

## Natural Selection, Evolution and Speciation - Mark Scheme

Q1.

Question Number	Answer	Additional Guidance	Mark
(i)	<p>1. idea that bacteria are resistant to fewer {antibiotics / antibiotic combinations} (in 2006 than 2007) ;</p> <p>2. in both years there are resistant strains to {streptomycin / INH + rifampicin + ethambutol / INH } ;</p> <p>3. idea that there are resistant strains to INH + rifampicin in 2006 but not in 2007 ;</p> <p>4. idea that there are resistant strains to {ethambutol / rifampicin} in 2007 but not in 2006 ;</p>	<p><b>ACCEPT</b> clear abbreviations to the names of the antibiotics throughout</p> <p><b>1 ACCEPT</b> a description e.g. new resistances, resistant to 4 in 2006 and 5 in 2007</p> <p><b>3 ACCEPT</b> idea that {resistance decreased to zero / no longer resistant}</p> <p><b>4 ACCEPT</b> idea of resistance developing <b>NB</b> development of new resistances to {ethambutol / rifampicin} = Mp 1 and 4</p>	<b>(3)</b>

Question Number	Answer	Additional Guidance	Mark
(ii)	<ol style="list-style-type: none"> <li>1. bacteria have a mutation in {DNA / gene / eq } ;</li> <li>2. idea that the {presence / usage of} {antibiotic (INH) / INH} acts as a selection pressure ;</li> <li>3. idea that the allele (for resistance) is passed on ;</li> <li>4. idea that bacteria {divide by asexual reproduction / divide by binary fission / produce clones / eq} ;</li> <li>5. idea of increasing the allele frequency ;</li> </ol>	<p><b>3 NOT</b> gene</p> <p><b>4 ACCEPT</b> divide by mitosis / conjugation / transduction / transformation / eq</p>	

Question Number	Answer	Additional Guidance	Mark
	6. idea that the more resistant bacteria there are, the more likely new strains will acquire the (resistance) gene ;		<b>(3)</b>

Question Number	Answer	Additional Guidance	Mark
(iii)	<ol style="list-style-type: none"> <li>1. reference to codes of {practice / conduct / eq } ;</li> <li>2. idea that appropriate {antibiotics / named example} should be given to patients ;</li> <li>3. idea of {educating patients about taking antibiotics / taking the full course of antibiotics ;</li> <li>4. credit another appropriate procedure e.g. hand washing, screening ;</li> </ol>	<p><b>1 ACCEPT</b> named policy /code <b>NB</b> Mp5 is for named practice</p> <p><b>2 ACCEPT</b> not giving antibiotics if not necessary / not using antibiotics for prophylactic treatment / using narrow spectrum antibiotics / rotate antibiotic use</p>	<b>(2)</b>

Q2.

Question Number	Answer
* (i)	<p>Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <ul style="list-style-type: none"> <li>• feeding behaviours</li> <li>• anatomy</li> <li>• genetic differences</li> <li>• no information on whether they can interbreed to produce fertile offspring</li> <li>• different locations do not indicate that they are different species</li> <li>• no information on number of elephants used for DNA analysis</li> <li>• GBA alleles K and L are exclusive to one type of elephant / genetic isolation</li> </ul>

Level	Mark	Descriptor	
<b>Level 0</b>	Marks	No awardable content	
<b>Level 1</b>	1-2	<p>An answer may be attempted but with limited interpretation or analysis of the scientific information with a focus on mainly just one piece of scientific information.</p> <p>The answer will contain basic information with some attempt made to link knowledge and understanding to the given context.</p>	Makes reference to one of behavioural, phenotypic, anatomical or genetic differences
<b>Level 2</b>	3-4	<p>An answer will be given with occasional evidence of analysis, interpretation and/or evaluation of more than one pieces of scientific information.</p> <p>The answer shows some linkages and lines of scientific reasoning with some structure.</p>	<p>Makes reference to more than one of behavioural, phenotypic, anatomical or genetic differences</p> <p>Also includes an interpretation of allele data <b>or</b> considers reasons why may not be different species</p>
<b>Level 3</b>	5-6	<p>An answer is made which is supported throughout by sustained application of relevant evidence of analysis, interpretation and/or evaluation of all pieces of scientific information.</p> <p>The answer shows a well-developed and sustained line of scientific reasoning which is clear and logically structured.</p>	Also includes an interpretation of allele data <b>and</b> considers reasons why may not be different species

Question Number	Answer	Additional Guidance	Mark
(ii)	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>two populations are geographically isolated from each other (1)</li> <li>therefore reduced gene flow between the two populations (1)</li> <li>which leads to allopatric speciation (1)</li> <li>different selection pressures leading to natural selection (1)</li> </ul>	<p>ALLOW description of populations separated by a geographical feature</p> <p>ALLOW description of natural selection in context of selection pressures</p>	3

Q3.

Question Number	Answer	Additional Guidance	Mark
	<ul style="list-style-type: none"> <li>peer review (1)</li> </ul>	ALLOW reviewed by other scientists IGNORE peer assessment	(1)

Q4.

Question Number	Acceptable Answer	Additional guidance	Mark
(a)	A		(1)

Question Number	Acceptable Answer	Additional guidance	Mark
(b)	<p>An explanation that makes reference to the following:</p> <ul style="list-style-type: none"> <li>mosquitoes are geographically isolated in the tunnels (1)</li> <li>random genetic mutations cause variation in the population which allows some individuals to feed on rats, mice and humans (1)</li> <li>these individuals {will be selected for / are more likely to survive and reproduce} (1)</li> <li>the proportion of individuals in the population with this mutation will change over time (1)</li> <li>over many generations these populations become genetically distinct from the above ground population (1)</li> </ul>		(5)

Q5.

Question Number	Answer	Additional Guidance	Mark
(a)(i)	<ol style="list-style-type: none"> <li>(successful interbreeding) produces offspring;</li> <li>(same species produce) fertile (offspring);</li> <li>credit reason why offspring of different species might be infertile ;</li> </ol>	<p><b>Accept</b> converse throughout</p> <p><b>Ignore</b> viable</p> <p>eg genetic incompatibility, different number of chromosomes, poor quality gametes , low number of gametes</p>	(3)

Question Number	Answer	Additional Guidance	Mark
(a)(ii)	<ol style="list-style-type: none"> <li>1. reference to reproductive isolation ;</li> <li>2. different breeding times;</li> <li>3. do not recognise {courtship displays / songs / eq} ;</li> <li>4. physically incompatible eg genitalia ;</li> </ol>		(3)
Question Number	Answer	Additional Guidance	Mark
(b)	<ol style="list-style-type: none"> <li>1. idea that the two species share the same habitat ;</li> <li>2. idea that the two species experience the same environmental conditions ;</li> <li>3. (therefore) the same selection pressures ;</li> <li>4. idea that they are both well-adapted (to their environment) ;</li> <li>5. idea that no mutations have happened that {improve / change} their {phenotypes / survival};</li> <li>6. {no / few} changes in allele frequency / gene pool is stable ;</li> <li>7. idea that there has been very little change in environment (over the years) ;</li> </ol>	<p><b>Accept</b> similar</p> <p><b>NB</b> this needs to be in the context of both species being subjected to the same selection pressures</p> <p><b>Accept</b> similar</p>	(3)