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Exp . Name : Fractional Distillation

Exp .number : #5

Objectives :-

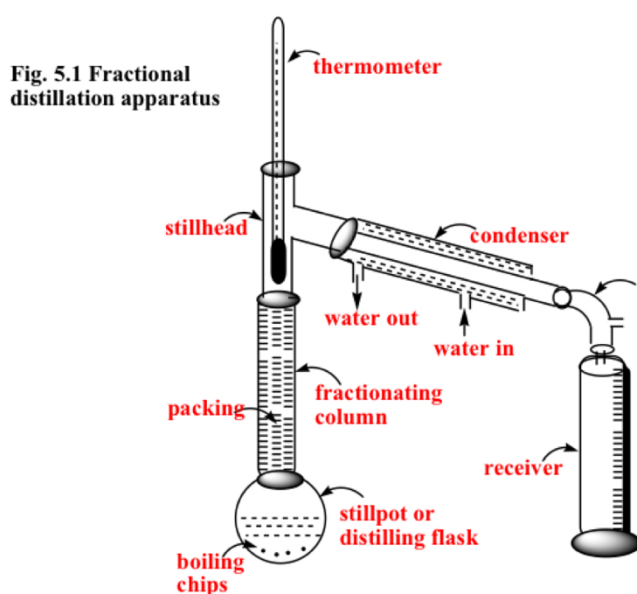
- ❖ To separate a mixture of methanol and water.
- ❖ To determine the percentage composition of each fraction collected.

Chemical reaction :-

- ❖ Not available in this exp.

Procedure :-

- ❖ Place 10 mL of Methanol and 10 mL of distilled water in a 25 mL round-bottomed flask and add a few boiling chips.
- ❖ Connect the flask to a fractionating column and condenser as shown in Fig. 4.1.
- ❖ Heat the flask gently so that the distillation occurs slowly (drop by drop). In each three dry, clean 10 mL graduated cylinders collect the fractions (5 mL each)
- ❖ Weigh a clean, dry 5 mL volumetric flask. Fill the flask with the liquid in fraction (a) and weigh it again. Calculate the density of the liquid collected in fraction (a). The volume of a 5 mL volumetric flask is 5.0 mL
- ❖ Use the same method to calculate the density of the liquids in fractions (b) and (c).
- ❖ From the graph provided, read off the percentage composition of each fraction.



Observation :-

- ❖ At approximately 70 C the methanol was started boiling, and after a few minutes it was starter distillate
- ❖ The methanol at 100 C was almost vanish and the distilled process was occurred to the water
- ❖ The mixture that the distillation worked for was very homogenous
- ❖ After turned on the hot plat some bubbles were noticed

Data :-

Volume of three graduated cylinder with each fraction	5 ml
mass of graduated cylinder (Fr_1) (empty)	32.71 g
mass of graduated cylinder (Fr_2) (empty)	31.94 g
mass of graduated cylinder (Fr_3) (empty)	31.26 g
mass of graduated cylinder (Fr_1) + Fraction 1	36.73 g
mass of graduated cylinder (Fr_2) + Fraction 2	36.16 g
mass of graduated cylinder (Fr_3) + Fraction 3	36.17 g

Calculations:-

$$\text{① density of } Fr_1 (\text{methanol}) = \frac{m (\text{methanol})}{V} = \frac{4.02 \text{ g}}{5 \text{ ml}} = 0.804 \text{ g/ml}$$

$$\Rightarrow \text{mass of methanol} = m_{1f} - m_{1i} = 36.73 \text{ g} - 32.71 \text{ g} = 4.02 \text{ g}$$

*Percentage composition of water = 4% , methanol = 96%

$$\text{② density of } Fr_2 (\text{mixture}) = \frac{m (\text{mixture})}{V} = \frac{4.22 \text{ g}}{5 \text{ ml}} = 0.844 \text{ g/ml}$$

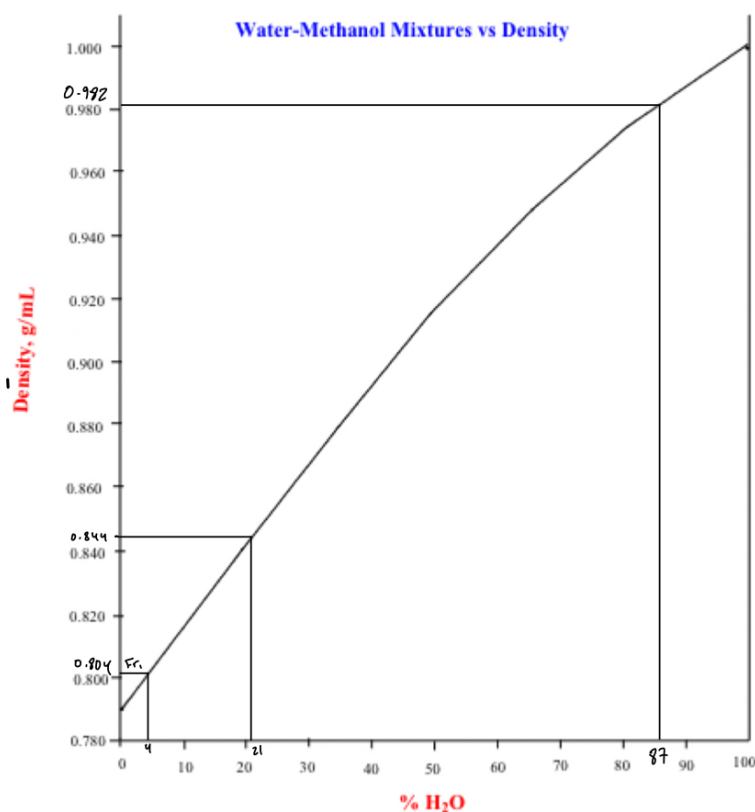
$$\Rightarrow \text{mass of mixture} = 36.16 \text{ g} - 31.94 \text{ g} = 4.22 \text{ g}$$

*Percentage composition of water = 21% , methanol = 79%

$$\text{③ density of } Fr_3 (\text{water}) = \frac{m (\text{water})}{V} = \frac{4.91 \text{ g}}{5 \text{ ml}} = 0.982 \text{ g/ml}$$

$$\Rightarrow \text{mass of water} = 36.17 \text{ g} - 31.26 \text{ g} = 4.91 \text{ g}$$

*Percentage composition of water = 87% , methanol = 13%



•d of methanol = 0.804	temperature range = (71 - 78)
•d of mixture = 0.844	temperature range = (79 - 88)
•d of water = 0.982	temperature range (89 - 99)
Percentage composition of water = 4% , methanol = 96% \Rightarrow Fr ₁	
Percentage composition of water = 21% , methanol = 79% \Rightarrow Fr ₂	
Percentage composition of water = 87% , methanol = 13% \Rightarrow Fr ₃	

Discussion:-

In every exp, we have error or mistakes, for example, we did some the first fraction boiled very fast we increased the temperature fast so it wasn't very accurate. And the other potential mistake was in collecting fractions in each cycle.

