Compounds Containing Nitrogen

Question1

Identify the product obtained when nitro ethane is treated with Sn – HCl under ideal conditions.

MHT CET 2025 5th May Evening Shift

Options:

A.

Ethanamine

B.

Acetamide

C.

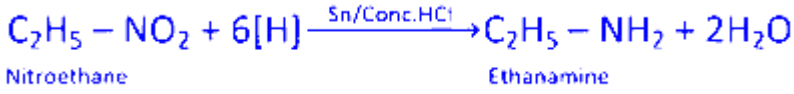
Formamide

D.

Methanamine

Answer: A

Solution:



Question2

Identify tertiary amine from following.

MHT CET 2025 26th April Evening Shift

Options:

A.

Cyclohexanamine

B.

Ethane-1,2-diamine

C.

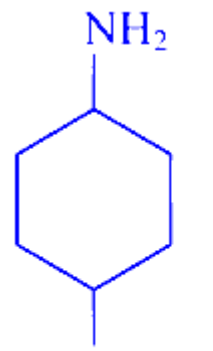
N -Phenylbenzeneamine

D.

N-Ethyl-N-Methylpropan-2-amine

Answer: D

Solution:



Cyclohexanamine
(1° Amine)

$H_2N - CH_2 - CH_2 - NH_2$

Ethane-1,2-diamine
(1° Amine)

$C_6H_5 - NH - C_6H_5$

N-Phenylbenzenamine
(2° Amine)

$CH_3 - CH - CH_3$
$|$
$C_2H_5 - N - CH_3$

N-Ethyl-N-methylPropan-2-amine
(3° amine)

Question3

Which from following compounds is an example of primary amines?

MHT CET 2025 26th April Morning Shift

Options:

A.

N -methylmethanamine

B.

4-Bromobenzenamine

C.

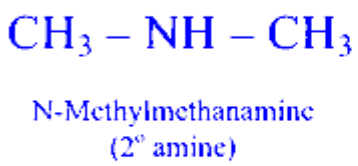
N-Phenylbenzenamine

D.

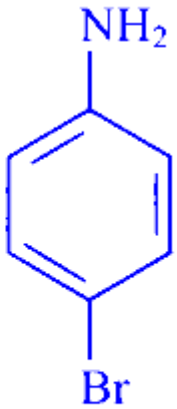
N-Ethyl-N-methylpropan-2-amine

Answer: B

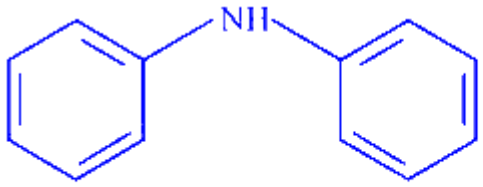
Solution:



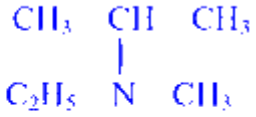
N-Methylmethanamine
(2° amine)



4-Bromobenzenamine
(1° amine)



N-Phenylbenzeneamine
(2° amine)



N-Ethyl-N-methyl
Propan-2-amine
(3° amine)

Question4

Which from following compounds does NOT contain nitrogen in it?

MHT CET 2025 25th April Evening Shift

Options:

A. Thiophene

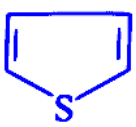
B. Pyridine

C. Pyrrole

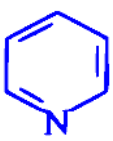
D. Piperidine

Answer: A

Solution:



Thiophene



Pyridine

Pyrrole

Piperidine

Question5

What is the number of moles of H atoms required for complete reduction of one mole acetonitrile?

MHT CET 2025 25th April Evening Shift

Options:

A. 2

B. 4

C. 6

D. 1

Answer: B

Solution:

In Mendius reaction

$$\underset{\text{Acetonitrile}}{CH_3 - C \equiv N} + 4[H] \xrightarrow[\text{Or } LiAlH_4]{Na/C_2H_5OH} \underset{\text{Ethylamine}}{CH_3 - CH_2 - NH_2}$$

$\therefore$ 4 moles of H atoms are required for complete reduction of one mole of acetonitrile to ethylamine.

Question6

Which from following amines on heating with chloroform and ethanolic potassium hydroxide produces foul smell?

MHT CET 2025 25th April Evening Shift

Options:

A. $(CH_3)_3\ N$

B. $(CH_3)_2NH$

C. $(CH_3CH_2)_2NH$

D. $CH_3CH_2NH_2$

Answer: D

Solution:

Aliphatic or aromatic primary amines on heating with chloroform give foul (offensive) smelling products called alkyl/aryl isocyanides or carbylamines. This reaction is a test for primary amines. Secondary and tertiary amines do not give this test.

Question7

Which from following amines has lowest pK_b value?

MHT CET 2025 25th April Morning Shift

Options:

A. $C_2H_5NH_2$

B. $(CH_3)_3\ N$

C. $C_6H_5NH_2$

D. $C_6H_5CH_2NH_2$

Answer: A

Solution:

Amines	$\mathbf{pK_b}$ value
$C_2H_5NH_2$	3.29
$(CH_3)_3$ N	4.22
$C_6H_5NH_2$	9.38
$C_6H_5CH_2NH_2$	4.70

Question8

Identify correct decreasing order of basic strength of amines from following.

MHT CET 2025 23rd April Evening Shift

Options:

A.

$(CH_3)_3$ N $> (CH_3)_2NH > CH_3NH_2$

B.

$(CH_3)_2NH > CH_3NH_2 > (CH_3)_3$ N

C.

$(CH_3)_2NH > (CH_3)_3$ N $> CH_3NH_2$

D.

$CH_3NH_2 > (CH_3)_2NH > (CH_3)_3$ N

Answer: B

Solution:

Basicity in aqueous phase: $1^\circ < 2^\circ > 3^\circ$

If R = Me, then basicity order will be: $3^\circ < 1^\circ < 2^\circ$.

Question9

Identify the product ' B ' in the following sequence of reactions.

$$\text{Ethanenitrile} \xrightarrow{\text{SnCl}_2.\text{HCl}} \text{A} \xrightarrow{\text{H}_3\text{O}^+} \text{B} + \text{NH}_4\text{Cl}$$

MHT CET 2025 23rd April Evening Shift

Options:

A. Ethylamine

B. Ethanamide

C. Ethanol

D. Ethanal

Answer: D

Solution:

$$\underset{\text{Ethanenitrile}}{CH_3CN} \xrightarrow{SnCl_2,HCl} \underset{\text{Imine hydrochloride (A)}}{CH_3 - HC = NH.HCl} \xrightarrow{H_3O^+} \underset{\text{Ethanal (B)}}{CH_3 - CHO} + NH_4Cl$$

This is Stephen reaction.

Question10

Identify secondary amine from following.

MHT CET 2025 23rd April Evening Shift

Options:

A. Phenylmethanamine

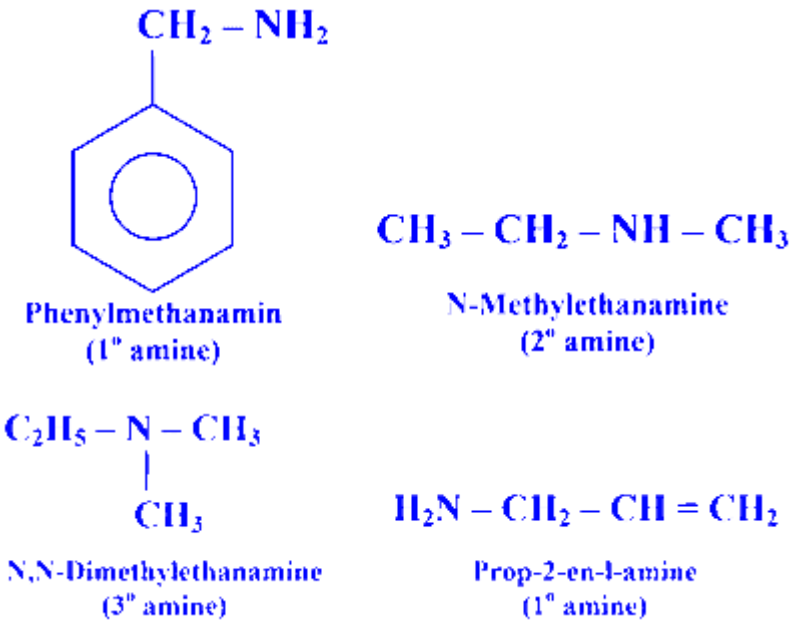
B. N-Methylethanamine

C. N, N-Dimethylethanamine

D. Prop-2-en-1-amine

Answer: B

Solution:



Question11

What is the number of moles of hydrogen atoms required to reduce one mole of nitroethane completely using Sn and HCl ?

MHT CET 2025 23rd April Morning Shift

Options:

A. 2

B. 3

C. 4

D. 6

Answer: D

Solution:

Question12

Identify the substrate ' A ' in the following conversion.

$$\mathrm{A} \xrightarrow[\mathrm{H_3O^+}]{\mathrm{AlH_4(-Bu_2)}} \text{Pent-3-enal}$$

MHT CET 2025 22nd April Evening Shift

Options:

A. Pentanenitrile

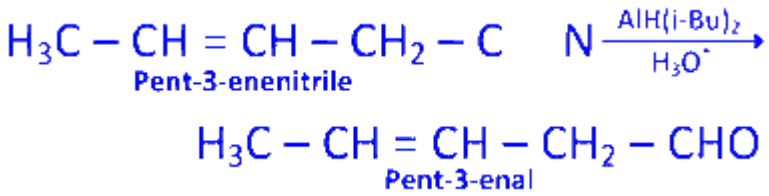
B. Pent-3-enenitrile

C. Pent-3-en-1-amine

D. Pent-3-ynenitrile

Answer: B

Solution:



Question13

Identify product ' B ' in the following sequence of reaction.

$$\text{Aniline} \xrightarrow[273\ \text{K}]{\text{NaNO}_2+\text{HCl}} \text{A} \xrightarrow[\Delta]{\text{H}_2\text{O}} \text{B} + \text{N}_2 \uparrow$$

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Options:

A. Sodium phenoxide

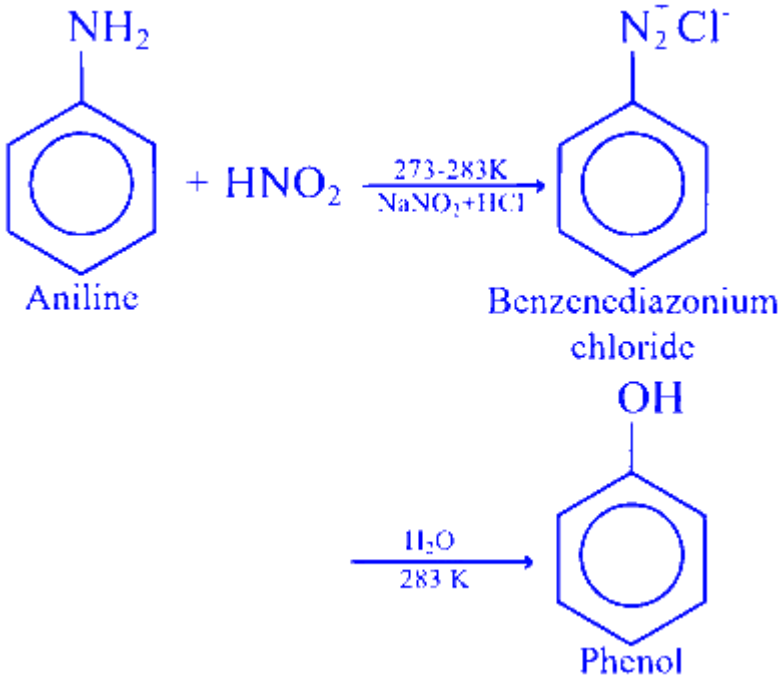
B. Nitrobenzene

C. Benzenediazonium chloride

D. Phenol

Answer: D

Solution:



Question14

Identify the amine having highest pK_b value.

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Options:

A. $(CH_3)_3\ N$

B. $C_6H_5CH_2NH_2$

C. $C_6H_5NH_2$

D. $(CH_3)_2NH$

Answer: C

Solution:

Arylamines are weaker bases than aliphatic amines.

As the lone pair on nitrogen is not completely available for donation due to its participation in resonance. Hence, $C_6H_5NH_2$ is the weakest base with highest pK_b value.

Question15

Which from following compounds can be obtained by azo coupling reaction.

MHT CET 2025 22nd April Evening Shift

Options:

A. Benzenediazonium chloride

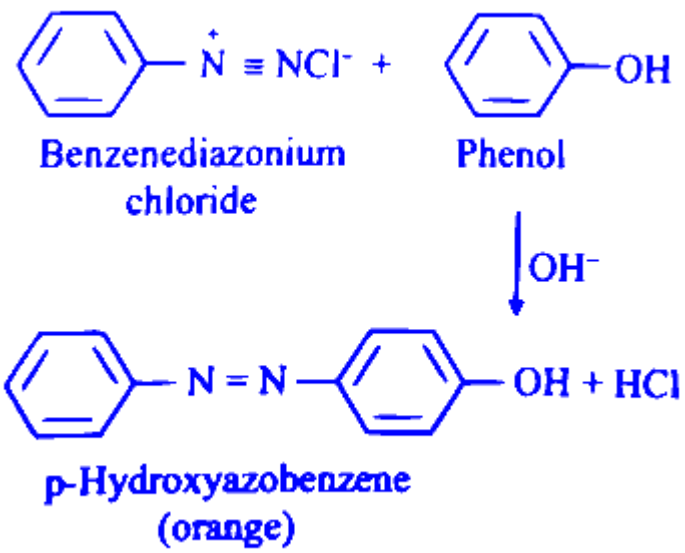
B. Fluoroarene

C. p-Hydroxyazobenzene

D. N-Ethylbenzene sulfonamide

Answer: C

Solution:



Question16

Identify strongest base from following in aqueous medium.

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Options:

A. NH_3

B. CH_3NH_2

C. $(CH_3)_2NH$

D. $(CH_3)_3\ N$

Answer: C

Solution:

As a consequence of combined effect of inductive effect, steric effect and solvation, the secondary amines are the strongest bases among aliphatic methyl amines in aqueous medium and the basic strength varies as:

2° amine $>$ 3° amine $>$ 1° amine $>$ ammonia.

Hence, among the given options, $(CH_3)_2NH\ (2^\circ)$ is most basic in aqueous medium.

Question17

Which from following reactión results in azo coupling?

MHT CET 2025 22nd April Morning Shift

Options:

A.

$C_6H_5NH_2 \xrightarrow{HNO_2}$

B.

$C_6H_5\ N_2Cl + C_6H_5OH \xrightarrow{OH^-}$

C.

$C_6H_5N_2Cl \xrightarrow{HBr_4}$

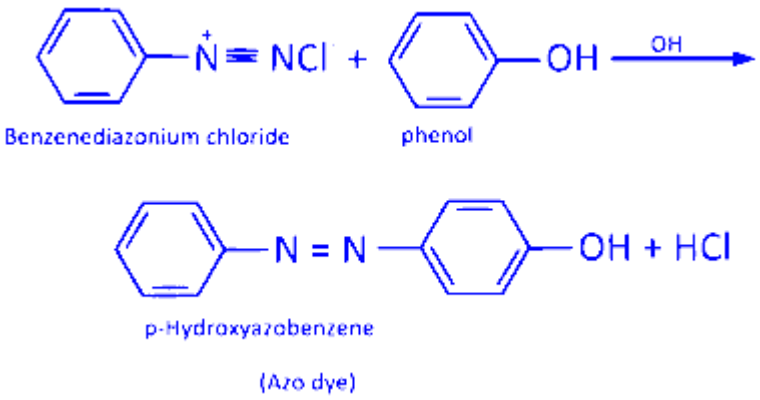
D.

$$C_6H_5N_2Cl \xrightarrow[HCl]{Cu\ (Powder)}$$

Answer: B

Solution:

Arene diazonium salts when treated with certain reactive aromatic compounds such as phenols of aromatic amines, give azo compounds. These have extended conjugated system of double bonds in which two aromatic rings are joined through azo group $-N=N-$. This reaction is called azo coupling.



Question18

Identify product A in following reaction.

$$C_6H_5\overset{+}{N}_2Cl^- \xrightarrow{C_2H_5OH} A + N_2 + CH_3CHO + HCl$$

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Options:

A. C_6H_6

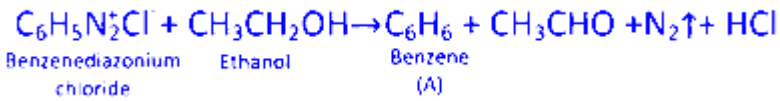
B. $C_6H_5NH_2$

C. C_6H_5COOH

D. C_6H_5Cl

Answer: A

Solution:



Question19

Which from following compounds is an example of secondary amine?

MHT CET 2025 20th April Evening Shift

Options:

A. Ethane-1, 2-diamine

B. Propan-2-amine

C. N-Methylmethanamine

D. N,N-Dimethylmethanamine

Answer: C

Solution:

N-Methylmethanamine is a secondary amine. The structure can be written as:

$CH_3 - NH - CH_3$

Question20

What is the loss in molar mass when a primary amine is obtained by Hofmann degradation of amide?

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Options:

A. 32 g mol^{-1}

B. 14 g mol^{-1}

C. 28 g mol^{-1}

D. 30 g mol^{-1}

Answer: C

Solution:

Hofmann degradation of an amide involves the following reaction:

$$\text{RCONH}_2 \xrightarrow{\text{Br}_2/\text{KOH}} \text{RNH}_2 + \text{CO}_2$$

Let's compare the molar masses of the starting amide (RCONH_2) and the final amine (RNH_2):

1. **Molar Mass of Amide (RCONH_2):**

- R group: M (unspecified)
- C: 12 g mol^{-1}
- O: 16 g mol^{-1}
- N: 14 g mol^{-1}
- 2 H: $2 \times 1 = 2 \text{ g mol}^{-1}$
- **Total:** $M + 12 + 16 + 14 + 2 = M + 44 \text{ g mol}^{-1}$

1. **Molar Mass of Amine (RNH_2):**

- R group: M
- N: 14 g mol^{-1}
- 2 H: 2 g mol^{-1}
- **Total:** $M + 14 + 2 = M + 16 \text{ g mol}^{-1}$

1. **Loss in Molar Mass:**

   $$\text{Loss} = (M + 44) - (M + 16) = 44 - 16 = 28 \text{ g mol}^{-1}$$

Therefore, the correct answer is:

Option C $\boxed{28 \text{ g mol}^{-1}}$

Question21

Which from following compounds has lowest $\mathrm{pK_b}$ value?

MHT CET 2025 19th April Morning Shift

Options:

A. N -Ethylethanamine

B. Propan-2-amine

C. NH_3

D. Benzenamine

Answer: A

Solution:

We are asked: **Which of the following has the lowest pK_b value?**

(Remember: lower pK_b means **stronger base**.)

Step 1: Recall the concept

- For bases:

  Stronger base ⟶ higher K_b ⟶ lower pK_b.

- Effect of groups attached to nitrogen:
- **Alkyl groups**: electron donating by +I effect ⟶ increase electron density on N ⟶ increase basicity.
- **Aromatic group (like phenyl in aniline)**: due to resonance, the lone pair on N is delocalised into the ring ⟶ decreases basicity.
- Hence, aniline is a much weaker base than aliphatic amines.

Step 2: Compare each option

1. **N-Ethylethanamine** (a secondary amine):

   Two alkyl groups donate electrons by +I effect.

   It has electron density on N enhanced ⟶ relatively strong base.

2. **Propan-2-amine** (a primary aliphatic amine):

   One alkyl group ⟶ slightly less strong base than secondary alkyl amine.

3. **Ammonia (NH_3)**:

   No electron donating group other than H.

   Weaker base than aliphatic amines.

4. **Benzenamine (Aniline)**:

   Lone pair involved in resonance with benzene ring.

   Very weak base compared to ammonia and aliphatic amines.

Step 3: Order of basicity

Aliphatic secondary amine (N-ethylethanamine) >

Aliphatic primary amine (Propan-2-amine) >

Ammonia >

Aniline.

Step 4: Relation to pK_b

- Strong base = lower pK_b.
- Weak base = higher pK_b.

So, the **lowest** pK_b is for the **strongest base**:

N-Ethylethanamine (Option A).

Final Answer:

Option A: N-Ethylethanamine

Question22

Identify ' Y ' in the following reaction.

$$CH_3Br \xrightarrow{KcN} X \xrightarrow{Na_2/C_2H_5OH} Y$$

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Options:

A. $CH_3 - CH_2 - NH_2$

B. $CH_3 - O - Na$

C. $CH_3 - O - C_2H_5$

D. CH_3CN

Answer: A

Solution:

$$CH_3Br \xrightarrow{KCN} \underset{(X)}{CH_3 - CN} \xrightarrow{Na/C_2H_5OH} \underset{(Y)}{CH_3 - CH_2 - NH_2}$$

Question23

Identify a compound having properties of tear gas.

MHT CET 2024 16th May Evening Shift

Options:

A. $SOCl_2$

B. $COCl_2$

C. $Cl(CH_2)_2\,S(CH_2)_2Cl$

D. CCl_3NO_2

Answer: D

Solution:

Among the listed options, the compound known to have tear gas properties is **chloropicrin** (CCl_3NO_2). It is sometimes referred to as "nitrochloroform" and is well-known for causing severe irritation to the eyes (tearing), hence its tear-gas properties.

$\boxed{CCl_3NO_2 \text{ (chloropicrin) is the tear gas.}}$

Question24

Which of the following conversions is Hofmann Elimination reaction?

MHT CET 2024 16th May Evening Shift

Options:

A. $RCONH_2 \xrightarrow{Br_2, KOH_{(aq)}} R - NH_2$

B. $R - NH_2 \xrightarrow[\text{excess}]{R-X} R_4NX$

C. $R_4NX \xrightarrow[\Delta]{\text{mois} \quad Ag_2O} \text{Alkene} + R_3N$

D. $RCN \xrightarrow{Na_2/C_2H_5OH} RCH_2NH_2$

Answer: C

Solution:

The Hofmann Elimination reaction is represented by Option C:

$$R_4NX \xrightarrow[\Delta]{\text{mois} \quad Ag_2O} \text{Alkene} + R_3N$$

In Hofmann Elimination, a quaternary ammonium salt (typically an iodide or bromide) reacts under the influence of heated silver oxide and water to form an alkene, along with a tertiary amine. This elimination process follows the E2 mechanism, where the less substituted alkene is generally favored, often referred to as the "Hofmann product." This is contrary to Zaitsev's rule, which usually predicts the more substituted alkene formation in elimination reactions.

Question25

Identify the class of $(C_6H_5)_3\ N$?

MHT CET 2024 16th May Morning Shift

Options:

A. 3° aliphatic simple amine

B. 3° aromatic mixed amine

C. 3° aromatic simple amine

D. 3° aliphatic mixed amine

Answer: C

Solution:

The compound $(C_6H_5)_3\ N$ is known as triphenylamine. This structure involves a nitrogen atom bonded to three phenyl groups, where a phenyl group is an aromatic ring derived from benzene (C_6H_5). Since all substituents attached to the nitrogen are aromatic rings, the compound is classified based on these criteria.

The nitrogen atom in triphenylamine is attached to three carbon atoms, none of which are hydrogen atoms, making it a tertiary amine (commonly denoted as 3° amine). Additionally, because all three substituents (the phenyl groups) contain an aromatic ring, it is considered an aromatic amine.

Thus, triphenylamine is classified as a tertiary aromatic simple amine. The correct choice is:

Option C: 3° aromatic simple amine

Question26

Identify the substrate ' A ' in the following conversion.

$$A \xrightarrow[H_3O^+]{AlH(\ i-Bu)_2} \text{Pent-3-enal}$$

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Options:

A. Pentanenitrile

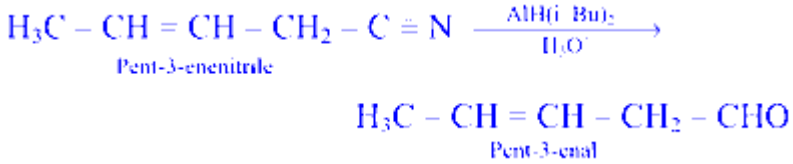
B. Pent-3-enenitrile

C. Pent-3-en-1-amine

D. Pent-3-ynenitrile

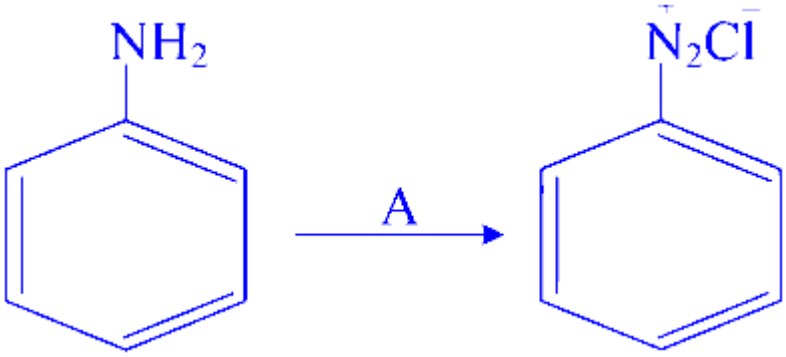
Answer: B

Solution:



Question27

Identify reagent 'A' used in the following reaction?



MHT CET 2024 15th May Evening Shift

Options:

A. $\xrightarrow[\Delta]{\text{dil. HCl}}$

B. $\xrightarrow[\text{low temp.}]{NaNO_2+HCl}$

C. $\xrightarrow[\Delta]{H_3O^+}$

D. NaOH, 623 K

Answer: B

Solution:

This is the diazotisation reaction of aniline.

Question28

Which of the following is a primary amine?

MHT CET 2024 15th May Morning Shift

Options:

A. N-methyl methanamine

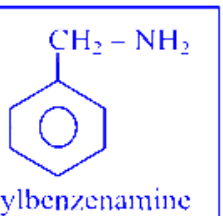
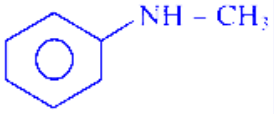
B. Phenyl methanamine

C. N-phenyl benzenamine

D. N-methyl benzenamine

Answer: B

Solution:

$CH_3 - NH - CH_3$ N-methylmethanamine	 Phenylbenzenamine
$C_6H_5 - NH - C_6H_5$ N-phenylbenzenamine	 N-methylmethanamine

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Question29

Which of the following compounds is NOT obtained at any stage of Gabriel phthalimide synthesis?

MHT CET 2024 11th May Evening Shift

Options:

A. Potassium salt of phthalimide

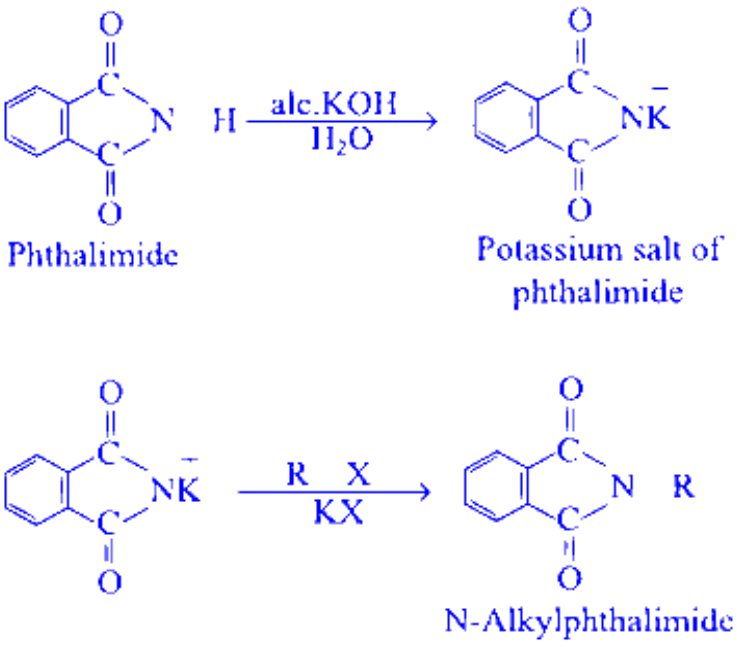
B. N -alkyl phthalimide

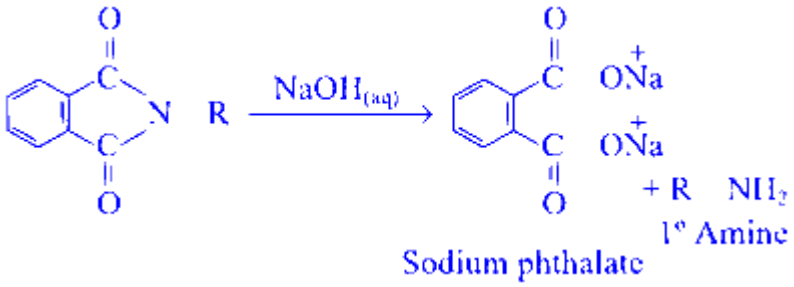
C. Phthalic acid

D. Primary amine

Answer: C

Solution:





Hence, phthalic acid is not formed.

Question30

Identify the product ' A ' obtained in following reaction.

N -alkyl phthalimide $\xrightarrow{N_2OH_{(aq)}}$ sodium phthalate + A

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Options:

A. Primary amine

B. Amide

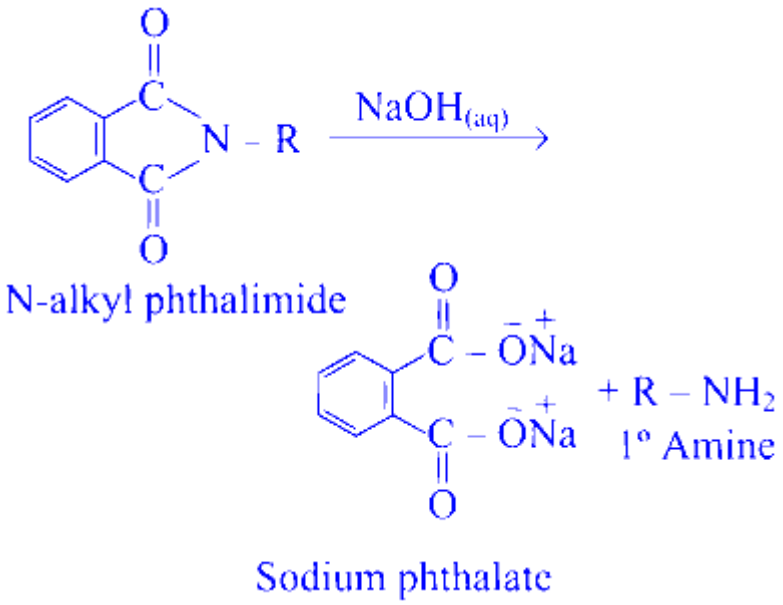
C. Phenol

D. Benzoic acid

Answer: A

Solution:

Alkaline hydrolysis of N-alkyl phthalimide forms the corresponding primary amine.



Question31

Identify reagent used for preparation of benzophenone from benzonitrile?

MHT CET 2024 11th May Morning Shift

Options:

A. C_6H_5MgBr

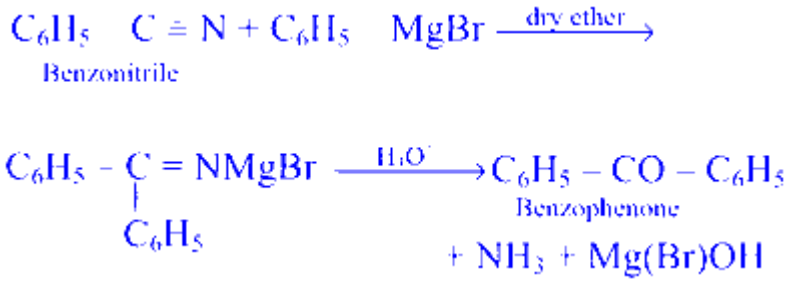
B. CH_3MgCl (in dry ether)

C. $(CH_3)_2Cd$

D. $AlH(i-Bu)_2$

Answer: A

Solution:



Question32

Which compound from following contains N atom in its ring?

MHT CET 2024 11th May Morning Shift

Options:

A. Furan

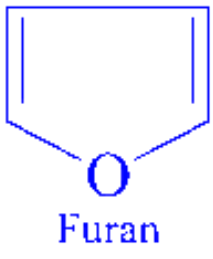
B. Thiophene

C. THF

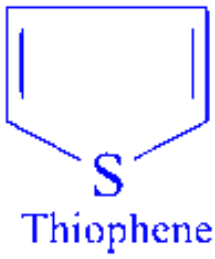
D. Pyrrole

Answer: D

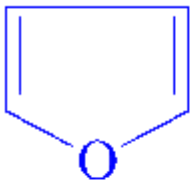
Solution:



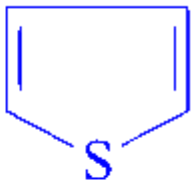
Furan



Thiophene



Furan



Thiophene

Question33

Which from the following statement is NOT correct regarding Mendius reduction?

MHT CET 2024 11th May Morning Shift

Options:

A. It is useful for preparation of $R - NH_2$.

B. In this alkyl cyanides are reduced.

C. In this sodium and ethanol is used for reduction.

D. In this method one carbon atom is lost in the form of CO_2.

Answer: D

Solution:

The statement that is NOT correct regarding Mendius reduction is:

Option D: In this method one carbon atom is lost in the form of CO_2.

In Mendius reduction, alkyl cyanides ($R - CN$) are reduced using sodium in the presence of ethanol to form primary amines ($R - NH_2$). The process does not involve any loss of carbon atoms, and a carbon atom is not

lost as CO_2 during the reaction. Therefore, Option D is the incorrect statement.

Steps involved in Mendius reduction can be summarized as:

Starting Material: Alkyl cyanide ($R - CN$).

Reagents Used: Metallic sodium (Na) and ethanol (CH_3CH_2OH).

Product Formed: Primary amine ($R - NH_2$).

The reduction reaction can be represented as follows:

$R - CN + 4[H] \rightarrow R - CH_2 - NH_2$

Here $[H]$ represents atomic hydrogen provided by the sodium-ethanol combination. No carbon atoms are lost during this conversion, so Option D is incorrect.

Question34

Which from following amines has highest pK_b value?

MHT CET 2024 11th May Morning Shift

Options:

A. Arylamine

B. Tertiary alkanamine

C. Secondary alkanamine

D. Primary alkanamine

Answer: A

Solution:

In general, arylamines are weaker bases than aliphatic amines.

Hence, arylamine is the weakest base and its pK_b value is the highest among the given aliphatic amines.

Question35

Which reagent from following is used for preparation of aliphatic aldehyde from nitriles?

MHT CET 2024 11th May Morning Shift

Options:

A. CrO_2Cl_2 in CS_2

B. CrO_3 in acetic anhydride

C. $SnCl_2$, HCl

D. Co, HCl, anhydrous $AlCl_3$

Answer: C

Solution:

$$\underset{\text{Nitrile}}{R-C\equiv N} \xrightarrow[(ii)\ H_3O^+]{(i)\ SnCl_2,\ dil.HCl} \underset{\text{Aldehyde}}{RCHO} + NH_4Cl$$

Question36

Which of the following is Mendius reduction?

MHT CET 2024 10th May Evening Shift

Options:

A. $R-CONH_2 \xrightarrow[\Delta]{B_2,KOH_{(aq)}} R-NH_2$

B. $R-NH_2 \xrightarrow{RX\ (excess)} R_4NX$

C. $R_4NX \xrightarrow[\Delta]{Moist\quad Ag_2O} Alkene + R_3N$

D. $R - CN \xrightarrow[\text{or } LiAlL_4]{Na/2C_2OH} R - CH_2NH_2$

Answer: D

Solution:

Option D is the Mendius reduction. This reaction involves the reduction of a nitrile ($R - CN$) to a primary amine ($R - CH_2NH_2$). In the context of Mendius reduction, sodium in ethanol (Na/C_2H_5OH) is used for the reduction process, though lithium aluminum hydride ($LiAlH_4$) is also a common reagent for achieving this transformation. The reaction can be described as follows:

$$R - CN + 4[H] \xrightarrow[Na/C_2H_5OH \text{ or } LiAlH_4]{} R - CH_2NH_2$$

This reaction is significant in organic synthesis for converting nitriles into useful amine products.

Question37

Identify the product 'B' obtained in following reaction.

$$R - C \equiv N \xrightarrow[HCl]{SnCl_2} A \xrightarrow{H_3O^+} B$$

MHT CET 2024 10th May Morning Shift

Options:

A. $R - NH_2$

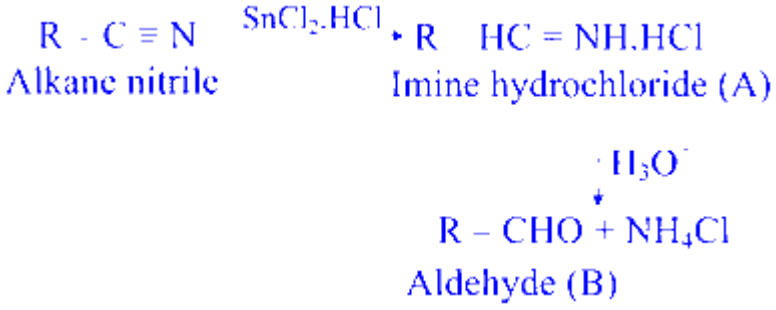
B. $R - CONH_2$

C. $R - CHO$

D. $R - COOH$

Answer: C

Solution:



Question38

Identify the correct decreasing order of pK_b values of compounds from following.

MHT CET 2024 10th May Morning Shift

Options:

A. $NH_3 > R - NH_2 > R_2NH$

B. $R_2NH > R - NH_2 > NH_3$

C. $R - NH_2 > R_2NH > NH_3$

D. $R_2NH > NH_3 > R - NH_2$

Answer: A

Solution:

Basic strength increases as we move from NH_3 to $R - NH_2$ and from $R - NH_2$ to R_2NH, but basic strength decreases as we move from R_2NH to R_3 N.

Order of basic strength:

$NH_3 < R - NH_2 < R_2NH$

Thus, Order of pK_b values:

$NH_3 > R - NH_2 > R_2NH$

Question39

Which one of the following compounds does not react with acetyl chloride?

MHT CET 2024 9th May Evening Shift

Options:

A. $CH_3CH_2NH_2$

B. $CH_3CH_2CH_2NHCH_3$

C. $(CH_3CH_2)_3N$

D. $(CH_3)_3CNH_2$

Answer: C

Solution:

To determine which compound does not react with acetyl chloride, it's essential to consider the nature of the functional groups in each compound and how they interact with acetyl chloride (CH_3COCl). Acetyl chloride generally reacts with nucleophiles, such as primary (1°) and secondary (2°) amines, to form amides. However, tertiary amines (3°) do not participate in such reactions due to the lack of a hydrogen atom necessary for forming an amide.

Examination of the given options:

Option A: $CH_3CH_2NH_2$ is a primary amine. Primary amines can react with acetyl chloride to form amides.

Option B: $CH_3CH_2CH_2NHCH_3$ is a secondary amine. Secondary amines can also react with acetyl chloride to form amides.

Option C: $(CH_3CH_2)_3N$ is a tertiary amine. Tertiary amines do not have a hydrogen atom bonded to the nitrogen and, therefore, do not react with acetyl chloride to form amides.

Option D: $(CH_3)_3CNH_2$ is a primary amine. As with other primary amines, it can react with acetyl chloride to yield an amide.

Thus, the compound that does not react with acetyl chloride is:

Option C: $(CH_3CH_2)_3N$ (a tertiary amine).

Question40

Which of the following amines undergoes acylation reaction?

MHT CET 2024 9th May Evening Shift

Options:

A. Ethyldimethylamine

B. N -Methylaniline

C. N, N-Dimethylmethanamine

D. N, N-Dimethylaniline

Answer: B

Solution:

Amines can undergo acylation reactions if they have at least one hydrogen atom attached to the nitrogen. The acylation process typically involves the substitution of this hydrogen atom with an acyl group, often facilitated by acyl chlorides or acid anhydrides.

Here's the analysis of each option:

Option A: Ethyldimethylamine

This is a tertiary amine with the structure $CH_3CH_2N(CH_3)_2$ (no hydrogen attached to the nitrogen). Tertiary amines do not undergo acylation because they lack the necessary hydrogen on the nitrogen atom for the acyl group to replace.

Option B: N-Methylaniline

This is a secondary amine with the structure $C_6H_5NHCH_3$. It has a hydrogen atom attached to the nitrogen, allowing it to undergo acylation reactions.

Option C: N, N-Dimethylmethanamine (also known as trimethylamine)

This is a tertiary amine with the structure $N(CH_3)_3$ (no hydrogen attached to the nitrogen). Like Ethyldimethylamine, it does not undergo acylation due to the absence of hydrogen on the nitrogen.

Option D: N, N-Dimethylaniline

This is a tertiary amine with the structure $C_6H_5N(CH_3)_2$. It has no hydrogen attached to the nitrogen, which means it does not undergo acylation.

Therefore, the amine that undergoes acylation reaction is **Option B: N-Methylaniline**.

Question41

The major product formed in carbylamine reaction is

MHT CET 2024 9th May Morning Shift

Options:

A. Alkyl halide

B. Alkyl cyanide

C. Nitroalkane

D. Alkyl isocyanide

Answer: D

Solution:

Aliphatic or aromatic primary amines on heating with chloroform give foul (offensive) smelling products called alkyl/aryl isocyanides or carbylamines.

$$R - NH_2 + CHCl_3 + 3KOH \xrightarrow[\text{alc.}]{\Delta} R - NC + 3KCl + 3H_2O$$

Alkyl isocyanide
(Carbylamine)

Question42

Which among the following compounds does not correctly match with its formula?

MHT CET 2024 9th May Morning Shift

Options:

A. Hydrazine: $NH_2 - NH_2$

B. Semicarbazide: $NH_2 - NH - CO - NH_2$

C. Phenylhydrazine: $C_6H_5 - NH - NH - C_6H_5$

D. Hydroxylamine: $NH_2 - OH$

Answer: C

Solution:

The compounds and their formulas are as follows:

Hydrazine: Correctly matched with the formula $NH_2 - NH_2$. Hydrazine is a simple nitrogen compound where two amine groups are attached to each other.

Semicarbazide: Correctly matched with the formula $NH_2 - NH - CO - NH_2$. This compound contains a ureido group ($-NH - CO - NH_2$) attached to an additional amine group (NH_2).

Phenylhydrazine: Incorrectly matched. The correct formula for phenylhydrazine is $C_6H_5 - NH - NH_2$. Instead of having two phenyl groups as shown in the option, it only has one phenyl group attached to the hydrazine core.

Hydroxylamine: Correctly matched with the formula $NH_2 - OH$. This compound consists of an amine group attached to a hydroxyl group.

Thus, Option C, Phenylhydrazine: $C_6H_5 - NH - NH - C_6H_5$, is not correctly matched. The correct formula should be $C_6H_5 - NH - NH_2$.

Question43

Which among the following compounds is NOT a tertiary amine?

MHT CET 2024 9th May Morning Shift

Options:

A. N, N-Dimethyl aniline

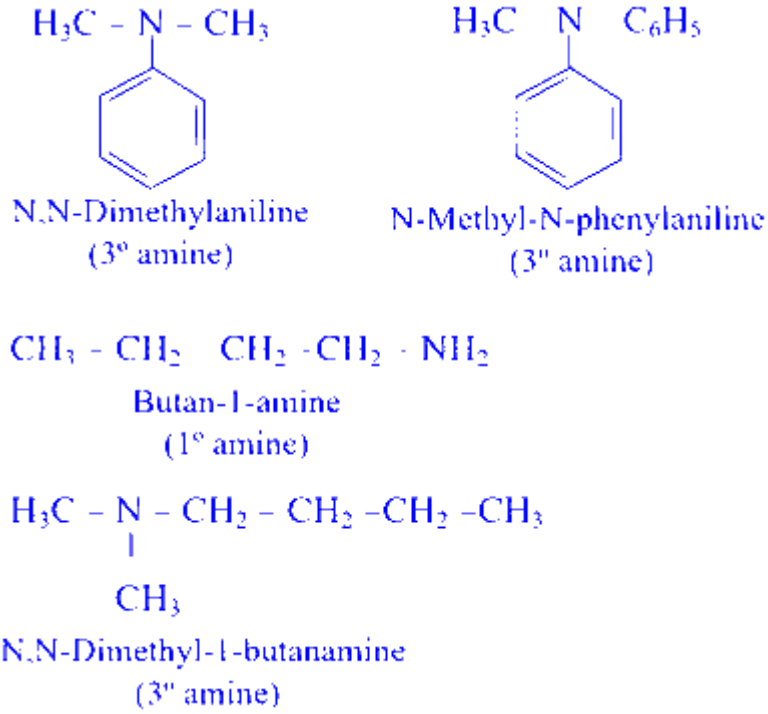
B. N-Methyl-N-Phenyl aniline

C. Butan-1-amine

D. N, N-Dimethyl-1-butanamine

Answer: C

Solution:



Question44

Which of the following is a molecular formula of cyclohexylamine?

MHT CET 2024 4th May Evening Shift

Options:

A. C_6H_8N

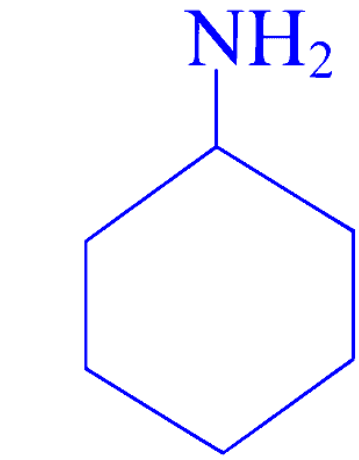
B. $C_6H_{10}N$

C. $C_6H_{12}N$

D. $C_6H_{13}N$

Answer: D

Solution:



Cyclohexylamine
($C_6H_{13}N$)

Question45

Identify the product ' B ' in the following series of reactions.

Isopropylcyanide $\xrightarrow[HCl]{SnCl_2}$ A $\xrightarrow{H_3O^+}$ B + NH_4Cl

MHT CET 2024 4th May Evening Shift

Options:

A. Propanal

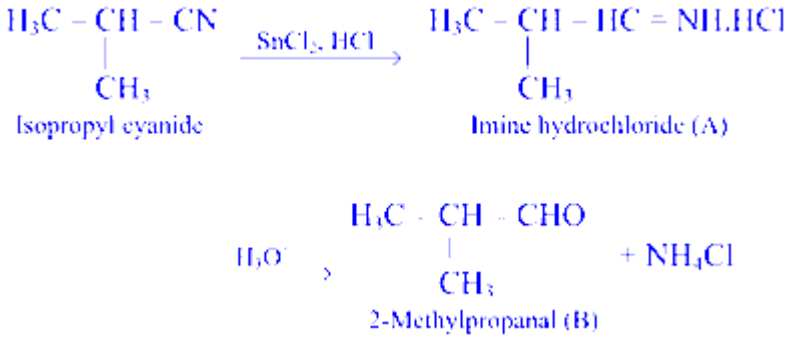
B. Propanone

C. 2-Methylpropanal

D. 2-Methylpropanoic acid

Answer: C

Solution:



Question46

How many isotopes of nitrogen are found?

MHT CET 2024 4th May Morning Shift

Options:

A. 2

B. 3

C. 4

D. 6

Answer: A

Solution:

Nitrogen has two stable isotopes found naturally: ^{14}N and ^{15}N. Therefore, the number of naturally occurring stable isotopes of nitrogen is:

Option A: 2

In addition to these stable isotopes, there are also several radioisotopes of nitrogen that have been identified, with ^{13}N and ^{16}N being some of the most studied due to their applications in radiochemistry and medical imaging. However, only ^{14}N and ^{15}N occur naturally in significant amounts.

Question47

What is the product obtained when benzonitrile is treated with C_6H_5MgBr in dry ether and then hydrolyzed?

MHT CET 2024 3rd May Evening Shift

Options:

A. Phenol

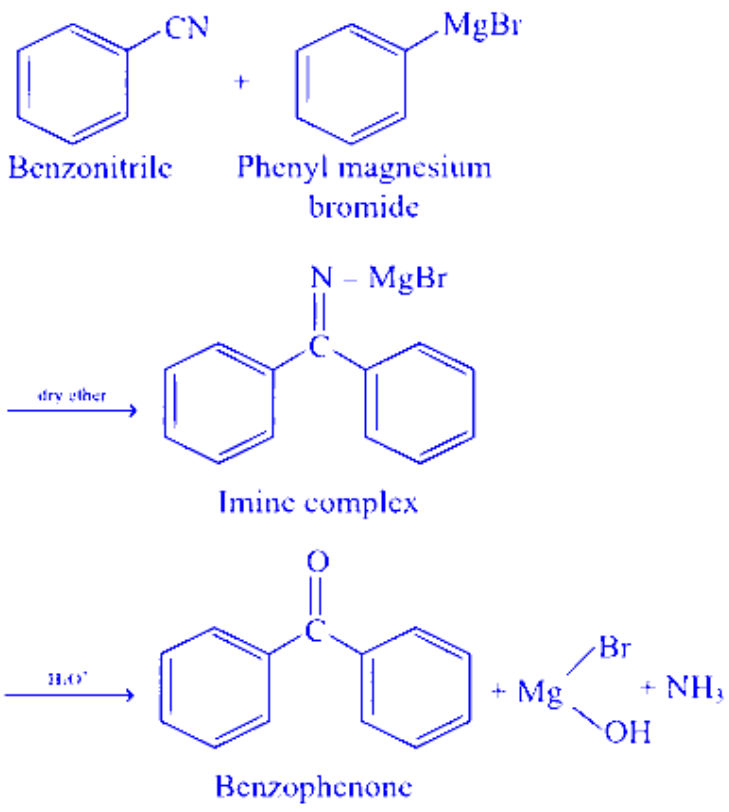
B. Benzophenone

C. Benzyl amine

D. Benzene

Answer: B

Solution:



Question48

What is the formula of Hinsberg's reagent?

MHT CET 2024 3rd May Evening Shift

Options:

A. $C_6H_5SOCl_2$

B. $C_2H_5SO_2Cl$

C. $C_6H_5SO_2Cl$

D. $C_2H_5CrOCl_2$

Answer: C

Solution:

The formula of Hinsberg's reagent is option C:

$C_6H_5SO_2Cl$

Hinsberg's reagent, also known as benzenesulfonyl chloride, is used in organic chemistry to test for primary, secondary, and tertiary amines. It reacts with primary amines to form sulfonamides, which are soluble in alkali, and with secondary amines to form sulfonamides that are insoluble. Tertiary amines do not react with Hinsberg's reagent.

Question49

Which of the following does not have intermolecular hydrogen bonding?

MHT CET 2024 3rd May Morning Shift

Options:

A. Cyclohexylamine

B. Allylamine

C. Trimethylamine

D. Diphenylamine

Answer: C

Solution:

Trimethylamine does not have intermolecular hydrogen bonding.

Intermolecular hydrogen bonding occurs when a hydrogen atom, covalently bonded to a highly electronegative atom (such as nitrogen, oxygen, or fluorine), interacts with an electronegative atom of another molecule.

Cyclohexylamine (Option A) and **Allylamine** (Option B) both have a hydrogen atom bonded to nitrogen, which can participate in hydrogen bonding with other nitrogen-containing compounds.

Diphenylamine (Option D) can also exhibit hydrogen bonding, although less prominently, due to the nitrogen atom having available lone pairs and the possibility of interacting weakly with other diphenylamine molecules.

Trimethylamine (Option C), on the other hand, has its nitrogen fully substituted with three methyl groups. This substitution prevents the nitrogen in trimethylamine from engaging in intermolecular hydrogen bonding, as there are no hydrogen atoms directly attached to the nitrogen atom to facilitate this type of bonding. The structure is:

$(CH_3)_3N$

The absence of a hydrogen bonded to the nitrogen atom in trimethylamine means that it cannot form hydrogen bonds with other molecules, as required for intermolecular hydrogen bonding.

Question50

Which among the following has highest basic strength?

MHT CET 2024 2nd May Evening Shift

Options:

A. Ammonia

B. Ethylamine

C. Diethylamine

D. Triethylamine

Answer: C

Solution:

As a consequence of combined effect of inductive effect, steric effect and solvation, the secondary amines are the strongest bases among aliphatic amines in aqueous phase so the basic strength varies as:

2° amine $>$ 3° amine $>$ 1° amine $>$ ammonia.

Hence, among the given options, diethylamine (2°) has the highest basic strength.

Question51

Identify an aromatic, mixed, 3° amine among the following compounds.

MHT CET 2024 2nd May Evening Shift

Options:

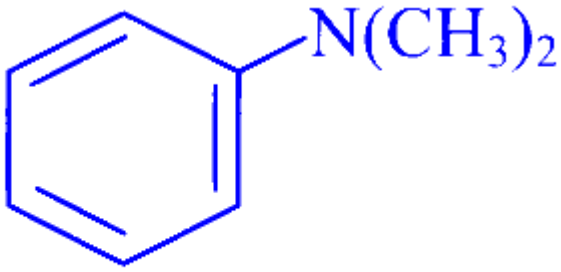
A. $C_6H_5NHC_2H_5$

B. $(C_2H_5)_3N$

C. $(CH_3)_3N$

D. $C_6H_5N(CH_3)_2$

Solution:



Aromatic, mixed, 3° amine

Question52

How many moles of iodomethane are consumed in the following conversion?

$$CH_3NH_2 \xrightarrow[\Delta]{CH_3I} (CH_3)_4\, N^+I^-$$

MHT CET 2024 2nd May Morning Shift

Options:

A. Four

B. Three

C. Two

D. One

Answer: B

Solution:

$$CH_3NH_2 \xrightarrow[\Delta]{CH_3I} (CH_3)_2NH \xrightarrow[\Delta]{CH_3I}$$

$$(CH_3)_3\,N \xrightarrow[CH_3I]{\Delta} (CH_3)_4\,N^+I^-$$

Question53

Which of the following isomers has highest boiling point?

MHT CET 2024 2nd May Morning Shift

Options:

A. tert-Butylamine

B. Ethyldimethylamine

C. Diethylamine

D. n-Butylamine

Answer: D

Solution:

The boiling point of amines generally depends on the molecular structure and the ability to form hydrogen bonds. Primary amines, such as n-butylamine, can form more hydrogen bonds compared to secondary and tertiary amines, leading to a higher boiling point. Let's consider the given amines:

Option A: tert-Butylamine

Tertiary amine with limited hydrogen bonding capabilities.

Option B: Ethyldimethylamine

Secondary amine, less hydrogen bonding than primary amines.

Option C: Diethylamine

Secondary amine, less hydrogen bonding than primary amines.

Option D: n-Butylamine

Primary amine, capable of forming more hydrogen bonds.

Among the listed options, **n-Butylamine** (Option D) will have the highest boiling point because it is a primary amine and can form extensive hydrogen bonds with neighboring molecules. This increased hydrogen bonding results in a higher boiling point compared to secondary and tertiary amines, which have fewer hydrogen bonding interactions.

Question54

What is molecular formula of cyclohexylamine?

MHT CET 2023 14th May Evening Shift

Options:

A. C_6H_8N

B. $C_6H_{10}N$

C. $C_6H_{12}N$

D. $C_6H_{13}N$

Answer: D

Solution:

The molecular formula for cyclohexylamine would reference the number of carbon (C), hydrogen (H), and nitrogen (N) atoms in the compound. Cyclohexylamine consists of a cyclohexane ring with an amine ($-NH_2$) group attached to one of the carbons. Therefore, to determine the correct molecular formula, we can simply add the typical number of hydrogens found in a cyclohexane ring to the number from the amine group.

Cyclohexane is a ring of six carbon atoms, and each carbon atom, being in a non-aromatic ring with single bonds, is bonded to two other carbons and two hydrogens, resulting in the molecular formula C_6H_{12} for cyclohexane.

However, when one hydrogen on the cyclohexane ring is substituted by an amine group, the nitrogen atom generally has two hydrogens. Thus, removing one hydrogen from cyclohexane and adding an amine group ($-NH_2$) changes the formula to:

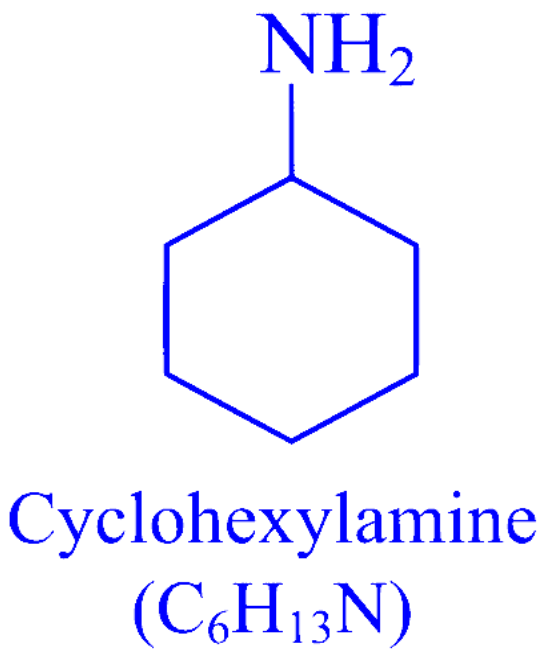
$C_6H_{12} \rightarrow C_6H_{11}NH_2$

You can simplify the expression by combining the number of hydrogen atoms:

$C_6H_{11}NH_2 = C_6H_{11} + NH_2 = C_6H_{13}N$

Therefore, the correct molecular formula for cyclohexylamine is Option D:

$C_6H_{13}N$



Question55

Which of the following amines on heating with chloroform generate foul smelling product?

MHT CET 2023 14th May Evening Shift

Options:

A. Ethanamine

B. Ethylmethylamine

C. Ethyldimethylamine

D. Diethylmethylamine

Answer: A

Solution:

Aliphatic or aromatic primary amines on heating with chloroform form foul smelling products (carbylamines).

Question56

Which from following molecules does NOT contain nitrogen in it?

MHT CET 2023 14th May Morning Shift

Options:

A. Pyrrole

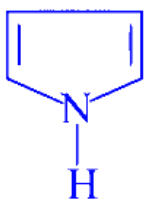
B. Piperidine

C. Pyridine

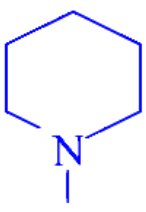
D. Pyran

Answer: D

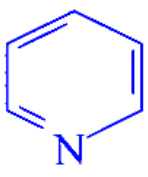
Solution:



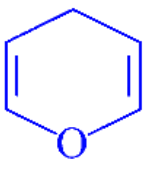
Pyrrole



Piperidine



Pyridine



Pyran

Question57

Identify the product 'B' in the following sequence of reactions.

$$CH_3Br \xrightarrow{KCN} A \xrightarrow{NaC_2H_3OH} B$$

MHT CET 2023 14th May Morning Shift

Options:

A. Methyl cyanide

B. Ethylamine

C. Methylamine

D. Ethyl cyanide

Answer: B

Solution:

$$CH_3Br \xrightarrow{KCN} CH_3CN \xrightarrow{Na/C_2H_5OH} \underset{\text{Ethylamine}}{CH_3 = CH_2 - NH_2}$$

Question58

Which isomer among the following has the highest boiling point?

MHT CET 2023 14th May Morning Shift

Options:

A. n-Butylaminc

B. tert-Butylamine

C. Ehyldimethylamine

D. Diethylamine

Answer: A

Solution:

In isomeric amines, boiling point decreases with increase in branching.

Question59

Identify substrate 'A' in the following conversion.

$$\underset{\text{(excess)}}{\text{A} + \text{CH}_3\text{I}} \xrightarrow{\Delta} \text{C}_2\text{H}_5(\text{CH}_3)_3\overset{+}{\text{N}}\,\text{I}^-$$

MHT CET 2023 13th May Morning Shift

Options:

A. $C_2H_5NO_2$

B. C_2H_5CN

C. $C_2H_5NH_2$

D. CH_3CONH_2

Answer: C

Solution:

$$C_2H_5NH_2 + \underset{\text{(excess)}}{CH_3I} \xrightarrow{\Delta} \underset{\text{Tetraalkylammonium iodide}}{C_2H_5(CH_3)_3NI^-}$$

The reaction is known as exhaustive alkylation of amines.

Question60

Identify the CORRECT decreasing order of basic strength of compounds from following.

MHT CET 2023 13th May Morning Shift

Options:

A. $CH_3NH_2 > (CH_3)_2NH > C_6H_5NH_2 > NH_3$

B. $(CH_3)_2NH > CH_3NH_2 > NH_3 > C_6H_5NH_2$

C. $NH_3 > CH_3NH_2 > (CH_3)_2NH > C_6H_5NH_2$

D. $C_6H_5NH_2 > (CH_3)_2NH > CH_3NH_2 > NH_3$

Answer: B

Solution:

Arylamines in general are weaker bases than ammonia and aliphatic amines.

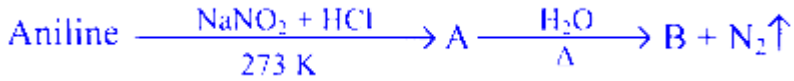
Aliphatic amines are stronger bases than ammonia. Among aliphatic amines, 2° amine is a stronger base than 1° amine.

Hence, the correct decreasing order of basic strength is:

$(CH_3)_2NH > CH_3NH_2 > NH_3 > C_6H_5NH_2$

Question61

Identify product B in the following reaction.



MHT CET 2023 12th May Evening Shift

Options:

A. Chlorobenzene

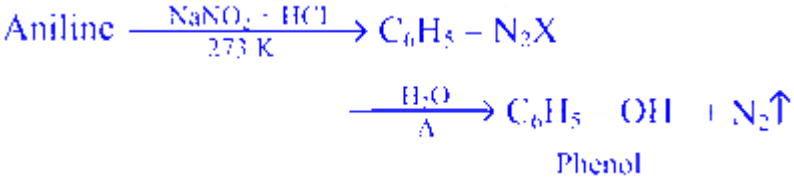
B. Benzyl alcohol

C. Benzenediazoniumchloride

D. Phenol

Answer: D

Solution:



Question62

Which of the following compounds does NOT develop intermolecular hydrogen bonding?

MHT CET 2023 12th May Evening Shift

Options:

A. Cyclohexylamine

B. Allylamine

C. Trimethylamine

D. Diphenylamine

Answer: C

Solution:

Trimethylamine, $N(CH_3)$ does not contain $N-H$ bond and hence it does not develop intermolecular hydrogen bonding.

Question63

Identify substrate A in the following reaction.

$$A + AgOH \xrightarrow[ii)\ \Delta]{i)\ moist} {}^{Ag_2O} CH_3CH_2\ N(CH_3)_2 + CH_2 = CH_2$$

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Options:

A. Diethyldimethyl ammonium halide

B. Ethyltrimethyl ammonium halide

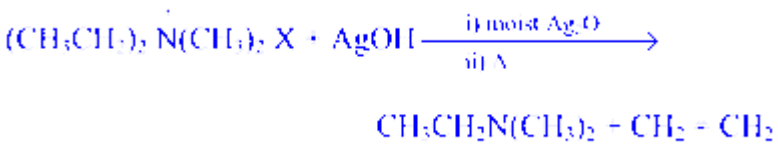
C. Diethyldimethyl ammonium hydroxide

D. Ethyltrimethyl ammonium hydroxide

Answer: A

Solution:

The reaction is Hofmann elimination and substrate 'A' is diethyldimethyl ammonium halide.



Question64

If, Aniline $\frac{\text{i) } NaNO_2+HCl, 273\text{ K}}{\text{ii) } H_2O, \Delta}$ Product.

Identify the product of above reaction.

MHT CET 2023 11th May Evening Shift

Options:

A. o-Nitroaniline

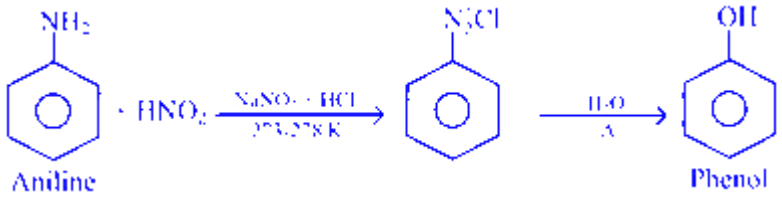
B. m-Nitroaniline

C. p-Nitroaniline

D. Phenol

Answer: D

Solution:



Question65

Identify 'A' and 'B' in the following reaction.

$$CH_3Br \xrightarrow{AgNO_2} A \xrightarrow{Sn/HCl} B$$

MHT CET 2023 11th May Evening Shift

Options:

A. CH_3NO_2 and CH_3Cl

B. CH_3NO_2 and CH_3NH_2

C. CH_3NH_2 and CH_3Cl

D. CH_3NH_2 and $CH_3CH_2NO_2$

Answer: B

Solution:

$$\underset{\text{Bromomethane}}{CH_3Br} \xrightarrow{AgNO_2} \underset{\text{Nitromethane}}{CH_3NO_2} \xrightarrow{Sn/HCl} \underset{\text{Methanamine}}{CH_3NH_2}$$

Question66

Which among the following reagents is called as Hinsberg's reagent?

MHT CET 2023 11th May Morning Shift

Options:

A. Benzenesulphonyl chloride

B. Sodium nitroprusside

C. Chromyl chloride

D. Hydraine

Answer: A

Solution:

✅ **Hinsberg's reagent is benzenesulphonyl chloride ($C_6H_5SO_2Cl$).**

So, the correct option is **A) Benzenesulphonyl chloride** .

Question67

Which among the following amines has highest value of pK_b ?

MHT CET 2023 11th May Morning Shift

Options:

A. $(CH_3)_2NH$

B. $(CH_3)_3N$

C. CH_3NH_2

D. $C_6H_5NH_2$

Answer: D

Solution:

In general, arylamines are weaker bases than aliphatic amines.

Hence, aniline is the weakest base and its pK_b value is the highest among the given amines.

Question68

Benzonitrile on reduction with stannous chloride in presence of hydrochloric acid followed by acid hydrolysis forms:

MHT CET 2023 11th May Morning Shift

Options:

A. Benzal chloride

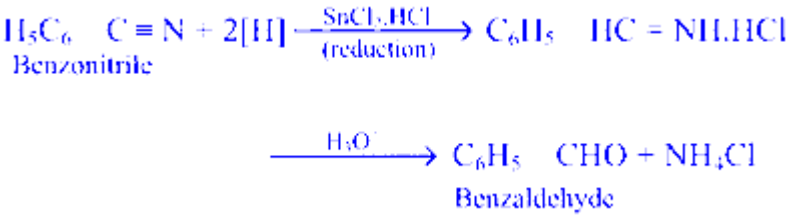
B. Benzoyl chloride

C. Benzophenone

D. Benzaldehyde

Answer: D

Solution:



Question69

Identify the product obtained when benzonitrile is reduced by stannous chloride in presence of hydrochloric acid followed by acid hydrolysis.

MHT CET 2023 10th May Evening Shift

Options:

A. Benzal chloride

B. Benzoyl chloride

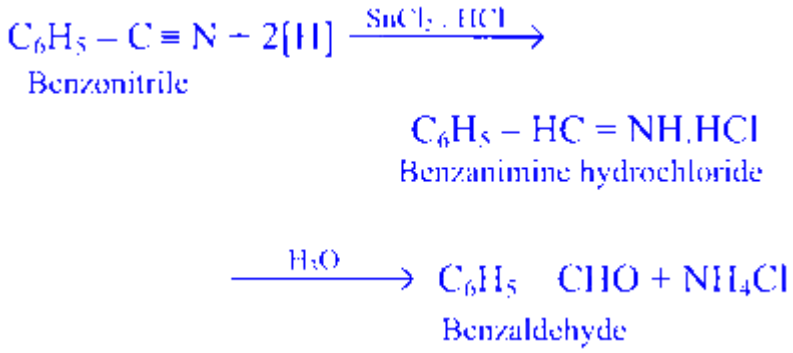
C. Benzophenone

D. Benzaldehyde

Answer: D

Solution:

This is Stephen reaction.



Question70

Identify 'A' in the following reaction:

$$\mathbf{A} \xrightarrow[\text{ether}]{LiAlH_4} \textbf{Ethanamine}$$

MHT CET 2023 10th May Evening Shift

Options:

A. C_2H_5CN

B. CH_3CONH_2

C. $C_2H_5CONH_2$

D. CH_3NO_2

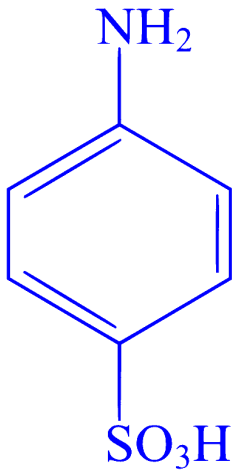
Answer: B

Solution:

$$CH_3CONH_2 \xrightarrow[\text{ether}]{LiAlH_4} \underset{\text{Ethanamine}}{CH_3CH_2NH_2}$$

Question71

Identify the name of compound



from following.

MHT CET 2023 10th May Morning Shift

Options:

A. Sulphanilic acid

B. Sulphonic acid

C. Benzene sulphonic acid

D. Amino benzoic acid

Answer: A

Solution:

The compound shown in the image is a benzene ring with an amine (NH_2) group and a sulfonic acid (SO_3H) group. The amine group is in the para position (opposite) relative to the sulfonic acid group. This compound is commonly known as sulphanilic acid.

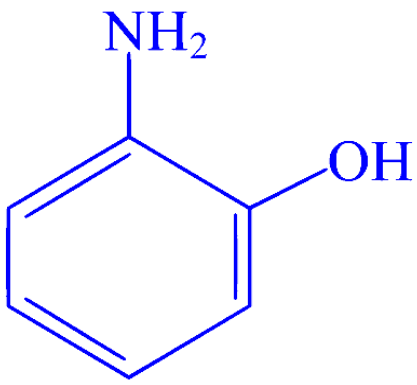
Therefore, the correct name of the compound is Option A : Sulphanilic acid.

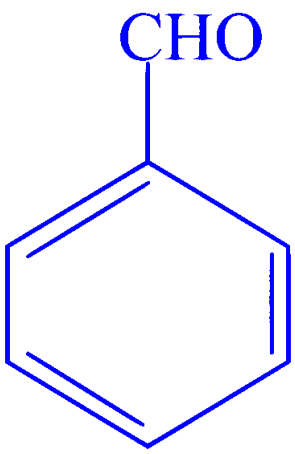
Question72

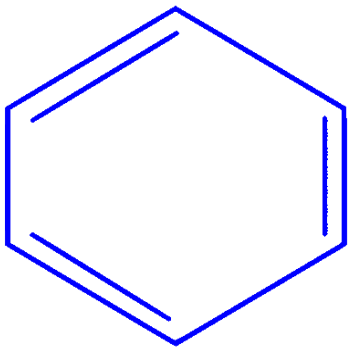
Aniline is treated with $NaNO_2 + HCl$ at low temperature to form:

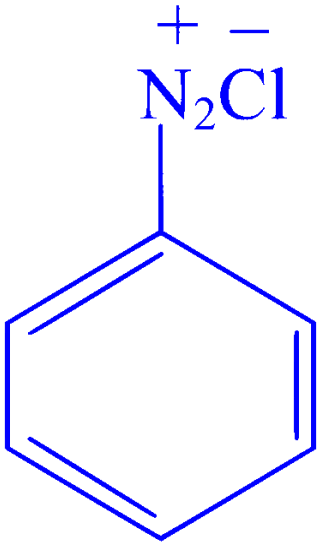
MHT CET 2023 10th May Morning Shift

Options:

A. 

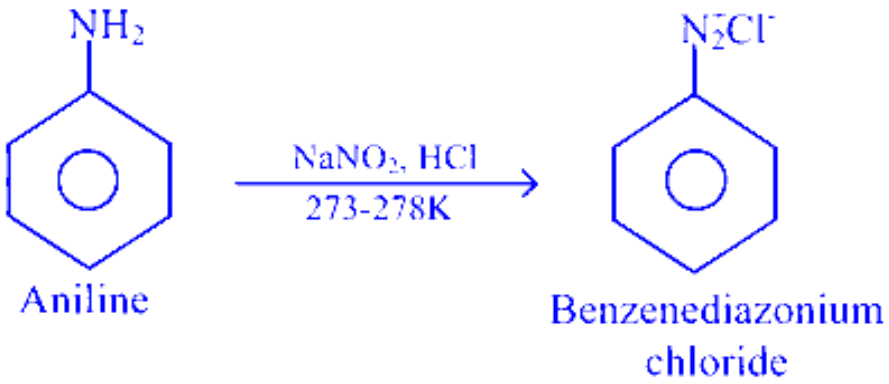
B. 

C. 

D. 

Answer: D

Solution:



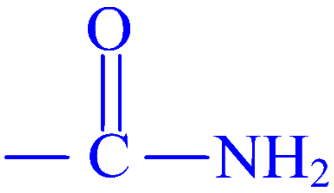
Question73

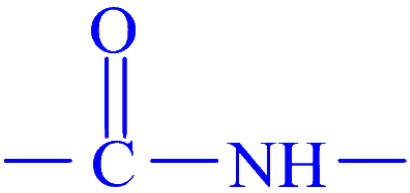
The structure of functional group of secondary amide is :

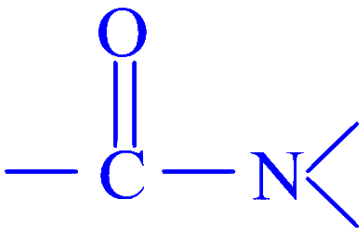
MHT CET 2023 10th May Morning Shift

Options:

A. $-NH-$

B. 

C. 

D. 

Answer: C

Solution:

A secondary amide functional group is characterized by the following general structure:

$R_1 - C(=O)NH - R_2$

Where R_1 and R_2 are alkyl or aryl groups and the nitrogen atom is bonded to two other carbon atoms. In other words, a secondary amide has the nitrogen atom bonded to one hydrogen and two carbon-containing groups. The structure of a secondary amide thus includes the amide bond $-C(=O)NH-$ as part of the core skeleton.

Therefore, among the options provided, the one that best represents the structure of a secondary amide is the one that shows a nitrogen atom bonded to a hydrogen and two carbon-containing groups with one of the groups being part of the carbonyl (C=O) functionality.

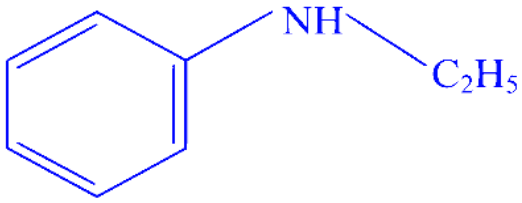
The correct option is C.

Question74

Identify an aromatic, mixed, 3° amine from following.

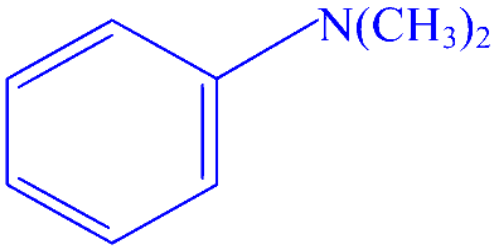
MHT CET 2023 9th May Evening Shift

Options:

A. 

B. $(C_2H_5)_3N$

C. $(CH_3)_3C - NH_2$

D. 

Answer: D

Solution:

An **aromatic, mixed, 3° (tertiary) amine** must have:

- **Aryl group (benzene ring) attached to N** → aromatic amine
- **Two other alkyl groups on N** → "mixed" (aryl + alkyl)
- **No H on N** → tertiary

✅ **Option D:** $C_6H_5 - N(CH_3)_2$ (N,N-dimethylaniline) is an **aromatic mixed tertiary amine.**

Question75

Which of the following amines undergoes acylation reaction?

MHT CET 2023 9th May Morning Shift

Options:

A. Ethyldimethylamine

B. N-Methylaniline

C. N,N-Dimethylmethanamine

D. N,N-Dimethylaniline

Answer: B

Solution:

Aliphatic and aromatic primary and secondary amines undergo acylation reaction.

Among the given options, N-Methylaniline is a secondary amine and hence, it undergoes acylation reaction. All other amines given are tertiary amines.

Question76

Which among the following reactions does NOT correctly match with its reagent?

MHT CET 2022 11th August Evening Shift

Options:

A. Stephen reaction: $SnCl_2, HCl$

B. Etard reaction : CrO_2Cl_2

C. Gatterman - Koch formulation : $CrO_3/(CH_3CO)_2O$

D. Rosenmund reduction : $H_2/Pd - BaSO_4$

Answer: C

Solution:

Gatterman Koch - CO, HCl and Anhydrous $AlCl_3$

Question77

Which among following compounds possesses highest number of N atoms in it ?

MHT CET 2022 11th August Evening Shift

Options:

A. Cytosine

B. Uracil

C. Guanine

D. Thymine

Answer: C

Solution:

The number of nitrogen atoms present in the given compounds can be determined by looking at the molecular structures of each base. Cytosine, uracil, guanine, and thymine are all nitrogenous bases found in nucleic acids. Let's analyze each one:

Cytosine (Option A) has a single ring structure known as pyrimidine and it contains three nitrogen atoms within that ring.

Uracil (Option B) is also a pyrimidine base and it too contains two nitrogen atoms.

Guanine (Option C) is a purine base and has a two-ring structure. It contains five nitrogen atoms—three in the larger six-membered ring and two in the smaller five-membered ring.

Thymine (Option D) is another pyrimidine base and it contains two nitrogen atoms, similar to uracil.

Among these options, guanine contains the most nitrogen atoms. Therefore, the correct answer is:

Option C - Guanine

Question78

Which among the following compounds contains amino group?

MHT CET 2021 24th September Evening Shift

Options:

A. N-Phenylbenzenamine

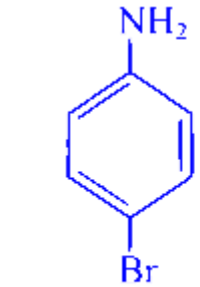
B. 4-Bromoaniline

C. N,N-Dimethylbenzenamine

D. N-Methylmethanamine

Answer: B

Solution:



→ Contains amino ($-NH_2$) group

4-Bromoaniline

Question79

Identify molecular formula of pyridine from following

MHT CET 2021 24th September Evening Shift

Options:

A. $C_5H_{11}N$

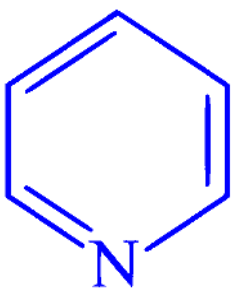
B. C_4H_4S

C. C_4H_4O

D. C_5H_5N

Answer: D

Solution:



Pyridine (C_5H_5N)

Question80

Which of the following amine is weakest base?

MHT CET 2021 24th September Evening Shift

Options:

A. Trimethyl amine

B. Methyl amine

C. Diethyl amine

D. Aniline

Answer: D

Solution:

When comparing the basicity of different amines, it's essential to consider the availability of the lone pair on the nitrogen atom for protonation. This availability is affected by several factors, including inductive effects from alkyl groups and resonance effects.

Let’s analyze each option:

Option A: Trimethyl amine

Trimethyl amine has three methyl groups attached to the nitrogen. Methyl groups are electron-donating through the inductive effect, which increases the electron density on the nitrogen, making it more basic.

Option B: Methyl amine

Methyl amine has one methyl group attached to the nitrogen. The electron-donating effect from the single methyl group increases the electron density on nitrogen, but to a lesser extent than trimethyl amine.

Option C: Diethyl amine

Diethyl amine has two ethyl groups attached to the nitrogen. Similar to methyl groups, ethyl groups are also electron-donating, which increases the electron density on the nitrogen, making it more basic.

Option D: Aniline

Aniline has a phenyl group attached to the nitrogen. The lone pair of electrons on the nitrogen in aniline is

delocalized over the benzene ring through resonance. This delocalization decreases the availability of the lone pair on the nitrogen for protonation, making aniline less basic compared to the aliphatic amines mentioned above.

In summary, the basicity order based on the availability of the lone pair on nitrogen is:

Diethyl amine > Trimethyl amine > Methyl amine > Aniline

Therefore, the weakest base among the given options is:

Option D: Aniline

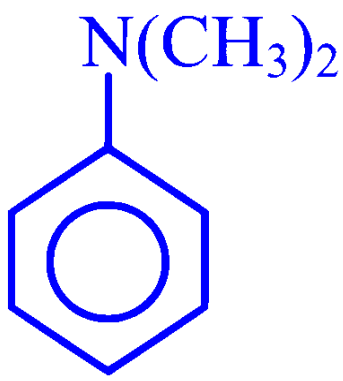
Question81

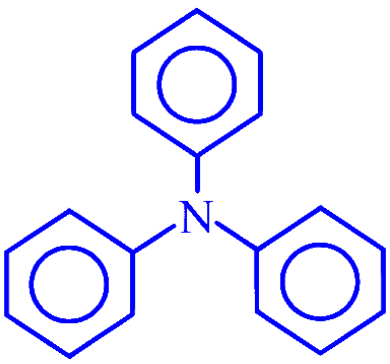
Which of the following is an example of symmetrical tertiary amine?

MHT CET 2021 24th September Morning Shift

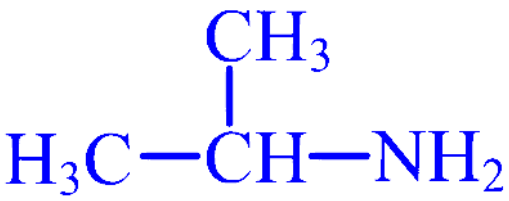
Options:

A. CH_3NHCH_3

B. 

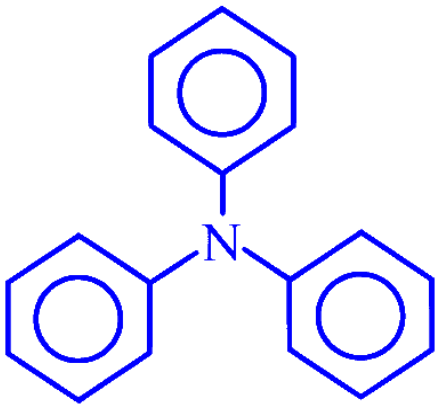
C. 

D.



Answer: C

Solution:



Question82

Which of the following is an example of primary amine?

MHT CET 2021 24th September Morning Shift

Options:

A. N-methyl aniline

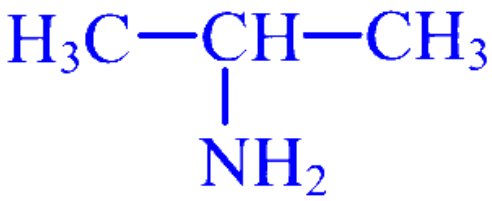
B. N-phenylbenzenamine

C. Methyl phenylamine

D. Isopropyl amine

Answer: D

Solution:



Isopropyl amine (1°amine)

Question83

Which among following compounds is a secondary amine?

MHT CET 2021 23rd September Evening Shift

Options:

A. Hexane-1,6-diamine

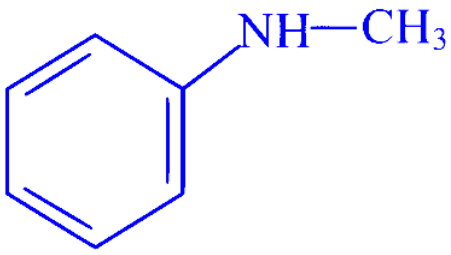
B. N,N-Dimethylbenzenamine

C. N-methylbenzenamine

D. Prop-2-en-1-amine

Answer: C

Solution:



N-methylbenzenamine

Question84

Conversion of benzene diazonium chloride to chlorobenzene in presence of $CuCl/HCl$ is known as

MHT CET 2021 22th September Evening Shift

Options:

A. Sandmeyer reaction

B. Mendius reaction

C. Gattermann reaction

D. Hofmann degradation

Answer: A

Solution:

The conversion of benzene diazonium chloride to chlorobenzene in the presence of $CuCl/HCl$ is known as the Sandmeyer reaction. This reaction involves the replacement of the diazonium group ($-N_2^+$) in benzene diazonium chloride by a chlorine atom when treated with cuprous chloride ($CuCl$) in hydrochloric acid (HCl). The Sandmeyer reaction is widely used in organic synthesis to substitute diazonium groups with other functional groups, such as chlorine, bromine, or cyanide. Therefore, Option A, Sandmeyer reaction, is the correct answer.

Question85

Identify compound from following having highest basic strength.

MHT CET 2021 22th September Evening Shift

Options:

A. $CH_3CH_2NH_2$

B. NH_3

C. $(CH_3)_2NH$

D. $C_6H_5NH_2$

Answer: C

Solution:

$(CH_3)_2NH$ is a secondary amine and secondary amines are the strongest bases.

Question86

Identify the compound from following having lowest boiling point.

MHT CET 2021 22th September Morning Shift

Options:

A. $n - C_4H_9NH_2$

B. $C_2H_5CH(CH_3)_2$

C. $C_2H_5\ N(CN_3)_2$

D. $(C_2H_5)_2NH$

Answer: B

Solution:

To identify the compound with the lowest boiling point, we need to analyze the structure, molecular weight, and types of intermolecular forces present in each compound. The types of intermolecular forces play a significant role in determining the boiling point of a compound. We'll consider hydrogen bonding, dipole-dipole interactions, and van der Waals (dispersion) forces.

Option A: $\mathrm{n}-\mathrm{C_4H_9NH_2}$

This is butylamine, an amine with a primary amino group. It can form hydrogen bonds due to the presence of the -$\mathrm{NH_2}$ group, leading to a relatively higher boiling point.

Option B: $\mathrm{C_2H_5CH(CH_3)_2}$

This is 2-methylbutane, an alkane. Alkanes have only van der Waals forces (dispersion forces), which are relatively weak. Hence, this compound is expected to have a lower boiling point.

Option C: $\mathrm{C_2H_5\ N(CN_3)_2}$

This is ethylcyanoamine, a compound with cyano groups, which can create some dipole-dipole interactions. These interactions are stronger than van der Waals forces but weaker than hydrogen bonds.

Option D: $\mathrm{(C_2H_5)_2NH}$

This is diethylamine, a secondary amine. It can also form hydrogen bonds, albeit weaker than primary amines, leading to a moderate boiling point.

Among the provided compounds, 2-methylbutane (Option B) relies solely on van der Waals forces, which are the weakest intermolecular forces. Therefore, it has the lowest boiling point.

Answer: Option B $\mathrm{C_2H_5CH(CH_3)_2}$

Question87

Which among following amines has lowest $\mathrm{pK_b}$ values?

MHT CET 2021 21th September Evening Shift

Options:

A. $\mathrm{CH_3CH_2NH_2}$

B. $\mathrm{(CH_3CH_2)_2NH}$

C. $\mathrm{(CH_3CH_2)_3N}$

D. $C_6H_5NH_2$

Answer: B

Solution:

$(CH_3CH_2)_2NH$ is secondary amine which is strong base and has lowest pK_b value.

Question88

Which of the following conjugate bases is stabilized to greater extent due to solvation of ammonia and amines?

MHT CET 2021 21th September Morning Shift

Options:

A. R_3NH^+

B. RNH_3^+

C. NH_4^+

D. $R_2NH_2^+$

Answer: C

Solution:

$NH_4^{\oplus}$ is best stabilized by solution while the stabilization by solvation is very poor in $R_3NH^{\oplus}$. Order of stabilization: $NH_4^{\oplus} > R-NH_3^{\oplus} > R_2NH^{\oplus} > R_3NH^{\oplus}$

Question89

Which of the following amines acts as strongest base?

MHT CET 2021 21th September Morning Shift

Options:

A. CH_3NH_2

B. $(C_2H_5)N(CH_3)_2$

C. $(CH_3)_2NH$

D. $(CH_3)_3N$

Answer: C

Solution:

Secondary amines are the strongest bases.

$\therefore (CH_3)_2NH$ acts as strong base.

Question90

Which among following compounds is a primary amine?

MHT CET 2021 20th September Evening Shift

Options:

A. Ethyl methyl propyl amine

B. Hexamethylene diamine

C. Diphenyl amine

D. N, N-Dimethyl aniline

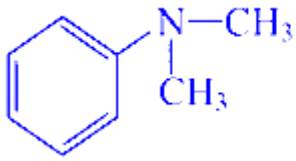
Answer: B

Solution:

(i)  — Ethyl methyl propyl amine (3°amine)

(ii) H_2N-$(CH_2)_6$-NH_2 - Hexamethylene diamine (1° amine)

(iii) C_6H_5-NH-C_6H_5 - Diphenyl amine (2° amine)

(iv)  — N,N-Dimethyl aniline (3°amine)

Question91

What is the number of moles of H atoms required to prepare one mole ethylamine from one mole acetamide?

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Options:

A. 2

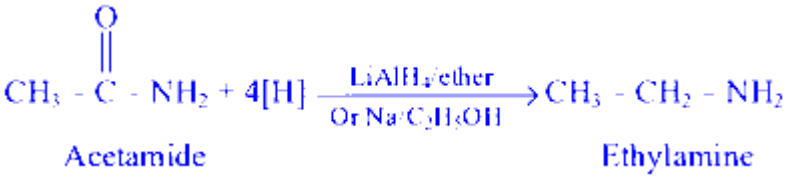
B. 4

C. 3

D. 1

Answer: B

Solution:



Question92

Which among following statements is NOT true about Gabriel phthalimide synthesis?

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Options:

A. In this method formation of N-alkyl phthalimide is involved.

B. In this method sodium phthalate is also obtained.

C. This method is useful for preparation of aromatic amines.

D. In this method potassium salt of phthalimide is formed as an intermediate product.

Answer: C

Solution:

Aromatic amines cannot be prepared by Gabriel phthalimide synthesis because aryl halides do not undergo nucleophilic substitution with the anion formed by phthalimide.

Question93

Which among the following compounds is NOT a carbocyclic compound?

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Options:

A. Benzene

B. Naphthalene

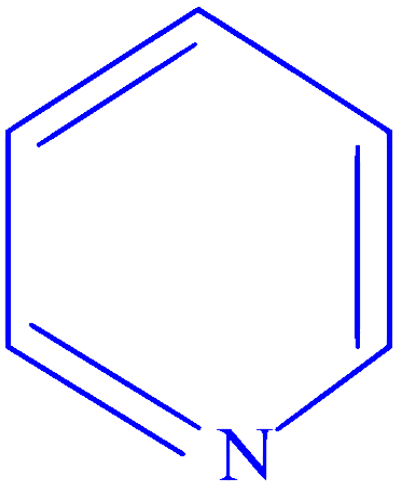
C. Pyridine

D. Cyclopentane

Answer: C

Solution:

Pyridine is a heterocyclic compound.



Question94

Which of the following compounds does not react with bromine in alkaline medium?

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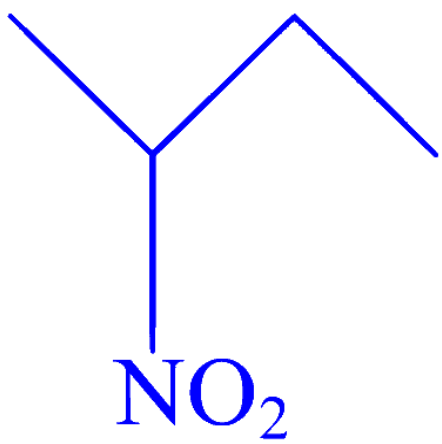
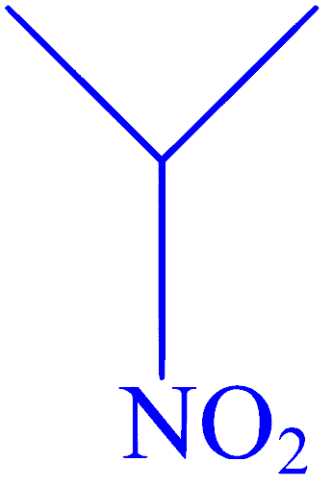
Options:

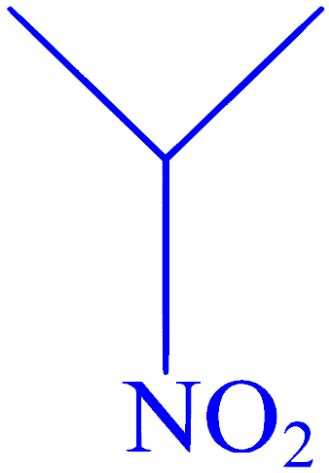
A.



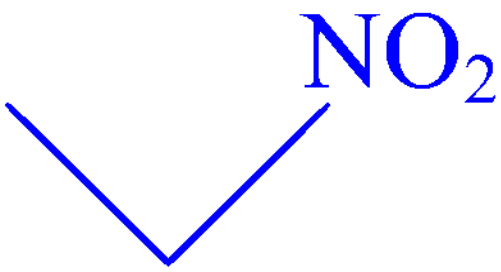
B.



C.



D.



Answer: C

Solution:

compound does not react with bromine in alkaline medium. Because in this when NO_2 releases it forms 3° carbanion which gives alkene due to elimination rather reaction that substitution reaction.

Question95

The end product C of the following reaction is

$$C_2H_5NH_2 \xrightarrow{HNO_2} A \xrightarrow{PCl_5} B \xrightarrow[\text{Alcohol}]{NH_3} C$$

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Options:

A. Nitroethane

B. Ethanol

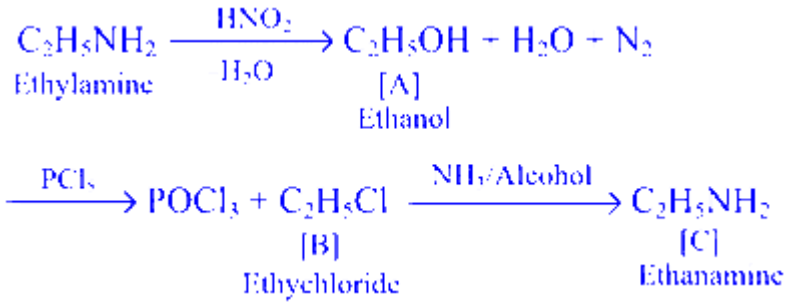
C. Chloroethane

D. Ethanamine

Answer: D

Solution:

Ethylamine reacts with nitrous acid to form ethanol and liberates N_2 gas as well. Ethanol react with phosphorus pentachloride to form ethyl chloride (C_2H_5Cl), after this ethyl chloride react with ammonia (NH_3) to form ethanamine. It's a double displacement reaction.



So, the end product [C] of this reaction is ethanamine.

Question96

Which of the following amines is most basic in nature in aqueous phase?

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Options:

A. Methylamine

B. Trimethylamine

C. Dimethylamine

D. Ammonia

Answer: C

Solution:

Dimethylamine is most basic in nature in aqueous phase. It is more basic as, it is a secondary amine. The lone pair of electrons on the nitrogen atom is further away from the nucleus at a higher energy level due to extra repulsion from the electrons in each C – N bond, thus the nitrogen atom is more capable at donating a pair of electrons. So, dimethylamine is a strong base in solution (aqueous phase), as more OH^- ions are formed, when nitrogen atom accepts a proton causing the solution to be more alkaline as the pH higher.

$CH_3NHCH_3 + H_2O \longrightarrow CH_3NH_2CH_3 + OH^-$

Question97

Which of the following reaction of diazonium salt involves retention of diazonium group?

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Options:

A. Reaction with phosphinic acid

B. Reaction with dilute sulphuric acid

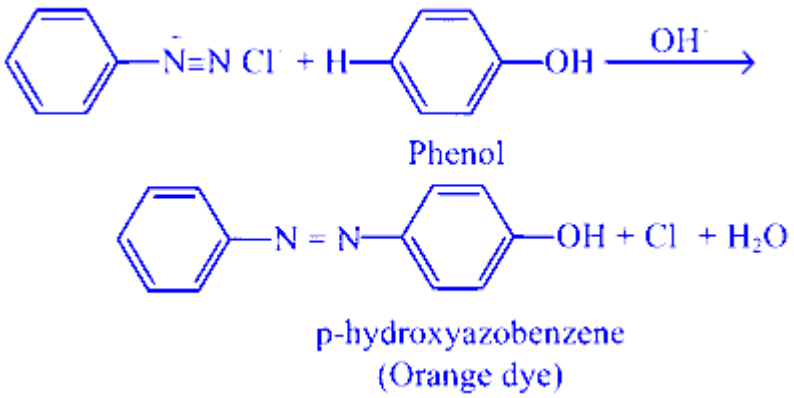
C. Reaction with HCl and Cu powder

D. Reaction with phenol

Answer: D

Solution:

Reaction with phenol of diazonium salt involves retention of diazonium group.



Benzene diazonium chloride reacts with phenol in which the phenol molecule at its para position is coupled with the diazonium salt to form p-hydroxyazobenzene. This type of reaction known as coupling reaction.

Question98

Identify compound 'B' in following series of reactions?

$$\text{Acetonitrile} \xrightarrow{\text{Na/ alcohol}} A \xrightarrow[\text{dil. HCl}]{\text{NaNO}_2} B$$

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Options:

A. Ethyl amine

B. Nitroethane

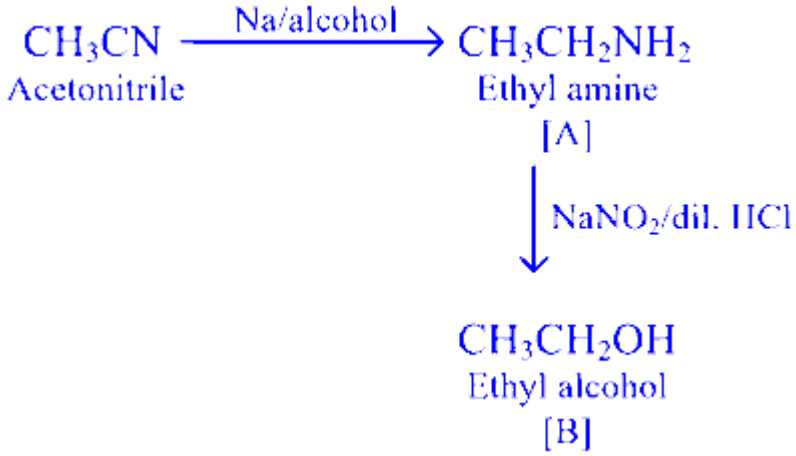
C. Ethyl alcohol

D. Ethyl chloride

Answer: C

Solution:

In the given reaction, acetonitrile (CH_3CN) on reaction with Na /alcohol forms ethyl amine [A] $(CH_3CH_2NH_2)$. Which on further reaction with $NaNO_2$/dil. HCl followed by hydrolysis gives ethyl alcohol [B].



Question99

Identify the product 'A' in the following reaction.

$$\text{Aniline} \xrightarrow[\text{Pyridine}]{(CH_3CO)_2O} A$$

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Options:

A. Sulphanilic acid

B. Benzenediazonium chloride

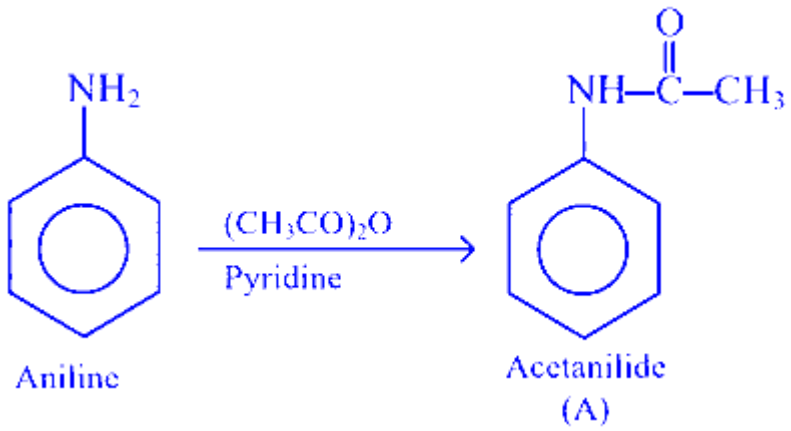
C. Acetanilide

D. *p*-nitroacetanilide

Answer: C

Solution:

The product(A) is acetanilide.



Amino group of aniline is acetylated with acetic anhydride/pyridine. It is an electrophilic substitution reaction. In this reaction pyridine being a base is used to remove the side product, i.e., HCl from reaction mixture.

Question100

Alkyl cynides on reduction by sodium and ethanol give primary amines. This reaction is called as

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Options:

A. Hell-Vohlard-Zelinsky reaction

B. Clemmensen reduction

C. Wolff-Kishner reduction

D. Mendius reduction

Answer: D

Solution:

$$\underset{\text{Alkyl cyanide}}{R-C\equiv N}+4[H]\xrightarrow{Na/Ethano}\underset{\text{Primary amine}}{R-CH_2-NH_2}$$

Given, reaction is called Mendius reduction. In this reaction the reduction of cyano group $(-C\equiv N)$

$(-C\equiv N)$ takes place by nascent hydrogen in the presence of sodium and alcohol. Here nascent hydrogen breaks X bond of cyano group.

Question101

Identify the product obtained, when benzamide is treated with bromine and aqueous sodium hydroxide.

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Options:

A. Bromobenzene

B. Phenol

C. Aniline

D. Benzyl alcohol

Answer: C

Solution:

When benzamide is treated with bromine and aqueous sodium hydroxide to give a aniline with one carbon atom less than the original amide.

Reaction involved is as follows:

This reaction is known as Hofmann bromamide/degradation reaction. The final product will be aniline ($C_6H_5NH_2$).

Question102

Which of the following is called as mandelonitrile?

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Options:

A. Acetaldehyde cyanohydrine

B. Acetone cyanohydrine

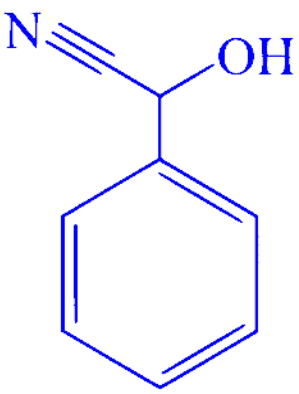
C. Formaldehyde cyanohydrine

D. Benzaldehyde cyanohydrine

Answer: D

Solution:

Benzaidehyde cyanohydrine is called as mandelonitrile. Mandelonitrile is the nitrite of mandelic acid or the cyanohydrin derivative of benzaldehyde. Small amounts of mandelonitrile occur in the pits of some fruits.



Benzaldehyde cyanohydrin

Question103

Hinsberg's reagent is

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Options:

A. benzene sulphonyl chloride

B. benzene sulphonic acid

C. sodium benzene sulphonate

D. benzene sulphonamide

Answer: A

Solution:

Hinsberg's reagent is benzene sulphonyl chloride. It's molecular formula is $C_6H_5SO_2Cl$ This reagent is used to distinguish primary (1°), secondary (2°) and tertiary (3°) amines.

Question104

Identify the amine formed when ethyltrimethyl ammonium iodide is treated with silver hydroxide and further heated strongly

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Options:

A. $C_2H_5N(CH_3)_2$

B. $C_2H_5NH_2$

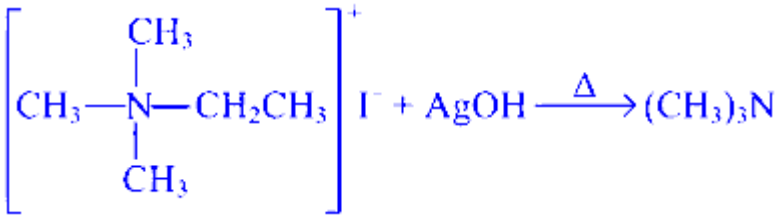
C. $(CH_3)_3N$

D. CH_3NH_2

Answer: C

Solution:

Trimethyl amine is formed when ethyltrimethyl ammonium iodide is treated with silver hydroxide and further heated strongly.



Question105

Identify B in the following reaction,

$$\text{Acetaldoxime} \xrightarrow[\text{alcohol}]{\text{Na}} A \xrightarrow[\text{HCl}]{\text{NaNO}_2} B + H_2O + N_2 \uparrow$$

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Options:

A. $CH_3CH_2CH_2OH$

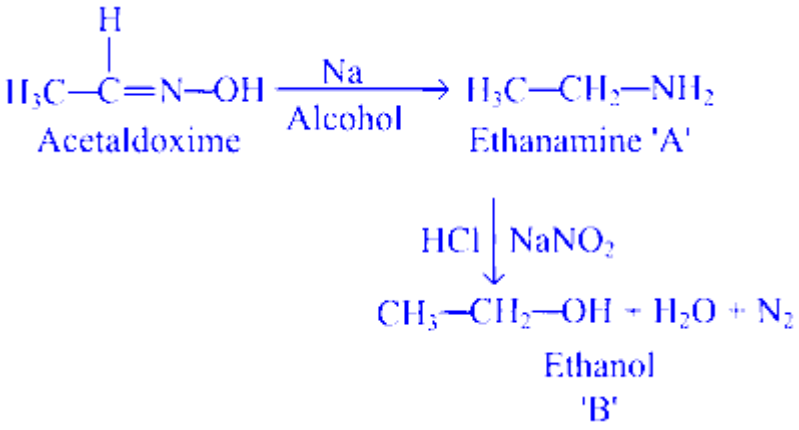
B. C_2H_5OH

C. C_2H_5Cl

D. $C_2H_5NH_2$

Answer: B

Solution:



Question106

Identify the reagent R used in the reaction stated below.

Benzene diazonium chloride $+\mathrm{R} \rightarrow$ Benzene

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Options:

A.

HCl

B.

$\mathrm{H_3PO_2/H_2O}$

C.

$\mathrm{H_2O/HCl}$

D.

$\mathrm{CH_3 - CH_2 - OH}$

Answer: B, D

Solution:

Benzene diazonium chloride can be converted to benzene using (i) H_3PO_2/H_2O or (ii) CH_3CH_2OH.
