

Mark schemes

Q1.

- (a) 1. Low respiration;
Accept less energy lost in respiration
2. More growth/biomass/colonisation;
Allow examples of more carbon-containing molecules eg glucose
- (b) 1. Less nitrification
- OR**
- Fewer/less active nitrifying bacteria;
- OR**
- Nitrification/nitrifying bacteria require oxygen/aerobic conditions;
2. (Less) oxidation/conversion of ammonium (ions) to nitrite (ions) and to nitrate (ions);
Order must be nitrite then nitrate
Accept ammonia for ammonium ions
Accept correct chemical formulae for ions, eg there will be little
oxidation/conversion of $\text{NH}_4^+ \rightarrow \text{NO}_2^- \rightarrow \text{NO}_3^-$
Ignore 'breakdown' for oxidation/conversion
3. More denitrification
- OR**
- More/more active denitrifying bacteria
- OR**
- Denitrification/denitrifying bacteria do not require oxygen
- OR**
- Denitrification/denitrifying bacteria require anaerobic conditions;
4. (So more) nitrate (ions) reduced/converted to nitrogen (gas);
Accept correct chemical formulae eg So more NO_3^- reduced/converted to N_2 ;
- (c) 1. Assumed that height is (directly) proportional to biomass;
Accept descriptions of 'is proportional to', eg

2

2 max

correlates to, is equivalent to

2. (Plants may put biomass into) other named aspect of growth (other than height)

OR

Height does not include the roots

OR

Some increase in height results from water gain;

Examples of other named aspects of growth could include root growth, flower/seed/fruit formation, lateral growth, wider leaves

2

- (d) 1. Answer of 12 days = **2 marks**;;
2. 12.16 (12.15774433) = **1 mark**

OR

4 days (used 387 and 268, ie not calculated starting length) = **1 mark**;

2

[8]

Q2.

- (a) 1.375 / 1.3746 / 1.38 / 1.4 (times greater);

1

- (b) 1. Potassium nitrate most effective **and** chicken manure least effective;
Accept greatest/highest growth/mass for most effective, and lowest growth/mass for least effective.

2. All fertilisers more effective than control;
3. No increase (in growth) with potassium nitrate above 30g;
4. Ammonium sulfate (shows) small/gradual increase after 30g;
5. Chicken manure effectiveness decreases after 45g

OR

Chicken manure effectiveness decreases at 60g;

6. Fertiliser/s provide nitrogen source for protein;
7. No statistical test (to determine if differences are significant);
Accept 'no SDs' (to determine if differences are significant).
Accept no (named) stats test, no error bars and no

confidence limits.

8. Only shows (results for) spinach;
Accept only shows 'one species' or one type of plant.

5 max

- (c) 1. Weigh and heat;
Accept 'heat until sample remains the same mass' for 2 marks.
Ignore temperature.
2. (Until) mass is constant;
Accept weight for mass.

2

[8]

Q3.

- (b) 0.155;
Accept standard form e.g. 15.5×10^{-2}

1

- (c) 1. Answer of 180/178/177.5 = **2 marks**;;
Ignore any numbers following 177.5
2. Incorrect answer but shows use of numbers 57 **and** 127 (with decimal points in any position) within the calculation = **1 mark**;

2

[7]

Q4.

- (a) Used to produce named phosphate compound in cells;
 e.g. ATP / ADP / phospholipids / DNA / RNA / RuBP / TP /GP etc.

1

- (b) Example of a carbon-containing biological compound e.g.
 carbohydrate / amino acid / vitamin;
Accept: sugars / organic (compounds).
Ignore: products of photosynthesis.
Ignore: starch.

1

- (c) 1. Represents dry mass / mass of carbon;
 2. Represents gross production minus respiratory losses;
 2. *Accept: $NPP = GPP - R$.*
 2. *Accept: Chemical energy minus respiratory losses.*
 1 and 2. *Chemical energy store minus respiratory losses = 2 marks.*

2

- (d)
1. For the control an increase in phosphate increases (plant) growth;
 2. For *Entrophospora* an increase in phosphate reduces (plant) growth;
 3. *Scutellospora* reduces (plant) growth (compared to control);
 4. *Entrophospora* and *Glomus* increases (plant) growth (compared to control);
 5. No SD / statistical test to determine significance;
 6. Only 20 weeks of growth;
 7. Underground / root growth not known;
 5. *Accept: no error bars.*
 7. *Accept: only shows shoot growth.*

4 max

- (e)
1. Answer in range 0.07 to 0.09 = **2 marks**;
 2. Answer in range 9.97 to 12.2
- OR**
Shows division by 140 or $20 \times 7 = 1$ mark;

2

[10]

Q5.

- (a)
1. 35.22 or 35.23% = 2 marks;

Award 1 mark if only fresh and dry masses correct, 1335.59 and 865.13 g;

2

- (b) (After 24 hours)

1. Record mass and reheat;
Accept return to oven = reheat

2. Until constant mass recorded;

2

- (c)
1. Positive correlation (between diameter and biomass);
 2. Not linear / geometric / exponential / gradient gets steeper;

2

- (d)
1. Calculate a mean diameter;
 2. (Use this to) estimate / determine the mean fresh biomass of trees;
 3. Use the percentage water content to find the dried biomass;
 4. Use the dried density to calculate the mass of tree;
 5. Count / estimate the number of trees in plantation and multiply by (mean) carbon content (to find total carbon);

4 max

[10]