JEE Main Chemistry Previous Year Questions With Solutions on Carboxylic Acid

1. The correct decreasing order for acid strength is

(1) $FCH_2COOH > NCCH_2COOH > NO_2CH_2COOH > ClCH_2COOH$

(2) $CNCH_2COOH > O_2NCH_2COOH > FCH_2COOH > ClCH_2COOH$

(3) $NO_2CH_2COOH > NCCH_2COOH > FCH_2COOH > ClCH_2COOH$

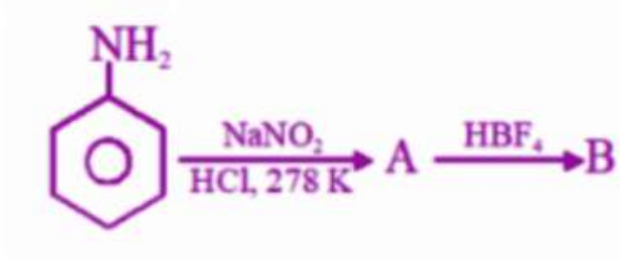
(4) $NO_2CH_2COOH > FCH_2COOH > CNCH_2COOH > ClCH_2COOH$

Solution:

Order of electron-withdrawing effect is $-NO_2 > -CN > -F > -Cl$. So the acid strength order is $NO_2CH_2COOH > NCCH_2COOH > FCH_2COOH > ClCH_2COOH$.

Hence option (3) is the answer.

2. In the chemical reactions,



The compounds 'A' and 'B' are respectively:

(1) Nitrobenzene and chlorobenzene

(2) Nitrobenzene and fluorobenzene

(3) Phenol and benzene

(4) Benzene diazonium chloride and fluorobenzene

Solution:

Hence option (4) is the answer.

3. On heating an aliphatic primary amine with chloroform & ethanolic potassium hydroxide the organic compound formed is

(1) An alkyl cyanide
(2) An alkyl isocyanide
(3) an alkanol
(4) an alkane diol

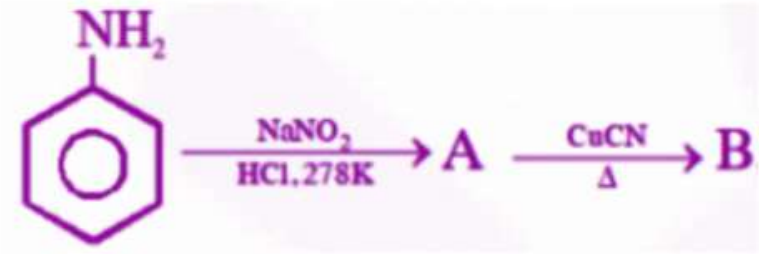
Solution:

On heating, an aliphatic primary amine with chloroform and ethanolic potassium hydroxide the organic compound formed is an alkyl isocyanide. This reaction is called the Carbylamine reaction.

$R\text{-}NH_2 + CHCl_3 \rightarrow R\text{-}NC$

Hence option (2) is the answer.

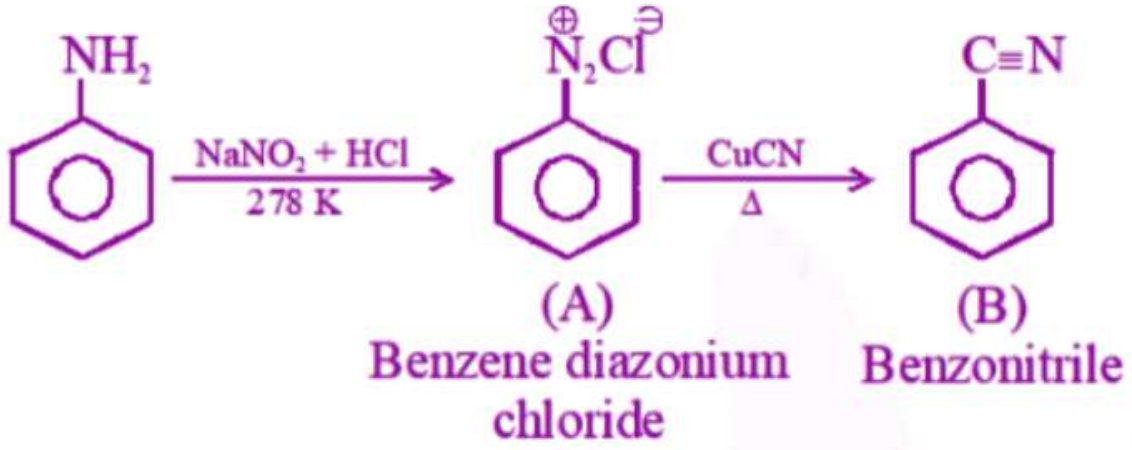
4. In the chemical reactions



The compounds 'A' and 'B' are respectively:

(1) Fluorobenzene and phenol
(2) Benzene diazonium chloride and benzonitrile
(3) Nitrobenzene and chlorobenzene
(4) Phenol and bromobenzene

Solution:



Compound A is Benzene diazonium chloride.
Compound B is benzonitrile.
Hence option (2) is the answer.

5. When $CH_2 = CH- COOH$ is reduced with $LiAlH_4$, the compound obtained will be
(1) $CH_2 = CH\text{-}CH_2OH$
(2) $CH_3\text{-}CH_2\text{-}CHOH$
(3) $CH_3\text{-}CH\text{-}CHO$
(4) $CH_3\text{-}CH_2\text{-}COOH$

Solution:
$LiAlH_4$ can reduce the COOH group and not the double bond.
$CH_2 = CH\text{-}COOH$ is reduced to give $CH_2 = CH\text{-}CH_2OH$
Hence option (1) is the answer.

6. Consider the acidity of the carboxylic acids: Most acidic is
(1) PhCOOH
(2) o – $NO_2C_6H_4COOH$
(3) p – $NO_2C_6H_4COOH$
(4) m – $NO_2C_6H_4COOH$

Solution:
Due to the ortho effect, the acidity of ortho nitrobenzoic acid is greater when compared to other given compounds.
Hence option (2) is the answer.

7. Among the following acids which have the lowest pK_a value?
(1) CH_3COOH
(2) HCOOH

(3) $(CH_3)_2COOH$
(4) CH_3CH_2COOH

Solution:
HCOOH is the most acidic. So it has the lowest pK_a value.
Hence option (2) is the answer.

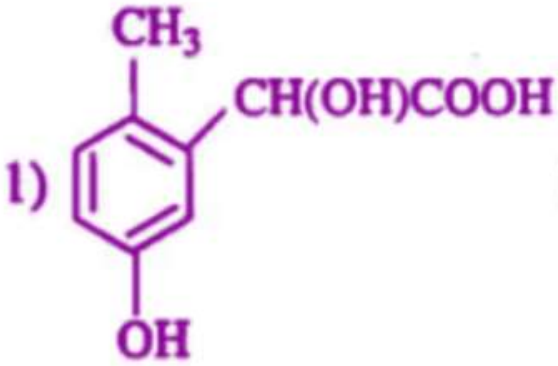
8. The correct order of increasing acid strength of the compounds is
(i) CH_3COOH
(ii) $MeOCH_2COOH$
(iii) CF_3COOH
(iv) $(Me)_2$ COOH
(1) ii < iv < i < iii
(2) iv < i < iii < ii
(3) iv < i < ii < iii
(4) i < iv < iii < ii

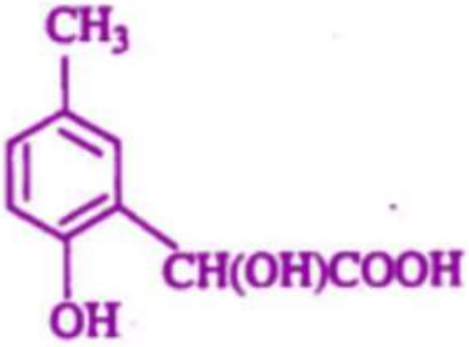
Solution:
The presence of the electron-withdrawing group increases acidic strength.
The correct order of increasing acid strength is iv < i < ii < iii.
Hence option (3) is the answer.

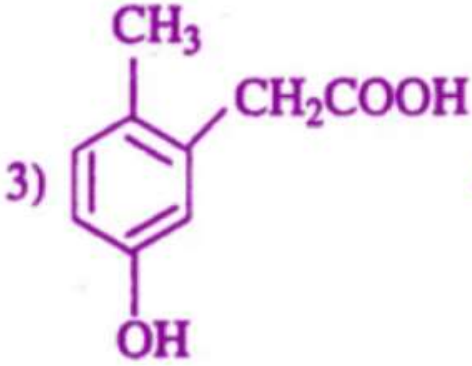
9. A liquid was mixed with ethanol and a drop of concentrated H_2SO_4 was added. A compound with a fruity smell was formed. The liquid was
(1) CH_3OH
(2) HCHO
(3) CH_3COCH_3
(4) CH_3COOH

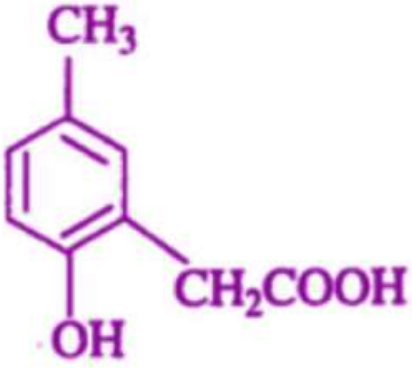
Solution:
The fruity smell occurs due to the formation of ester.
$CH_3COOH + CH_3CH_2OH \rightarrow CH_3COOC_2H_5$
Hence option (4) is the answer.

10. p-cresol reacts with chloroform in alkaline medium to give the compound A which adds hydrogen cyanide to form compound B. The latter on acidic hydrolysis gives chiral carboxylic acid. The structure of the carboxylic acid is

1) 

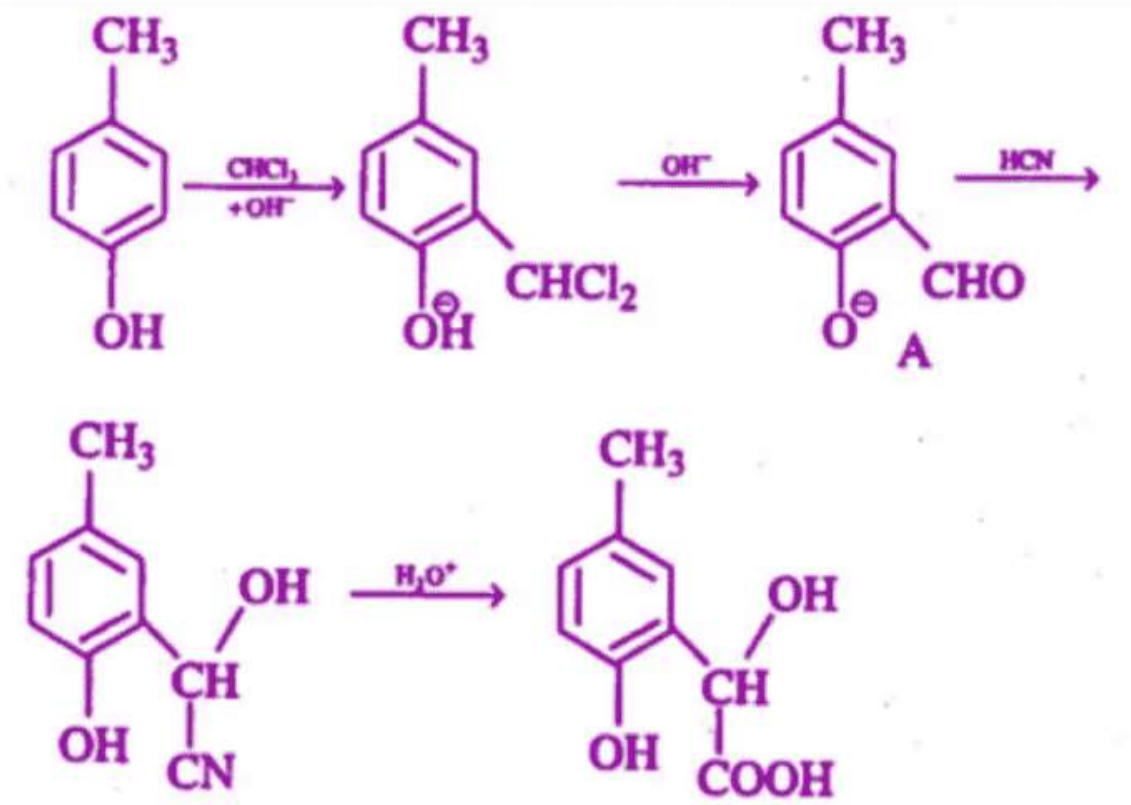
2) 

3) 

4) 

Solution:

The reaction of phenol derivative with chloroform in alkaline medium is Reimer-Tiemann reaction. The addition of HCN at aldehyde group will result in cyanohydrin formation.



Hence option (2) is the answer.

11. The strongest acid amongst the following compounds is

(1) $CH_3CH_2CH(Cl)COOH$

(2) $ClCH_2CH_2CH_2\ COOH$

(3) CH3COOH

(4) HCOOH

Solution:

Due to -I effect of Cl, $CH_3CH_2CH(Cl)COOH$ is the strongest acid.

Hence option (1) is the answer.

12. The general formula $C_nH_{2n}O_2$ could be for open chain

(1) diketones

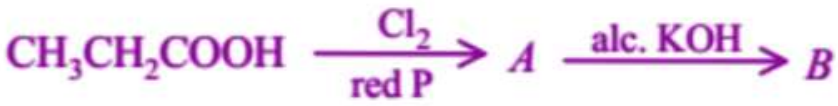
(2) carboxylic acids

(3) diols

(4) dialdehydes.

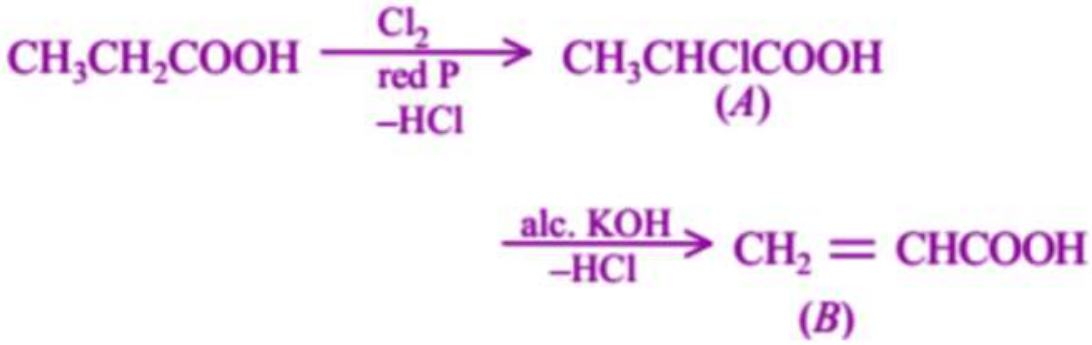
Solution:
The general formula $C_nH_{2n}O_2$ could be for open chain carboxylic acids.
Hence option (2) is the answer.

13. What is B?



(1) CH_3CH_2COCl
(2) CH_3CH_2CHO
(3) $CH_2 = CHCOOH$
(4) $ClCH_2CH_2COOH$

Solution:



Hence option (3) is the answer.

14. In the reaction,

C is:
(1) Ethylene
(2) Acetyl chloride
(3) Acetaldehyde
(4) Acetylene.

Solution:
The reduction of acetic acid gives CH_3-CH_2-OH (A). The reaction of CH_3-CH_2-OH with PCl_5 will give CH_3-CH_2-Cl (B). when it is treated with alcoholic KOH, the product obtained is CH_2=CH_2.
Hence option (1) is the answer.

15. In the presence of a small amount of phosphorous, aliphatic carboxylic acids react with chlorine or bromine to yield a compound in which α– hydrogen has been replaced by halogen. This reaction is known as :
(1) Etard reaction
(2) Hell -Volhard - Zelinsky reaction
(3) Wolff -Kishner reaction
(4) Rosenmund reaction

Solution:
Hell -Volhard - Zelinsky reaction is the reaction in which aliphatic carboxylic acids react with chlorine or bromine to yield a compound in which α– hydrogen has been replaced by halogen, in the presence of a small amount of phosphorus.
Hence option (2) is the answer.

Also Read :
FAQ's on Carboxylic Acid