



Distillation

Topic Summary

- Distillation is used to separate a liquid from a solution, or to separate two or more liquids with different boiling points.
- The liquid with the lowest boiling point evaporates first and can be collected after it condenses.
- A Liebig condenser is used to cool hot vapour back into liquid. Cold water flows in at the bottom of the water jacket and out at the top to keep it cool without using too much water.
- The thermometer should be placed at the junction of the still-head to show the boiling point of fraction that is being collected.
- Anti-bumping granules are added to make boiling smoother and prevent splashes.
- If two liquids have close boiling points, the fractions collected will not be completely pure because although only one fraction is at its boiling point, the second will still be evaporating at a reasonably high rate.
- Distillation is a required practical in GCSE chemistry, often using salty water to produce pure water - the equipment may be more limited for a student practical.
- Safety points: use clamps to secure apparatus, handle glassware carefully to avoid cuts, and be cautious of hot equipment and steam (which can cause very nasty scalds).



Quick Checks to Build Recall

1. Which mixtures would require the use of distillation to separate them?

Ethanol from ethanol and water

Water from salty water

(both right for 1 mark)

2. Label this diagram of the equipment needed for distillation in the laboratory.

(3 marks)

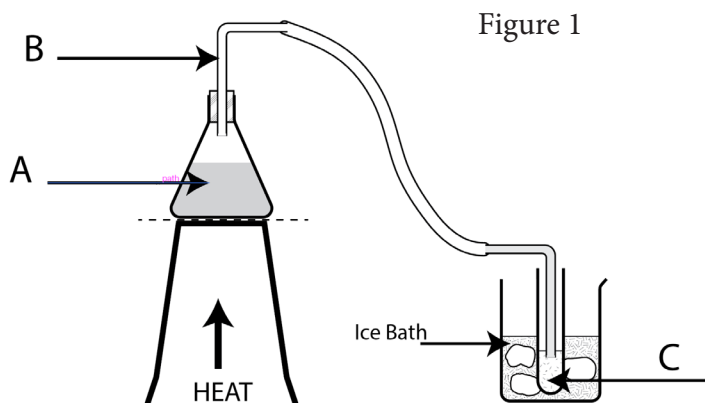


Figure 1

A: _Mixture

B: _Delivery Tube

C: _Distillate

3. What is purpose of the ice bath in this experiment?

.....Cools/condenses the hot vapour/gas.....

.....(1 mark)

4. Why are anti-bumping granules added to the flask during distillation?

.....prevents large bubbles forming / allows gentle boiling to stop the mixture 'bumping' up the deliver tube

.....(1 mark)



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Exam Style Questions

- A student distils a mixture of ethanol (boiling point 78°C) and water (boiling point 100°C). Analysis of the distillate shows it to be only 70% ethanol. Explain why the distillate is not pure ethanol.

.....The boiling points are similar (1) SO some of the water will evaporate (1) while the ethanol is boiling
- A student is asked to carry out a simple distillation to separate water from salty water in the laboratory, using apparatus similar to that shown in figure 1 (see over page). State one hazard and state a, linked, precaution to keep the student safe while carrying out this experiment.

cuts from glass/handle carefully
equipment may be hot/ allow to cool before touching or clamp securely (do not hold)
- A student wants to check if a sample of water they have produced by distillation is pure. Suggest a simple laboratory test that would confirm if their sample is pure water.

.....

.....measure its boiling point (or melting point) (1).....

.....pure water boils at 100°C (or freezes/melts at 0°C) (1)



Do this later...

Give your brain a break and come back to these questions later. Cover the rest of the sheet while you have a go. By doing this 24-48 hours after watching the video you will boost your chances of remembering the key points in an exam. If you struggle with these questions, re-watch the video and then try again.

- Draw a fully labelled diagram of the equipment required to carry out distillation in a school laboratory (assume that a Liebig condenser is NOT available).

see example on page 1
- When distilling a mixture of salt (NaCl) and pure water, why would the distillate be pure water?

Salt is a solid at room temperature / salt's boiling point is a lot higher than water's.
- When distilling a mixture of ethanol and pure water, why would the distillate NOT be pure ethanol?

Boiling points are similar so some water will evaporate while the ethanol is at its boiling point
- Why should the student use a hotplate rather than a Bunsen burner as the heat source when distilling a mixture of ethanol and water?

Ethanol is (highly) flammable and a Bunsen would pose a fire hazard