Fractional distillation Worksheet

Chemistry - Key Stage 4

Organic Chemistry

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Independent task 1

Link the substance with its common use.

1. Petrol
2. Naphtha
3. Kerosene
4. Diesel
5. Bitumen

a) Manufacture of chemicals

b) Used for laying roads

c) Fuel for cars

d) Fuel for aircrafts

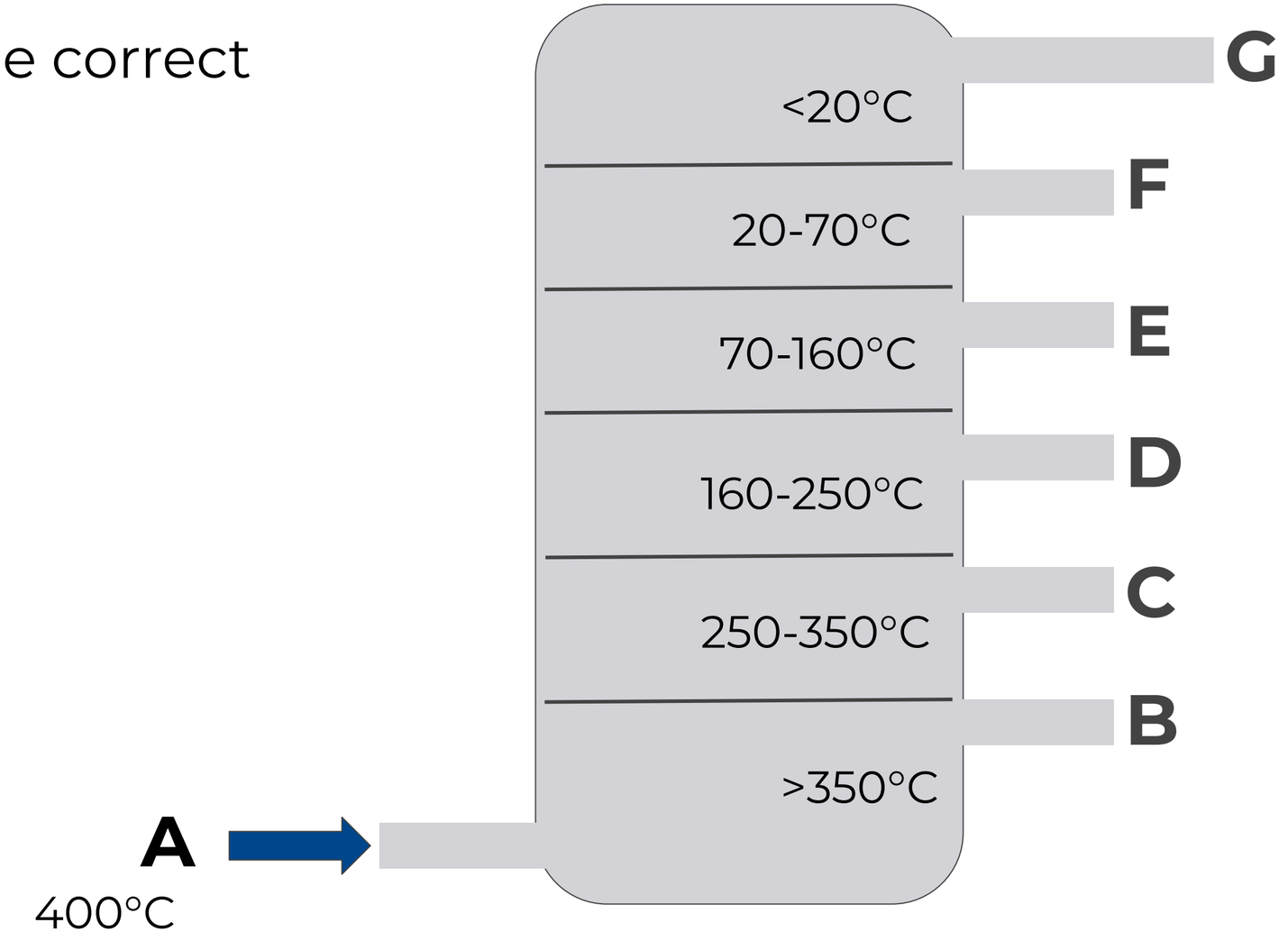
e) Fuel for cars, vans and lorries

Independent task 2

Label each letter with the correct fraction name.

Support:

- **Naphtha**
- **Refinery gas**
- **Diesel**
- **Kerosene**
- **Bitumen**
- **Petrol**



Independent task 3

1. What is the link between chain length and boiling point?

2. Where is the fractionating column the hottest/coldest?

3. What happens at the top of the fractionating column?

4. What happens at the bottom of the fractionating column?

5. How can the fractions naphtha, kerosene and bitumen from crude oil be used?

Independent task 4

Copy and complete the following sentences.

Fractional distillation is used to...

To carry this out, a **f**_____ **c**_____ has to be used.

The hydrocarbons are separated out based on their **c**_____ **l**_____ as this determines their **b**_____ **p**_____ due to the strength of the **i**_____ forces.

Longer chained molecules have **h**_____ boiling points because they have **s**_____ **i**_____ **f**_____ of attraction between **m**_____. This means more **e**_____ is required to break the **i**_____ forces of attraction.

Shorter chained molecules, on the other hand have ...

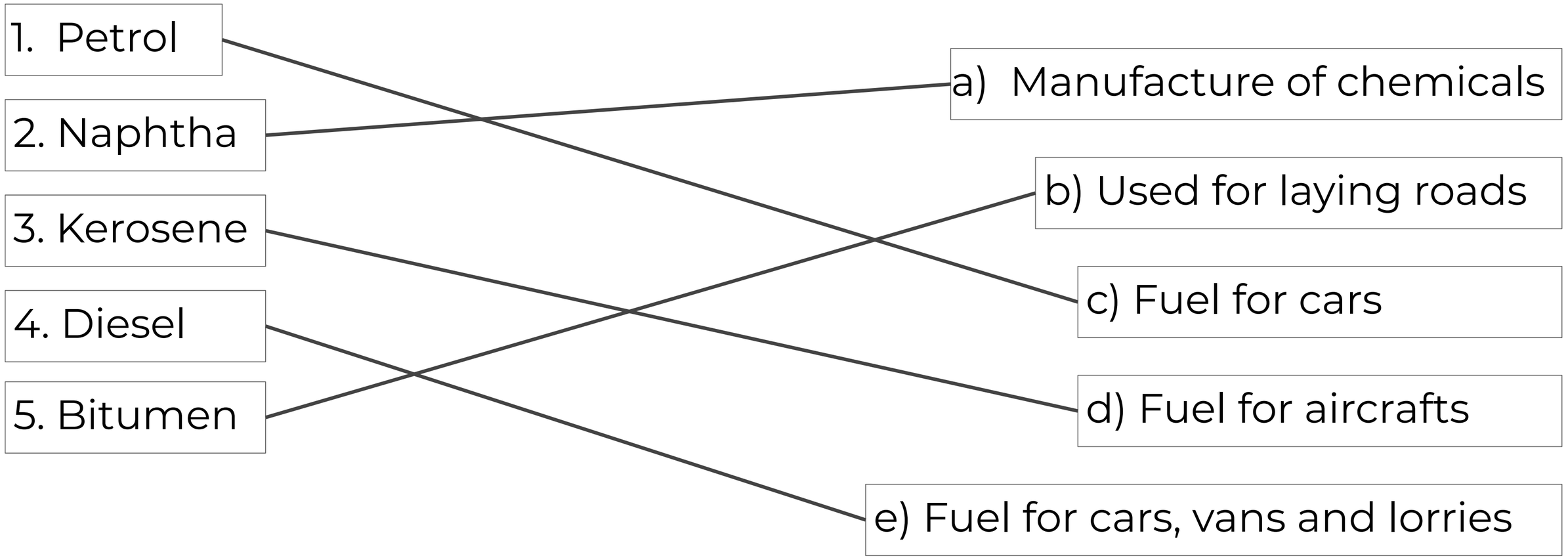
Exam-style question review

Describe and explain how the fractions are separated in a fractionating column

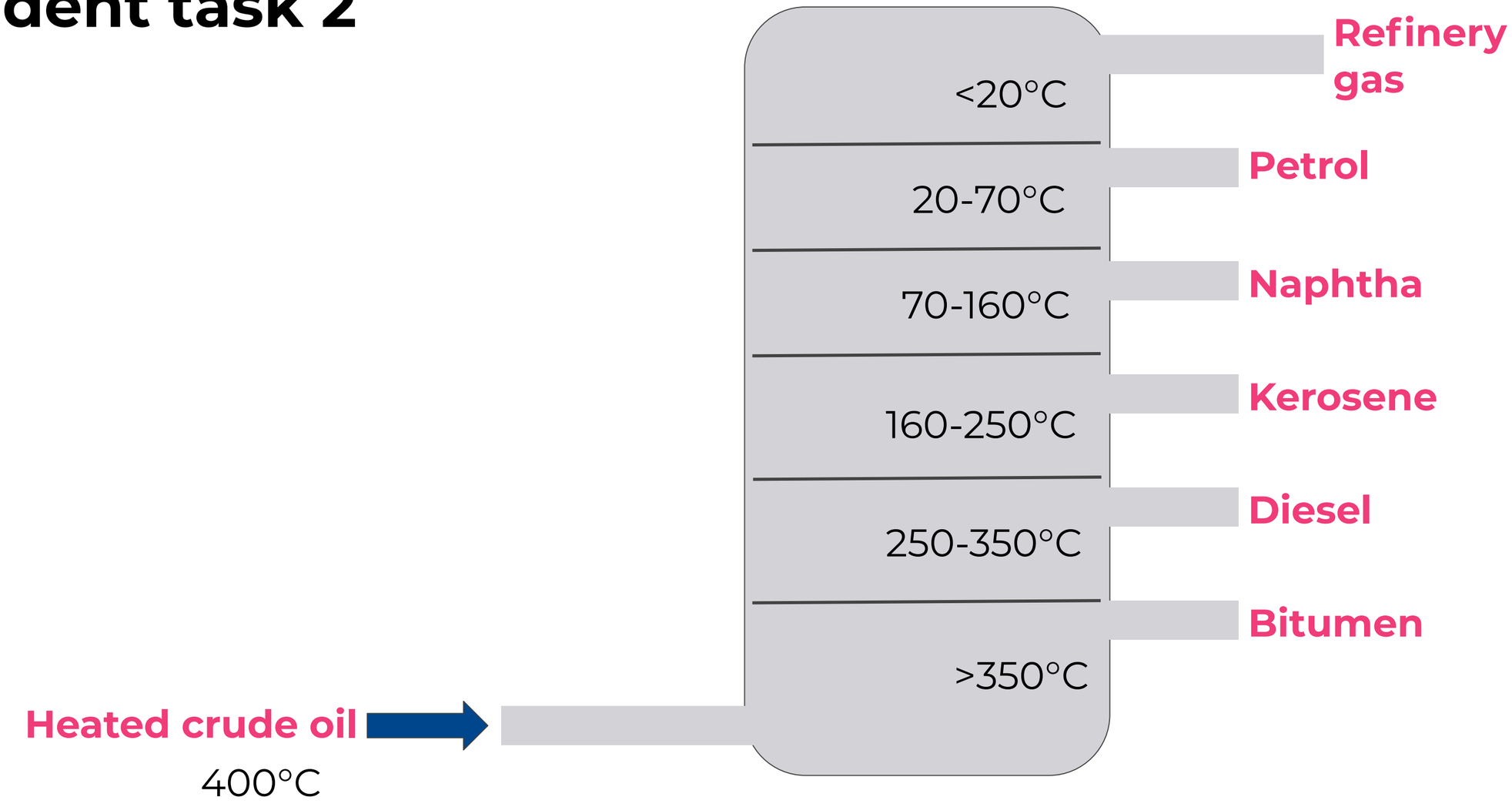
Answers

Independent task 1

Link the substance with its common use.



Independent task 2



Independent task 3

1. What is the link between chain length and boiling point?

The longer the chain length, the higher the boiling point.
OR The shorter the chain length, the lower the boiling point.

2. Where is the fractionating column the hottest/coldest?

Hottest at the bottom and coldest at the top.

3. What happens at the top of the fractionating column?

Fractions with the lowest boiling points condense (short-chain hydrocarbons).

4. What happens at the bottom of the fractionating column?

Fractions with the highest boiling points condense (long-chain hydrocarbons).

5. How can the fractions naphtha, kerosene and bitumen from crude oil be used?

Naphtha is used in the manufacture of chemicals.
Kerosene is used as a fuel for aircrafts.
Bitumen is used for laying roads.

Independent task 4

Fractional distillation is used to **separate the mixture of compounds in crude oil.**

To carry this out, a **fractionating column** has to be used.

The hydrocarbons are separated out based on their **chain length** as this determines their **boiling point** due to the strength of the **intermolecular** forces.

Longer chained molecules have **higher** boiling points because they have **stronger intermolecular forces** of attraction between **molecules**. This means more **energy** is required to break the **intermolecular** forces of attraction.

Shorter chained molecules, on the other hand have **lower boiling points because they have weaker intermolecular forces of attraction between molecules. This means less energy is needed to break the weaker intermolecular forces of attraction.**

Exam-style question review

Describe and explain how the fractions are separated in a fractionating column

- Crude oil is a mixture which is heated until it vaporises
- It is pumped into a fractionating column which is hotter at the bottom and cooler at the top
- Vapour rises through the column
- The different hydrocarbon vapours condense when their temperature falls below their boiling point
- Shorter chained hydrocarbons with lower boiling points condense at the top of the column because they have weaker intermolecular forces between the molecules
- Longer chained hydrocarbons with higher boiling points condense at the bottom of the column because they have more intermolecular forces between the molecules