

## Mark schemes

**Q1.**

- (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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**Q2.**

- (a)
1. LP due to mutation  
**OR**  
Allele due to mutation;  
*Reject mutation caused by drinking milk.*  
*Reject (LP) gene*
  2. Milk provides named nutrient;  
*Accept any correct named nutrient e.g. glucose, galactose, protein*  
*Ignore 'sugar' 'lactose' as named nutrient*
  3. Individuals with LP more likely to survive **and** reproduce  
**OR**  
Individuals with advantageous allele more likely to survive **and** reproduce;  
*Reject (LP) gene*  
*Accept 'individuals who produce lactase' for 'LP individuals'*  
*Accept 'pass on allele/LP/characteristic' for reproduce.*
  4. Directional selection;
  5. Frequency of allele increases (in the offspring/next generation);  
*Accept description of increasing frequency of allele e.g. 'higher proportion', 'more common' but ignore increase in **number** of allele*

4 max

- (b)
1. Dominant allele;
  2. (Always) expressed/shown (when present in phenotype/offspring)  
**OR**  
Expressed when only one (dominant allele) present;

2

**Q3.**

- (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

**Q4.**

- (a) 1. Correct answer of 19.4 / 19.41%  
**OR**  
 19.47 / 19.5% = **2 marks**;  
 2. Incorrect answer but shows increase of 1,048,320 **OR** 1,051,200 = one mark;  
*Accept: 19.46% for one mark.*
- 2
- (c) 1. Isolated **so** inbreeding / low genetic diversity / small gene pool;  
 2. Allele inherited (through generations) from (common) ancestor;
1. *Ignore: Founder effect.*
1. *Accept: no interbreeding with other populations.*
1. *Reject: interbreeding within the population.*
- 2
- (d) 1. AD / symptoms develops late / at 49;  
 2. Have already reproduced;
- Note: 'It' is not equivalent to AD / symptom as the question stem relates to the mutation.*
- 2

**Q5.**

- (a) (No – no mark)  
 Graph / bar chart only shows number of species, not the name of the

species.

1

(b) (No – no mark)

1. Mutations are spontaneous / random;
2. Only the rate of mutation is affected by environment;
3. Different species do not interbreed / do not produce fertile offspring;
4. So mutation / gene / allele cannot be passed from one species to another.

*Ignore references to correlation does not prove causation*

4

- (c)
1. Initially one / few insects with favourable mutation / allele;
  2. Individuals with (favourable) mutation / allele will have more offspring;
  3. Takes many generations for (favourable) mutation / allele to become the most common allele (of this gene).

3

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## Q6.

- (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: 'same alleles/ same DNA bases in three species/subspecies'.*

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

2

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