Mark schemes

**Q1.**

(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 × 7 = 1 mark;

**2**

**[10]**

**Q2.**

(a)     1.      (Required to) make ATP / glucose phosphate, so less respiration / less energy for growth;

2.      (Required to) make nucleotides, so less DNA / mRNA / tRNA for cell division / production of protein (for growth);

3.      (Required to) make RuBP / NADP, so less CO2 fixed / reduced into sugar;

4.      (Required to) make phospholipids for membranes;

**2 max**

(b)     1.      Hydrolyse;

*Accept digest*

2.      murein / glycoprotein (in cell wall);

**2**

(c)     1.      Bind to receptor (on target plant);

2.      Acts as / leads to production of a transcription factor;

3.      (Which) binds to promoter

**OR**

stimulates transcription of genes

**OR**

production of mRNA (for defensive enzymes);

**3**

(d)     1.      Direct plant-to-plant transmission;

2.      (So) localised response

**OR**

faster response

**OR**

no dilution of signal protein;

**2**

(e)     0.278;

*Accept 1 mark for 1001.7 or*

* × 100*

*= 122.6*

**2**

(f)      Should not use:

1.      Fertilisers prevent development of mycorrhizae;

2.      Mycorrhizae help plants to defend themselves (causing an increase in crop yield);

3.      Mycorrhizae help plants to take up nitrates / phosphates (causing an increase in crop yield);

Should use:

4.      Fertilisers containing phosphate and nitrate increase gross primary production so increase yield;

5.      Most soil is poor in phosphate so without fertiliser (tomato) plant might not get enough phosphate;

**4 max**

**[15]**

**Q3.**

(i)      excessive use of fertilisers;
run-off / leaching;

**2 max**

(ii)      1. growth of algae / plants stimulated / increased;
2. death of algae / plants;
3. more bacteria / decomposers / decomposition;
4. respiration;
5. decomposers / bacteria remove oxygen;
6. animals die (because of lack of oxygen);

**5 max**

**[7]**

**Q4.**

(a)     R.

**1**

(b)     1.      Protein / amino acids broken down (to ammonium ions / ammonia);

*Accept: nucleic acids / RNA / DNA / urea / any named nitrogen containing compound as an alternative to protein / amino acids*

*Accept: saprophytes / saprotrophs*

2.      By saprobionts / saprobiotic (microorganisms).

*Neutral: decomposers*

*Reject: answers where incorrect type of bacteria given as saprobionts e.g. Nitrogen fixing bacteria*

**2**

(c)     1.      (Fertility increased as) more nitrate formed / less nitrate removed / broken down;

*Accept: Nitrate remains*

2.      Less / no denitrification / process P is decreased / fewer denitrifying bacteria.

*Accept: more nitrification / more nitrifying bacteria / process R is increased*

**2**

(d)     1.      Grow crops / plants with nitrogen-fixing (bacteria);

*Accept: grow legumes / named example e.g. peas, beans, clover*

*Accept: fallow year*

*Accept: use different amounts of ions / nutrients*

2.      (Different crops use) different minerals / salts / nutrients / ions (from the soil);

3.      (Different crops have) different pests / pathogens / diseases.

**2 max**

**[7]**

**Q5.**

(a)     (i)      1.      Amino acid / protein / enzyme / urea / nucleic acid /
         chlorophyll / DNA / RNA / / ATP / ADP / AMP / NAD / NADP;

2.      DNA / RNA / nucleic acid / ATP / ADP / AMP / NADP / TP / GP / RuBP / phospholipids;

*1. and 2. Accept any named equivalent examples e.g. nucleotides.*

*Neutral: ammonia / nitrite / nitrate / phosphate.*

**2**

(ii)     1.      Saprobiotic (microorganisms / bacteria) break down remains / dead material / protein / DNA into ammonia / ammonium;

*Accept: saprobionts / saprophytes / saprotrophs*

*Neutral: decomposer*

2.      Ammonia / ammonium ions into nitrite and then into nitrate;

*Allow correct chemical symbols.*

*Accept: correct answers which use incorrect bacteria e.g. nitrogen-fixing but then reject m.p. 3.*

3.      (By) Nitrifying bacteria / nitrification;

**3**

(b)     1.      Nitrate / phosphate / named ion / nutrients for growth of / absorbed / used by plants / algae / producers;

2.      More producers / consumers / food **so** more fish / fish reproduce more / fish grow more / fish move to area;

*Must have idea of more plants related to some increase in fish.*

**2**

**[7]**

**Q6.**

run off / leaching of nutrients / nitrates;
leads to increased growth of algae / plants;
competition for light / effect of competition;
death of algae / plants;
increases food supply / increases microorganisms / decomposers;
respiration (of microorganisms) uses up oxygen / increases BOD;
fish / animals die due to lack of oxygen;

**[5]**

**Q7.**

(a)     prevents disease / pest organisms from reaching crop plants / prevents herbicides from reaching hedgerow / enables machinery to manoeuvre without damaging crop / hedgerow;

**1**

(b)     some weeds provide habitats / niche for (beneficial) insects / animals:
allow (insect) pest predators to survive;
conserve (common) weed plants;
weeds are producers in food chains / food source;

**2 max**

(c)     decomposers / saprophyte / bacteria / fungi / micro organisms (organisms) excrete / produce nitrogenous waste / e.g.; bacteria convert to nitrate / nitrifying bacteria;
(increased) nitrates(in soil) taken up / used by plants;
release of phosphate / potassium;
organisms respire and produce carbon dioxide which is used by plants in photosynthesis;

**4**

**[7]**