A-Level Biology

Populations in Ecosystems

Mark Scheme

Time available: 78 minutes
Marks available: 50 marks

www.accesstuition.com

1. (a) Interspecific (competition);

1

(b) 1. Do not provide the livestock/cows/horses/yaks with extra food, **as** their populations will not grow large enough to cause competition

OR

Keep small numbers of livestock/cow/horse/yak, **so** their populations will not grow large enough to cause competition;

*Requires suggestion **and** explanation for each mark*

2. Do not farm horse/choose animals other than horse to farm, **as** they have the same habitat **and** (very) similar food to the ibex;

*Accept farm fewer horses **as** they have the same habitat **and** (very) similar food to the ibex*

3. Keep horses (but) in enclosed/separate areas, **as** they occupy the same habitats as ibex;

Accept descriptions of enclosed areas, eg fenced areas or accept do not let horses out

4. Farm cows, **as** they have the least similar food **and** (one of the least similar) habitat (to that of the ibex);

5. Farm yaks, **as** despite eating the same food, they live in a very different habitat;

6. (Only) grow crops, **so** no competition;

Accept examples of crops

3 max

[4]

2.

(a) 1. Use a grid
OR
Divide area into squares/sections;

Accept use of tape measures/map/area with coordinates.

Accept Belt transect.

2. Method of obtaining random coordinates/numbers e.g. calculator/computer /random numbers table/generator;

If transect method used accept quadrats at regular intervals or current mark point 2.

3. Count number/frequency in a quadrat/section;

Accept % cover in quadrat/section.

Ignore amount/abundance.

4. Large sample **and** calculate mean/average number (per quadrat/section);

*Accept large sample **and** calculate mean %.*

*Accept large sample **and** method of calculating mean.*

Accept many/multiple for large sample but ignore several.

If a specific number is given it must be 10 or more.

5. Valid method of calculating total number of sundews, e.g. mean number of plants per quadrat/section/m^2 multiplied by number of quadrats/sections/m^2 in marsh;

Do not allow 'scale up' without further qualification.

Do not award if % cover determined.

5

(b)

***Mark in pairs** 1 and 2, or 3 and 4.*

Ignore carbohydrates, lipids or named carbohydrate/ lipid.

1. Digestion/breakdown of proteins;

2. Provides amino acids
OR
(Sundew can) produce a **named** (organic) nitrogen-containing compound e.g. proteins, amino acids, DNA, ATP;

Ignore if nitrate or ammonium ions given as products.

3. Digestion/breakdown of **named** (organic) phosphate-containing compound e.g. DNA, RNA;

4. Provides **named** (organic) phosphate-containing product e.g. nucleotides
OR
(Sundew can) produce a **named** phosphate-containing compound e.g. ATP, DNA;

Accept phosphate as a named product.

2 max

[7]

3.

(a) 1. Compete (with fertile males) to mate / for food / resources
OR
intraspecific competition;
2. Do not reproduce / breed
OR
Reduces population (of mosquitoes);

1. Must convey idea of competition.

2. Accept: 'fewer mosquitoes' / 'fewer offspring'.

2

(b) 1. Capture / collect / sample, mark **and** release;
2. Leave time for mosquitoes / Aedes to disperse before second sampling / collection;
3. (Population =) number in first sample × number in second sample divided by number of marked in second sample / number recaptured;

3. Accept: correct equation.

3

(c) (Radiation) affects their 'attractiveness' / courtship / survival / life span;

*Accept: 'die / less likely to survive **due** to radiation'.*

Accept: 'disease can be transmitted by other means' (other than mosquitoes).

1

(d) To maintain number / competition as they die / have a short life span;

Accept: to replace mosquitoes that have died.

1

(e) 1. Number (of mosquitoes in treated area) is low / lower at / after 12/13/14/15/16 weeks = **2 marks**;

2. For one mark accept number (of mosquitoes in treated area) is low/lower without reference to relevant week;

Accept: amount for number.

Accept: comparison of numbers (of mosquitoes) for lower/low.

2

[9]

4.

(a) 1. (Use) coordinates / number the rocks/sites/squares;

Ignore: references to grid, tape measures, metre rulers etc.

2. Method of generating/finding random numbers e.g. calculator/computer/random number generator/random numbers table;

Accept: numbers out of a hat / use of dice.

2

(b) Difficult/too many to count / individual organisms not identifiable / too small to identify/count / grows in clumps;

Ignore: easier/quicker/representative/ more accurate, unless qualified.

1

(c) Any suitable factor with valid explanation = 1 mark

1. Wave action - firmer grip on rock is necessary (at either site);
2. Wind/air movement/less humid - more evaporation at site A / more (physical) damage;
3. Light – (linked to) photosynthesis (at either site);
4. Temperature – (linked to) photosynthesis/respiration/enzymes/ evaporation (at either site);
5. pH – (linked to) enzymes/proteins;

Note: other common factors include salt (salinity) linked to water potential / named nutrient e.g. nitrate linked to protein/DNA.

Ignore: carbon dioxide/oxygen/pollution/rainfall/food/nutrients.

Reject: biotic factors e.g. predation.

2 max

(d) 1. Greater variety of food / more food sources;

Ignore: more food.

2. More/variety of habitats/niches;

Ignore: homes/shelters.

Accept: different habitats.

2

(e) (i) 1. (So they were) hungry/not full;

Accept: description of hunger e.g. appetite / 'empty stomach'/'so they eat'.

2. (Allows) comparison;

2

(ii) 1. Alga without consumer/named consumer/animal;

Accept: repeat experiment without consumer.

Accept: in separate tank / in tank where not eaten.

2. (Find change in mass) in dark;
3. For 50 hours;

Accept: 'same time as in experiment'.

Accept: For lower time period then scaled up to 50.

3

(iii) 1. For *Laurencia pacifica* **and** *Cystoseira osmondacea*

(difference in results) significant /reject null hypothesis / not due to chance / less than 5%/0.05 probability due to chance;

Accept: for Laurencia pacifica 'less than 1%/0.01 probability'.

2. For *Egregia leavigata* **and** *Microcystis pyrifera* no significant (difference in results)/accept null hypothesis / is due to chance/more than 5%/0.05 probability due to chance;

Accept: 'insignificant' for 'no significant difference'.

3. (Difference in results) for *Laurencia pacifica* is the most significant;

Note: reference to probabilities on their own is not sufficient.

1, 2 and 3. Accept: abbreviations for all species.

3

[15]

5. (a) (i) (Organisms that) can breed together / interbreed **and** produce fertile offspring;

Need both aspects. Reject 'inbreed'

Reject viable offspring

1

(ii) Same number (of organisms) in each region / (organisms) equally spread;

Allow other ways of expressing 'region' or 'equally spread', eg not clumped together, same number per unit area

1

(b) $P = \frac{AS}{R}$;;

2 marks for correct answer

*1 mark for having **A** on top of equation (recognises that total population related to total area)*

Note:

P = A × S / R or
P = A / R × S

are also correct.

Allow 1 mark for

$$\frac{S}{P} = \frac{R}{A}$$

2

(c) (i) *In mark–release-recapture (technique)*

Accept converse by considering assumptions of proportional sampling

1. No assumption that organisms are uniformly distributed;

2. Size of total area / size of sampled region not required;

Marking point 1 or marking point 2 do not have to start with the same technique

In this case, allow difference by implication i.e. do not penalise if the two techniques are not compared

2

(ii) Animals are from / all part of the same population;

1

[7]

6. (a) (i) 1. No overall pattern / pattern (of right or left most common) is not the same for all islands;

Allow expression in other ways e.g. three islands show left on top is more common

2. For **(B) C** and **E** there is little difference;

3. Large differences on **A** *and* **D** *and* opposite ways (to each other);

Need both aspects but allow other expressions of 'opposite ways'

2 max

(ii) 1. Can record all individuals on (small) islands;

2. (So) no / less sampling error;

3. (Maybe) different rates of mutation / different selection pressures / different environmental conditions;

4. Inbreeding / breeding with close relatives (more likely);

5. (Little) gene flow / (more chance of) genetic drift;

Accept reference to either of these ideas for this point

2 max

(b) 1. If R is recessive, R × R parents cannot produce L offspring;

Accept use of genetic diagrams to illustrate points 1 and 2

2. If L is recessive, L × L parents cannot produce R offspring;

Accept right arm on top as R etc.

3. R × R **and** L × L parents produce both types of offspring;

Need reference to two parent crosses for this mark

3

(c) Both L and R in a set of twins / (some) twins show different arm-folding;

1

[8]