

THE ATMOSPHERE 1

Q1. Many human activities result in carbon dioxide emissions. Our carbon footprint is a measure of how much carbon dioxide we each cause to be produced.

(a) Why should we be concerned about our carbon footprint?

(1 mark)

(b) Most power stations in the UK burn coal. Coal was formed from tree-like plants over millions of years. Suggest why burning wood instead of coal would help to reduce our carbon footprint.

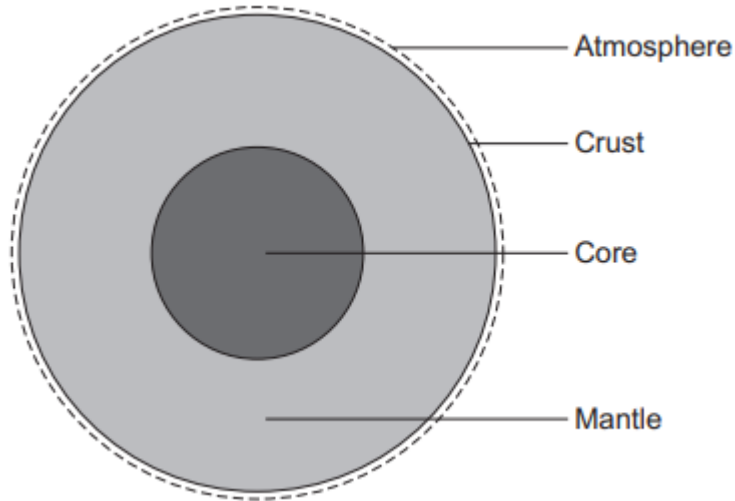
(3 marks)

Q2. In the UK copper is produced from imported blister copper (98% pure), which has been extracted from copper ores. In the first stage of purification, air is blown into molten blister copper to remove any sulfur.

The sulfur reacts to form a gas that should not be allowed to escape into the atmosphere. Explain why.

(2 marks)

Q3. The Earth has a layered structure and is surrounded by an atmosphere.

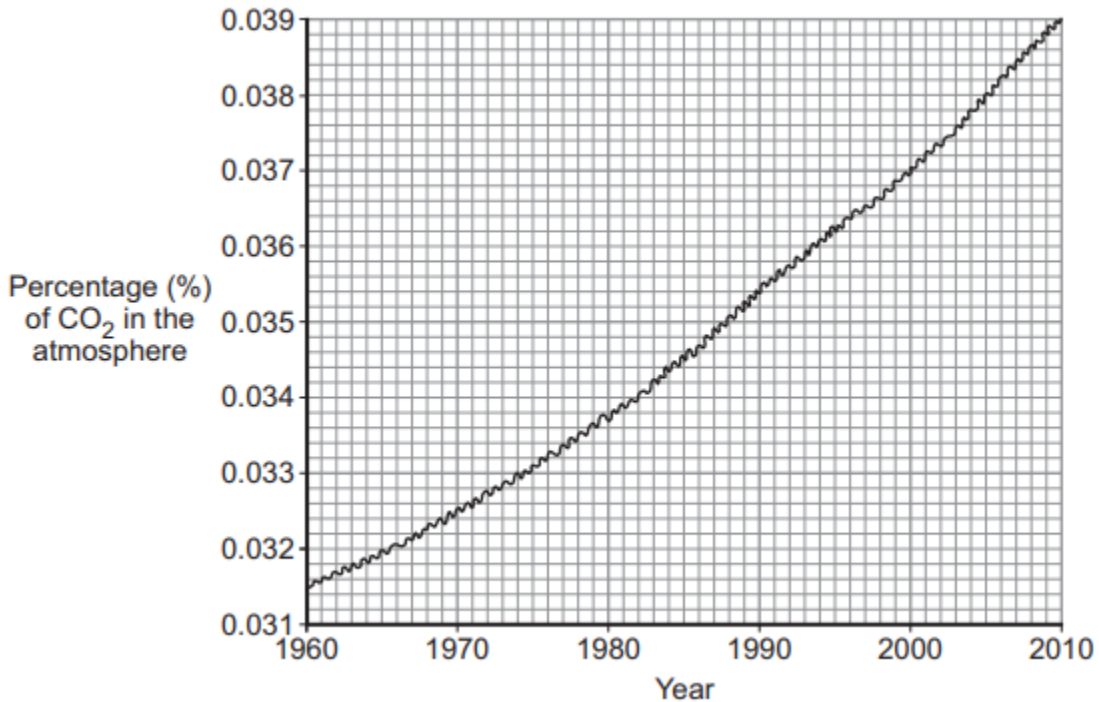


Scientists believe that the Earth's atmosphere was formed by volcanoes releasing gases. This early atmosphere was about 95 % carbon dioxide. The composition of the Earth's atmosphere is always changing.

(a) The Earth's atmosphere today contains about 0.035% carbon dioxide. What happened to most of the carbon dioxide that was in the Earth's early atmosphere?

(2 marks)

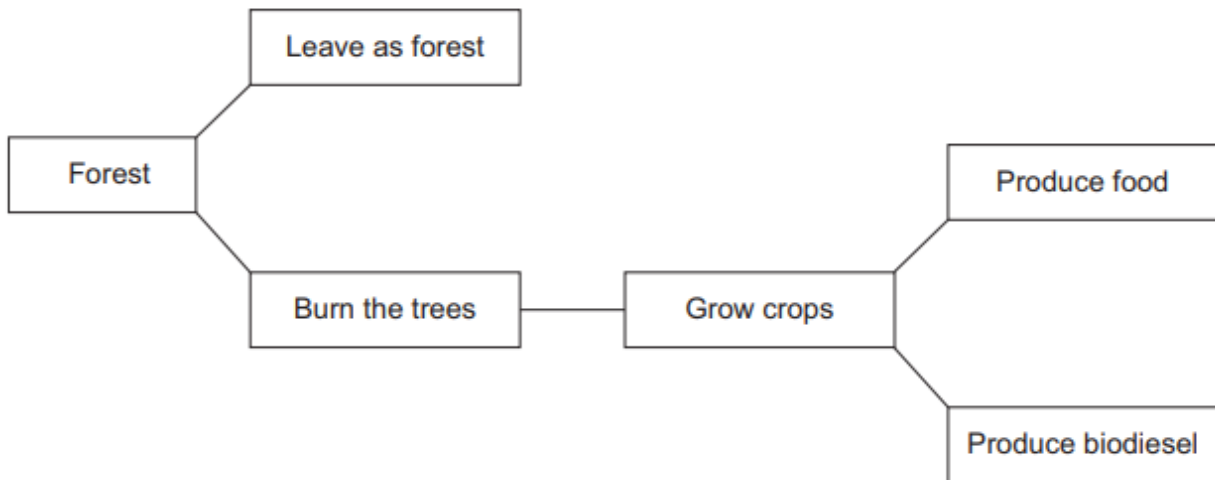
(b) The graph shows the percentage of carbon dioxide in the Earth's atmosphere over the last 50 years.



Explain, as fully as you can, why we should be concerned about the information displayed on this graph.

(3 marks)

Q4. Petroleum diesel is a fuel made from crude oil. Biodiesel is a fuel made from vegetable oils. To make biodiesel, large areas of land are needed to grow crops from which the vegetable oils are extracted. Large areas of forest are cleared by burning the trees to provide more land for growing these crops.



Use this information and your knowledge and understanding to answer these questions.

(i) Carbon neutral means that there is no increase in the amount of carbon dioxide in the atmosphere.

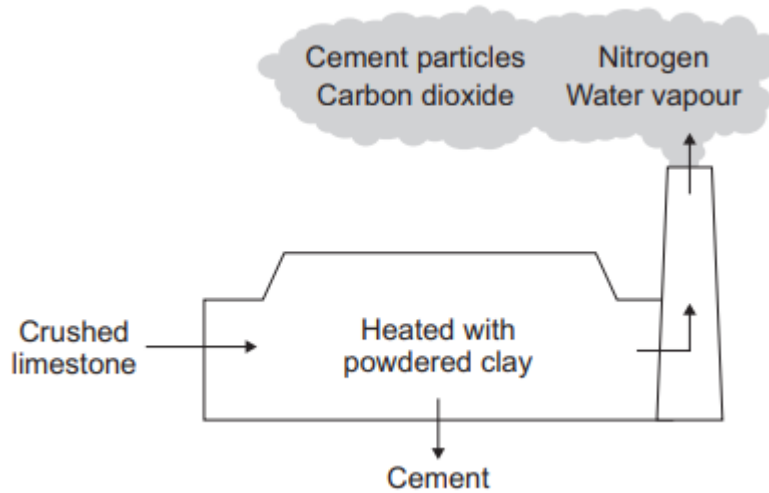
Suggest why adverts claim that using biodiesel is carbon neutral.

(2 marks)

(ii) Explain why clearing large areas of forest has an environmental impact on the atmosphere.

(2 marks)

Q5. The diagram shows some of the substances used and produced at a cement works.



Name one of the substances produced at the cement works that causes atmospheric pollution.
State one effect of this atmospheric pollution.

(2 marks)

Q6. Scientists study the atmosphere on planets and moons in the Solar System to understand how the Earth's atmosphere has changed.

(a) Millions of years ago the Earth's atmosphere was probably just like that of Mars today. The table shows data about the atmosphere of Mars and Earth today.

Mars today		Earth today	
nitrogen	3%	nitrogen	78%
oxygen	trace	oxygen	21%
water	trace	water	trace
Carbon dioxide	95%	Carbon dioxide	trace
Average surface temperature -23°C		Average surface temperature 15°C	

The percentages of some gases in the Earth's atmosphere of millions of years ago have changed to the percentages in the Earth's atmosphere today. For two of these gases describe how the percentages have changed and suggest what caused this change.

(2 marks)

(b) Titan is the largest moon of the planet Saturn. Titan has an atmosphere that contains mainly nitrogen. Methane is the other main gas.

Main gases in Titan's atmosphere	Percentage (%)	Boiling point in °C
Nitrogen	95	-196
Methane	5	-164
Average surface temperature -178°C		

When it rains on Titan, it rains methane! Use the information above and your knowledge and understanding to explain why.

(2 marks)

Q7. Copper is a suitable material to use for hot water pipes.
PEX is now used as an alternative material for hot water pipes.

Copper is extracted from its ore by a series of processes.

1. The low-grade copper ore is powdered and concentrated.
2. The concentrated powdered copper ore is blown into a furnace with air to produce impure, molten copper. (This furnace is heated to 1100°C using a hydrocarbon fuel.)
3. Oxygen is blown into the impure, molten copper to remove any sulfur. The molten copper is cast into rectangular slabs.
4. The final purification of copper is done by electrolysis.

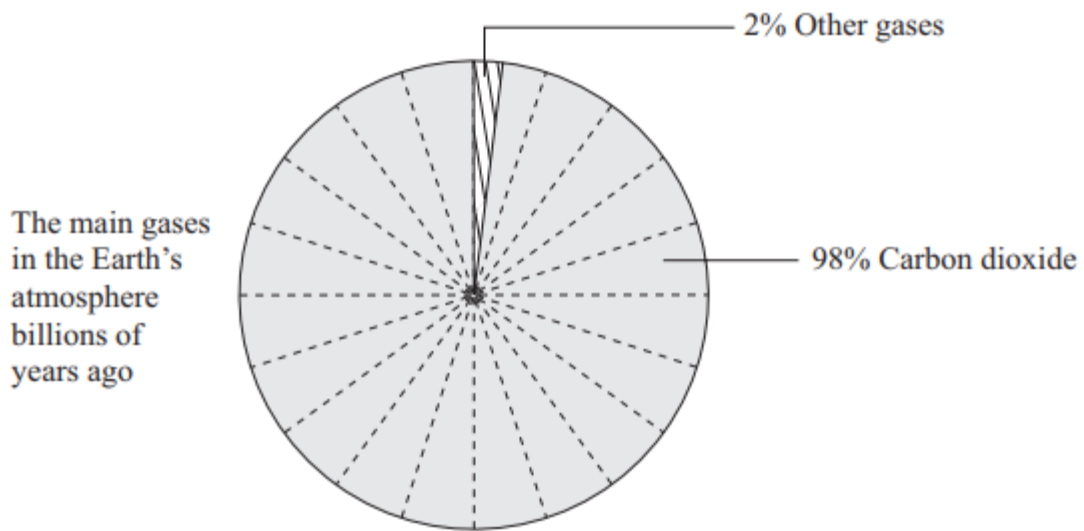
PEX is made from crude oil by a series of processes:

1. fractional distillation of crude oil
2. cracking of naphtha fraction
3. polymerisation of ethene
4. conversion of poly(ethene) into PEX.

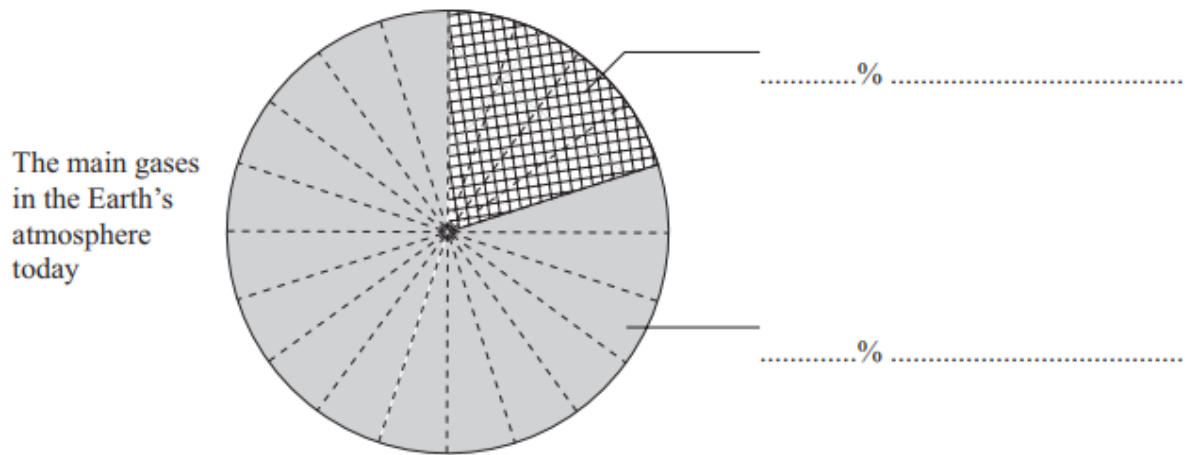
Use the information above and your knowledge and understanding to suggest possible environmental advantages of using PEX instead of copper for hot water pipes.

(4 marks)

Q8. Life on Earth would not exist without the atmosphere. Billions of years ago the composition of the Earth’s atmosphere was very different from the composition today.



(a) Label the pie chart below to show the percentages and names of the two main gases in the Earth's atmosphere today.



(2 marks)

(b) Excess carbon dioxide should be prevented from entering the atmosphere. Explain why.

(2 marks)

Q9. Since 2000 there has been a lot more research into alternative, environmentally friendly fuels for road transport.

Several pollutants are found in the exhaust emissions produced when fossil fuels are used for road transport.

Carbon monoxide (CO) interferes with the way that red blood cells carry oxygen. Carbon dioxide (CO₂) increases the level of carbon dioxide in the atmosphere and causes global warming.

Oxides of nitrogen (NO_x) are produced at high temperatures when nitrogen and oxygen from the atmosphere combine.

Sulfur dioxide (SO₂) is produced when sulfur impurities in the fuel combine with oxygen in the atmosphere.

Tiny particles of solids are produced when the fuel does not burn completely.

This increases the level of particulates (PM10) in the atmosphere.

(a) Name the environmental effect caused by:

(i) oxides of nitrogen (NO_x) and sulfur dioxide (SO₂)

(1 mark)

(ii) the increased level of particulates (PM10).

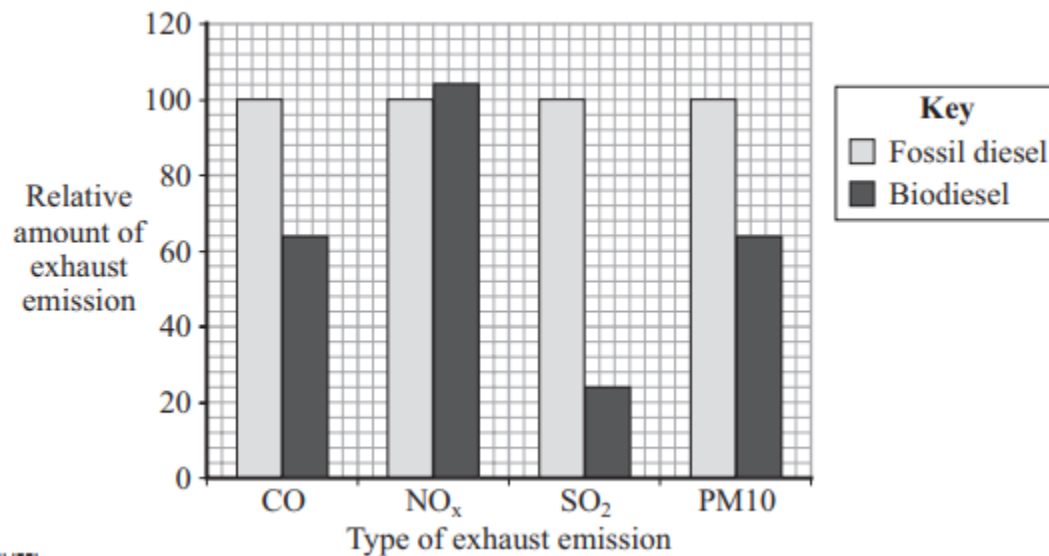
(1 mark)

(b) Diesel obtained from crude oil is often called fossil diesel.

Biodiesel can be made from many vegetable oils.

One research project compared the exhaust emissions when fossil diesel or biodiesel were used as fuels.

Some of the relative amounts of these exhaust emissions are shown in the bar chart.



(i) Use your knowledge and the information opposite to explain the environmental benefits of using biodiesel as a sustainable, low pollution fuel.

(3 marks)

(ii) Biodiesel is called a green fuel. This is because the life-cycle emission of carbon dioxide from biodiesel is less than that from fossil diesel. Use your knowledge and the information opposite to explain why biodiesel's contribution to global warming is considered to be much less than that of fossil diesel.

(3 marks)

Q10. Read the article and then answer the question.

(4 marks)

Total marks (41)