



# **A-Level Biology**

## **Stimuli and Response**

### **Mark Scheme**

**Time available: 66 minutes**

**Marks available: 48 marks**

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## Mark schemes

1.

- (a) 1. Tip produces IAA;  
*Accept source/release for produces but ignore contains/stores IAA.*
2. IAA diffuses (into shoot);  
*Accept auxin for IAA.*  
*Accept IAA diffuses down.*
3. (More) elongation of cells on one side (than other);  
*Accept (more) elongation of cells on left side.*  
*Reject any reference to shaded/dark side or away from light.*

3

- (b) 1. Size of shoot/tip;
2. Number of shoot tips;
3. Size/type of agar (block);  
*Accept 'amount of agar'.*
4. (Shoots) at same stage of growth/development;  
*Accept (Shoots/plants) are same age.*
5. Time (period) tips kept on agar
- OR**
- Time (period) agar/block kept on (cut shoot)
- OR**
- Time (period shoots) kept in dark;
6. Temperature;  
**Mark points 1 to 6 = max 3.**  
*Ignore pH, species, carbon dioxide, humidity, nutrients, water and light.*
7. (Repeat several times and) calculate a mean;
8. Compare/read degree of curvature (on calibration curve) to determine (IAA) concentration
- OR**
- Higher the degree of curvature the higher the IAA concentration;

5 max

(c) 1. (IAA) is not broken down by light

**OR**

(IAA) is produced in the dark **OR**

Light/dark does not affect (IAA) production;

2. (IAA) moves away from light

**OR**

(IAA) moves to shaded side;

*IAA accumulates on shaded side is not enough on its own, idea of movement is required.*

2

[10]

2.

(a) Behaviour

1. (Positive photo) taxis;

*Reject negative (photo) taxis*

Advantage

2. Accept any suitable suggestion, eg to avoid competition, to find a mate, increase dispersal, to avoid predators;

*Neutral – to move into the open or to move out of the tree bark*

2

- (b) 1. No stats test, so do not know if change (in movement away from light) is significant;
2. Between 35 °C and 36.5 °C more than half of beetles are still found on the light side;
3. (At higher temperatures/above 35 °C) beetles might be flying (not walking)

**OR**

(Y-axis) states speed of movement, might not just be walking speed;

4. Slowing of movement happens before 35 °C;
5. Slowing of movement could be due to beetles preparing to fly (and not temperature);
6. Speed (of movement) not recorded above 35 °C/ between 35 and 37.5 °C/between 35 and 40 °C;

**OR**

Speed (of movement) not recorded at 37.5 °C

7. (Mean speed could mean) some might walk very quickly **and** others stay still/not move;

3 max

[5]

**3.**

(a)

**Mark in pairs 1 and 2 or 3 and 4.**

1. Tip produces IAA;  
*Accept auxin for IAA.*  
*Accept affects amount of IAA.*  
*Ignore contains/stores IAA.*
2. Affects concentration of IAA  
**OR**  
 Affects (shoot) length/growth/elongation;  
*Accept affects independent variable.*  
*Accept auxin for IAA.*  
*Ignore affects results.*
3. Mitosis/division occurs in shoot tips;
4. Affects (shoot) length/growth/elongation;  
*Ignore affects results.*

2 max

- (b) 1. For respiration;  
*Ignore photosynthesis.*  
*Ignore aerobic/anaerobic (respiration).*  
*Reject glucose used in photosynthesis.*
2. Provide ATP/energy (for growth);  
*Reject produce energy.*  
*Do **not** credit photosynthesis provides ATP.*
- 2

- (c) 1. To prevent/reduce evaporation;  
*Accept evaporation of (IAA/glucose) 'solution'.*  
*Ignore contamination.*
2. (Which) alters concentration of (IAA) solution  
**OR**  
 (Which) alters water potential;  
*Accept auxin for IAA.*
- 2

- (d) 1. Increase in IAA concentration the higher/greater the mean (change in) length;  
*Accept auxin for IAA.*
2. (High) IAA stimulates cell elongation;  
*Accept auxin for IAA.*
3. In roots, growth/elongation less/inhibited;  
*Accept auxin for IAA.*  
*Accept decrease in (mean) change in length but reject 'decreases length' on its own.*  
*Accept 'opposite results or 'negative correlation'.*
- 3

- (e) 0.4 **and** 39.6;  
*Both numbers required and must be in order shown.*
- 1
- [10]**

**4.**

- (a) 1. Similarity – directional response (to a stimulus) / movement towards / away from a stimulus;
2. Difference – taxis (whole) organism moves and tropism a growth (response).  
*Must be clear which one, taxis or tropism, they are referring to*  
*Taxis occurs in animals / motile organisms and tropism occurs in plants*
- 2

- (b) 1. Grow in direction of / towards (pull of) gravity;  
*Accept: tropism for growth*  
*Ignore: pulled by gravity*  
*Accept: positively geotropic / gravitropic*
2. Grow away from salt;  
*Accept: negatively chemotropic / halotropic*  
*1 and 2. Ignore: references to bends / moves*
3. Salt has more effect (than gravity).  
*Accept: converse statement for gravity*  
*Note: all three points may appear in one sentence*

3

- (c) 1. More carriers in (cell) **L** / lower in **R**;  
*Accept: left for **L** and right for **R** / side nearer salt for **L***
2. (So) less IAA in (cell) **L** / more IAA in (cell) **R**;  
*Accept: more IAA moves out of **L** / less IAA moves out of **R***
3. (So) more (elongation) growth in **L** / less (elongation) growth in **R**.  
*Accept: less inhibition of growth in **L** / more inhibition of growth in **R**;*

3

[8]

5.

- (a) 1. (Taxis is) movement towards / away from a stimulus / a directional response / movement (to a stimulus);
2. (Move towards) temperature they were used to / cultured in;  
*Movement towards temperature they were used to = 2 marks*
- (b) 1. Hungry, so seeking food / in absence of food respond to temperature;  
*Ignore references to temperature and enzymes*  
*Must be stated not inferred from other statements*
2. Move towards temperature they were used to / cultured in;
3. Associate (this temperature) with food;  
*Accept they think food is here*  
*Stated not inferred*
4. (Then) stay in this temperature;

2 max

3 max

- (c) 1. (Dim) worms live in soil / dark / affected by bright light / dim light is like normal environment / what they are used to;
2. (Even) because worms might move towards / away from bright light / to avoid creating light gradient / prevent worms showing phototaxis / all parts of surface exposed to same light;  
*Accept to avoid kinesis due to light*
3. (Dim light) ensures heat from light not a variable / heat from lamp could kill / dry out worms;  
*Not just to control variables / factors*

2 max

[7]

6.

- (a) Three changes described;;;  
*Neutral nucleus shrinks, since it doesn't*

Eg

1. Formation / growth of vacuole;
2. Formation of starch grains / amyloplasts;  
*2. Accept starch grains get bigger*
3. Movement of grains / amyloplasts towards bottom of cell;  
*Note – list rule applies*
4. Cells get longer / wider / larger;

3 max

- (b) 1. Grows sideways before starch grains form;  
**Q**
2. Bending starts when / as grains form;
3. More bending as grains increase in number;  
*3. Ignore starch grain growth references*
4. More elongation (of cells) / growth (of roots) downwards as starch grains increase / move;
5. Bending starts before grains move down;
6. Could be related to vacuole;  
*6. Ignore references to nucleus*

3 max

- (c) 1. (IAA) at bottom of root / where IAA concentration high inhibits expansion / elongation (of cells);  
*2 and 3 need reference to expansion / elongation, not just growth*
2. (IAA) at top of root / where IAA concentration low leads to expansion / elongation (of cells);  
*2. Accept less inhibition*

2

**[8]**