

Candidate Name	Centre Number				Candidate Number			
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**GCSE**

**BIOLOGY**

**UNIT 2: VARIATION, HOMEOSTASIS AND  
MICRO-ORGANISMS  
FOUNDATION TIER**

**SAMPLE ASSESSMENT MATERIALS**

**(1 hour 45 minutes)**

<b>For Examiner's use only</b>		
<b>Question</b>	<b>Maximum Mark</b>	<b>Mark Awarded</b>
<b>1.</b>	<b>5</b>	
<b>2.</b>	<b>7</b>	
<b>3.</b>	<b>8</b>	
<b>4.</b>	<b>7</b>	
<b>5.</b>	<b>6</b>	
<b>6.</b>	<b>5</b>	
<b>7.</b>	<b>4</b>	
<b>8.</b>	<b>6</b>	
<b>9.</b>	<b>6</b>	
<b>10.</b>	<b>6</b>	
<b>11.</b>	<b>5</b>	
<b>12.</b>	<b>5</b>	
<b>13.</b>	<b>3</b>	
<b>14.</b>	<b>7</b>	
<b>Total</b>	<b>80</b>	

**ADDITIONAL MATERIALS**

In addition to this paper you will require a calculator.

**INSTRUCTIONS TO CANDIDATES**

Use black ink or black ball-point pen. Do not use gel pen. Do not use correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page

Answer all questions.

Write your answers in the spaces provided in this booklet.

**INFORMATION FOR CANDIDATES**

The number of marks is given in brackets at the end of each question or part-question.

Question **10** is a quality of extended response (QER) question where your writing skills will be assessed.

Answer **all** questions

1. The diagram shows an example of a nervous response.



(a) Name this type of nervous response. [1]

.....

(b) What is the purpose of the type of response shown in the diagram? [1]

.....

(c) Complete the sentences below using some of the words in the list. [3]

fast                      automatically                      nervous                      deliberately

These responses of the ..... system are very .....

They happen ..... without thought.

5

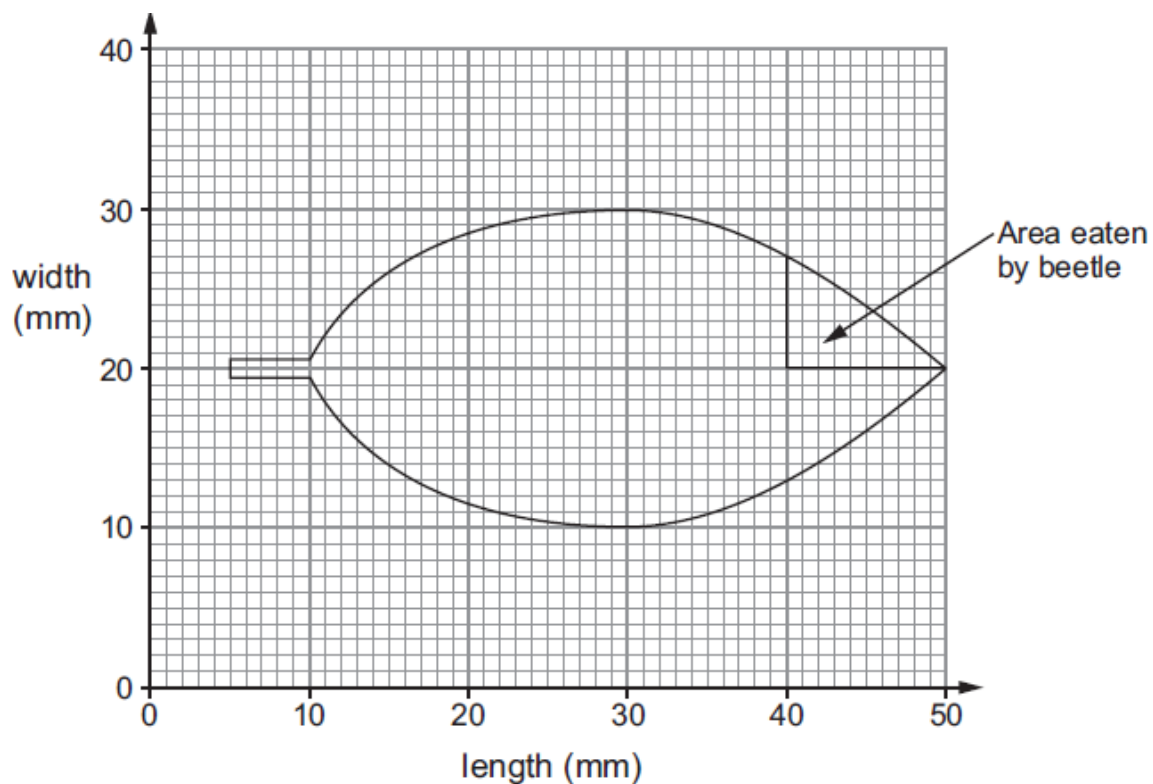
2. The photograph shows a species of leaf-eating beetle.



- (a) The actual length of the beetle from the tip of the snout to the tip of the abdomen is 5 mm.
- (i) Measure the length of the beetle in the photograph from the tip of the snout to the tip of the abdomen. [1]
- length = ..... mm
- (ii) Calculate the magnification of the photograph. [1]

magnification = x .....

- (b) This species of beetle was accidentally introduced to Fiji in the Pacific. The beetles ate the leaves of a rare plant. It was estimated that one of these beetles could eat the area of the leaf shown on the graph paper in five minutes.



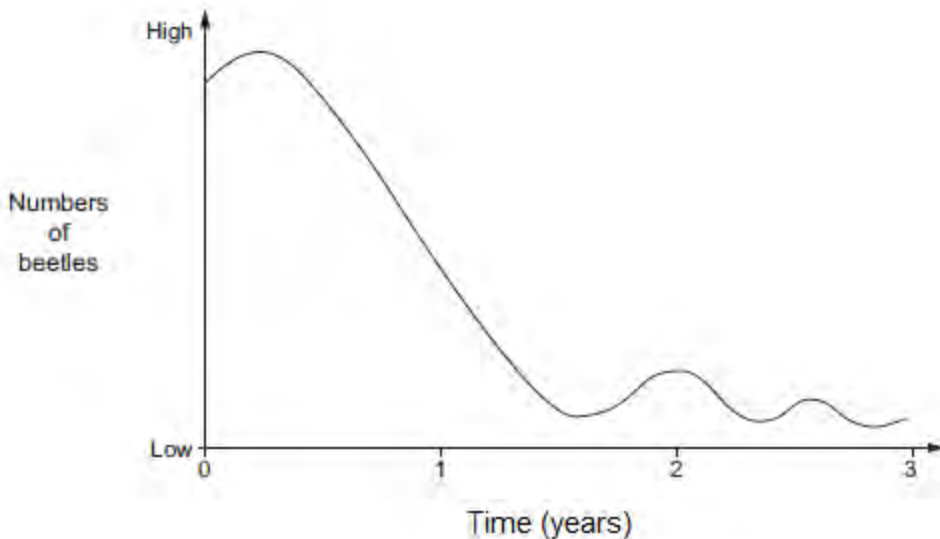
Use the drawing of the leaf to estimate the area eaten. [2]

area = .....

units = .....

- (c) A wasp was discovered which laid its eggs in the beetle eggs and killed the developing beetles.

A large number of these wasps were released in Fiji. The graph shows the effect of releasing the wasps on the number of beetles over a three year period.



Use the graph to select the most suitable statement from the list below. Underline your answer.

[1]

After two years:

- the beetles died out;**
- the wasps did not survive in Fiji;**
- the wasps were reducing the population of beetles;**
- the beetle did not have enough to eat.**

- (d) Name the method of control demonstrated by the use of the wasp. [1]

.....

- (e) Suggest a problem that could arise by the introduction of the wasp to Fiji. [1]

.....

.....

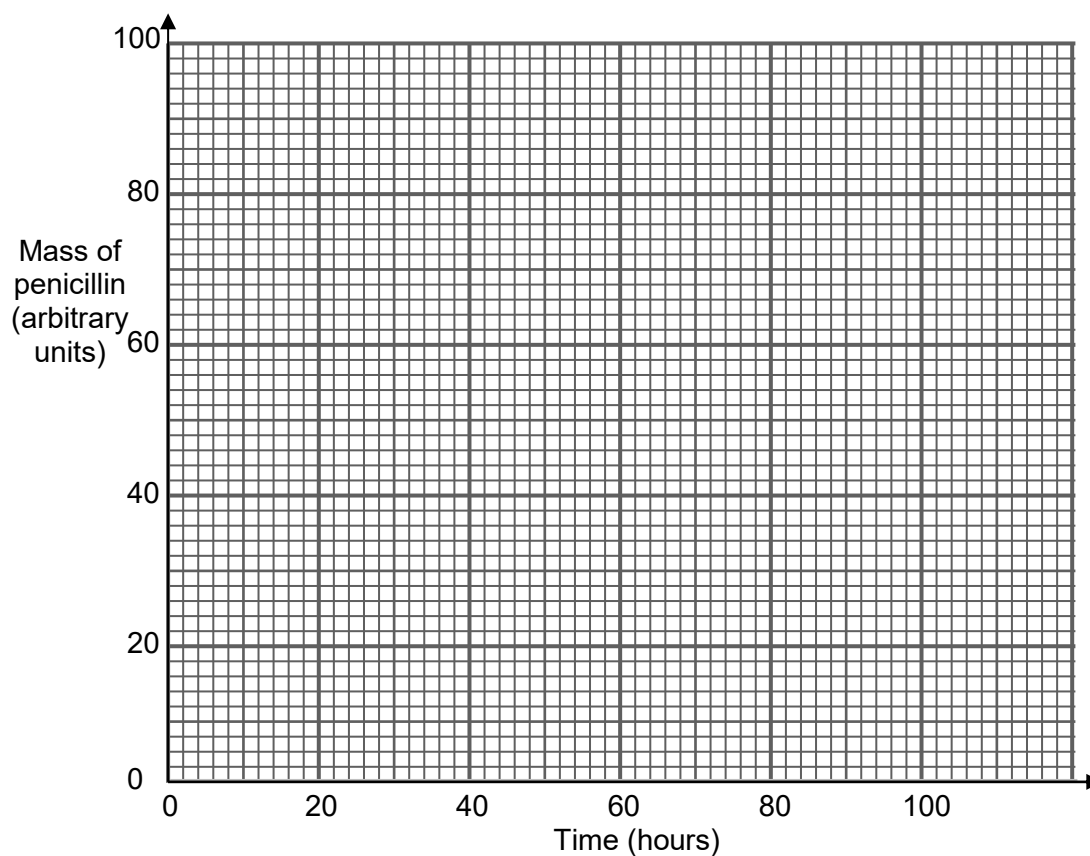
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3. The antibiotic, penicillin, is produced by a fungus, *Penicillium*. Using *Penicillium* grown as a culture on a type of sugar, scientists measured the mass of penicillin produced over a period of seventy hours.

The results are shown in the table below:

Time (hours)	Mass of penicillin (arbitrary units)
20	0
30	4
40	12
50	43
60	67
70	67

- (a) Plot the results on the grid below. Join the plots with a ruler. [3]



(b) From the graph:

(i) State the mass of penicillin at 44 hours. [1]

mass = ..... arbitrary units

(ii) What mass of penicillin was produced between 44 and 54 hours? [1]

mass = ..... arbitrary units

(iii) After how many hours did the production of penicillin stop rising? [1]

.....

(c) (i) How do antibiotics help in curing some diseases? [1]

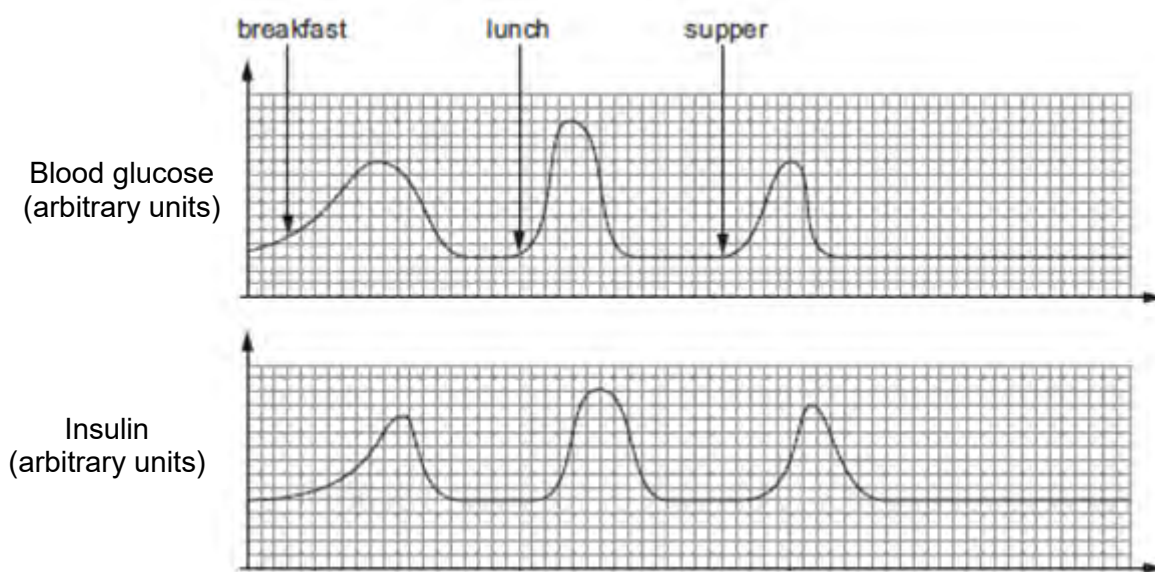
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(ii) What problem can occur if antibiotics are over-used? [1]

.....

8

4. The graphs show the variation in the blood glucose and insulin concentrations in a person a day.



(a) State the effect of eating a meal on the concentration of: [2]

(i) blood glucose;

.....

(ii) insulin.

.....

(b) Explain how the pancreas helps to reduce blood glucose levels. [3]

.....  
 .....  
 .....  
 .....



(c) Some people with diabetes have to inject insulin into their bodies. [2]

(i) What would be the effect of injecting too much insulin on the blood glucose concentration?

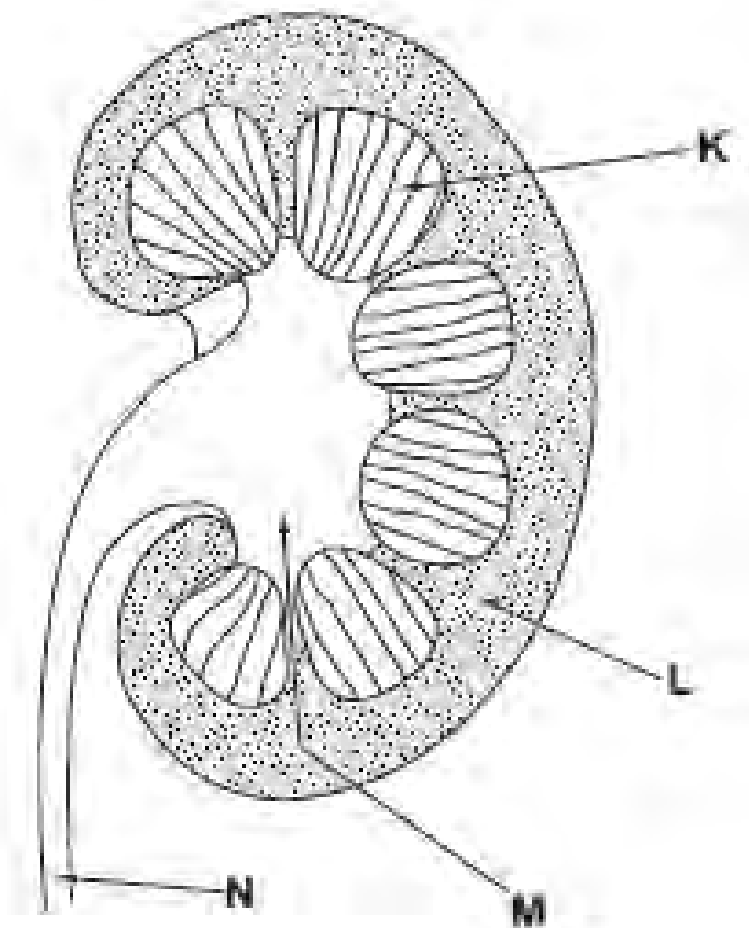
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(ii) How could the effect of injecting too much insulin be corrected?

.....

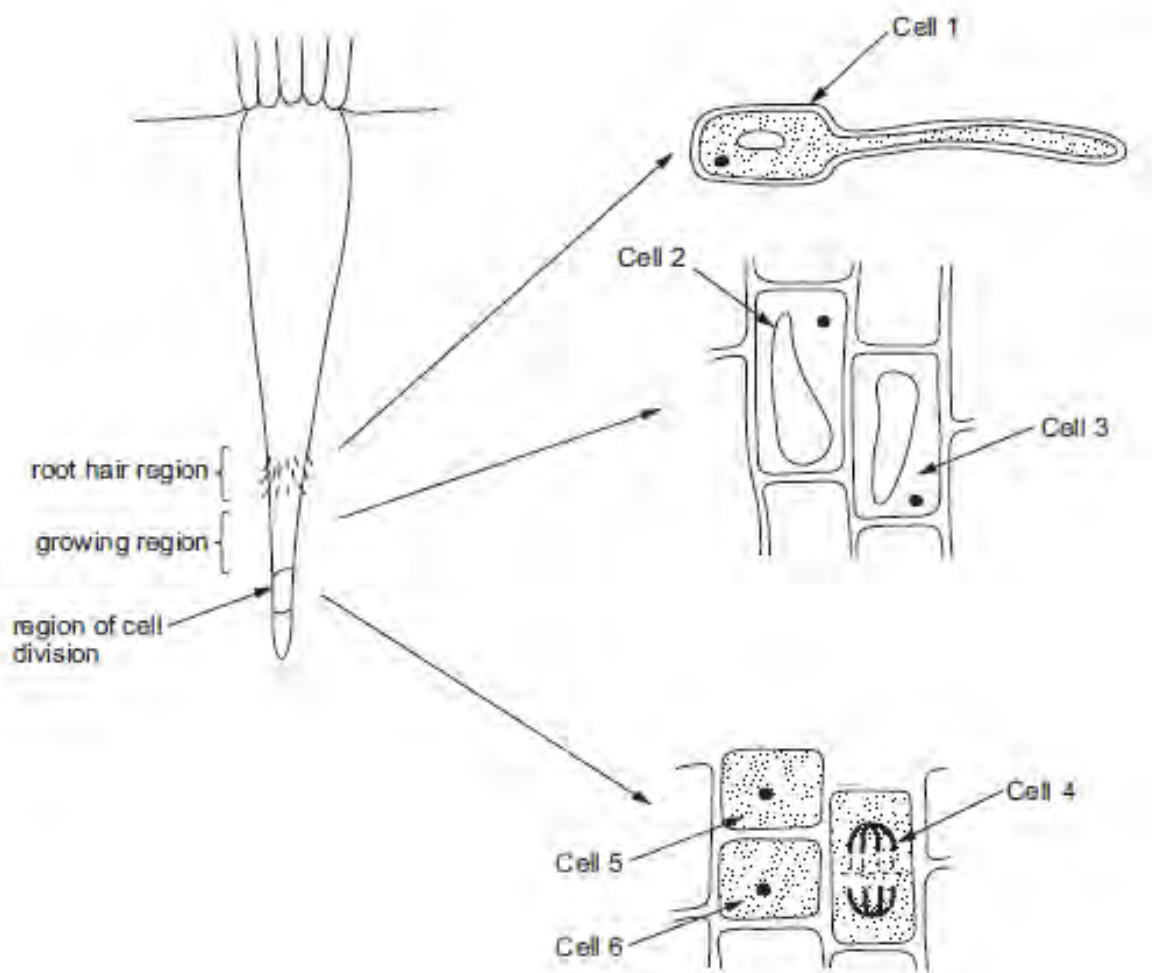
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5. The diagram shows a section through a human kidney.



- (a) Which letters (**K – N**) show the: [3]
- (i) cortex .....
- (ii) medulla .....
- (iii) pelvis .....
- (b) Complete the following statements, naming the structures in the excretory system. [3]
- (i) Urine leaves the kidney through the .....
- (ii) Urine is stored in the .....
- (iii) Urine leaves the body through the .....

6. The diagrams shows some of the cells found in a root of a plant.



Use the numbers in the diagrams (1 – 6) to identify the following cells: [5]

(Any number can be used once, more than once, or not at all).

- |   | number(s) |
|---|-----------|
| (a) a cell which is dividing;                                 | .....     |
| (b) the pair of cells which have just been formed by mitosis; | .....     |
| (c) the cell with the largest surface area;                   | .....     |
| (d) the oldest cell;  | .....     |
| (e) the cell where chromosomes are visible.                   | .....     |

5

7. In fruit flies, the normal wing allele (**N**) is dominant to the small wing allele (**n**).



Normal wing



Small wing

(a) (i) Complete the Punnett Square below to show the results of a cross between a fly with normal wings and a fly with small wings. [1]

	<b>N</b>	<b>n</b>
<b>n</b>		
<b>n</b>		

(ii) What is the percentage of small winged flies in the offspring of this cross? [1]

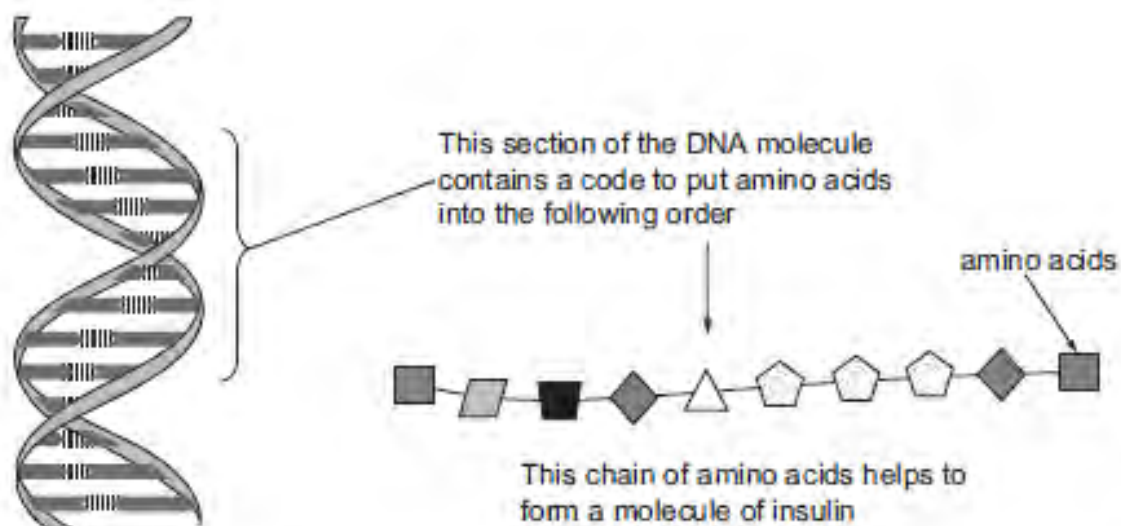
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(b) Use the same letters as in part (a) and fill in the blanks to show two crosses which would **only** produce normal winged flies. [2]

(I) ..... x .....

(II) ..... x .....

8. The diagram shows a part of a molecule of DNA.



- (a) How many different types of bases are found in a DNA molecule? [1]

.....

- (b) A person had a change in his DNA which resulted in him not being able to produce insulin. Instead of producing the chain of amino acids shown in the diagram above, he produced the following chain of amino acids.

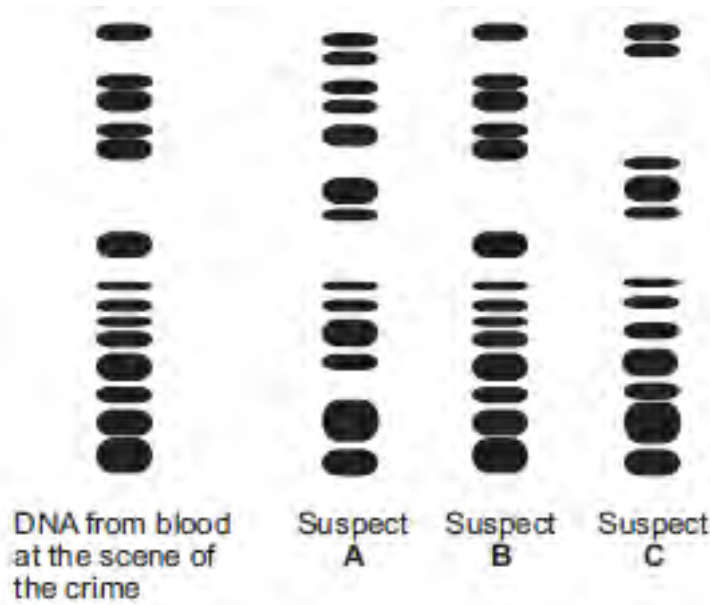


- (i) **Draw a circle** around the part of the chain of amino acids that shows the fault. [1]
- (ii) What name is given to this change in the DNA? [1]

.....

- (c) In the 1980s, Professor Alec Jeffreys showed how genetic profiles could be used to identify crime suspects. He showed that genetic profiles can be used to compare the DNA of different people.

In 1988, DNA was taken from blood found at the scene of a crime. DNA samples were also taken from three suspects, A, B and C. The genetic profiles are shown below.



- (i) Which suspect is most likely to have committed the crime? [1]

.....

- (ii) Give a reason for your answer. [1]

.....  
 .....  
 .....

- (d) In which of the following would the genetic profiles be exactly the same? Underline your answer: [1]

**Two brothers;**

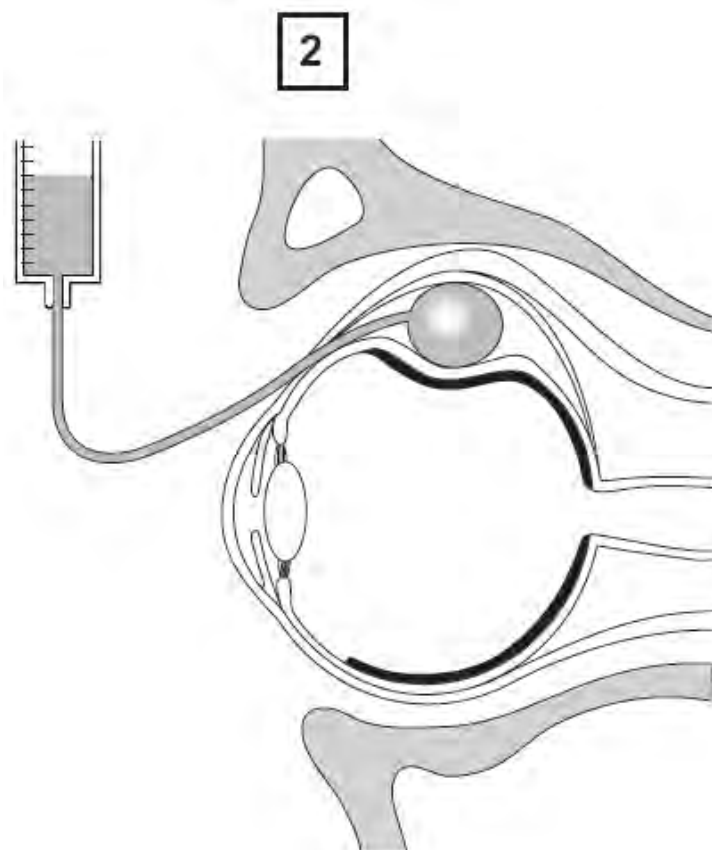
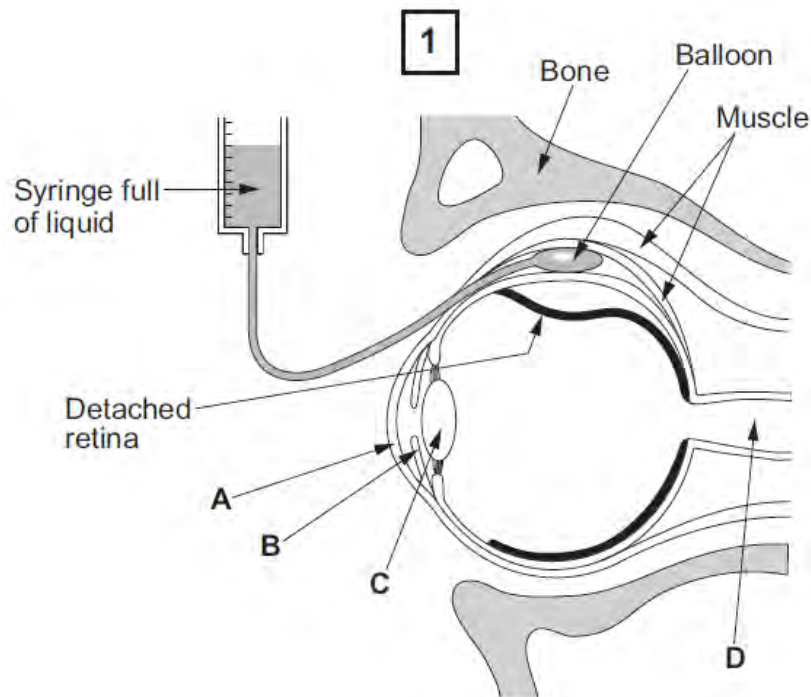
**Mother and daughter;**

**Identical twins;**

**Non-identical twins.**

9. A serious sports injury can result when a cricket player is hit in the eye by a cricket ball. This often causes the retina of the eye to become detached as shown in diagram 1 below.

In 1980, scientists began to use lasers and small balloons to help them repair detached retinas. A laser beam is a perfectly straight beam of light energy and is directed onto the detached retina. The energy in the laser beam fuses the retina back in its normal position.



(a) Which letters (**A – D**) on diagram **1** show: [4]

- |       |  | letter |
|-------|--|--------|
| (i)   | An effector in a reflex action.  | .....  |
| (ii)  | The structure which finely adjusts the focussing of light onto the retina. | .....  |
| (iii) | A connection to the central nervous system.                                | .....  |
| (iv)  | A part which allows light through.   | .....  |

(b) On diagram **2**, **draw a single, straight line** with a ruler to show the path taken by a laser beam when it is passed through the pupil onto the detached retina. [1]

(c) Suggest the function of the balloon in this operation. [1]

.....

.....





11. An investigation was carried out into the effect of caffeine on the reaction time of eight people. Each person was given 2 g of instant coffee dissolved in 200 cm<sup>3</sup> boiling water. A computer program was used to measure the reaction times before and after drinking the coffee.

In order to measure the reaction times, each person had to press a button as soon as a signal was heard.

The results are shown in the table:

Person	Age	Gender	Reaction time (s)	
			Before Coffee	After Coffee
1	15	Male	0.17	0.16
2	17	Female	0.15	0.14
3	19	Female	0.18	0.15
4	16	Male	0.19	0.17
5	17	Male	0.14	0.12
6	20	Male	0.17	0.14
7	18	Male	0.21	0.15
8	16	Female	0.17	0.16

- (a) What is the effect of caffeine on the reaction time of the people tested? [1]

.....  
 .....

- (b) State **one** factor that has been kept constant. .... [1]

- (c) State **three** *other* factors which should have been controlled to make this a fair test. [3]

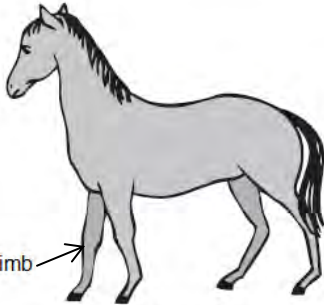
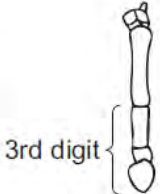
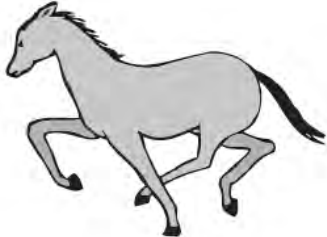

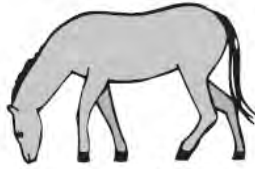





(I) .....

(II) .....

(III) .....

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12. The diagrams show stages in the evolution of the horse.

Age of oldest fossils in millions of years	Name	Body form and size	Bones of right fore limb
1	<i>Equus</i>	 <p>up to 1.6 m</p>	 <p>3rd digit</p>
7	<i>Pliohippus</i>	 <p>1.0 m</p>	
26	<i>Merychippus</i>	 <p>up to 1.0 m</p>	
38	<i>Mesohippus</i>	 <p>up to 0.6 m</p>	
54	<i>Hyracotherium</i>	 <p>about 0.4 m</p>	

All the examples shown are extinct except for the modern horse, *Equus*. *Hyracotherium* is the earliest ancestor. It lived in swampy, marshy areas with dense vegetation.

Gradually, during evolution, the modern horse and its ancestors became adapted to living in drier areas such as firmer, open grassland.

- (a) Suggest why the increase in size shown in the evolutionary stages was an advantage to the modern horse. [2]

.....

.....

.....

.....

- (b) (i) Describe **two** changes that have taken place in the bones of the forelimb during evolution. [2]

.....

.....

.....

- (ii) Suggest an advantage to *Hyracotherium* of having several digits touching the ground. [1]

.....

.....

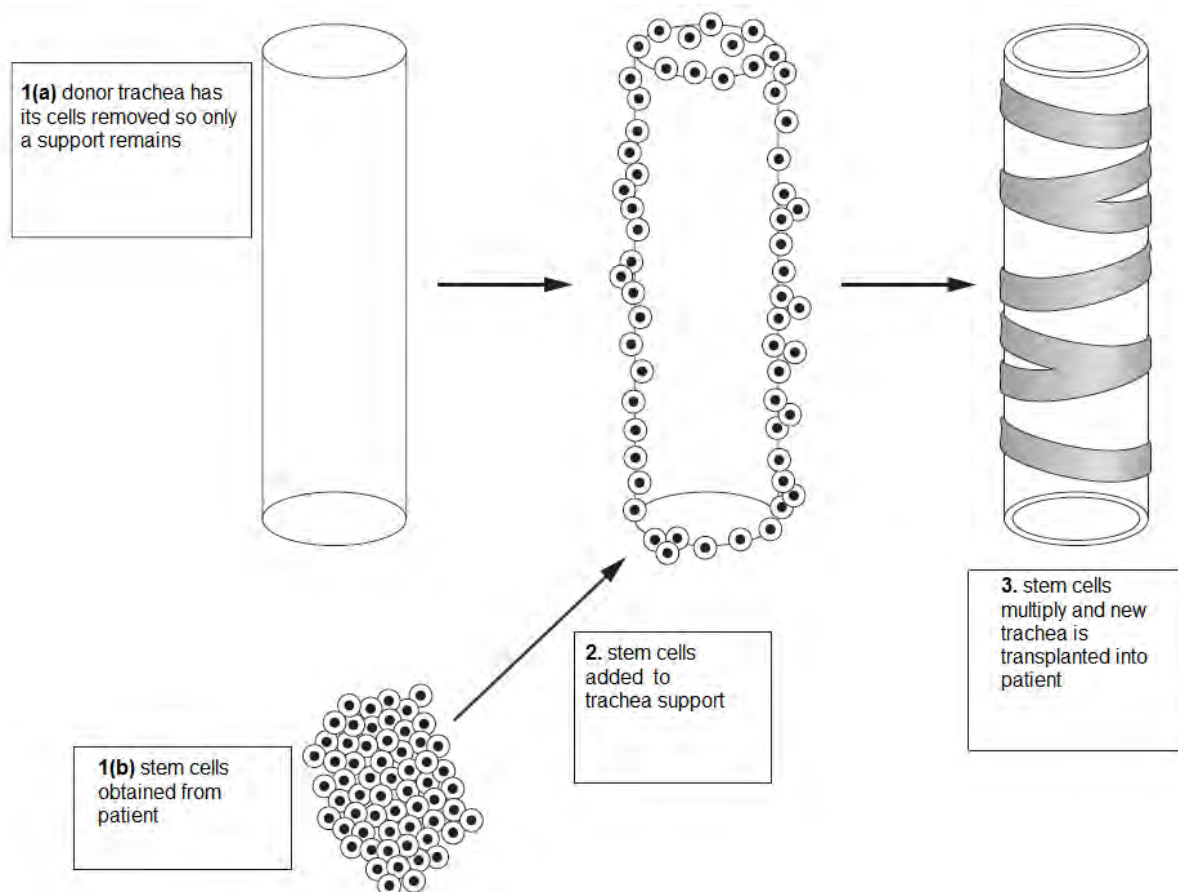
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13. (a) Why are stem cells different to most cells in mature tissues of the body? [1]

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The trachea supplies the lungs with air. If the trachea becomes damaged it can now be replaced by one that is made using the person's own stem cells. The process is summarised in the following diagram.

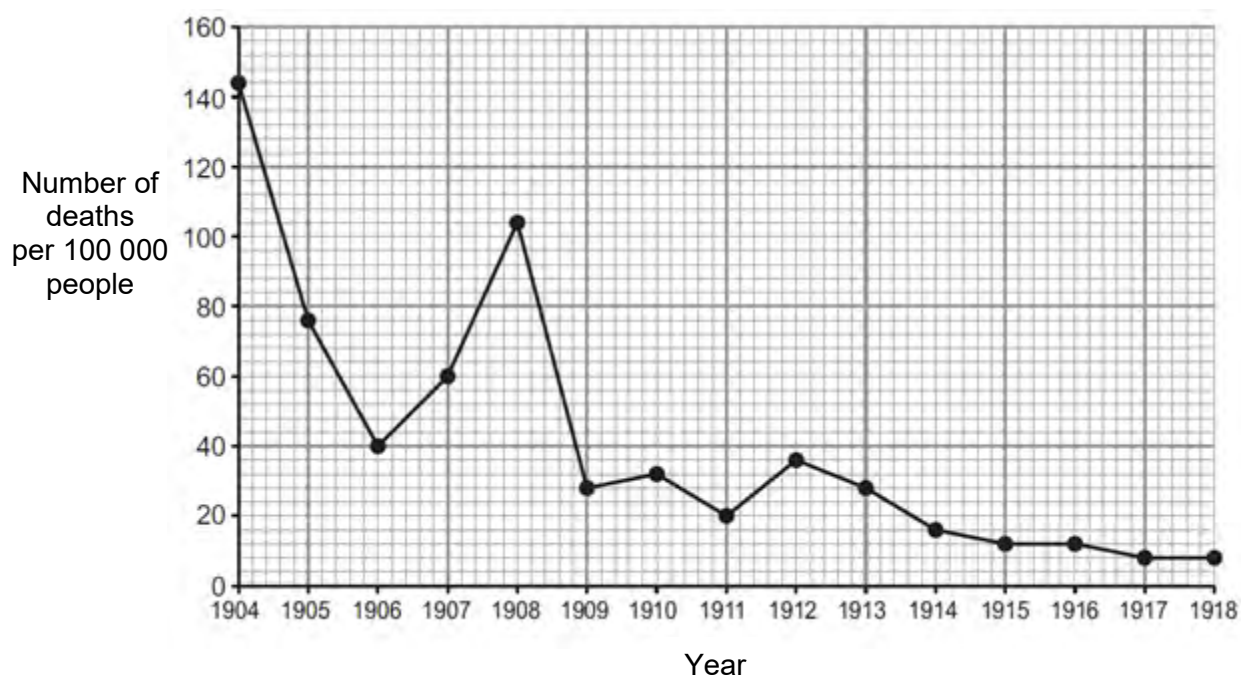


- (b) State **two** advantages to the patient of using their own stem cells rather than using embryonic stem cells from another source. [2]

.....

.....

14. The graph shows the death rate from the disease, typhoid, over a period of fourteen years in Mexico. The disease is caused by the bacterium *Salmonella typhi*. In 1908, chlorine was added to Mexico's drinking water for the first time.



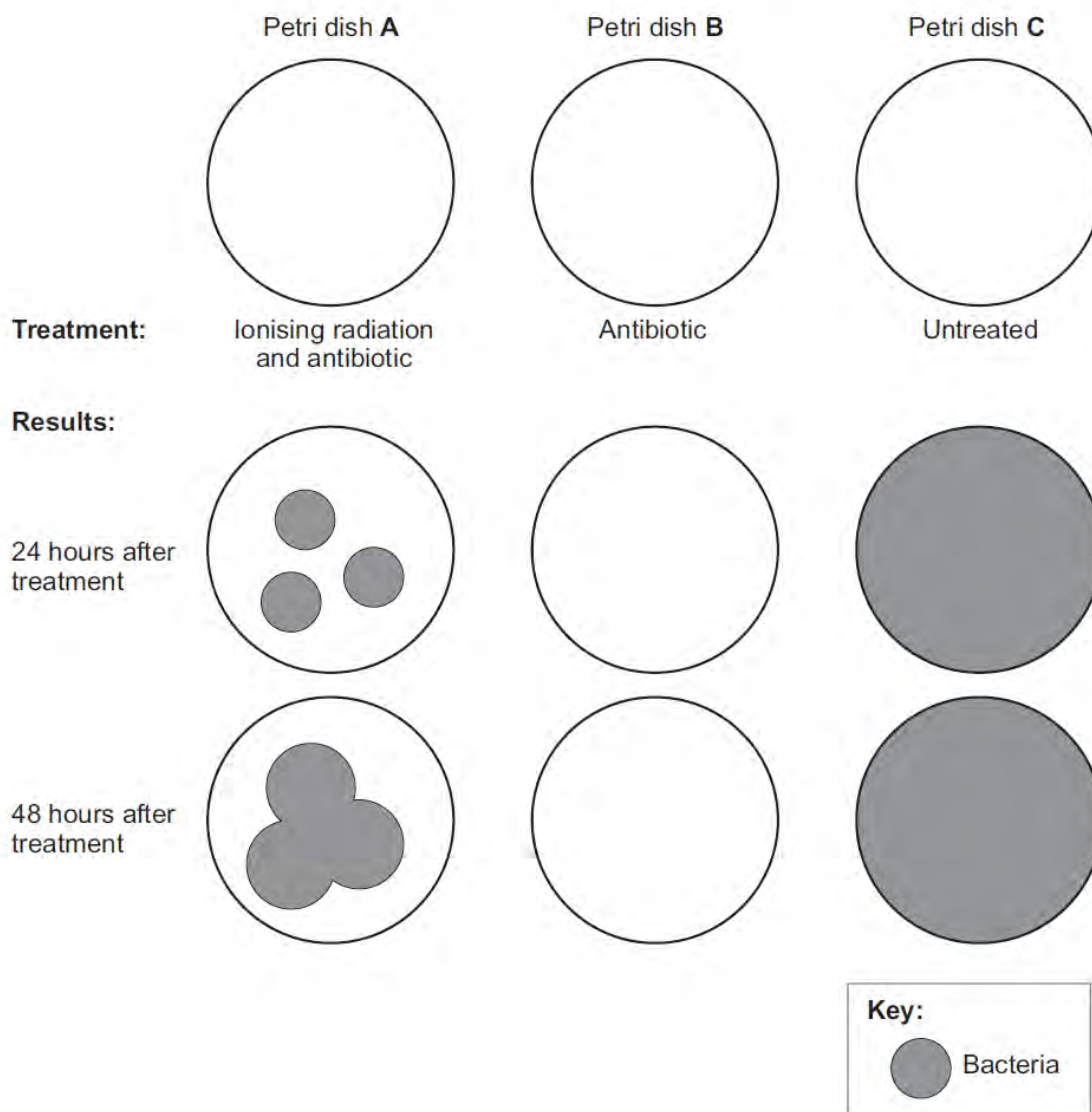
- (a) Use the data given to answer the following:
- (i) What can be concluded about how *Salmonella typhi* can enter the body? [1]
- .....
- (ii) Suggest a reason why the death rate in 1910 was lower than in 1905. [1]
- .....
- (b) Antibiotics were not used to treat typhoid until the 1950s. Suggest a way by which deaths could have been reduced before 1908. [1]
- .....

- (c) In 1979, fourteen thousand people in Mexico died during an outbreak of typhoid. The antibiotic, chloramphenicol, proved to be ineffective during the outbreak. In order to find out why chloramphenicol failed to cure patients, scientists cultured *Salmonella typhi* in Petri dishes and treated them as follows:

Petri dish **A**: this was subjected to ionising radiation followed immediately with a dose of chloramphenicol.

Petri dish **B**: a dose of chloramphenicol, equal to the dose given in Petri dish **A**, was added.

Petri dish **C**: this was given neither ionising radiation, nor chloramphenicol.



- (i) What was the purpose of Petri dish **C**? [1]

.....

- (ii) Explain the effect of ionising radiation on *Salmonella typhi* and why scientists must continue to discover new antibiotics. [3]

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**END OF PAPER**