

# INDEX

S.r. No.	Name of the Experiment	Page No.	Date of Experiment	Date of Submission	Remarks
1.	To estimate the Cu as $CuSCN$ in the given solution of copper salt.	1-2			
2.	To estimate $(NiDMG)$ in the given solution of nickel ammonium sulphate.	3-4			
3.	To identify the functional group from the given organic compound.	5-7			
4.	To identify the given organic compound.	8-10			
5.	To determine the given organic synthesis.	11-13			

# INDEX

S.r. No.	Name of the Experiment	Page No.	Date of Experiment	Date of Submission	Remarks
6.	To determine the functional group & melting point to the given organic compound.	14-16			
7.	To identify the given organic compound.	17-19			
8.	To determine the given organic compound.	20-22			
9.	To determine the heat of neutralization of strong acid and strong base.	23-26			
10.	To determine the heat of the given salt and water by calorimeter.	27-30			

## Experiment No.1

### Object :-

To estimate copper as  $\text{CuSCN}$  (Copper thiocyanide) is the given solution of the copper salt.

### Process :-

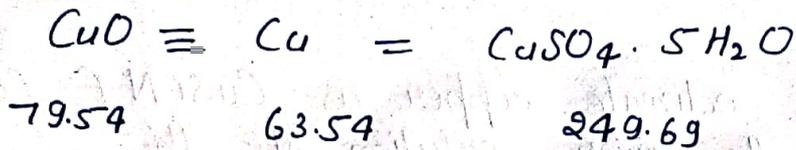
To the supplied solution of copper sulphate ( $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ) add an equal volume of distilled water and 1ml of conce. HCl cover the beaker by watch glass and boil the contents of the beaker.

Now add few drops of phenolphthaleine add slowly a hot 10% solution of NaOH with constant stirring until clear liquid become light pink colour. A blue precipitate of  $[\text{Cu}(\text{OH})_2]$  is obtained.

Cover the beaker and boil the 5 min on boiling  $\text{Cu}(\text{OH})_2$  partially change to dark brown colour  $\text{CuO}$ . After the precipitate has settled immediately pour off the wash the precipitate by with hot water until

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Calculation :-



$$\text{Conversion factor} = \frac{\text{Cu}}{\text{CuO}}$$

$$= \frac{63.54}{79.54}$$

$$= 0.7988$$

Weight of Cu is supplied volume of solution

$$= 0.7988 \times \text{weight of ppt}$$

$$= 0.7988 \times 2$$

$$= 1.597$$

last filtrate become free from alkyl. If any precipitate sticks on the side of the beaker and on the tip glass rod wash it down with hot water using filter paper and continue the washing till the filtrate free from sulphate ion and chloride ion.

Dry the precipitate cover with funnel burn the filter paper to the clean as cool the crucible and add one drop of conc  $\text{HNO}_3$  and now heat cool and weight.

### Result:—

The weight of copper is supplied volume of solution is. 1.597.

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## Experiment No 2.

### Object :-

To estimate nickel as nickel dimethyl glyoxime (Ni DMG<sub>2</sub>) in the given solution of nickel ammonium sulphate.

### Requisite reagent :-

1% alcoholic DMG.

### NH<sub>3</sub> solution :-

3.5% absolute alcohol.

### Principle :-

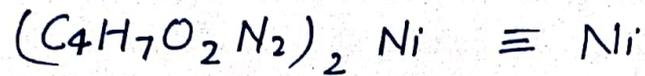
Ni is precipitated as a complex salt on treatment with the alcoholic DMG in presence of NH<sub>3</sub>. The precipitate is filtered and washed till free from chloride ion and weighed.

### Method :-

Dilute the given solution to 150 ml in 400 ml beaker by distilled water and about 30-35% of

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Calculation :-



(288.69)

(58.69)

Hence weight of Ni = 0.2033 x weight of PPT

$$\text{Weight of Ni ammonium sulphate} = \frac{394.69}{288.69} \times \text{weight of Ni DMG}$$

$$= 1.3671 \times \text{weight of Ni DMG}$$

$$= 1.367 \times 3.6$$

$$= 4.92$$

alcoholic DMG Solution. Heat the solution to  
70-80°C and then add  $\text{NH}_3$  solution.  
(1:1) drop constant till a smell of  
 $\text{NH}_3$  persists long of heat the  
beaker till sud of precipitate do  
get add few drop of DMG and  
wash the precipitate by heat  
water 3-4 time.

~~Cold the precipitate and weight.~~

**Result :-**

The weight of ~~nickel ammonium~~  
sulphate is 4.92.

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## Experiment No 3

### Object:—

To identify the functional group from the given organic compound.

### Apparatus:—

Test tube, test tube holder, porcellin disk, metallic spatula, ignition tube, sprut lamp, filter paper.

	Experiment	Observation	Inference
1.	Preliminary test		
	Physical state	Solid	
	Odour	NH <sub>3</sub> smell	
	Colour	White	
2.	Solubility test	soluble in cold water	
3.	Ignition test	Burn with non sooty flame	may be aliphatic

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4	Unsaturation test		
	Compound + $H_2O$ + $Na_2CO_3$ + $KMnO_4$	Colour disappears	Unsaturation Compound
5	Detection test		
	Na extract + $H_2SO_4$ + $NaOH$	Dirty green ppt	May be N
	Solution + dil $H_2SO_4$	Blue ppt	N confirm
6	Functional group test		
	Compound + $H_2O$ + $NaOH$	smell of $NH_3$	$Co(NH_2)_2$ percent
7	Compound test		
	0.5 gm compound + 2 ml dil $NaOH$	smell of $NH_3$	Urea confirm

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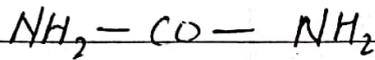
Expt. No.....

Page No...07.....

Date...../...../.....

**Result :-**

Used. The given organic compound is



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## Experiment No. 4

**Object:** — To identify the given organic compound.

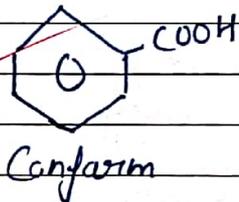
**Apparatus:** — Test tube, test tube holder, ignition tube, test tube metallic spatula, sodium metal, spirit lamp.

	Experiment	Observation	Inference
1	Preliminary test Physical state Colour Odour	Solid Crystalline white Pungent smell	
2	Ignition test	Burn with sooty flame.	May be aromatic compound.

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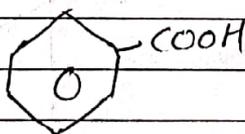
3	Solubility test		
	Organic Compound + hot water	soluble in hot water	
4	Unsaturation test.		
	Compound + $H_2O$ + $Na_2CO_3$ + 1ml $KMnO_4$ + heat	Colour disappears	Unsaturation Compound.
5	Element test		
	No reaction + $FeSO_4$ + $NaOH$	dirty green colour	
	Solution + $H_2SO_4$	Colourless	N absent.
6	Functional group.		
	Organic Compound + $NaHCO_3$	Efferescence smell of acid	Carboxylic group present. ( $COOH$ )

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7.	Specific test.		
	Sodium nitronde + Compound + Conc $H_2SO_4$	Buff colour	Benzoic acid
	Compound + NaOH	Buff colour	 Benzoic acid
8.	Melting point.	<u>120°</u>	

**Result:—**

The given organic compound is benzoic acid.



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## Experiment No. 5

**Object: —**

To determine the organic synthesis.

**Apparatus: —**

Test tube, spirit lamp, tung, filter paper, test tube holder, tripod stand, thermometer.

	Experiments	Observation	Inferences
1	Preliminary test		
	Physical state	Solid	
	Colour	White	
	Odour	Characteristic smell	
2	Ignition test	Burn with non sooty flame	May be aliphatic
3	Solubility test	Soluble in hot water	

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4.	Unsaturation test		
	Compound + $H_2O$ + Ber water	Discolour	Unsaturated Compound.
	Compound + $H_2O$ + $Na_2CO_3$ + $KMnO_4$ + heat	Colour disappear	Unsaturated Compound
5	Element test		
	Na extract + $FeSO_4$ + $NaOH$	Dirty green	
	Solution + dil $H_2SO_4$	No prussion Blue colour	N- absent.
6.	Functional group		
	Compound + $H_2O$ + $NaHCO_3$	white ppt	
7	Specific test		
	Compound + dil $HCl$ + $KMnO_4$ + heat	smell of bitter almond.	
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Expt. No.....

Page No.....13.....

Date...../...../.....

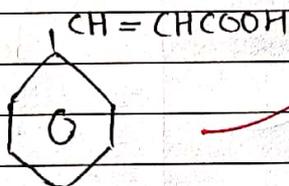
Compound + NaOH  
+  $KMnO_4$

discolour

Cinnamic acid

**Result :-**

The given organic compound  
is cinnamic acid.



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## Experiment No.6

### Object :-

To determine the functional group and melting point of the given organic compound

### Apparatus :-

Test tube, test tube holder, wire gauze, spirit lamp, spatula, test tube holder, filter paper.

	Experiment	Observation	Inference
1	Preliminary test		
	Physical state	Solid	
	Colour	White	
	Odour	Characteristic smell	
2	Ignition test	Non sooty flame	May be aliphatic

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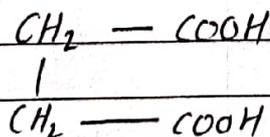
3	Solubility test	Soluble in hot water	
4	Unsaturation test		
	Compound + $H_2O$ + $Al_2CO_3$ in water	Dis colour	Unsaturated Compound
	Compound + $H_2O$ + $Na_2CO_3$ + $KMnO_4$ + heat	Colour disappear	Unsaturated Compound.
5	Element test		
	Na extract + $FeSO_4$ + $NaOH$	Dirty green	
	Solution + dil $H_2SO_4$	No precipitation blue ppt	N absent
	Na extract solution + nitroprusside	perpel colour	S present

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6. Functional group test		
Compound + $\text{NaHCO}_3$ + $\text{H}_2\text{O}$		presence of carboxylic group.
7. Specific test		
Compound + $\text{NaOH}$ + $\text{CaCl}_2$	white ppt	
Compound + dil $\text{H}_2\text{SO}_4$ + $\text{H}_2\text{O}$ + $\text{KMnO}_4$ + heat	discolour	$\text{COOH}$ group present.
8. Melting point	$185^\circ\text{C}$	

**Result:—**

The given organic compound is  
succinic acid.



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## Experiment No 7

**Object :—**

To identify the given organic compound.

**Apparatus :—**

Test tube holder, tong, test tube, spirit lamp, metallic spatula, filter paper, wiregase.

	Experiment	Observation	Inference
1	Preliminary test		
	Physical state	solid	
	Odour	characteristic smell	
	Colour	Black	
2	Ignition test	Burn with sooty flame	May be aromatic
3	Solubility test	Soluble in hot water	

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4	Unsaturation test		
	Compound + Br <sub>2</sub> water + KMnO <sub>4</sub> + heat	Colour disappears	Unsaturated Compound
	Compound + H <sub>2</sub> O + Na <sub>2</sub> CO <sub>3</sub> + KMnO <sub>4</sub>	Colour disappears	Unsaturated Compound
5.	Element test.		
	Na extract + FeSO <sub>4</sub> + dil NaOH	dirty green ppt	
	Solution + dil H <sub>2</sub> SO <sub>4</sub>	No precipitation blue colour	N absent
6	Functional Group		
	Compound + NaHCO <sub>3</sub> + H <sub>2</sub> O	Effervescence white ppt	Wt - COOH group confirm.
7.	Specific test		
	Compound + H <sub>2</sub> O + FeCl <sub>3</sub>	Violent or purple colour	Salicylic acid
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## Experiment No. 8

**Object:** —

To determine the given organic compound.

**Apparatus:** —

Test tube, tongs, holder, filter paper, ignition tube, split lamp, spatula, Na metal.

**Experiment**

**Observation**

**Inference**

1 Preliminary test

Physical state

Solid

Colour

White

Odour

Characteristic smell

2 Ignition test

Burn with non sooty flame

May be aromatic

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Expt. No.....

Page No....21.....

Date...../...../.....

3	Solubility test		
	Compound + dil NaOH + heat	Soluble in hot water	May be ( $C_2H_5OH$ )
4	Unsaturation test		
	Compound + $H_2O$ + $Na_2CO_3$ + few drop $KMnO_4$ + heat	<del>Colour disappear</del>	Unsaturated Compound.
5	Element test		
	Na extract + $FeSO_4$ + NaOH	<del>No dirty green ppt</del>	
	Solution + dil $H_2SO_4$	No prussin	N absent
6.	Functional group test.		
	Compound + $H_2O$ + $NaHCO_3$	<del>Vialit Colour</del>	-OH group percent

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Expt. No.....

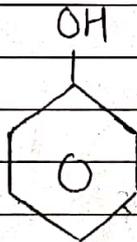
Page No.....22.....

Date...../...../.....

7.	specific test		
	Compound + $FeCl_3$	Violet Colour	-OH group present

**Result :—**

The given organic compound is phenol.



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## Experiment No. 9

**Object :—**

To determine the heat of neutralization of strong acid HCl and strong base.

**Required apparatus & chemical :—**

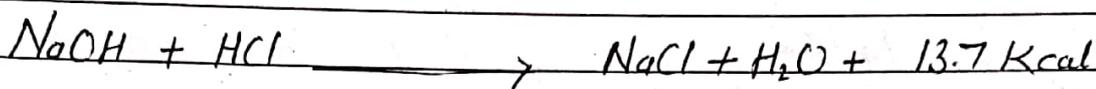
Thermometer, beaker, HCl, NaOH, Calorimeter. etc.

**Theory :—**

The heat of neutralization is the amount of heat liberated when 1 gm equivalent of an acid is neutralized by 1 gm equivalent of base. When both acid and base are strong. The heat evolved is minimum 13.7 cal/mole.

In case of HCl and NaOH the neutralization reaction may be represented by the following reaction—

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Since both acid and base strong  
 therefore dicute completely the amount  
 of heat evolved. When a mole  
 of  $\text{H}_2\text{O}$  is produced from complete  
 reaction of an acid and base  
 is called of neutralization.

## Determination of water equivalent of calorimeter

Observation : —

Mass of cold water = 100 gm

Mass of hot water = 100 gm

Temperature of cold water  $T_1 = 28^\circ\text{C}$

Temperature of hot water  $T_2 = 65^\circ\text{C}$

Temperature of attained after mixing  $T_3 = 45^\circ\text{C}$

Heat given by hot water = heat taken by calorimeter +  
 heat taken by cold water

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Where  $100(T_2 - T_3) = w(T_3 - T_1) + 100(T_3 - T_1)$   
 $w =$  water equivalent of calorimeter

Therefore:

$$w = \frac{100(T_2 - T_3) - 100(T_3 - T_1)}{T_3 - T_1}$$

### Determination of heat neutralization Observation:—

The heat of neutralization of strong acid and strong base is

$$\Delta H = Z \times \Delta H \text{ kcal}$$

$$\Delta H = 13.0566 \text{ kcal}$$

### Precaution:—

Both acid (HCl) and base (NaOH) should be of same temp. and should be of equal normality.

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Expt. No.....

Page No...26.....

Date...../...../.....

**Result : —**

The heat of neutralization  
of HCl acid and NaOH  
base is 13.7 Kcal.

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## Experiment No. 10

### Object :—

To determine the heat of solution of the given salt and water by calorimeter.

### Requisit apparatus :—

Calorimeter, glass rod, thermometer, salt, beaker, measuring cylinder etc.

### Principle :—

The heat of solution is determined by dissolving a small known weight of salt that in a large measured quantity of water in a calorimeter. The rises are from in temperature that is noted then  $\Delta H$  is calculated by the formula —

$$\Delta H = \frac{W + M (\Delta T \cdot m)}{w}$$

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Where:—

$W$  = Water equivalent of calorimeter

$M$  = Mass of the water taken

$m$  = molecular weight of solute

$w$  = Mass of the solute

### Determination of the water equivalent of the Calorimeter:—

Mass of the cold water = 50 gm

Mass of the hot water = 50 gm

Temperature of the cold water  $T_1 = 30^\circ\text{C}$

Temperature of the hot water  $T_2 = 65^\circ\text{C}$

Temperature of the mixture after mixing  $T_3 = 45^\circ\text{C}$

### Heat of salt:—

Mass of water  $m = 100\text{ gm}$

Temp. of water  $T_4 = 30^\circ\text{C}$

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Calculation :-

$$w = \frac{50(T_2 - T_3) - 50(T_3 - T_1)}{T_3 - T_1}$$

$$= \frac{50(65 - 45) - 50(45 - 30)}{45 - 30}$$

$$= \frac{50 \times 20 - 50 \times 15}{15}$$

$$= \frac{1000 - 750}{15}$$

$$= \frac{250}{15}$$

$$w = 16.66 \text{ gm}$$

Mass of salt added  $w = 3\text{ gm}$

Final temperature of solution  $T_5 = 25^\circ\text{C}$

Heat given by hot water = Heat taken by cold water  
+ heat taken by calorimeter.

$$S_0 (T_2 - T_3) = w (T_3 - T_1) + S_0 (T_3 - T_1)$$

Where

$w$  = water equivalent of calorimeter.

Therefore:

$$w = \frac{S_0 (T_2 - T_3) - S_0 (T_3 - T_1)}{T_3 - T_1}$$

Since the given salt sodium nitrate  
( $\text{NaNO}_3$ ) produced cooling when  
dissolved in water.

$$\Delta T = T_5^\circ\text{C} - T_4^\circ\text{C}$$

$$= 25 - 30$$

$$= -5^\circ\text{C}$$

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Heat loss by calorimeter and water  
then.

$$(W+M) \cdot \Delta T$$

$$= (16.66 + 100) (-5^\circ\text{C})$$

$$= -583.30$$

Heat loss by calorimeter + water

$$= -583.30$$

Molecular weight of  $M = 04.99$

Then

$$\Delta H = \frac{(W+M) \cdot \Delta T \cdot m}{w}$$

**Result : —**

The heat of solution of the  
given salt in the  
water is ~~-16.524 Kcal.~~

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