Chemistry Investigation NAME_____

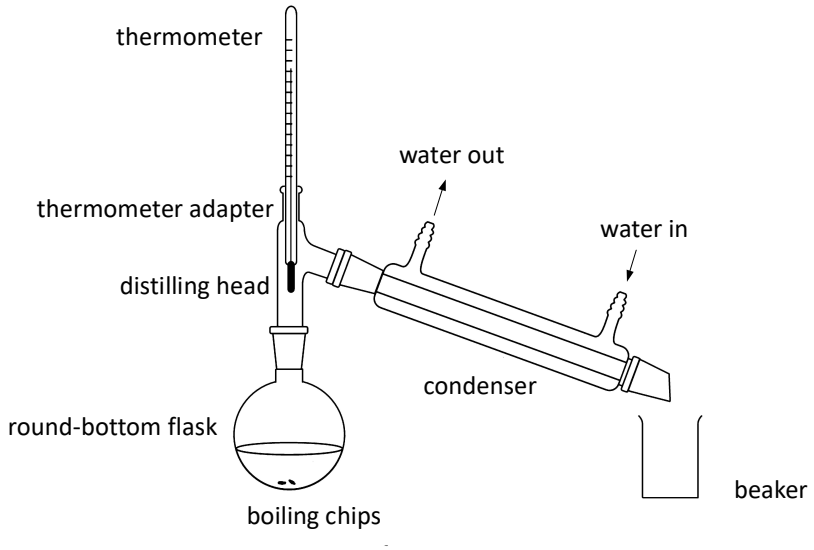
Distillation of Ethanol

Learning Intentions:

- To be able to separate substances using distillation
- To be able to characterise a substance using its density

Equipment:

- 'Quickfit' apparatus
- Three retort stands with clamps
- Bunsen burner and heat mat
- 10 mL measuring cylinder
- 100 mL beaker
- Electronic balance
- Silicone grease
- Boiling chips
- 30 mL wine



Procedure:

1. Ensure the lab tables are joined and a large area is clear by a lab sink for setting up the apparatus.
2. Weigh your empty measuring cylinder on the electronic balance. Record this mass.
3. Place the bunser burner on a heat mat close to the gas tap and connect the hose.
4. Use one or two retort stands with clamps to support the condenser. Ensure that the apparatus is stable and is at the correct height and angle so that:
   (a) when the distilling head is connected it will be vertical,
   (b) when the round-bottom flask is connected there will be room underneath for the bunsen burner, and
   (c) the beaker is elevated so that distillate will not splash out of the beaker when it drops in from the condenser.

   At all points throughout the investigation, check that equipment is stable.

   Do not clamp glassware too tightly or you will crack the glass.

INSTRUCTIONS CONTINUE ON NEXT PAGE

5. Connect the condenser hose to the lab sink and turn on the tap. Ensure that the water is flowing in at the lower end of the condenser and flowing out from the upper end.
6. Insert a thermometer into the thermometer adapter and insert this into the distlling head. Ensure the entire thermometer bulb is below the output pipe of the distilling head.
7. Use a retort stand and clamp to hold the round-bottom flask under the distilling head.
8. Once the apparatus is set up as shown above, check with the teacher and receive your sample of wine. Add two boiling chips.

   The liquids used in this investigation include ethanol which is flammable. Keep bunsen burner flame away from any liquids or vapours.
9. Assembly the apparatus, sealing all joints with silicone grease (paint a line and then twist a full turn).

   *Silicone grease makes the connections air tight. It does **not** hold the glassware together.*
10. Check with the teacher again. Once approved, light the bunsen burner and slowly heat the wine to 80°C. This should take a few minutes.

    If at any point there are vapours escaping through a seal, immediately turn off the bunsen burner. Wait for the glassware to cool to touch, check seals, then continue heating.
11. Keep the temperature between 80°C and 90°C for 15 minutes or until no more distillate is collecting, then turn off the bunsen burner.

    The glassware and bunsen flame will be very hot. Use care at all points to avoid burns.
12. Weigh the beaker containing the distillate. Record this mass and any observations.
13. Measure the volume of distillate collected, using the 10 mL measuring cylinder. Record this volume and any observations.
14. Once the glassware has cooled, disassemble and clean the Quickfit glassware.

Questions:

A. Explain why the water must travel upwards through the condenser in order to be effective.

B. The boiling point of ethanol is 78.4°C. Explain why it is important to keep the distillation temperature between 80°C and 90°C.

C. Describe how the results would be different if the thermometer bulb was above the output pipe of the distilling head.

D. Compare (by observation) the collected distillate to a sample of pure ethanol. Suggest reasons for any differences.

E. Use the data below to determine the Percentage by Volume Alcohol content for your distillate. Density is calculated by dividing mass (in g) by volume (in mL).

% by Volume	Density (g/mL)
20	0.98
40	0.95
60	0.91
80	0.86
100	0.79