

UNIT 4 BIOLOGY

Revision Booklet 13 - SOLUTIONS

2012 – Question 5

Question 5

Many students appeared confident with this topic and were generally able to interpret and analyse the data.

Question 5a.

Marks	0	1	Average
%	71	29	0.3

Food availability or finding food source

Diet was deemed too vague and was therefore not awarded a mark.

Question 5bi–ii.

Marks	0	1	2	Average
%	2	28	69	1.7

5bi.

Molossus molossus or Velvety free-tailed bat

5bii.

One of

- detects insects far away or trees are large
- better chance of finding prey or a mate
- travel better over longer distances.

Question 5c.

Marks	0	1	Average
%	22	78	0.8

Divergent or adaptive radiation

Speciation is the product of divergent evolution.

Question 5d.

Marks	0	1	2	Average
%	39	30	31	0.9

The Mexican long-tongued and Velvety free-tailed bats had a similar number of differences in their DNA or their DNA when hybridised had a higher melting temperature. The DNA of both the Mexican long-tongued and Velvety free-tailed bats when hybridised with the DNA of the Black myotis bat had a lower melting temperature. The Mexican long-tongued and Velvety free-tailed bats had a smaller number of differences when their DNA was hybridised together.

The question asked for what results would have led to the construction of this phylogeny, but many students incorrectly based their answer on describing the diagram as 'The Mexican Long-tongued and Velvety free-tailed bats are more closely related'.

Question 5e.

Marks	0	1	2	Average
%	61	18	21	0.6

Disagree, as there is no physical barrier. The different species live in the same area.

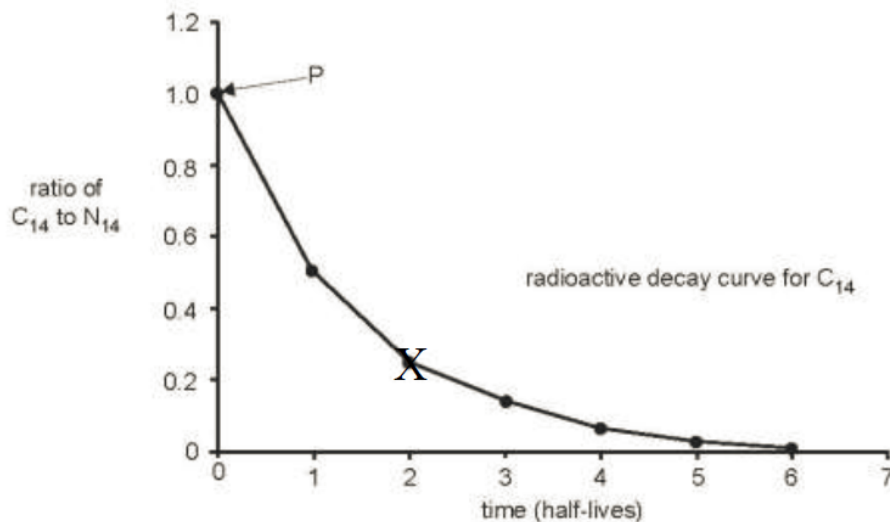
2012 – Question 6

Question 6ai.–ii.

Marks	0	1	2	Average
%	37	28	35	1

6ai.

The X should have been placed on the curve at coordinates 2, 0.25.



Key Point P on the graph represents the ratio of C₁₄ to N₁₄ found in present-day organisms.

6aii.

12 000

Many students did not mark the graph at all and a considerable number were unable to successfully obtain the answer of 12 000.

2010 – Question 4

Question 4a.

Marks	0	1	2	3	Average
%	23	22	29	26	1.6

All of:

- there was variation in the mussel population or thick-shelled mussels had a selective advantage
- the crabs eat more thin-shelled mussels or crabs are a selective pressure
- the thicker-shelled mussels survived, reproduced and passed their alleles on to the next generation.

Many students answered this question concisely and in a well-thought-out way. Others, however, provided confused answers such as 'the mussels needed thicker shells so they grew them.'

Question 4b.

Marks	0	1	2	Average
%	24	16	60	1.4

Either of:

- no change in variation and due to crabs (selection pressure) not being present
- variation occurs due to a different selection pressure or gene flow with the Southern population.

This question was generally well answered.

2010 – Question 7

Question 7a.

Marks	0	1	Average
%	50	50	0.5

Either of:

- strata near the top are more recent (or the converse)
- strata are laid down in chronological order.

The question specifically asked for assumptions about the formation of fossils, hence students who stated that disturbances had not occurred could not gain full marks.

Question 7b.

Marks	0	1	2	Average
%	35	25	40	1.1

7bi.

The decrease in bird numbers was due to:

- predation by humans/dogs
- habitat destruction by dogs/humans/volcanic eruption.

7bii.

The evidence given needed to relate to the answer given in 7bi., such as:

- dog bones in the strata
- pottery, indicating human settlement

- charred plant remains, indicating habitat destruction by humans
- charred plant remains, indicating human settlement/volcanic eruption.

The suitability of the account was assessed in this question.

Question 7c.

Marks	0	1	2	3	4	Average
%	26	19	19	20	17	1.8

7ci.

Founders (founder effect was also acceptable)

7cii.

- population separated/no gene flow
- natural selection occurs (or a suitable description of this process)
- when brought back together, they are unable to produce viable/fertile offspring

Many students were able to gain some marks for this question. Students who were awarded full marks answered this question in a clear and logical manner.

2009 – Question 4

Questions 4ai-ii.

Marks	0	1	2	3	Average
%	32	35	23	10	1.1

4ai.

The bird was rapidly covered by sediment, and one of:

- hidden from scavengers
- decreased rate of decomposition
- undisturbed
- long time.

This question was poorly answered. Too many students stated that the fossil was buried under rock or lava. The sediments, over time, form rock.

4aii.

Both of:

- stratigraphy is where layers of sediment build up over time
- the oldest fossils are found in the lowest stratum (or the converse).

Students could also have suggested radioisotopic dating and described how the sequence could be determined. If students answered in this way it was difficult to gain marks as they did not relate their answer to the sequencing.

Question 4bi-ii.

Marks	0	1	2	3	4	Average
%	26	18	23	25	8	1.7

4bi.

Mountain range/dry ground/road/or any other suitable answer

A common incorrect answer was geographic isolation.

4bii.

All of:

- the two separated populations have different gene pools/genetic variation/mutations present
- different selection pressures/environments/natural selection acts on each population
- if the two populations, when brought together, do not produce fertile offspring, they are different species

Many students were able to gain three marks for this question. They set out clear and logical answers, taking advice from previous Assessment Reports. The question allowed for a broad range of responses.

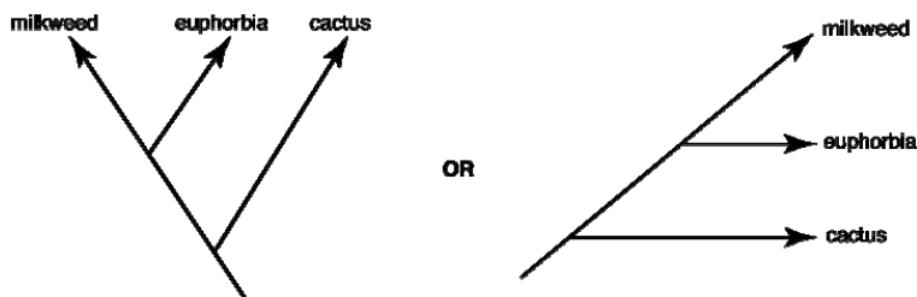
Too often students incorrectly wrote that ‘the environment caused mutations which were advantageous’. Unlike similar questions in past examinations, students were able to choose their own example of an isolation barrier and describe speciation in general terms.

2008 – Question 5

Question 5

Question 5a.

Marks	0	1	Average
%	28	72	0.8



Question 5b.

Marks	0	1	Average
%	42	58	0.2

Natural Selection

Question 5c.

Marks	0	1	Average
%	56	44	0.5

Either of:

- lack of sedimentation
- lack of hard parts.

For students to gain the mark, it was important that they named a necessary condition for fossilisation or identified that the lack of a specific condition would have prevented fossilisation.

Vague statements such as ‘incorrect conditions for fossilisation’ did not score a mark.

2008 – Question 7

Question 7

Question 7a.

Marks	0	1	Average
%	43	57	0.6

- phenotypic characteristic: colour of skin
- selection pressure: camouflaged from predators

Many students could not correctly identify the selection pressure.

Question 7b.

Marks	0	1	2	Average
%	6	13	80	1.8

Two of *L. myola* has:

- a longer mating call than *L. genimaculata*
- a faster note rate than *L. genimaculata*
- a higher pitch than *L. genimaculata*.

This part was well answered and most students correctly interpreted the data. Some students needed to take greater care in constructing their answers, for example, stating that '*L. myola* mates more frequently and faster than *L. genimaculata*' has a completely different meaning.

Question 7c.

Marks	0	1	Average
%	79	21	0.2

Either of:

- pockets of rainforest may have changed and become more or less favoured by frogs
- some ponds may have dried up restricting location of frogs.

The condition that isolated the groups had to be **permanent**, due to **climate change**, and relevant. Some incorrect suggestions were flooding (not a permanent event), mountains, (not climatic) and volcanoes (not relevant).

Question 7d.

Marks	0	1	Average
%	74	26	0.3

Extent of differences in:

- mitochondrial DNA
- DNA
- amino acid sequence.

or

A description of fossil or stratigraphic evidence, such as 'the sequence of fossils are observed to determine when divergence occurred'.

Question 7e.

Marks	0	1	2	3	Average
%	58	17	14	11	0.8

All of:

- for many generations, a small population of *L. genimaculata* was isolated by changed geography due to climate and there was no gene flow (or allele flow) between the populations
- allele frequencies in the small population changed (particularly with respect to size and mating call) due to natural selection or genetic drift
- eventually the two groups are different enough to prevent successful reproduction.

Many students failed to recognise that this was a question on speciation. Many students wrote a sentence using the words required with no additional information.

Question 7f.

Marks	0	1	Average
%	63	37	0.4

Either of:

- interbreed the two species and if they produce viable and fertile offspring, **they are the same species**
- interbreed the two species and if they do not produce viable or fertile offspring, **they are not the same species.**

To gain the mark for this question students needed to state what could be concluded from their suggestion.

2007 – Question 5

Question 5

Question 5a.

Marks	0	1	Average
%	35	65	0.7

The effect of the diet on the size of the jaw.

Question 5b.

Marks	0	1	Average
%	62	38	0.4

The size of the prey given.

‘The type of prey’ was deemed too vague, as other types of prey were listed in the stem of the question.

Question 5c.

Marks	0	1	2	Average
%	31	32	37	1.1

5ci.

Mainland snakes (groups C and D) had normal jaw length at maturity.

5cii.

Island snakes’ (groups A and B) jaw length increased in size when large prey was eaten.

Question 5d.

Marks	0	1	2	3	Average
%	33	19	22	27	1.5

Students needed to make the following points in their responses:

- the island and mainland snakes were geographically isolated **or** no gene flow
- each population experienced different selection pressures
- populations, if reintroduced, were unable to produce viable fertile offspring.

This question was well answered and many students set out their answers in a clear and concise way. They also related the information to the snakes and a few students included diagrams to assist their explanation (although a diagram was not required to achieve full marks). Incorrect terms that were used included ‘geologically separated’ and ‘environmental pressure’. It is important to note that not all environmental pressures act as selective pressures.

2007 – Question 6

Question 6

Question 6a.

Marks	0	1	Average
%	45	55	0.6

A trait determined by two or more genes.

Some students incorrectly stated many alleles.

Question 6b.

Marks	0	1	Average
%	49	51	0.5

Larger seeds have proportionally more protein.

Many students incorrectly answered this part in terms of the plant’s qualities, such as drought tolerance.

Questions 6c.

Marks	0	1	2	Average
%	64	20	15	0.5

Students needed to make both of the following points in their responses:

- the farmer would choose the largest seeds from a crop and plant them

- these plants would then reproduce and the process would be repeated for many generations.

The question specifically asked how a farmer could develop a large-seeded variety. Many students did not recognise this as a question on selective breeding. The method described had to be possible for a farmer to undertake, hence genetic engineering was not accepted. Many students suggested cross breeding different species, even though they had correctly answered Question 5c. It is important to note that scientific methods and processes apply to everyday life and are not just confined to laboratories.

2007 – Question 7

Question 7

Question 7a.

Marks	0	1	Average
%	80	20	0.2

Stratigraphy could be used, where the relative age of a fossil can be determined by the position of that stratum.

This question was very poorly answered as many students did not understand the term 'relative dating' and described absolute dating, using an element with a known half life.

Question 7b.

Marks	0	1	Average
%	41	59	0.6

Convergent evolution

Some students incorrectly used the term 'co-evolution' and a number of students used the term 'parallel evolution'.

Question 7c.

Marks	0	1	2	Average
%	12	19	70	1.6

Method	Evidence
<ul style="list-style-type: none"> • killed and ate fresh meat • hunted 	<ul style="list-style-type: none"> • killing teeth • slicing teeth • no grinding teeth for crunching old bones
Ambush rather than pursuit	Short strong limbs – suited for grappling, not running fast or climbing
Grappled and killed prey	<ul style="list-style-type: none"> • opposable thumbs for holding • claws for killing or climbing
Killed by biting (jugular, spine of prey)	<ul style="list-style-type: none"> • long front teeth • powerful jaws

This part was very well answered and students could easily identify the method of feeding and relate it to the evidence given.

2007 – Question 9

Question 9

Question 9a.

Marks	0	1	2	Average
%	55	23	22	0.7

Students needed to make both of the following points:

- DNA hybridisation involves the dissociation of different samples of DNA and their reassociation, providing a measure of similarity
- the greater the similarity of the DNA (determined by melting temperature), the more closely related the two organisms are from which the samples were taken.

Many students demonstrated a sound understanding of the process of DNA hybridisation, which was pleasing. The inference of close relationship due to the degree of hybridisation was not clearly made by many.

Question 9b.

Marks	0	1	Average
%	67	33	0.4

Any one of:

- artefacts associated with the production of clothing, such as bone needles
- fossilised remains of clothing
- cave paintings showing humans wearing clothes.

Common incorrect answers involved the presence of fossilised lice or of preserved humans showing less hair.

Question 9c.

Marks	0	1	Average
%	37	63	0.7

Living in clothing provided the lice with:

- a warm environment
- close contact to the whole body
- more places to hide
- an easier way to transfer between hosts.

A common error was that many students stated that the lice ate the clothes, whereas the stem stated 'the lice live in the clothing but feed on the body'.

2005 – Question 7**Question 7a.**

Marks	0	1	Average
%	36	64	0.7

Population X has selection against the homozygous recessive phenotype, as the frequency of the b allele is decreasing over time.

Question 7b.

Marks	0	1	Average
%	44	56	0.6

Any of:

- the allele b has become fixed
- the frequency of allele b = 1
- only one allele in population Y.

Some students misread the graphs for parts a. and b. Students should be encouraged to take greater care when reading the axes and applying this knowledge to the question asked.

Question 7c.

Marks	0	1	Average
%	75	25	0.3

In population X there is selection against bb, but there are b alleles still present in the heterozygotes that survive and will pass on these alleles to the next generation.

This question was not well done. Many students did not realise that the b allele would be present in heterozygotes and would therefore persist in the population.