Name of the Student:_____
Max. Marks : 25 Marks **Time : 25 Minutes**

Mark Schemes

Q1.

(a) Accept any **two** of the following for **1** mark;

Volume/mass soda lime

Concentration of soda lime

Number/mass of woodlice

Age of woodlice

Same woodlice

Species/type of woodlice

Time for woodlice to acclimatise to (water bath) temperature

(Starting) concentration of oxygen (inside the apparatus)

Light intensity

Accept weight/volume of woodlice for number/mass of woodlice
Ignore 'amount' for concentration/volume/weight/mass

1

(b) 1. Open the (3-way) tap;
Accept descriptions of opening the tap, eg push/move/turn

2. Push/press the syringe (down);
Accept descriptions of the pushing the syringe down, eg apply pressure to the syringe

2

(c) 1. No woodlice **and** all other conditions/apparatus/equipment the same;
Accept other inert objects instead of woodlice eg glass beads
Accept dead woodlice for no woodlice
Accept descriptions of 'all other conditions/apparatus/equipment the same' eg same investigation

2. To show that (respiring) woodlice are causing the drop to move

OR

To show that (respiring) woodlice are taking up the oxygen

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OR

To show that (respiring) woodlice are causing the change in volume/pressure;

Accept to show that (respiring) woodlice are affecting the results

*Accept 'no other factor(s)' **OR** no other named factor **OR** 'nothing else' for woodlice*

2

(d) Correct answer of 0.11 = **3 marks**;;;

0.10816247795/0.1082600897/0.1082173395 = **2 marks** (answer not to 2 dp)

Evidence of $\frac{3.14 \times 1.25^2 \times 25}{(5 \times 60) \times 3.78}$ and incorrect answer to 2 dp = **2 marks** (for input error into calculator)

0.41 = **2 marks** (mean rate in $mm^3\ s^{-1}$ for 3.78 g of woodlice)

32.45/32.48/32.47 = **2 marks** (mean rate in $mm^3\ g^{-1}$ in 5 minutes)

0.43 = **2 marks** (used diameter instead of radius in calculation)

Evidence of $\frac{3.14 \times 1.25^2 \times 25}{(5 \times 60) \times 3.78}$ and incorrect answer to **not** to 2 dp = **1 mark** (for input error into calculator)

122.65625/122.767857142/122.718463 = **1 mark** (volume of oxygen taken up in 5 minutes)

0.40885416/0.40922619047/0.4090615434 = **1 mark** (mean rate in $mm^3\ s^{-1}$ for 3.78 g of woodlice and not to 2 dp)

32.44874339/32.47826909/32.46520186 = **1 mark** (mean rate in $mm^3\ g^{-1}$ in 5 minutes and not to 2 dp)

0.4326499118/0.43286935813/0.43304358780 = **1 mark** (used diameter instead of radius in calculation and not to 2 dp)

0.08 = **1 mark** (distance travelled by the drop per second)

0.02 = **1 mark** (just used 25 mm distance travelled by the drop and not worked out volume)

*For **3 marks** accept 1.08×10^{-1}*

3

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Q2.

(a) 1. Draw line/origin on (chromatography) paper (using ruler and pencil);

2. (Use pipette/tubing/dropper to) add chlorophyll/solution to origin/line;

3. Add solvent/**A** below line/origin;

Accept 'so solvent is not above line' for 'solvent below line'.

4. Remove/stop (from glassware) before solvent reaches end (of chromatography paper)

OR

Mark (position) where solvent reaches/front;

Accept all marks on a labelled diagram.

Allow filter paper for chromatography paper.

Accept remove/stop (immediately) when solvent reaches end/top.

Accept ensure solvent does not reach top/end.

Ignore Rf values.

4

(b) For **2 marks** = two pigments have same solubility in (solvent) **A** but different solubility in (solvent) **B**

OR

For **2 marks** = one pigment is soluble in (solvent) **B** but not in (solvent) **A**

OR

For **2 marks** = pigments have different solubilities in the solvents/**A** and **B**

OR

For **2 marks** = one pigment is only soluble in (solvent) **B**

OR

For **2 marks** = one pigment is insoluble (only) in (solvent) **A**;;

For **1 mark** = response as for 2 marks but refers to solution rather than solvent;

Accept 'dissolves' for solubility.

Accept correct reference to 'affinity' for solubility e.g., 'greater affinity' (to solvent) indicates more soluble.

Accept correct reference to 'polarity' for solubility' e.g. pigments have different polarities.

Accept 'Rf value' for solubility.

Ignore 'solvent stronger'.

2

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Q3.

(a) Correct answer of 12 = **2 marks**

OR

Correct answer of 11.95 = **2 marks**;;

Incorrect answer but shows 1195 (ignoring orders of magnitude) = **1 mark**

OR

Incorrect answer but shows 1.05 (Tg) or 13 (Tg) = **1 mark**;

*Accept any numerical representation of the correct answer for **two** marks.*

Do not allow 1.05 or 13 to the incorrect order of magnitude e.g. x 10^{1}.

2

(b) 1. No significant difference (in production between untreated and treated) with **no** water shortage

OR

No significant difference (in production) between **R** and **S**;

1, 2, 3, 4 Accept descriptions of production e.g., more tomatoes and descriptions of treated and untreated seedlings / plants / seeds e.g., with / without mycorrhizae / Glomus / fungus.

*1, 2, 3, 4 Reject 'results are significant' or 'results are not significant' **once**, but **only** where there is no indication that these results are 'different', 'greater', 'reduced' etc.*

1, 2, 3, 4 Accept 'not due to chance' for significant and converse for not significant.

2. Significantly greater/different (production in treated than untreated) with water shortage

OR

Significantly greater/different (production) in **Q** than **P**;

3. Significant decrease/difference (in production) of treated with water shortage

OR

Significant increase/difference (in production) of treated with **no** water shortage

OR

Significantly greater/different (production) in **S** than **Q**;

4. Overlap in SDs indicate no significant difference

OR

No overlap in SDs indicate a significant difference;

Accept '(error) bars' for SDs.

5. Only one (mycorrhizae) species studied;

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Accept 'only Glomus studied'.

6. Only shows (results for) tomato(es);
   Accept only shows 'one crop' or one 'species or type of plant'.

7. Large sample size increases validity/reliability;

8. (Investigation) done in sterile soil;

9. (Investigation) done in green/glasshouse

   OR

   Not done in field;

   Max 3 marks from points 5 to 9
   Do not credit idea of variation between green/glasshouses.

5 max

(c) 1. Kill/remove/no (other) mycorrhizae/fungi;
   1 to 6 Accept in context of organisms being present if soil not sterilised.

2. Kill/remove/no nitrogen-fixing /nitrifying/denitrifying/saprobiotic bacteria;
   Accept saprophytes and saprobionts.

3. Kill/remove/no pathogens;
   Accept removes disease-causing bacteria/viruses /microorganisms.
   Removes 'harmful bacteria' is not enough.

4. Kill/remove/no pests;
   Accept named pests.

5. Kill/remove/no competitors;

6. Kill/remove/no seeds/spores;
   Accept weeds or (other) plants.

7. Is a (controlled) variable;

2 max

(d) 1. So mycorrhizae/water is the only variable

   OR

   (So fertiliser) is **not** a variable

   OR

   So fertiliser is a controlled variable;
   'For comparison' on its own is not enough.
   Accept same amount of fertiliser.

2. Affects (crop) production/growth/mass;
   Accept benefits or limiting factor of named nutrient/ion.

3. (Concentration of fertiliser) would affect water potential of soil;

4. Does not affect pH (of soil);

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5. To provide (usual) soil/farming conditions;
Ignore leaching and eutrophication.

2 max

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