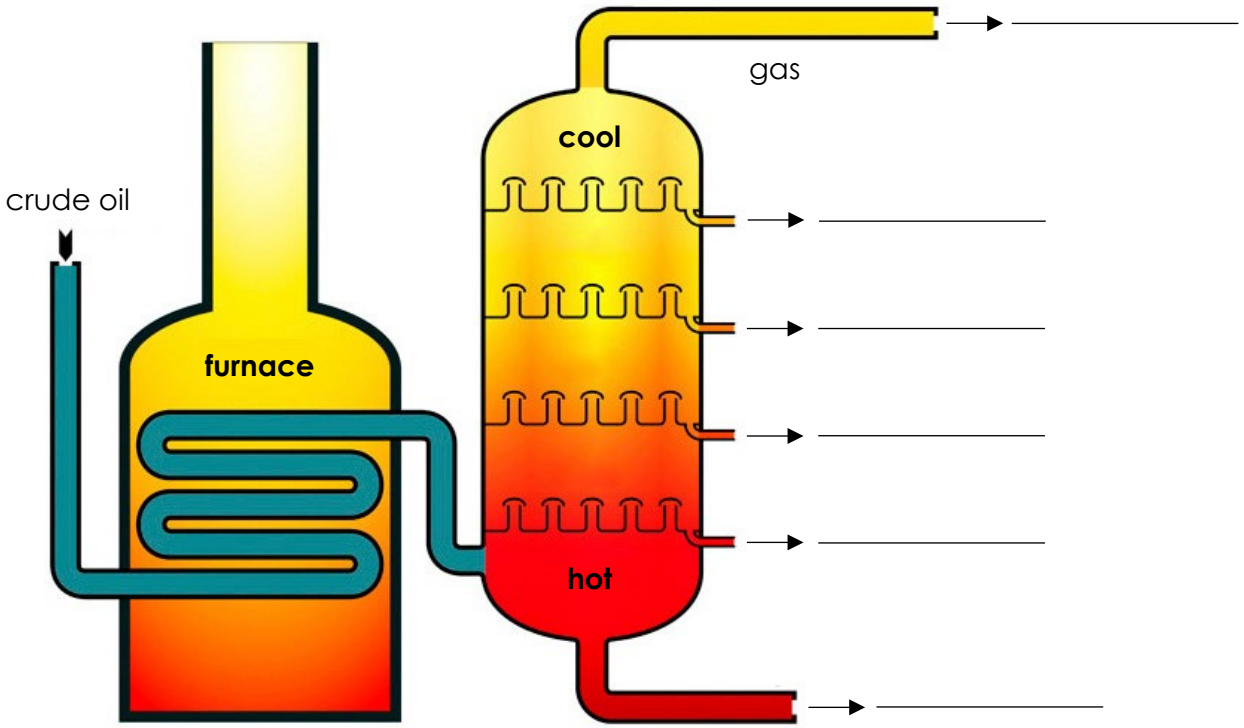
Fractional distillation and hydrocarbons: knowledge check

1.1 The diagram shows crude oil being separated into fractions in a fractionating column.

Use the words listed to label each of the fractions produced.

liquified petroleum gas **diesel** **kerosene**

petrol **heavy fuel oil** **bitumen**



1.2 Add the correct letter into the box provided to match the correct ending (A to E) for each of the sentence starters in the table. The first one has been done for you.

Crude oil contains …	D
Fractional distillation is used to …	
During fractional distillation, the hydrocarbon fractions …	
The hydrocarbons are separated according to …	
The fractionating column is …	

A	… evaporate and then condense.
B	… hotter at the bottom.
C	… separate crude oil into hydrocarbon fractions.
D	… a mixture of hydrocarbons.
E	… their different boiling points.

1.3 Choose the correct word from the brackets to complete each of the following sentences.

- The mixtures of hydrocarbons collected from the fractionating column are called [**multiples/fractions**].
- Hydrocarbons are compounds containing [**hydrogen/water**] and [**oxygen/carbon**] only.
- The hydrocarbons in crude oil are mostly alkanes, which have the general formula [C_nH_{2n+2}/C_nH_{2n}].
- A molecule of ethane, which contains [**two/three**] carbon atoms, has the formula [C_2H_6/C_2H_4].

1.4 Use the words listed to complete the gaps in the following sentences.

stronger **condense** **intermolecular forces**

liquified petroleum gas **higher**

Small alkane molecules have weak _____ _____ and low boiling points. They do not _____ in the fractionating column and leave as _____ _____ _____.

Larger alkane molecules have _____ intermolecular forces. Energy is needed to break the intermolecular forces, so alkanes with larger molecules have _____ boiling points.

Fractional distillation and hydrocarbons: test myself

Answer questions 2.1 to 2.4 by circling the correct answer.

2.1 Which of the following formulas represents a hydrocarbon? Circle the correct answer.

C_5H_{12} CH_3COOH

CO_2

2.2 Which of the following alkanes has the highest boiling point?

Circle the correct answer.

CH_4 $C_{20}H_{42}$

C_7H_{16} $C_{70}H_{142}$

2.3 The hydrocarbons in the liquified petroleum gas fraction contain between one and four carbon atoms.

Which of the following is a correct property of these hydrocarbons? Circle the correct answer.

high boiling points **have high viscosity**

easy to ignite **strong intermolecular forces**

2.4 Which **two** products are produced in the incomplete combustion of methane?

Circle the correct answer.

oxygen **carbon**

hydrogen **carbon dioxide**

water **methanol**

2.5 Complete the missing reactant in the general equation representing the complete combustion of a hydrocarbon.

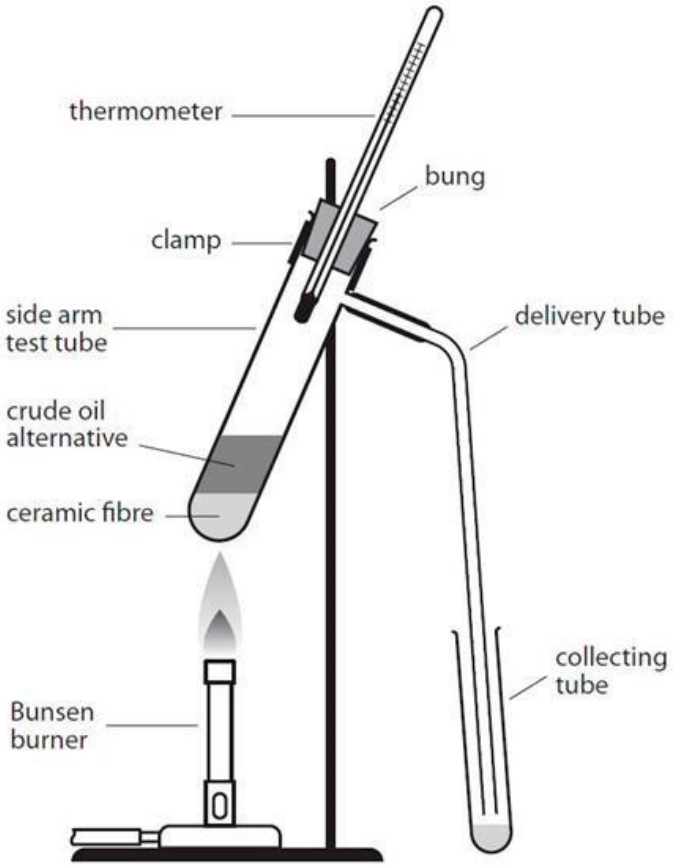
hydrocarbon + _____ → carbon dioxide + water

2.6 Complete the balanced symbol equation representing the complete combustion of propane by adding the correct numbers.

$$\_\_\_\_\_C_3H_8(g) + \_\_\_\_\_O_2(g) \rightarrow \_\_\_\_\_CO_2(g) + \_\_\_\_\_H_2O(l)$$

Fractional distillation and hydrocarbons: feeling confident?

3.1 The diagram shows the apparatus used by learners during the fractional distillation of a crude oil alternative. During the experiment, the learners collected four different fractions.



The table shows some of the observations recorded by the learners when they tested the properties of each fraction.

Fraction	Temperature range over which the fraction was obtained/°C	Colour	Viscosity	Ease of ignition
1	20–100	very pale yellow	low viscosity	
2	100–150		flows quite easily	
3	150–200		doesn't flow very easily	difficult to ignite
4	200–250	brown		

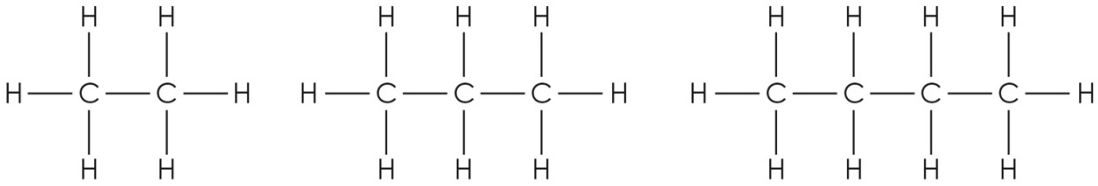
Make predictions about the missing observations and complete the gaps in the table using the words and phrases listed.

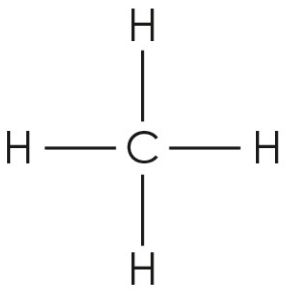
very difficult to ignite **yellow** **high viscosity**

easy to ignite **very easy to ignite** **light brown**

3.2 The table includes the names, molecular formulas and displayed formulas for the first four alkanes. Complete the table by selecting the correct molecular formulas and displayed formulas from those listed.

C_3H_8 C_2H_6



Alkane	Molecular formula	Displayed formula
methane	CH_4	
ethane		
propane		
butane	C_4H_{10}	

Fractional distillation and hydrocarbons: what do I understand?

Think about your answers and confidence level for each mini-topic. Decide whether you understand it well, are unsure or need more help. Tick the appropriate column.

Mini-topic	I understand this well	I think I understand this	I need more help
I can describe the process of fractional distillation.			
I can explain why crude oil can be separated into fractions.			
I can identify a hydrocarbon from its molecular formula.			
I can write the general and molecular formulas for alkanes.			
I can describe how the length of the hydrocarbon chain affects its boiling point.			
I can compare the physical properties of the fractions.			
I can compare complete and incomplete combustion.			
Feeling confident? topics	**I understand this well**	**I think I understand this**	**I need more help**
I can predict the results of an experiment in which a crude oil alternative undergoes fractional distillation.			
I can give the molecular and displayed formulas of the first four alkanes.			