
BIOLOGY VCE UNITS 3&4 DIAGNOSTIC TOPIC TESTS 2017

TEST 8: DETERMINING RELATEDNESS BETWEEN SPECIES AND HUMAN CHANGE OVER TIME

SUGGESTED SOLUTIONS AND MARKING SCHEME

SECTION A – MULTIPLE-CHOICE QUESTIONS

Question 1 **C**

Fossils do not only include bones and not all are found within rock. Fossils are the preserved remains or traces of animals, plants and other organisms.

Question 2 **B**

A transitional fossil is any fossil which provides us with information about a transition from one species to another. Transitional fossils exhibit traits that are common to both an ancestral group and its descendant group.

Question 3 **D**

Trace fossils are any fossil that provides evidence of past life that is not the remains of the organism itself.

Question 4 **D**

Hard parts of organisms are more likely to be fossilised than soft parts.

Question 5 **A**

Conditions for fossilisation include rapid burial, lack of oxygen, lack of scavengers and detritivores.

Question 6 **C**

Fossils thought to be less than 50 000 years old can be dated using radioisotope carbon-14 which breaks down to nitrogen. The other radioisotopes have much longer half-lives and so are used to date much older fossils.

Question 7 **C**

Hominoids includes all apes, humans, and their close ancestors. Hominins includes humans and their close ancestors.

Question 8 A

Vestigial structures are structures that have changed over time (evolution) so that most or all their original function is lost.

Question 9 D

These skulls all show marked differences in the size of brow ridges; size of cranium and size of lower jaw. Only the size and number of teeth has remained constant.

Question 10 B

Only the egg/ova contain mitochondria that are passed to all offspring. Sperm contain mitochondria in their tails. The tail section does not enter the egg/ova.

SECTION B – SHORT-ANSWER QUESTIONS

Question 1 (6 marks)

- a. T A G C T A G C C T A G 1 mark
- b. The DNA for two humans may not match exactly as they may have different alleles at that position. 1 mark
- c. Dolphin and dog as they are both mammals thus closer together on the evolutionary tree than bats (mammals) and birds (aves). 1 mark
- d. These structures carry out a similar function – flight – but they are not derived the same way from a common ancestor so they are analogous. 1 mark
- e. Homologous structures show common underlying anatomy due to being derived from a common ancestor even if they carry out a different function. Analogous structures show common function but no common underlying anatomy as they have no evolutionary link; they have evolved independently. 1 mark
- f. DNA degrades over time, therefore extracting enough DNA from the fossils to be able to carry out DNA hybridisation would be very difficult. 1 mark

Question 2 (3 marks)

- a. they must have shared a common ancestor in the evolutionary past. 1 mark
- b. True, 1 mark
 humans have evolved from an organism that once lived in the water and had gills. 1 mark

Question 3 (7 mark)

- a. the rate of mutation 1 mark
- b. Comparing the DNA of two species, the number of differences (mutations) can be added up. DNA mutates at a known rate, 1 mark
 thus the number of mutations can determine the amount of time. 1 mark
- c. Mitochondrial DNA mutates at a faster rate than nuclear DNA 1 mark
 and it does not recombine during cell division. 1 mark

- d. *Any one of:*
- nucleotide sequences in DNA can be compared
 - amino acid sequences for proteins can be compared
- 1 mark
- e. Epidemiologists compare the mutations within a pathogen or pathogenic agent to work out when mutations have occurred and what strains of the disease have occurred in different locations and times.
- 1 mark

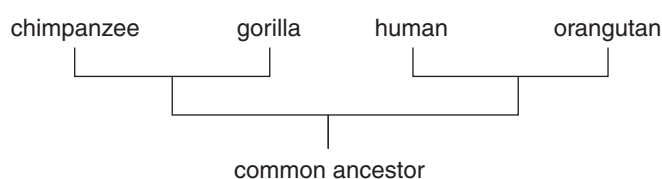
Question 4 (5 marks)

- a. A single gene whose expression is required to initiate activation of many other genes which together lead to development of a specific tissue, organ or structure.
- 1 mark
- b. BMP4 is acting as a master gene.
- 1 mark
- The expression of BMP4 regulates the expression of different genes in the different species.
- 1 mark
- This leads to different proteins being produced and different end products in terms of structural morphology.
- 1 mark
- c. *Any one of:*
- abnormal bone development
 - abnormal skull shape
 - abnormal vertebral column
 - orofacial cleft (cleft lips or cleft palate)
 - microphthalmia
- 1 mark

Question 5 (6 marks)

- a. Hominidae have arms shorter than legs, whereas Pongidae have longer arms than legs.
- 1 mark
- Hominidae have a rounded pelvis whereas Pongidae have an elongated pelvis.
- 1 mark
- Note: Students must include both for full marks.*
- b. *Any one of:*
- enamel on molar teeth
 - sinuses in bones of forehead
 - brow ridges
- 1 mark

- c. *For example (brow ridges):*



- d. chimpanzee
- 1 mark

- e. Phenotypic characteristics may be similar due to similar selective pressures in the environment, and thus may not be the result of common ancestry. Alternatively, while DNA is subject to mutation, it is still reliable in showing evolutionary relationships. 1 mark

Question 6 (3 marks)

- a. The 'new' fossil of modern man found in the Middle East pre-date those of modern man found in Europe. 1 mark
- b. The information suggests that Neanderthals migrated from Europe to the Middle East. 1 mark
- c. no
Modern human fossil remains have been found that are older than the oldest Neanderthal remains and Neanderthals appear to have evolved in Europe unlike modern man. 1 mark