

- M1.** (a) Succession;  
*Ignore any word in front of succession e.g. secondary / ecological succession.*  
*Neutral 'forestation'.* 1
- (b) 1. Greater variety / diversity of plants / insects / more plant / insect species;  
*Neutral: more plants.*
2. More food sources / more varieties of food;  
*Neutral: more food / more / greater food source (singular).*
3. Greater variety / more habitats / niches;  
*Accept: more nesting sites.*  
**Q** *Neutral: more homes / shelters.* 3
- (c) (i) Temperature and carbon dioxide;  
*Neutral: water, chlorophyll.* 1
- (ii) Shows (gross) photosynthesis / productivity minus respiration / more carbon dioxide used in photosynthesis than produced in respiration;  
*Correct answers are often shown as: net productivity = (gross) photosynthesis – (minus) respiration.* 1
- (iii) 1. (Shade plant) has lower (rate of) respiration / respiratory losses;  
*Accept use of figures.*  
*Accept: lower compensation point.*
2. (Shade plant) less CO<sub>2</sub> released at 0 light intensity / in dark;
3. Greater (net) productivity / less sugars / glucose used / more sugars / glucose available;  
*Neutral: any references to rate of photosynthesis.* 2

[8]

- M2.** (a) 1. Transect / lay line / tape measure (from one side of the dune to the other);  
 1&2. *Reject random in context of placing transect / quadrats*
2. Place quadrats at regular intervals along the line;  
 2. *Accept references to stratified sampling / different seral stages*
3. Count plants / percentage cover / abundance scale (in quadrats)  
 3. *Accept abundance scale*

**OR**

Count plants and record where they touch line/transect;

3 max

- (b) 1. Stabilises sand / stops sand shifting;
2. Forms / improves soil / makes conditions less hostile;
2. *Allow credit for example of making conditions less hostile such as:*  
*Adds nutrients*  
*Improves water retention*

2

[5]

**M3.** (a) Crabgrass;

*Reject: grass or grassland*

*Reject: crabgrass if another organism is also included*

1

- (b) 1. Species / plants / animals change the environment / conditions / add humus / nutrients etc.;

*Accept 'they' for species/plants in mark points 1 and 3*

2. Less hostile (habitat);

*Allow 'more hospitable' or equivalent for mark point 2*

3. Species/plants better competitors;

2 max

- (c) (Only) plants which can photosynthesise with less light (remain);

*Accept converse but do not award mark for idea that plants cannot photosynthesise and die because there is no light*

*Answers must be in context of being or not being able to photosynthesise with less light*

1

[4]

**M4.** (a) Increase in number of species;

Increase in numbers of some species;

2

- (b) Initial environment hostile / few organisms adapted;

These organisms change the environment / suitable example;

More niches / more habitats;

Allowing other organisms to become established;

max. 3

[5]

- M5.** (a) species present change the habitat/named change;  
other species able to colonise;  
new species better competitors; 3 max
- (b) D - as more species present;  
more complex food webs;  
change in one species will have little effect on others;  
as alternative food sources; 2 max
- (c) sand drains easily/low water retention;  
(sunken stomata) reduce transpiration;  
as pocket of saturated air trapped near stomatal pore;  
this reduces diffusion/water potential gradient; 3 max
- (d) series of changes over a distance;  
gradient of environmental factor/named environmental  
factor/cline present;  
ensures sampling of each community; 1 max
- [9]

- M6.** (a) pioneers/suitable example colonise land;  
example of change in environment;  
enables change in species;  
conditions change further/example to favour trees; 4
- (b) stable community/no further succession/final community; 1
- (c) roots unable to respire (aerobically);  
active transport of minerals/other metabolic effect stops; 2
- (d) action of bacteria/decomposers inhibited/ fewer bacteria/decomposers;  
acid conditions inhibits enzymes/enzymes denatured/changes active site;  
H<sup>+</sup> ions affect active site;  
anaerobic conditions; 3 max
- [10]

- M7.** (a) (Increase in) dead organisms/humus/decomposition;  
 Leading to (increase in) nitrification/ammonia to nitrate/activity of nitrifying bacteria;  
 Nitrogen fixation;  
*Accept: pioneer species for plants* 2 max
- (b) (i) Bare soil temperatures fluctuate;  
*Reject: environmental temperature*  
*Accept: converse*  
 More bare soil, early/at start of succession/when few plants; 2
- (ii) Plant will grow/survive in the shade/when overshadowed (by taller plants)/when receiving less light;  
*Effect on plant with reason for effect*  
*Ignore reference to competition* 1
- (c) (Grassland consists of) small/annual plants;  
*Must be in the context of grassland*  
 Will be replaced by/outcompeted by woody plants;  
*Need idea of replaced not just an increase in percentage cover*  
 So these (woody plants) must be removed/have growth checked/grazed; 2 max
- M8.** (a) Tapes / string / axes laid out at right angles / grid area;  
Method of obtaining random co-ordinates;  
*Do not allow "Use random number generator"* 2
- (b) (i) Decrease then remain constant;  
 From 200 cm / over 150 cm; 2
- (ii) Oxygen decreasing because soil becomes more compacted/ not replaced;  
 Decrease in oxygen leads to fewer aerobes surviving;  
 Respiration; max 2
- (c) Anaerobic bacteria replace aerobic;  
 As oxygen decreased by aerobic bacteria;  
 Remove competition;  
 Aerobic bacteria no longer able to survive in these conditions; max 3

[7]

- |     |      |  |   |
|-----|------|--|---|
| (d) | (i)  | Near the surface / in top 50 cm;<br>Table shows decrease with time at greater depths;  | 2 |
|     | (ii) | Decrease;<br>Fewer aerobic bacteria with depth;<br>Oxygen concentration decreases / less oxygen at depth;                        | 3 |
| (e) |      | Probability greater than 95% / 0.95;<br>Results are not due to chance / results are significant;<br>Because bars do not overlap; | 3 |
| (f) |      | Plot as graph;<br>Draw line of best fit;<br>Read off appropriate value;  | 3 |

[20]

**M9. Quality of Communication**

The answers to all sections of this question require the use of continuous prose. Quality of language should be considered in crediting points in the scheme. In order to gain credit, answers should be expressed logically and unambiguously, using scientific terminology where appropriate.

- (a) (Decomposers):             Secretaion/release of enzymes; *[REJECT 'excrete]*
- Digest/hydrolyse organic matter;  
Absorption /'taken in' – by named process  
e.g. diffusion/active transport; (*ALLOW 'endocytosis'*)  
Respiration  
Release carbon dioxide;  
Carbon dioxide used in photosynthesis;  
Release ammonia/ammonium salts/ions/mineral salts / nutrients;  
(*ALLOW named small organic molecules*)
- (Nitrifying bacteria):         Ammonia/ammonium to nitrate; }     OR ammonia  
  Nitrate to nitrate;        }     → nitrate = 1mk  
  Aerobic/use of oxygen/by oxidation;  
  (*ALLOW correct symbols*)
- Nitrates/nitrites/ammonium used in synthesis of amino acids/protein  
/nucleic acids/other correct organic –N;

max 7

- (b) (Increase in carbon dioxide because) –
- Burning releases carbon dioxide; *[IGNORE ref. to felling]*  
Less carbon dioxide removed by trees/less removed in photosynthesis;
- 2

- (c)
1. Cleared areas light/tree seeds germinate/grow in light;
  2. Light for photosynthesis;
  3. Softwoods compete for light;
  4. Hardwoods can grow in low light;
  5. Additional seeds from close/adjacent areas;
  6. Less water evaporation (from hardwood seedlings)  
/maintains humidity
  7. Less extremes of temperature; /maintains microclimate;
  8. (canopy) reduces impact of rainfall (on hardwood seedlings)/ref. 'torrential';
  9. roots stabilise soil / less soil erosion (by rainfall);
  10. less leaching (of ions)(by rainfall);
  11. litter fall → recycling of ions (for hardwood seedlings);
  12. (Trees) provide food for animals;
  13. (Trees) provide habitats/niches/cover/shelter/nest sites for animals;
  14. Correct ref to succession / climax established;

max 6

[15]

