A-Level Biology

Evolution and Speciation

Mark Scheme

Time available: 53 minutes
Marks available: 42 marks

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1.

(a) 1. Laboratory-raised female (guppies) might not react/behave/choose in the same way (as wild guppies);

Ignore answers relating to sample size

Accept laboratory-raised female (guppies) might not be representative of wild females

2. (Transparent) barrier might not allow for normal (courtship) behaviour/interaction;

Accept choice might involve chemical/ mechanical signals/interaction

Accept colour might not be the only thing females are attracted to

3. Do not know if (guppies) have been used in previous experiments;

4. 10 minutes might not be long enough for females to make a (final) choice

OR

Not enough time for females to make a (final) choice;

Accept descriptions of a choice eg 'show attraction'

3 max

(b) 1. (Females with large brains) will mate with males bright in colour;

Accept answers that include references to alleles

2. Their (male) offspring would be (more likely to be) bright in colour;

3. (Bright in colour male) offspring could attract larger brained females;

4. The population/offspring could (evolve to) have larger brains;

Ignore answers relating to females only

5. The population/offspring are better at identifying/avoiding predators;

Ignore answers relating to females only

3 max

(c) 1. **Not** geographically isolated;

Accept are in the same area

2. (Leading to) reproductive isolation

OR

Gene pools kept separate;

Accept large brained females will only mate with males bright in colour and small brained females will only mate with males dull in colour

3. Changes in allele frequencies;

Reject gene frequencies

4. Cannot breed/mate to produce fertile offspring;

Reject inbreeding

3 max

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2. (a) All the alleles in a population;

Accept: The number of alleles in a population.

Note: All or number of alleles in a species on its own is not enough on its own.

1

(b) 1. Occurs in the same habitat / environment / population;
2. Mutation/s cause different flowering times;
3. Reproductive separation / isolation
OR
No gene flow
OR
Gene pools remain separate;
4. Different allele/s passed on / selected
OR
Change in frequency of allele/s
5. Disruptive (natural) selection;
6. Eventually different species cannot (inter)breed to produce fertile offspring;

*1. Accept: are **not** geographically isolated / separated.*

1. Accept: same place

3. Accept: no interbreeding but must be a separate idea from mark point 6 which relates to definition of a species.

Note: Answers relating only to allopatric speciation = 3 max, mark points 3, 4 and 6.

5 max

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3.

(a) 1. No interbreeding / gene pools are separate / geographic(al) isolation;

Accept: reproductive isolation as an alternative to no interbreeding.

2. Mutation linked to (different) markings/colours;
3. Selection/survival linked to (different) markings/colours;
4. Adapted organisms breed / differential reproductive success;

Note: 'passed on to offspring' on its own is not sufficient for reproduction.

5. Change/increase in allele frequency/frequencies;

5

(b) 1. (Compare DNA) base sequence / base pairing / (DNA) hybridisation;

Ignore: compare chromosomes / 'genetic make-up'.

Accept: (compare) genes / introns / exons.

*Note: reference to **only** comparing alleles is 1 max.*

2. Different in six (species) /different in different species / similar in three (subspecies) /similar in same species/subspecies;

Ignore: compare chromosomes / 'genetic make-up'.

Reject: '<u>same</u> alleles/ <u>same</u> DNA bases in three species/subspecies'.

Note: mark point 2 can be awarded without mark point 1.

2

[7]

4.

(a) 1 4 year cycles;
2 predator / stoat peaks after prey / lemming;
3 lemmings increase due to low numbers of stoats / available food;
4 more food for stoats so numbers increase;
5 increased predation reduces number of lemmings;
6 number of stoats decreases due to lack of food / starvation;

6

(b) smaller populations have fewer different alleles / more homozygosity / less heterozygosity / smaller gene pool / lower genetic variability;
migrants bring in new alleles / increase gene pool;

2

(c) geographical isolation of populations;
variation present in population(s);
different environmental conditions / different selection pressures / different phenotypes selected;
change in genetic constitution of populations / gene pools / allele frequency;

4

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5.

(a) breed together;
if fertile offspring, then same species;

2

(b) <u>isolation</u> of two populations;
variation already present due to mutations;

different environmental conditions / selection pressures leading to selection of different features and hence different alleles;
different frequency of alleles;
separate gene pools / no interbreeding;

4

(c) selection of mate dependent on colour pattern;
prevents interbreeding / keeps gene pools separate;

2

[8]