AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

# GCSE
# BIOLOGY

**F**

Foundation Tier Paper 2F

Monday 11 June 2018 Morning Time allowed: 1 hour 45 minutes

**Materials**

For this paper you must have:
- 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 in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

**Information**
- There are 100 marks available on this paper.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

| For Examiner's Use | |
|---|---|
| Question | Mark |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| 9 | |
| 10 | |
| 11 | |
| **TOTAL** | |

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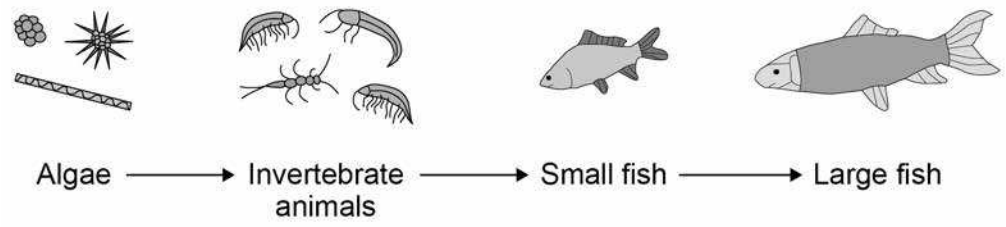
**0 1** **Figure 1** shows a food chain in a river.

**Figure 1**




**0 1 . 1** Draw **one** line from each scientific term to the correct organism in the food chain.

**[3 marks]**

| **Scientific term** | **Organism in the food chain** |
|---|---|
| | Algae |
| Apex predator | Invertebrate animals |
| Primary consumer | Large fish |
| Producer | Small fish |

*Do not write outside the box*

**0 1 . 2** **Table 1** shows the biomass of the organisms at each stage in the food chain.

**Table 1**

| Organism | Biomass in arbitrary units |
|---|---|
| Algae | 840 |
| Invertebrate animals | 200 |
| Small fish | 40 |
| Large fish | 10 |

Calculate the percentage of the biomass of the invertebrate animals that is transferred to the large fish.

**[2 marks]**

Use the equation:

$$\text{percentage} = \frac{\text{biomass of large fish}}{\text{biomass of invertebrate animals}} \times 100$$

Percentage = _____

**Question 1 continues on the next page**

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**0 1 . 3** A large amount of biomass is lost from the food chain.

Complete the sentences.

**[3 marks]**

Choose answers from the box.

| | | |
|---|---|---|
| **coordination** | **digestion** | **excretion** |
| **filtration** | **ingestion** | **respiration** |

When the small fish eat the invertebrate animals, not all of this material is broken down during _____ .

Materials absorbed from the gut may enter the body cells of the small fish. These materials are broken down into carbon dioxide and water by _____ .

The carbon dioxide and other waste materials from the body cells are removed from the small fish by _____ .

**0 1 . 4** A disease kills many of the small fish.

Why does the number of invertebrate animals increase?

**[1 mark]**

_____

_____

**9**

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**Turn over for the next question**

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**ANSWER IN THE SPACES PROVIDED**

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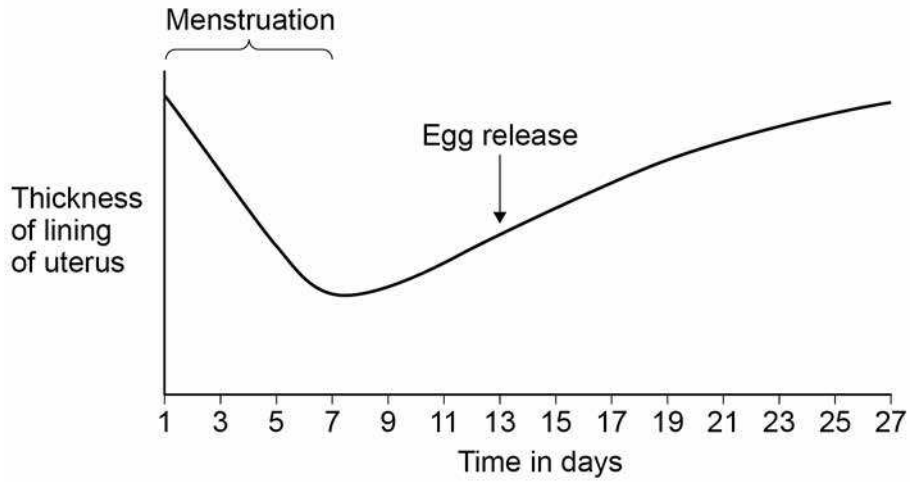
**0 2** **Figure 2** shows some changes that occur during the menstrual cycle.

**Figure 2**




**0 2 . 1** **Figure 2** shows that the lining of the uterus thickens between days 7 and 27.

What is the purpose of thickening the lining of the uterus?

**[1 mark]**

Tick **one** box.

To allow implantation of the embryo ☐

To break down waste ☐

To prevent sperm reaching the egg ☐

**0 2 . 2** Which hormone causes thickening of the lining of the uterus?

**[1 mark]**

Tick **one** box.

Auxin ☐

Oestrogen ☐

Testosterone ☐

*Do not write outside the box*

**0 2 . 3** On which day is fertilisation most likely to occur?

Use information from **Figure 2**.

**[1 mark]**

Contraception can be used to lower the chance of pregnancy.

**0 2 . 4** Draw **one** line from each method of contraception to how the method works.

**[3 marks]**

| Method of contraception | How the method works |
|---|---|
| Contraceptive pill | Barrier to prevent sperm reaching the egg |
| Diaphragm | Contains hormones to stop eggs maturing |
| Spermicidal cream | Kills sperm |
| | Slows down sperm production |

**Question 2 continues on the next page**

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**0 2 . 5** **Table 2** gives information about some different methods of contraception.

**Table 2**

| Method | Number of pregnancies per 100 women in one year | Possible Side effects |
|---|---|---|
| Diaphragm and spermicidal cream | 8 | Usually none, but can cause bladder infection in some women |
| Condom | 2 | None |
| Contraceptive pill | 1 | Mood swings, headaches, high blood pressure, blood clots, breast cancer |

A man and a woman decide to use the condom as their method of contraception.

Suggest **three** reasons for this decision.

Use information from **Table 2** and your own knowledge.

**[3 marks]**

1 _____

_____

2 _____

_____

3 _____

_____

9

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**ANSWER IN THE SPACES PROVIDED**

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**0 3** Fossils give evidence about organisms that lived a long time ago.

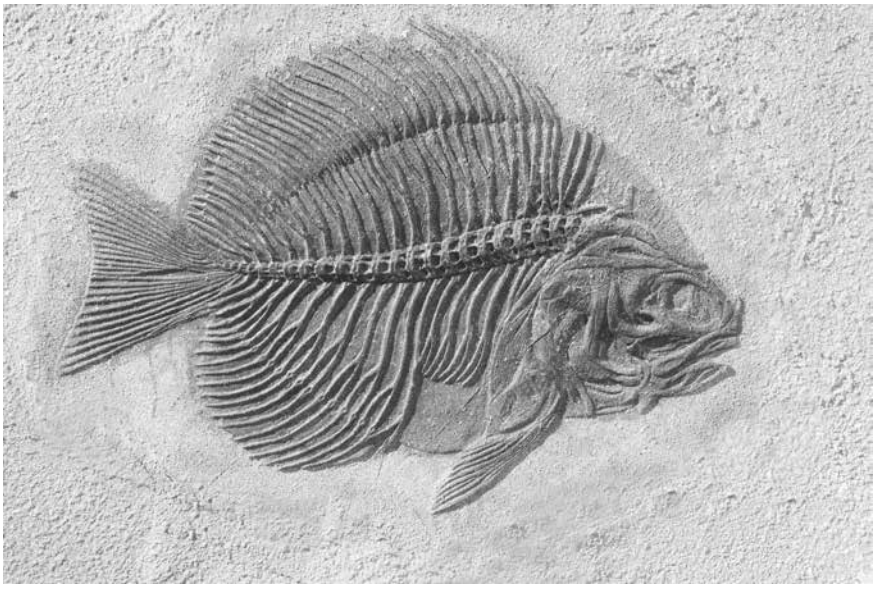
**0 3 . 1** Scientists have found very few fossils of the earliest life forms.

Give **one** reason why.

**[1 mark]**

**Figure 3** is a photograph of a fossilised fish.

**Figure 3**



**0 3 . 2** Suggest how the fossil in **Figure 3** was formed.

**[2 marks]**

*Do not write outside the box*

**0 3 . 3** The species of fish shown in **Figure 3** is now extinct.

Give **two** possible causes of extinction.

**[2 marks]**

1 _____

_____

2 _____

_____

Modern fish species have evolved from fish that lived a long time ago.

Evolution is caused by mutation and natural selection.

**0 3 . 4** What is a mutation?

**[1 mark]**

Tick **one** box.

A change in a gene ☐

Accidental damage to an organism ☐

An organism with a new characteristic ☐

The loss of a species ☐

**0 3 . 5** Describe the process of natural selection.

**[3 marks]**

_____

_____

_____

_____

_____

_____

**9**

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**0 4** In the mid-19th century, a scientist studied inheritance in pea plants.

The scientist's work was the beginning of our modern understanding of genetics.

**0 4 . 1** What is the name of this scientist?

**[1 mark]**

Tick **one** box.

- Alfred Russel Wallace ☐
- Charles Darwin ☐
- Gregor Mendel ☐
- Jean-Baptiste Lamarck ☐

**0 4 . 2** In the mid-20th century, other scientists identified the chemical substance that makes up genetic material.

What is the name of the chemical substance that makes up genetic material?

**[1 mark]**

Tick **one** box.

- Carbohydrate ☐
- DNA ☐
- Lipid ☐
- Protein ☐

*Do not write outside the box*

**0 4 . 3** A gene often has two alleles.

One allele is dominant and the other allele is recessive.

When is a recessive allele expressed as a characteristic?

**[1 mark]**

Tick **one** box.

When the dominant allele is not present ☐

When the recessive allele is inherited from the female parent ☐

When the recessive allele is inherited from the male parent ☐

When the recessive allele is present on only one of the chromosomes ☐

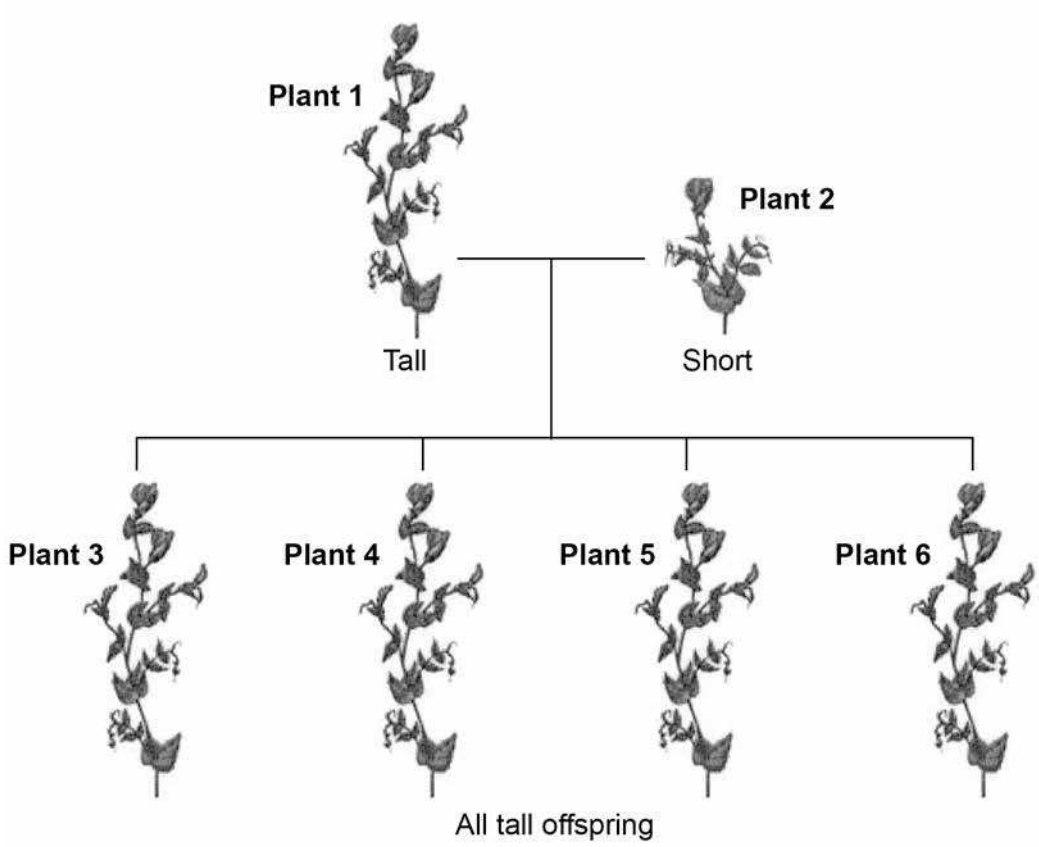
**Question 4 continues on the next page**

A scientist investigated the inheritance of height in pea plants.

The scientist crossed tall pea plants with short pea plants.

**Figure 4** shows the scientist's results.

**Figure 4**



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In Questions **04.4** and **04.5**, use the following symbols to represent alleles:

**T** = the dominant allele for tall.

**t** = the recessive allele for short.

**0 4 . 4** In **Figure 4**, the genotype of plant **1** is **TT**.

Give the genotype of plant **2**.

**[1 mark]**

_____

**0 4 . 5** The scientist crossed plant **3** with plant **4**.

Complete **Figure 5** to show the offspring produced from this cross.

**[2 marks]**

**Figure 5**

| | | **Male gametes** | |
|---|---|---|---|
| | | **T** | **t** |
| **Female gametes** | **T** | **TT** | |
| | **t** | | |

**0 4 . 6** Draw a circle around **one** of the homozygous offspring in **Figure 5**.

**[1 mark]**

**0 4 . 7** What is the ratio of tall plants **:** short plants in the offspring in **Figure 5**?

**[1 mark]**

Ratio of tall plants **:** short plants = _____ **:** _____

**8**

**Turn over ►**

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**ANSWER IN THE SPACES PROVIDED**

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**0 5** A person with Type 1 diabetes cannot make enough insulin.

**0 5 . 1** Which organ makes insulin?

**[1 mark]**

Tick **one** box.

Adrenal gland ☐

Pancreas ☐

Pituitary gland ☐

Thyroid ☐

**0 5 . 2** A person with Type 1 diabetes can control the concentration of glucose in the blood by injecting insulin.

Complete the sentences.

**[2 marks]**

Choose answers from the box.

| | | |
|---|---|---|
| **DNA** | **glycogen** | **kidney** |
| **liver** | **protein** | **skin** |

Insulin acts on an organ called the _____.

This organ then takes in excess glucose from the blood and changes the glucose into _____.

**0 5 . 3** Insulin cannot be taken as a tablet. This is because insulin is a type of protein.

What would happen to the insulin in the tablet if it reached the stomach?

**[1 mark]**

_____

_____

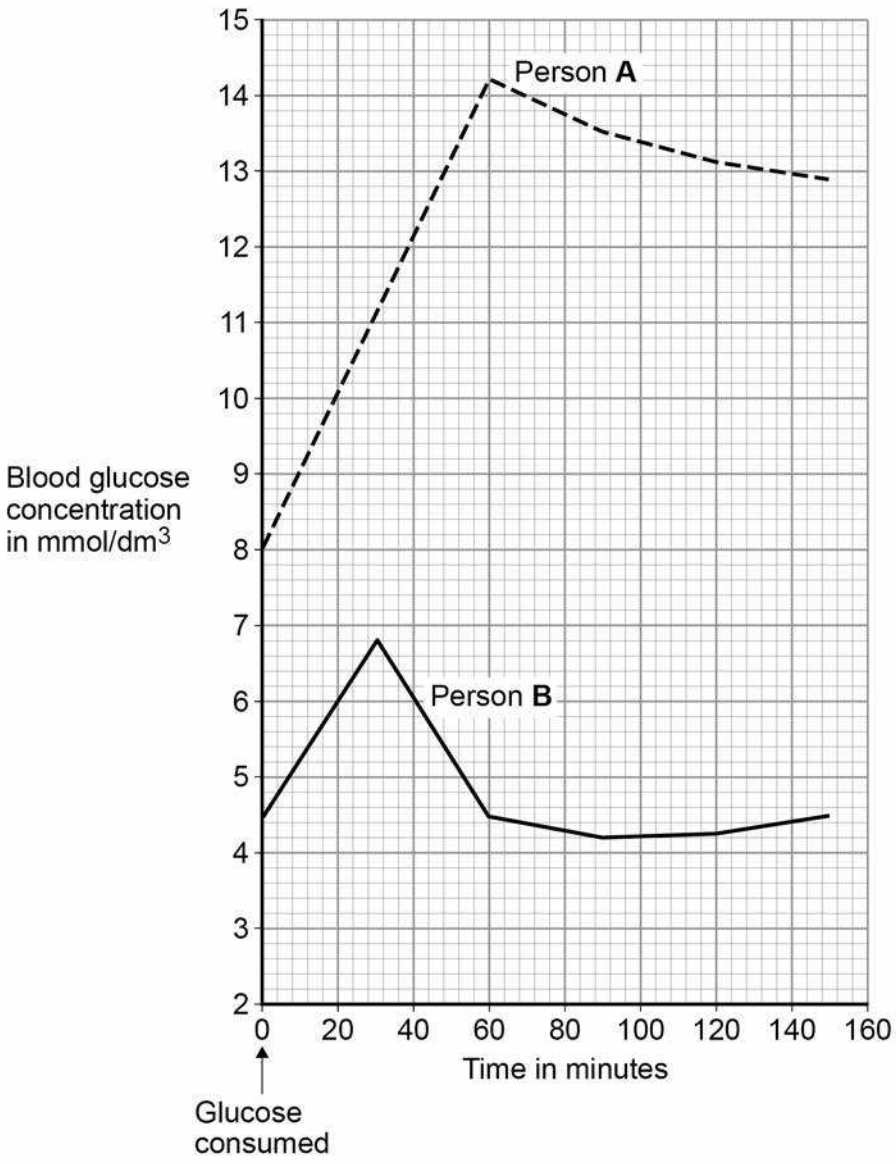
Two people each drank the same volume of a glucose drink.

Person **A** has Type 1 diabetes.

Person **B** does **not** have diabetes.

**Figure 6** shows how the concentration of glucose in their blood changed.

**Figure 6**



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**0 5 . 4** How much higher was the **highest** concentration of glucose in the blood of person **A** than the **highest** concentration in person **B**?

Use information from **Figure 6**.

**[2 marks]**

Answer = _____ mmol/dm$^3$

**0 5 . 5** Describe **one** other way that the results for person **A** were different from the results for person **B**.

Use information from **Figure 6**.

**[1 mark]**

**Question 5 continues on the next page**

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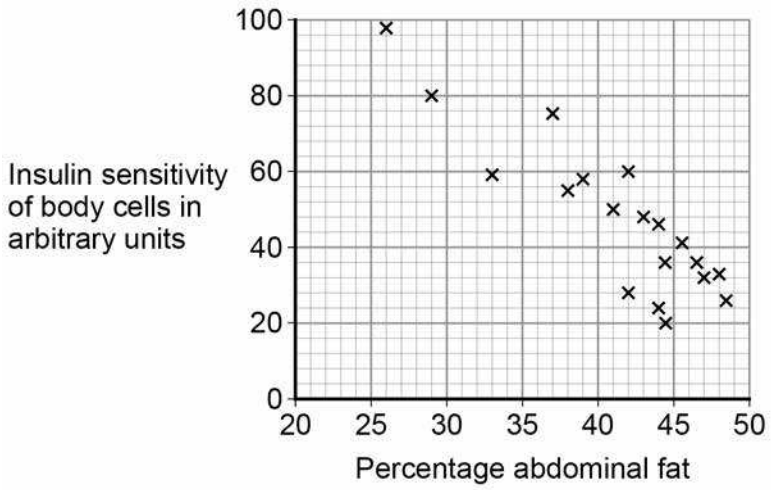
Type 2 diabetes is another form of diabetes. Type 2 diabetes is common in obese people.

People with Type 2 diabetes make enough insulin, but still cannot control their blood glucose concentration. This is because the body cells are not sensitive to the insulin.

**Figure 7** shows information about abdominal fat and insulin sensitivity in body cells.

**Figure 7**




**0 5 . 6** What type of relationship is shown in **Figure 7**?

**[1 mark]**

Tick **one** box.

A negative correlation ☐

No correlation ☐

A positive correlation ☐

**0 5 . 7** A person is at risk of developing Type 2 diabetes.

Suggest **two** ways the person could lower the chance of developing Type 2 diabetes.

**[2 marks]**

1 _____

_____

2 _____

_____

**10**

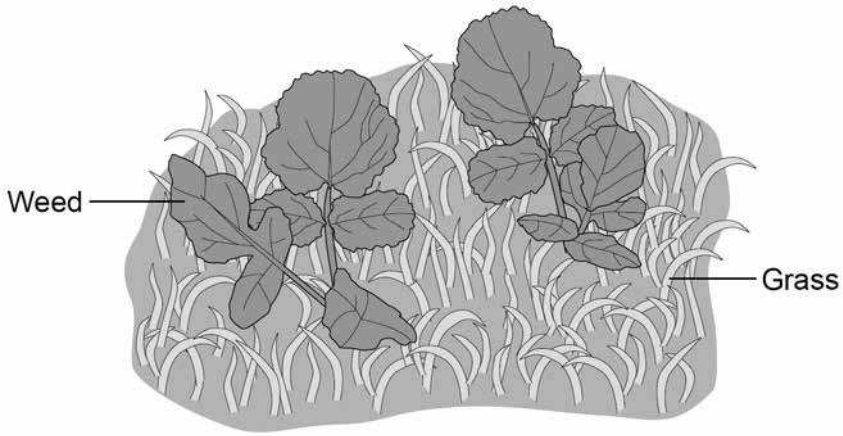
*Do not write outside the box*

**0 6** Some weed killers are selective.

Selective weed killers kill broad-leaved weed plants, but do **not** kill narrow-leaved grass plants.

**Figure 8** shows some weeds growing on a grassy lawn.

**Figure 8**




Some students investigated the effect of a selective weed killer on the weeds growing in a lawn. They used 0.5 m × 0.5 m quadrats.

The lawn was 20 metres long and 10 metres wide.

This is the method used.

1. Divide the lawn into two halves, side **A** and side **B**.
2. Place 5 quadrats in different positions on side **A**.
3. Place 5 more quadrats in different positions on side **B**.
4. Count the number of weed plants in each quadrat.
5. Spray side **A** with weed killer solution.
6. Spray side **B** with the same volume of water.
7. Repeat steps 2-4 after 2 weeks.

**0 6 . 1** Suggest a method the students should have used to place each quadrat.

**[1 mark]**

*Do not write outside the box*

**0 6 . 2** Give the reason for the method you suggested in Question **06.1**.

**[1 mark]**

**0 6 . 3** Explain why the students used water on one side of the lawn instead of weed killer.

**[2 marks]**

**Table 3** shows the students' results.

**Table 3**

| | Number of weeds per quadrat | | | |
|---|---|---|---|---|
| | At start | | After 2 weeks | |
| | Side A (Weed killer) | Side B (Water) | Side A (Weed killer) | Side B (Water) |
| | 8 | 14 | 3 | 8 |
| | 2 | 9 | 4 | 15 |
| | 12 | 3 | 0 | 7 |
| | 15 | 16 | 2 | 12 |
| | 13 | 3 | 1 | 13 |
| **Mean** | 10 | 9 | 2 | **X** |

**0 6 . 4** Calculate the mean value, **X**, in **Table 3**.

**[1 mark]**

Mean value, **X** = _____

*Do not write outside the box*

**0 6 . 5** Calculate the percentage decrease in the number of weeds on side **A** after 2 weeks.

**[2 marks]**

Use the following equation:

$$\text{percentage decrease} = \frac{(\text{mean at start} - \text{mean after 2 weeks})}{\text{mean at start}} \times 100$$

Percentage decrease = _____

**0 6 . 6** One student thought the results were **not** valid.

Suggest **one** improvement the students could have made to the method to make the results more valid.

Give the reason for your answer.

**[2 marks]**

Improvement _____

Reason _____

**9**

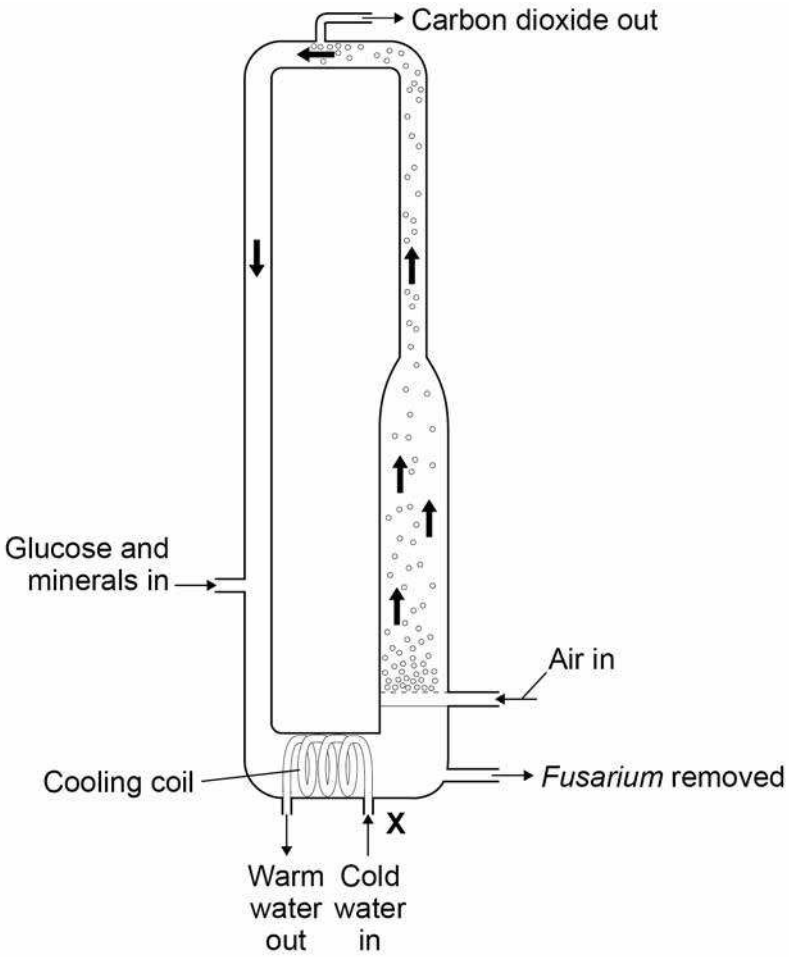
**Turn over for the next question**

**0 7** Mycoprotein is a protein-rich food.

Mycoprotein is made from the fungus *Fusarium*.

**Figure 9** shows a fermenter used for growing *Fusarium*.

**Figure 9**




**0 7 . 1** Explain why the fermenter is sterilised before use.

**[2 marks]**

*Do not write outside the box*

**0 7 . 2** Cold water is pumped through the cooling coil at point **X**.

This maintains a constant temperature inside the fermenter.

Suggest the temperature at which *Fusarium* grows fastest.

**[1 mark]**

Tick **one** box.

5 °C ☐

20 °C ☐

30 °C ☐

85 °C ☐

**0 7 . 3** Glucose and bubbles of air enter the fermenter.

The bubbles of air supply oxygen.

Explain why *Fusarium* needs glucose and oxygen.

**[2 marks]**

**0 7 . 4** The bubbles of air also move materials around the fermenter.

Suggest why it is useful for bubbles of air and materials to move around inside the fermenter.

**[2 marks]**

Do not write outside the box

**0 7 . 5** 100 grams of chicken meat contains 22 grams of protein.

100 grams of mycoprotein contains 11 grams of protein.

A man ate 100 grams of chicken in one meal.

How many grams of mycoprotein would the man need to eat to get the same mass of protein as in 100 grams of chicken?

**[1 mark]**

Tick **one** box.

100 grams ☐

110 grams ☐

200 grams ☐

220 grams ☐

8

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**Turn over for the next question**

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**ANSWER IN THE SPACES PROVIDED**

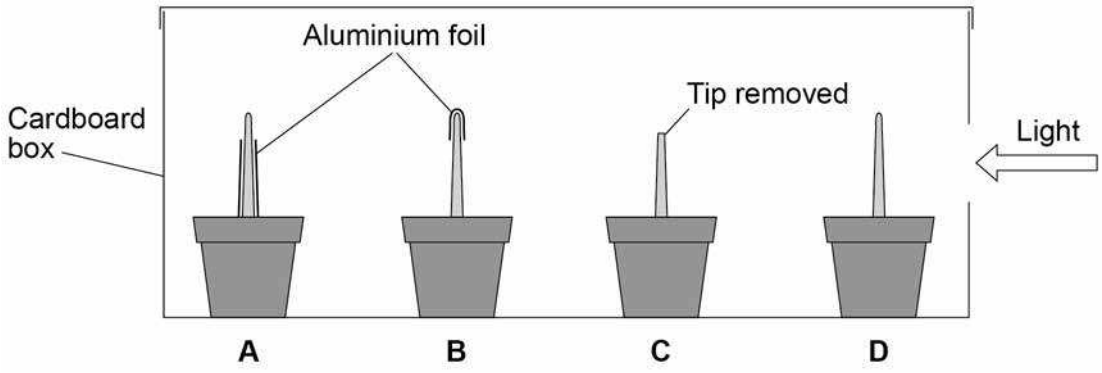
**0 8** Some students investigated phototropism in plant seedlings.

This is the method used.

1. Measure the lengths of the shoots of 20 seedlings.
2. Set up four groups of seedlings as follows:
   - **A** – bottom of shoot covered in aluminium foil
   - **B** – tip covered in aluminium foil
   - **C** – tip removed
   - **D** – no changes.
3. Put the seedlings in a cardboard box.
4. Use a lamp to shine a light into the box through a hole in one side.
5. After one day, re-measure the lengths of the shoots.
6. Make a drawing of the appearance of one seedling from each group.

**Figure 10** shows the appearance of one seedling in each group at the start of the investigation.

**Figure 10**



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**0 8 . 1** Which **two** conditions should the students have kept constant for each group of seedlings?

**[2 marks]**

Tick **two** boxes.

- The length of the roots ☐
- The number of seedlings in each group ☐
- The temperature ☐
- The thickness of the aluminium foil ☐
- The volume of water added to the soil ☐

**0 8 . 2** What is the purpose of the aluminium foil?

**[1 mark]**

Tick **one** box.

- To hold the shoot straight ☐
- To keep the shoot warm ☐
- To remove the effect of gravity ☐
- To stop light reaching the shoot ☐

**Question 8 continues on the next page**

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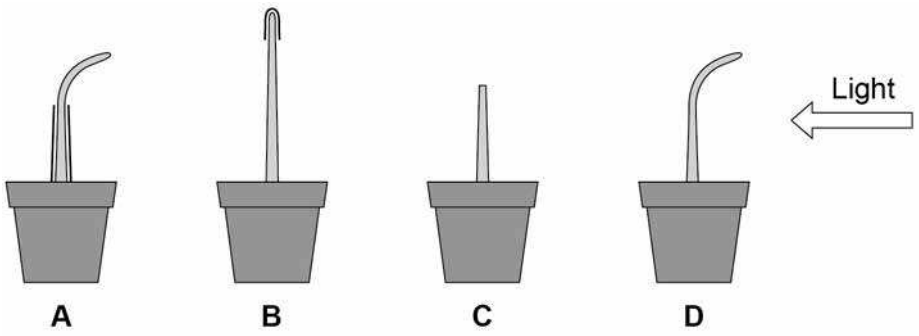
**Figure 11** shows the students' results.

**Figure 11**




| | A | B | C | D |
|---|---|---|---|---|
| Mean length of shoot at start in mm | 23 | 24 | 21 | 25 |
| Mean length of shoot after 1 day in mm | 28 | 30 | 23 | 30 |
| Mean change in length of shoot in mm | 5 | 6 | 2 | 5 |

**0 8 . 3** Suggest how the students measured the lengths of the curved shoots of seedlings **A** and **D** at the end of the investigation.

**[2 marks]**

**0 8 . 4** The students concluded that the **tip** of the shoot is needed for the plant to respond to light.

Give evidence for this conclusion from **Figure 11**.

**[2 marks]**

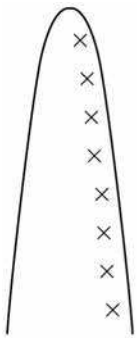
*Do not write outside the box*

**0 8 . 5** A hormone stimulates growth in shoots.

Which distribution of the hormone would cause the results seen in shoot **D**?

**[1 mark]**

Tick **one** box.

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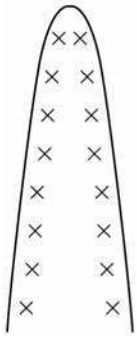


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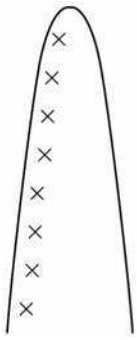


☐

**Key:**

× ×
× × = Molecules of
× hormone

8

**Turn over for the next question**

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**0 9** Many human actions are reflexes.

**0 9 . 1** Which **two** of the following are examples of reflex actions?

**[2 marks]**

Tick **two** boxes.

Jumping in the air to catch a ball ☐

Raising a hand to protect the eyes in bright light ☐

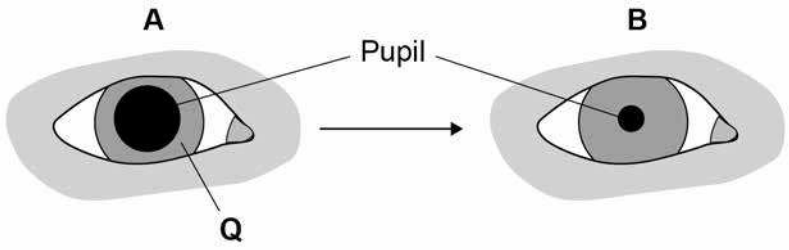
Releasing saliva when food enters the mouth ☐

Running away from danger ☐

Withdrawing the hand from a sharp object ☐

**Figure 12** shows how the size of the pupil of the human eye can change by reflex action.

**Figure 12**




**0 9 . 2** Name **one** stimulus that would cause the pupil to change in size from **A** to **B**, as shown in **Figure 12**.

**[1 mark]**

_____

*Do not write outside the box*

**0 9 . 3** Structure **Q** causes the change in size of the pupil.

Name structure **Q**.

**[1 mark]**

_____

**0 9 . 4** Describe how structure **Q** causes the change in the size of the pupil from **A** to **B**.

**[1 mark]**

_____

_____

**Question 9 continues on the next page**

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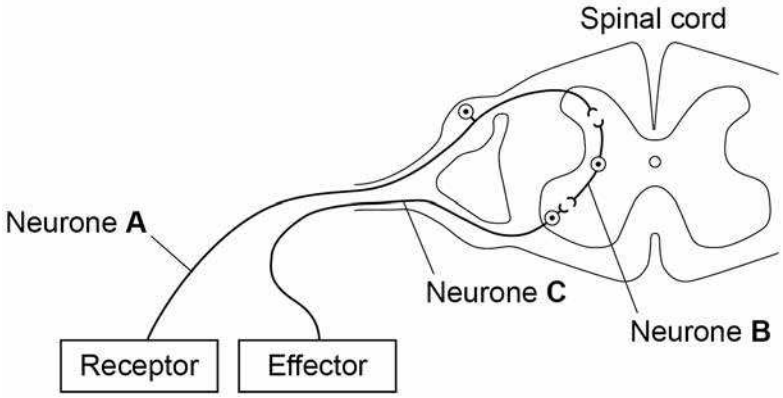
**0 9 . 5** **Figure 13** shows some structures involved in the coordination of a reflex action.

**Figure 13**




Describe how the structures shown in **Figure 13** help to coordinate a reflex action.

**[6 marks]**

**11**

*Do not write outside the box*

**Turn over for the next question**

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**ANSWER IN THE SPACES PROVIDED**

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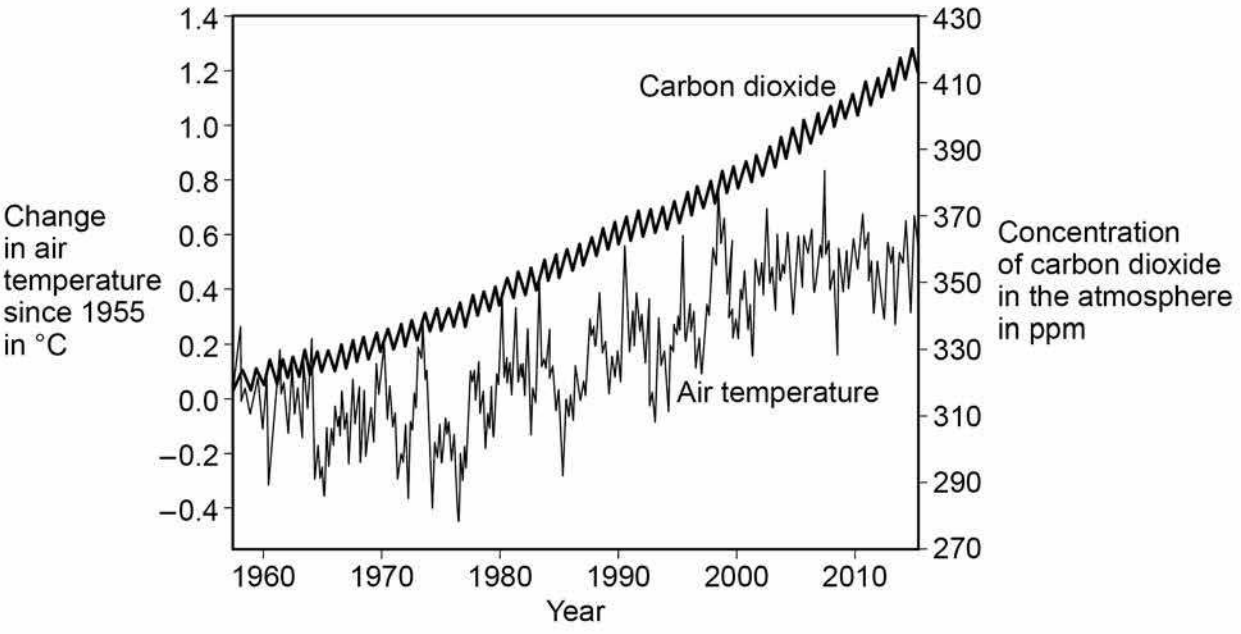
**1 0** Many scientists think that global air temperature is related to the concentration of carbon dioxide in the atmosphere.

**Figure 14** shows changes in global air temperature and changes in the concentration of carbon dioxide in the atmosphere.

**Figure 14**




**1 0 . 1** Complete **Table 4**.

Use information from **Figure 14**.

**[2 marks]**

Choose answers from the box.

You may use each answer once, more than once or not at all.

| | | |
|---|---|---|
| **constant** | **decreasing** | **increasing** |

**Table 4**

| | **1960 – 1977** | **1977 – 2003** | **2003 – 2015** |
|---|---|---|---|
| **Trend in carbon dioxide concentration** | Increasing | | |
| **Trend in air temperature** | | | |

*Do not write outside the box*

Many scientists think that an increase in carbon dioxide concentration in the atmosphere causes an increase in air temperature.

**1 0 . 2** How would an increase in the concentration of carbon dioxide in the atmosphere cause an increase in air temperature?

**[1 mark]**

**1 0 . 3** Evaluate evidence for and against the theory that an increase in the concentration of carbon dioxide in the atmosphere causes an increase in air temperature.

Use data from **Figure 14** and your own knowledge.

**[4 marks]**

*Do not write outside the box*

In each year, the concentration of carbon dioxide in the atmosphere is higher in the winter than in the summer.

**1 0 . 4** Give **one** human activity that could cause the higher concentration of carbon dioxide in the winter.

**[1 mark]**

**1 0 . 5** Give **one** biological process that could cause the lower concentration of carbon dioxide in the summer.

**[1 mark]**

**1 0 . 6** Give **two** possible effects of an increase in global air temperature on living organisms.

**[2 marks]**

1

2

**11**

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**Turn over for the next question**

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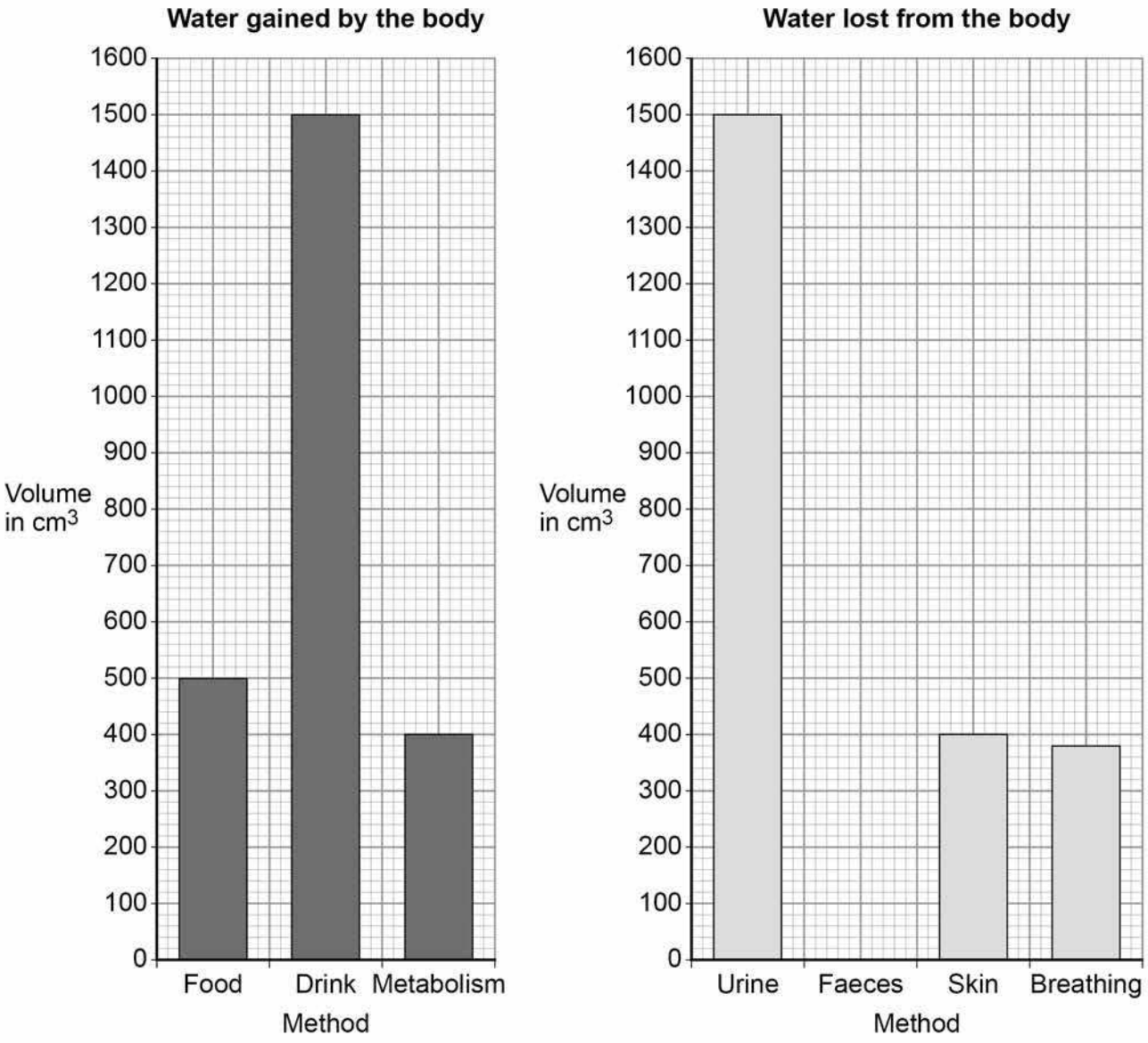
**1 1** It is important to maintain water balance in the body.

**Figure 15** shows how much water a person gained and lost by different methods in one day.

**Figure 15**



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When water is balanced, the volume of water taken in by the body is equal to the volume of water lost from the body.

**1 1 . 1** Calculate the volume of water the person lost in one day in faeces.

Use information from **Figure 15**.

**[2 marks]**

Volume lost in faeces = _____ $cm^3$

**1 1 . 2** **Figure 15** shows that one method of gaining water is by metabolism.

Which metabolic process produces water?

**[1 mark]**

Tick **one** box.

| | |
|---|---|
| Breakdown of protein to amino acids | ☐ |
| Changing glycogen into glucose | ☐ |
| Digestion of fat | ☐ |
| Respiration of glucose | ☐ |

**Question 11 continues on the next page**

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The next day, the person ran a 10-kilometre race.

The volume of water lost from the body through the skin and by breathing increased.

**1 1 . 3** Explain why more water was lost through the skin during the race.

**[2 marks]**

**1 1 . 4** Explain why more water was lost by breathing during the race.

**[3 marks]**

**8**

**END OF QUESTIONS**

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