



EXAM PAPERS PRACTICE

Boost your performance and confidence with these topic-based exam questions

Practice questions created by actual examiners and assessment experts

Detailed mark scheme

Suitable for all boards

Designed to test your ability and thoroughly prepare you

2002

XVIII

1583

Time allowed

54 Minutes

Score

/45

Percentage

%

Biology

**AQA
AS & A LEVEL**

Mark Scheme

3.4 Genetic information, variation and relationships between organisms

www.exampaperspractice.co.uk



1

- (a) 1. Kingdom, Phylum, Class, Order, Family; 2.
Luscinia svecica.

1 mark for each correct column

*Allow Genus and Species if both placed in box for species
but not if both placed in genus box*

2

- (b) Number of different alleles of each gene.

*Accept number of different base sequences (found) in each
gene*

1

- (c) 1. Has greater proportion of genes / percentage of genes showing
diversity;
2. Percentage is 35% compared with 28% / proportion is 0.35 compared
with 0.28.

*Allow correct figures that are not rounded up, i.e., 34.9% /
0.349 and 27.8% / 0.278*

2

[5]



2 (a) 0.32.

Correct answer = 2 marks

Accept 32% for 1 mark max

Incorrect answer but identifying 2pq as heterozygous = 1 mark

2

- (b)
1. Mutation produced *KDR minus* / resistance allele;
 2. DDT use provides selection pressure;
 3. Mosquitoes with *KDR minus* allele more likely (to survive) to reproduce;
 4. Leading to increase in *KDR minus* allele in population.

4

- (c)
1. Neurones remain depolarised;
 2. So no action potentials / no impulse transmission.

2

- (d)
1. (Mutation) changes shape of sodium ion channel (protein) / of receptor (protein);
 2. DDT no longer complementary / no longer able to bind.

2

[10]

- 3 (a) PKNJ. 1
- (b) *Lutra lutra*. 1
- (c) Bone / skin / preserved remains / museums. 1
- (d) 1. (Hunting) reduced population size(s), so (much) only few alleles left;
Accept bottleneck
2. Otters today from one / few surviving population(s);
Accept founder effect
3. Inbreeding.
Allow any two 2 max
- (e) 1. Population might have been very small / genetic bottleneck;
2. Population might have started with small number of individuals / by one pregnant female / founder effect;
3. Inbreeding.
Allow any two 2 max
- [7]



- 4 (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

[8]



5

- (a) 1. Change / mutation in base / nucleotide sequence (of DNA / gene); Q.
Ignore: references to changing base-pairing
Accept: affect for change, if in correct context
Accept: changes triplets / codons
2. Change in amino acid sequence / primary structure (of enzyme);
Accept: different amino acid(s) coded for
Q Reject: different amino acids produced / formed / made
3. Change in hydrogen / ionic / disulfide bonds;
Accept: references to sulfur bonds
4. Change in the tertiary structure / shape;
Neutral: alters 3D structure / 3D shape
5. Change in active site;
6. Substrate not complementary / cannot bind (to enzyme / active site) / no enzyme-substrate complexes form.
Accept: no E S complexes form

6

- (b) 1. Non-SR strain falls more / SR strain falls less / up to $10(\mu\text{g} / \text{cm}^{-3})$;
Must include 10 but only required once in either MP1 or MP2
Ignore: units or absence of
This must be a comparative statement
2. Above $10(\mu\text{g} / \text{cm}^{-3})$, SR strain levels out / off and non-SR strain continues to decrease;
3. Greater difference between strains with increasing concentration of antibiotic.
This must be a comparative statement

2 max

- (c) 1. Division stopped (of both strains by scientist);
Reject: references to mitosis stopping
2. SR strain still more resistant / fewer die / none die (at higher concentrations of antibiotic).
Accept: SR strain and non-SR strain would be similar if



*resistance is due to only stopping division
Need some comparison with non-SR*

2

- (d) 1. Make a competitive / non-competitive inhibitor;
*Mark in pairs
either MP1 and MP2 OR MP3 and MP4*
2. Competitive competes with / blocks active site / non-competitive inhibitor affects / changes active site;
Do not mix and match
- OR
3. (Make a drug) that inhibits / denatures / destroys enzyme / stringent response;
Accept: drug that 'knocks out' / destroys enzyme
4. Give at the same time as / before an antibiotic.

2 max

- (e) (SR strain)
1. Fewer free radicals (than non-SR);
Note: has to be comparative statement
2. Produces more catalase (than non-SR);
Accept converse statements for non-SR.
3. Catalase (might be) linked to production of fewer free radicals / breaking down / removing free radicals.
Accept: hydrolysis of radicals by catalase.

3

[15]