



# **A-Level Biology**

**Succession**

**Mark Scheme**

**Time available: 60 minutes**

**Marks available: 51 marks**

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## Mark schemes

1.

- (a) 1. Method of randomly determining position (of quadrats) e.g. random numbers table/generator;

*Ignore line/belt transect*

2. Large number/sample of quadrats;

*Accept many/multiple*

*Ignore point quadrat*

*If a specified number is given, it must be 20 or more*

3. Divide total percentage by number of quadrats/samples/readings;

3

- (b) 1. Beach grass is the pioneer (species);

2. Pioneers/named species change the (abiotic) environment/habitat/conditions/factors;

*Must convey idea of change being caused by a species*

*Accept example of change e.g. more humus*

3. (So) less hostile for named species

**OR**

(So) more suitable for named species;

4. Conifer/hardwood trees represent climax community;

4

- (c) Trees block/reduce (sun)light;

*Reject 'blocks' all of the light*

1

- (d) 1. (NPP) remains constant;

2. GPP/photosynthesis **and** respiration constant;

*Accept GPP/photosynthesis equals respiration*

**OR**

3. (NPP) low/decreases;

4. Less light so less photosynthesis/GPP;

*Reject no photosynthesis*

*Mark in paired statements*

*1 and 2 or 3 and 4*

2

[10]

- 2.** (a) 1. (Overall, data show an) increase in species richness / increase in species diversity / increase in total number of living organisms;
2. *Baetis quilleri* and / or *Pentaneurini guttipennis* are pioneers;
3. (Pioneers cause) named change of environment e.g. provide food for other species;
4. New species / example from data colonise once there is a change;
5. *Baetis quilleri* / *Pentaneurini guttipennis* / *Helicopsyche mexicana* decline / outcompeted / eaten as succession continues.
- 5
- (b) Correct answer 5.5 = 2 marks;
- Allow 1 mark for correct calculation of mean population growth rate per day for each species, i.e:
- Cryptolabis paradoxa* = 3.226
- Leptohyphes packeri* = 0.585
- 2
- (c) 1. Same species present (over long time) / stable community (over long time);
2. Abiotic factors (more or less) constant (over time)
3. Populations stable (around carrying capacity)
- 2 max
- [9]**
- 3.** (a) *Ulva lactuca*;
- Reject: Ulva on its own*
- Accept: lactuca on its own*
- Accept: Incorrect spelling*
- 1
- (b) (i) Difficult / too many / too many to count / individual organisms not identifiable / too small to identify / grows in clumps;
- Neutral: easier / quicker / representative / more accurate, unless qualified*
- 1
- (ii) Any described feature of concrete eg texture / flat / composition chemicals / nutrients etc;
- Neutral: not natural / man made / are different, without further qualification*
- 1

- (c) 1. Pioneer species / *Ulva* increases then decreases;  
*1 and 4. Growth / reproduces = increases. Dies = decrease*
2. Principle of a species changing the conditions / a species makes the conditions less hostile;  
*2. Accept description of change in conditions eg soil / humus forms, nutrients increased*
3. New / named species better competitor / previous / named / pioneer species outcompeted;  
*Pioneer species grows, dies and forms humus = 2 marks*  
*G. coulteri / Gelidium outcompetes other / named species = 2 marks*
4. *G. coulteri / Gelidium* increases and other / named species decreases;

4

[7]

4.

- (a) 1. Decrease in (percentage cover) of bare ground / water linked to more plants / species / increase in plant coverage;  
*Allow **one maximum mark** for answers which describe all three changes **without** a suitable explanation for any change*  
*Must be idea of more / increase not just change in species / plants*
2. Change in diversity / number of plant / species / named (species) as abiotic conditions altered / due to competition / more soil / less hostile;  
*Accept pioneer species replaced due to competition*  
*Accept description of change in species*  
*Accept 'more suitable' = less hostile*
3. Increase in depth of soil as plants die / humus formed;
- (b) 1. Greater variety of food / more food sources;  
*'More food' = neutral*
2. More / variety of habitats / niches;  
*Ignore 'more homes' or reference to 'shelters'*

3

2

- (c) (i) 1. Marking is not removed / marking does not affect survival / predation;  
 2. Limited / no immigration / emigration;  
*Accept 'migration' and descriptions of immigration / emigration*  
 2. and 4. Increase / decrease in population is not sufficient – there must be a reason  
 3. Sufficient time for (marked) individuals to mix (within the population);  
*Accept – 'For mixing to occur between samples'*  
 4. No / little births / deaths / breeding;  
 5. Sampling method is the same;  
*Ignore 'random sampling'*

2 max

- (ii) Correct answer of ...34 = 2 marks;

**Allow one mark** for an answer of 51 as candidate has misinterpreted the second sample as being = 30

Incorrect answer but shows correct formula in words or numbers  
 e.g.  $17 \times 20 \div 10$ ;

*Reject correct formula multiplied by 100*

2

[9]

5.

- (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. / less hostile (habitat);

*Accept 'they' for species / plants in mark points 1 and 2*

2. Species / plants better competitors;

2

- (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]

- 6.** (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;  
*Accept references to stratified sampling / different seral stages*
3. Count plants / percentage cover / abundance scale (in quadrats)  
*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;  
*Allow credit for example of making conditions less hostile such as:*  
*Adds nutrients*  
*Improves water retention* 2
- [5]**
- 7.** (a) (Increase in) dead organisms / humus / decomposition;  
 Leading to (increase in) nitrification / ammonia to nitrate / activity of nitrifying bacteria; 2
- (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 which will be replaced by / outcompeted  
 by woody plants;  
*Must be in the context of grassland*  
*Need idea of replaced not just an increase in percentage cover*
- So these (woody plants) must be removed / have growth checked / grazed; 2
- [7]**