

AQA Style

GCSE

BIOLOGY

Higher Tier

Biology Paper 2

H

Time allowed: 1 hour 45 minutes

Materials

- A ruler
- A pen and pencil
- A calculator

Instructions

- Answer all the questions using a black pen.
- Answer the questions in the space available and cross out any work you do not want to be marked.
- In any calculations make sure you show your working out.
- The marks for each question are shown in brackets.
- The maximum mark for the paper is 100.
- You must make your work as neat as possible and use good English in your answers.
- You should make sure you leave time to check your answers.

Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
Total	

Name _____

Date _____

0 1

Haemochromatosis is an inherited condition that causes an accumulation of excess iron in the body.

Haemochromatosis is caused by a recessive allele.

0 1 . 1

What is an allele?

[1 mark]

0 1 . 2

When does a recessive allele control the development of a characteristic?

[1 mark]

0 1 . 3

A man with haemochromatosis wants to have a child with a heterozygous woman.

Complete **Figure 1** to determine the probability of the child having haemochromatosis.

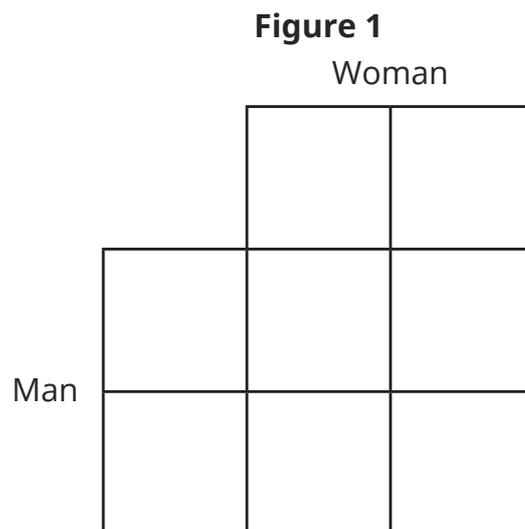
Circle any children who would have haemochromatosis.

Use the following symbols to represent the alleles:

H = dominant allele

h = recessive allele

[4 marks]



probability of a child having haemochromatosis = _____

01.4

Doctors can screen embryos for haemochromatosis. **Table 1** gives details of two methods of embryo screening.

Table 1

Preimplantation Genetic Diagnosis (PGD)	Chorionic Villus Sampling (CVS)
<p>Egg and sperm cells are collected from the couple and used for IVF. The embryos will be tested for haemochromatosis at 3 days old. Only the healthy embryos will be implanted into the woman.</p> <p>It costs the NHS between £8000 and £12 500.</p> <p>Affected embryos are discarded. Extra unaffected embryos can be frozen for later use.</p> <p>There is a 15% chance of a false-positive result, which would result in destroying a healthy embryo.</p>	<p>The couple would conceive naturally. Ten weeks into the pregnancy, a sample of blood would be taken from the placenta and tested for haemochromatosis.</p> <p>It costs the NHS around £500.</p> <p>If the embryo has the disorder parents can choose whether to terminate the pregnancy or allow it to continue.</p> <p>There is a 1% chance of a false-positive result, which may result in aborting a healthy embryo.</p> <p>The procedure has a 1% risk of causing a miscarriage.</p>

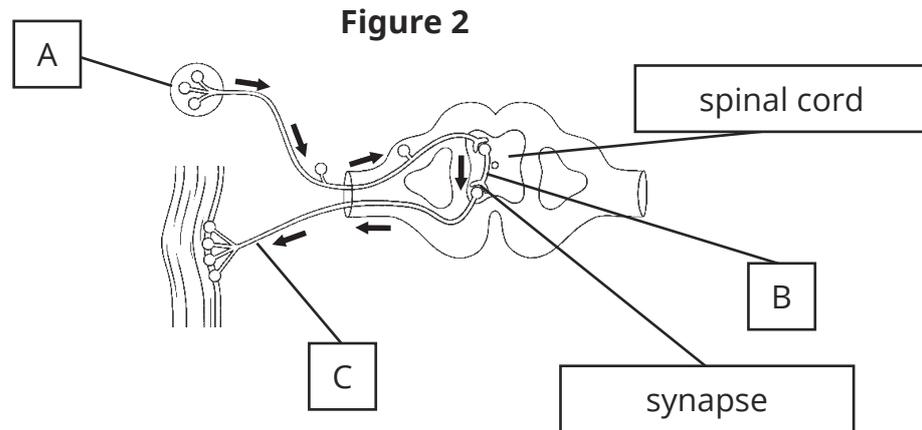
Evaluate the **benefits** of the two methods of embryo screening.

[4 marks]

0 2

The nervous system enables humans to react to their surroundings and coordinate their behaviour.

Figure 2 shows a reflex arc.



0 2 . 1

Some parts of the reflex arc have been labelled on **Figure 5**.

Name structures **A**, **B** and **C**.

[3 marks]

A _____

B _____

C _____

0 2 . 2

Describe what happens when an impulse arrives at a synapse.

[2 marks]

0 2 . 3

Explain why reflex actions are important.

[2 marks]

02.4

Some students investigated the effect of caffeine on reaction times. They used the following method.

- Student 1 sits on the chair and places their arm on the table so that their hand is hanging over the edge.
- Student 2 places a ruler vertically between Student 1's thumb and first finger, with the 0cm mark level with the top of the thumb as shown in **Figure 3**.
- Student 2 drops the ruler with no warning.
- Student 1 catches the ruler as quickly as possible.
- The students record how many centimetres the ruler falls before student 1 catches it.
- The students repeat the experiment four more times.
- Student 1 drinks a caffeine drink.
- 15 minutes later, the students repeat the experiment.

Figure 3

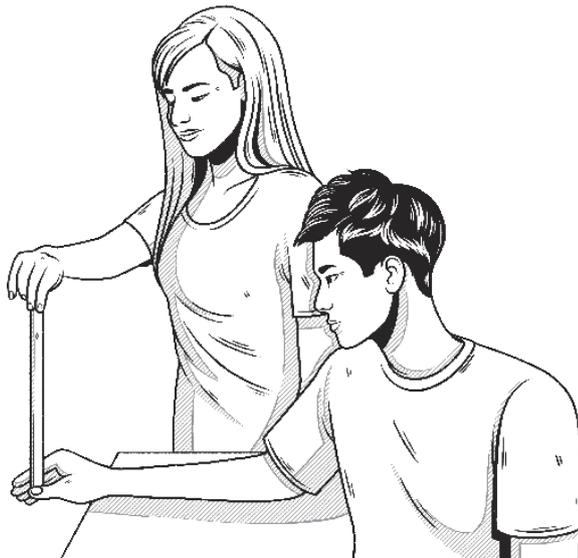


Table 2 shows the students' results.

Table 2

	Drop Distance (cm)					Mean
	Repeat 1	Repeat 2	Repeat 3	Repeat 4	Repeat 5	
Before Caffeine	21	18	20	16	20	19
After Caffeine	14	11	13	10	12	

Calculate the mean drop distance after caffeine.

[1 mark]

mean = _____ cm

0 2 . 5 Describe what the results in **Table 2** show about the effect of caffeine on reaction times.

[1 mark]

0 2 . 6 Suggest **two** improvements that the students could make to their method.

[2 marks]

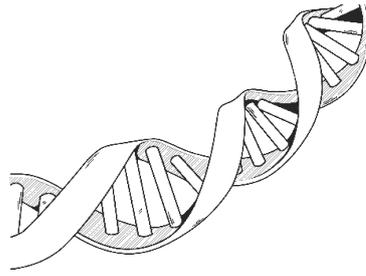
1. _____

2. _____

03

Figure 4 shows a section of DNA.

Figure 4



DNA is contained in structures called chromosomes.

03.1

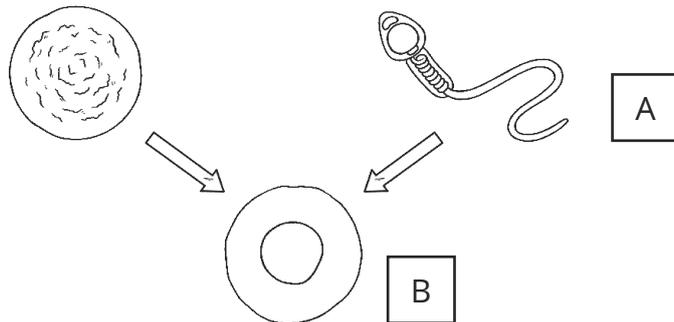
Name the part of the cell where you would find chromosomes.

[1 mark]

03.2

Figure 5 shows how a male gamete and a female gamete join together during sexual reproduction.

Figure 5



Name the process shown in **Figure 5**.

[1 mark]

03.3

Write down the number of chromosomes found in cell **A** and cell **B**.

[2 marks]

cell A _____

cell B _____

03.4 Protein synthesis occurs in a different part of the cell.

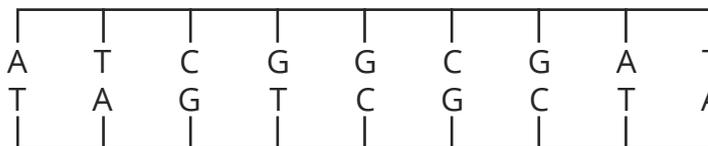
Describe the process of protein synthesis.

[4 marks]

03.5 Mutations during the production of gametes can result in variation between individuals.

Figure 6 shows two complementary strands of DNA that code for a section of protein. There is a mutation in the DNA.

Figure 6



Circle the mutation on **Figure 6**.

[1 mark]

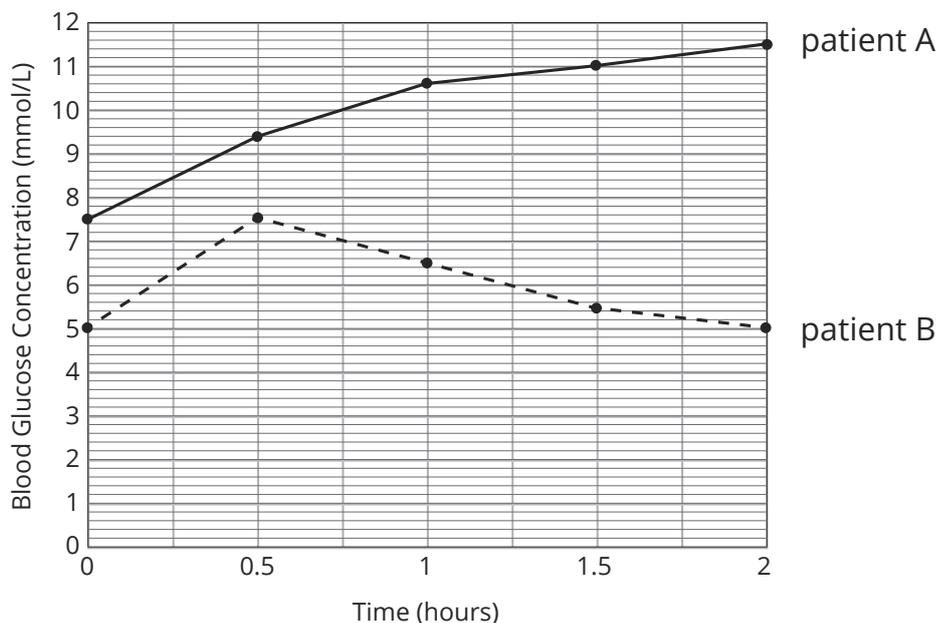
03.6 The section of protein forms part of an enzyme.

Explain how the mutation may affect the activity of the enzyme.

[3 marks]

0 4

Two patients were given a glucose solution to drink. **Figure 7** shows how their blood glucose concentration changed after they drank the glucose solution.

Figure 7

0 4 . 1

Write down the maximum blood glucose concentration of patient **A**.

[1 mark]

_____ mmol/L

0 4 . 2

Write down the time taken for the blood glucose concentration of patient **B** to reach its maximum level.

[1 mark]

_____ hours

0 4 . 3

Patient **A** has Type 1 diabetes.

Name the hormone that patient **A** does not produce enough of.

[1 mark]

0 4 . 4 Patient **B** does **not** have Type 1 diabetes.

Explain what happens when the blood glucose concentration in patient **B** falls too low.

[2 marks]

0 4 . 5 Another patient, patient C, has Type 2 diabetes.

Compare the two types of diabetes.

You should include:

- what causes each type of diabetes
- how each type should be treated

[4 marks]

0 4 . 6 The levels of hormones that control blood glucose concentration are part of a negative feedback cycle.

Name **one** other hormone that is controlled by negative feedback.

[1 mark]

04.7

Blood is filtered by the kidneys to maintain the water balance of the body.

Describe what happens to the glucose in the blood when blood is filtered by the kidneys.

[2 marks]

12

Turn over for the next question

0 5

Vitamin A deficiency is common in developing countries where diets contain rice as their largest food source. Golden rice is a crop that can help to prevent vitamin A deficiency. Golden rice is genetically engineered to produce a substance called beta-carotene, which is converted to vitamin A in the body.

One of the genes inserted into the golden rice comes from a daffodil plant.

0 5 . 1

Describe how scientists can transfer the gene from a daffodil plant to rice plants.

[4 marks]

0 5 . 2

Before the golden rice project was started, Vitamin A deficiency was responsible for 1-2 million deaths and around 500 000 cases of irreversible blindness a year.

Suggest **two** reasons why some people had objections to the genetic engineering of golden rice.

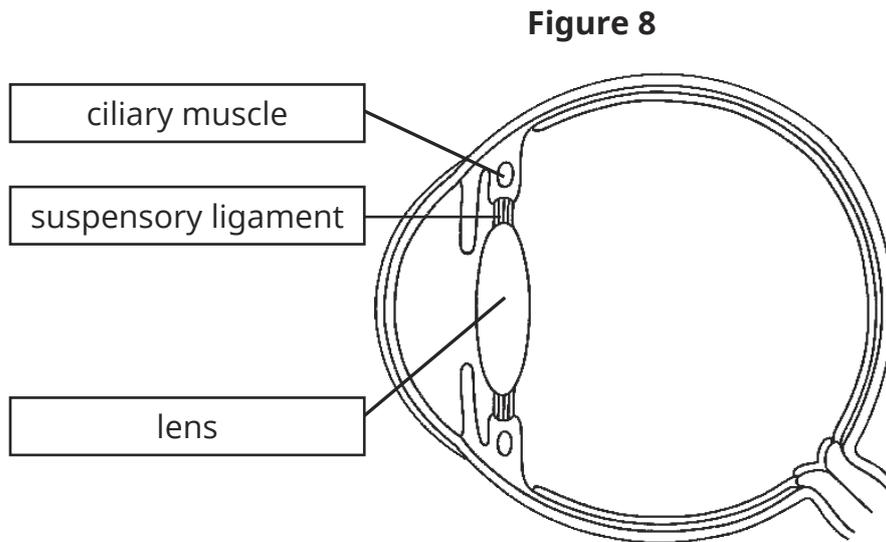
[2 marks]

1.

2.

05.3 Vitamin A deficiency causes damage to the retina and cornea.

Figure 8 shows a diagram of the eye.



Label the cornea **and** the retina on **Figure 8**.

[2 marks]

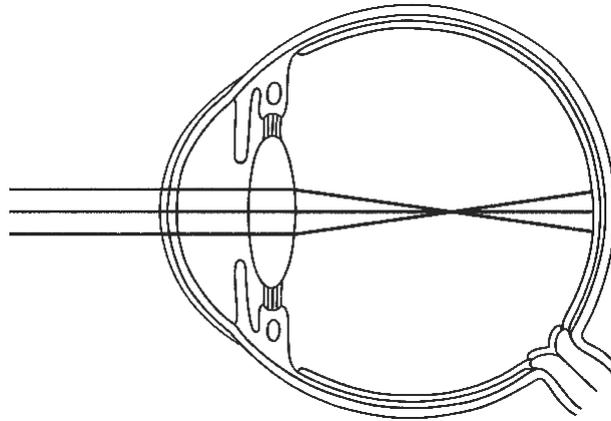
05.4 In a healthy eye, the shape of the lens changes to focus on an object. This is called accommodation.

Explain how the eye focuses on a near object.

[3 marks]

- 05.5 Blindness caused by vitamin A deficiency is not common in the UK. **Figure 9** shows how light rays travel in the eyes of someone with a common eye defect that is seen regularly in the UK.

Figure 9



Name the eye defect shown in **Figure 9**.

[1 mark]

- 05.6 Give **one** way that the defect you named in **05.5** could be treated.

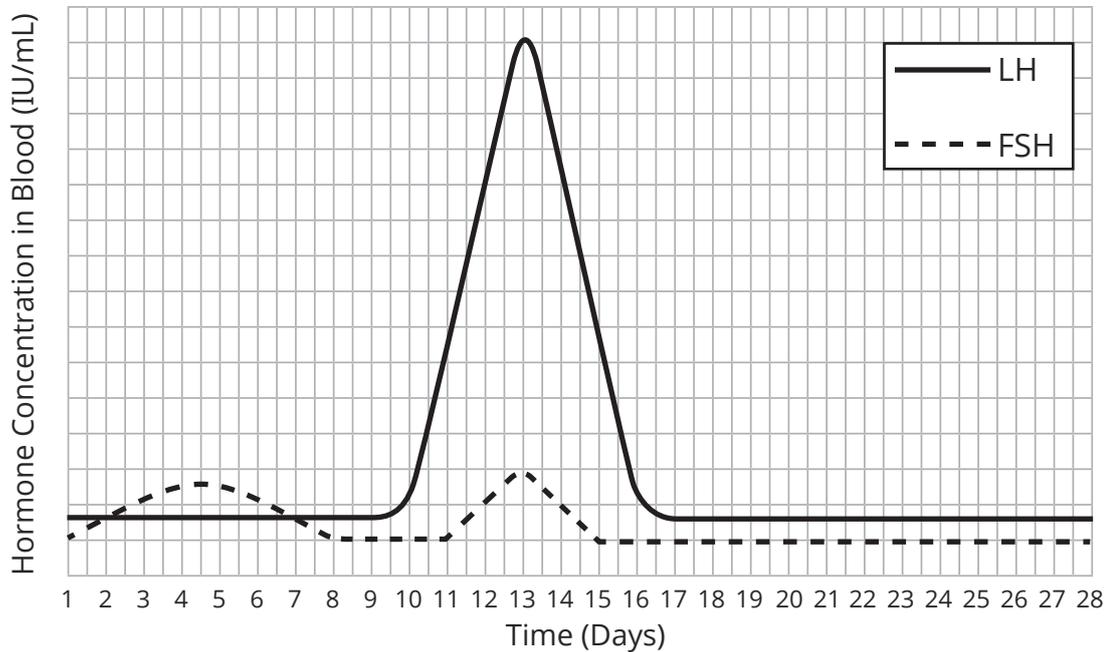
[1 mark]

06

The female menstrual cycle is controlled by several hormones.

Figure 10 shows the levels of the hormones LH and FSH in the blood during the menstrual cycle of woman A.

Figure 10



06.1

Describe the roles of FSH and LH in the menstrual cycle.

[2 marks]

06.2

Write down the day on which woman A ovulated.

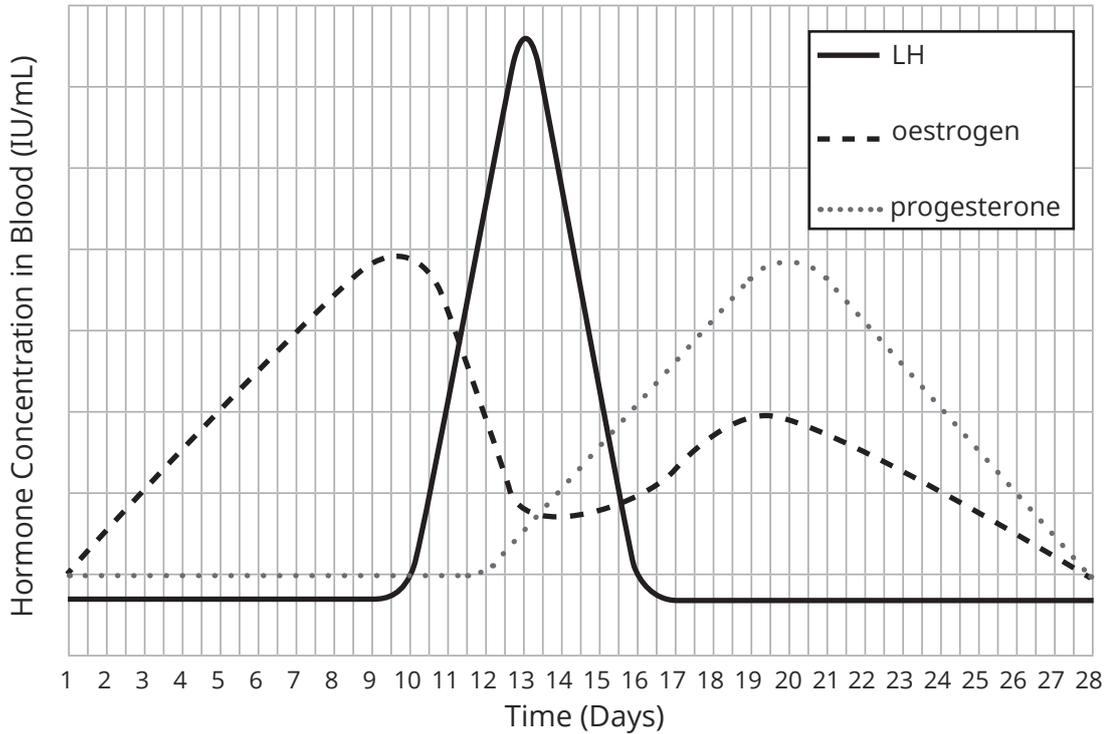
[1 mark]

day _____

06.3

Figure 11 shows the levels of LH, progesterone and oestrogen in the blood during the menstrual cycle.

Figure 11



Use the information in **Figure 11** to explain how the release of LH is controlled.

[2 marks]

06.4

Menstruation occurs when oestrogen and progesterone are both at their lowest levels.

Explain why.

[2 marks]

- 0 6 . 5 The hormones LH and FSH are given to a patient in the first stage of in vitro fertilisation (IVF).

Describe the remaining steps that a patient undergoing IVF would go through.

[4 marks]

- 0 6 . 6 Give **one** reason why a couple who are struggling with infertility may choose **not** to undergo IVF.

[1 mark]

12

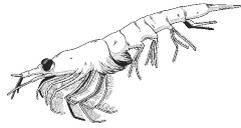
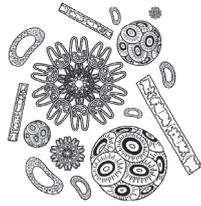
Turn over for the next question

07

Figure 12 shows a food chain.

Figure 12

phytoplankton → krill → Arctic tern → Arctic wolf



07.1

Draw a pyramid of biomass for the food chain in **Figure 12**.

You should label each trophic level in your pyramid.

[2 marks]

07.2

In one month, an Arctic tern eats 400g of krill and gains 30g of body mass.

Calculate the percentage efficiency of biomass transfer.

[2 marks]

efficiency = _____ %

- 07.3 Explain why not all the biomass in the 400g of consumed krill is transferred to biomass in the Arctic tern.

[3 marks]

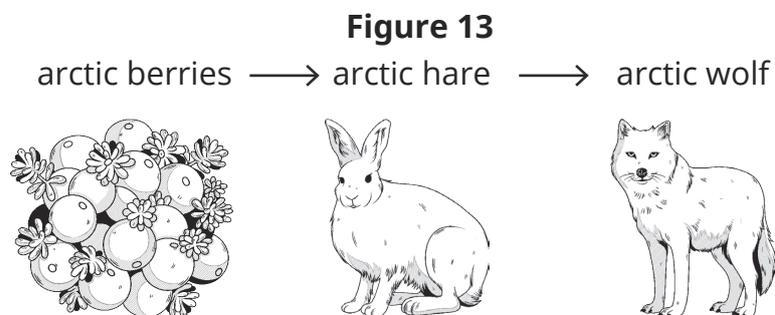
- 07.4 Scientists that study the organisms shown in **Figure 12** cannot always calculate the exact biomass of each organism.

Suggest **one** reason why.

You should refer to an organism in **Figure 12** in your answer.

[1 mark]

- 07.5 **Figure 13** shows a food chain.



Snow covers the Arctic landscape during the autumn and winter. Most of this snow melts in spring. However, in 1997 and 2000, snow also covered the Arctic landscape during the summer months.

Suggest why the Arctic wolf population fell after the year 2000.

[3 marks]

07.7

Polar bears are predators that live in the Arctic. They feed on ringed seals which they hunt for on the sea ice.

Suggest why the number of polar bears in the Arctic is affected by global warming.

[3 marks]

20

Turn over for the next question

0 8

Plant roots have a directional growth response to gravity. This is known as gravitropism.

0 8 . 1

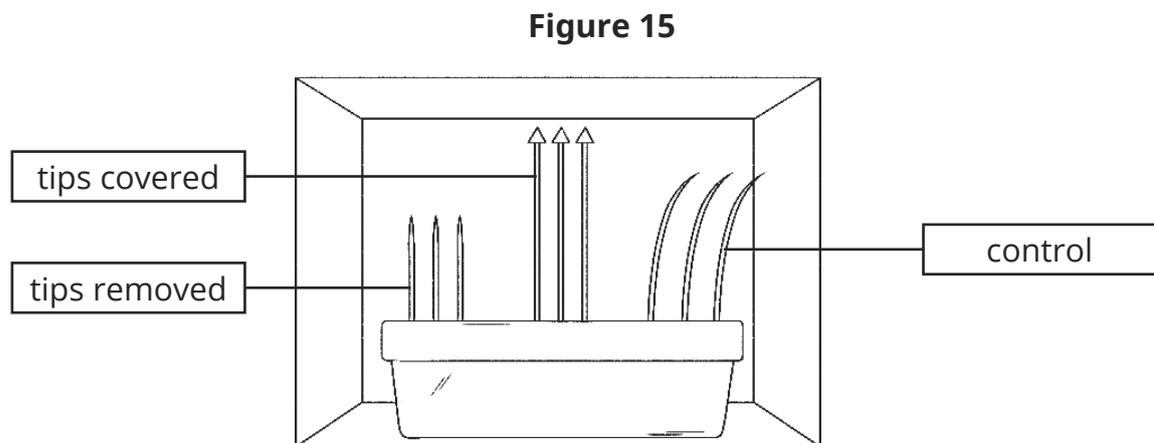
Name the response of a plant to light.

[1 mark]

0 8 . 2

Some students investigated shoot growth by growing shoots inside a box. They cut a hole in one side of the box.

Figure 15 shows the growth of the shoots inside the box.



Draw a cross (×) on **Figure 15** to show where the hole in the box is.

[1 mark]

0 8 . 3

Plant responses happen because of plant hormones.

From the results in **Figure 15**, the students concluded that the hormone that coordinates the response to light is produced in the tip of the shoot.

Explain why the students came to this conclusion.

[3 marks]

0 8 . 4 Explain what causes the control shoots to bend.

[3 marks]

0 8 . 5 Describe **two** ways that humans use plant hormones to control plant growth.

You should name the hormone used in each case.

[2 marks]

Hormone: _____

Use: _____

Hormone: _____

Use: _____

10

END OF QUESTIONS