OCR
Oxford Cambridge and RSA

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Friday 12 June 2015 – Afternoon

GCSE GATEWAY SCIENCE
BIOLOGY B

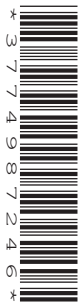**B732/02**   Biology modules B4, B5, B6 (Higher Tier)

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. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
* Do **not** write in the bar codes.

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 **28** pages. Any blank pages are indicated.

Turn over

Answer **all** the questions.

SECTION A – Module B4

1 Wilson grows tomatoes in a glasshouse.

The more the tomato plants photosynthesise, the bigger the crop of tomatoes.

Wilson knows that the rate of photosynthesis depends on temperature.

He wants to use heaters in his glasshouse to make his tomato plants photosynthesise faster.

(a) He wants to find out the best temperature to have in his glasshouse.

Look at the graph.
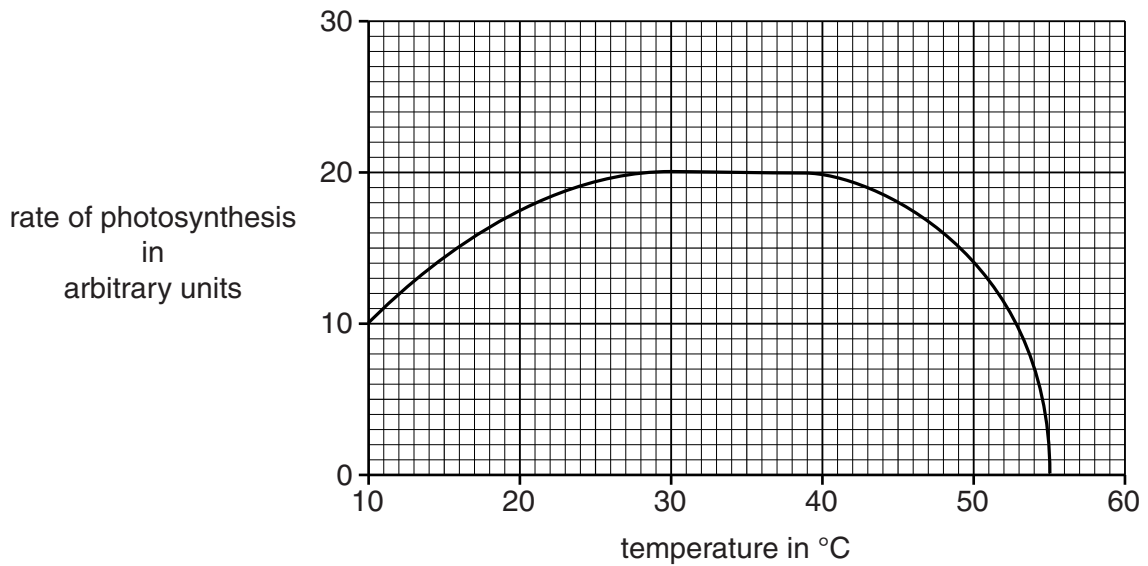
(i) Describe what the graph shows. Use data in your answer.

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   (ii) **Explain** the shape of the graph.

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   .... **[3]**

   (iii) According to the graph, what is the best temperature for Wilson to have in his glasshouse?

   ....°C

   Explain your answer.

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   .... **[2]**

(b) Before Wilson decides to use heaters in his glasshouse, suggest what else he should consider, apart from the increased rate of photosynthesis.

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Turn over

2 Pesticides can be used to kill pests, such as insects, that damage plants.

(a) Some pesticides are dissolved in water and can be poured onto soil. They are absorbed by plant roots and transported to the leaves to kill insects feeding there.

These pesticides move through plants more quickly on warm sunny days.

Use this information to suggest what part of the plant transports these pesticides to the leaves, and why this happens more quickly on warm sunny days.

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

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.... **[6]**

(b) Some pesticides are persistent.

(i) What does **persistent** mean?

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.... **[1]**

(ii) Describe **one** disadvantage of pesticides being persistent.

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.... **[1]**

3 The venus flytrap is a plant that lives in very wet ground, such as bogs.

Bogs contain very low levels of minerals, such as nitrates, that plants need for growth.

The venus flytrap catches insects which it digests to get minerals.
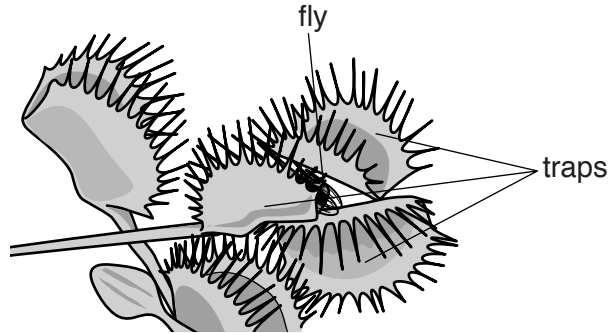
(a) Venus flytraps digest insects by extracellular digestion.

What does **extracellular** mean?

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.... **[1]**

(b) Bogs contain very low levels of minerals because the rate of decay is very slow.

This is because very low levels of oxygen mean there are very low numbers of the microorganisms that cause decay.

Explain why very low levels of oxygen mean there are very low numbers of these microorganisms.

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.... **[2]**

Turn over

(c) The way the traps close to catch insects involves osmosis.

The cells on the outside of the trap become turgid and swell more than the cells on the inside.

This causes the trap to close.

| inside | | outside | **open trap** | **closed trap** |
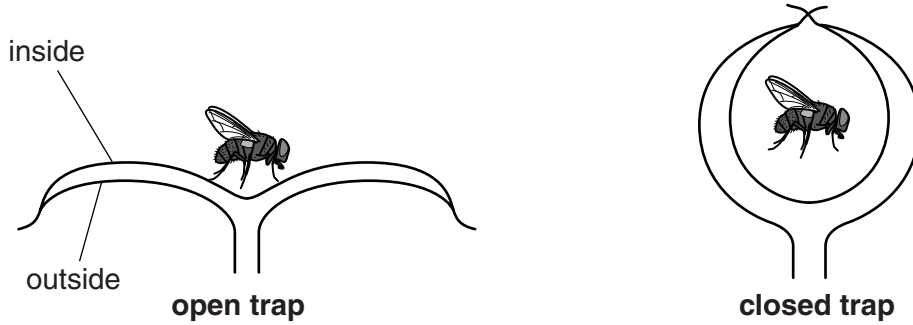
Suggest how the cells on the outside become more turgid than those on the inside.

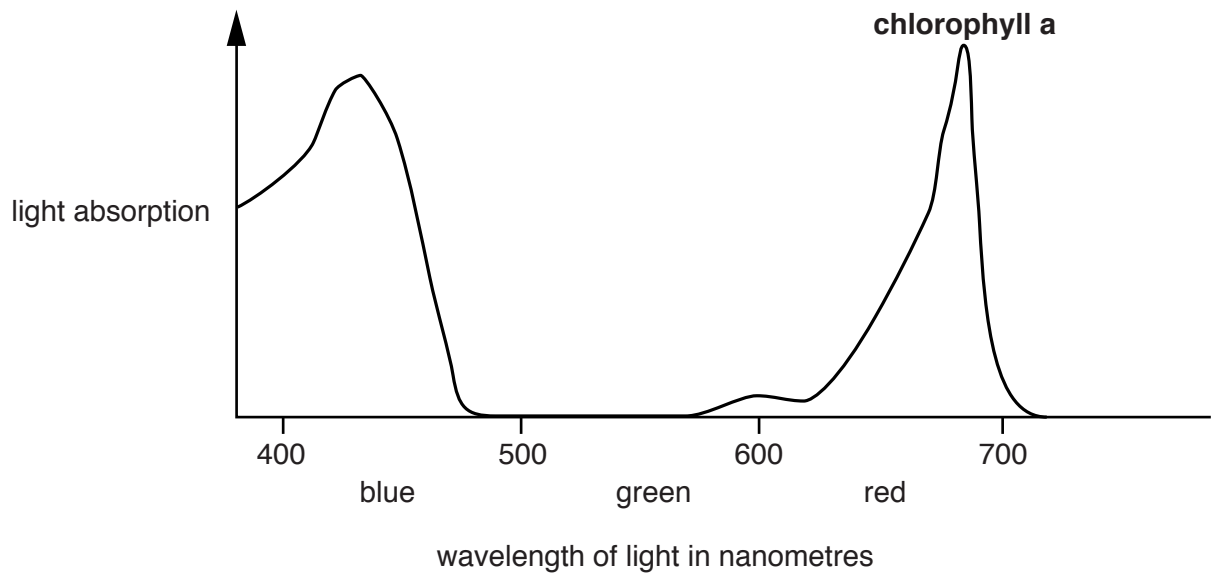..

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.... **[3]**

(d) The outside of each trap is green because these cells contain **chlorophyll a**.

The inside of each trap is red because these cells contain a red pigment called anthocyanin.

The red colour attracts insects.

The diagram shows how **chlorophyll a** absorbs light of different wavelengths.

Draw a line **on the graph** to show the absorption of light by anthocyanin.   **[1]**

8

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SECTION B – Module B5

4 Many processes in the human body are controlled by hormones.

Details of some of these hormones are shown in the table.

(a) Complete the table by writing in the blank boxes.

Hormone	Where hormone is released	Function of hormone
ADH		increases the permeability of kidney tubules
	pituitary gland	controls the growth of long bones
progesterone	ovaries	
FSH	pituitary gland	

[4]

(b) Some people have a condition which means they do **not** release enough ADH.

Suggest what effects this might have.

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.... [2]

5 Sometimes people need to have their organs replaced by donor organs.

Many of these donor organs are taken from dead people.

There are different systems of deciding whether the organs of a dead person can be used.

*   **Opt in** – the organs can only be used if the person carries a donor card or is on the donor register.

*   **Opt out** – the organs can be used unless the person has said no while they were alive.

Two doctors are talking about organ donation.

I think **opt out** is best.

It would give us more organs to use for transplants.

This means we would have fewer difficult ethical decisions to make.

Opt out may provide more organs but I think there could be problems.

Relatives might think that the donor has forgotten to opt out.

We could then have difficult ethical decisions to make.

Dr Grace

Dr Henshaw

 (a) Both doctors are talking about ethical decisions.

Write about the ethical decisions that each doctor is talking about.

Dr Grace ....

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Dr Henshaw ....

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.... **[2]**

(b) Dr Grace thinks that in an **opt out** system more people will donate their organs.

(i) Suggest why this might happen.

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.... **[2]**

(ii) The table shows the number of people in different countries who donated organs in 2008.

Country	Number of people donating organs per million people in the country	System used
Spain	34.2	opt out
Portugal	26.7	opt out
Poland	11.2	opt out
UK	14.7	opt in
Germany	14.6	opt in
Netherlands	12.8	opt in

How well does the data in the table support Dr Grace's prediction?

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.... **[2]**

Turn over

12

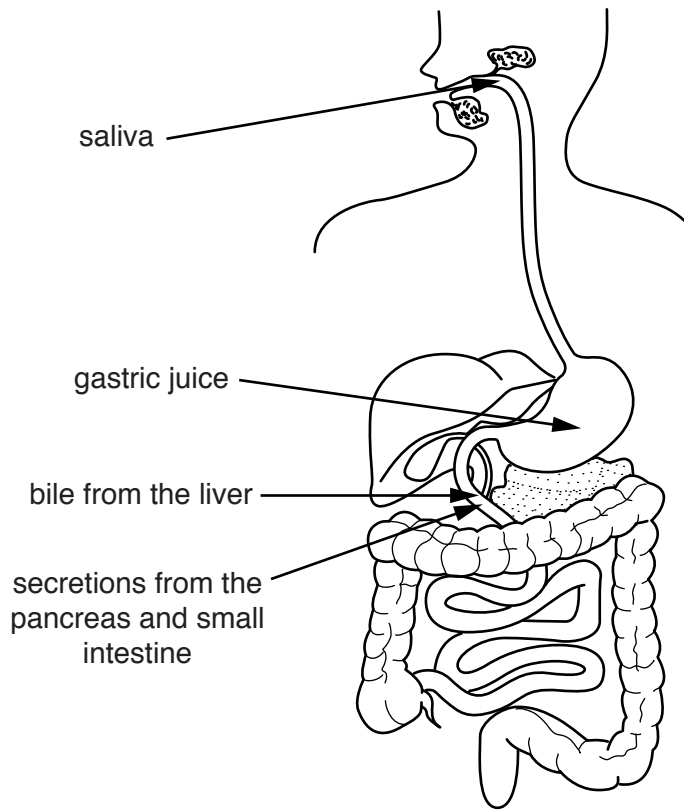**BLANK PAGE**

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6 Different liquids are added to food as it passes through the digestive system.

saliva

gastric juice

bile from the liver

secretions from the pancreas and small intestine

(a) One of the liquids released into the digestive system contains no enzymes.

Put a tick (✓) in the box next to this liquid.

saliva	
gastric juice	
bile from the liver	
secretions from the pancreas and small intestine	

[1]

(b) Saliva and gastric juice have different pH values.

Explain why this is important.

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.... **[2]**

Turn over

7 Dicky is visiting the hospital to have his heart checked.

(a) Dicky runs to the hospital because he is worried about being late for his appointment.

The doctor must wait until the level of a hormone in Dicky's blood returns to normal before he checks Dicky's heart.
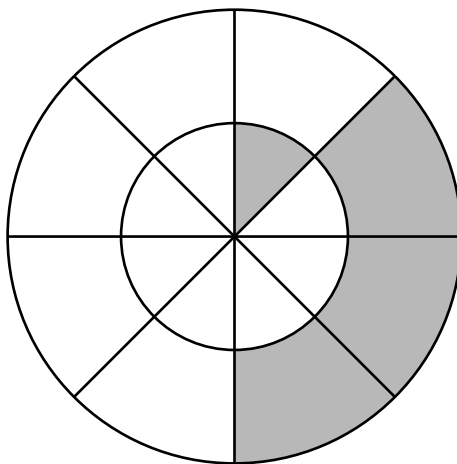
Write down the name of this hormone.

.... **[1]**

(b) The doctor produces this diagram showing one complete cycle of Dicky's heart.

The inner circle shows what is happening in the atria and the outer circle shows what is happening in the ventricles.

The whole cycle lasts for 0.64 seconds.

	contracting
	relaxing

(i) For how long do the atria contract during one cycle of Dicky's heart?

answer .... seconds **[1]**

(ii) The longer a contraction lasts, the greater the pressure that can be generated by the heart.

Explain how and why the contraction time of the ventricles is different from the contraction time for the atria.

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.... **[2]**

8 Doctors are developing a new way of predicting the chance of a person developing heart disease.
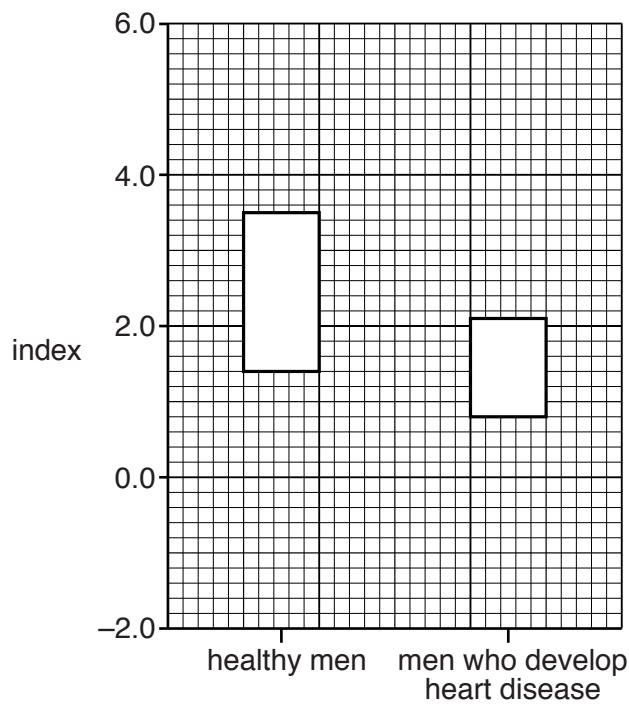
They use a machine to take images of the coronary artery.

They do this when the ventricles are contracting and when they are relaxing.

They can then work out an **index** using this formula.

$$\text{index} = \frac{\begin{array}{c}\text{cross-sectional area of artery} \\ \text{when ventricles are contracting}\end{array} - \begin{array}{c}\text{cross-sectional area of artery} \\ \text{when ventricles are relaxing}\end{array}}{0.7}$$

The graph shows the range of results for healthy men and for men who develop heart disease.

Eric's coronary artery has a cross-sectional area of **11.5** mm^2 when his ventricles are **relaxed**.

The diagram shows the cross-section of Eric's coronary artery when his ventricles are **contracting**.

r = 2.0 mm

Write about the link between the coronary artery and heart disease.

Calculate Eric's index and use the graph to discuss how likely it is that he will develop heart disease.
(use area = πr^2 and π = 3.14)

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

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.... **[6]**

SECTION C – Module B6

9 Enzymes have many industrial uses.

(a) Draw straight lines to join each **enzyme** with the correct **use of the enzyme**.
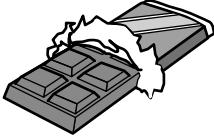
Draw only **three** lines.

Enzyme   **Use of the enzyme**

| | used in the production of milk for people with intolerance to dairy products |

| sucrase |

| | used on reagent strips to detect lactose |

| lactase |

| | used to join strands of DNA together |

| ligase |

| | used to produce sweeter sugars for food |

[2]

19

(b) Read the article about using enzymes to make chocolate.

> **Using enzymes to make better chocolate**
>
> Chocolate is made from cocoa seeds.
> The fresh seeds have to be treated to produce the chocolate flavour.
>
> Scientists think that they can use protease enzymes to treat the seeds.
> They claim that the chocolate tastes 50% better.
> The enzymes can be made by genetic engineering.
> This might also help the chocolate manufacturers.

 (i) Which substance in the cocoa seeds is digested by protease enzymes?

 .... [1]

 (ii) The scientists say that this chocolate tastes 50% better.

 Suggest why they may **not** be allowed to use this statement in advertising.

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 .... [2]

 (iii) The protease enzyme can be made by genetically engineered bacteria.

 The gene for the protease enzyme can be inserted into bacteria using a vector.

 Write down **one** type of vector that can be used.

 .... [1]

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Turn over

10 Lake Tahoe is a large lake in California.

(a) In 1968, people noticed that algae in the lake were increasing in numbers.

They thought it could be a sign that the lake was becoming more polluted.

(i) Write down the name of **one** type of pollutant that could have caused the increase in algae.

.... **[1]**

(ii) If the algae all die at once then this could cause fish in the lake to die.

Explain how the death of large numbers of algae could cause the death of fish.

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.... **[2]**
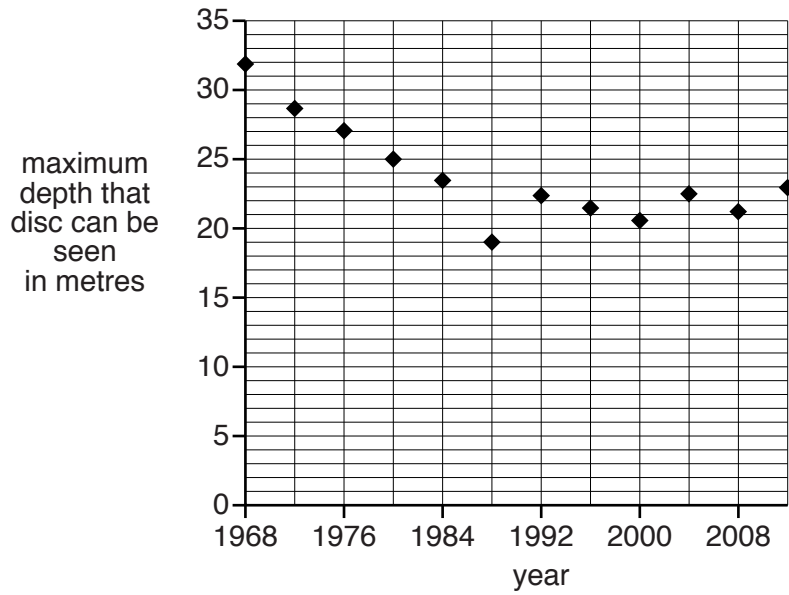
(b) Scientists have been taking measurements of how clear the water is in Lake Tahoe since 1968.

A black and white disc is slowly lowered into the water.

When the disc cannot be seen, the depth of the disc is measured.
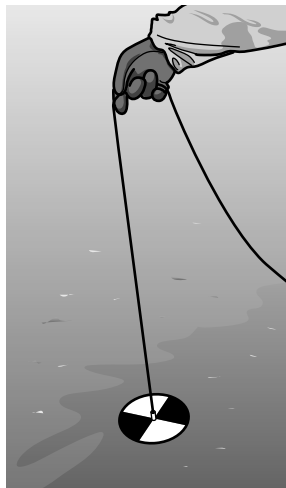
The graph shows the results for Lake Tahoe.

(i) Explain why it is important that each measurement was taken at the same time in the year.

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.... **[1]**

(ii) Describe the evidence shown by the graph about pollution in Lake Tahoe.

Explain your answer.

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.... **[3]**

(iii) Many of the pollutants are washed into the lake when winter snow melts rapidly.

In which year was there rapid melting of snow around Lake Tahoe?

.... **[1]**

Turn over

11 (a) Some farmers regularly give their cows low doses of antibiotics.

This can increase the amount of milk that the cows make.

Use of antibiotics can lead to the development of resistant strains of bacteria.

Suggest why the regular use of low doses of antibiotics may make this problem worse.

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.... **[2]**

(b) When cows are given antibiotics, some of these antibiotics pass into the milk.

Cows' milk is used to make yoghurt.

The graph shows the effect of antibiotics in milk on yoghurt making.

Explain the effects of antibiotics on the yoghurt making process and suggest why giving antibiotics to cows can cause problems for yoghurt makers.

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

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Turn over

12 There are many different types of microorganisms that live in soil.

The table gives the average number of each type of microorganism in one gram of soil.

Type of microorganism	Average number of microorganisms in one gram of soil
viruses	150 000 000
bacteria	3 000 000
fungi	1 000 000

Lucy knows that bacteria are important in soil.

She wants to find out if the soil in her garden contains the average number of bacteria.

She reads about a way of estimating the number.

It involves taking one gram of soil, mixing it with water and spreading the mixture on an agar plate.

Each single bacterium reproduces many times and makes a colony.

(a) When Lucy incubates this **first** agar plate the whole surface of the agar is covered and it is impossible to see individual colonies.

Explain why.

.... **[1]**

(b) Lucy then makes a series of agar plates by diluting the mixture.

The second plate receives 10 times fewer bacteria than in the soil sample.

The third plate receives 100 times fewer bacteria and so on.

The diagram shows some of her results.

colonies of bacteria

5th plate	6th plate	7th plate
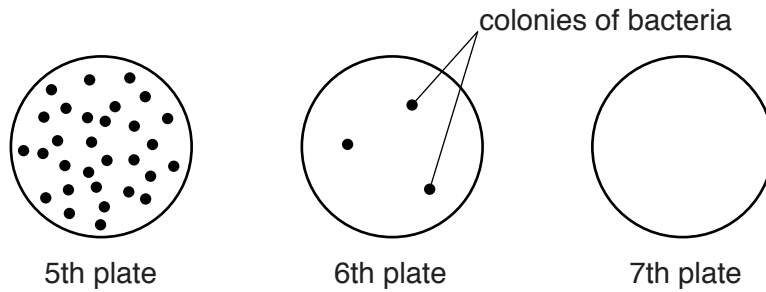
Do the results show that Lucy's soil contains the average number of bacteria?

Use her results and the data in the table to work out your answer.

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.... **[2]**

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

It shows the mean (average) mass, heart rate and life span.

It also shows the mean (average) number of heart beats in a life time, in billions.

(1 billion = 1 thousand million.)

Animal	Mass in g	Heart rate per minute	Life span in years	Life time heart beats in billions
hamster	60	450	3	0.7
chicken	1 500	275	15	2.2
cat	2 000	150	15	1.2
pig	150 000	70	25	0.9
horse	1 200 000	44	40	0.9
whale	120 000 000	20	80	0.8

(i) Look at the information in the table.

What patterns can you see between mass, heart rate and life span?

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.... **[2]**

(ii) The 'heart beat hypothesis' states that:

'every animal has a similar number of heart beats in its life time'.

Discuss whether or not the information in the table supports the 'heart beat hypothesis'.

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.... **[2]**

(iii) This table shows data for humans.

Animals	Mass in g	Heart rate per minute	Life span in years	Life time heart beats in billions
human	90 000	60	70	2.2

Do humans fit the patterns shown by the other animals?

Explain your answer.

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.... **[2]**

(b) Scientists have made a four-year study of over 31 000 heart disease patients from around the world.

The scientists compared patients with high rates (greater than 78 beats per minute) with patients with low heart rates (58 or fewer beats per minute).

They found that the patients with high heart rates had:

* a 39% greater chance of having a heart attack

* a 77% greater chance of dying from a heart attack.

(i) This study will be important for doctors.

Explain why.

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(ii) Describe any limitations in the data.

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.... **[2]**

END OF QUESTION PAPER

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