Q1. Choose words from this list to complete the sentences,

ammonia	**carbon dioxide**	**hydrogen**	**nitrogen**
electrical	**heat**	**solar**	**sound**

(a) In air, the two most common gases are oxygen and ..... .

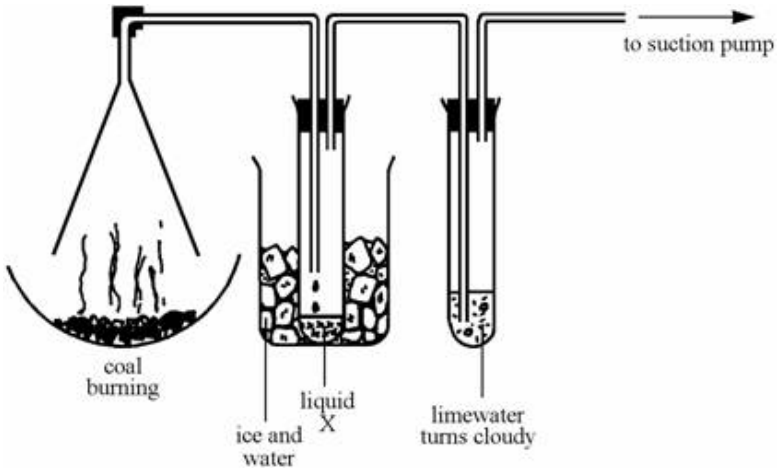
(b) When natural gas burns, energy is released mainly as ..... .

(c) When natural gas burns, a gas is produced which turns limewater milky.

The gas is ..... .

(Total 3 marks)

Q2. The gases produced when coal burns are cooled by ice and then bubbled through limewater.



(a) Complete these sentences.

(i) The coal is reacting with ..... when it burns.

(ii) During burning, elements in the coal are converted to compounds

called .....

(2)

(b) Choose words from this list to complete the sentences.

carbon	**carbon dioxide**	**sulphur**	**sulphur dioxide**
	sodium	**water**	

(i) Liquid X is a compound made from hydrogen and oxygen.

It is called .....

(ii) Sulphur dioxide is an acidic gas. It is given off when coal burns, because coal contains the element .....

(iii) Most fuels are compounds of hydrogen and .....

(3)

(c) Burning coal is an exothermic reaction.

Explain what "exothermic" means.

.....

.....

(1)

(d) (i) Which gas turns limewater cloudy?

.....

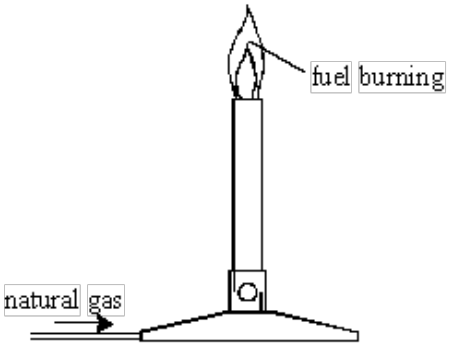
(ii) Which element in the coal is oxidised to form this gas?

.....

(2)

(Total 8 marks)

Q3. Natural gas is a fuel.



(a) Complete these sentences.

When the fuel burns completely, we cannot see the new substances produced because they are mainly colourless ..... .

The energy of the fuel is released as ..... .

(3)

(b) Choose words from this list to complete the sentence below.

carbon carbon dioxide hydrogen nitrogen
oxygen sulphur dioxide water vapour

Three gases which can be produced when fuels burn are:

1. .....

2. .....

3. .....

(3)
(Total 6 marks)

Q4. Wax is a fuel.

A young child watched a candle burning and wondered where the wax had gone.

(a) Complete the sentence below.

When wax burns, energy is released as .....

(1)

(b) Why does the wax disappear as it burns?

.....

.....

(1)
(Total 2 marks)

Q5. Choose words from this list to complete the sentences below.

a chemical an electrical a physical hydrogen nitrogen oxygen

(a) Burning is ..... change.

(1)

(b) When substances burn, they are reacting with ..... from the air.

(1)
(Total 2 marks)

Q6. Crude oil and natural gas are mixtures of hydrocarbons. They are obtained from wells drilled into rocks where they are trapped.

(a) (i) What is the name of the process used to separate the different hydrocarbons in crude oil?

.....

(1)

(ii) Methane is one of the gases obtained when crude oil is separated.

Give the name of another hydrocarbon gas obtained from this process.

.....

(1)

(b) A fuel used in gas cookers is natural gas. It is mainly methane, CH_4.

(i) Complete the word equation for the complete combustion of methane.

methane + oxygen → ..... + ...

(2)

(ii) What different gas is produced by the incomplete combustion of methane?

.....

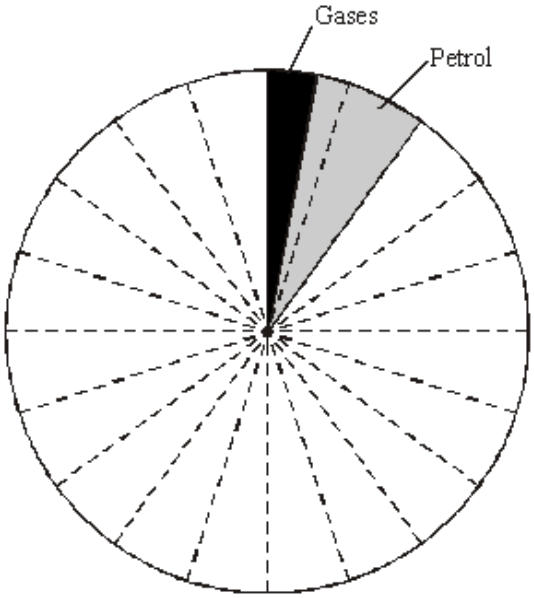
(1)

(Total 5 marks)

Q7. The table shows the composition of some crude oil.

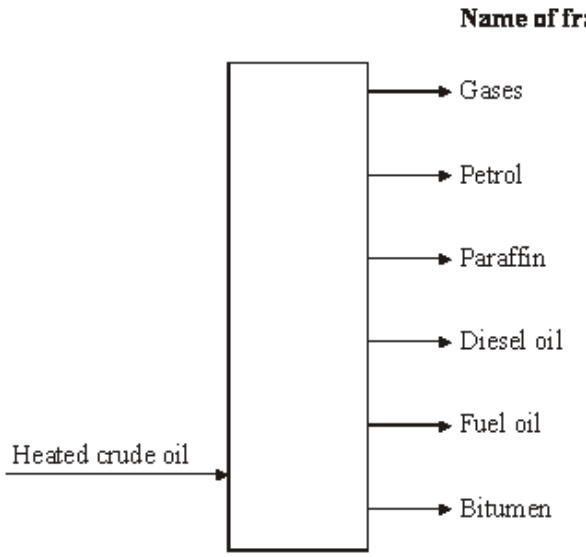
Fraction	Percentage in crude oil
Gases	3
Petrol	7
Naphtha	10
Kerosine	15
Gas oil	20
Fuel oil	45

(a) Complete the pie chart for the composition of this crude oil. Remember to label the chart.



(3)

(b) The diagram shows the process of separating a different sample of crude oil into fractions.



(i) What is the name given to this process?

.....

(1)

(ii) Which fraction has the lowest boiling point?

.....

(1)

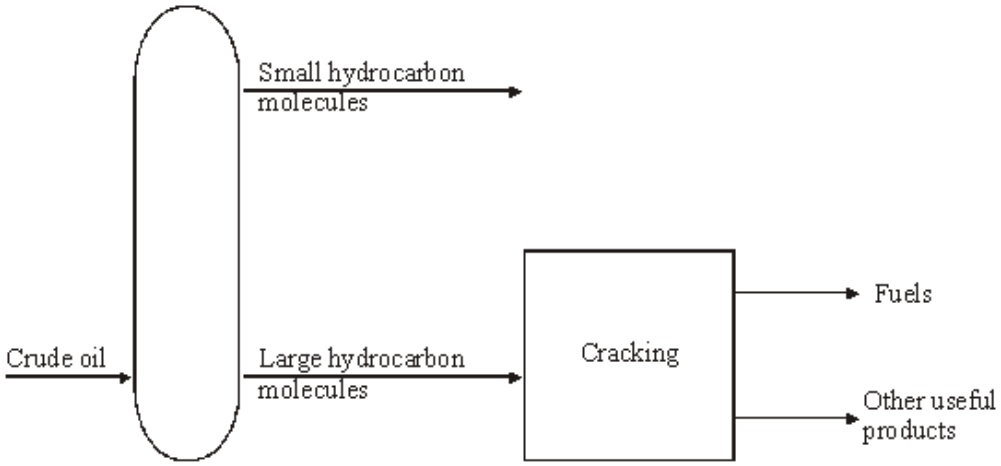
(iii) Which fraction is the least volatile?

.....

(1)

(Total 6 marks)

Q8. Crude oil is a mixture of hydrocarbons. These hydrocarbons can be separated and some of them can be used to make other useful products.



(a) Complete the sentence.

Hydrocarbons are made up of ..... atoms and ..... atoms.

(2)

(b) How are the small and large hydrocarbon molecules in crude oil separated?

.....

.....

.....

.....

(2)

(c) The diagram shows that one useful product of cracking is fuels.
Name **one** of the other useful products.

.....

(1)

(Total 5 marks)

Q9. Crude oil is separated into fractions by fractional distillation.

The table gives information about some of the fractions.

Fraction	Boiling point range in °C	Number of carbon atoms per molecule
Gas	Below 20	1 – 4
Petrol	20 – 100	5 – 10
Paraffin	100 – 250	11 – 15
Diesel	250 – 350	16 – 20
Lubricant	350 – 500	21 – 35
Bitumen	Above 500	Above 35

(a) What is the relationship between the boiling point of a fraction and the number of carbon atoms in its molecules?

.....

.....

(1)

(b) Give **one** further difference, other than boiling point, between diesel and paraffin that also depends on the number of carbon atoms in their molecules.

.....

.....

(1)

(c) All the fractions contain hydrocarbons.

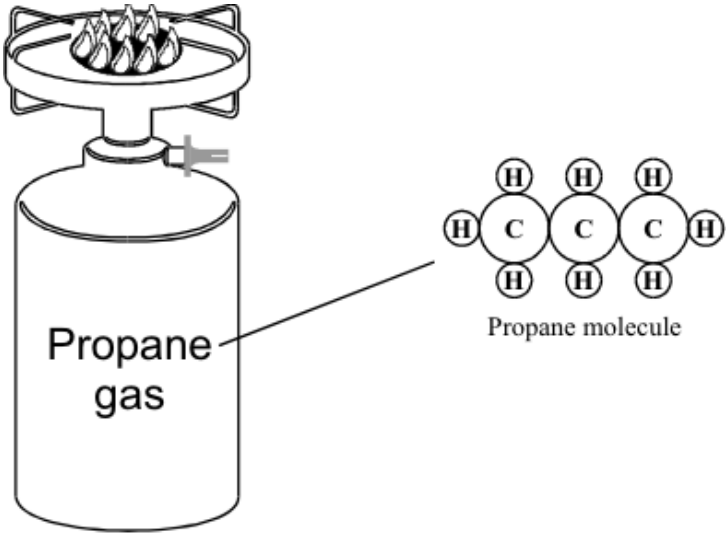
Name the **two** elements in a hydrocarbon.

..... and .....

(1)

(Total 3 marks)

Q10. Propane has a small, hydrocarbon molecule, so it is used as a fuel.



(a) Complete the sentences by choosing the correct words from the box.

carbohydrate	**high**	**hydrogen**
hydroxide	**low**	**volatile**

Propane is a hydrocarbon with a ..... boiling point. Propane is a hydrocarbon because it is made of ..... and carbon only.

(2)

(b) Describe, in as much detail as you can, what happens when propane burns.

.....

.....

.....

.....

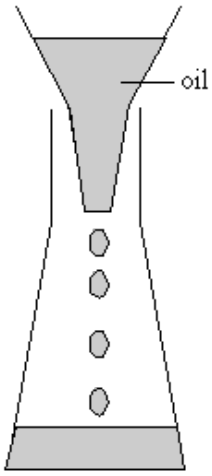
.....

.....

(3)

(Total 5 marks)

Q11. A teacher carried out an experiment to study car engine oil. The experiment was carried out in a fume cupboard and the teacher wore plastic gloves. The oil was poured through a funnel. The time taken for all the oil to go through the funnel was measured. The experiment was repeated with the oil at different temperatures.



(a) What **two** safety precautions were taken in the experiment?

1 .....

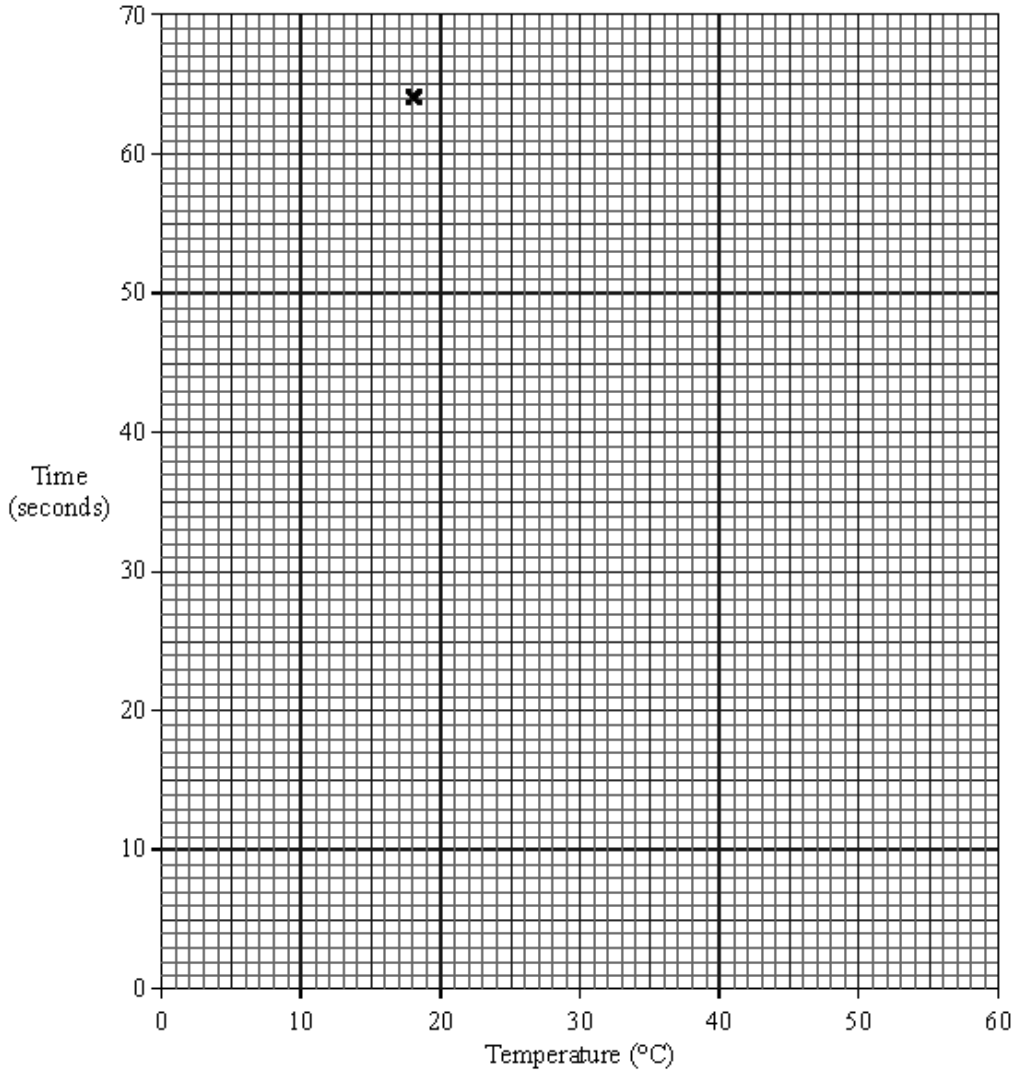
2 .....

(1)

(b) The results of the experiment are shown in the table below.

TEMPERATURE (°C)	TIME (seconds)
18	64
25	43
32	28
42	19
52	15

(i) Plot the results on the graph paper. One of the results has been plotted for you. Join the points in a smooth curve.



(3)

(ii) Use your graph to find the time it would take the oil to travel through the funnel at 37 °C.

Time = ... seconds

(1)

(iii) How does the time taken for the oil to go through the funnel change when the temperature is increased?

.....

.....

(1)

(c) An engine oil must be viscous enough to stop the metal parts of the engine from rubbing against each other. It must not be too viscous or the parts cannot move freely.

(i) Complete the sentences below.

The more viscous a liquid is, the less easily it ..... .

As the liquid gets hotter it gets ..... viscous.

(2)

(ii) Why should the oil in a car engine **not** be allowed to get too hot?

.....

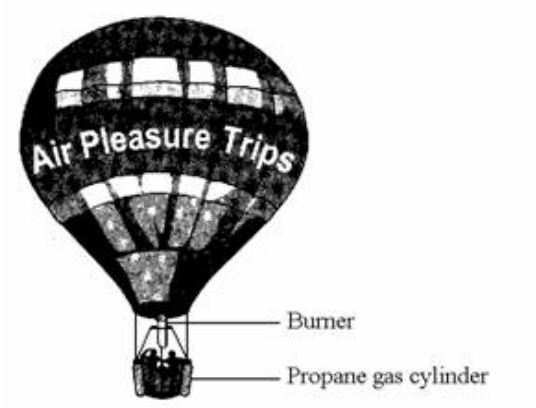
.....

.....

(1)

(Total 9 marks)

Q12. Hot air balloons are used mainly for pleasure trips.



(a) Air is a mixture of gases. Complete the table. (Carbon dioxide has been done for you.)

Gas	Chemical formula	% in air
nitrogen		78
oxygen	O_2	
argon		0.9
carbon dioxide	CO_2	0.03

(3)

(b) The air in the balloon is heated using a propane burner. Propane, C_3H_8, is a *hydrocarbon* that burns in air forming carbon dioxide, CO_2, and water, H_2O.

(i) What does *hydrocarbon* mean?

.....

.....

(1)

(ii) Which gas, in the air, reacts with propane when it burns?

.....

(1)

(iii) What type of chemical reaction happens when a hydrocarbon burns?

.....

(1)

(iv) The formation of more carbon dioxide causes global problems. Explain why.

.....

.....

.....

.....

(2)

(Total 8 marks)

Q13. The table shows some information about alkanes.

Name	Formula	Relative formula mass	Boiling point in °C
methane	CH_4	16	–160
ethane	C_2H_6	30	–90
propane		44	–40
butane	C_4H_{10}	58	
pentane	C_5H_{12}	72	36
hexane	C_6H_{14}	86	68

(a) Give the formula of propane.

.....

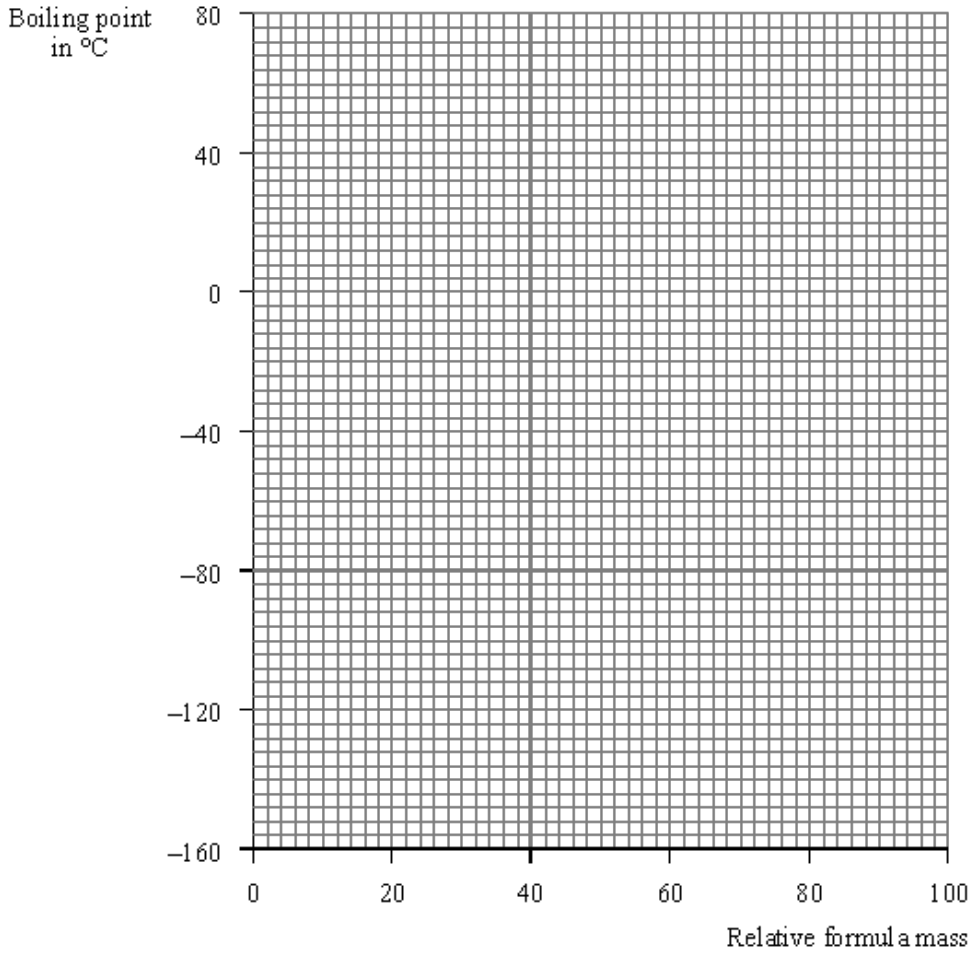
(1)

(b) (i) What happens to the boiling points of the alkanes as the relative formula mass increases?

.....

(1)

(ii) Draw a graph. Plot the points and draw a best fit line.



(3)

(iii) What is the boiling point of butane?

.....

(1)

(iv) Show clearly on the graph how you found the boiling point of butane.

(1)

(c) Circle which of the following is **not** an alkane.

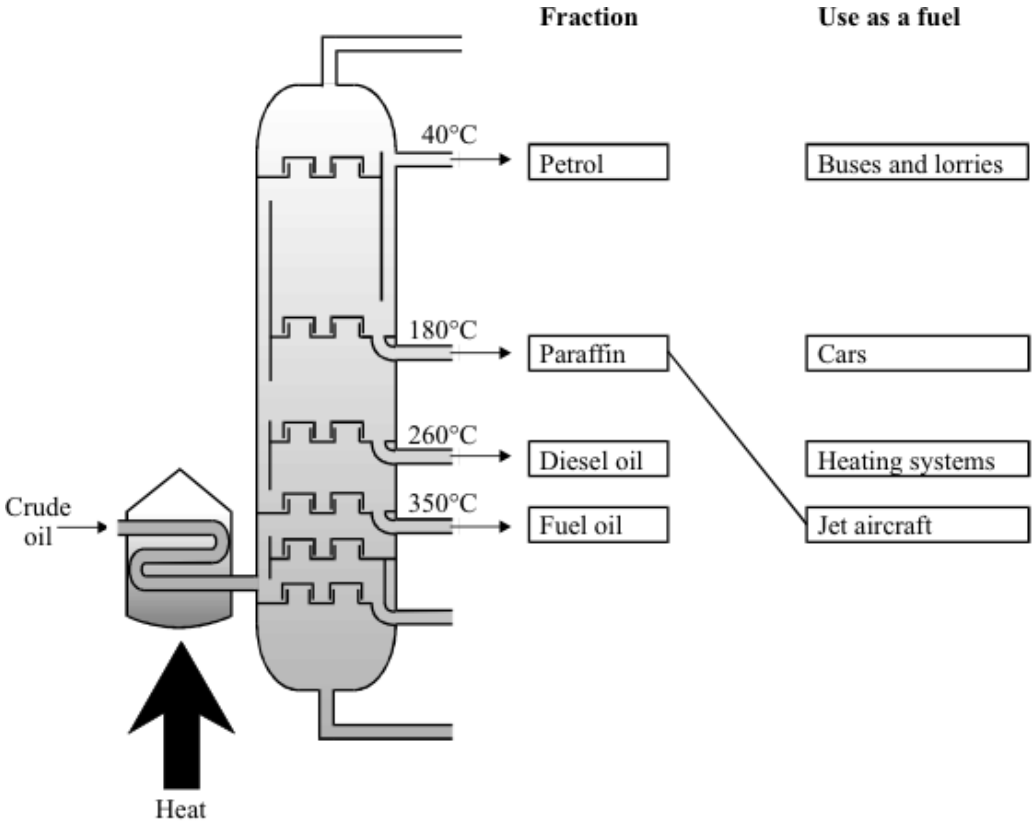
$C_7 11_{16}$ C_9H_{18} $C_{11}H_{24}$ $C_{24}H_{50}$

(1)

(Total 8 marks)

Q14. Fractional distillation is used to separate fractions in the crude oil mixture.

(a) Draw a line to join each fraction to its use as a fuel. One line has been drawn for you.



(2)

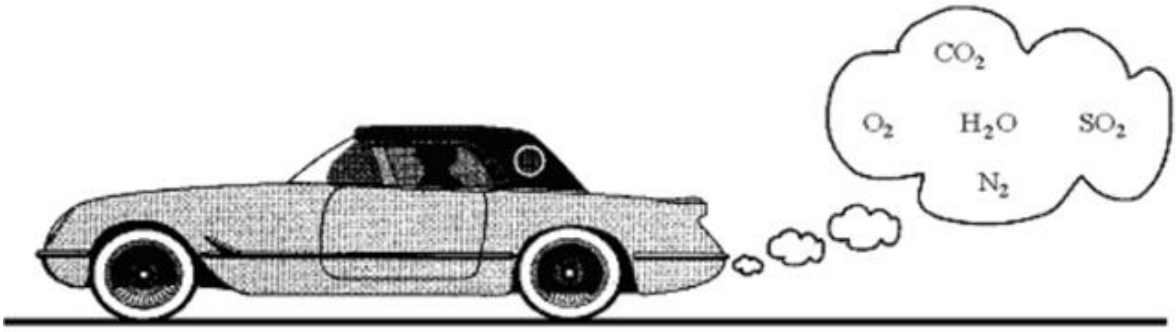
(b) (i) Why does petrol separate from the other fractions in the crude oil mixture?

.....

.....

(1)

(ii) Petrol contains the elements carbon and hydrogen only.



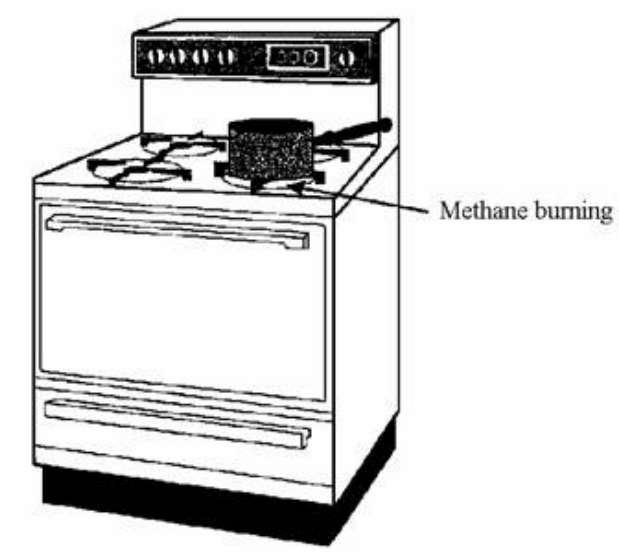
Which **two** of the substances in the diagram are formed when petrol burns?

1 .....

2 .....

(2)
(Total 5 marks)

Q15. Some gas cookers burn natural gas, methane. Methane, CH_4, is a *hydrocarbon.*



(a) What is meant by *hydrocarbon?*

.....

.....

(2)

(b) When methane burns there must be a good supply of air.

(i) Complete the word equation by choosing the correct **two** chemicals from the box.

carbon dioxide	hydrogen	oxygen	water

methane + oxygen → ..... + ...

(2)

(ii) Without a good supply of air, carbon monoxide is formed. Why is carbon monoxide a dangerous gas?

.....

.....

(1)

(Total 5 marks)

Q16. Petrol is a hydrocarbon fuel.

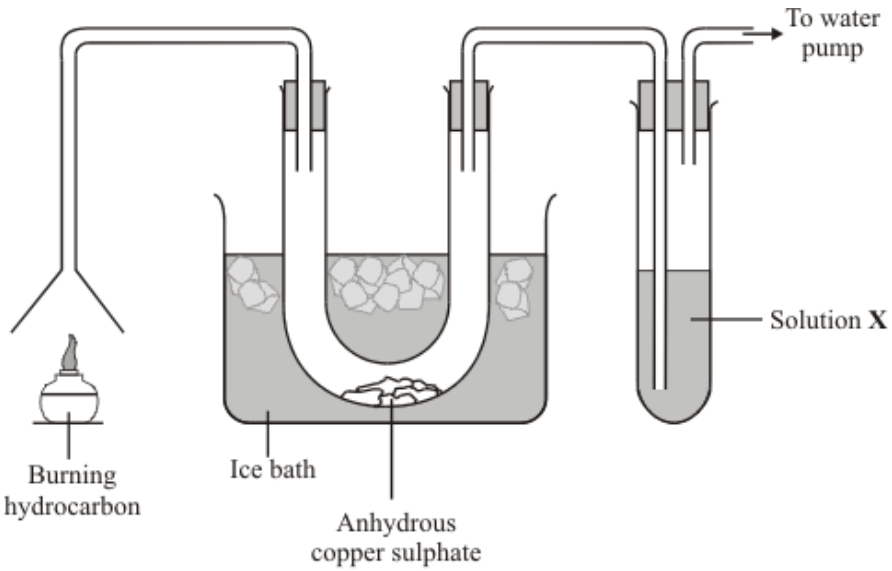
(a) Complete this sentence.

Hydrocarbons are compounds which are made from the elements .....

and ..... only.

(2)

(b) This apparatus was used to study the combustion of a hydrocarbon fuel.



(i) Name the substance which changed the anhydrous copper sulphate from white to blue.

.....

(1)

(ii) Carbon dioxide is also produced when the hydrocarbon fuel is burned.
Name the solution, labelled **X** on the diagram, which tests for carbon dioxide.

.....

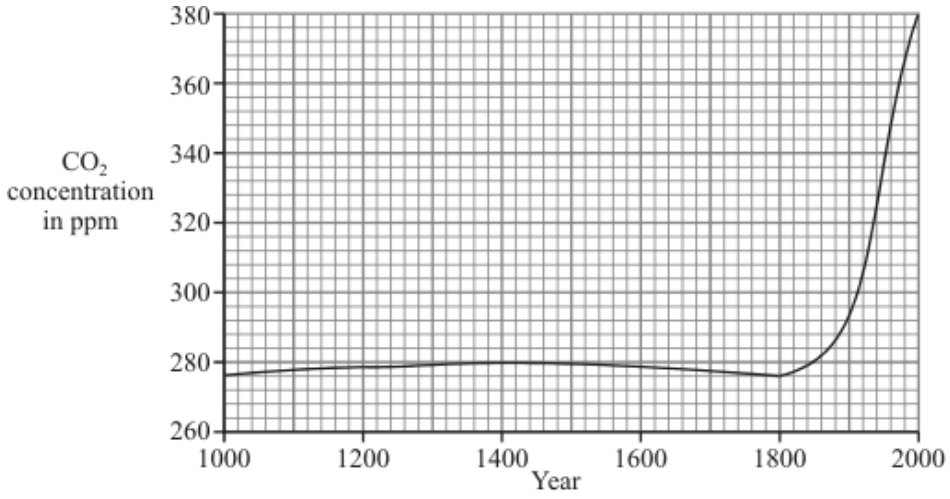
(1)

(iii) Complete this sentence.

Carbon dioxide turns solution **X** .....

(1)

(c) The graph shows how the concentration of carbon dioxide in the air has varied since the year 1000.



(i) Describe the changes in the concentration of carbon dioxide in the air since the year 1000.

.....

.....

.....

.....

.....

.....

(3)

(ii) Suggest why the concentration of carbon dioxide in the air has changed since the year 1800.

.....

.....

(1)

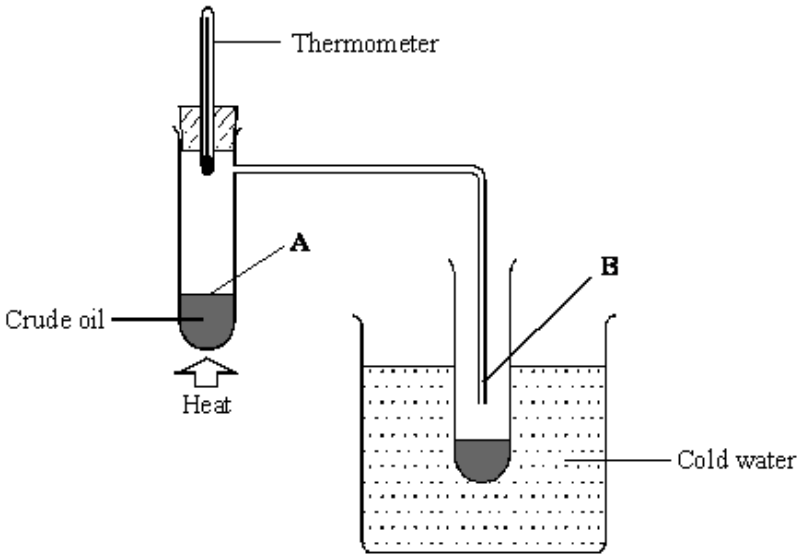
(Total 9 marks)

Q17. (a) Complete this sentence about crude oil.

Crude oil is mainly a mixture of compounds called ..... which contain carbon and hydrogen only.

(1)

(b) The diagram shows a laboratory experiment used to separate crude oil.



Complete each sentence by choosing the correct words from the box.

condensation	**distillation**	**evaporation**
melting	**sublimation**	

The main process taking place at **A** is .....

The main process taking place at **B** is .....

This method of separating crude oil is called .....

(3)

(c) Complete this sentence by crossing out the word in each box that is wrong. The first one has been done for you.

This method of separating crude oil works because the [smaller ~~larger~~] the molecules are, the [higher / lower] their boiling point and the [more / less] volatile they are.

(1)

(Total 5 marks)

Q18. Crude oil is a natural resource from which useful fuels can be separated.

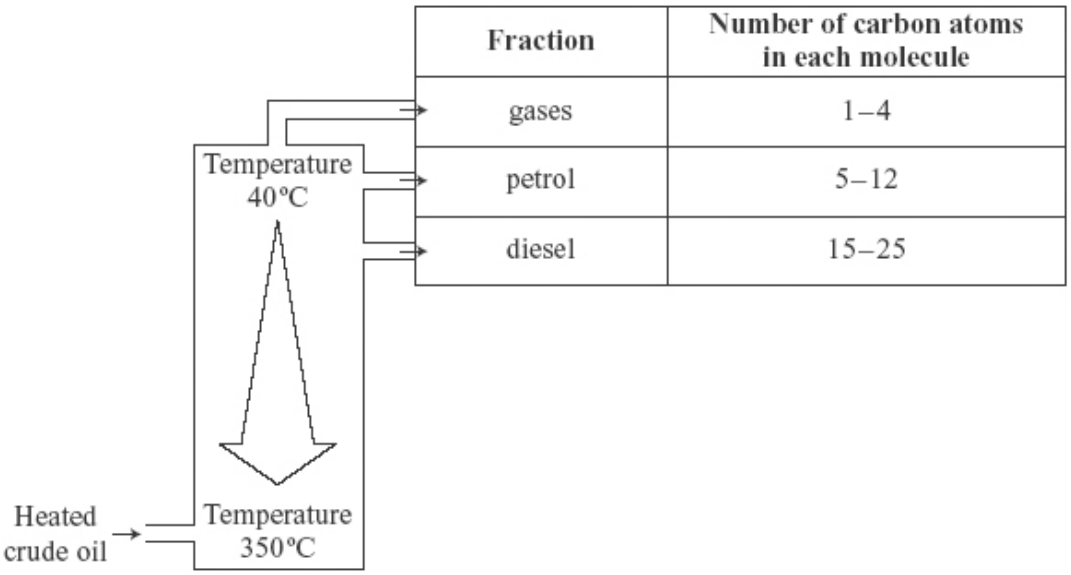
(a) Crude oil is a mixture of hydrocarbons.

Complete the sentence about a hydrocarbon molecule.

A hydrocarbon molecule is made up of ..... and carbon atoms only.

(1)

(b) Many fuels come from crude oil. Some of these fuels are shown in the diagram.



Fraction	Number of carbon atoms in each molecule
gases	1–4
petrol	5–12
diesel	15–25

Suggest **two** properties of these fuels that allow them to be separated from crude oil.

.....

.....

.....

.....

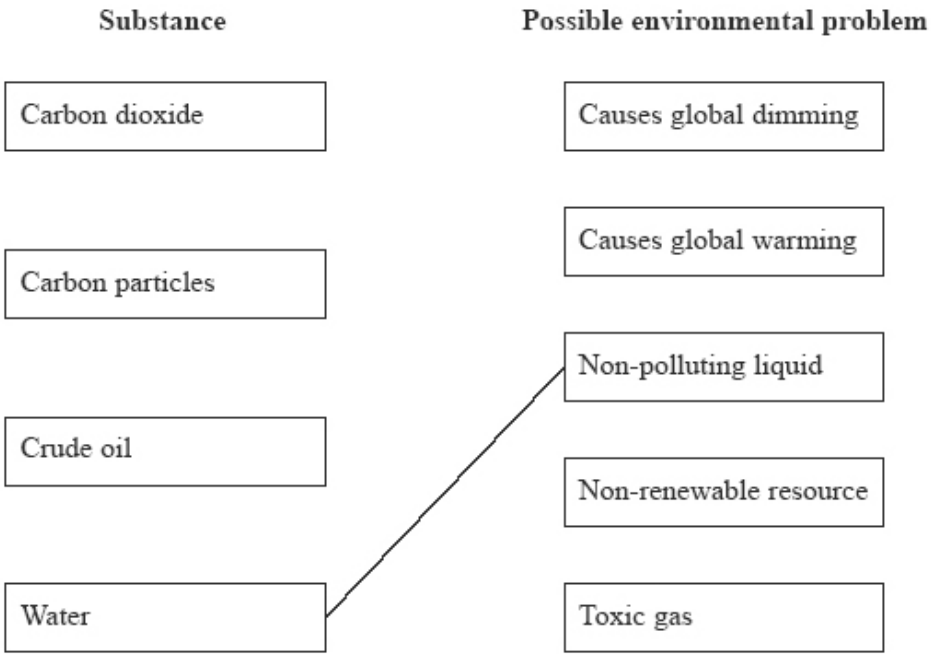
(2)

(c) Fuels from crude oil burn to provide heat energy.

When a fuel burns, it combines with oxygen in the air and produces carbon dioxide and water. When there is not enough oxygen, the fuel burns and also produces carbon monoxide and carbon particles.

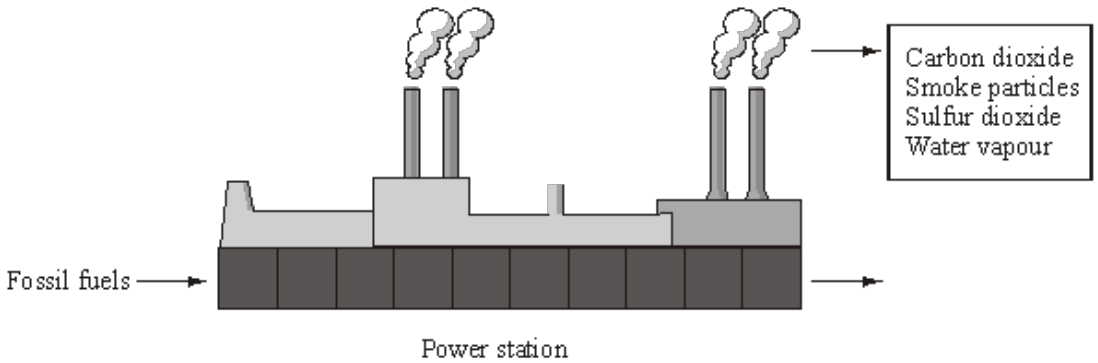
Draw a straight line from each substance that links it to a possible environmental problem.

One has been done for you.



(3)
(Total 6 marks)

Q19. Most electricity in the UK is generated in power stations that burn fossil fuels. The diagram lists some of the substances released into the air when fossil fuels are burned.



(a) (i) Which **one** of the substances released into the air causes acid rain?

.....

(1)

(ii) In the sentence below, draw a ring around the correct answer.

The type of environmental pollution caused by

smoke particle is

global dimming
global warming
rising sea levels

(1)

(iii) Suggest how the burning of fossil fuels may cause climate change.

.....

.....

.....

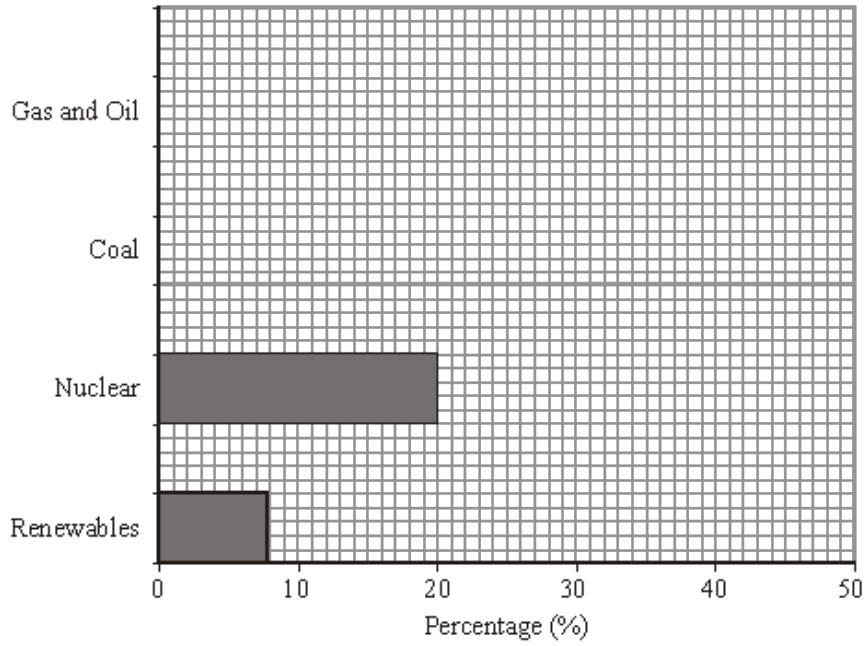
.....

(2)

(b) The table shows the percentage of electricity generated by different energy sources.

Energy sources	Renewables	Nuclear	Coal	Gas and Oil
Percentage (%)	8	20	32	40

Complete the bar chart to show the percentage of electricity generated by coal and by gas and oil.



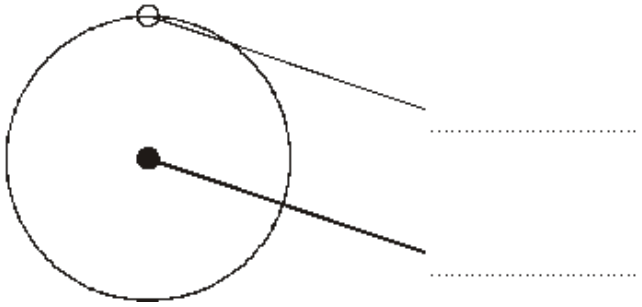
(2)
(Total 6 marks)

Q20. Hydrogen is an element.

(a) The diagram shows the parts of a hydrogen atom.

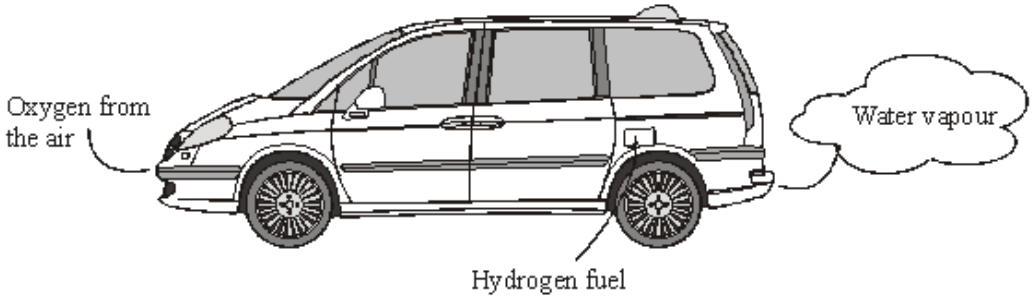
Use words from the box to label the diagram.

electron	**group**	**nucleus**	**symbol**



(2)

(b) Hydrogen can be used as a *clean fuel* for cars.



(i) When hydrogen burns in air, it reacts with another element.

Complete the word equation for this reaction.

hydrogen + ... → water

(1)

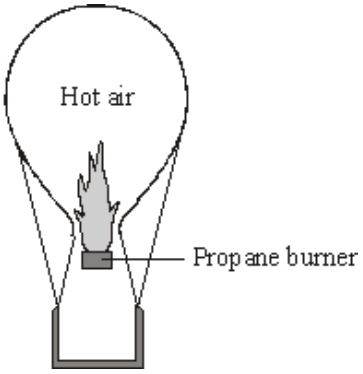
(ii) Suggest **one** reason why hydrogen is called a *clean fuel*.

.....

.....

(1)
(Total 4 marks)

Q21. Hot air balloons burn hydrocarbons to heat the air.



(a) The hot air contains these gases: nitrogen, N_2
oxygen, O_2
argon, Ar
carbon dioxide, CO_2
water vapour, H_2O

(i) Argon is an *element*.

What is an *element*?

.....

.....

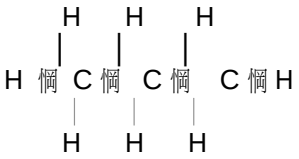
(1)

(ii) Name **one** other gas in the hot air that is also an element.

.....

(1)

(b) Propane, C_3H_8, can be represented as:



Use the correct words from the box to complete the sentences.

bond	**carbon**	**compound**	**element**	**mixture**

(i) Propane is a ..... and is made up of atoms of hydrogen and .....

(2)

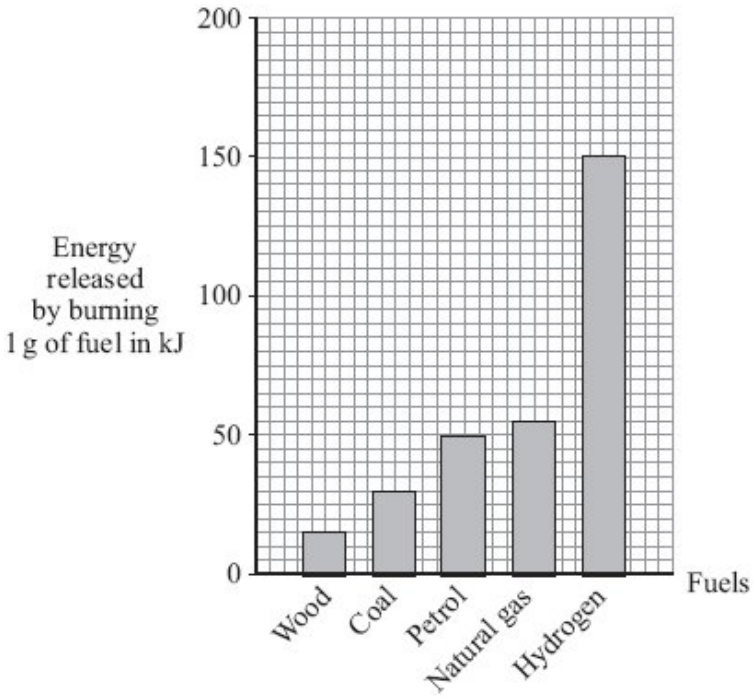
(ii) Each line between the atoms in propane represents a chemical .....

(1)

(Total 5 marks)

Q22. Energy is released by burning fuels.

(a) The bar chart shows the energy in kilojoules, kJ, released by burning 1 g of five different fuels.



(i) Which fuel releases the least energy from 1 g?

.....

(1)

(ii) How much energy is released by burning 1 g of coal?

Energy = ... kJ

(1)

(iii) Coal burns in oxygen and produces the gases shown in the table.

Name	**Formula**
Carbon dioxide	CO_2
Water vapour	H_2O
Sulfur dioxide	SO_2

Use information from the table to name **one** element that is in coal.

.....

(1)

(iv) Use information from the bar chart to calculate the mass of petrol that will release the same amount of energy as 1 g of hydrogen.

.....

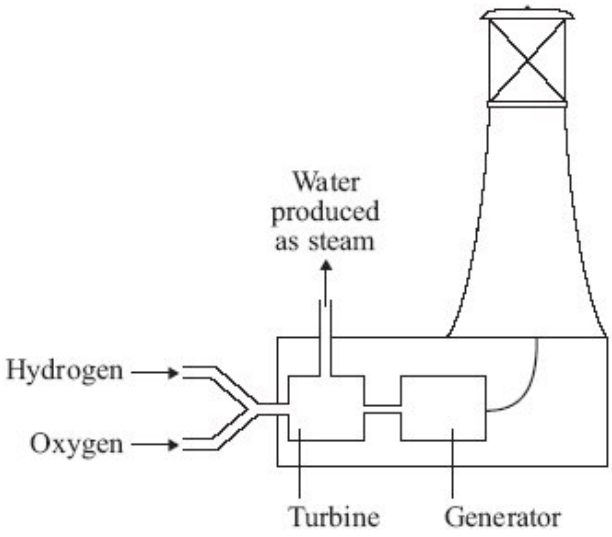
.....

Mass = ... g

(1)

(b) Hydrogen can be made from fossil fuels.
Hydrogen burns rapidly in oxygen to produce water only.

A lighthouse uses electricity generated by burning hydrogen.



(i) Use information from the bar chart and the diagram above to suggest **two** advantages of using hydrogen as a fuel.

1 .....

.....

2 .....

.....

(2)

(ii) Suggest **one** disadvantage of using hydrogen.

.....

(1)

(Total 7 marks)

Q23. Useful fuels can be produced from crude oil. Crude oil is a mixture of hydrocarbons.

(a) The table shows the boiling points of four of these hydrocarbons.

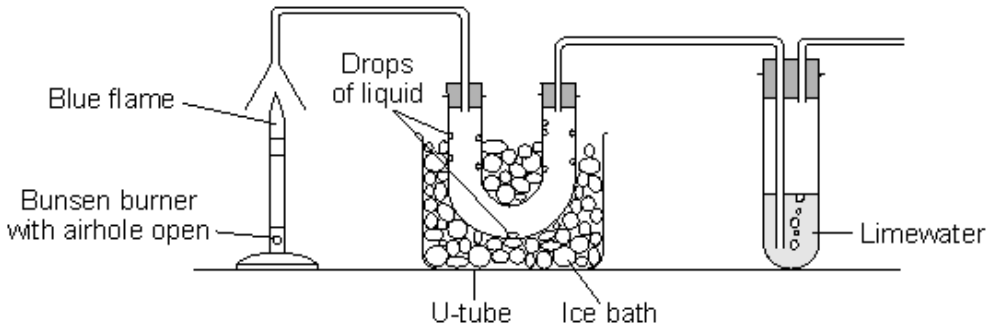
Hydrocarbon	Boiling point in °C
methane, CH_4	–162
butane, C_4H_{10}	0
pentane, C_5H_{12}	+36
decane, $C_{10}H_{22}$	+175

Tick (✓) **two** statements that are correct about these hydrocarbons.

Statement	Tick (✓)
decane has the largest molecules	
pentane is a liquid at 40°C	
methane and butane are gases at 20°C	
methane has the highest boiling point	
butane does **not** boil	

(2)

(b) Natural gas supplied to homes and schools is mainly methane.
The diagram shows an apparatus to investigate the two substances produced when natural gas burns completely in air.



(i) Name the liquid that collects in the U-tube. .....

(1)

(ii) Name the gas that turns the limewater cloudy .....

(1)

(c) Some crude oil contains sulfur. Petrol and diesel fuels are produced from crude oil.

The sulfur must be removed from these fuels before they are burned.

Explain why.

.....

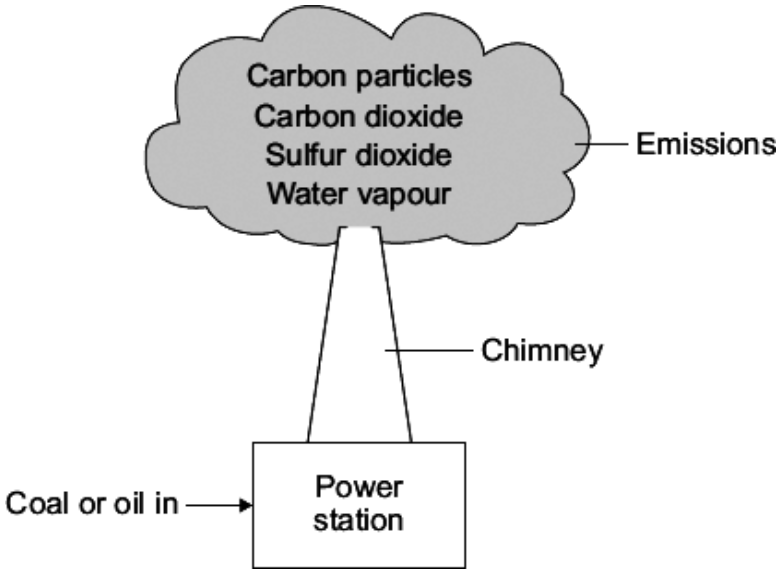
.....

.....

.....

(2)
(Total 6 marks)

Q24. In the future more coal-fired and fewer oil-fired power stations will be used to generate electricity.
When coal and oil are burned they produce the same types of emissions which can cause environmental problems.



(a) Emissions from the chimney can cause acid rain, global dimming and global warming.
Draw **one** straight line from each possible environmental problem to the emission that causes it.

Possible environmental problem	**Emission that causes it**
acid rain	carbon particles
global warming	carbon dioxide
global dimming	sulfur dioxide
	water vapour

.....

(3)

(b) Draw a ring around the correct word in the box to complete each sentence.

(i) Incomplete combustion of coal or oil is caused by too little

carbon dioxide.
nitrogen.
oxygen.

(1)

(ii) A gas formed by the incomplete combustion of coal or oil is

carbon monoxide.
hydrogen.
oxygen.

(1)

(c) The table shows the world production for both coal and oil in 2000.

The world production figures after 2000 are predicted.

Year	World production of coal (billions of tonnes per year)	World production of oil (billions of barrels per year)
2000	3.5	12.5
2050	4.5	5.6
2100	5.0	1.7
2150	5.5	0.5
2200	6.0	0.0

(i) How is the world production of oil predicted to change from 2000 to 2200?

.....

.....

(1)

(ii) Suggest **two** reasons why the world production of coal is predicted to increase.

1 .....

.....

2 .....

.....

(2)

(Total 8 marks)

Q25. Natural gas is mainly a hydrocarbon called methane.

(a) Use **one** word from the box to complete the sentence.

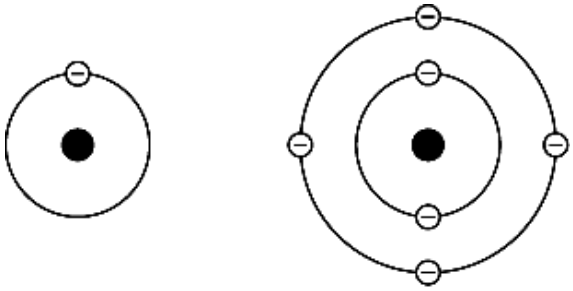
compounds	**elements**	**molecules**

Hydrocarbons contain hydrogen and carbon only.

Hydrogen and carbon are ..... .

(1)

(b) The diagrams represent atoms of hydrogen and carbon.



Hydrogen Carbon

Draw a ring around the correct answer to complete the sentences.

(i) The centre of each atom is called the

bond.

nucleus.

symbol.

(1)

(ii) The hydrogen atom has one electron and the carbon atom has

three

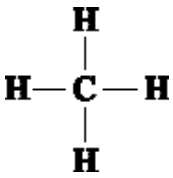
four

six

electrons.

(1)

(c) A molecule of methane can be represented as



Draw a ring around the correct answer to complete the sentences.

(i) The formula of methane is

CH
CH_4
C_4H_4

(1)

(ii) The line between C—H is called a

bond.
molecule.
nucleus.

(1)

(d) Methane burns to produce carbon dioxide (CO_2) and water (H_2O).

(i) Draw a ring around the correct answer to complete the sentence.

When methane burns it reacts with

carbon.
nitrogen.
oxygen.

(1)

(ii) Hydrogen (H_2) can be used as a fuel.

Suggest why burning hydrogen would be less harmful to the environment than burning methane.

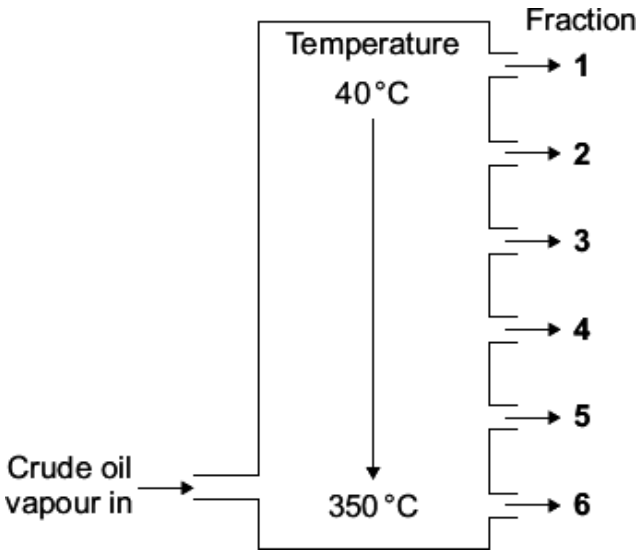
.....

.....

(1)

(Total 7 marks)

Q26. Crude oil is a mixture of hydrocarbons.
Crude oil can be separated into fractions.



(a) (i) Complete the sentence.

The process used to separate the crude oil into fractions is called

fractional ..... .

(1)

(ii) Why do the fractions separate at different temperatures?

.....

.....

(1)

(b) Tick (✓) **two** properties of fraction **6**.

Property	**Tick (✓)**
contains hydrocarbons	
has a small number of carbon atoms in each molecule	
is easy to ignite	
has a high boiling point	

(2)

(c) Fraction **1** contains hydrocarbons called alkanes.
The general formula of an alkane is: C_nH_{2n+2}

What is the formula of the alkane that has 5 carbon atoms in each molecule?

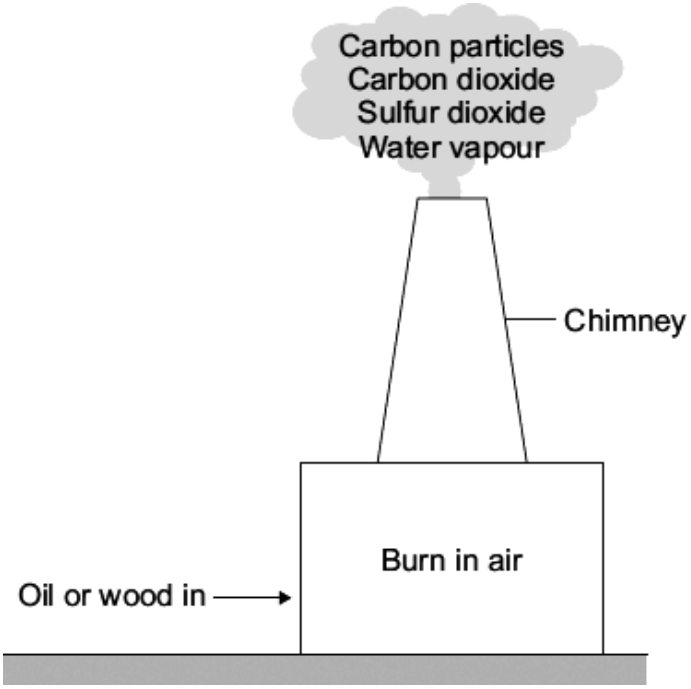
Draw a ring around the correct answer.

C_5H_9 C_5H_{10} C_5H_{11} C_5H_{12}

(1)
(Total 5 marks)

Q27. In the future:

- there will be fewer oil burning power stations
- there may be more wood burning power stations.



(a) Which **one** of the emissions from the chimney can cause acid rain?

.....

(1)

(b) Draw a ring around the correct answer to complete the sentence.

Carbon particles in the Earth's atmosphere cause

acid rain.
global dimming.
global warming.

(1)

(c) Which gas in the air is needed for oil or wood to burn?

.....

(1)

(d) Suggest why there will be **fewer** power stations burning oil in the future.

.....

.....

(1)

(e) Some power stations burn wood.
The wood comes from trees grown in forests.

Suggest why burning wood in power stations is said to be 'carbon-neutral'.

.....

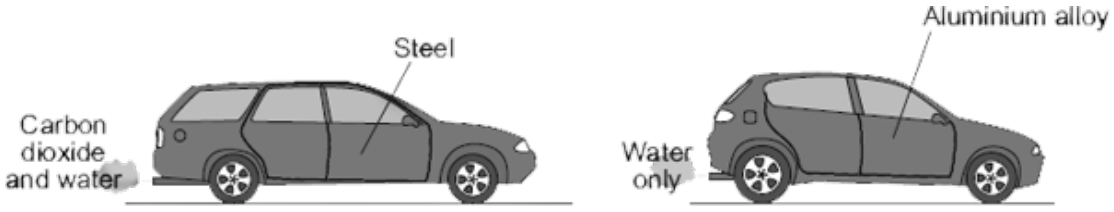
.....

.....

.....

(2)
(Total 6 marks)

Q28. The picture shows two different cars.



(a) Some properties of aluminium are given below.

Tick (✓) **two** reasons why aluminium is better than steel for car bodies.

Reason	Tick (✓)
Aluminium is not a transition metal.	
Aluminium has a low density.	
Aluminium is expensive to extract.	
aluminium is resistant to corrosion.	

(2)

(b) Each car body is made from an *alloy*.

(i) What is an *alloy*?

.....

.....

(1)

(ii) An alloy is used to make a car body. A pure metal is **not** used to make a car body.

Suggest why.

.....

.....

(1)

(c) The car with a steel body uses petrol for fuel.

Draw a ring around the correct answer to complete each sentence.

(i) Petrol is made from

air.
crude oil.
metal ores.

(1)

(ii) Petrol is a mixture of

carbonates
hydrocarbons
polymers

including C_8H_{18}

(1)

(iii) In the car engine petrol reacts with

argon
nitrogen
oxygen

to produce carbon dioxide and water.

(1)

(d) Look at the substances coming out of each car's exhaust.

(i) Suggest the name of the fuel used in the car with the aluminium alloy body.

Name of fuel ..... .

(1)

(ii) Why is the fuel burned in the car with the aluminium alloy body better for the environment than petrol?

.....

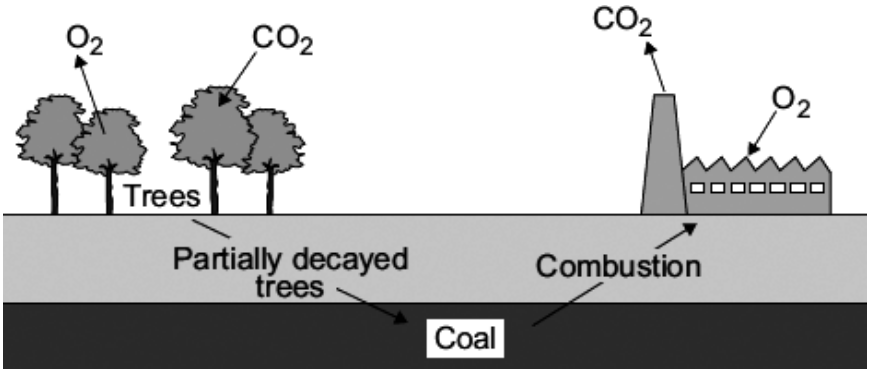
.....

(1)
(Total 9 marks)

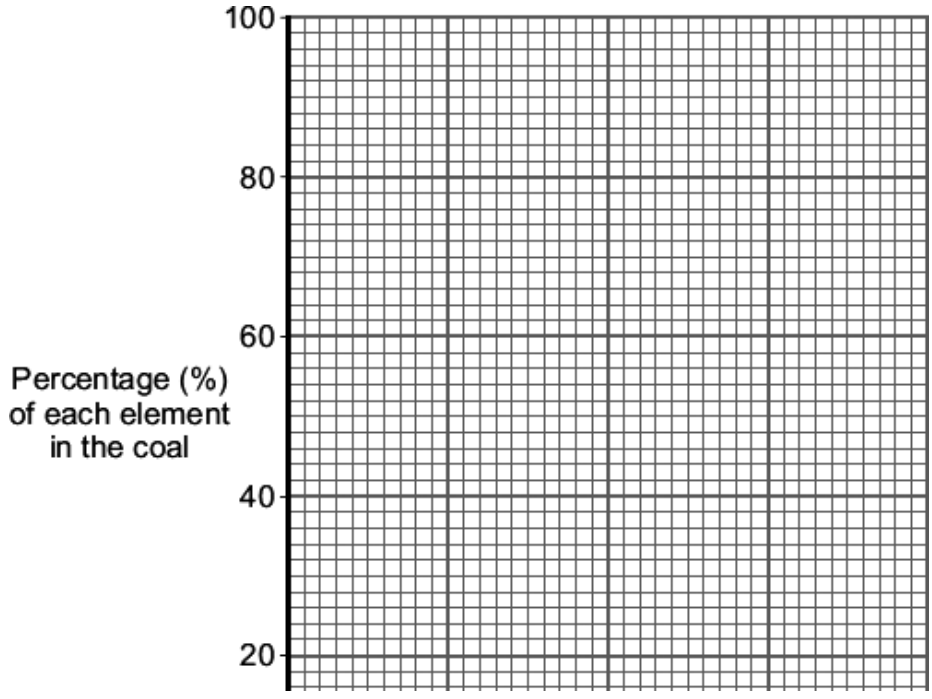
Q29. About 3000 million years ago carbon dioxide was one of the main gases in the Earth's early atmosphere.

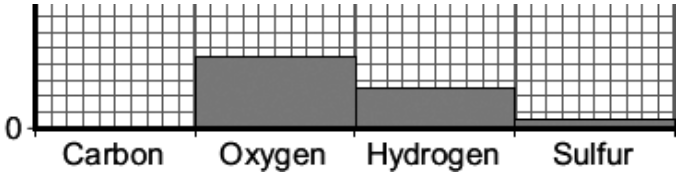
About 400 million years ago plants and trees grew on most of the land. When the plants and trees died they were covered by sand and slowly decayed to form coal.

Today coal is burned in power stations to release the energy needed by industry.



(a) The bar chart shows the percentage of some of the elements in this coal.





(i) This coal contains 85 % carbon. Draw the bar for carbon on the chart.

(1)

(ii) Coal is burned in the atmosphere to release energy.
Two of the products of burning coal are shown.

Draw **one** line from each product to its environmental impact.

Product	**Environmental impact**
Sulfur dioxide	Acid rain
Carbon particles	Global dimming
	Global warming

(2)

(b) Use the information above and your knowledge and understanding to answer these questions.

(i) How did the formation of coal decrease the amount of carbon dioxide in the Earth's early atmosphere?

.....

.....

(1)

(ii) How does burning coal affect the amount of carbon dioxide in the Earth's atmosphere?
Explain your answer.

.....

.....

.....

.....

(2)
(Total 6 marks)

Q30. Cement is made by heating a mixture of clay and limestone in a kiln.

(a) Many kilns are heated by burning natural gas (methane) in air.

A chemical equation for the burning of methane is:

$$CH_4 + 2O_2 \rightarrow 2H_2O + CO_2$$

Describe this reaction in words.

Give the names of the molecules **and** the numbers of each molecule in this chemical equation.

.....

.....

.....

.....

(2)

(b) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Limestone contains calcium carbonate.
There is a large deposit of limestone under an area of natural beauty.
A company wants to quarry this limestone and build a kiln near to the quarry to make cement.

Area of natural beauty

Evelyn Simak [CC-BY-SA-2.0], via Wikimedia Commons

A quarry

By Thomas Bjørkan (Own work) [CC-BY-SA-3.0], via Wikimedia Commons

Explosives will be used to extract the limestone out of the ground.
Heavy machinery will be used to lift and crush the limestone.
Lorries will be used to transport the limestone to the kiln to make cement.
The lorries and the heavy machinery will use diesel fuel.

Quarrying limestone and making cement will have an impact on everything near the area.

Describe the positive and the negative impacts of quarrying limestone and making cement.

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(6)
(Total 8 marks)

Q31. (a) Crude oil is a mixture of compounds.
These compounds are made up of hydrogen and carbon atoms only.

(i) Draw a ring around the correct answer to complete the sentence.

Compounds made up of carbon and hydrogen atoms only are called

alcohols.
hydrocarbons.
vegetable oils.

(1)

(ii) The table shows five of these compounds.

Compound	State at room temperature (20 °C)	Boiling point in °C
ethane, C_2H_6	gas	– 89
butane, C_4H_{10}	gas	0
hexane, C_6H_{14}	liquid	+69
pentadecane, $C_{15}H_{32}$	liquid	+270
heptadecane, $C_{17}H_{36}$	solid	+302

Tick (✓) **two** correct statements about the five compounds.

Statement	Tick (✓)
ethane has the smallest molecules	
hexane and pentadecane are liquid at 100 °C	
heptadecane has the highest boiling point	
butane boils at 100 °C	

(2)

(iii) Draw a ring around the correct answer to complete each sentence.

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

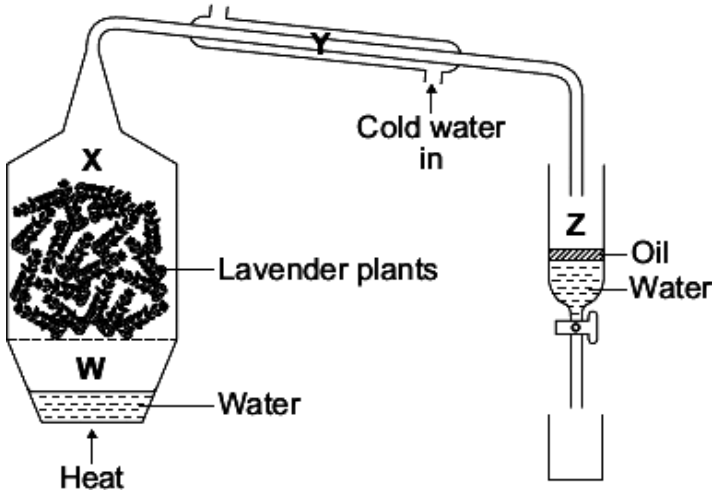
The first step in fractional distillation is [cracking / displacing / evaporating] the crude oil.

During fractional distillation the compounds [burn / condense / decompose] at different temperatures.

(2)

(b) Steam distillation is used to separate oils from plants.

The diagram shows some apparatus that can be used to separate oil from lavender plants. Four parts of the apparatus are labelled **W**, **X**, **Y** and **Z**.



(i) In which part, **W**, **X**, **Y** or **Z**, of the apparatus:

is steam produced ☐

are steam and oil condensed? ☐

(2)

(ii) Use the correct word from the box to complete the sentence.

dissolves	**floats**	**sinks**

When the oil separates from the water, the oil .....

(1)

(iii) Describe how part **Z** of the apparatus can be used to remove the water from the oil.

.....

.....

.....

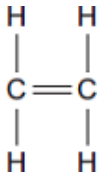
.....

(2)

(Total 10 marks)

Q32. Crude oil is used to make useful substances such as alkenes and plastics.

(a) The alkene shown is ethene.



(i) Tick (✓) the correct formula for ethene.

Formula	Tick (✓)
CH_4	
C_2H_4	
C_2H_6	

(1)

(ii) Tick (✓) the name of the plastic formed when many ethene molecules join together.

Name of plastic	Tick (✓)
Poly(ethene)	
Poly(ethenol)	
Poly(propene)	

(1)

(b) Read the article about plastics and then answer the questions.

THE PROBLEM WITH PLASTIC WASTE

Millions of tonnes of plastics are made from crude oil every year.

Most of the litter found on beaches is plastic waste.

80 % of plastics produced end up in landfill sites.

(i) Draw a ring around the correct answer in the box to complete the sentence.

Plastic waste needs to be removed from beaches because it

decomposes.
is reactive.
is not biodegradable.

(1)

(ii) Suggest a problem caused by 80 % of plastics going to landfill sites.

.....

.....

(1)

(iii) Suggest **one** way of reducing the amount of plastics going to landfill sites.

.....

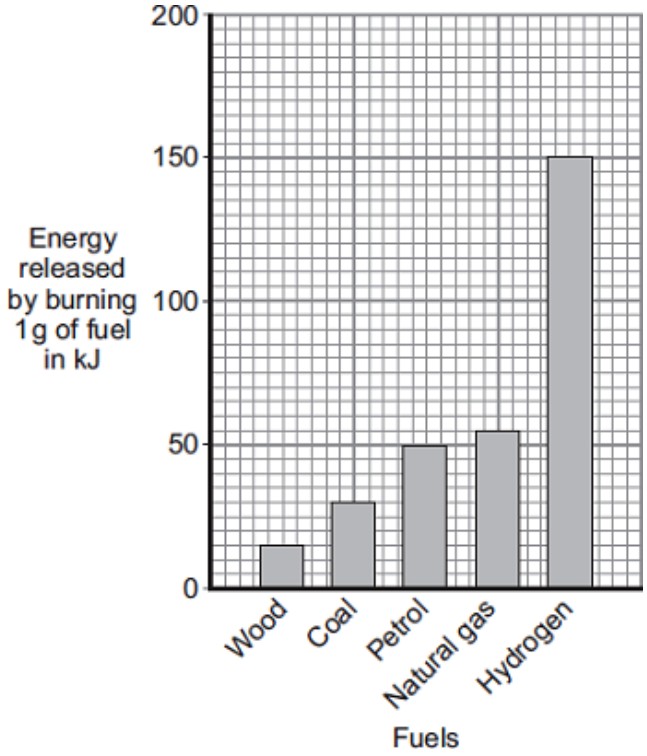
.....

(1)

(Total 5 marks)

Q33. Energy is released by burning fuels.

(a) The bar chart shows the energy in kilojoules, kJ, released by burning 1 g of five different fuels.



(i) Which fuel releases least energy by burning 1 g?

.....

(1)

(ii) How much energy is released by burning 1 g of coal?

Energy = ...kJ

(1)

(iii) Calculate the mass of petrol that will release the same amount of energy as 1 g of hydrogen.

Use information from the bar chart to help you.

.....

.....

Mass = ... g

(1)

(b) Coal burns in oxygen and produces the gases shown in the table.

Name	Formula
Carbon dioxide	CO_2
Water vapour	H_2O
Sulfur dioxide	SO_2

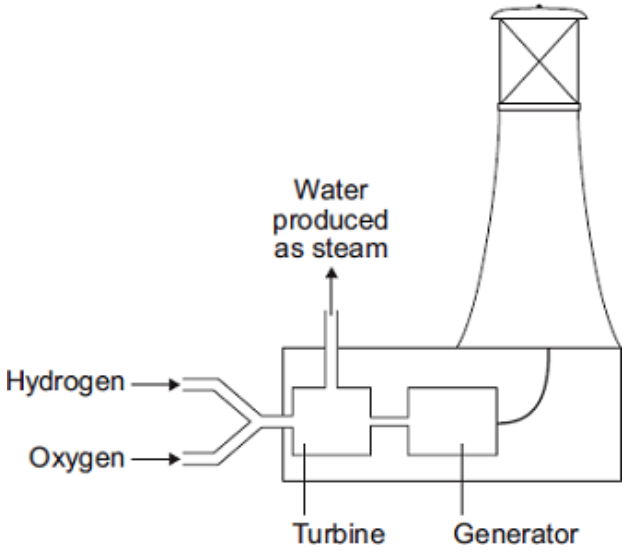
Use information from the table to name **one** element that is in coal.

.....

(1)

(c) Hydrogen can be made from fossil fuels.
Hydrogen burns rapidly in oxygen to produce water only.

A lighthouse uses electricity generated by burning hydrogen.



Suggest **two** advantages of using hydrogen as a fuel.

Use information from the bar chart and the diagram above to help you.

1 .....

.....

2 .....

.....

(2)
(Total 6 marks)

Q34. This question is about compounds produced from crude oil.

The table below shows four of these compounds.

Compound	Melting point in °C	Boiling point in °C
methane (CH_4)	−183	−164
ethene (C_2H_4)	−169	−104
decane ($C_{10}H_{22}$)	−30	+174
icosane ($C_{20}H_{42}$)	+37	+343

(a) Tick (✓) **two** correct statements about the four compounds.

Statement	Tick (✓)
Methane has the lowest melting point and icosane has the highest boiling point.	
Ethene and methane are alkanes.	
Methane and decane are gases at room temperature (20°C).	
Decane and icosane are liquid at 100°C.	

(2)

(b) Petrol contains a mixture of compounds, including octane (C_8H_{18}).

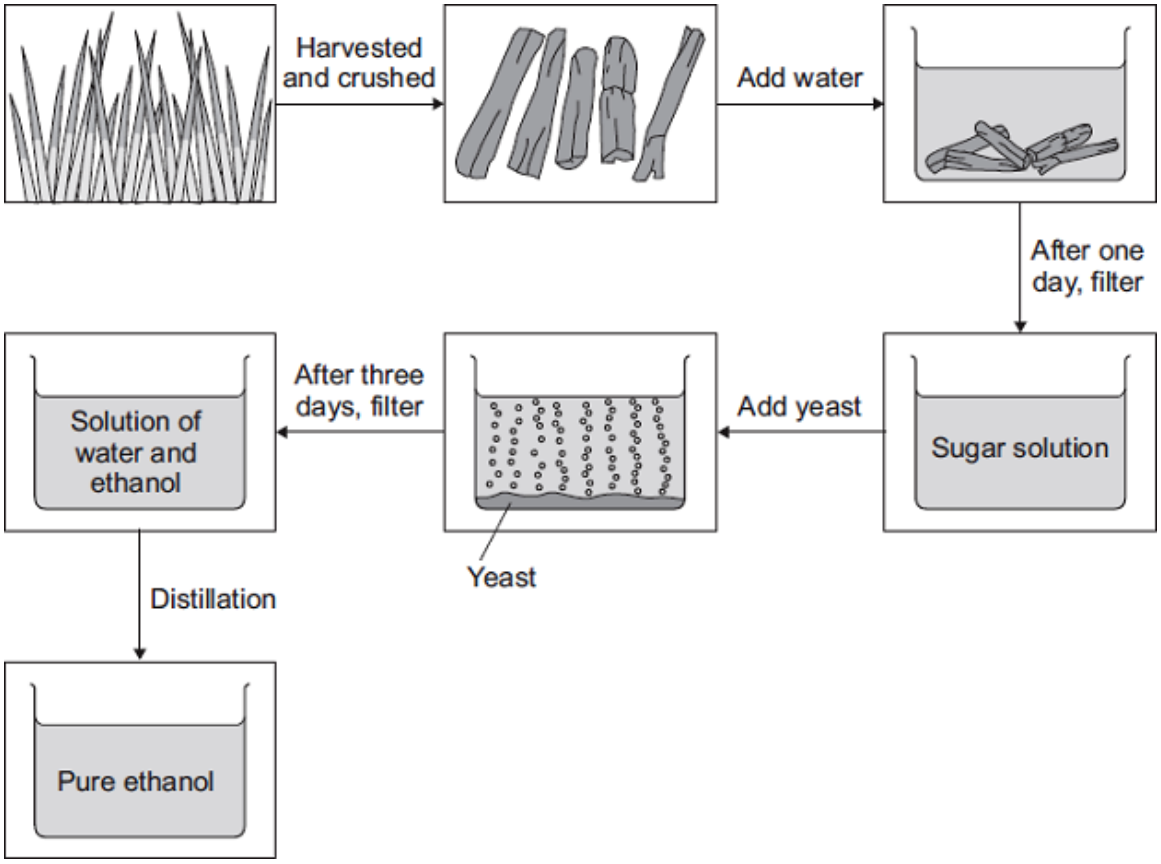
Complete the word equation for the complete combustion of octane.

octane + oxygen → ..... + ...

(2)

(c) Most petrol used in cars contains about 5% ethanol (C_2H_5OH).

Ethanol can be produced from sugar cane.



(i) Draw a ring around the correct answer to complete the sentence.

The reaction to produce ethanol from sugar solution is

combustion.
displacement.
fermentation.

(1)

(ii) Some people say that increasing the production of ethanol from sugar cane will be **good** for the environment.

Suggest **two** reasons why.

1 .....

.....

.....

2 .....

.....

.....

(2)

(iii) Other people say that increasing the production of ethanol from sugar cane will be **bad** for the environment.

Suggest **two** reasons why.

1 .....

.....

.....

2 .....

.....

.....

(2)
(Total 9 marks)

Q35. This question is about compounds produced from crude oil.

The table below shows four of these compounds.

Compound	Melting point in °C	Boiling point in °C
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ethene (C_2H_4)	−169	−104
decane ($C_{10}H_{22}$)	−30	+174
icosane ($C_{20}H_{42}$)	+37	+343

(a) Tick (✓) **two** correct statements about the four compounds.

Statement	Tick (✓)
Methane has the lowest melting point and icosane has the highest boiling point.	
Ethene and methane are alkanes.	
Methane and decane are gases at room temperature (20°C).	
Decane and icosane are liquid at 100°C.	

(2)

(b) Petrol contains a mixture of compounds, including octane (C_8H_{18}).

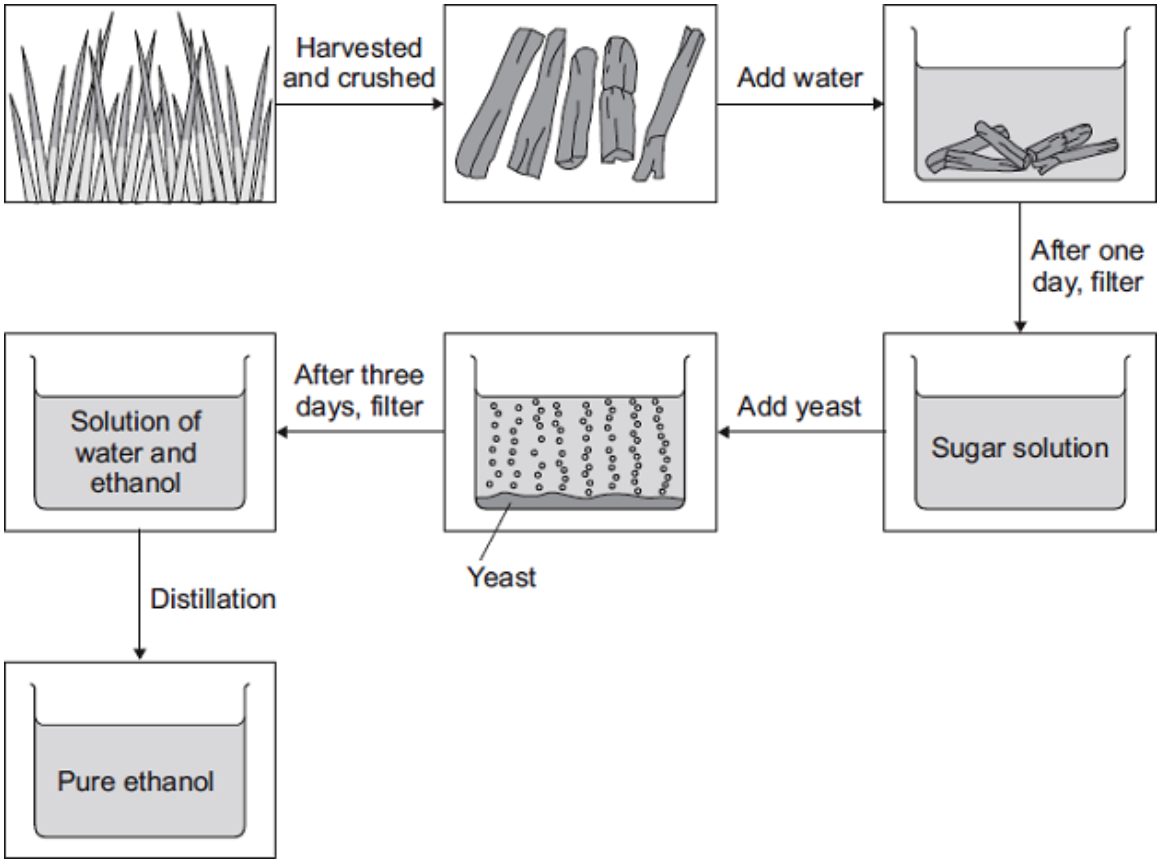
Complete the word equation for the complete combustion of octane.

octane + oxygen → ..... + ...

(2)

(c) Most petrol used in cars contains about 5% ethanol (C_2H_5OH).

Ethanol can be produced from sugar cane.



(i) Draw a ring around the correct answer to complete the sentence.

The reaction to produce ethanol from sugar solution is

combustion.
displacement.
fermentation.

(1)

(ii) Some people say that increasing the production of ethanol from sugar cane will be **good** for the environment.

Suggest **two** reasons why.

1 .....

.....

.....

2 .....

.....

.....

(2)

(iii) Other people say that increasing the production of ethanol from sugar cane will be **bad** for the environment.

Suggest **two** reasons why.

1 .....

.....

.....

2 .....

.....

.....

(2)
(Total 9 marks)