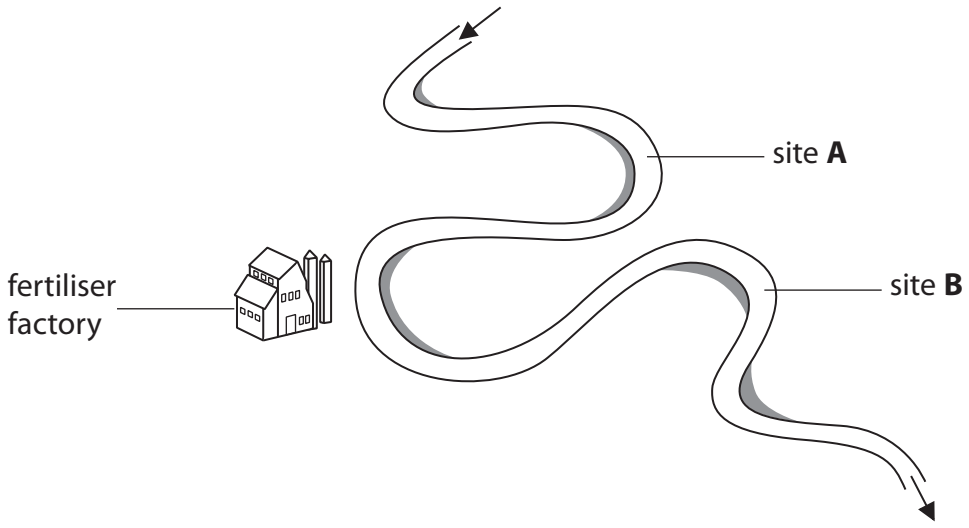
1 The diagram shows a river and the location of a fertiliser factory.

The arrows indicate the direction of the flow of the river.



A scientist recorded the nitrate concentrations of the water at site **A** and site **B**.

Her results are shown in the table.

site	nitrate concentration / mg per dm^3			
	sample 1	**sample 2**	**sample 3**	**mean**
A	17	25	18	20
B	49	64	58	

(a) (i) Calculate the mean nitrate concentration found at site **B**.

(2)

answer = ... mg per dm^3

(ii) The scientist observed algae and some dead fish in the river at site **B**.

These were not present at site **A**.

Give an explanation for these observations.

(4)

*(b) Scientists observe living organisms in an environment to assess the level of pollution.

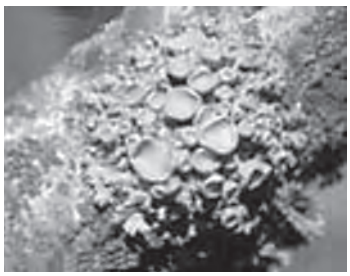
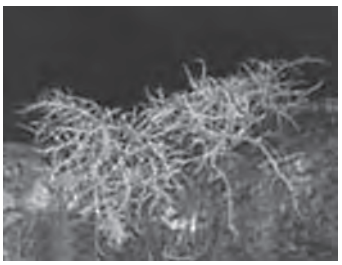
Describe how the level of water pollution and air pollution can be assessed using living organisms.

(6)

(Total for Question 1 = 12 marks)

2 (a) The photographs show three species of lichen.

Each species can tolerate different concentrations of pollutants present in the air.

species 1	**species 2**	**species 3**
		
tolerant to oxides of nitrogen	tolerant to oxides of sulfur	not tolerant to oxides of nitrogen or sulfur

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

Lichens are examples of

(1)

☒ **A** living indicators

☒ **B** pathogens

☒ **C** pollutants

☒ **D** vectors

(ii) Explain which one of these species is most likely to be found near a coal-burning power station.

(2)

.....

.....

.....

.....

(b) Plants cannot use nitrogen directly from the air but need it to make proteins.

Explain how plants get the nitrogen they need to make protein.

(3)

*(c) Explain how an increase in the production of pollutants can be due to an increase in human population.

Include both air and water pollution in your answer.

(6)

(Total for Question 2 = 12 marks)

3 Figure 1 shows the times when *Homo sapiens* and some of their ancestral species are thought to have lived.

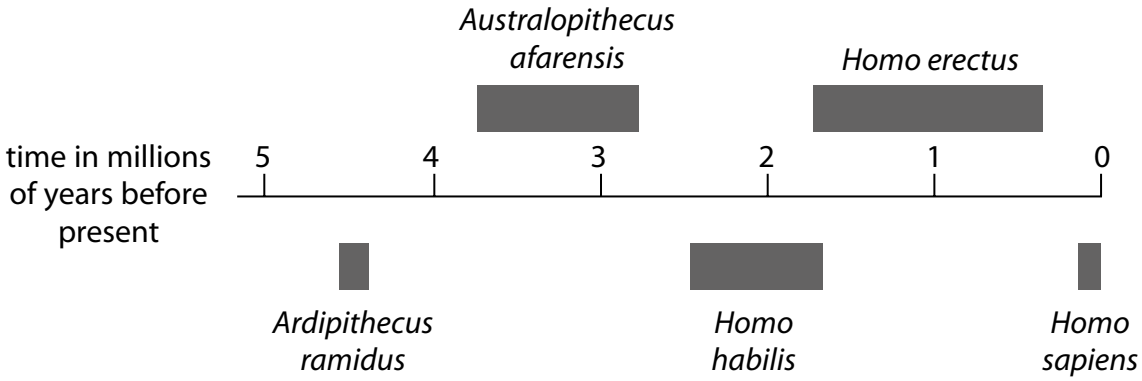


Figure 1

(a) Fossil remains of *Ardipithecus ramidus* were discovered in Ethiopia.

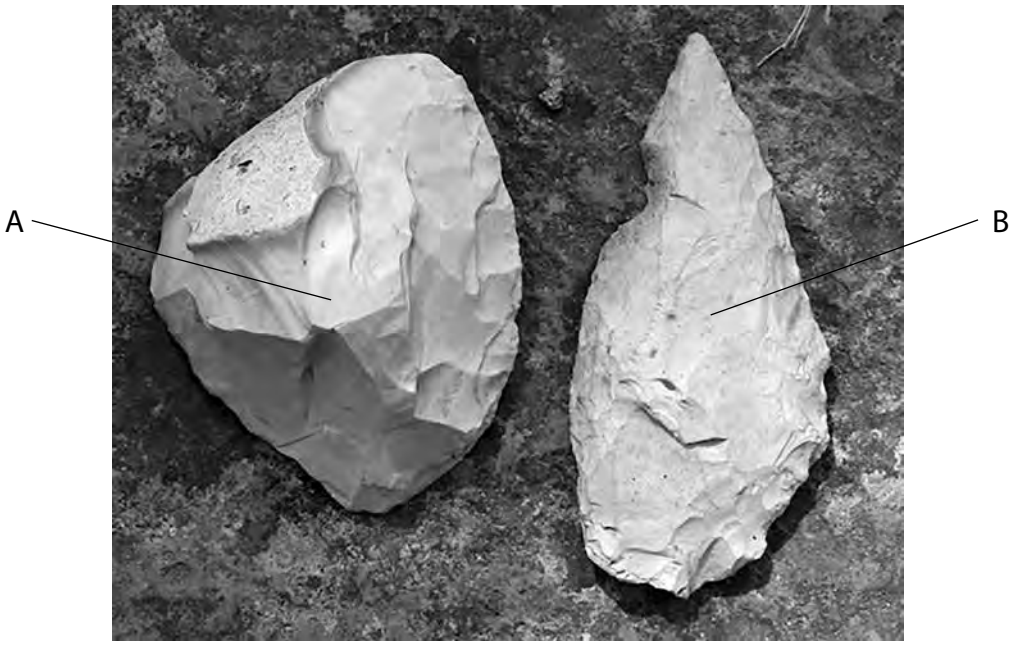
(i) Describe the evidence that scientists might have used to show that *Ardipithecus ramidus* inhabited the Earth earlier than *Homo habilis*.

(2)

(ii) Suggest an explanation for the extinction of *Homo habilis*.

(2)

(iii) Figure 2 shows two stone tools, one used by *Homo habilis* and one used by *Homo erectus*.



(Source: Frederic Surmely/look at sciences/Science Photo Library)

Figure 2

Explain which stone tool was most likely to be used by *Homo erectus*.

Use information from Figure 1 and Figure 2.

(2)

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.....

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(b) The population of humans on Earth has increased significantly leading to food shortages.

The growth of drought-resistant crop plants could lead to an increase in food supply.

Describe how drought-resistant crop plants can be produced.

(3)

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(Total for Question 3 = 9 marks)

4 Auxins are plant hormones.

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

Auxins cause the shoot of a plant to grow towards light in a process called

(1)

☒ **A** negative gravitropism

☒ **B** negative phototropism

☒ **C** positive gravitropism

☒ **D** positive phototropism

(ii) Explain how auxins cause the shoot of a plant to grow towards light.

(2)

.....

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.....

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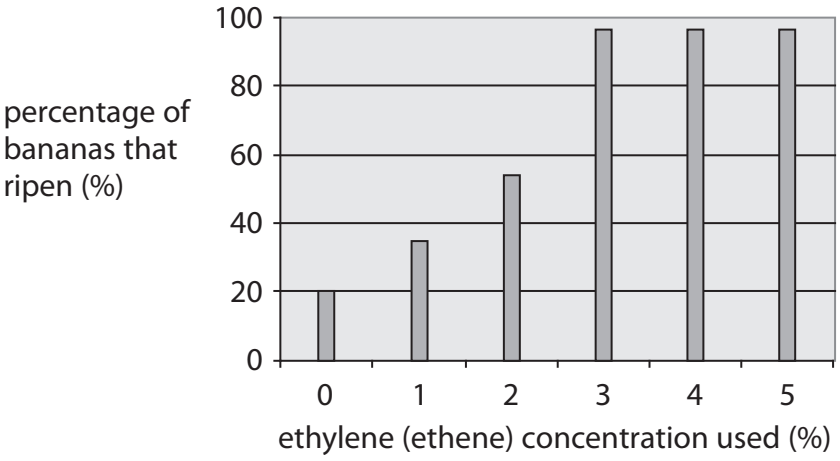
(b) Ethylene (ethene) is a plant hormone that stimulates the ripening of fruit.

The graph shows the effect of ethylene (ethene) concentration on the ripening of bananas after three days.



(i) Describe the effect of ethylene (ethene) on the ripening of bananas.

(1)

.....

.....

(ii) Explain which concentration of ethylene (ethene) a supermarket should use to be most cost effective when ripening bananas.

(2)

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*(c) Fruit ripening is one use of plant hormones.

Describe the other uses of plant hormones in crop production.

(6)

(Total for Question 4 = 12 marks)