Q1. This question is about hydrocarbons.

(a) The names and formulae of three hydrocarbons in the same homologous series are:

Ethane	C_2H_6
Propane	C_3H_8
Butane	C_4H_{10}

The next member in the series is pentane.

What is the formula of pentane?

.....

(1)

(b) Which homologous series contains ethane, propane and butane?

Tick **one** box.

Alcohols ☐

Alkanes ☐

Alkenes ☐

Carboxylic acids ☐

(1)

(c) Propane (C_3H_8) is used as a fuel.

Complete the equation for the complete combustion of propane.

C_3H_8 + $5O_2$ → 3 ..... + 4 .....

(2)

(d) Octane (C_8H_{18}) is a hydrocarbon found in petrol.

Explain why octane is a hydrocarbon.

.....

.....

(2)

(e) The table below gives information about the pollutants produced by cars using diesel or petrol as a fuel.

Fuel	**Relative amounts of pollutants**		
	Oxides of Nitrogen	**Particulate matter**	**Carbon dioxide**
Diesel	31	100	85
Petrol	23	0	100

Compare the pollutants from cars using diesel with those from cars using petrol.

.....

.....

.....

.....

.....

.....

(3)

(f) Pollutants cause environmental impacts.

Draw **one** line from each pollutant to the environmental impact caused by the pollutant.

Pollutant	**Environmental impact caused by the pollutant**

	Acid rain
Oxides of nitrogen	Flooding
	Global dimming
Particulate matter	Global warming
	Photosynthesis

(2)
(Total 11 marks)

Q2. Crude oil is a fossil fuel.

(a) To make crude oil more useful it is separated into fractions.

Use the correct word from the box to complete each sentence.

boiling	**compound**	**decomposition**	**distillation**
filtration	**mixture**	**molecule**	

(i) Crude oil is a ..... of different substances.

(1)

(ii) The substances in crude oil have different

..... points.

(1)

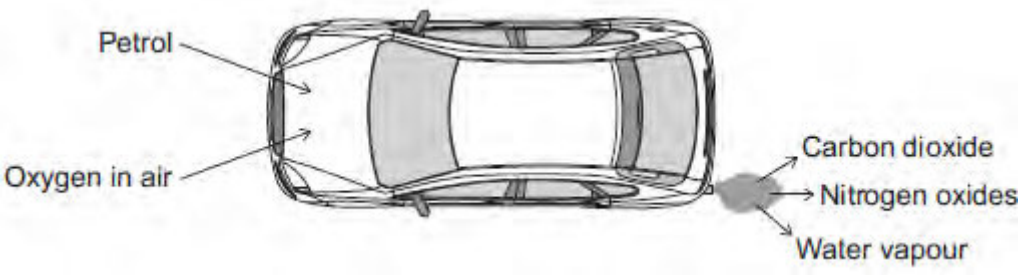
(iii) Crude oil is separated by fractional ..... .

(1)

(b) Petrol is one of the fractions produced from crude oil.

Car engines use a mixture of petrol and air.

The diagram shows some of the gases produced.



(i) What type of reaction happens to petrol in a car engine?

Tick (✓) **one** box.

combustion ☐

decomposition ☐

neutralisation ☐

(1)

(ii) Petrol contains octane (C_8H_{18}).

Complete the word equation for the reaction of octane with oxygen.

octane + ... ⟶ ..... + ...

(2)

(iii) Cars use sulfur-free petrol as a fuel.

Describe why sulfur should be removed from petrol.

.....

.....

.....

.....

(2)

(c) Some fractions from crude oil contain large hydrocarbon molecules.

These molecules can be cracked to produce smaller, more useful molecules.

An equation for cracking decane is:

$C_{10}H_{22}$ ⟶ C_3H_8 + C_2H_4 + C_5H_{10}

decane propane ethene pentene

(i) Why is propane useful?

Tick (✓) **one** box.

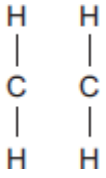
Propane is a polymer. ☐

Propane is an alloy. ☐

Propane is a fuel. ☐

(1)

(ii) Draw bonds to complete the displayed structure of ethene.



(1)

(iii) What is the colour change when bromine water reacts with ethene?

Tick (✓) **one** box.

Orange to colourless ☐

Orange to green ☐

Orange to red ☐

(1)

(iv) Complete the sentence.

Pentene is useful because many pentene molecules can join together

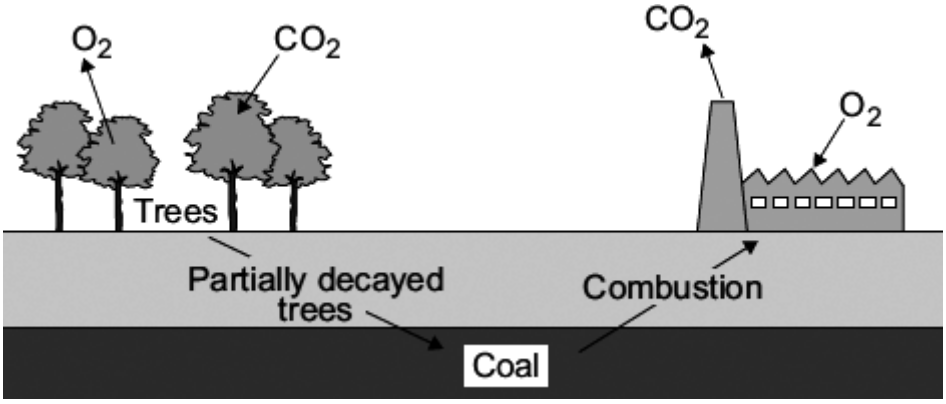
to form ..... .

(1)

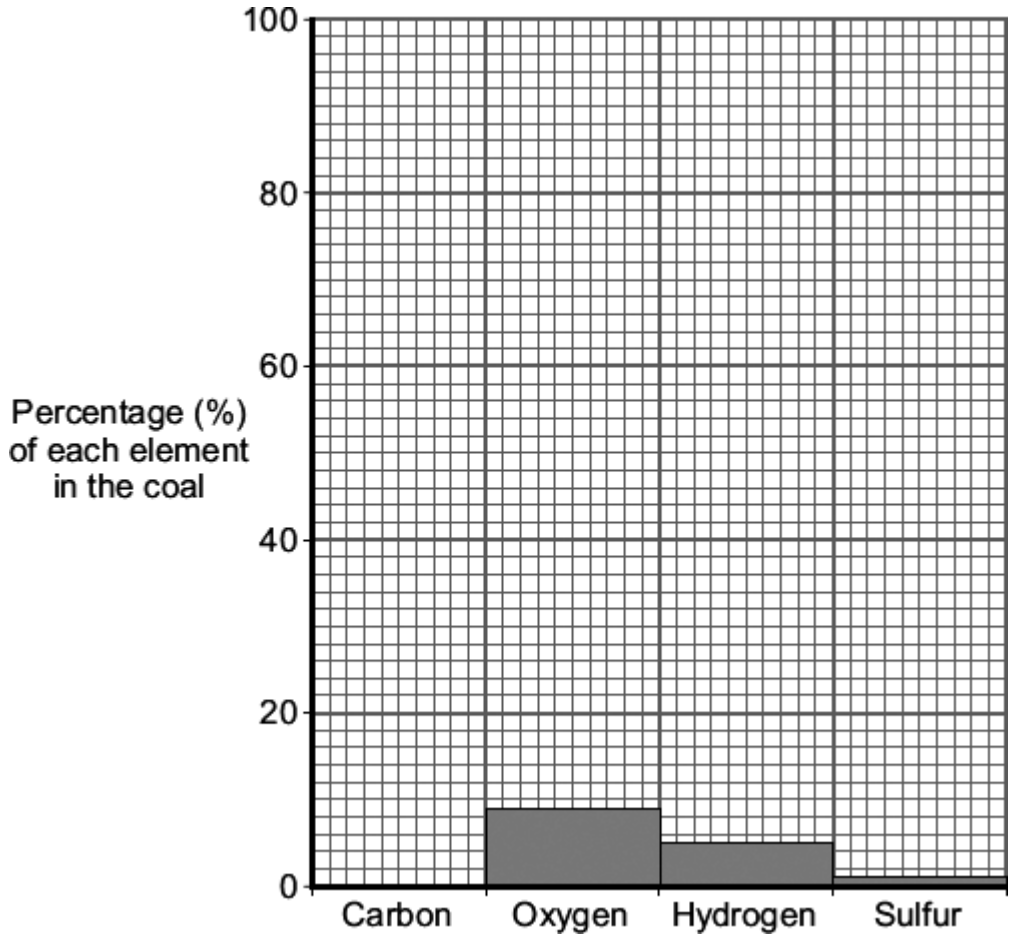
(Total 12 marks)

Q3. 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.

.....

.....

.....

.....

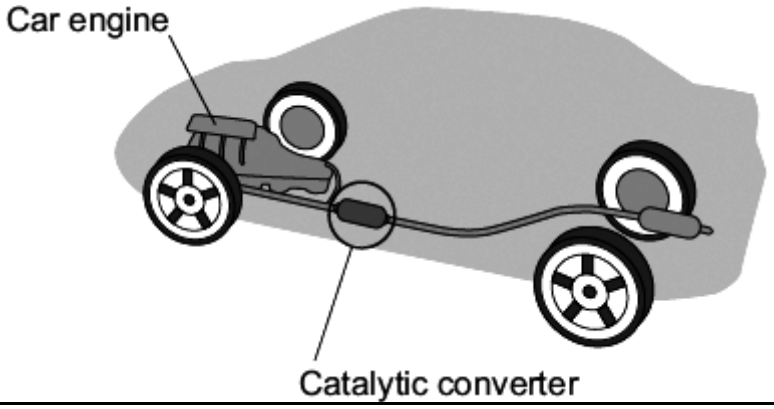
(2)
(Total 6 marks)

Q4. Read the information about car engines.

Burning petrol in air is an exothermic reaction. This reaction is used in car engines.

When petrol burns it produces harmful substances such as nitrogen oxides and carbon monoxide.

A catalytic converter stops these harmful substances being released into the air.



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

(i) The exothermic reaction makes the temperature of the engine

decrease.

increase.

stay the same.

(1)

(ii) This is because during exothermic reactions

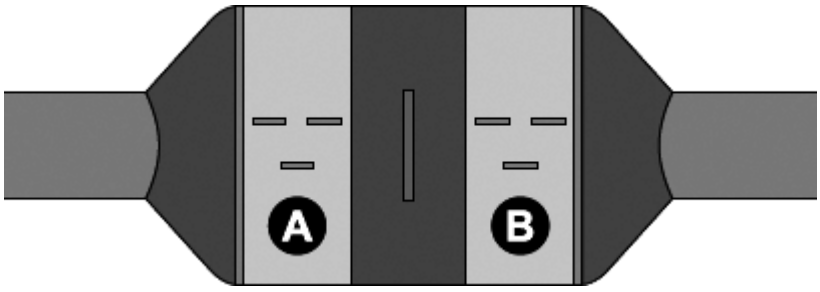
energy is taken in from the surroundings.

energy is given out to the surroundings.

there is no energy change.

(1)

(b) The diagram shows a catalytic converter which removes harmful substances.
The catalytic converter has two parts, **A** and **B**, which contain different catalysts.



(i) The equation for the reaction that takes place in part **A** is:

$2NO \rightarrow N_2 + O_2$

Which **one** of the substances shown in the equation is a compound?

Give the formula of this compound.

.....

(1)

(ii) The equation for the reaction that takes place in part **B** is:

$2CO + O_2 \rightarrow 2CO_2$

Why is it important to stop carbon monoxide (CO) from being released into the air?

.....

.....

(1)

(c) The table lists some statements about catalysts. Only **two** statements are correct.

Tick (✓) the **two** correct statements.

Statement	Tick (✓)
A catalyst can speed up a chemical reaction.	
A catalyst is used up in a chemical reaction.	
Different reactions need different catalysts.	
A catalyst does **not** change the rate of a chemical reaction.	

(2)

(d) Modern catalytic converters contain nanosized particles of catalyst.
Less catalyst is needed when nanosized catalyst particles are used.

(i) Complete the sentence.

The size of nanosized particles is ..... than normal sized particles.

(1)

(ii) The catalysts contain platinum.

Suggest why a manufacturer of catalytic converters would want to use less catalyst.

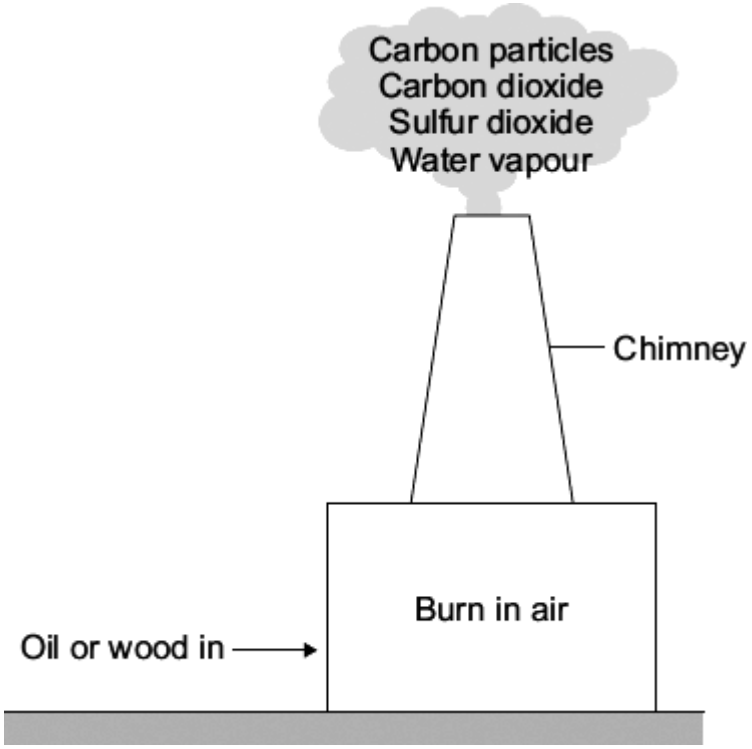
.....

.....

(1)
(Total 8 marks)

Q5. 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'.

.....

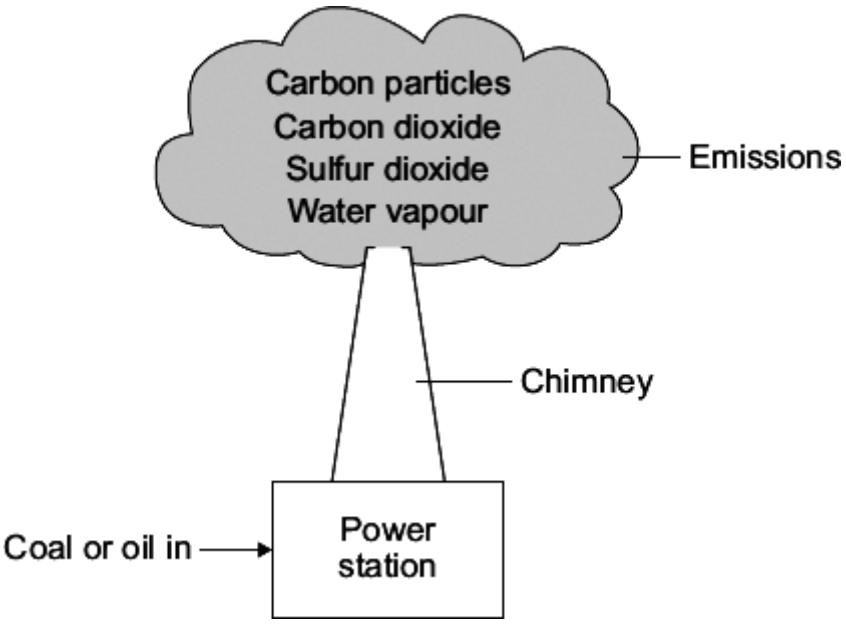
.....

.....

.....

(2)
(Total 6 marks)

Q6. 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 .....

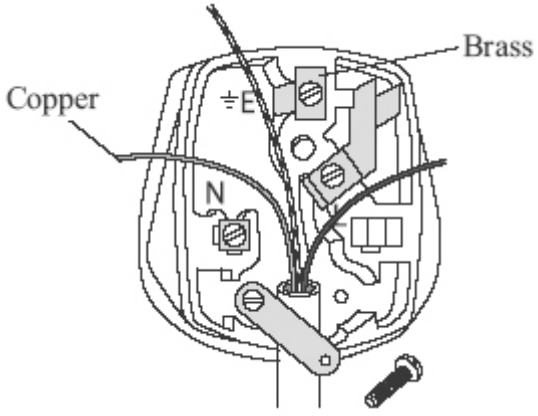
.....

2 .....

.....

(2)
(Total 8 marks)

Q7. Copper metal is used for electric wires.
An alloy of copper, called brass, is used for pins and terminals of electric plugs.



(a) Copper metal is relatively soft and flexible.

Give another reason why copper is used for electric wires.

.....

.....

(1)

(b) Brass is an *alloy*.

What is an *alloy*?

.....

.....

(1)

(c) Open-cast mining of copper ore makes a very large hole.



(i) Suggest **one** environmental problem that is caused by open-cast mining of copper ore.

.....

.....

(1)

(ii) Some copper ores contain copper sulfide, CuS.

Copper sulfide is heated in air to produce copper and sulfur dioxide.

$$CuS + O_2 \rightarrow Cu + SO_2$$

Suggest **one** environmental problem caused by heating copper sulfide in air.

.....

.....

(1)

(d) The amount of copper-rich ores is estimated to last only a few more years. New houses

need several kilometres of copper wire.

(i) Explain why the need to use so much copper will cause a problem in the future.

.....

.....

(1)

(ii) Suggest **two** ways in which society could overcome this problem.

1 .....

.....

2 .....

.....

(2)

(Total 7 marks)