

(Carbon compounds as the basis of organic chemistry)

Q1. a). (2019)

This question is about crude oil and hydrocarbons.

Figure 1 shows a fractionating column used to separate crude oil into fractions.

Figure 1

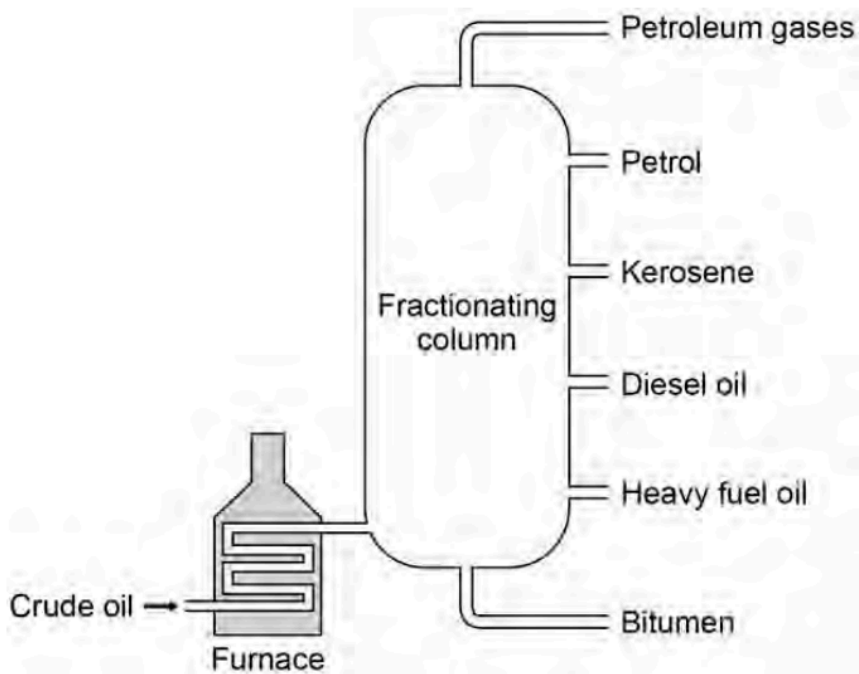


Table 1 gives information about some of the fractions.

Table 1

Fraction	Boiling point range in °C
Petroleum gases	Below 30
Petrol	40–110
Kerosene	180–260
Diesel oil	260–320
Heavy fuel oil	320–400
Bitumen	400–450

Suggest a suitable temperature for the furnace in **Figure 1**.

[1 mark]

_____ °C

Q1. b). (2019)

Explain why diesel oil collects above heavy fuel oil but below kerosene in the fractionating column.

Use **Table 1**.

[2 marks]

Q1. c). (2019)

Suggest **two** reasons why bitumen is **not** used as a fuel.

[2 marks]

1 _____

2 _____

Q2. a). (2022)

This question is about the fractions obtained from crude oil.

Crude oil is separated into fractions by fractional distillation.

The fractions obtained from crude oil include:

- lubricating oil
- naphtha
- petroleum gases.

Table 3 shows the boiling point range of these fractions.

Table 3

Fraction	Boiling point range in °C
Lubricating oil	300–350
Naphtha	90–200
Petroleum gases	< 25

Explain how these fractions are obtained from crude oil by fractional distillation.

[4 marks]

Q2. b). (2022)

Fractions from crude oil can be processed to produce feedstock for the petrochemical industry.

Which **two** are useful materials produced from this feedstock?

[2 marks]

Tick (✓) **two** boxes.

Alloys

☐

Ceramics

☐

Detergents

☐

Fertilisers

☐

Solvents

☐

Q2. c). (2022)

Another fraction obtained from crude oil is petrol.

Petrol contains a hydrocarbon with the formula C_9H_{20}

Complete the equation for the complete combustion of C_9H_{20}

You should balance the equation.

[2 marks]

Q2. d). (2022)

Petrol obtained from crude oil contains sulfur impurities.

Explain why sulfur impurities are removed before petrol is burned in car engines.

[2 marks]

Q3. (2022)

Table 4 shows information about two more fractions obtained from crude oil.

Table 4

Fraction	Range of number of carbon atoms in each molecule
Kerosene	11–15
Heavy fuel oil	20–40

A student predicted that heavy fuel oil is more viscous than kerosene.

The student's prediction was correct.

Justify the student's prediction.

[2 marks]

Central heating boilers can also burn kerosene.

Kerosene is produced from crude oil in a fractionating column using fractional distillation.

In the first step, crude oil is heated and hydrocarbon vapours are formed.

Explain how kerosene is produced from these hydrocarbon vapours.

[3 marks]
