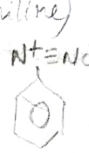
"Worksheet – 03" "Identify the compound"

1. $CH_3Br \xrightarrow{KCN(alc.)} [A] \xrightarrow[\text{(complete hydrolysis)}]{+HOH/H^+} [B]$

[A] CH_3CN [B] CH_3COOH

2. $C_6H_5NH_2$ (Aniline) $+ HNO_2 + HCl \xrightarrow[(273K-278K)]{0-5^\circ C} [A] \xrightarrow{Cu_2Cl_2/HCl} [B]$

[A]  (Benzene diazonium chloride)

[B]  (Chlorobenzene)

3. $C_6H_5NO_2$ (Nitrobenzene) $\xrightarrow[\text{Reduction}]{Sn+HCl} [A] \xrightarrow[273K-278K]{NaNO_2+HCl} [B] \xrightarrow{H_2O} [C]$

[A] $C_6H_5NH_2$ (Aniline)

[B]  (Benzene diazonium chloride)

[C]  Phenol

4. $CH_3CN \xrightarrow[\text{(complete hydrolysis}]{H_2O/H^+} [A] \xrightarrow{NH_3/heat} [B] \xrightarrow[\text{Hoffman Bromamide reaction}]{Br_2+KOH} [C]$

[A] CH_3COOH (Acetic acid)

[B] CH_3CONH_2 (Ethanamide)

[C] CH_3NH_2 (Methyl Amine)

5. $[A] \xrightarrow{aq.\ KCN} [B] \xrightarrow[\text{(reduction)}]{Na/C_2H_5OH} [C] \xrightarrow{NaNO_2+HCl} [D]$

CH_3Br CH_3CN or $LiAlH_4$

(molecular formula C_2H_7N)

$[E] \xleftarrow[(conc.\ H_2SO_4)]{CH_3COOH}$ * D to E Esterification

(sweet smelling compound)

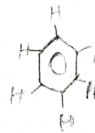
[A] CH_3Br [B] CH_3CN [C] $CH_3CH_2NH_2$ (Ethyl Amine) / Ethanamine

[D] CH_3CH_2OH (ethanol) [E] $CH_3COOCH_2CH_3$ (ESTER / Ethyl Acetate / Ethyl Ethanoate)

6. $[A] \xrightarrow[conc.\ H_2SO_4]{conc.\ HNO_3} [B] \xrightarrow{Sn/HCl} [C] \xrightarrow{NaNO_2+HCl} [D]$

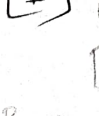
Nitration

$[D] \xrightarrow[H_2O]{Boil\ in}$ 

[A]  (C_6H_6 – Benzene)

[B] $C_6H_5NO_2$ (Nitrobenzene)

[C] $C_6H_5NH_2$ (Aniline)

[D]  (Benzene diazonium chloride)

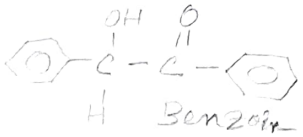
Aldol condensation

7 $C_6H_5COOH \xrightarrow{PCl_5} [A] \xrightarrow[\text{Rosenmund reduction}]{H_2 - Pd/BaSO_4} [B] \xrightarrow[\text{distillation}]{KCN\ alc.} [C]$

(Benzoic acid)

[A] C_6H_5COCl (Benzoyl chloride)

[B] C_6H_5CHO (Benzaldehyde)

[C]  Benzoin

8 $H-C\equiv C-H \xrightarrow[\text{dil } H_2SO_4/HgSO_4]{H_2O} [A] \xrightarrow[[Ni]]{H_2} [B] \xrightarrow[\text{conc. } H_2SO_4]{140^\circ C/413\ K} [C]$

(Ethyne) (Hydration)

[A] CH_3CHO (Acetaldehyde)

[B] CH_3CH_2OH (Ethanol)

[C] $CH_3-CH_2-O-CH_2CH_3$ Diethyl ether

9 Benzene $\xrightarrow[AlCl_3(anhy)]{CH_3Cl} [A] \xrightarrow[K_2Cr_2O_7 + H_2SO_4]{[O]} [B]$

(Friedel Crafts Alkylation) $-H_2O$

[A]  (Toluene)

[B]  Benzoic Acid

10 $CH_3COCH_3 \xrightarrow[HNO_3(conc.)]{[O]} [A] \xrightarrow{PCl_5} [B]$

(Acetone)

[A] CH_3COOH (acetic acid)

[B] CH_3COCl (Acetyl chloride)

or $SOCl_2$ (dehydration)

11 $[A] \xrightarrow{NH_3/heat} [B] \xrightarrow[(-H_2O)]{P_2O_5/\Delta} [C]$

[A] $C_3H_6O_2$ CH_3CH_2COOH (propanoic acid)

[B] C_3H_7ON $CH_3CH_2CONH_2$ (propanamide)

[C] C_3H_5N CH_3CH_2CN

[C] $\xrightarrow[\text{complex metalhydride (i.e. } LiAlH_4)]{\text{complete Reduction with}}$ [D] C_3H_9N (nitrogenous compound)

$CH_3CH_2CH_2NH_2$ propanamine (primary amine)

[D] $\xrightarrow{HNO_2}$ [E] $CH_3CH_2CH_2OH$ (propanol) C_3H_8O (alcohol)

[E] $\xrightarrow{\text{oxidation}}$ [A] CH_3CH_2COOH

[A] $\xrightarrow[(H_2O/H^+)]{\text{complete acid hydrolysis}}$ [C] CH_3CH_2CN

CH_3CH_2COOH

* CH_3CH_2CN = *

(1) $C_2H_5CONH_2$ C_2H_5COOH

"Methanol to ethanol" conversion.

10

$CH_3OH \xrightarrow{HI} [A] \xrightarrow{KCN} [B] \xrightarrow[4H]{LiAlH_4} [C] \xrightarrow[273\ K]{HNO_2} [D]$

[A] CH_3I (Methyl Iodide)

[B] CH_3CN (Methyl cyanide)

[C] $CH_3CH_2NH_2$ (Ethanamine)

[D] CH_3CH_2OH (Ethyl alcohol)

12 Ethanol to methanol

$CH_3CH_2OH \xrightarrow[K_2Cr_2O_7/H_2SO_4]{O} [A] \xrightarrow[\text{oxidation}]{O} [B] \xrightarrow{NaOH} [C]$

$[C] \xrightarrow[\text{Heat}]{\text{Sodaline } (NaOH + CaO)} [D] \xleftarrow{Cl_2} [E] \xrightarrow{KOH(aq)} [F]$

$[D] = CH_4$ (decarboxylation) $-Na_2CO_3$

[A] CH_3CHO (Ethanal / Acetaldehyde)

[B] CH_3COOH (Ethanoic acid)

[C] CH_3COONa (Sodium Ethanoate)

[D] CH_4

[E] CH_3Cl

[F] CH_3OH (Methanol)

14 Ethanoic acid into methanamine

$CH_3COOH \xrightarrow{SOCl_2} [A] \xrightarrow[\text{(Excess)}]{NH_3} [B] \xrightarrow[\Delta]{Br_2/KOH} [C]$

Ethanoic acid

$Br_2/NaOH$ or $NaOBr$

(Hoffmann Bromamide reaction)

[A] CH_3COCl (Ethanoyl chloride / Acetyl chloride)

[B] CH_3CONH_2 (Ethanamide)

[C] CH_3NH_2 (Methyl amine / Methanamine)

15 Methanol to ethanoic acid

$CH_3OH \xrightarrow{PCl_5} [A] \xrightarrow{KCN(alc)} [B] \xrightarrow[\text{(complete hydrolysis)}]{H_2O/H^+} [C]$

Methanol

[A] CH_3Cl

[B] CH_3CN

[C] CH_3COOH (acetic acid / Ethanoic acid)

16 Ethanamine to methanamine

$CH_3CH_2NH_2 \xrightarrow{HNO_2} [A] \xrightarrow[[O]]{K_2Cr_2O_7/H_2SO_4} [B] \xrightarrow[[O]]{K_2Cr_2O_7/H_2SO_4} [C]$

$[C] \xrightarrow{NH_3} [D] \xrightarrow{\Delta} [E] \xrightarrow[\Delta]{Br_2/KOH} [F]$

[A] CH_3CH_2OH (Ethanol)

[B] CH_3CHO (Ethanal)

[C] CH_3COOH (Ethanoic acid)

[D] CH_3CONH_2

[E] CH_3CN

[F] CH_3NH_2

17 Methanamine to ethanamine :

$CH_3NH_2 \xrightarrow{HNO_2} [A] \xrightarrow{P+I_2} [B] \xrightarrow{KCN} [C] \xrightarrow[\text{(reduction)}]{Na/C_2H_5OH} [D]$

Methanamine (CH_5N)

[A] CH_3OH (Methanol) [B] CH_3I [C] CH_3CN [D] $CH_3CH_2NH_2$ (Ethanamine)

18 Ethanoic acid into propanoic acid

$CH_3COOH \xrightarrow[\text{(reduction)}]{LiAlH_4} [A] \xrightarrow{P+I_2} [B] \xrightarrow{KCN} [C] \xrightarrow{H_2O/H^+} [D]$

[A] CH_3CH_2OH (Ethanol) [B] CH_3CH_2I (Ethyl Iodide) [C] CH_3CH_2CN [D] CH_3CH_2COOH (Propanoic acid)

19 propanoic acid into ethanoic acid.

$CH_3CH_2COOH \xrightarrow{NH_3} [A] \xrightarrow{\Delta} [B] \xrightarrow[\Delta]{Br_2/KOH} [C] \xrightarrow{HNO_2} [D]$

$[D] \xrightarrow[H_2SO_4]{K_2Cr_2O_7} [E] \xrightarrow[H_2SO_4]{K_2Cr_2O_7} [F]$

[C]

[A] $CH_3CH_2COONH_4$ (Ammonium Propanoate) [B] $CH_3CH_2CONH_2$ (Propanamide) [C] $CH_3CH_2NH_2$ (Ethanamine)

[D] CH_3CH_2OH (Ethanol) [E] CH_3CHO (Ethanal) [F] CH_3COOH (Acetic acid)

20 Ethanoic acid to methanol

$CH_3COOH \xrightarrow[\Delta]{NH_3} [A] \xrightarrow[OR\ (Br_2+NaOH)\ OR\ (Br_2+KOH)]{NaOBr} [B] \xrightarrow[\text{or. } HNO_2]{NaNO_2/HCl} [C]$

(Ethanoic acid / Acetic acid)

[A] CH_3CONH_2 [B] CH_3NH_2 [C] CH_3OH (methanol)

* Alcohol $\xrightarrow[[O]\ [K_2Cr_2O_7/H_2SO_4]]{\text{controlled oxidation}}$ Aldehyde $\xrightarrow[\text{(or Tollen's reagent)}]{\text{controlled oxidation}}$ Carboxylic acid.

* Aldehyde $\xrightarrow[\text{(reduction)}]{LiAlH_4}$ Alcohol $\xrightarrow[573K,\ \text{catalytic (dehydrogenation)}\ (-H_2)]{Cu}$ Aldehyde.