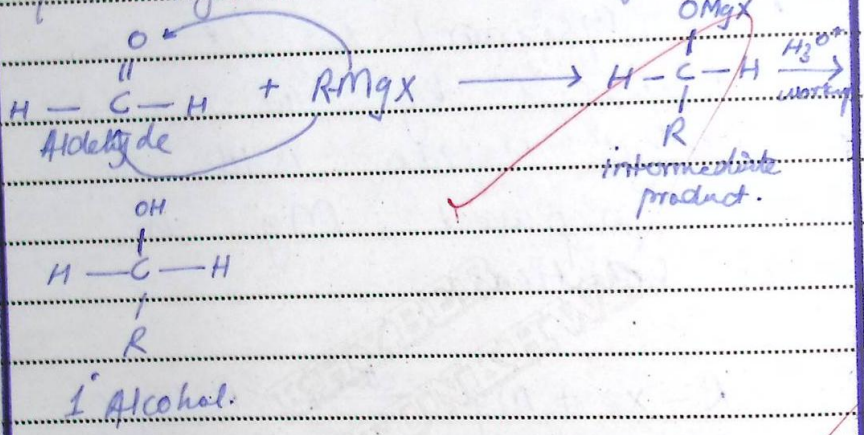
$$R-X + Mg \xrightarrow{\text{ether}} R-MgX$$

alkyl halide — Magnesium — Grignard Reagent.

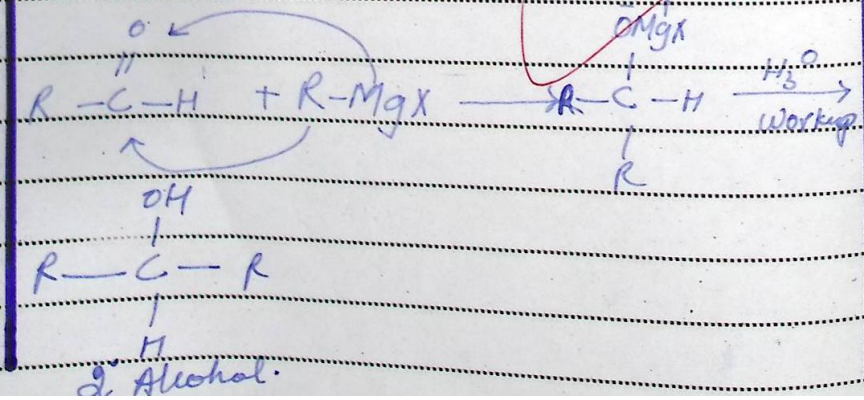
Grignard Reactions:

With Aldehyde:

Reaction of Grignard Reagent with Aldehydes give primary and secondary Alcohol;

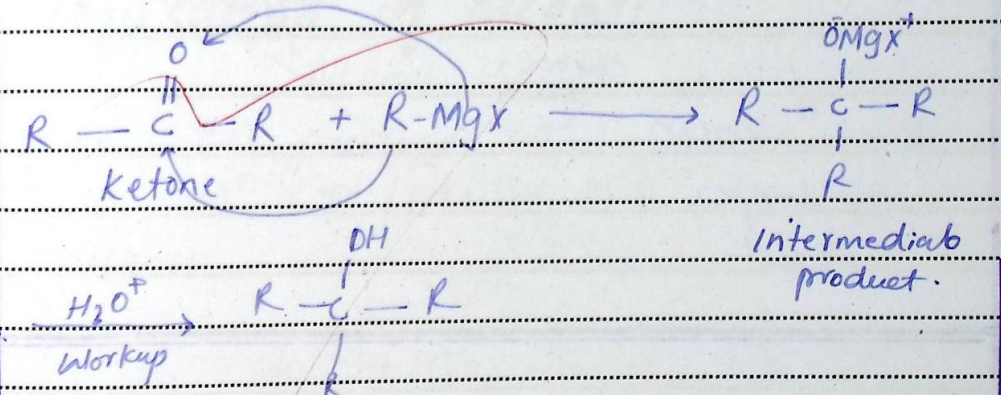


Higher Aldehyde gives Secondary Alcohol;



With Ketones:

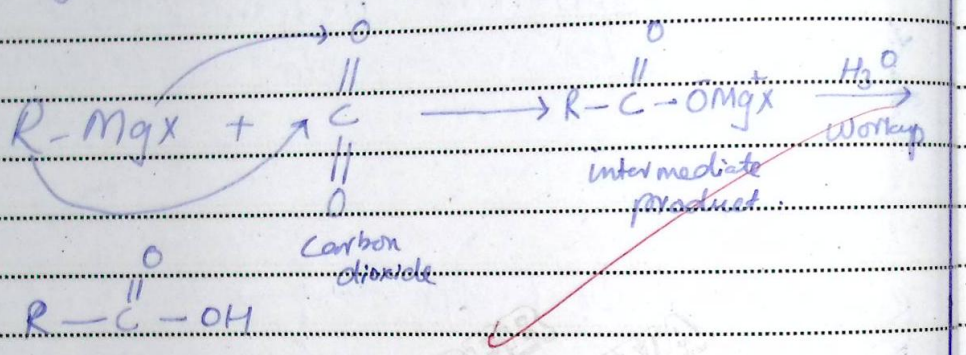
Grignard Reagent react with Ketones to give tertiary Alcohol.



By reacting R-Mgx with Ketone we get tertiary Alcohol.

With Carbondioxide:

Grignard reagent react with Carbondioxide to give intermediate product which on acid workup gives carboxylic Acid.



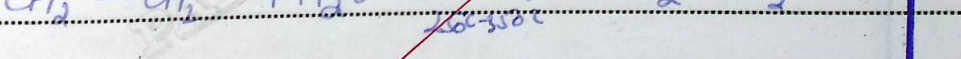
Question: 04

Important Chemical Reactions of Alkenes:

Following are the some important chemical reactions of Alkenes:

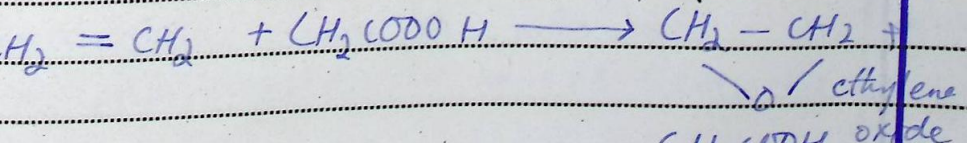
Hydration of Alkenes:

Alkenes react with water in the presence of Ni 250°C-350°C or at pt/pd at 25°C to give alkanes.



Exploidation:

Alkenes react with peracid thinoyl to give oxirine (cyclic Ethers)



Industrial preparation followed as;

$$CH_2=CH_2 + \tfrac{1}{2}O_2 \xrightarrow[\text{Ag}]{\text{200°C}} CH_2-CH_2 \quad (O)$$

Halogenation:

Alkenes react with halogens to give vicinal dihalides in the presence of CCl_4.

$$CH_2=CH_2 + Br-Br \xrightarrow{CCl_4} CH_2(Br)-CH_2(Br)$$

Mechanism:

$$CH_2=CH_2 + Br-Br \longrightarrow CH_2-CH_2 + Br^- \longrightarrow CH_2(Br)-CH_2^+ \longrightarrow CH_2(Br)-CH_2(Br)$$

(cyclic Bromonium ion)

Bromine Water test:

When alkene is reacted or added to Bromine water the bromine color disappeared and the solution became transparent.

Halohydration:

In this reaction there are two nucleophile as halogen and water they form halo alcohol.

$$CH_2=CH_2 + Br-Br \longrightarrow CH_2(Br)-CH_2^+ \xrightarrow{H_2O} CH_2(OH)-CH_2(Br) \xrightarrow{-H^+} CH_2(OH)-CH_2(Br) + HBr$$

2-bromo ethanol

Hydrohalogenation:

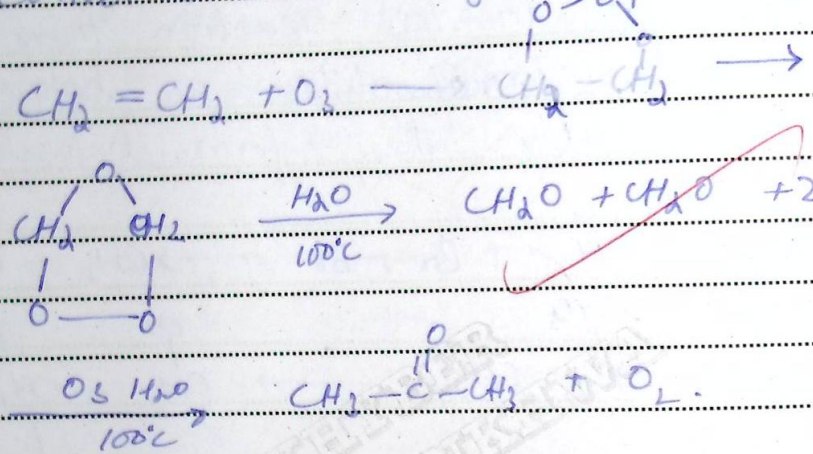
Alkenes react with Acid halide to form Alkyl halides;

$$CH_2=CH_2 + H-X \longrightarrow CH_2-CH_2-X$$

$$CH_2=CH_2 + H-Br \longrightarrow CH_2-CH_2-Br$$

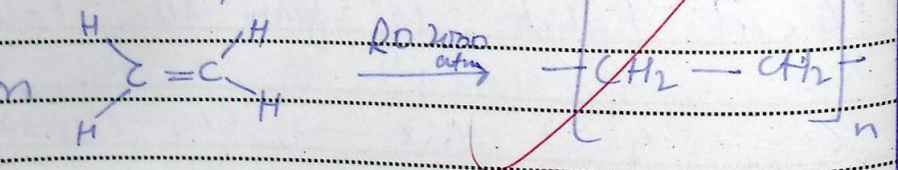
Ozonolysis:

Alkenes in the presence of O_2 (-80°C) molozonide, molozonide rearranges to ozonide finally converted to carboxyl compounds.



Polymerization:

Alkene due to ploymerization yeilds polythene.



It is performed under high temperature and pressure.

Question: 06

Oxidation Reactions of Aldehydes and Ketones:

Oxidation of Aldehydes:

Oxidation of Aldehyde under high pressure strong oxidizing agent $K_2Cr_2O_7$, $KMnO_4$ to yeild Carboxylic Acid.

Oxidation of Ketones:

Oxidation of Ketones required very vagirous condition causes oxidation of α carbon.

Oxi. of Aldehyde under mild oxidizing agents:

Tollen's test:

- Also called Silver mirror test. It changes Aldehyde to carboxylate ion.

$$R-CHO + 2(Ag\,NH_3)_2OH \rightarrow R-CO^- + 2Ag + 3NH_3 + 2H_2O$$

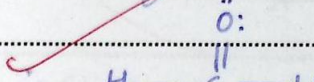
Fehling test:

- Used to identify aldehydes.

$$R-CHO + 2Cu^{+} + 5OH^{-} \rightarrow R-CO^- + 3H_2O + Cu_2O$$

Structure of Aldehyde and Ketone:

We can take the example of formaldehyde to illustrate the structure of Aldehyde and Ketone

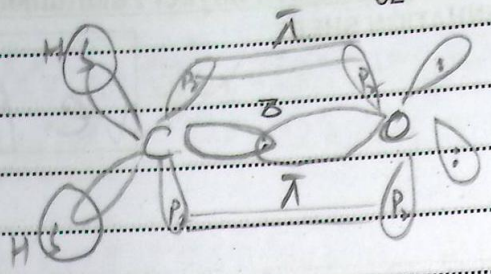


→ Carbon in formaldehyde is sp^2 hybridized.

→ 1 sp hybrid orbital of Carbon overlap with S orbital of hydrogen

→ sp^2 Orbital of Carbon and hydrogen overlap side wise to form π-bonds.

- $2sp^2$ orbital of hydrogen and having 2 lone pairs.



Orbital diagram.

Angle b/w
$\angle s \approx 120°$

Bond length $C=O$ 120 pm