B.Sc. - 2ND Year

CHEMISTRY - 3RD Semester

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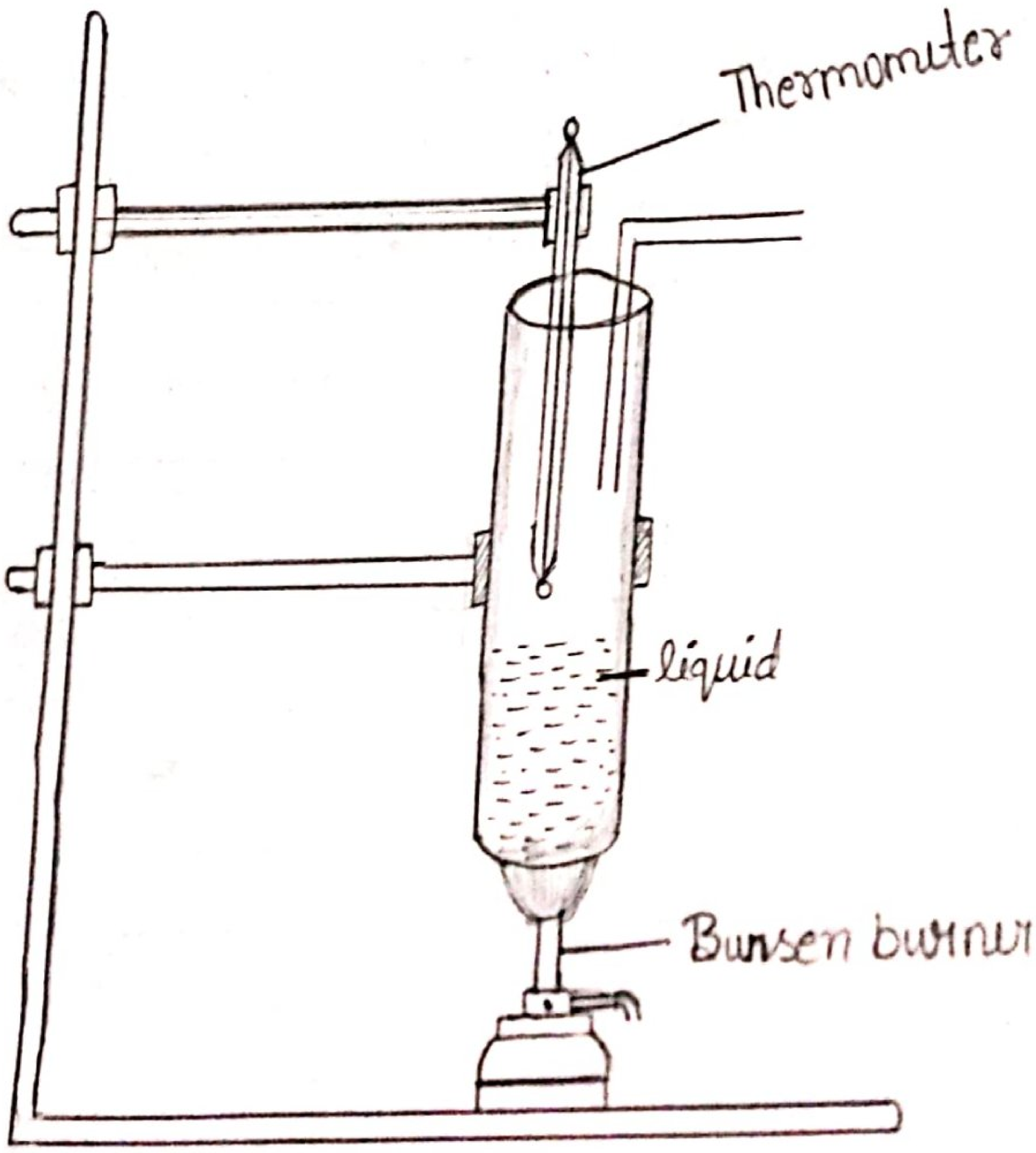
Ex-1



Ditermination of Boiling Point

Experiment no.-1.

Object -

To determine the boiling point of the given organic compound.

Apparatus -

Boiling tube, sprit lamp, thermometer, burette stand etc.

Procedure -

The liquid whose boiling point is to be determined is taken in a test tube or boiling tube. The tube is clamped in a stand and heated gently. A thermometer is inserted in the tube so that its bulb remains at a distance of about 1 cm above the surface of the liquid. When the liquid begins to boil the temprature is noted. This is boiling point.

Result -

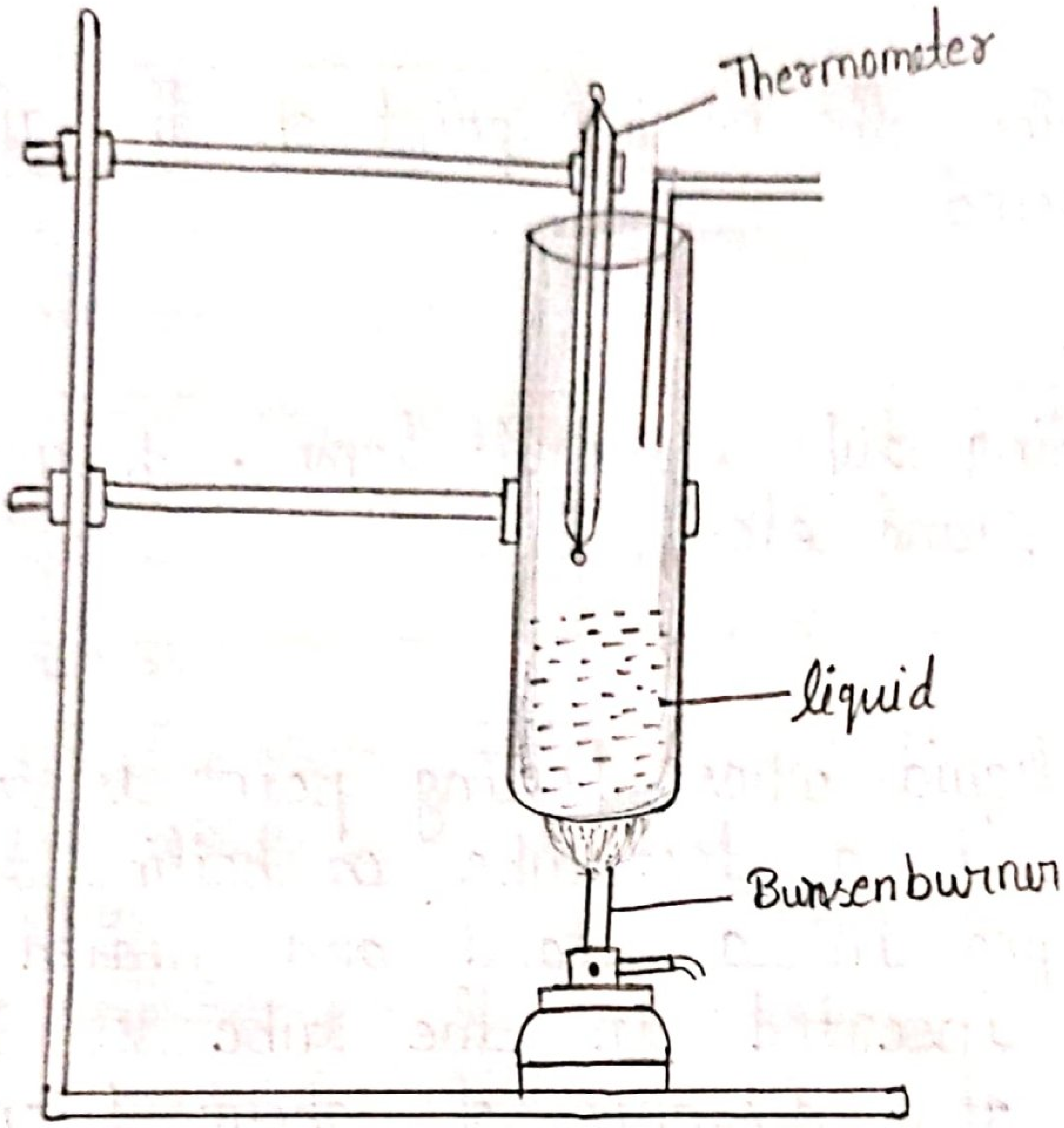
The given organic compound is boiling point -

Cyclohexanol - 161.8°C

Fixed value - 161.8°C

Observed value - 158.9°C

Ex- 2



Determination of Boiling Point

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Experiment no. -2

Object -

To determine the boiling point of the given organic compound.

Apparatus -

Boiling tube, sprit lamp, thermometer, burette stand etc.

Procedure -

The liquid whose boiling point is to be determined is taken in a test tube or boiling tube. The tube is clamped in a stand and heated gently. A thermometer is inserted at a distance of about 1 cm above the surface of the liquid. When the liquid begine to boil, the temprature is noted. This is boiling point.

Result -

The given organic compound is boiling point.

Cyclohexanone - 155.6°C

fixed boiling point - 155.6°C

Observed boiling point - 154.0°C

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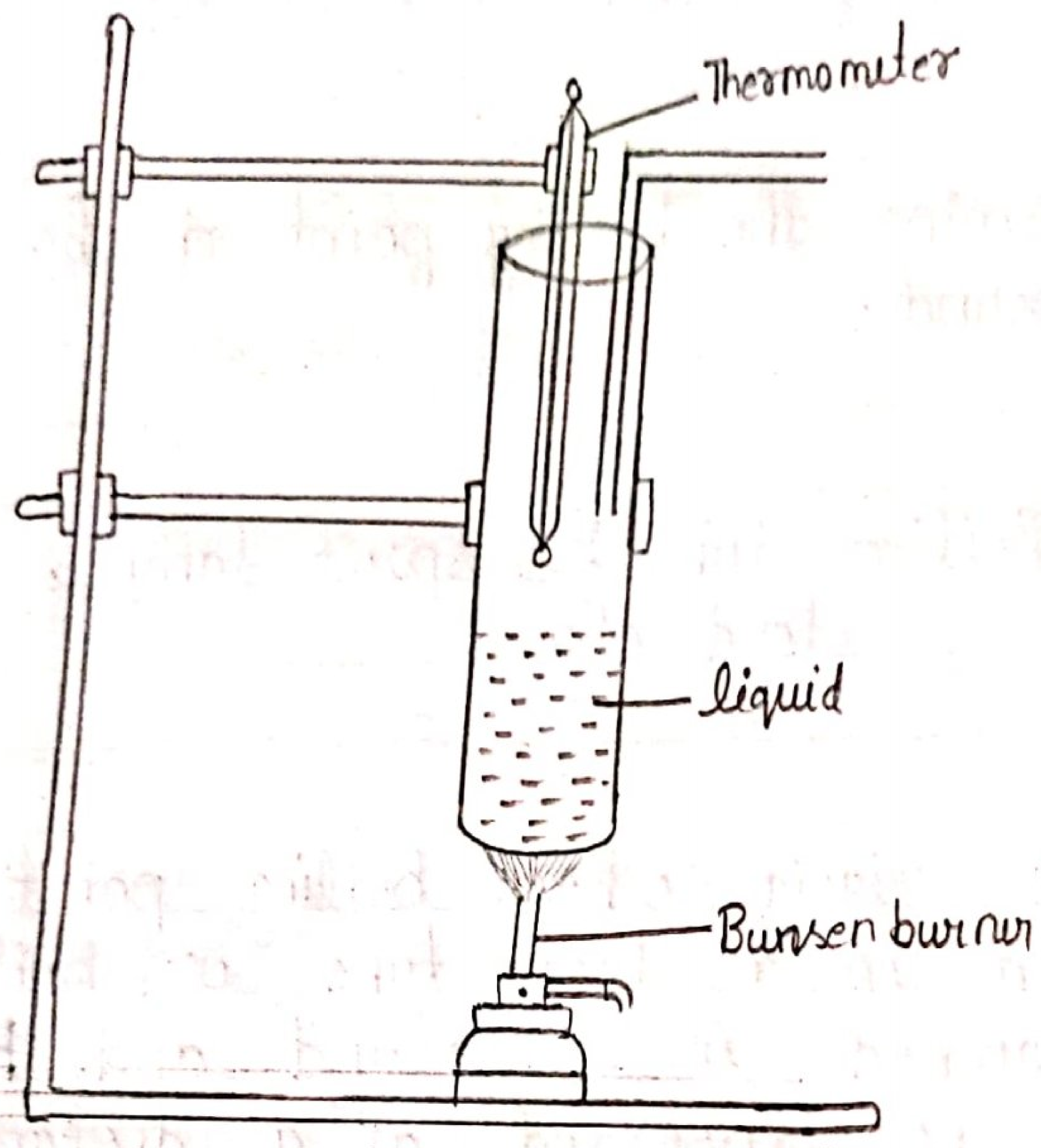
Ex-3



Determination of boiling point

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Experiment no.-3

Object-

To determine the boiling point of the given organic compound.

Apparatus-

Boiling tube, sprit lamp, thermometer, burette stand etc.

Procedure-

The liquid whose boiling point is to be determined is taken in a test-tube or boiling tube. The tube is clamped in a stand and heated gently. A thermometer is inserted in the tube so that its bulb remains at a distance of about 1cm above the surface of the liquid. When the liquid begine to boil. Temprature is noted. This is boiling point.

Result-

The given organic compound is boiling point-

Benzaldehyde - 178.1°C

Fixed m.p. - 178.1°C

Observed m.p. - 177.0°C

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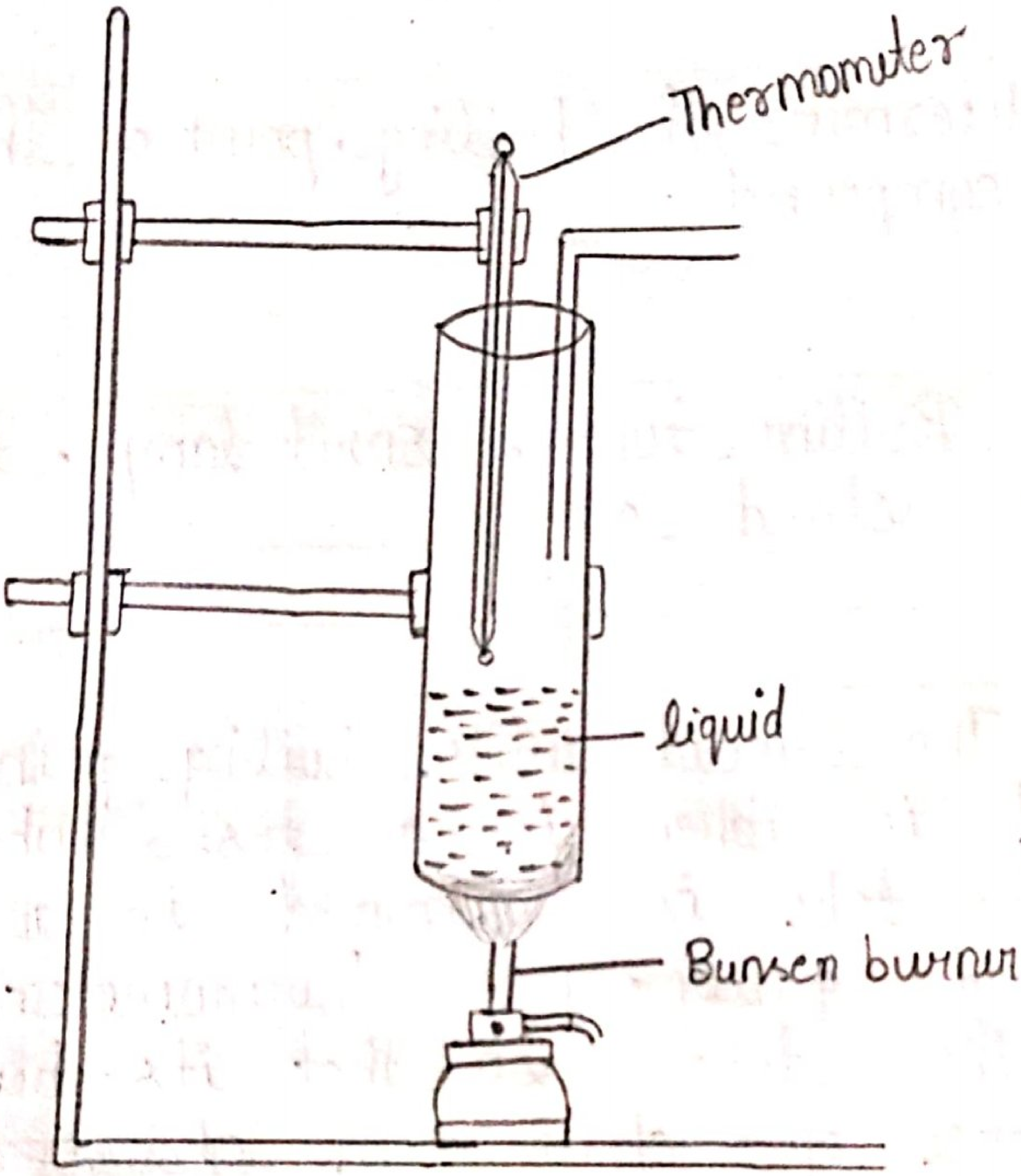
Ex-4



Determination of boiling point

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Experiment no. - 4

Object -

To determine the boiling point of the given organic compound.

Apparatus -

Boiling tube, sprit lamp, thermomiter, burette stand etc.

Procedure -

The liquid whose boiling point is to be determined is taken in a test tube or boiling tube. The tube is clamped in a stand and heated gently. A thermometer is inserted in the tube so that its bulb remains at a distance of about 1 cm above the surface of the liquid. When the liquid begine to boil, the temprature is noted. This is boiling point.

Result -

The given organic compound is boiling point -

(Acetylacetone) - 140°C

Fixed B.P. = 140°C

Observed B.P. = 138.8°C

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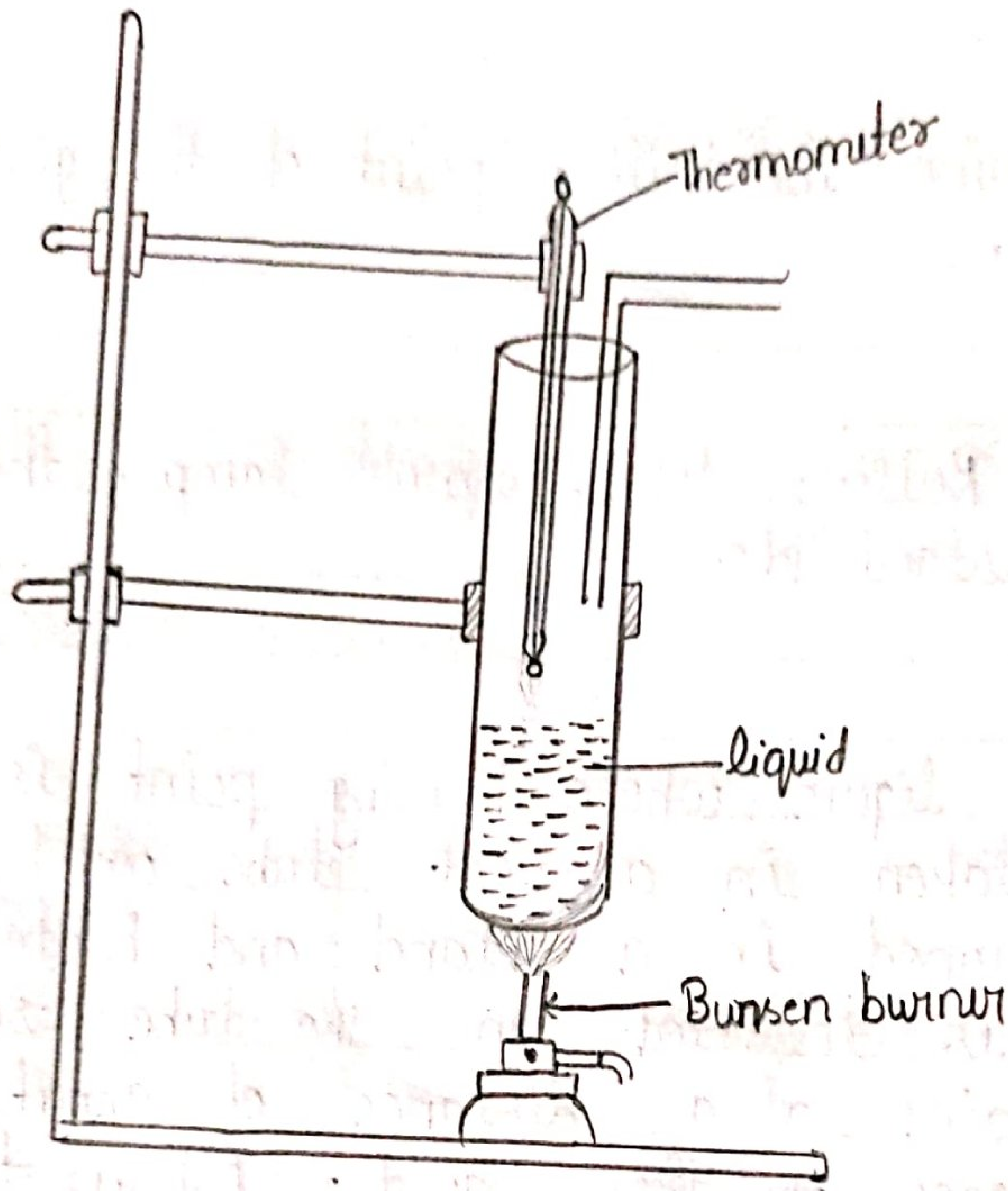
Ex-5



Determination of boiling point

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Experiment no- 5

Object -

To determine the boiling point of the given organic compound.

Apparatus -

Boiling tube, sprit lamp, thermomiter, burette stand etc.

Procedure -

The liquid whose boiling point is to be determined is taken in a test tube or boiling tube. The tube is clamped in a stand and heated gently. A thurmomiter is inserted in the tube so that its bulb remains at a distance of about 1 cm above the surface of the liquid. When the liquid begins to boil, the temprature is noted. This is boiling point.

Result -

The given organic compound is boiling point-

108 °C (Isobutyl Alcohol)

Fixed boiling point - 108 °C

Observed boiling point - 107 °C

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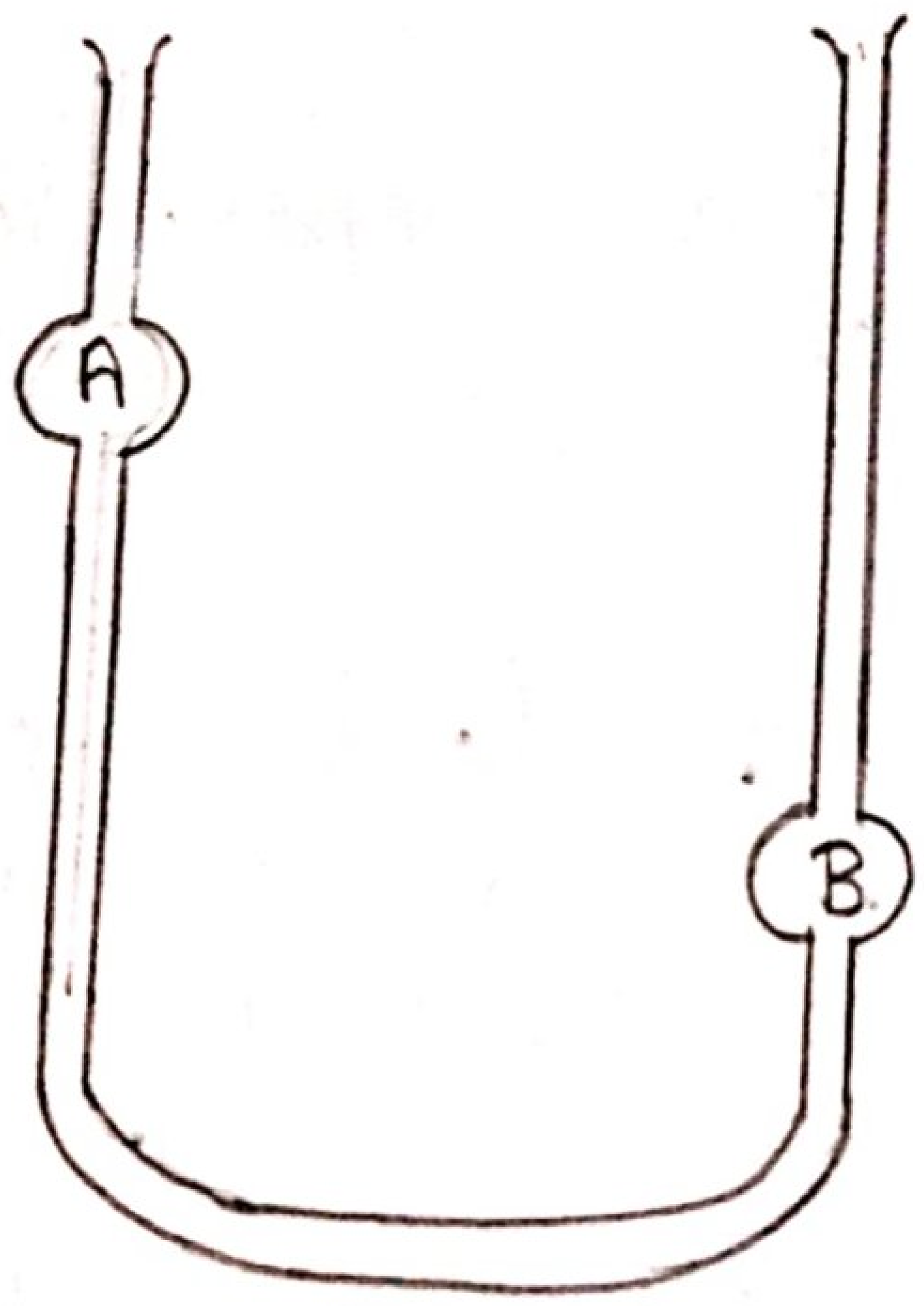
Ex - 6



Ostwald viscometer

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Experiment no-6

Object -

To ditemine the viscosity supplied solution using ostwald viscomiter.

Apparatus -

Viscomiter, beaker, glass rod, stop watch, chemical balance etc.

Procedure -

The ostwald viscomiter is wash through with cromic acid rinsed with a large volume of weter and finally with acetone (CH_3COCH_3) repeate the processes three or four times to insure that there is no serious deviation in any case from the average time. find out the mean time.

Observation table -

(a) Room temprature = 20°C

(b) Measurement of flow time

S.No.	Water flow time, t_w	Supplied solution flow time, t_s
1.		
2	12	15
3	13	16
4	11	13
Mean value.	$\frac{12+13+11}{3} = 12.$	$\frac{15+16+13}{3} = 14.66$

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Calculation -

By subs' i the values of t_1, t_w, d_1, and η_w in the viscosity of supplied solution can be calculated.

$$\eta_{solution} = \frac{d_{solution} \times t_{solution}}{d_{water} \times t_{water}} \times \eta_{water}$$

$$= \frac{1.22 \times 14.66}{1 \times 12} \times 0.0101$$

$$\boxed{\eta_{solution} = 0.01505 \text{ Poise}}$$

(C) Density of water = d_2 = 1gm
(d) Viscosity of water = 0.0101 poise at 20°C
(e) Density of benzene = d_1
(i) Weight of the empty pyknometer = ag = 19.18 gm
(ii) Weight of pyknometer filled with water = bg = 23.58gm
(iii) Weight of water filled = (b-a)gm = 4.40 gm
(iv) Weight of pyknomiter filled with supplied solution = cg = 24.58 gm
(v) Weight of solution filled = 5.40 gm

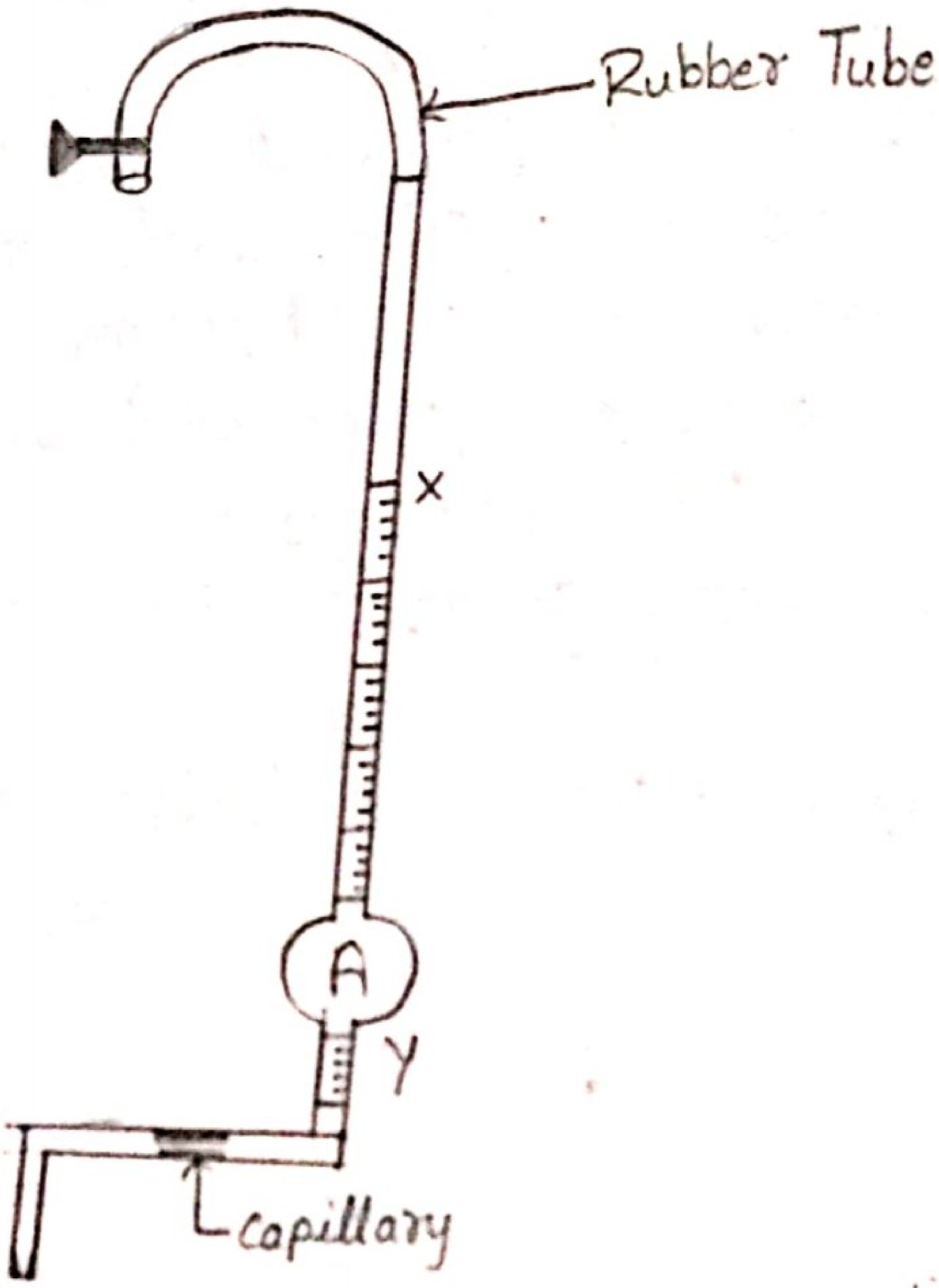
$$\text{Density of benzene} = \frac{\text{Weight of solution}}{\text{Weight of water}}$$

$$d_1 = \frac{(c-a)}{(b-a)} = \frac{5.4}{4.4} = 1.22 \text{ gm/ml}$$

Result-

Viscosity of supplied solution = 0.01505 poise

Ex - 7



Stalagmometer

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Experiment no. 7

Object-

To determine the surface tension of supplied solution using stalagmometer.

Apparatus-

Stalagmometer, pyknomiter or specific gravity battle, supplied solution, water, beaker, thermomiter.

Procedure-

Clean the stalagmometer, throughly with chromic acid and then rinse it with a large volume ~~of~~ water several times. Dry the stalagmometer. Dip one end ~~of~~ the stalagmometer in a beaker containing water. Such the water till its level rises 1-2 cm above the mark A, keep the stalagmomiter vertical by fixing it in a clamp and allow the drops to fall and start counting the number of drops till the water level reaches the lower mark A. Let the number of drops be n_w. Now dry the stalagmomiter either by blowing not air or in an electric oven, and repeat the above procedure with benzene. Let the number ~~of~~ drops be n_l.

Teacher's Signature : ....

Calculation

With the help of the following equation calculate the surface tension of given solution.

$$\boxed{\gamma_1 = \frac{n_w}{n_i} \times \frac{d_i}{d_w} \times \gamma_w}$$

Substitude the value of γ_w, n_w, d_i, n_l and d_w in the above equation and calculation the surface tension of benzene.

$$\gamma_1 = \frac{88 \cdot 67 \times 1{\cdot}22 \times 72{\cdot}8}{101 \times 1}$$

$$\boxed{\gamma_1 = 77{\cdot}97 \text{ Dyne / cm}}$$

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Observation table–

(A) Data –

Temprature = 20°C
Density of water, d_w = 1gm/ml at 20°c
Surface tension of water, γ_w = 72.8 dynes/cm at 20°C

(B) Table for the drop Numbers —

S.No.	No. of drops water	Given solution No. of drops
1.	91	85
2.	86	85
3.	86	86
	Mean(n_w) = 88.67	Mean(n_i) = 85.33

(C) Determination of density of given solution —

Weight of the empty pyknometer = ag = 18.18gm
Weight of pyknometer filled with water = ng = 22.5 gm
∴ Weight of water = (b–a)g = 4.40 gm.
Weight of pyknometer filled with solution = cg = 23.58 gm

∴ Weight of solution = (c–a)g m = 5.40gm

$$\text{Density of solution} = \frac{\text{Weight of solution}}{\text{Weight of water}}$$

$$= \frac{(c-a)}{(b-a)} d_b = \frac{5.40}{4.40} \; 1.22\,gm/ml$$

Teacher's Signature : ....

Experiment no. 8

Object-

To prepare 250 ml dilute solution of 0.001 m sulphuric acid. Provided 0.1 m sulphuric acid.

Theory -

for preparing dilute solution of the required concentration, the molarity equation $m_1V_1 = m_2V_2$ is used. To prepared 250 ml of 0.001 m sulphuric acid the volume of 0.1 m sulphuric acid required will be calculated as follow -

$$0.1\,m \times V_1 = 0.001\,N \times 250$$

$$V_1 = \frac{0.001 \times 250}{0.1} = 2.5\,ml$$

Thus, 2.5 ml of 0.1 m sulphuric acid is taken and dilute to 250 ml in a measuring flask.

Apparatus -

Measuring flask, graduated pipette, measuring sylinder, beakers, glass rod, 0.1 m sulphuric acid.

Procedure -

[i] The valume of 0.1 m H_2SO_4 required for preparing 250 ml of 0.001 m concentration is 2.5 ml.

[ii] Take a 250 ml measuring flask and put 100 ml of distilled water in it.

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[iii] Transfer with the help of a graduate pipette 2.5 ml of 0.1 m H_2SO_4 into the measuring flask slowly with stirring.

[iv] After adding all the acid add more of distilled water to make the total solution to 250 ml.

A Mole —

Chemists have defined a mole as a 'definite number' of particles (atoms, molecules, ions or electrons)

This definite number is called Avogadro number, equal to 6.022×10^{23}, in honour of Amadeo Avogadro.

At present a mole is defined as the amount of a substance containing as many atoms, molecule, ions, electrons. or other elementary quatities as there are carbon atoms in exactly 12 gm of ^{12}C.

The following are the definitions of 'mole' represented in the form of equation.

[i] The number of moles of atoms - $\frac{\text{Weight in gm}}{\text{Atomic weight}}$

[ii] Number of moles of molecule — $\frac{\text{weight in gm}}{\text{molecular weight}}$

[iii] Number of moles of gasses — $\frac{\text{Volume at NTP}}{\text{Standard molar volume}}$

(Standard molar volume is the volume occupied by 1 mole of any gas at NTP which is equal to 22.4 liters)

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[iv] Number of moles of atoms/ molecules / ions / electrons = $\frac{\text{No. of atom/ molecule / ions / electrons}}{\text{Avagadro no.}}$

[V] Number of moles of solution = molarity x volume of solution in liters or No. of millimoles = Molarity x Volume in m

$= \frac{\text{Milli moles}}{1000} = \text{moles}$

[vi] for a compound Mx, x moles of N = y moles of M

Molecular weight -

Molecular weight of a compound is defined as the weight of a molecules of a compound relative to a carbon atom, the atomic weight of which is supposed to be exactly 12. The molecular weight when expressed in gram is called gram molecular weight. The molecular weigh in gram is the weight of 1 mole of ~~molecular~~. example.

Example— Molecular weight of O_2 is 32 gm is the weight of 1 mole oxygen molecules.

$$\text{Molecular weight} = \frac{\text{Weight of molecules in gram}}{\text{No. of moles of molecules}}$$

Experiment no. -9

Object-

To prepare 250 ml dilute solution of 0.001 m sulphuric acid. Provided 0.1 m sulphuric acid.

Theory-

For preparing dilute solution of the required concentration, the molarity equation $M_1V_1 = M_2V_2$ is used.

To prepare 250 ml of 0.001 m sulphuric acid the volume of 0.1 m sulphuric acid required will be calculate as follows—

$$0.1\ m \times V_1 = 0.001\ N \times 250$$

$$V_1 = \frac{0.001 \times 250}{0.1} = 2.5\ ml$$

Thus, 2.5 ml of 0.1 m sulfuric acid is taken and dilute to 250 ml in a measuring flask.

Apparatus—

Measuring flask, graduate pipette, measuring cylinder, beakers, glass rod, 0.1 m sulphuric acid.

Procedure-

[i] The volume of 0.1 m H_2SO_4 required for preparing 250 ml of 0.001 m Concentration is 2.5 ml.

(ii) Take a 250 ml measuring flask and put 100 ml of distilled water in it.

[iii] Transfer with the help of a graduated pipette 2.5 ml of 0.1 m H_2SO_4 into the measuring flask slowly with stirring.

[iv] After adding all the acid add more of distilled water to make the total solution to 250 ml.

Normality -

Number of the gram-equivalent of a substance dissolved in 1000 cc and 1 liter of the solution is called the normality of the solution. If one gram equivalent weight of the substance is dissolved in 1 litre of the solution, then its normality is equal to one and it is called normal solution. Then Normality is represented by N.

Thus,

$$N = \frac{\text{No. of gram equivalent of the solute}}{\text{Volume of the solution in litre.}}$$

or

$$N = \frac{\text{Weight in gram of the solute per litre of the solution}}{\text{Gram equivalent mass of the solute.}}$$

We can prepare the solution of desired normality by using the following relation.

$$W = \frac{E \cdot N \cdot V}{1000}$$

Where
W = amount of the substance (Solute)
E = Equivalent weight of the substance (Solute)
V = Volume of the solution
N = Normality of the solution.

Molality -

Number of moles of a substance dissolved in 1000 gm or 1 kg of the solvent is called the molality of the solution. If one mole of the substance is dissolved in 1 kg of the solvent, then its molality is equal to one add it is called molal solution. Molality is represented by m.

Then,

$$m = \frac{\text{No. of moles of solute}}{\text{Mass of the solvent in kg}}$$

or

$$m = \frac{\text{Weight in grams of the solute per kg of the solvent}}{\text{Gram molecular mass of the solute.}}$$

Molarity -

No. of moles of a substance dissolved in one litre of the solution is called the molarity of the solution. If the one litre of the solution contains one moles of the solute, then it is called molar solution. Molarity of the solution represented by m.

Thus,

$$m = \frac{\text{No. of moles of the solute}}{\text{Volume of the solution in litre}}$$

or

$$m = \frac{\text{Weight in grams of the solute per litre of the solution}}{\text{Gram molecular mass of the solute.}}$$

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Experiment no-10

Object -

To calibrate the given burette.

Procedure -

1. Before calibrate, it is necessary that the buratte is throughly cleaned. Thus, the burette is first filled with cleaning mixture which consist of concentration sulphuric acid and potassium-dichromate and allowed to stand for half an hour. After that the clearing mixture is pured off and throughly rinsed three to four times with tap water and finally with distilled water.

2. The burette is fixed vertically in a stand and distilled water is filled slightly above the zero mark. The air bubbles at the tip of burette is captiniously removed by opening the stop clock to its full extent. Now the level of water in burette is brought to the zero mark by opening the stop clock. Wait for one minute to avoid drainage error. Then the ~~sp~~ stopclock is slowly turned so that liquid flows out dropwise into a weighted stoppered 100 ml Erlenmyer flask. A period of 30 seconds should be required to deliver 5 ml. The level of water is brought as closely as possible to 5 ml mark. The tip of the burette is touched to the inside wall of the flask to remove adhering droplet of water and the stoppered flask, is then weighed accurately. From the weight of water delivered, the volume delivered is

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calculated and the result is compared with the observed volume as obtained by subtracting the first reading from the last. The difference the first reading between the observed and calculating values gives the errors of the burette at the 5 ml graduation.

3. The burette is then filled to the zero mark again and water is allowed to flow out drop wise as before to the 10 ml marks at the rate not deliverer exceeding 10 ml per minuts. The water is dilivered in the same flask weight accurately. The difference of this mass to last mass gives the mass of next portion of water. Note the reading after one minute.

Observation—

Room temprature = 22°C

mass of empty Erlenmeyer flask = 10.65 gm

density of distilled water

at 22°C = 0.9997 gm/ml

Obs. No	Volume of water delivered (ml)	mass of water delivered (b)	mass of flask	mass of water in flask (a)	Error = (a-b)
1	50	2	10.65	12.65	2
2	50	3	10.00	13.00	3
3	50	2	11.00	13.00	2
4	50	2	10.65	12.65	2

Result- Error in the burette was = 2.25 ml

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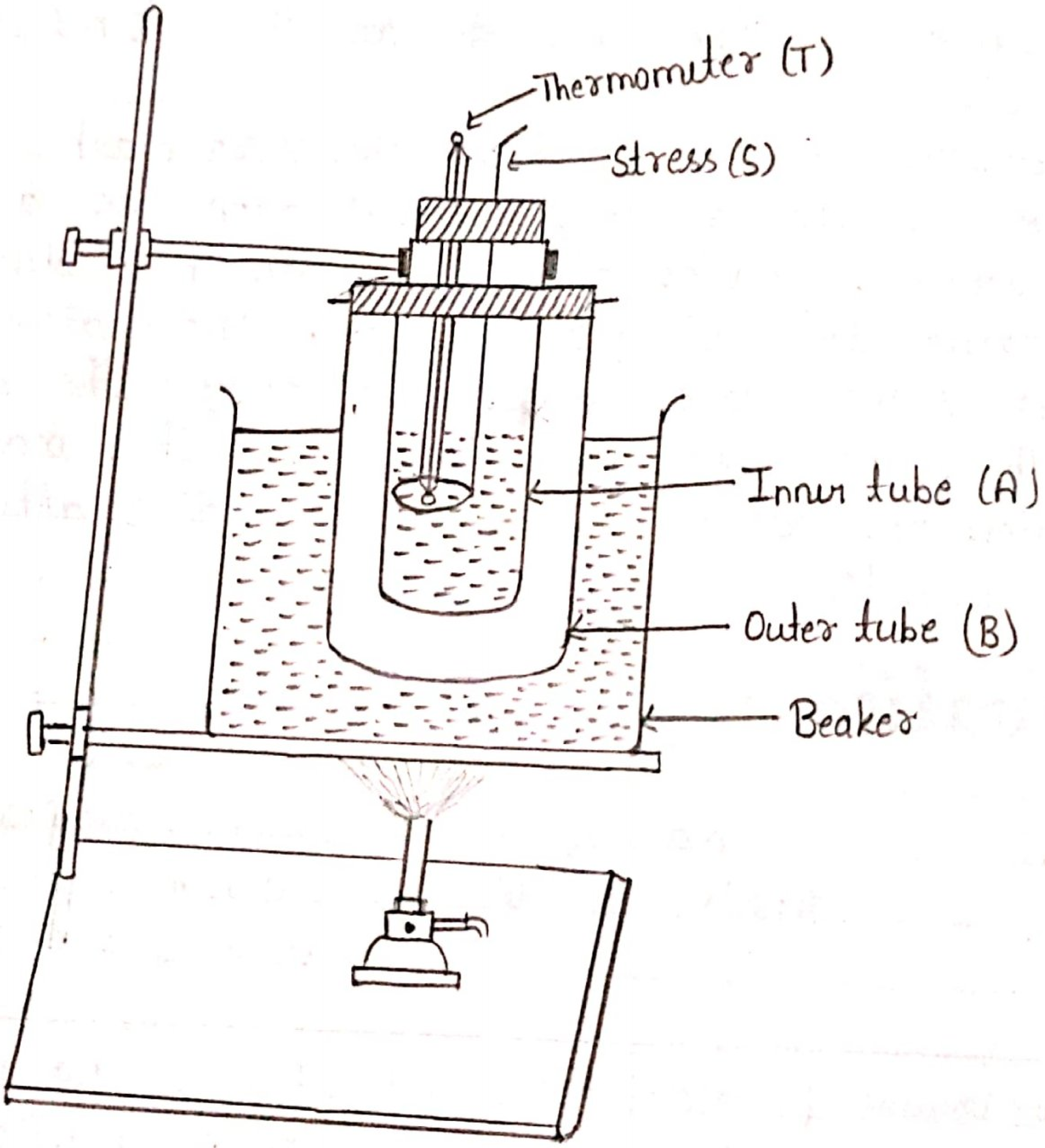
Ex- 11



Apparatus for determining C.S.T

Experiment no-11

Object –

Determine the mutual solibility curve of phenol and water system and hence the critical solution temprature.

Theory –

In order to determine the mutual solibility curve of this system synthetic method is followed. known amounts of the two liquid are heated slowly, and a temprature is recorded at which the two layers just disappears. The temprature is once more determined at the appearance of turbidity when the system is cooled. The mean of the two temprature gives the miscibility temprature of the two liquids in that proportion.

Requirements –

Boiling tubes, stirrer, a large tube as an air jacket, thermometer reading to 0.1°C, pure phenol.

Observation –

Weight of phenol – 8.0 gm

Density of water – 1 gm/ml

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Calculation -

A curve is platted between miscibility temprature as ordinate and percentage by weight of phenol as abscissa. This curve is shown in the following figure and is known as mutual solubility curve of phenol water system. The maxima of the solubility curve will give the critical solution temprature.

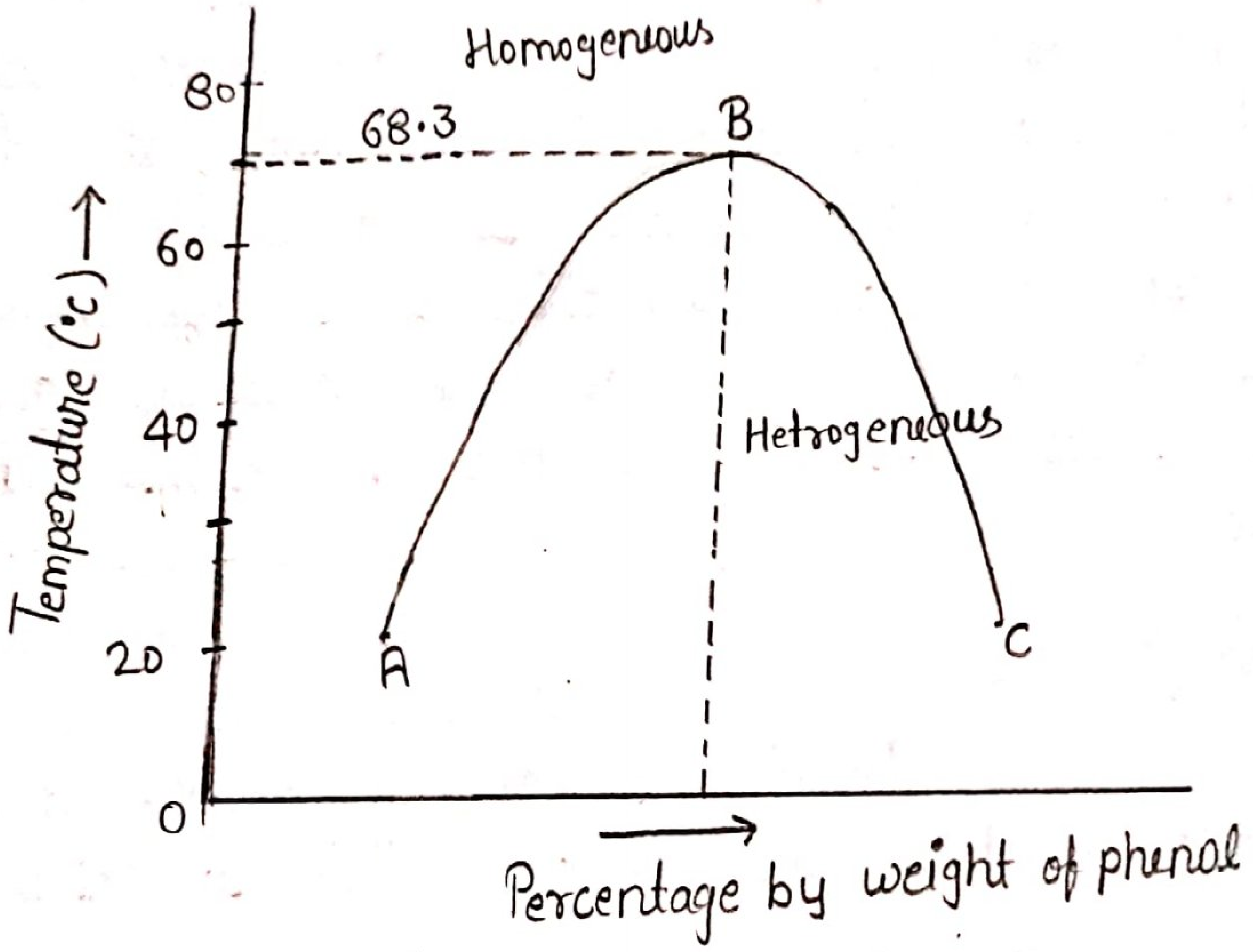

fig. - Miscibility Curve