1 (a) The table shows possible percentages of some of the gases in the Earth's early atmosphere.

gas	percentage in early atmosphere (%)
oxygen	small amount
nitrogen	small amount
carbon dioxide	12
water vapour	77

(i) Some time after the early atmosphere had been formed, oceans appeared on the Earth's surface.

State how these oceans were formed.

(1)

....

....

(ii) The amount of carbon dioxide in today's atmosphere is much lower than that in the early atmosphere.

State how the formation of the oceans caused this reduction.

(1)

....

....

(iii) The amount of oxygen in today's atmosphere is much higher than that in the early atmosphere.

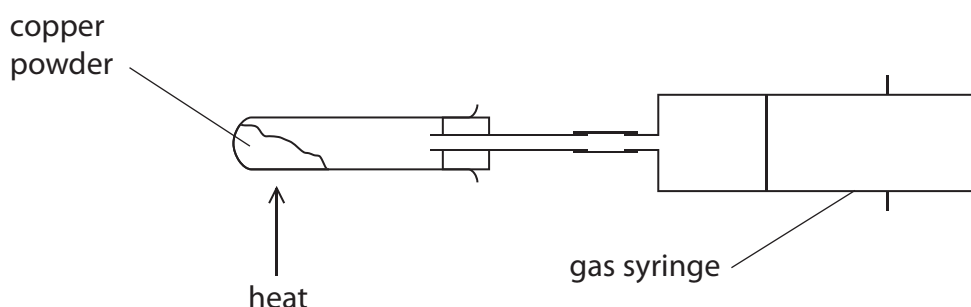Describe the process that has caused this increase.

(2)

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....

(b) John was doing an experiment to find the percentage of oxygen in air at room temperature. He used this apparatus.

copper powder

gas syringe

heat

The copper powder in the test tube was heated strongly so that it could react with oxygen in the air in the apparatus.
John stopped heating the copper when there was no further change in the reading on the gas syringe.

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

At the end of the experiment the apparatus was allowed to cool before the final reading on the syringe was recorded.

This is because

(1)

☒ **A** reading the volume while the apparatus is hot is dangerous

☒ **B** the apparatus must be left to allow the reaction to finish

☒ **C** the gas must be at room temperature when its volume is measured

☒ **D** the copper expands when it is hot

(ii) At the end of the experiment not all of the copper had reacted.

Suggest a reason for this.

(1)

....

....

(iii) John's results were
initial volume of gas in syringe = 32 cm^3
final volume of gas in syringe   = 24 cm^3

Calculate the percentage decrease in the volume of gas originally in the syringe.

(2)

....

....

....

percentage decrease = ...

(iv) The percentage of oxygen in air at room temperature is 21%.
John thought the answer to part (iii) was the percentage of oxygen in air and was surprised that the value was too high.

John confirmed that he had not made an error when doing his experiment.
Suggest why the answer calculated in part (iii) is higher than John expected.

(1)

....

....

....

(Total for Question 1 = 9 marks)

2 (a) Which of these shows the relative amounts of carbon dioxide and oxygen in the Earth's early atmosphere?

(1)

Put a cross (☒) in the box next to your answer.

☒ **A** large amount of carbon dioxide and large amount of oxygen

☒ **B** large amount of carbon dioxide and small amount of oxygen

☒ **C** small amount of carbon dioxide and large amount of oxygen

☒ **D** small amount of carbon dioxide and small amount of oxygen

(b) The concentration of carbon dioxide in the Earth's atmosphere depends on the balance between the processes that remove carbon dioxide from the atmosphere and those that release carbon dioxide into the atmosphere.

(i) Explain how carbon dioxide is removed from the atmosphere.

(2)

....

....

....

....

....

(ii) Explain how carbon dioxide is released into the atmosphere.

(2)

....

....

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(c) Describe the test to show that a gas is carbon dioxide.

(2)

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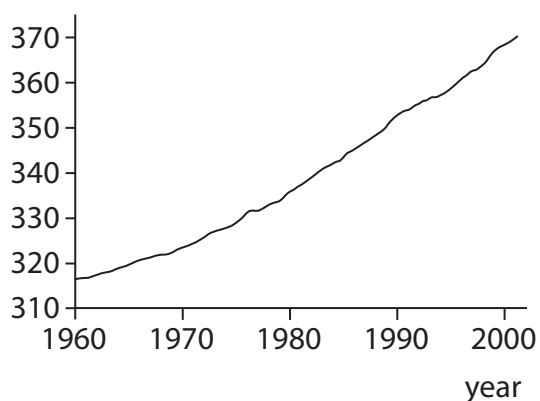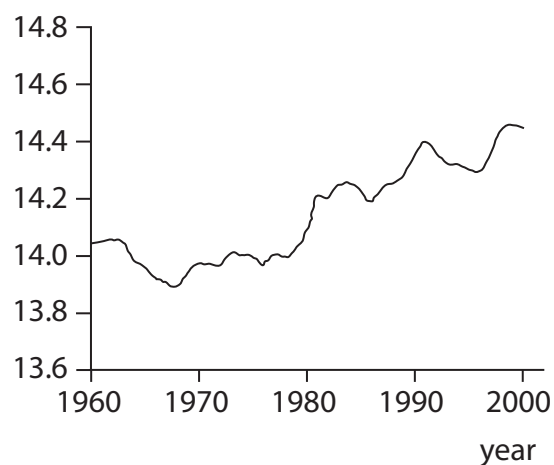
(d) The graphs show the concentration of carbon dioxide in the atmosphere and the mean global temperature between 1960 and 2000.

Explain whether or not these graphs provide evidence that human activity is causing the Earth's temperature to rise.
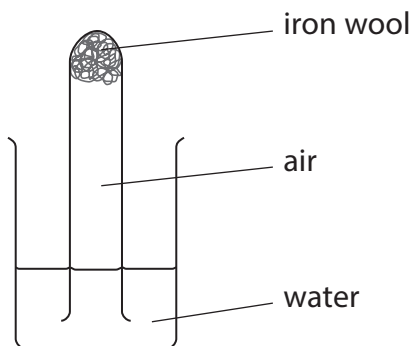
(3)

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(Total for Question 2 = 10 marks)

3 (a) Iron reacts with oxygen to form iron oxide. Iron wool was placed in the bottom of a wet test tube.

The test tube was then put in a beaker of water as shown in the diagram.

After some time the water level in the test tube rose and some of the iron wool had formed iron oxide.

(i) Write the word equation for the reaction of iron with oxygen.

(1)

....

(ii) Explain why the water level in the test tube rose during the experiment.

(2)

....

....

....

(iii) The volume of air in the test tube at the start of the reaction was 10 cm^3.

Calculate the volume of gas that should be present in the test tube at the end of the reaction.

(2)

....

....

....

answer = ...

(iv) Complete the sentence by putting a cross ☒) in the box next to your answer.

Most of the gas remaining in the test tube at the end of the experiment
would be **(1)**

☒

☒ **A** argon

☒ **B** carbon dioxide

☒ **C** nitrogen

D oxygen

(b) Several processes change the composition of the Earth's atmosphere.

Explain how the use of fossil fuels affects the composition of the atmosphere.

(2)

....

....

....

....

(Total for Question 3 = 8 marks)