M1.(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]

M2.(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

2 max

(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;

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]

M3.(a) Push – legume

Pull – grass;

Both needed for mark

1

(b) 1. Set up tape measures on two sides of the plot / make grid of plot;

Allow 'Number each plant'. With this approach mp3 cannot be awarded.

2. Use random number table / calculator / generator;
Allow 'Select from a hat' idea.

3. To generate coordinates;

3

(c) 1. To prevent competition between the maize and the grass;

2. For light / nutrients / water;

OR

3. Idea of limits movement of pest (between grass and maize);

4. Only eating / damaging grass;

2 max

(d) 1. Nitrogen-fixing bacteria convert nitrogen (in the air) into ammonium compounds (in the soil) which are converted into nitrates / nitrification occurs;
Accept 'ammonia' for 'ammonium compounds'.

2. Maize uses nitrates (in soil) for amino acid / protein / ATP / nucleotide production;
2. Must be in the context of maize.
Ignore ionic formulae unless only these are given.

2

(e) 1. Reduced % damage to maize plants / increased maize grain yield;

2. Calculation to justify mp 1;

3. Standard deviation shows no overlap but need stats to show significance of this difference;

4. More profit / net income / greater income than additional cost (with push-pull);

5. $322 extra / 408% more / $401 v $79 profit;
Accept '$350 extra income compared to $28 extra spend'.
Mp5 gains credit for both mp4 and 5

3 max

[11]

M4.(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]

M5. (a) 1. (Seedlings) respond to light / are phototropic;
Reject: <u>roots</u> are positively phototropic / grow towards light

OR

Neutral: 'to control a variable'

2. (Only) measuring the effect of gravity / response to gravity;
Neutral: light affects growth / results

1

(b) 1. (Cells in) root tip detect gravity / respond to gravity;
Must refer to root tip and not just the root

OR

2. IAA / auxin is produced in the root tip;

1

(c) (i) 1. IAA / auxin moves to lower side / more IAA / auxin on lower side;
Accept: references to 'cell elongation' instead of 'growth'

2. Lower side grows less / slower / upper side grows more / faster / inhibits growth on lower side;
Note: if auxin is placed at upper side, mark point 2 can still be awarded
Need idea of 'less / slower' or 'more / faster' for mark point 2

2

(ii) 1. Less IAA / auxin (produced);

2. Lower side grows more / faster / less inhibition of growth on lower side;
Must refer to the lower side

2

[6]