



# **BIOLOGY 2017**

## **Unit 4**

### **Key Topic Test 2 – Changes in biodiversity over time**

Recommended writing time\*: 45 minutes

Total number of marks available: 45 marks

## **SOLUTIONS**

**SECTION A: Multiple-choice questions (1 mark each)**

**Question 1**

*Answer: A*

*Explanation:*

Bacteria lack hard components, such as bone and therefore decompose readily. Although it may be assumed that they are too small to fossilise, this is not the case as microscopic organisms may fossilise under appropriate conditions.

**Question 2**

*Answer: A*

*Explanation:*

The information provided states that feathers and scales are homologous features. Homology is derived from common ancestry.

**Question 3**

*Answer: B*

*Explanation:*

The presence and position of gill slits are one of the factors that are compared when studying embryos from different species. Generally, organisms that are more closely related have a greater similarity in the number and position of gill slits in their embryos. Similarity tends to decrease as the embryo matures.

**Question 4**

*Answer: A*

*Explanation:*

Biogeography is defined as the distribution of plants and animals. This may be in the present, but is often considered in the past as well. The location and distribution of fossils may enable the presence and range of a former species to be determined.

**Question 5**

*Answer: C*

*Explanation:*

A geological time scale is a means of establishing a relationship between major events that occurred in the Earth's history and our conventional way of recording time.

**Question 6**

*Answer: B*

*Explanation:*

The presence of horns in both species is an example of analogous features developing due to convergent evolution. Organisms exposed to similar environments tend to evolve similar adaptations to those environments. In this example, the production of horns is a means of defence from large predators.

**Question 7**

*Answer: C*

*Explanation:*

Body fossils show evidence of the structure and anatomy of an organism. Trace fossils show evidence of an organism's activity or behaviour. Footprints and coprolite (fossilised faecal material) are examples of trace fossils.

**Question 8**

*Answer: D*

*Explanation:*

This is an example of a transitional fossil as it has features in common with ancestral and descendant species. Indicator and index fossils are the same thing and are used in relative dating. There is no such thing as a temporary fossil.

**Question 9**

*Answer: A*

*Explanation:*

The term morphology refers to shape, so structural morphology involves comparing structures in different species. These are then referred to as being homologous or analogous.

**Question 10**

*Answer: C*

*Explanation:*

The key term in this question is "developmental". The only developmental technique referred to is comparing embryos.

**SECTION B - Short-answer questions**

**Question 1 (8 marks)**

- a. Absolute dating. 1 mark
- b. Approximately 6800 years (accept 6500 to 7000). 1 mark
- c. It would be impossible to use radio carbon dating to establish the age of a fossil if it were approximately 4.5 million years old.

AND

The half-life of carbon in this graph is shown as 5700 years and the majority of the carbon-14 has decayed by 28,500 years. There would be insufficient carbon-14 remaining in the fossil to provide a reliable means of dating it.

1 mark

- d. Section H.

1 mark

AND

The lowest areas were deposited first and should contain the oldest fossils. Section H is the lowest portion (it extends through section I which is more recent).

1 mark

- e. This opinion is accurate. There would not have been any organisms living in the lava and if any had fallen into it the temperature would have been so high that anything organic would have been completely incinerated.

1 mark

- f. Sedimentary rocks commonly contain fossils because the conditions under which they were formed provide appropriate conditions for fossilization to occur. These include:

Rapid coverage of an organism.

Prevention of bacterial action.

Lack of interference by weather conditions

Any two correct responses to a maximum of 2 marks

Total 8 marks

**Question 2 (8 marks)**

- a. The development of the first multicellular organisms lead to the evolution of more complex multicellular organisms.

1 mark

- b. Prior to the presence of the photosynthetic bacteria the atmosphere contained little if any oxygen. The photosynthetic bacteria produced the oxygen which facilitated the evolution of organisms that require oxygen in order to carry out aerobic cellular respiration.

1 mark

- c. Endosymbiosis is a type of symbiosis where one organism lives inside another. In this context, it refers to the belief that mitochondria and chloroplasts were once separate entities that subsequently became incorporated into eukaryotic cells.

1 mark

AND

This is a major advent in evolution as the presence of the mitochondria enabled eukaryotic cells to carry out aerobic respiration, increasing the amount of energy that they could generate. The presence of the chloroplasts enabled plants to carry out photosynthesis. The ability to carry out these processes lead to the evolution of more highly developed plants and animals.

1 mark

- d. This term refers to the rapid increase in the number of species present over a relatively short time period.

1 mark

- e. Diversification means that a large number of species evolved from a limited number of ancestral species during a relatively short time period.

1 mark

- f. The term “age of” refers to a time period when a specific organism or type of organism are considered to be dominant.

1 mark

AND

The Devonian period is considered to be the age of fishes.

1 mark

Total 8 marks

**Question 3 (7 marks)**

- a. The number of genera present has rapidly decreased at these points.

1 mark

AND

Mass extinctions.

1 mark

- b. This would have to be a worldwide catastrophic event, such as an ice age.

1 mark

- c. The number of marine species would decrease. OR The populations of marine species would decrease.

1 mark

AND

Marine species still depend on oxygen in order to carry out aerobic respiration to produce the ATP energy required to carry out their life processes. Anoxic oceans have a lower concentration of oxygen and therefore cannot support as many organisms as would be possible if the dissolved oxygen concentration were higher.

1 mark

- d. This would have had a greater impact on marine species than on terrestrial organisms.

1 mark

AND

If a significant amount of water was locked up in ice then the levels of the seas and oceans would have dropped dramatically leaving less habitat and resources for the marine organisms.

1 mark

Total 7 marks

**Question 4 (4 marks)**

- a. The hand and the two flippers are very similar in structure with all three having carpals and metacarpals. 1 mark
- b. Homologous features. 1 mark
- c. Humans, seals and whales all share a recent common ancestor. 1 mark

AND

The presence of similar features in different species may occur due to having a similar genetic ancestry.

1 mark

Total 4 marks

**Question 5 (8 marks)**

- a. These organisms are closely related. 1 mark

AND

All of these organisms have a similar appearance which may indicate that they are all closely related to each other.

1 mark

- b. Analogous features. 1 mark

- c. These organisms all live or lived in a similar environment. As a result, they developed similar features due to similar selection pressures.

1 mark

- d. Convergent evolution. 1 mark

AND

Two or more non-related species that experience the same or similar selection pressures develop similar features in order to survive.

1 mark

- e. Information might come from:  
Analysing fossils.  
Observing closely related modern species.  
Any other relevant answer.

1 mark for each correct response to a maximum of 2 marks

Total 8 marks