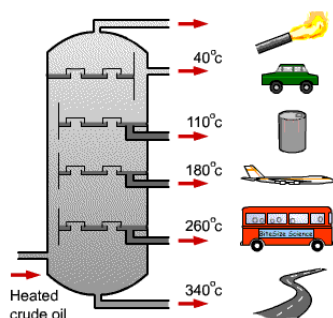


Fractional Distillation – Reading and Writing Task

Read the following passage of scientific text, then answer the questions which follow.



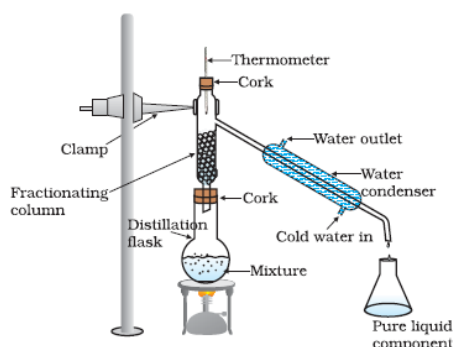
Fractional distillation is a separation technique used to separate mixtures of liquids, which have different boiling points. Fractional distillation is used to separate mixtures of ethanol (alcohol) and water to make strong alcoholic drinks, such as whisky and vodka. Companies, such as BOC, distil liquid air to provide cylinders of oxygen for medical uses and diving, argon to fill light bulbs etc.. Air

must be cooled to -200°C to turn it into a liquid, before distillation takes place. Oil refineries, like those in Pembroke Dock and Milford Haven, use fractional distillation to separate crude oil, to form a range of useful products, such as petrol, diesel and fuel oil.

Fractional distillation involves heating the liquid mixture to the boiling point of the most **volatile** component. This liquid then evaporates to form a vapour, which leaves the mixture. Once the vapour has left the distillation flask, the vapour can be cooled and **condensed**. The component is collected as a liquid and is called a fraction, as it is a part of the original mixture. Components with higher boiling points will remain in the distillation flask. A fractionating column is fitted to the top of the distillation flask. The column has a large, cold surface area, which prevents any of the less volatile components leaving the mixture before their boiling points have been reached. If a mixture contains more than 2 liquids, the mixture is heated to each boiling point in turn, to remove successive components.

During the production of Welsh ethanol must be separated from Ethanol has a boiling point of 78°C a boiling point of 100°C . Heating will distil ethanol out of the leave water in the distillation flask.

Condensers, such as a Liebig can be used to cool vapours and turn them back into liquids.



remove

whisky,
water.
and water has
the mixture
mixture and

condenser,

Questions

1. Name 2 uses of oxygen cylinders. [1]
2. Name 3 products made in oil refineries. [1]
3. What alcohol is found in whisky? [1]
4. What physical property forms the basis for fractional distillation? [1]
5. What do the following words mean?
a) **volatile**. [1]

b) *condensed*.

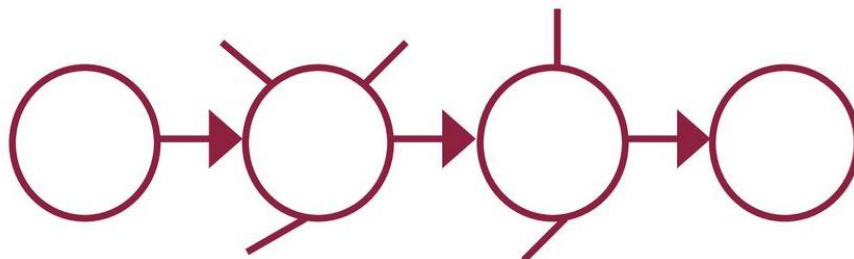
[1]

6. How does a fractionating column stop less volatile components escaping? [2]

7. Write a brief account to explain how ethanol and water can be separated. [4]

Success Criteria

- Write your account using explanation connectives.



- Include appropriate data to help explain how the process works.
- Ensure you use scientific terms correctly, in well constructed sentences.

Fractional Distillation – Reading Task – Mark Scheme

1. Oxygen cylinders are used for **medical uses** and **diving**.
Both uses needed for 1 mark.
2. **Petrol, diesel** and **fuel oil** are made in oil refineries.
All 3 products needed for 1 mark.
3. **Ethanol** is the alcohol in whisky. **1 mark.**
4. Fractional distillation uses the **different boiling points** of liquids.
Must mention “different” as well as “boiling points”.
Accept “volatility” or “boiling temperatures” instead of “boiling points”.
5. a) Condensed means changed from a **gas / vapour into a liquid**. **1 mark.**
b) Volatile describes **how easily a liquid turns into a gas / evaporates**. **1 mark.**
Accept – volatile means a liquid has a low boiling point / temperature.
6. The cold surface area of the fractionating column **cools the vapour**, so that it **condenses** and falls back into the distillation flask. **1 mark for each key point.**
7. The mixture / ethanol and water is **heated**. **1 mark.**
The **ethanol boils** at 78°C. **1 mark.**
Ethanol vapour leaves the flask and is **condensed**. **1 mark.**
Water is left in the distillation flask. **1 mark.**