

Plant responses: practice questions

8 questions • 27 marks • mark scheme at the back

 For Pearson Edexcel International AS Biology XBI11 and International A Level Biology YBI11. **A Level only** is IA2 content (Units 4 to 6), not needed for the International AS.

Name

Total / 27

1 UNIT 5 STYLE [1 mark]

A seed that needs light to germinate is exposed to a brief flash of red light, followed immediately by a brief flash of far-red light. What happens to the phytochrome and to germination?

- A. ☐ Pr is converted to Pfr and the seed germinates
- B. ☐ Pfr is converted to Pr and the seed does not germinate
- C. ☐ Pr remains unchanged and the seed does not germinate
- D. ☐ Pfr remains unchanged and the seed germinates

2 UNIT 5 STYLE [4 marks]

The table shows the results of an investigation into flowering in a short-day plant kept in a 16-hour night. Explain the results for treatments 2 and 3.

Flowering of a short-day plant after treatments during a long dark period		
Treatment	Light given in the night	Flowering
1	None (continuous darkness)	Yes
2	5-minute flash of red light	No
3	5-minute flash of red light, then 5-minute flash of far-red light	Yes

3 UNIT 5 STYLE

[4 marks]

Explain how auxin causes a shoot to grow towards the light.

4 UNIT 5 STYLE

[3 marks]

Explain how gibberellin affects transcription in a germinating barley grain.

5 UNIT 6 STYLE

[5 marks]

Describe how you would investigate the production of amylase in germinating barley grains, including the controls you would use.

6 UNIT 6 STYLE

[3 marks]

In core practical 18, the diameters of the clear zones around three embryo halves were measured. Calculate the mean area of the clear zone, in mm², to 3 significant figures.

Diameter of the clear zone around three embryo halves	
Grain half	Diameter of clear zone / mm
1	10
2	12
3	14

Answer = ...

7 UNIT 6 STYLE

[3 marks]

A student placed boiled embryo halves on a starch agar plate as a control. Explain why this control was needed and what result would be expected.

8 UNIT 5 STYLE

[4 marks]

Explain how a root grows downwards in response to gravity.

Mark scheme

One mark for each point unless a maximum is given. Words in brackets are not needed for the mark.

1. [1]

B B (1) The last flash was far-red, which converts Pfr to Pr.

2. [4]

- red light converts Pr to Pfr (1)
- Pfr is the active form that inhibits flowering in a short-day plant / prevents flowering (1)
- far-red light converts Pfr to Pr, so Pr is dominant and flowering occurs (1)
- the last light flash determines the form / the effect of red is reversed by far-red (1)
- Max 4. Accept a reference to changes in transcription of flowering genes

3. [4]

- auxin (IAA) is moved to the shaded side of the shoot (1)
- auxin stimulates proton pumps / H^+ pumped into the cell wall, lowering pH (1)
- wall becomes more extensible / cellulose microfibrils loosened (1)
- cells on the shaded side elongate more (than on the lit side), so the shoot bends towards the light (1)
- Max 4. Accept effect on transcription of genes for elongation

4. [3]

- embryo releases gibberellin, which diffuses to the aleurone layer (1)
- gibberellin binds to a receptor and causes breakdown of a repressor protein (1)
- so transcription factors can bind and switch on the amylase gene / transcription of amylase mRNA increases (1)
- so amylase is made and hydrolyses starch to sugars used by the embryo (1)
- Max 3

5. [5]

- surface-sterilise the grains / use aseptic technique, as microorganisms also make amylase (1)
- cut grains in half so that one half has the embryo and one half does not (1)
- place the halves cut-side down on starch agar plates (1)
- control: boiled embryo halves / agar without a grain (1)
- keep temperature, time of incubation, grain age and mass constant / incubate for 24–48 hours at the same temperature (1)
- flood plates with iodine solution and measure the diameter of the clear zone around each half (1)
- repeat for each treatment and calculate the mean (1)
- Max 5

6. [3]

- radius = diameter $\div$ 2, so radii are 5.0, 6.0 and 7.0 mm (1)
- areas (πr^2) = 78.5, 113 and 154 mm² (1)
- mean area = 115 mm² (1) (correct answer with no working gains 3 marks; accept 115.2 mm²; 113 mm², the area of the mean diameter, gains 2 marks)

7. [3]

- to show that the clear zone is caused by amylase made by living / active tissue (1)
- boiling denatures enzymes / amylase / gibberellin (1)
- no clear zone (starch not digested; agar stays blue-black with iodine) (1)

8. [4]

- auxin (IAA) accumulates on the lower side of the root (1)
- high concentration of auxin inhibits elongation in roots (1)
- cells on the upper side elongate more than those on the lower side (1)
- so the root bends downwards (positive gravitropism) (1)