

Please write clearly in block capitals.

Centre number

Candidate number

Surname

Forename(s)

Candidate signature

I declare this is my own work.

INTERNATIONAL GCSE

COMBINED SCIENCE

Paper 1 Biology Core

C

Tuesday 4 June 2024

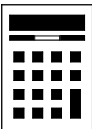
07:00 GMT

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:

- a pencil and a ruler
- a scientific calculator.



Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- All working must be shown.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 100.
- You are expected to use a scientific calculator where appropriate.

| For Examiner's Use |      |
|--------------------|------|
| Question           | Mark |
| 1                  |      |
| 2                  |      |
| 3                  |      |
| 4                  |      |
| 5                  |      |
| 6                  |      |
| 7                  |      |
| 8                  |      |
| 9                  |      |
| 10                 |      |
| TOTAL              |      |

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ANSWER IN THE SPACES PROVIDED**



Answer **all** questions in the spaces provided.

0 1

All living organisms are made of cells.

0 1 . 1

Why does the human body have specialised cells?

[1 mark]

Tick (✓) **one** box.

All the cells of the body need to divide and grow.

☐

Different parts of the body have different functions.

☐

The body needs to maintain a constant temperature.

☐

0 1 . 2

Which structures in the human body are made of tissues?

[1 mark]

Tick (✓) **one** box.

Cells

☐

Genes

☐

Organs

☐

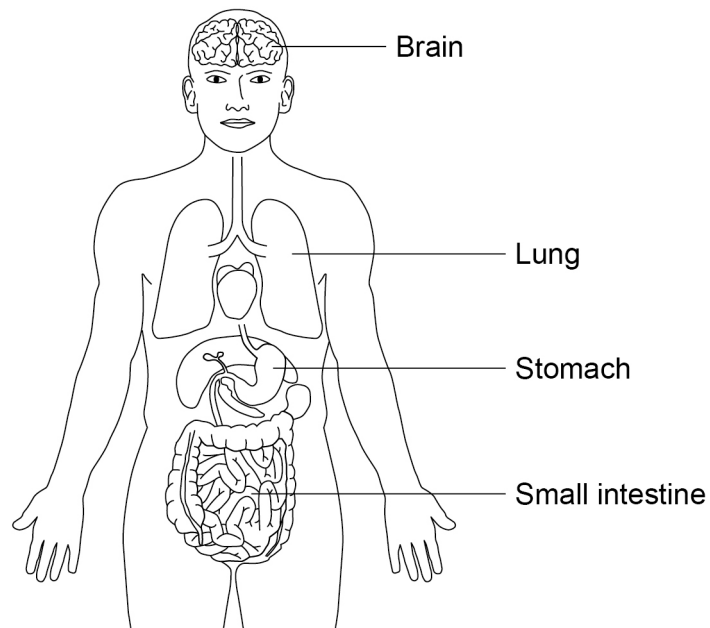
Question 1 continues on the next page

Turn over ►



**Figure 1** shows some organs in the human body.

**Figure 1**



**0 1 . 3** How many different **organ systems** do the organs labelled in **Figure 1** belong to?

**[1 mark]**

Tick (✓) **one** box.

2

☐

3

☐

4

☐


**0 1 . 4** Which organ contains muscle?

**[1 mark]**

Tick (✓) **one** box.

Brain

☐

Lung

☐

Stomach

☐

**0 1 . 5** Which organ in **Figure 1** produces hydrochloric acid?

**[1 mark]**

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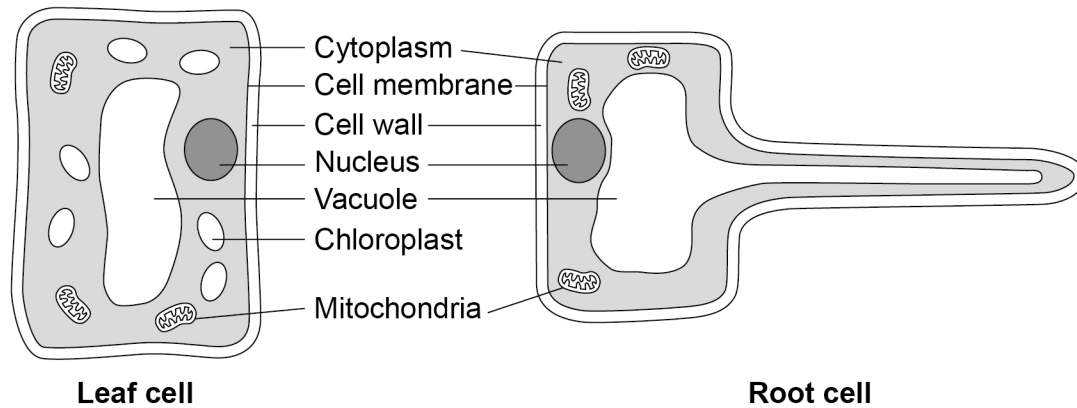
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Figure 2 shows two plant cells.

Figure 2



Leaf cell

Root cell

0 1 . 6 Give **two** similarities between the leaf cell and the root cell.

[2 marks]

1 \_\_\_\_\_

2 \_\_\_\_\_

0 1 . 7 Give **one** difference between the leaf cell and the root cell.

[1 mark]

\_\_\_\_\_

\_\_\_\_\_



**0 2**

The human nervous system allows the body to respond to changes in the environment.

**0 2 . 1**

Which structures in the human nervous system detect stimuli?

**[1 mark]**

Tick (✓) **one** box.

Glands

☐

Receptors

☐

Synapses

☐**0 2 . 2**

Give **two** stimuli that the human nervous system can detect.

**[2 marks]**

1 \_\_\_\_\_

2 \_\_\_\_\_

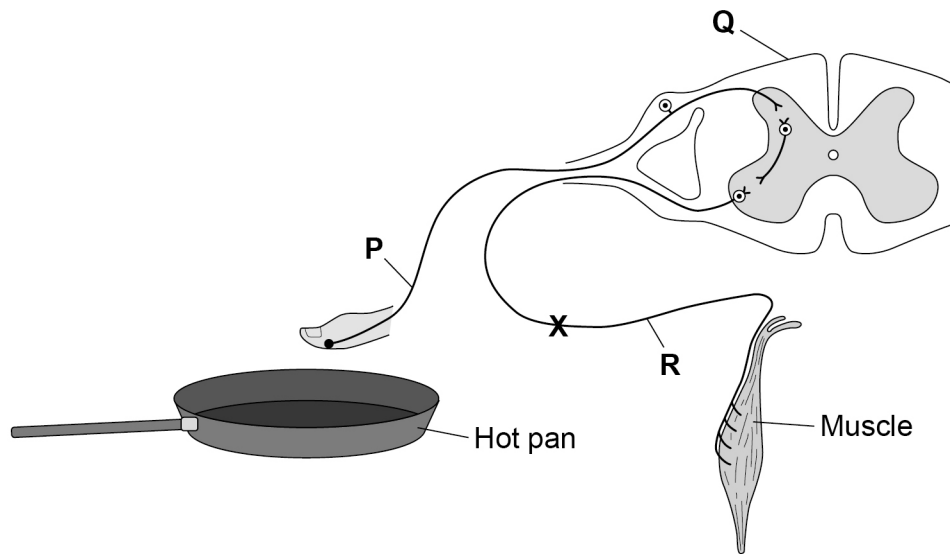
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**Figure 3** shows the pathway of a simple reflex action.

**Figure 3**



**0 2 . 3** Structure **Q** is part of the central nervous system.

What is structure **Q**?

**[1 mark]**

Tick (✓) **one** box.

- |             |                          |
|-------------|--------------------------|
| Brain       | <input type="checkbox"/> |
| Pancreas    | <input type="checkbox"/> |
| Spinal cord | <input type="checkbox"/> |



**0 2 . 4** Describe the function of neurone **P** in **Figure 3**.

**[1 mark]**

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---

**0 2 . 5** Neurone **R** is damaged at point **X** on **Figure 3**.

Explain how the damage at point **X** will affect the reflex response.

**[2 marks]**

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**Question 2 continues on the next page**

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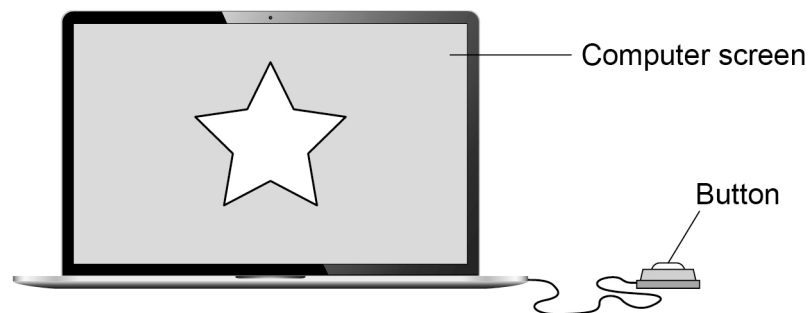
A student carried out a reaction time experiment.

The student pressed a button when a shape appeared on a computer screen.

The computer recorded the student's reaction time.

**Figure 4** shows the equipment used.

**Figure 4**



0 2 . 6

Suggest **one** way the student could avoid distractions during the experiment.

[1 mark]

---

---

The student then drank coffee.

Coffee contains a substance called caffeine.

After 15 minutes, the student repeated the reaction time experiment.

0 2 . 7

Suggest **one** reason why the student waited 15 minutes after drinking the coffee before repeating the experiment.

[1 mark]

---

---



The student repeated the experiment on three different days.

**Table 1** shows the results.

**Table 1**

| Day         | Reaction time in milliseconds |                |
|-------------|-------------------------------|----------------|
|             | Before caffeine               | After caffeine |
| 1           | 255                           | 228            |
| 2           | 251                           | 223            |
| 3           | 248                           | 221            |
| <b>Mean</b> | <b>X</b>                      | 224            |

**0 2 . 8** Calculate value **X** in **Table 1**.

Give your answer to the nearest whole number.

**[3 marks]**

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**X** (nearest whole number) = \_\_\_\_\_ milliseconds

**0 2 . 9** What do the results in **Table 1** show about the effect of caffeine on reaction time?

**[1 mark]**

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**0 3**

Algae produce glucose by photosynthesis.

**0 3 . 1**Name **one other** type of organism that produces glucose by photosynthesis.**[1 mark]**

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**0 3 . 2**

What type of energy is used for photosynthesis?

**[1 mark]**

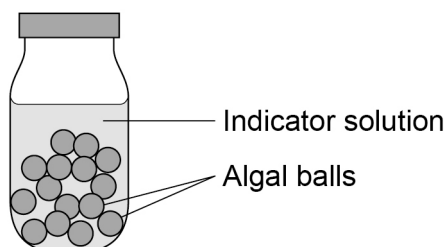
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A student made small algal balls to use in a photosynthesis investigation.

Algal balls contain algae.

**Figure 5** shows a bottle containing algal balls in indicator solution.

**Figure 5**



Carbon dioxide from the indicator solution is used during photosynthesis.

The indicator solution changes colour when carbon dioxide concentration decreases.

**0 3 . 3**

The student compared the rate of photosynthesis at different temperatures.

Name the apparatus used to measure temperature.

**[1 mark]**

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**Question 3 continues on the next page**

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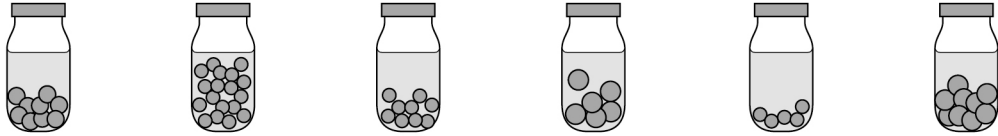


The student used six bottles containing algal balls in indicator solution.

The student kept each bottle at a different temperature.

**Figure 6** shows the six bottles the student used.

**Figure 6**



Temperature: 0 °C    \_\_\_\_\_ °C    \_\_\_\_\_ °C    \_\_\_\_\_ °C    \_\_\_\_\_ °C    50 °C

0 3 . 4

Complete **Figure 6** to suggest **four other** temperatures the student should have used in the investigation.

[1 mark]

0 3 . 5

The student's investigation would **not** allow a valid comparison of the rate of photosynthesis at different temperatures.

Suggest **two** changes to the investigation so a valid comparison can be made.

Use **Figure 6**.

[2 marks]

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_



**0 3 . 6** What type of variable was **temperature** in the investigation?

**[1 mark]**

Tick (✓) **one** box.

Control variable

☐

Dependent variable

☐

Independent variable

☐

**0 3 . 7** The student also used some bottles with **no** algal balls in the indicator solution.

Why did the student use some bottles with no algal balls?

**[1 mark]**

Tick (✓) **one** box.

Because algal balls make it difficult to see the colour change

☐

Because the colour change is too fast using algal balls

☐

To show that the algal balls cause the colour change

☐

**Question 3 continues on the next page**

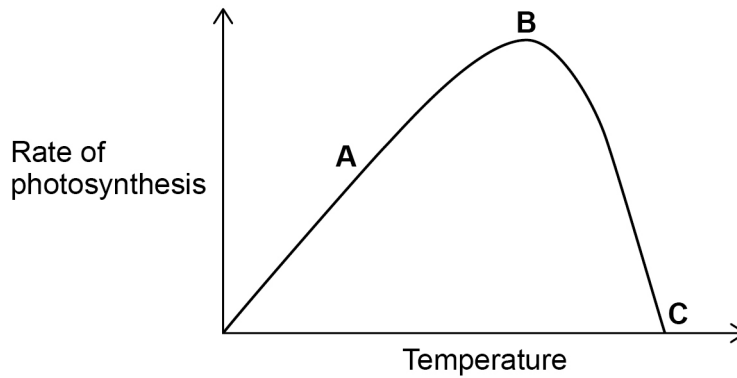
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The student repeated the investigation using a valid method.

**Figure 7** shows the effect of changing temperature on the rate of photosynthesis.

**Figure 7**



0 3 . 8

Describe the changes in the rate of photosynthesis as the temperature increases from **A** to **C**.

Use **Figure 7**.

[2 marks]

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0 3 . 9

Give the reason for the result at **C** in **Figure 7**.

[1 mark]

---



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**0 4**

Processes in the body depend on different chemical substances.

Proteins are chemical substances.

**0 4****. 1**

Which proteins speed up the breakdown of large molecules in the digestive system?

**[1 mark]**

Tick (✓) **one** box.

Antibodies

☐

Enzymes

☐

Hormones

☐**0 4****. 2**

Haemoglobin is a protein in red blood cells.

Which molecule combines with haemoglobin in the lungs?

**[1 mark]**

Tick (✓) **one** box.

Oxygen

☐

Starch

☐

Urea

☐

**Question 4 continues on the next page**

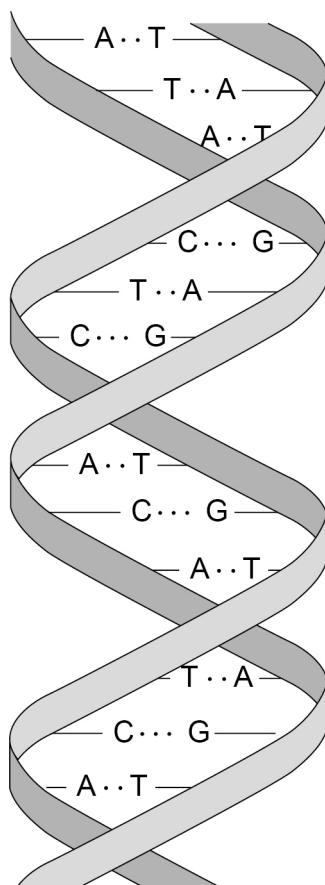
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DNA controls the synthesis of proteins.

**Figure 8** shows a molecule of DNA.

**Figure 8**



**0 4 . 3** Complete the sentence about the structure of DNA.

Choose the answer from the box.

**[1 mark]**

**double helix**

**single strand**

**triple compound**

A DNA molecule is twisted to form a \_\_\_\_\_.



0 4 . 4

Complete the sentence.

Choose the answer from the box.

[1 mark]

atoms

bases

molecules

The order of amino acids in a protein is determined

by the sequence of DNA \_\_\_\_\_.

0 4 . 5

What is the name of a section of DNA that controls the development of a particular characteristic?

[1 mark]

Tick (✓) **one** box.

Chromosome

☐

Gene

☐

Vector

☐

Question 4 continues on the next page

Turn over ►



0 4 . 6

Some conditions develop because the DNA sequence is changed.

Cystic fibrosis is an inherited condition caused by a recessive allele, **r**.

A person with the alleles **RR** and a person with cystic fibrosis plan to have a child.

Complete **Figure 9**.

Give the chance of the child having cystic fibrosis.

[3 marks]

**Figure 9**

|      |   | Female |    |
|------|---|--------|----|
|      |   | R      | R  |
| Male |   | Rr     |    |
|      | r |        | Rr |

Chance of the child having cystic fibrosis = \_\_\_\_\_

8



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0 5

Giraffes have long necks.

0 5

1

How would **Lamarck's** theory be used to explain why giraffes developed long necks?**[1 mark]**Tick (✓) **one** box.

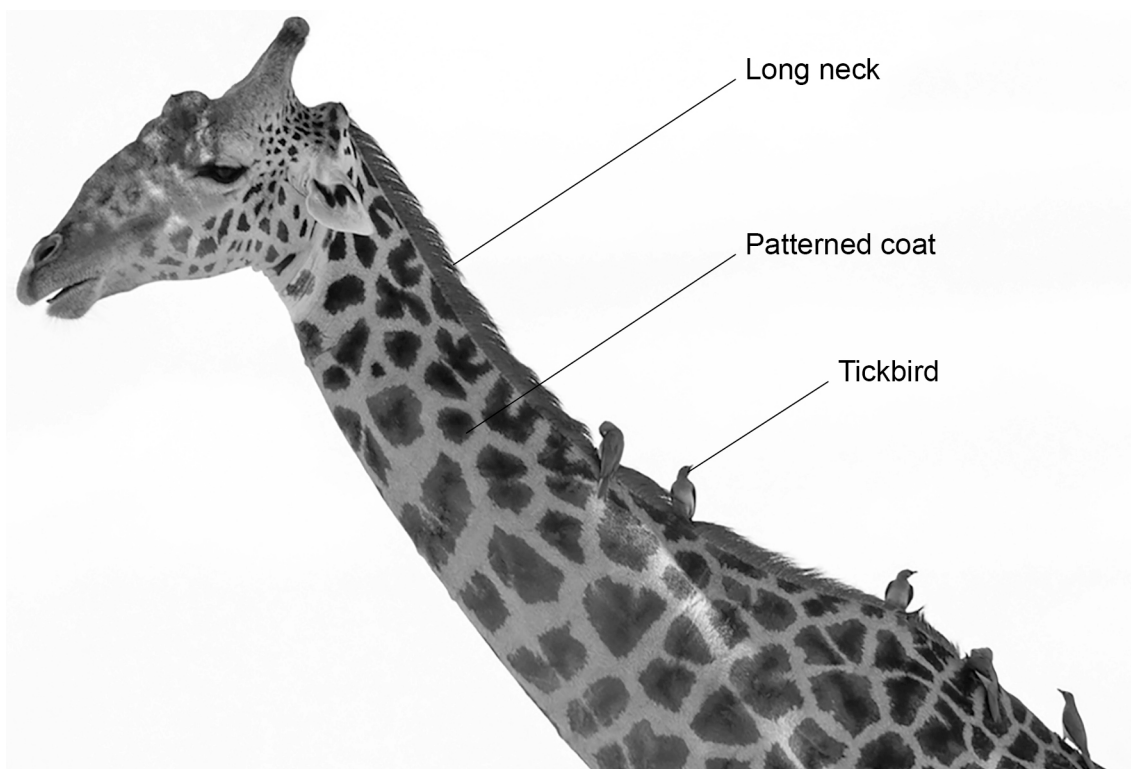
A mutation in the DNA causes longer necks to develop in giraffes.

☐

Giraffes with longer necks are more likely to survive and reproduce.

☐

Longer necks that develop during the lifetime of a giraffe are passed to offspring.

☐**Figure 10** shows a giraffe and some tickbirds.**Figure 10**

0 5 . 2

Giraffes are adapted to live in their environment.

Suggest how the long neck and the patterned coat help giraffes survive in their environment.

[2 marks]

Long neck \_\_\_\_\_

\_\_\_\_\_

Patterned coat \_\_\_\_\_

\_\_\_\_\_

0 5 . 3

Small insects live in the fur of giraffes.

The insects pierce the skin of the giraffe and suck blood from the giraffe.

Suggest **one** reason why having insects in the fur increases the risk of infectious disease.

[1 mark]

\_\_\_\_\_

\_\_\_\_\_

0 5 . 4

The tickbirds in **Figure 10** eat the insects in the fur of the giraffe.

Suggest **one** benefit for the tickbirds and **one** benefit for the giraffe.

[2 marks]

Benefit for tickbirds \_\_\_\_\_

\_\_\_\_\_

Benefit for giraffe \_\_\_\_\_

\_\_\_\_\_

**Question 5 continues on the next page**

**Turn over ►**



**Figure 11** shows four places in Africa where populations of giraffe live.

**Figure 11**

**Key**

- ☒ populations of giraffe  
☐ no population of giraffe



**0 5 . 5**

Which **two** of the following are stages in the evolution of a new species of giraffe?

**[2 marks]**

Tick (✓) **two** boxes.

Asexual reproduction

☐

Courtship

☐

Isolation

☐

Mitosis

☐

Natural selection

☐


0 5 . 6

Scientists thought that all the giraffes in the world were the same species.

In 2016, experiments using DNA showed that giraffes are **not** all the same species.

Why were giraffes only identified as different species recently?

**[1 mark]**

Tick (✓) **one** box.

Giraffes evolved into more than one species in 2016.

☐

The number of giraffes in the world has recently increased.

☐

The technology used in DNA testing improved.

☐

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9

**Turn over for the next question**

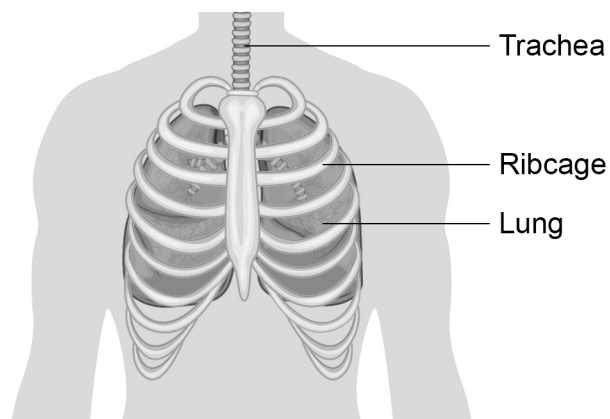
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0 6

Figure 12 shows some parts of the respiratory system.

Figure 12



0 6 . 1

Complete the sentence about the trachea.

Choose the answer from the box.

[1 mark]

arteries

bronchi

muscles

The trachea branches into two \_\_\_\_\_.

0 6 . 2

Give **one** function of the ribcage.

[1 mark]

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0 6 . 3

The lungs contain 480 000 000 alveoli.

One alveolus has an area of  $0.27 \text{ mm}^2$ .

Calculate the total area of the alveoli in the lungs.

[2 marks]

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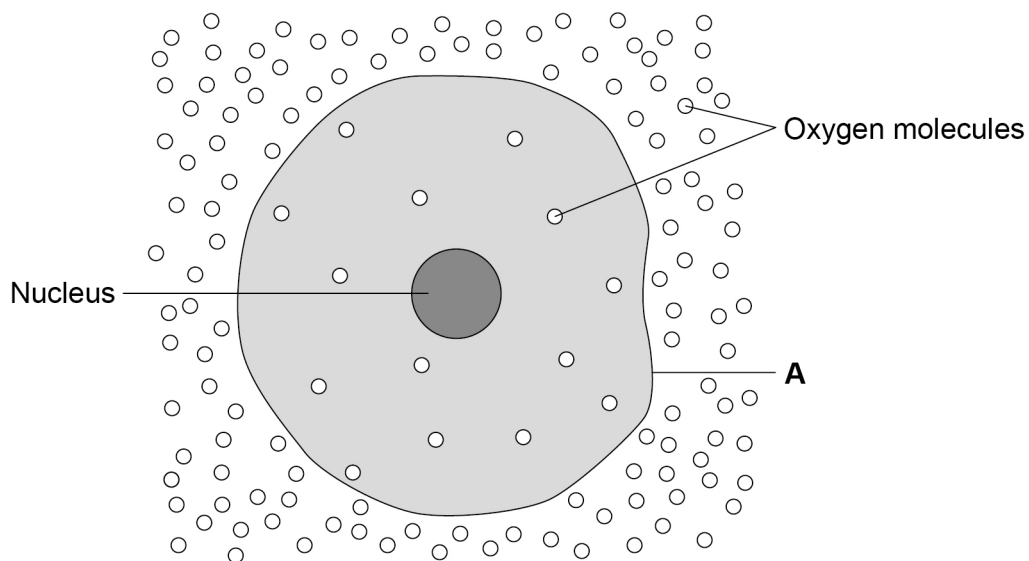
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Total area = \_\_\_\_\_  $\text{mm}^2$



**Figure 13** shows oxygen molecules inside an animal cell and surrounding the cell.

**Figure 13**



**0 6 . 4** Name structure **A** on **Figure 13**.

[1 mark]

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**0 6 . 5** After 30 minutes, the concentration of oxygen molecules inside the cell is different from **Figure 13**.

Explain why the concentration of oxygen molecules inside the cell changes.

[3 marks]

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Turn over ►



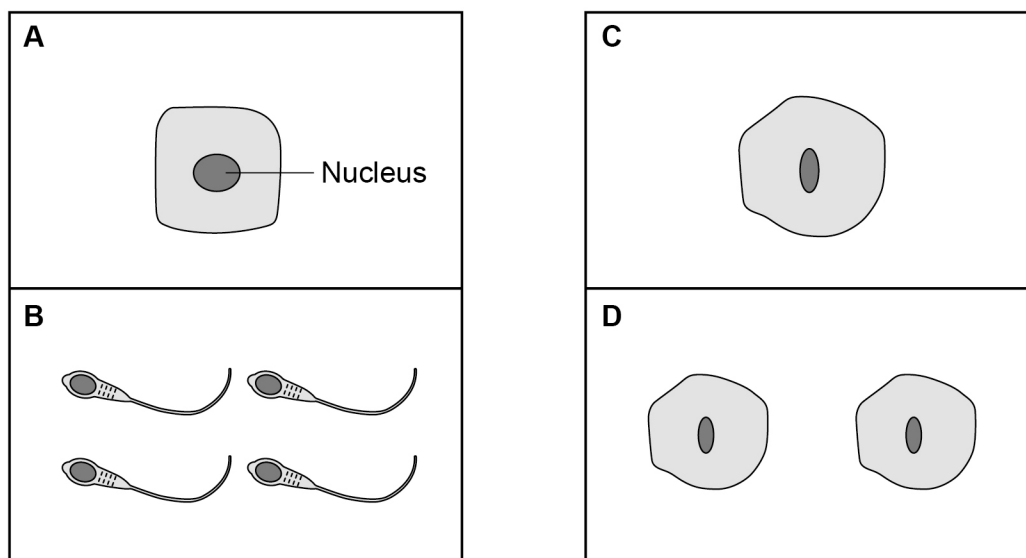
0 7

Cells divide to produce new cells for growth and reproduction.

There are two types of cell division.

**Figure 14** shows the products of both types of cell division.

**Figure 14**



The cell in **A** divides to produce  
the four cells in **B**

The cell in **C** divides to produce  
the two cells in **D**

0 7 . 1

Complete the sentence.

[1 mark]

The cells in **B** are called \_\_\_\_\_.

0 7 . 2

The cell in **C** divides once to form the cells in **D**.

How many times does the cell in **A** divide to form the cells in **B**?

[1 mark]

\_\_\_\_\_



**0 7 . 3** All the cells in **Figure 14** are from the same animal.

Complete **Table 2** to show the number of chromosomes in each cell.

**[3 marks]**

**Table 2**

| Each cell in | Number of chromosomes |
|--------------|-----------------------|
| <b>A</b>     | 16                    |
| <b>B</b>     |                       |
| <b>C</b>     |                       |
| <b>D</b>     |                       |

**Question 7 continues on page 31**

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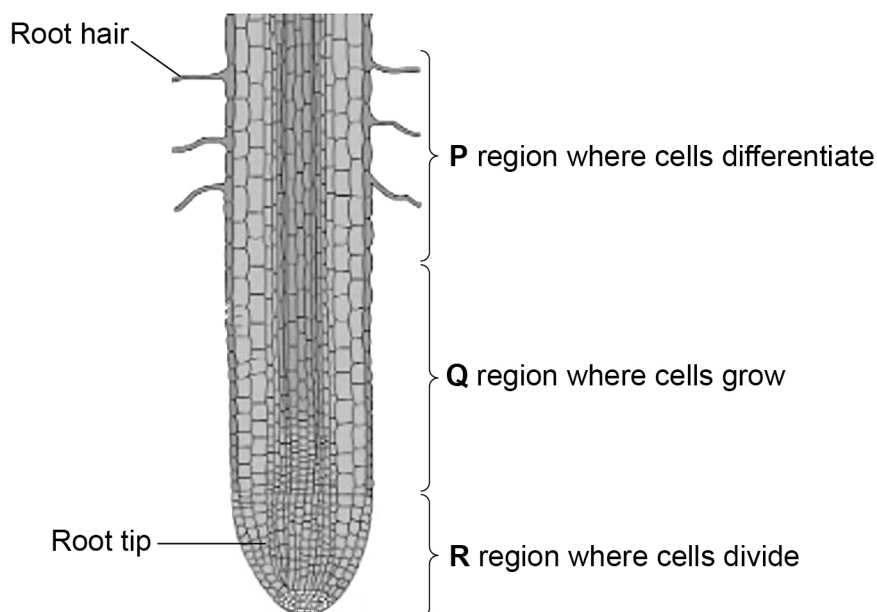
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Cell division takes place in plant roots.

**Figure 15** shows what happens to plant cells in different regions of a root.

**Figure 15**



A student looked at cells from one part of the root.

**0 7 . 4**

The cells need to be magnified more than 100 times.

Which apparatus would the student use to magnify and look at the plant cells?

**[1 mark]**

Tick (✓) **one** box.

Hand lens

☐

Inoculating loop

☐

Microscope

☐

Pipette

☐

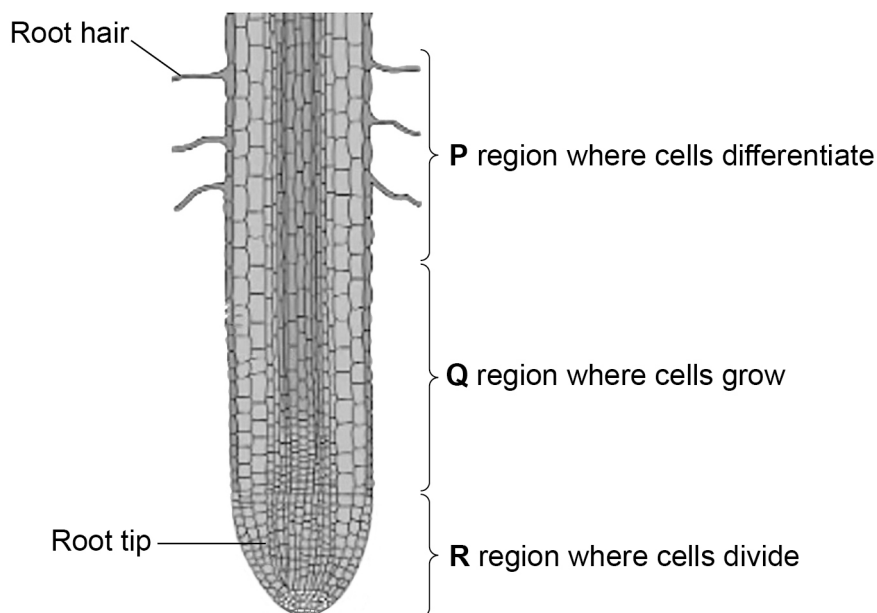
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Figure 15 is repeated below.

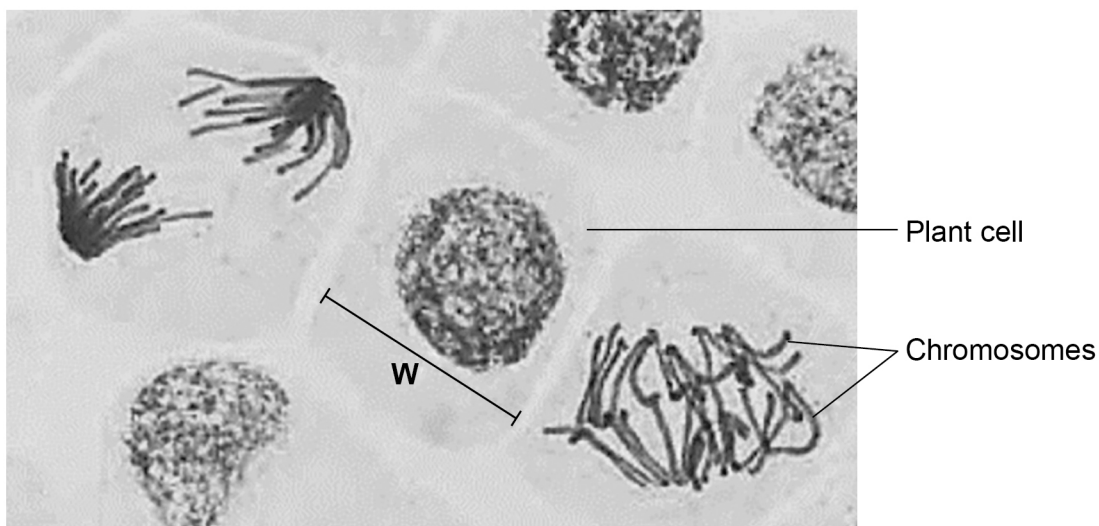
**Figure 15**



During mitosis, it is possible to see individual chromosomes.

Figure 16 is a magnified image of the plant cells observed by the student.

**Figure 16**



0 7 . 5

Which region in **Figure 15** were the cells in **Figure 16** taken from?

[1 mark]

---



07.6

Line **W** on **Figure 16** is the image width of the plant cell.

Determine the image width of the plant cell.

You should:

- measure line **W**
- give your answer in mm.

[1 mark]

Image width **W** = \_\_\_\_\_ mm

07.7

The actual width of the plant cell is 20  $\mu\text{m}$ .

Calculate the magnification of the image in **Figure 16**.

Use your answer to **Question 07.6** and the equation:

$$\text{magnification} = \frac{\text{image width}}{\text{actual width}}$$

1 mm = 1000  $\mu\text{m}$ .

[3 marks]

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Magnification =  $\times$  \_\_\_\_\_

07.8

Chromosomes can be seen in 33% of the cells in **Figure 16**.

Give the reason why this **may not** be representative of the whole region that the cells were taken from.

[1 mark]

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Turn over for the next question

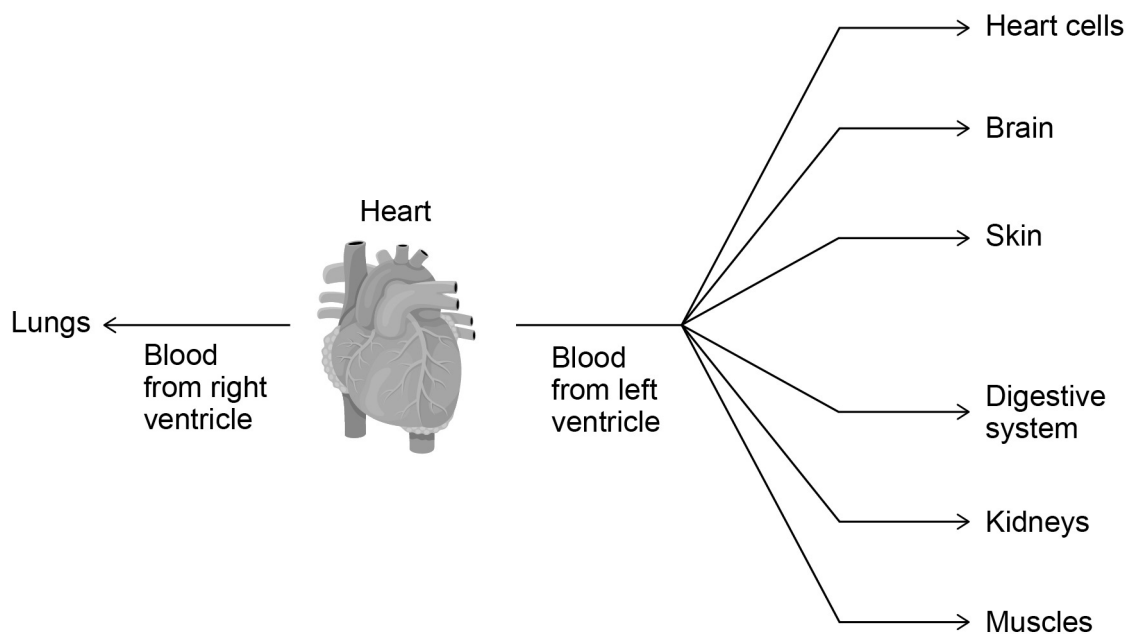
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0 8

**Figure 17** shows the flow of blood to different parts of the body.

**Figure 17**



0 8

1

The blood transports oxygen and carbon dioxide.

Complete **Table 3** to show the concentration of gases in blood from each ventricle.

You should write either **high** or **low** in each box.

**[2 marks]**

**Table 3**

|                                   | Concentration of oxygen | Concentration of carbon dioxide |
|-----------------------------------|-------------------------|---------------------------------|
| Blood from <b>right ventricle</b> |                         |                                 |
| Blood from <b>left ventricle</b>  |                         |                                 |



**0 8 . 2**

Why does blood flow to the small intestine increase during digestion?

**[1 mark]**Tick (✓) **one** box.

So that insoluble molecules are digested

☐

So that more water is absorbed from the faeces

☐

To add more enzymes onto the food

☐

To speed up absorption of soluble molecules

☐**0 8 . 3**

Explain why blood flow to muscles increases as a person starts to exercise.

Do **not** refer to lactic acid.**[4 marks]**

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**Question 8 continues on the next page****Turn over ►**

Lactic acid is produced in the muscles during vigorous exercise.

**0 8 . 4** Complete the word equation for the production of lactic acid in muscles.

**[1 mark]**

\_\_\_\_\_ → lactic acid

The blood transports lactic acid from the muscles to the liver to be broken down.

**0 8 . 5** Why is it important to remove lactic acid from the muscles?

**[1 mark]**

\_\_\_\_\_  
\_\_\_\_\_

An athlete investigated how blood lactic acid concentration varied after exercise.

The athlete:

- exercised vigorously for a period of time
- had a recovery period of 40 minutes after the exercise finished
- measured blood lactic acid concentration during the recovery period
- repeated the same vigorous exercise the next day.

On day **1**, the athlete did **no** exercise during the recovery period.

On day **2**, the athlete did gentle exercise during the recovery period.

**0 8 . 6** Suggest **two** ways that the athlete could make sure that the exercise had the same effect on the body on both days.

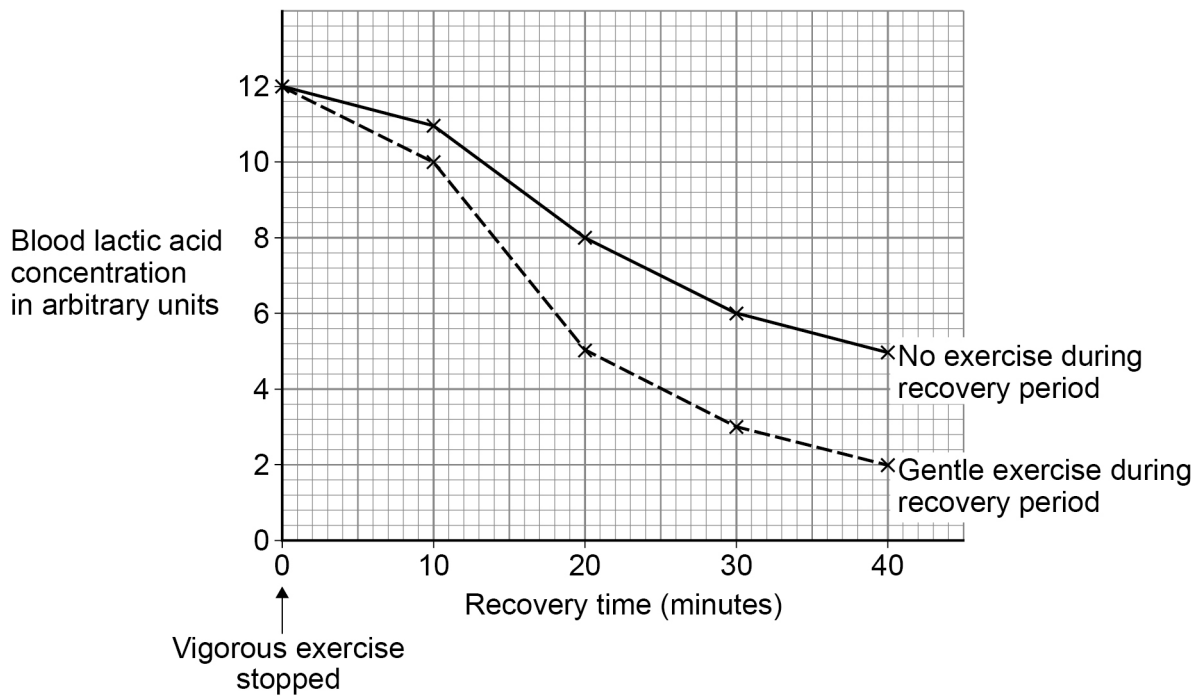
**[2 marks]**

1 \_\_\_\_\_  
\_\_\_\_\_  
2 \_\_\_\_\_  
\_\_\_\_\_



**0 8 . 7** Figure 18 shows the results.

**Figure 18**



Blood lactic acid concentration at rest is 1 arbitrary unit.

Give **three** conclusions from the results in **Figure 18**.

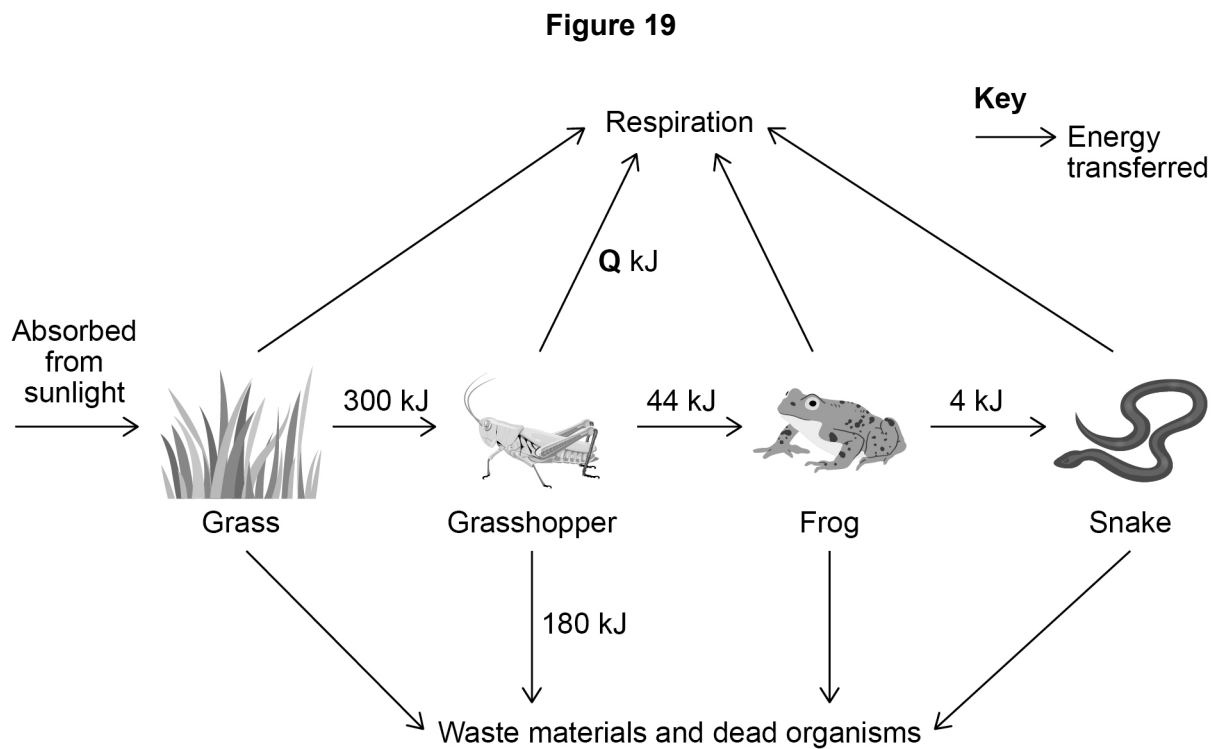
**[3 marks]**

- 1 \_\_\_\_\_
- 2 \_\_\_\_\_
- 3 \_\_\_\_\_



0 9

Figure 19 shows the flow of energy through a food chain.



0 9 . 1

300 kJ of energy is transferred from grass to grasshoppers.

Energy transferred by respiration of the grasshoppers is shown as **Q** in Figure 19.

Determine value **Q** in Figure 19.

[2 marks]

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**Q** = \_\_\_\_\_ kJ



**0 9 . 2** Which **two** molecules are produced in grass using energy from respiration?

**[2 marks]**

Tick (✓) **two** boxes.

Amino acids

☐

Carbon dioxide

☐

Nitrates

☐

Protein

☐

Water

☐

**0 9 . 3** Describe how the carbon in waste materials and dead organisms is returned to the environment to be used by plants.

**[4 marks]**

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8

Turn over ►



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|---|---|
| 1 | 0 |
|---|---|

There are different species of ferret.

**Figure 20** shows one species of ferret called the black-footed ferret.

**Figure 20**



The number of black-footed ferrets is too low for the species to survive in the wild.

Scientists removed some black-footed ferrets from the wild and kept them captive in a zoo.

|   |   |   |   |
|---|---|---|---|
| 1 | 0 | . | 1 |
|---|---|---|---|

Suggest **one** reason why keeping black-footed ferrets in a zoo helps them survive.

**[1 mark]**

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**Question 10 continues on the next page**

**Turn over ►**

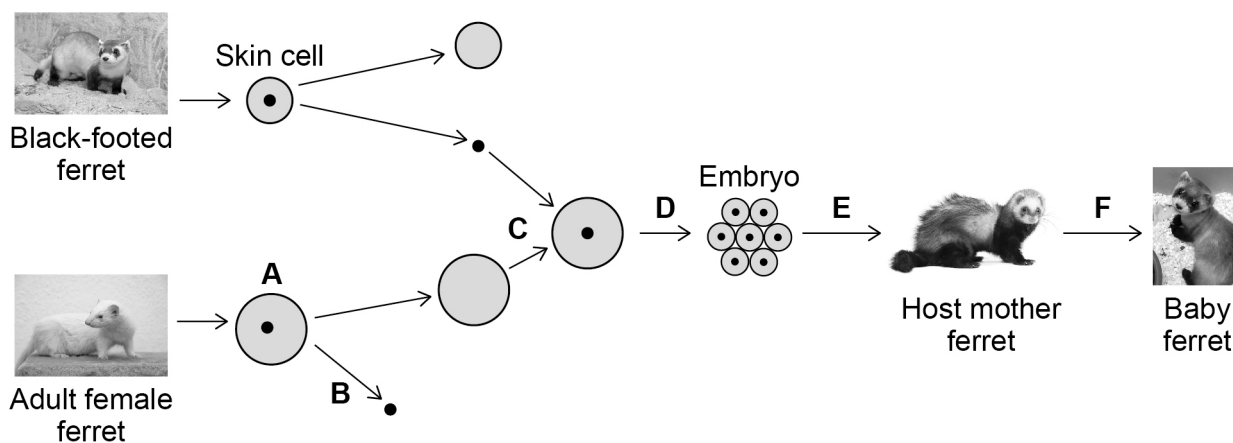


The black-footed ferrets in the zoo did not produce any offspring by sexual reproduction.

A skin cell taken from a black-footed ferret in the zoo was used to produce another black-footed ferret by adult cell cloning.

**Figure 21** shows the process of adult cell cloning.

**Figure 21**



**1 0 . 2** What type of cell is cell **A**?

**[1 mark]**

Tick (✓) **one** box.

Egg cell

☐

Muscle cell

☐

Nerve cell

☐

Skin cell

☐


**1 0 . 3** Table 4 describes some of the stages of adult cell cloning shown in **Figure 21**.

Complete **Table 4**.

**[3 marks]**

**Table 4**

| Stage on Figure 21 | Description                                         |
|--------------------|-----------------------------------------------------|
| <b>B</b>           |                                                     |
| <b>C</b>           |                                                     |
| <b>D</b>           | The cell divides and forms an embryo                |
| <b>E</b>           |                                                     |
| <b>F</b>           | The host mother ferret gives birth to a baby ferret |

**1 0 . 4** What is used to stimulate the cell to start dividing at stage **D**?

**[1 mark]**

---

**1 0 . 5** Which ferret in **Figure 21** is genetically identical to the baby ferret?

**[1 mark]**

---

**1 0 . 6** Animal species may not survive when there are changes in their environment.

Suggest **two** human activities that can cause changes in the environment where a species lives.

**[2 marks]**

1 

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2 

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**END OF QUESTIONS**



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