

GCSE Biology

Worksheet: Control and coordination

TIME 30 min	TOTAL 29 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Plant hormones

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

Plants respond to light and gravity by changing the direction in which they grow. A growth response towards or away from a stimulus is called a tropism.

0 1 . 1

Which response is controlled mainly by auxin?

Tick (✓) **one** box.

Cell division in the root tip

☐

Fruit ripening

☐

Growth towards light (phototropism)

☐

Seed germination

☐

[1 mark]

0 1 . 2

Give the name of the response in which a plant root grows downwards, in the direction of gravity.

.....

.....

.....

[1 mark]

0 1 . 3

Which **two** of these are examples of a tropism?

Tick (✓) **two** boxes.

A flower opening at dawn

☐

A leaf carrying out photosynthesis

☐

A root growing towards water in the soil

☐

A shoot growing towards a light source

☐

[2 marks]

0 1 . 4

Complete the sentence.

Unequal distributions of the hormone auxin cause unequal rates in plant roots and shoots.

.....

.....

.....

[1 mark]

0 2

A student is investigating how the roots of bean seedlings respond to gravity. The student pins germinating bean seedlings onto damp cotton wool inside a lidded box: some with the root pointing sideways (horizontal) and some with the root pointing vertically downwards. The box is kept in the dark for 48 hours.

0 2 . 1

Write a hypothesis for this investigation, including scientific reasoning to justify your prediction.

.....

.....

.....

.....

[2 marks]

0 2 . 2

Identify the independent and dependent variables. Give **one** variable that should be controlled, and explain why.

.....

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.....

.....

.....

[3 marks]

0 3

In a shoot lit from one side, the ratio of the auxin concentration on the shaded side to the auxin concentration on the lit side is 3 : 2. Assume that the rate of growth of each side of the shoot is directly proportional to the auxin concentration on that side. The lit side of the shoot grows at a rate of 0.4 mm per hour.

0 3 . 1

Calculate the rate of growth of the shaded side of the shoot.

.....

.....

.....

.....

Rate = mm per hour

[2 marks]

0 3 . 2

Assuming both rates stay constant, calculate how much more the shaded side grows than the lit side in 5 hours.

.....

.....

.....

.....

Difference = mm

[2 marks]

0 3 . 3

Explain how this difference in growth causes the shoot to bend towards the light.

.....

.....

.....

.....

[2 marks]

0 4

A student investigated the effect of light on the growth of newly germinated cress seedlings. This is the method used.

- 1. Place 20 cress seeds on damp cotton wool in each of three dishes, A, B and C.
- 2. Leave the seeds in a warm place until they germinate.
- 3. Put dish A in a box with a slit, so that light enters from one side only.
- 4. Put dish B in a box in complete darkness.
- 5. Put dish C under a lamp so that light comes from directly above.
- 6. After 5 days, measure the length of each seedling and record observations.

0 4 . 1

Give **two** control variables in this investigation.

.....

.....

.....

.....

[2 marks]

0 4 . 2

The seedlings in dish A were curved.
Suggest how the student could measure the length of a curved seedling accurately.

.....

.....

[1 mark]

0 4 . 3

The lengths of five seedlings from dish A were:
26 mm 29 mm 31 mm 27 mm 32 mm
Calculate the mean length.

.....

.....

.....

.....

Mean length = mm

[2 marks]

0 4 . 4

The student also made a labelled scientific drawing of the seedlings in dish A.
Describe what the drawing would show.

.....

.....

[1 mark]

0 4 . 5

Suggest why the student used 20 seeds in each dish rather than 1 seed.

.....

.....

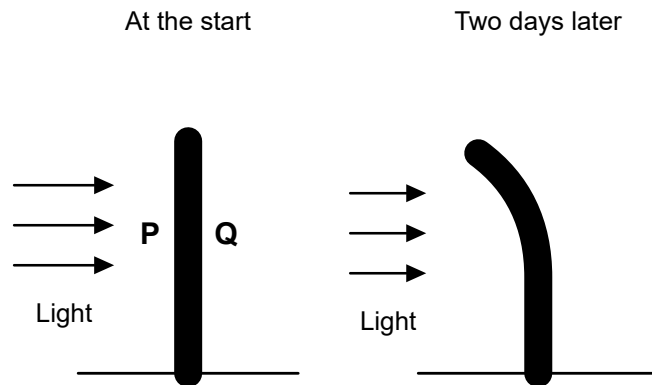
[1 mark]

.....

0 5

A student grew a plant shoot with light coming from one side only. Figure 1 shows the shoot at the start and two days later.

Figure 1



0 5 . 1

Name the plant hormone that controls this response.

.....

.....

.....

[1 mark]

0 5 . 2

Explain why the shoot bent towards the light.
Refer to sides P and Q in your answer.

.....

.....

.....

.....

.....

[3 marks]

0 5 . 3

Suggest how this response helps the plant to survive.

.....

.....

.....

.....

[2 marks]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Biology · Worksheet: Control and coordination · 29 marks

Question 1 (5 marks)

01.1 [1 mark]

Correct: Growth towards light (phototropism)

01.2 [1 mark]

Answer: Gravitropism (geotropism)

- gravitropism / geotropism (1)
-

01.3 [2 marks]

Correct: A root growing towards water in the soil; A shoot growing towards a light source

01.4 [1 mark]

Answer: Growth

- growth (1)
-

Question 2 (5 marks)

02.1 [2 marks]

- a suitable hypothesis, e.g. 'roots placed horizontally will curve downwards, but roots placed vertically will keep growing straight down' (1)
 - with reasoning, e.g. because auxin collects on the lower side of a horizontal root and inhibits growth there, so the upper side grows faster and the root curves downwards (1)
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02.2 [3 marks]

- independent variable: the direction the root was placed in (horizontal or vertical) (1)
 - dependent variable: the angle of curvature of the root (after 48 hours) (1)
 - control, e.g. keeping all the seedlings in the dark — so that any curvature is not caused by a response to light coming from one side (allow: same species / age of seedling, same temperature, same moisture, with a matching reason) (1)
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Question 3 (6 marks)

03.1 [2 marks]

Answer: 0.6 mm per hour

- $0.4 \times (3 \div 2)$ (1)
- 0.6 (mm per hour) (1)

Notes: Correct answer with no working scores 2 marks.

03.2 [2 marks]

Answer: 1.0 mm

- shaded side: $0.6 \times 5 = 3.0$ (mm) **and** lit side: $0.4 \times 5 = 2.0$ (mm) (1)
- $(3.0 - 2.0 =) 1.0$ (mm) (1)

Notes: Correct answer with no working scores 2 marks. Allow ECF from an incorrect rate for the shaded side.

03.3 [2 marks]

Answer: The shaded side grows (elongates) more than the lit side in the same time, so the shaded side becomes longer and the shoot curves towards the light

- the shaded side grows / its cells elongate more than the lit side in the same time (1)
 - so the shaded side becomes longer than the lit side, and this uneven growth curves the shoot towards the light (1)
-

Question 4 (7 marks)

04.1 [2 marks]

Answer: E.g. temperature; volume of water added to the cotton wool; type of seed; number of seeds

- temperature (1)
- volume of water / how damp the cotton wool is (1)
- type / species of seed (1)
- number of seeds per dish (1)
- time before measuring (1)
- light intensity (in dishes A and C) (1)

Any 2 of the points above.

04.2 [1 mark]

Answer: Lay a piece of string or thread along the seedling, then measure the string with a ruler

- place string / thread along the seedling and then measure the string (with a ruler) (1)

04.3 [2 marks]

Answer: 29 mm

- $(26 + 29 + 31 + 27 + 32) \div 5$ / $145 \div 5$ (1)
- 29 (mm) (1)

Notes: Correct answer with no working scores 2 marks.

04.4 [1 mark]

Answer: The shoots bending / growing towards the side where the light entered

- shoots bending / growing towards the light (source) / the slit (1)

04.5 [1 mark]

Answer: Some seeds may not germinate, and a mean of many seedlings is more representative

- some seeds may not germinate / to calculate a (more representative) mean / to identify anomalies (1)

Notes: Do not accept 'to make it a fair test'.

Question 5 (6 marks)

05.1 [1 mark]

Answer: Auxin

- auxin (1)

05.2 [3 marks]

Answer: Auxin became unequally distributed, with more on the shaded side Q; auxin makes shoot cells elongate, so cells on side Q grew longer than on side P and the shoot bent towards the light

- more auxin on the shaded side / side Q (than on side P) (1)
- (auxin causes) cells on side Q to elongate / grow more (than on side P) (1)
- (unequal growth) so the shoot bends towards the light (1)

Notes: Do not accept 'auxin is destroyed by light' for the first mark. Do not accept 'cells divide faster on side Q' for the second mark.

05.3 [2 marks]

Answer: The leaves absorb more light, so the plant can photosynthesise faster

- the leaves receive / absorb more light (1)
 - (so) more photosynthesis / more glucose produced for growth (1)
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