Experiment 2:Purifying Chemical by Distillation

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Procedure: As described in the Lab manual(Experiment 2: Purifying Chemicals by Distillation)

Observation:

-25mL of 2-Propanol 1-butanol 50:50 mixture was a clear colourless liquid.
-The initial temperature before beginning the experiment was 21c.
-Connected the three condenser to each other with a horses.
-Temperature over all steadily.
-For simple distillation,the initial heating and starting process took a very long time.And the temperature was a bit higher than (52c -70c). The first drop occurred at 52c.
-For fractional distillation,the process went faster as heat was higher.The first drops occurred at 38c,and it took longer to mix around 9mL.

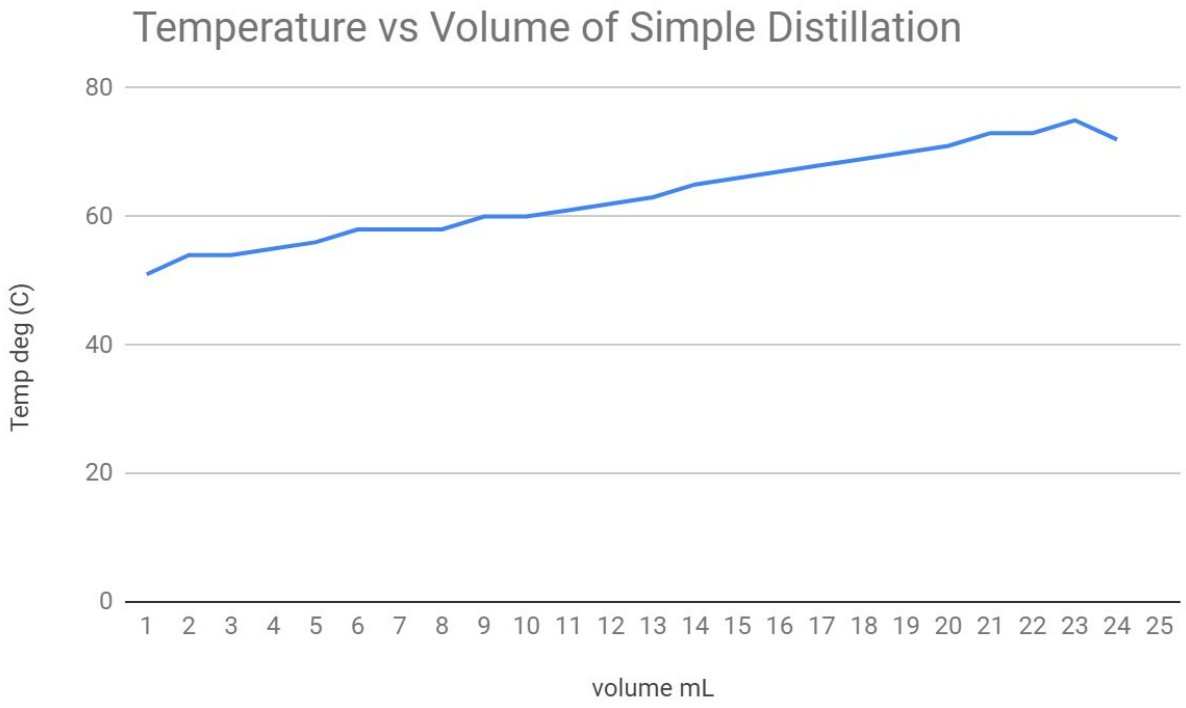
Tables:

Part A- Simple Distillation

volume mL	Temp deg (C)
1	51
2	54
3	54
4	55
5	56
6	58
7	58

8	58
9	60
10	60
11	60
12	62
13	63
14	65
15	66
16	70
17	71
18	72
19	73
20	73
21	72
22	69
23	
24	
25	

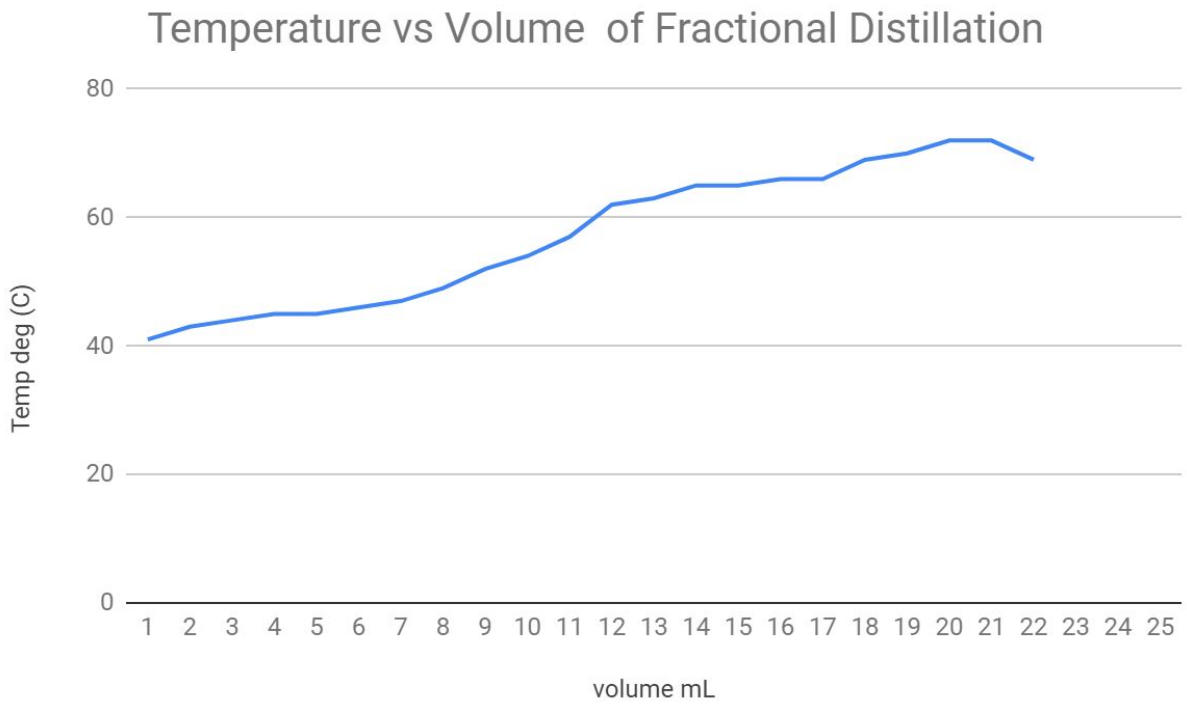
Graph:



Part B- Fractional Distillation

volume mL	Temp deg (C)
1	41
2	43
3	44
4	45
5	45
6	46
7	47
8	49
9	52
10	54
11	57
12	62
13	63

14	65
15	65
16	66
17	66
18	69
19	70
20	72
21	72
22	69
23	
24	
25	



Questions:

1.It is possible to separate them by treating the mixture with enough sodium metal to convert all the Ethanol to Sodium.The toluene could then be removed by distillation and the solide Ethoxide residue treated with water to regenerate the Ethanol.

2.It is important to maintain a uniform temperature in fractionating column because it helps to ensure that vapour created by the heating of sodium travels up to the column rather than having it condense and drop back down to the original solution being heated.

3.The temperature will remain constant that is 39.6c.

4.It will cause the boiling point to get a lower proportionally meaning it will need a greater amount of energy to make vapour pressure equivalent to the atmospheric pressure.

5.There are 2 reason ;

-It is because filling from the bottom exposes the hottest vapour to the coldest water maximizing heat transfer.

-Filling from the the top can result in the condenser emptying quicker than it is filling degrading heat transfer.

6.Since the ratio of mixture=4:1

Mole of fraction A=xa=0.80

Mole of fraction B=xb=0.20

P=0.80*350+0.20*140

P=280+28

P=380mmHg.

Discussion:

Part One

-The simple distillation was suppose to be the shorter process of the two but however it took a long time to begin.

-Graph is supposed to have a gradual increase with a slight upward slopes,data is some how comparable although all the information was gathered.

-The simple distillation graph is consistently for the most part but around 58 deg c the temperature begins to increase at a slightly faster rate causing a slope.

-Only record data until 15ML as the process was taking to long.

-The technique used was not too difficult that is attaching the condenser to a lask and a distillation head.

-2-propanol and 1-butanol both have alcohol characteristics .

Part Two:Fractional distillation

-The heat was turn up higher and therefore result to the process of increasing too much faster.

-Graph is supposed to show a lat line followed by a very large spike in temperature,our result had more gradual increase and then spike.

-The fractional distillation graph shows a step jump in temperature beginning around 48c,rather than simple distillation steadier increase.

-After around 70c the graph begins to plateau.

-The technique involved the same setup,with the addition of fractional distillation column in between the lask and the distillation heat to increase the surface area.

Sources Of Errors:

-Another source of error is the reading of graduated cylinder ,is it was under a fume hood and therefore further away.

-Another error was that the condenser was really hot during the process.

Raw Data

References:

Criscuoli, A., Bafaro, P., & Drioli, E. (2013). Vacuum membrane distillation for purifying waters containing arsenic. *Desalination*, *323*. Ghadiri, M., Abkhiz, V., Parvini, M., & Marjani, A. (2014). Simulation of Membrane Distillation for Purifying Water Containing 1,1,1-Trichloroethane.(Report). *Chemical Engineering & Technology*, *37*(3), 543–550. https://doi.org/10.1002/ceat.201300473