OCR
Oxford Cambridge and RSA

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Friday 16 June 2017 – Morning

GCSE GATEWAY SCIENCE
BIOLOGY B

B732/02 Biology modules B4, B5, B6 (Higher Tier)

Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: 1 hour 30 minutes

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the barcodes.

INFORMATION FOR CANDIDATES

- The quality of written communication is assessed in questions marked with a pencil (✎).
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **85**.
- This document consists of **32** pages. Any blank pages are indicated.

Answer **all** the questions.

SECTION A – Module B4

1 Look at the equation for a process that occurs in plants.

$$6CO_2 + 6H_2O \xrightarrow[\text{(chlorophyll)}]{\text{(light energy)}} C_6H_{12}O_6 + 6O_2$$

(a) Write down the name of this process.

..... **[1]**

(b) The equation shows that oxygen is produced.

Which scientist first used experiments to show that plants produce oxygen?

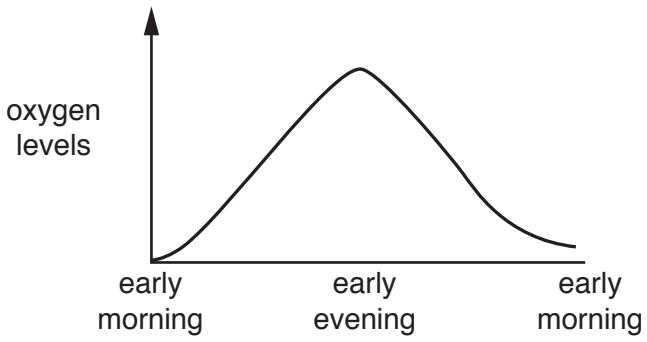
Put a (ring) around the correct answer.

Darwin **Lister** **Pasteur** **Priestley** **Van Helmont** **[1]**

(c) Josh investigates how oxygen levels change in a pond.

He uses a probe to measure the levels of oxygen in the pond at different times of the day.

The graph shows his results.



The pond is full of plant life.

Use the equation to explain the pattern in the graph.

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..... **[2]**

2 Mia investigates the effect of salt concentration on animal cells.

She puts 5 cm^3 of distilled water into a test tube.

Mia then adds 3 drops of blood to this test tube.

The liquid in the test tube is cloudy.

If the blood cells burst and release their contents then the solution becomes clear.

Mia times how long it takes for the liquid to go clear.

She then repeats the method with different concentrations of salt solution.

Here is her results table.

Concentration of salt in %	Time to go clear in seconds
0.00	20
0.25	300
0.50	600
1.00	remained cloudy after 15 minutes
2.00	remained cloudy after 15 minutes

Explain the results including the correct scientific terms to describe the appearance of the cells in the solution at the end of the investigation.

The quality of written communication will be assessed in your answer to this question.

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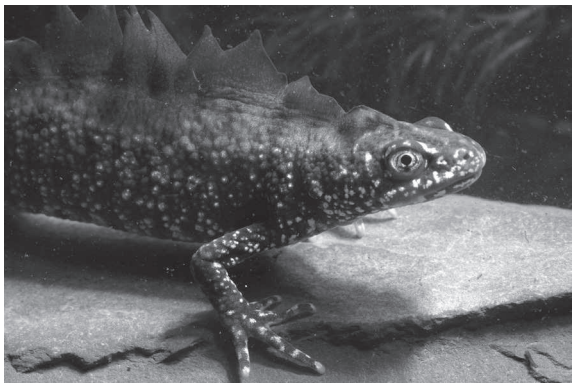
..... **[6]**

3 The picture shows a great crested newt.



Great crested newts live in ponds.

Scientists monitor the population of newts in one pond over 5 years.

They use the method of capture - recapture each spring to estimate the population.

The table shows their results.

year	Number of newts captured and marked in 1st sample	Number of newts captured in 2nd sample	Number of newts in 2nd sample previously marked	Estimate of newt population
1	14	13	3	61
2	21	14	5	59
3	19	12	4	57
4	18	16	5	58
5	17	11	5	

(a) Use this formula to calculate the population estimate for **year 5**.

Give your answer to the nearest whole number.

$$\text{population size} = \frac{\text{number in 1st sample} \times \text{number in 2nd sample}}{\text{number in 2nd sample previously marked}}$$

answer ..... **[2]**

(b) (i) Write down **two** conclusions from the data.

1 .....

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2 .....

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[2]

(ii) Suggest **one** reason why these conclusions may not be valid.

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..... **[1]**

(c) The scientists are studying the **population** of newts in the pond.
The newts are also part of a **community** living in the pond.

Explain the difference between the terms population and community.

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..... **[1]**

4 Transpiration is the loss of water from the leaves of a plant.

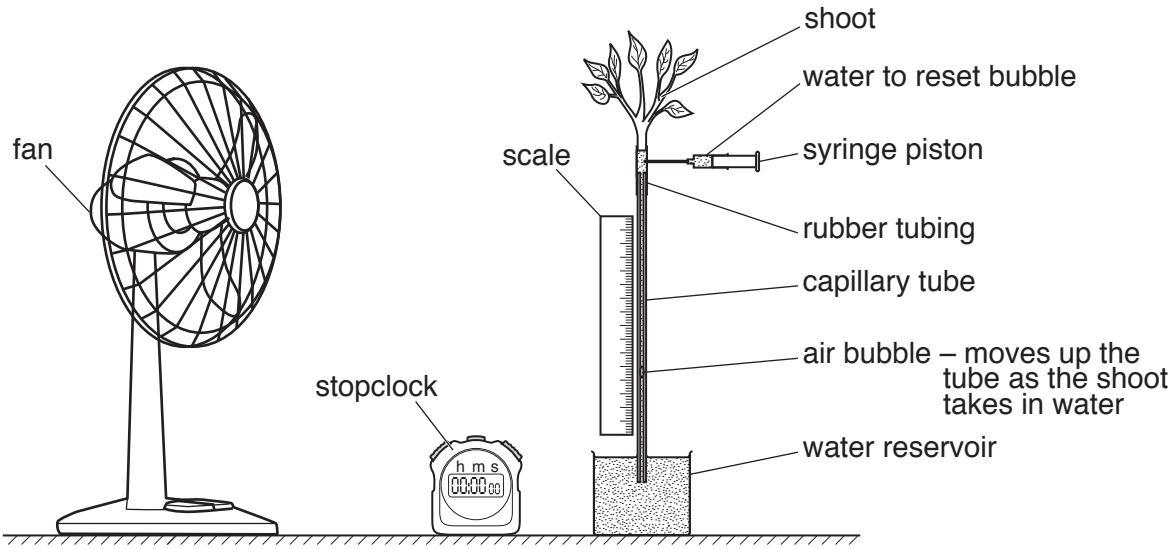
(a) Look at the apparatus in the diagram.

The apparatus is used to measure the effect of air movement on the rate of transpiration.

The distance the air bubble moves in 5 minutes is measured.

The fan is used to change the amount of air movement around the leaves.

The method is repeated 3 times for each fan speed.



Here are the results.

Conditions	Distance air bubble moves in 5 minutes in mm		
	repeat 1	repeat 2	repeat 3
no fan	4	3	4
fan on slow speed	13	12	10
fan on medium speed	47	44	46
fan on fast speed	45	46	48

Explain the **complete** pattern in the results.

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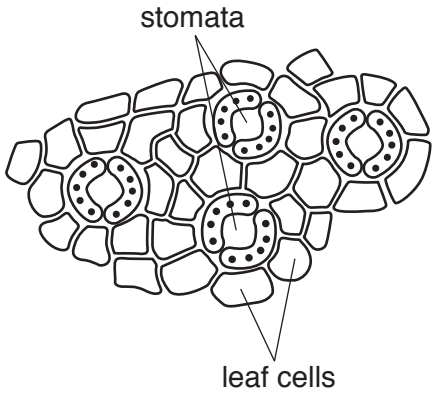
(b) Look at the diagram showing stomata.



Water is lost through stomata.

Plants can close stomata to reduce water loss.

Explain **two** other ways that leaves are adapted to reduce the loss of water through stomata.

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..... **[2]**

5 The picture shows crops being grown using hydroponics.

Hydroponics is a form of intensive farming where plants are grown without soil.

(a) Hydroponics allows more crops to be grown in a limited space.

Explain **one other** advantage and **one** disadvantage of growing crops using hydroponics.

advantage .....

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disadvantage .....

.....

[2]

(b) In Africa farmers often have problems with droughts and high temperatures.

This makes growing crops in soil difficult.

Farmers in Africa often use intensive farming methods such as hydroponics.

In the UK, farmers often use organic farming methods.

Write about why the development of intensive farming methods like hydroponics maybe more important in Africa than in the UK.

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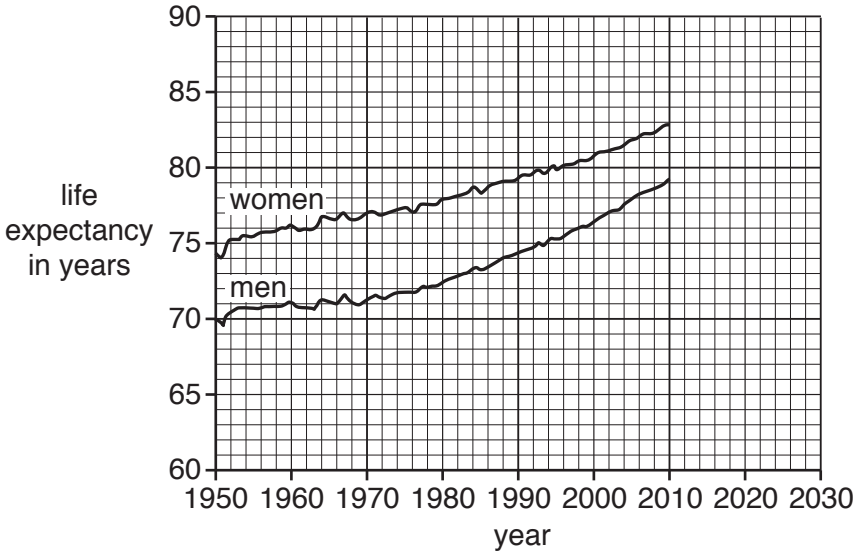
SECTION B – Module B5

6 The graph shows how life expectancy has changed in England and Wales from 1950 to 2010.



(a) Suggest **two** reasons for the change in life expectancy since 1950.

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..... **[2]**

(b) Continue the two lines on the graph to predict the life expectancy ages in 2030.

(i) Write down **two** conclusions about the predicted life expectancies in 2030.

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..... **[2]**

(ii) Suggest **one** reason why any prediction may **not** be correct.

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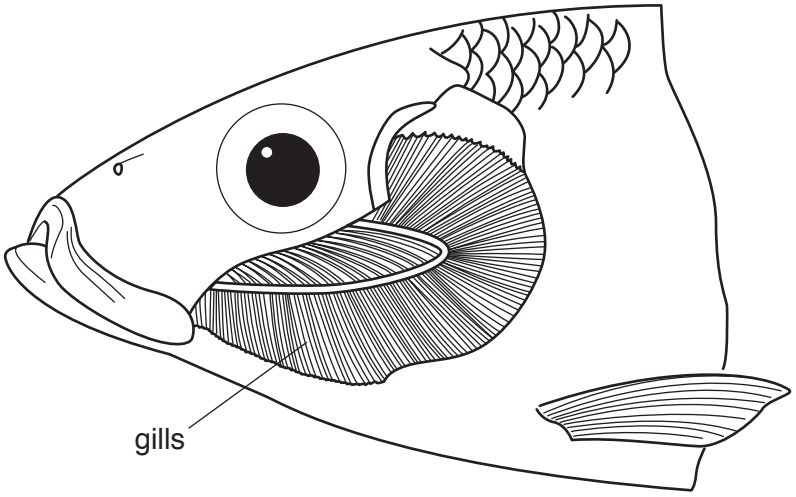
..... **[1]**

7 Look at the diagram of the head of a fish.



(a) Gas exchange takes place in the gills.

Explain why this method of gas exchange restricts where fish can live.

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..... **[2]**

(b) In humans gas exchange happens in the lungs.

Asbestosis is a disease that affects the lungs.

Describe how asbestosis affects the lungs.

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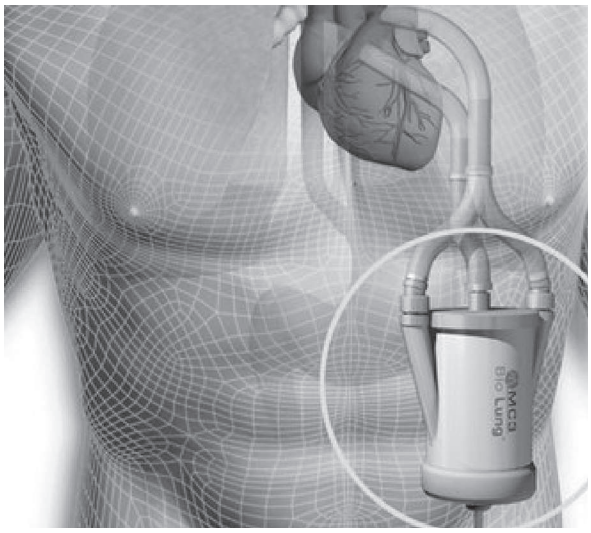
(c) The picture shows an artificial lung.



Scientists have developed an artificial lung that can be attached to the heart.

The heart pumps blood into the artificial lung.

Gas exchange takes place inside the artificial lung.

The blood then passes back into the body.

(i) The artificial lung could be used to help someone with lung damage from smoking cigarettes.

This treatment would be expensive but could be available **free** on the National Health Service (NHS).

Discuss whether the artificial lung should be available on the NHS.

Include reasons **for** and **against**.

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..... **[3]**

(ii) The artificial lung will form part of a double circulatory system.

In a double circulatory system the heart has four chambers.

Explain why.

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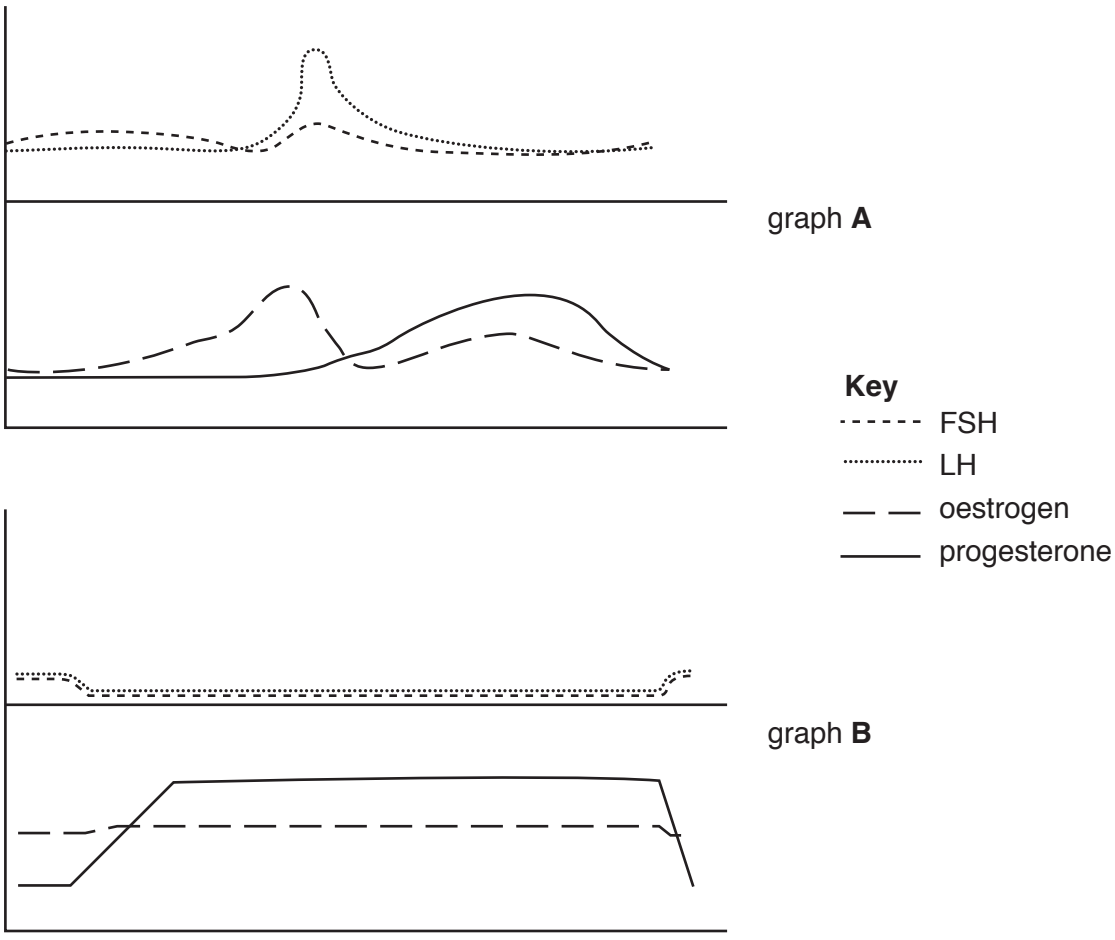
..... **[1]**

8 The diagram shows the hormone levels in the blood during the menstrual cycle.

Graph **A** represents a normal menstrual cycle.

Graph **B** represents a cycle if the woman is taking contraceptive pills.



Compare the graphs and use them to explain how the contraceptive pill can reduce the chance of pregnancy occurring.

The quality of written communication will be assessed in your answer to this question.

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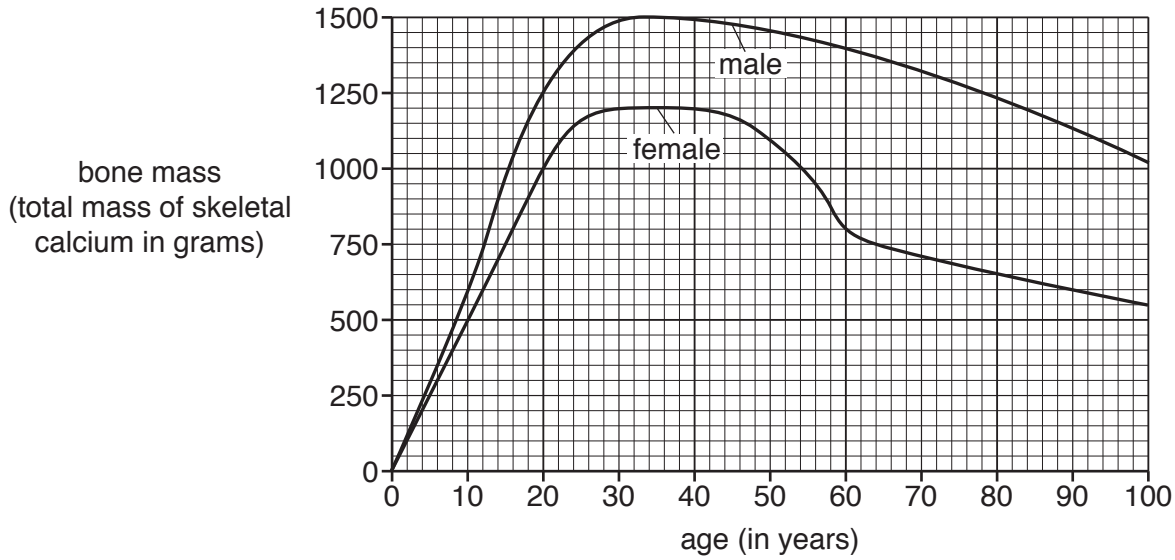
9 The graph shows the typical bone mass of the human skeleton at different ages.



(a) Bone mass depends on the amount of calcium inside the bone.

Explain how changes in the bones as they grow can account for the increase in bone mass.

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..... **[3]**

(b) As some adults become older they can suffer from osteoporosis.

Osteoporosis is a result of reduced bone mass.

(i) Between the ages of 30 and 60 bone mass in males typically falls by 6.7%.

Calculate the percentage difference in bone mass of females aged 30 and 60 years.

.....% **[2]**

(ii) Use your answer to **(b)** part **(i)** to explain whether females or males are more likely to suffer from osteoporosis in old age.

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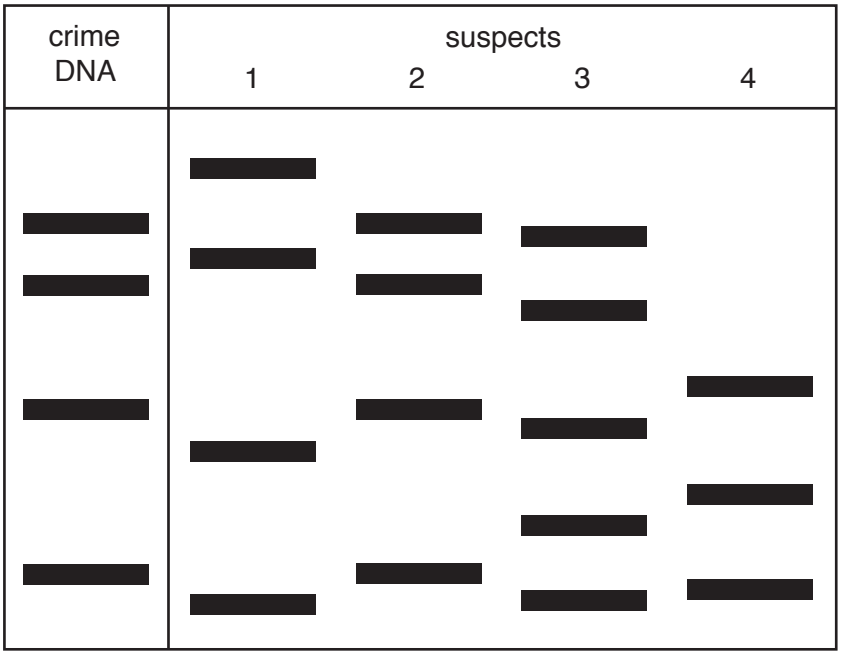
..... **[1]**

SECTION C – Module B6

10 The image shows DNA fingerprints made from the DNA found at a crime scene and from four suspects.



(a) Which suspect left their DNA at the crime scene? Explain your answer.

Suspect .....

Reason .....

..... **[1]**

(b) Describe the stages in the production of a DNA fingerprint.

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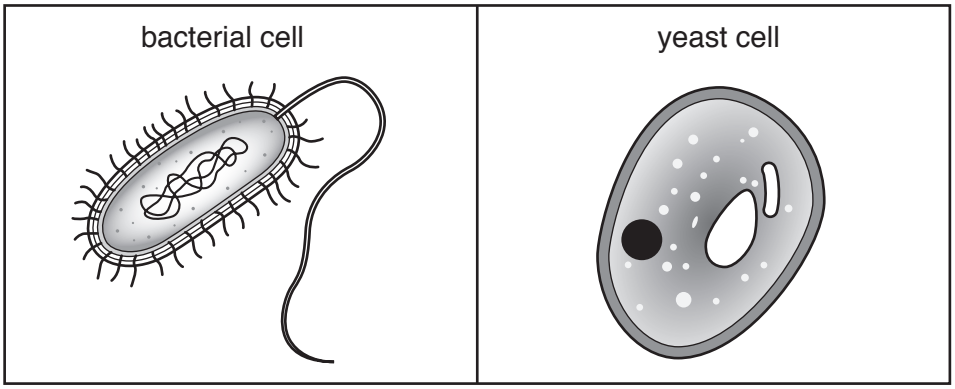
..... **[3]**

11 Look at the diagrams of two different microorganisms.



(a) The bacterial cell in the diagram causes cholera.

After an earthquake there can be a **rapid** spread of cholera.

Explain **two** reasons why.

1 .....

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2 .....

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[2]

(b) Yeast cells are used in the production of alcohol.

During this process conditions are controlled so that the yeast grows at an optimum rate.

One condition that is controlled is temperature.

Write down two **other** ways to optimise the growth rate of yeast.

1 .....

2 .....

[2]

(c) Sam investigates the rate of alcohol production by fermentation.

She mixes yeast with sugar and water and leaves the mixture to ferment for 4 days.

She does this for two different strains of yeast, **A** and **B**.

Sam monitors the fermentation process by recording the specific gravity of the mixture.

The lower the specific gravity the more alcohol the mixture contains.

Look at Sam's results.

Time in hours	**Specific gravity in g/cm^3**	
	Yeast strain A	**Yeast strain B**
0	1.090	1.090
24	1.065	1.057
48	1.054	1.038
72	1.044	1.023
96	1.037	1.010
120	1.037	1.001

Explain the patterns seen in the two sets of data.

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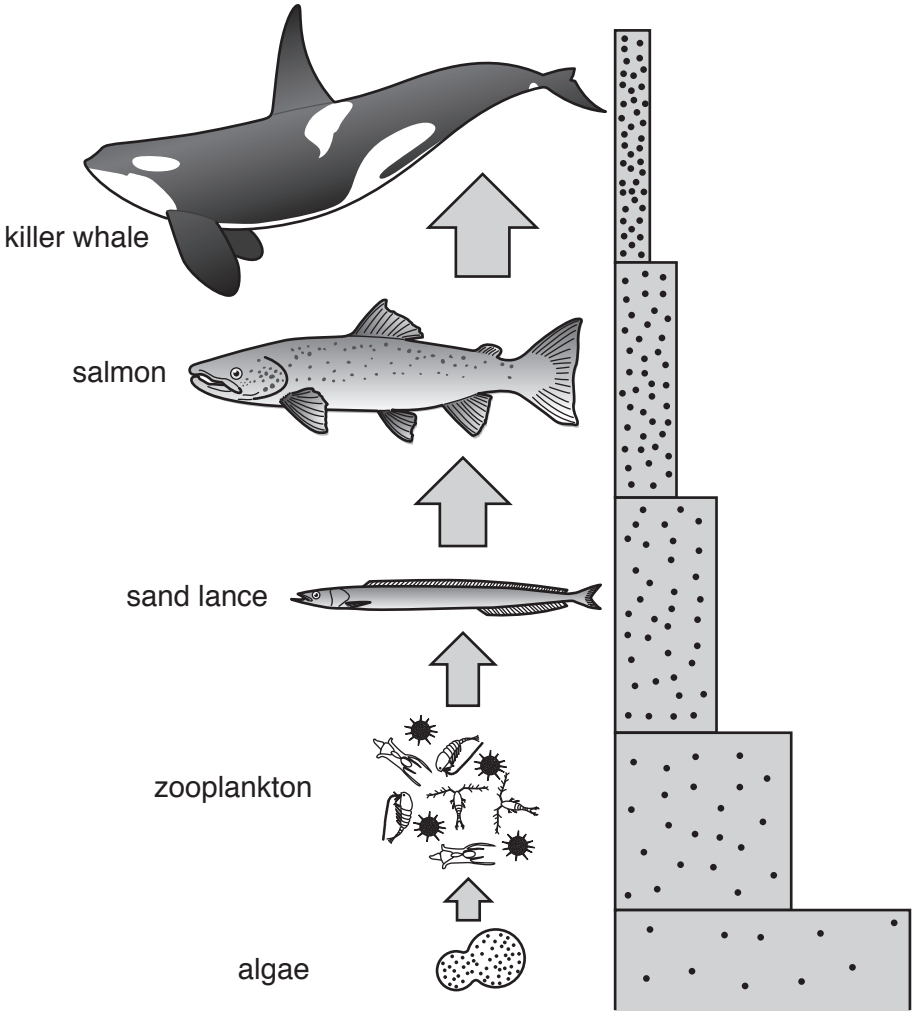
..... **[2]**

12 The diagram shows a marine food chain.

The width of the bars represents the number of organisms at each level of the food chain.

The dots represent the concentration of toxins found in the organism.



Use the diagram to explain why the toxins have different long term effects on killer whales compared to sand lances.

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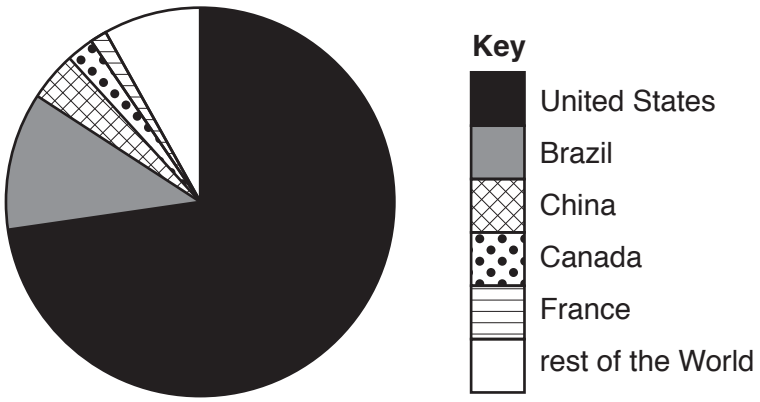
13 This question is about biofuels.

(a) Biogasoline is a type of biofuel that can be made from sugar cane.

Look at the pie chart.

It shows the amount of biogasoline produced in one year.

World: 18 689 thousand tons



(i) Brazil produced 2200 thousand tons of biogasoline in one year.

Calculate this as a percentage of World production.

Give your answer to three significant figures.

.....% **[2]**

(ii) The rest of the World produced 3.3% of the biogasoline in that year.

Compare the percentage produced by Brazil and the rest of the World.

Suggest reasons for the difference.

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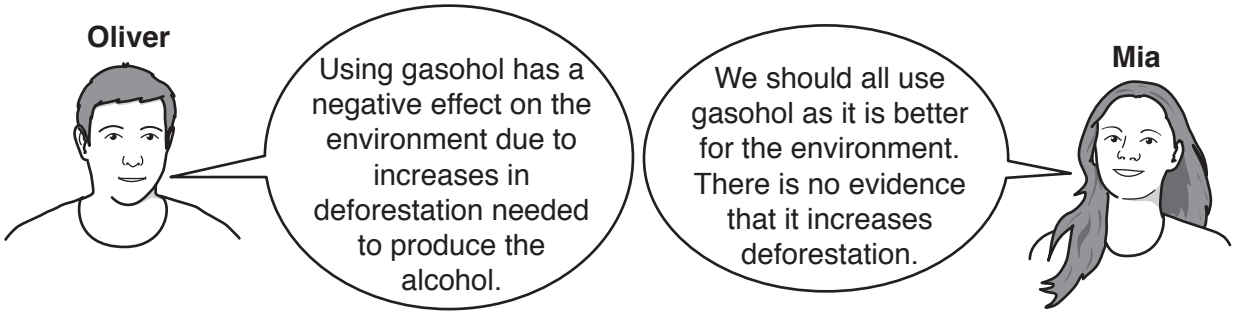
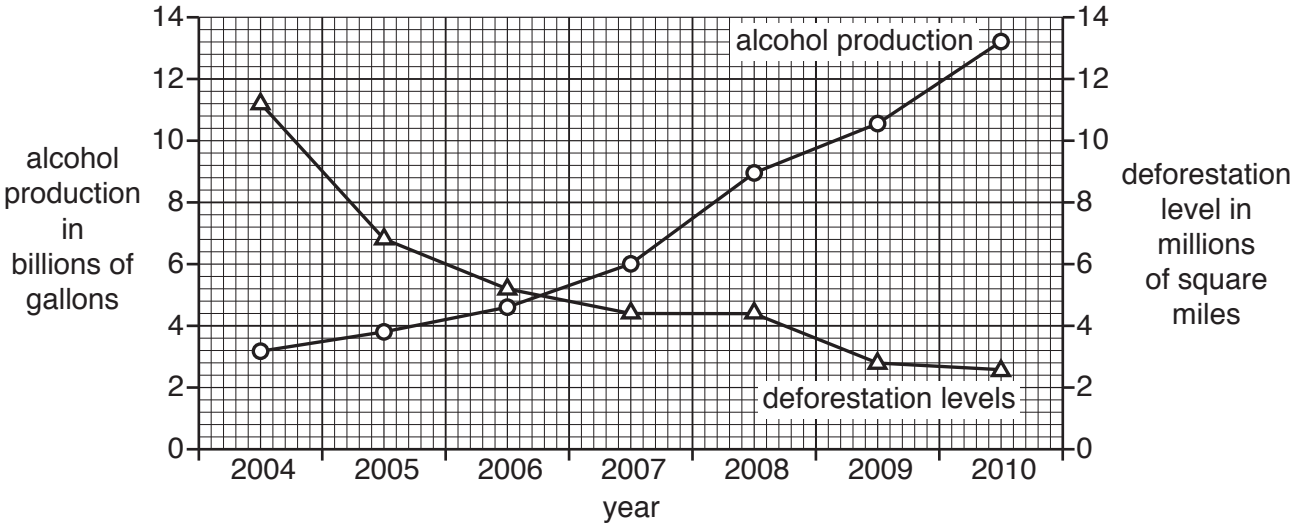
(b) Gasohol is another biofuel, it is made using alcohol.

Two friends are discussing the impact of gasohol production on the environment.



Look at the graph.

It shows the amount of deforestation and alcohol production.



Identify which of the friends' opinions is **not** backed up by the evidence in the graph.

Use the data in the graph to explain your answer.

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..... **[2]**

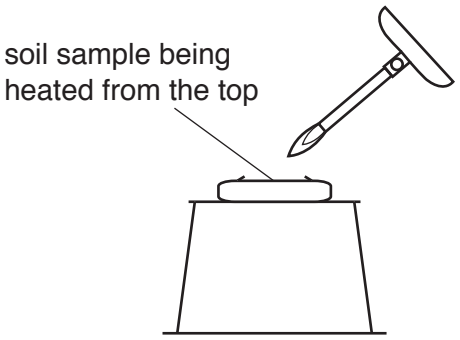
14 Adam investigates the water and humus content of soil.

He collects 50 g of three different soil samples.

He then dries each sample in an oven and measures their mass again.

Adam then burns each soil sample using a Bunsen burner.

He continues to burn them until there is no change in mass.



Adam records his results in a table.

Soil sample	Mass before drying in g	Mass after drying in g	Change in mass after drying in g	Mass after burning in g	Change in mass after burning in g	Percentage humus content of dry soil
A	50.00	47.45	2.55	45.52	1.93	4.07
B	50.00	39.78	10.22	36.32	3.46	8.70
C	50.00	43.34	6.66	36.36	6.98	16.11

Adam knows that he has a sample of a clay soil, a sandy soil and a loam soil.

Identify the three samples **A**, **B**, and **C**.

Explain your answer using the data and ideas about mineral particle size.

The quality of written communication will be assessed in your answer to this question.

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SECTION D

15 (a) Look at the table about some different animals.

It shows the mean (average) body mass, brain mass and **relative** brain mass.

The **relative** brain mass is the percentage (%) that the brain mass is of the body mass.

Animal	Body mass in g	Brain mass in g	Relative brain mass (% of body mass)
marmoset monkey	320	8	2.5
rhesus monkey	7750	93	1.2
chimpanzee	48 750	390	0.8
gorilla	100 000	500	0.5
elephant	4 148 000	4148	0.1

(i) Look at the information in the table.

What patterns can you see between body mass, brain mass and **relative** brain mass?

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..... **[2]**

(ii) The mean (average) body mass, brain mass and **relative** brain mass of a human is shown below.

Animal	Body mass in g	Brain mass in g	Relative brain mass (% of body mass)
human	66 500	1330	2.0

Do humans fit the patterns shown by the other animals?

Explain your answer.

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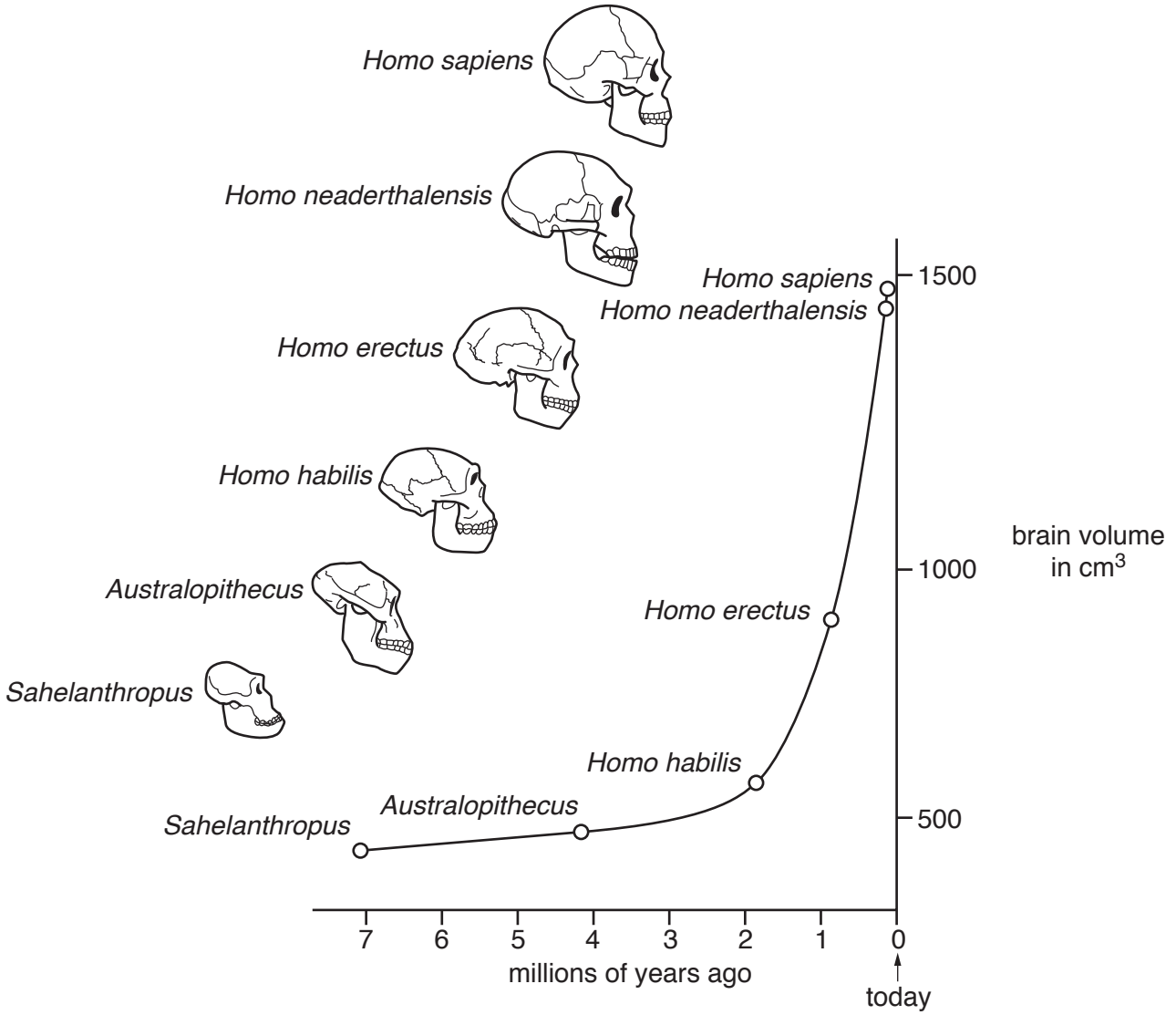
..... **[2]**

(b) Look at the graph.

It shows the mean (average) brain volume of modern day humans (*Homo sapiens*).

It also shows some extinct relatives of humans that lived in the past.



(i) Describe what pattern the graph shows.

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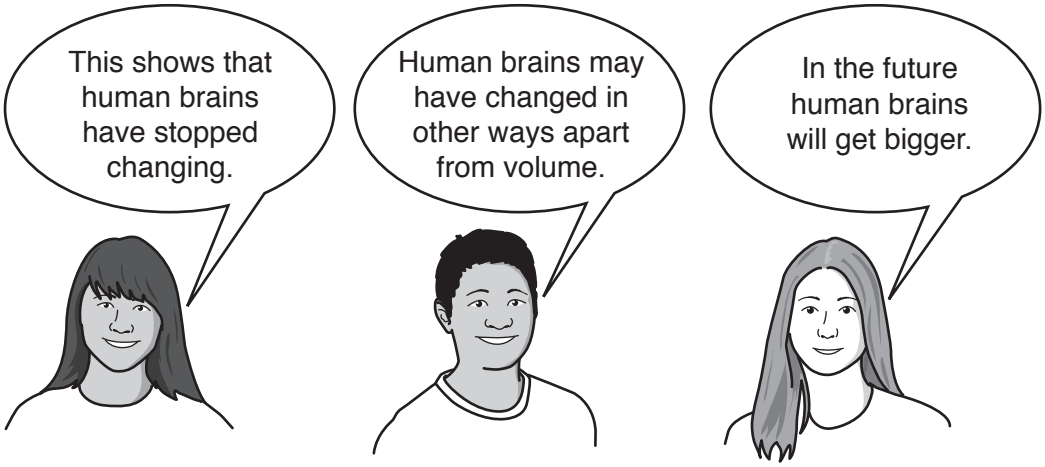
(ii) The brain volume of modern day humans (*Homo sapiens*) has **not** changed in the last 200 000 years.

Some students have different ideas about this.



Ann **Ben** **Clare**

One of the students has made a correct conclusion from the data.

Which student?

Explain your answer.

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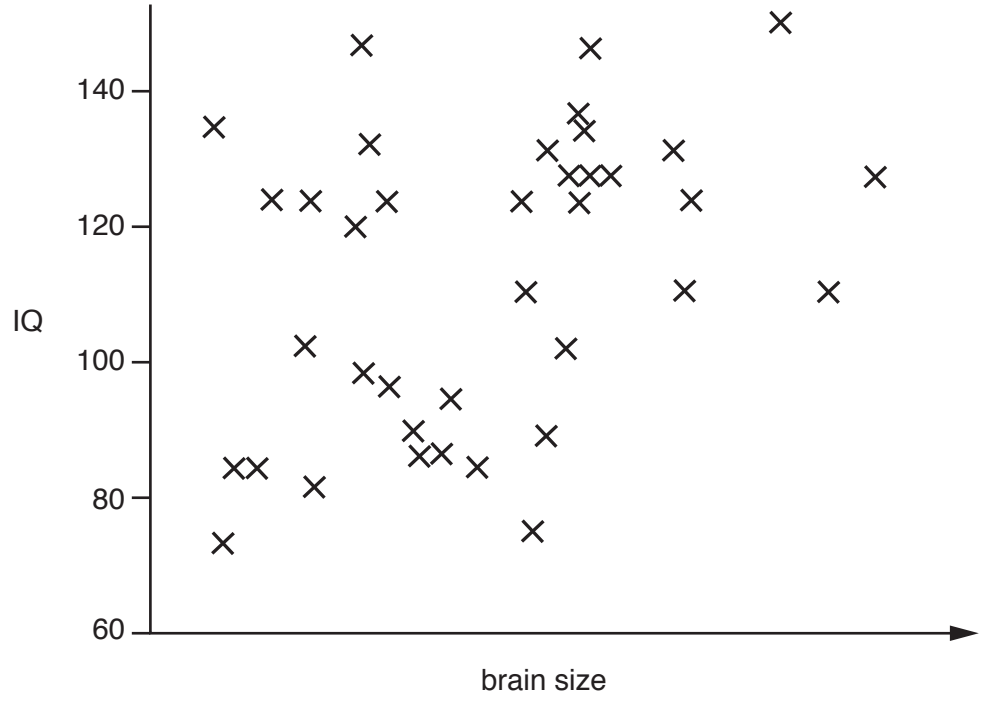
(c) IQ is one way of measuring intelligence.

Scientists investigated whether there is a link between brain size and IQ for university students.

The scatter graph shows their results.



Does the graph show a link between brain size and IQ?

Explain your answer.

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..... **[2]**

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).