

Aim of the experiment:-

To determine the viscosity of a lubricant by Redwood's viscometer.

Apparatus required:-

i) Chemical - Lubricant oil.

ii) Apparatus - Redwood's viscometer, Kohlrausch's flask, thermometer, stopwatch.

Redwood's viscometer: There are available in two sizes

1) Universal & 2) Viscometer admiralty both of them being identical in principle. The difference lie in the dimensions of the discharge capillary tube.

$R_{W1}$  = 1.62 mm diameter & 10mm length.

$R_{W2}$  = 3.8 mm diameter & 15mm length.

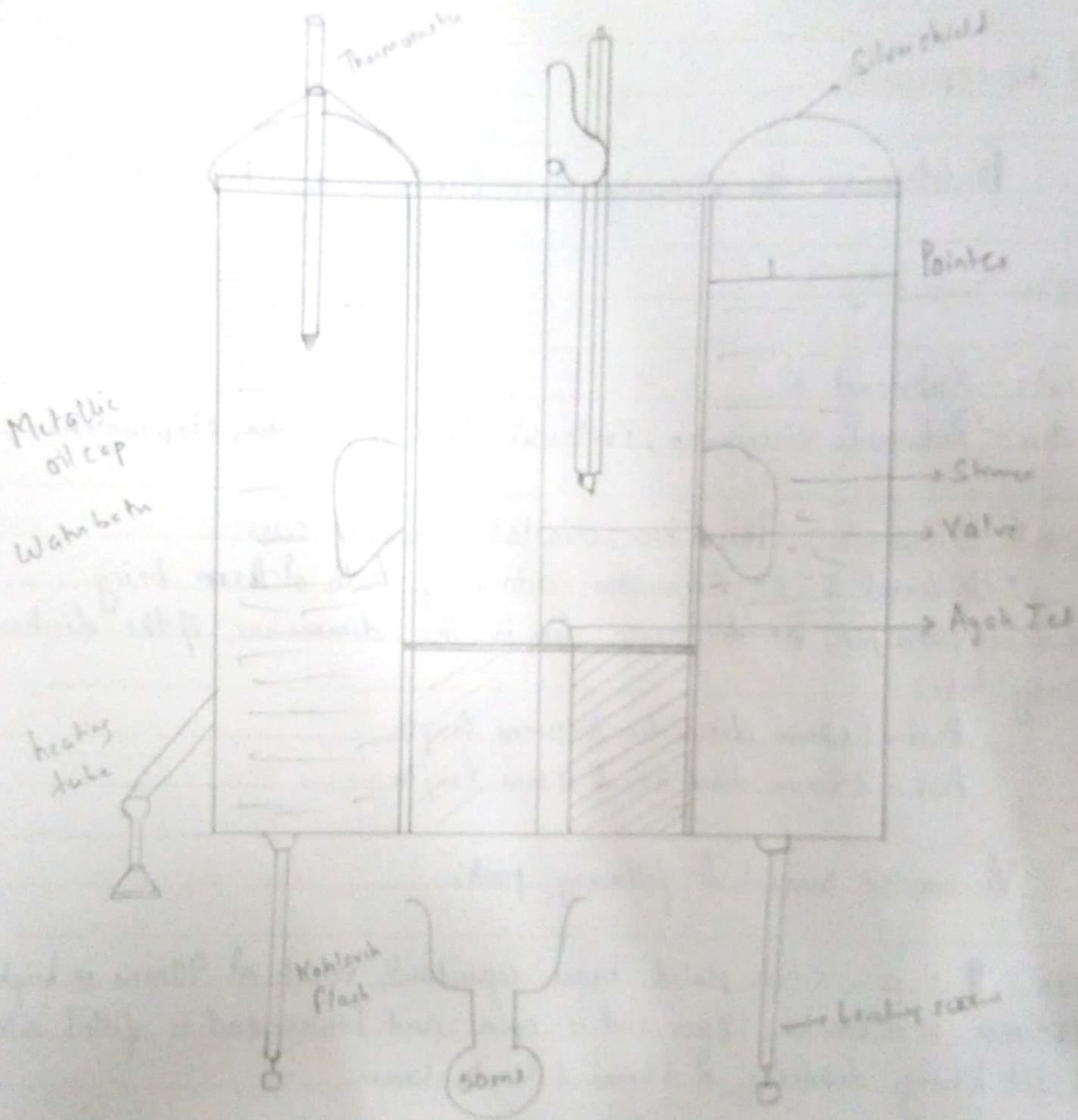
Viscometer consist of following parts:-

1. Oil cap :- It is a silver plated brass cylindrical vessel of 90mm in height & 46.5mm in diameter. Upper end is open and lower end is fitted with agate jet having diameter of 1.6mm & length 10mm.

2. Heating bath :- The oil cap is surrounded by a cylindrical bath made up copper. It has a tap for empty  $H_2O$ .

3. Stirrer :- The heating bath is provided with a stirrer which stirs the water in heating bath for uniform temperature.

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(Redwood viscometer)

4. Spirit Level:- The cover of the cup is provided with a spirit level for vertical leveling of jet.

5. Levelling screw:- The entire apparatus rests on the legs provided at the bottom with levelling screw.

6. Kohlrausch Flask:- The flask receives the oil from jet outlet. The capacity is 50ml upto neck.

Principle:-

Viscosity is the measure of flow ability at a definite temperature. Lubricating oil must have sufficient viscosity to enable it to stay in the position. It is the measure of bearing function heat generation and rate of flow under specific load condition and design.

Viscosity is the measure of flow ability at a definite temperature. It is the property by virtue of which it tends to oppose the relative motion between its layers with rise in temperature forces of cohesion between the molecules of a fluid are weakened resulting in a decrease in viscosity.

Procedure:-

\* Level the viscometer with the help of the levelling screws & fill the water bath with water.

\* Fill the cup with the oil. Keeping the values read on the capillary jet to close it & fill the level of metal detector.

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## Observation Table:

Name of the oil	No. of observation	Time of flow (sec)	Mean
Castor Oil at 27°C	1	63	
	2	58	
	3	60	
	4	54	
	5	50	
at 56°C	1	36	
	2	38	
	3	36	
	4	39	
	5	40	38

- \* Place the clean & empty Kohlrausch flask immediately.
- \* Stir the water in the bath till the temperature of the bath and oil is same.
- \* Lift the bulb valve & start the stop watch and stop it when lower meniscus of oil.
- \* Notes: Repeat the experiment four or four times and report mean value.

Calculation:-

$$\text{At } 27^\circ\text{C} \quad V = 65 \times 57 = \frac{0.247}{127} = 3704.99 \text{ c.c.k}$$

$$\text{At } 56^\circ\text{C} \quad V = \alpha t - B/t \quad \text{where, } t = \text{time of flow}$$

$\alpha$  = viscosity constant

$$V = 190 \times 38 - \frac{40.264}{40} \quad B = \text{coefficient of K.E}$$

$$= 7221.00 \text{ c.c.k}$$

Range

t	$\alpha$	B
190	0.264	
65	0.247	

Conclusion:-

The viscosity of the lubricating oil is 3704.99 cSt at 27°C and  
and 7221.0 cSt at 56°C.

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Aim of the experiment:- To determine the flash point of a given oil by Pensky Marten's flash point apparatus.

Apparatus Required:-

Chemicals - The supplied oil.

Apparatus - Pensky Marten's apparatus, thermometer.

Description of Apparatus:-

**Oil Cap**:- It is used to hold the thermometer in the test flame and to pass stirrer carrying two brass blades, 5cm in diameter deep.

**Shutter**:- It is a larger mechanism provided at the tip of cup. By moving the shutter anticlockwise the opening is exposed to flame.

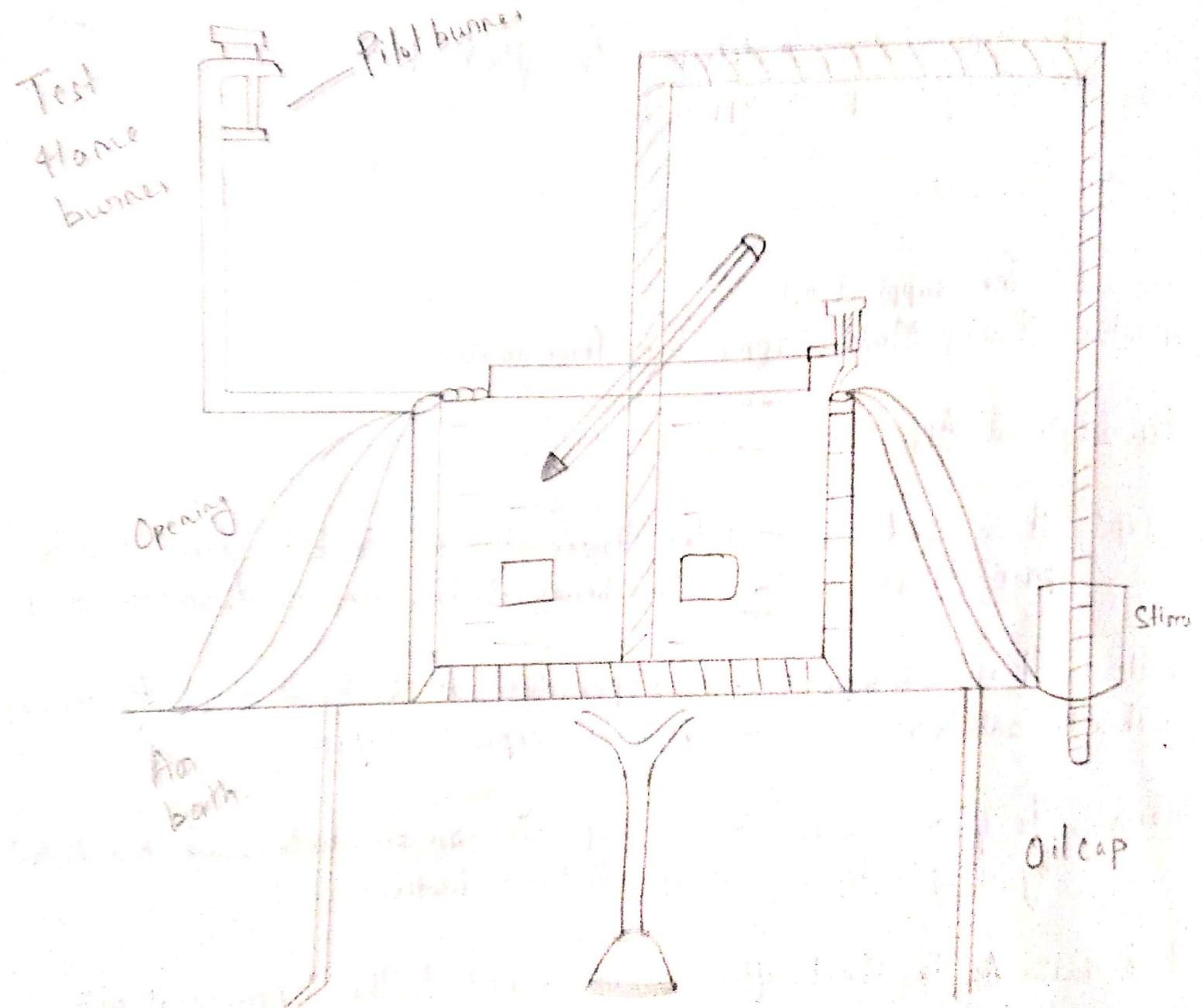
**Air bath**:- The flame support the oil cup over an air bath, which is heated by a gas burner or by electrical heater.

**Pilot burner**:- As the test flame is introduced to the opening it gets extinguished but when the test flame is returned to original position, it is automatically lighted.

**Flash burner**:- It is the minimum temperature at which the oil gives enough vapour to ignite for a moment when a small flame is ignited.

**Fire point**:- It is the lowest temp. at which the vapour of oil start burning continuously.

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(Pensky - Martin Flash Point Apparatus)

Principle: - The knowledge of flash point and fire point is very important in safe guarding from the fire hazard because of this oil. Putting use of lubricants are subjected to high temperature and at such high temp. they have a tendency to volatise and causes fire. Good lubricant should form inflammable vapours only at the temp. greater than working temp. oil with flash point less than 140°F are called flammable liquid & above 140°F are combustible.

These are also used to detect solvent contamination to determine the app. extent of dilution of lubricating oil.

Procedure:-

- \* The cup was fitted and was heated with the air bath. The oil was heated to raise the temp. around  $5^{\circ}\text{C}$  per min.
- \* When the temp. was reached to  $15^{\circ}\text{C}$  the flash point test was applied
- \* For every  $1^{\circ}\text{C}$  rise the flame was introduced for a moment.
- \* The temp. at which a distinct flash appears is considered as flash point
- \* The reading was converted to Fahrenheit unit.

Conclusion: - The flash point of the lubricating oil was found out to be and fire point was found to be.

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Observation Table:-

Name of the oil.	No. of observation.	Temp in (°C)	Flash Point
Castor oil	1.	40	No Flash
	2.	42	No flash
	3.	44	flash point
	4.	46	No fire point
	5.	48	No fire point
	6.	50	No fire point
	7.	52	fire point

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Conclusion:-

The flash point of H<sub>1</sub> lubricating oil was found out to be  $47^{\circ}\text{C}$  and fire point was found to be  $52^{\circ}\text{C}$ .

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Aim of the experiment:-

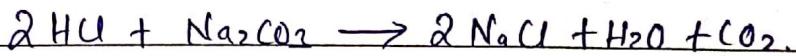
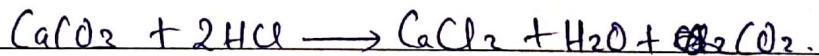
To estimate the amount of Ca in limestone.

Requirements:-

i) Chemicals:- Supplied sample of limestone, standardized  $\text{Na}_2\text{CO}_3$  solution, standard hydrochloric acid ( $\text{HCl}$  N/10)

ii) Indicator:- Methyl Orange

iii) Apparatus:- Measuring flask (250ml), Measuring cylinder (100ml), conical flask (25ml), Burette, Pipette (10ml).

iv) Chemical Reaction:-Principle:-

An excess amount of HCl is added to the sample of limestone. The unreacted HCl is titrated against standard solution using methyl orange indicator.

Procedure:-

- \*> Weight accurately 0.2gm of limestone and place inside a beaker.
- \*> About 50ml of standard HCl was added & warmed gently to complete the reaction.
- \*> The beaker was cooled and was transferred the whole solution into a 250ml of measuring flask along with three washes with diluted water.

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## Tabulation :-

Sl.No	Vol. of $\text{Na}_2\text{CO}_3$ (mls)	D.B.R (mls)	F.B.R (mls)	Difference	Remark
1.	10	0.0	6.6	6.6	Rough
2.	10	6.6	13.1	6.5	
3.	10	13.1	19.6	6.5	{ Concord.
4.	10	19.6	26.1	6.5	

- More amount of water was added to make it up to mark.  
 → The measuring flask was shaken to prepare homogeneous solution.  
 → The burette was filled with solution.  
 About 10 ml of  $\text{Na}_2\text{CO}_3$  solution was taken into a conical flask and was titrated against the solution until colour changes from yellow to red.

Calculation:-

Weight of Phenolphthalein = 0.2 gm

Strength of HCl = 0.1 N

Strength of  $\text{Na}_2\text{CO}_3$  solution = 0.005 N.

1000 ml of 1 N HCl solution contain 36.5 gm of HCl.

50 ml of 1 N HCl contain  $36.5 \times 50 \times 1000 = 1.825$  gm of HCl

50 ml of 0.1 N HCl contain 0.1825 gm of HCl.

From the titration;

$$N_1 V_1 = N_2 V_2$$

$V_1$  = Vol. of HCl soln.

$V_2$  = Vol. of  $\text{Na}_2\text{CO}_3$  soln = 10 ml

$N_1$  = concn. of HCl

$N_2$  = concn. of  $\text{Na}_2\text{CO}_3$  = 0.005 N

$$N_1 = \frac{N_2 V_2}{V_1} = \frac{0.005 \times 10}{6.5} = 0.007 \text{ N}$$

Strength of HCl = 0.007 N

1000 ml of 1 N HCl = 36.5 gm

250 ml of 0.007 N contains =  $(36.5 \times 250 \times 0.007) / 1000 = 0.06$  gm. HCl

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$$\text{Amt. of HCl} = 0.1825 - 0.06 \\ = 0.113 \text{ gm}$$

36.5 gm of HCl contain 20 gm of  $\text{Ca}^{2+}$

$$0.1135 \text{ gm of HCl contain} = \frac{20}{36.5} \times 0.1135 = 0.062 \text{ gm of } \text{Ca}^{2+}$$

0.2 gm of Limestone contain 0.062 gm of  $\text{Ca}^{2+}$

$$100 \text{ gm of Limestone contain} = \frac{0.062}{0.2} \times 100 = 31 \text{ gm}$$

Conclusion:-

The supplied solution contains 31 gm of Ca. in limestone.

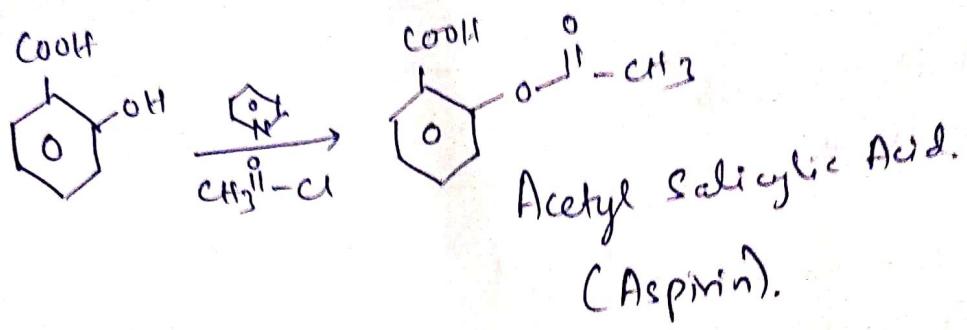
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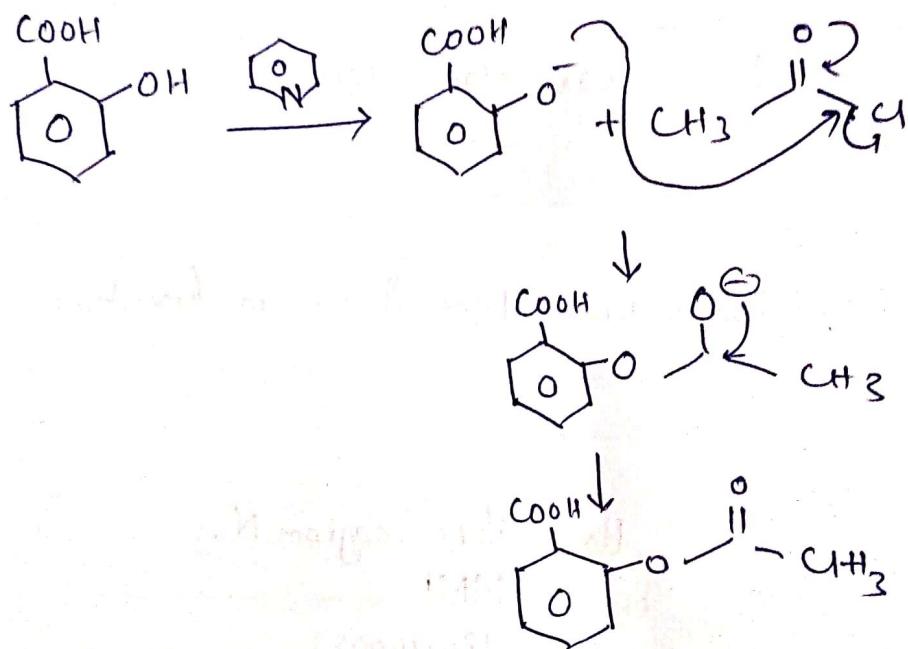
Regd. No- 1802100053

Group- M<sub>2</sub>.

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Mechanism :-



Aim of the experiment:

Preparation of aspirin (Acetyl Salicylic Acid).

Apparatus Required: i) Conical Flask.  
ii) Beaker.  
iii) Buchner funnel.

Theory:-

Salicylic acid upon acylation yields Acetyl Salicylic acid / aspirin. Acylation proceeds with Acetyl Chloride in presence of pyridine.

Procedure:-

- \* About 5 gm of salicylic acid was taken and was dissolved in 7.5 ml of pyridine in a 250ml of conical flask.
- \* 7.0ml of Acetyl Chloride was added drop wise, shaken well & heat the flask on a water bath keeping the temperature between 60°C to 70°C for 20min.
- \* This mixture was cooled in an the bath & crushed ice was added with stirring until the precipitation was appeared.
- \* The precipitate was filtered (Crude aspirin).
- \* The precipitate was washed with cold water.
- \* It was drained well & dried by pressing between filter paper.
- \* After that the filtrate was dried in the oven below 100°C and recrystallised the crude aspirin with 50% acetic acid.

Conclusion:-

The total yielded amount of aspirin was found to be 2.5gm.

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10g of B.P in 1lit

1000ml of 1M Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> = 35.5g of chlorine

1ml of 1M Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> =  $\frac{35.5}{1000} \times 1$  g of chlorine

Vml of 1M Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> =  $\frac{35.5}{1000} \times V$  g of chlorine.

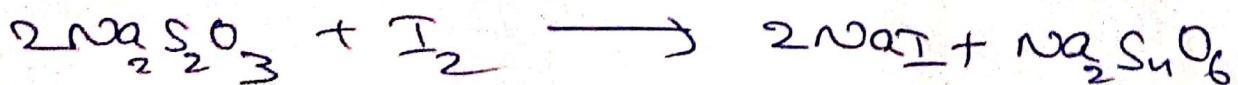
∴ 10ml of B.P.S is having w g of chlorine

lit of B.P.S is having  $w \times 100$  g of chlorine.

∴ 10g of B.P is having  $w \times 100$  g of chlorine

⇒ 100g of B.P is having will have  $w \times 10^4$  g.

i.e. % of Available Chlorine  $\approx w \times 10^4 \%$ ,



2eq  $\approx$  1eq I<sub>2</sub>  $\approx$  1eq Cl<sub>2</sub>  $\approx$  71g.  
1eq of 35.5g.

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To determine the % of active chlorine of a given sample of bleaching powder.

Requirements:-

- \* Bleaching powder
- \* KI solution ( $\text{KI}$ )
- \* Dilute  $\text{H}_2\text{SO}_4$  / Glacial acetic acid.
- \* Standard decinormal thiosulphate solution.
- \* Freshly prepared starch solution.

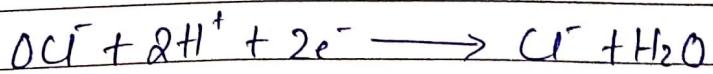
Object  
Caution  
(or) Caution

Apparatus Required:

- \* Burette
- \* Pipette
- \* Conical Flask.

Principle:-

There are two cl atom present in bleaching powder in diff. states of which one cl in  $\text{OCl}^-$  is active in nature. Bleaching powder solution is treated with an excess of KI solution and then acidified with dil.  $\text{H}_2\text{SO}_4$  / glacial acetic acid.



The filtrated iodine is treated with a standard solution of sodium thiosulphate using freshly prepared starch solution as indicated.

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## Tabulation

Sl.No	Vol. of $\text{CaOCl}_2$ (ml)	PBR (ml)	PBR (ml)	Difference (PBR - PBR)	Remarks
1.	10	0.0	9.5	9.5	Rough
2.	10	9.5	18.9	9.4	
3.	10	18.9	28.3	9.4	
4.	10	28.3	37.7	9.4	Concidental

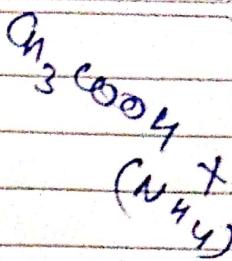
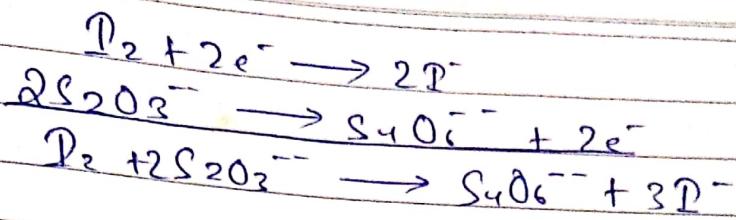
$$1\text{cm} = \frac{1}{10}\text{metre}$$

$$\begin{aligned}
 10m &= \frac{10e}{10} \\
 \text{Total weight} &= 10 \times g \times 1000 + 10 \times 35.5 \\
 &= 9.8 \times 10^3 \times 1000 + 9.8 \times 35.5 \times 10^3 \\
 &= 9.8 \times 10^6 + 35.5 \times 10^3
 \end{aligned}$$

$\text{X} \rightarrow \text{X}'$

$$T_2 = \frac{1}{2} + 3.5 \cdot \frac{1}{2} + 10 \cdot 1$$

$$\begin{array}{l}
 \text{Top row: } 0.1 + 3.5 + 10.0 \\
 \text{Bottom row: } 0.1 + 3.5 + 10.0 \\
 \text{Left column: } T_1 + 10 \\
 \text{Right column: } T_2 + 10
 \end{array}$$

Procedure:-

- \* 10ml of bleaching powder solution was pipetted out in a conical flask followed by addition of 5ml of 10% KI solution and about 3/4 tube of glacial acetic acid.
- \* The solution was titrated against  $Na_2S_2O_3$  solution with the colour of the solution become light yellow.
- \* About  $\frac{1}{2}$  ml of freshly prepared starch solution was added & was titrated until the starch solution iodine blue colour solution changes to colourless.
- \* The above experiment was repeated 3 times to get the concordant.

Calculation:-

Amount of bleaching powder in 1000ml of water = 10gm

Vol. of solution taken in each time = 10ml =  $V_1$

Strength of  $Na_2S_2O_3$  = 0.1 N =  $N_2$ .

Concordant reading of  $Na_2S_2O_3$  =  $V_2$  = 9.4ml.

We know,

$$N_1 V_1 = N_2 V_2$$

$$\Rightarrow N_1 = \frac{N_2 V_2}{V_1} = \frac{0.1 \times 9.4}{10} = 0.094 N.$$

with  $V_1$   $\frac{10}{10}$   
 ~~$V_1$~~   $C$

1000ml of 1N  $Na_2S_2O_3$  contains 36.5gm of active cl.

∴ The amount of Cl per lit of soln =  $36.5 \times 0.094 = 3.431 \text{ gm/lit.}$

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$$\therefore \% \text{ of active chlorine} = \frac{3.431 \times 100}{10} = 34.31\%$$

Conclusion:-

From the experiment, the amount of % of active chlorine in bleaching solution was found to be ~~34.31%~~.

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