PROPOSED MARKING GUIDE

CHEMISTRY DEPARTMENT 2023
S.6 BRAINSTORMING TEST
TEST ON: DISTINGUISHING SPECIES

NAME.....**INDEX number**.....
Signature.....**expected score(%)**.....

Instructions; Attempt *all questions in this paper.*

1. (a) Name **one** reagent that can be used to distinguish between members of the following pairs of compounds. In each case state what would be observed when each member of the pair (s) is separately treated with the reagent you have named;

(i) **HCOOH and CH_3COOH** (1 ½ marks)

Reagent Ammoniacal silver nitrate solution and warm.

Observations;
with HCOOH : Silver mirror deposit
with CH_3COOH : No observable change.

(ii) **CH_3OH and CH_3CH_2OH** (1 ½ marks)

Reagent Iodine solution and sodium hydroxide solution.

Observations;
with CH_3CH_2OH : Yellow precipitate formed
with CH_3OH : No observable change.

(iii) $\begin{matrix} COO^- \\ | \\ COO^- \end{matrix}$ and $HCOO^-$ (03 marks)

Reagent Hot acidified potassium manganate(VII) solution.

Observations;
with $\begin{matrix} COO^- \\ | \\ COO^- \end{matrix}$: A purple solution turns to a colourless solution.
with $HCOO^-$: No observable change.

(iv) $(CH_3CH_2)_2NH$ and $CH_3CH_2NH_2$ (03 marks)

Reagent

Sodiumnitrite solution and Concentrated hydrochloric acid at 0°C

Observations;

with $(CH_3CH_2)_2NH$: Yellow oily liquid

with $CH_3CH_2NH_2$: Bubbles of a colourless gas. (03)

.2. (a) State what is observed when each of the following compounds is treated with ammoniacal silver nitrate solution:

(i) $CH_3CH_2C \equiv CH$ *(1 mark)*

observations

White precipitate

Equation

$CH_3CH_2C{\equiv}CH_{(g)} + AgNO_{3(aq)} + NH_{3(aq)} \rightarrow CH_3CH_2C{\equiv}CAg_{(s)} + NH_4NO_{3(aq)}$ (01½)

(ii) $CH_3CH_2CH_2CHO$ *(1 mark)*

observations

Silver mirror deposit

Equation

$CH_3(CH_2)_2CHO_{(l)} + \bar{O}H_{(aq)} + 2Ag(NH_3)_2^+{}_{(aq)} \rightarrow 2Ag_{(s)} + CH_3(CH_2)_2COO^-{}_{(aq)} + 4NH_{3(aq)} + 2H^+_{(aq)}$ (01½)

3. Name a reagent that can be used to distinguish between each of the following pairs of substances. In each case state what would be observed when the reagent is treated with each member of the pair.

(a) propan-2-ol and ethanol

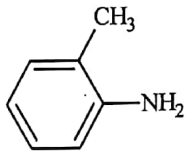
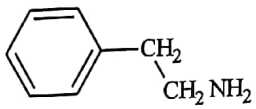
Reagent: *(½ mark)*

Anhydrous zinc chloride and concentrated hydrochloric acid.

Observation: *(1 mark)*

with Propan-2-ol : Cloudy solution formed within 5-10 minutes.

with ethanol : No observable change at room temperature. (1½)

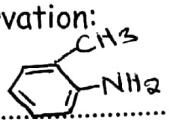
(b)  and 

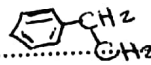
(1 mark)

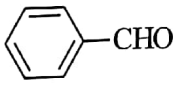
Reagent:

Sodium nitrite solution and concentrated hydrochloric acid at 0°C. (1½ marks))

Observation:

with  : No observable change ✓

with  : Bubbles of a colourless gas ✓ 2½

(c) HCHO and 

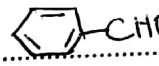
(1 mark)

Reagent: Hot Fehling's solution ✓

(1½ marks))

Observation:

with HCHO : Reddish-brown precipitate ✓

with  : No observable change ✓ 2½

4. Name one reagent that can be used to distinguish between each of the following pairs of compounds and state what would be observed in each case if the reagent is reacted with the compounds

(a) C_6H_5COOH and C_6H_5OH

Reagent Sodium carbonate solution ✓

Observations;

with C_6H_5COOH : Bubbles of a colourless gas ✓

with C_6H_5OH : No observable change ✓ 03

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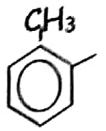
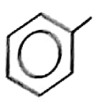
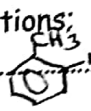
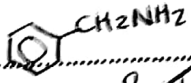
(b)  and 

Reagent Sodium nitrite solution and Concentrated hydrochloric acid at 0°C

Observations;
with  : No observable change ; with  Bubbles of a Coloured gas. (03)

(c) CH_3OH and CH_3CH_2OH

Reagent Iodine solution and sodium hydroxide solution

Observations;
with CH_3CH_2OH : Yellow precipitate
with CH_3OH : No observable change (03)

(d) $(CH_3)_2C=O$ and CH_3CH_2CHO *(03 marks)*

Reagent Ammoniacal silver nitrate solution and warm

Observations;
with $(CH_3)_2C=O$: No observable change
with CH_3CH_2CHO : Silver mirror deposit. (03)

(e) HCOOH and HOOCCOOH *(03 marks)*

Reagent Ammoniacal silver nitrate solution and warm

Observations;
with HCOOH : Silver mirror deposit
with HOOCCOOH : No observable change (03)

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(f) $CH_3C{\equiv}CCH_3$ and $CH_3CH_2C{\equiv}CH$ *(03 marks)*

Reagent Ammoniacal silver nitrate solution ✓

Observations;

with $CH_3C{\equiv}CCH_3$: No observable change ✓

with $CH_3CH_2C{\equiv}CH$: White precipitate ✓ 03

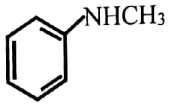
5. Name a reagent that can be used to distinguish between each of the following pairs of ions. In each case, state what would be observed if each member of the pair was treated with the reagent you have named.

(a) $C_2O_4^{2-}$ and CH_3COO^- *(3marks)*

Reagent: Hot acidified potassium manganate(VII) solution ✓

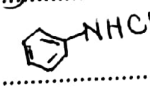
Observations: with $C_2O_4^{2-}$: A purple solution turns to a colourless solution ✓ 03

with CH_3COO^- : No observable change ✓

(b) $CH_3CH_2CH_2NH_2$ and  *(3 marks)*

Reagent: Sodium nitrite solution and Concentrated hydrochloric acid at 0°C ✓

Observations with $CH_3CH_2CH_2NH_2$: ~~Yello~~ Bubbles of a colourless gas ✓

with  : Yellow oily liquid ✓ 03

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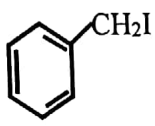
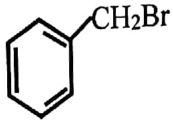
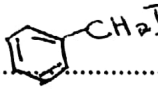
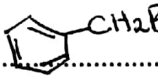
(c)  and  (3 marks)

Reagent: Hot sodium hydroxide solution, dilute nitric acid then silver nitrate solution

Observations with  : Yellow precipitate formed

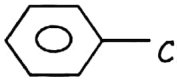
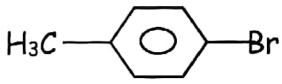
with  : Pale yellow precipitate formed: 03

(d) $CH_2CH_2COCH_3$ and $CH_2CH_2CH_2CHO$ (3 marks)

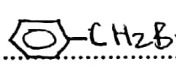
Reagent: Ammoniacal silver nitrate solution and warm.

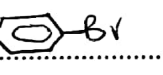
Observations with $CH_2CH_2COCH_3$: No observable change 03

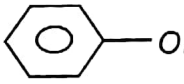
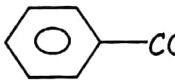
with $CH_3CH_2CH_2CHO$: Silver mirror deposit

e)  and  (03 marks)

Reagent: Hot sodium hydroxide solution, dilute nitric acid then silver nitrate solution.

Observations: with  : Pale-yellow precipitate formed 03

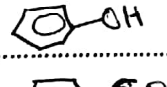
with  : No observable change.

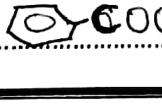
 and  (03 marks)

Reagent

Sodium carbonate solution

Observation

with  : No observable change 03

with  : Bubbles of a colourless gas.

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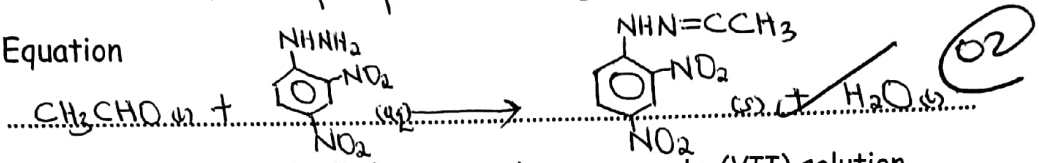
6. State what would be observed and write equation for the reaction that would take place if:

a) 2,4-dinitrophenyl hydrazine is added to ethanal. (02 marks)

Observation
Yellow precipitate ✓

Equation

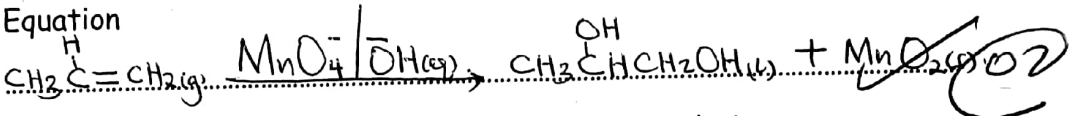


02

b) Propene is mixed with alkaline potassium manganate (VII) solution

Observation
A purple solution turns to a green solution and finally a brown solid is formed. ✓

Equation

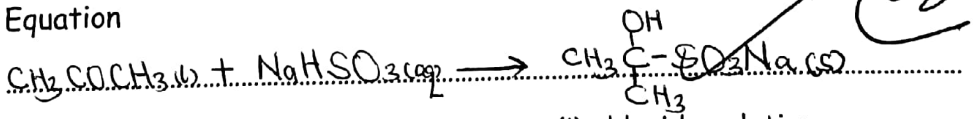


02

c) Propanone is mixed with sodium hydrogensuphite solution

Observation
White precipitate is formed ✓

Equation

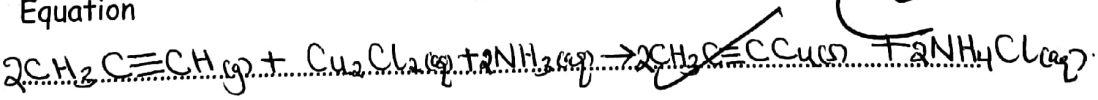


02

d) Propyne is mixed with ammoniacal copper(i) chloride solution

Observation
Red precipitate ✓

Equation



02

08

e) Propan-1-ol is mixed with iodine solution and sodium hydroxide solution

Observation

No observable change ✓ (07)

Equation

Marks transfered

7. For each of the following pairs of species, Name a reagent that gives similar observations if treated with each of the species. In each case state what would be observed when the reagent named is treated with the species. state the functional group in the species, equation for the reaction when the reagent is treated with the specie.

(a) $(CH_3)_2C=O$ and CH_3CH_2CHO *(03 marks)*

Reagent

2,4-Dinitrophenylhydrazine solution ✓

Observations;

Yellow precipitate with $(CH_3)_2C=O$ and CH_3CH_2CHO ✓

Functional group

Carbonyl group ✓ (03½)

Equation

$(CH_3)_2C=O_{(l)} + O_2N(NO_2)C_6H_3NHNH_{2(aq)} \rightarrow O_2N(NO_2)C_6H_3NHN=C(CH_3)_{2(s)} + H_2O_{(l)}$

OR $CH_3CH_2CHO_{(l)} + O_2N(NO_2)C_6H_3NHNH_{2(aq)} \rightarrow O_2N(NO_2)C_6H_3NHN=CCH_2CH_{3(s)} + H_2O_{(l)}$

END.

04½