



BIOLOGY 2016

Unit 4

Key Topic Test 6 – Evolution and the Evidence for evolution

Recommended writing time*: 45 minutes

Total number of marks available: 45 marks

SOLUTIONS

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

Question 1

Answer: B

Explanation:

It is known that different types of DNA exists within the cell. Ribosomal DNA evolves at a slower rate than mitochondrial DNA. The chloroplast has less than 200 genes that are utilised in photosynthesis.

Question 2

Answer: A

Explanation:

A is the only response that correctly identifies The Darwin and Wallace theory of natural selection in regards to evolution. Organisms are only able to make evolutionary changes through survival of the fittest in regards to producing offspring with the favoured traits.

Question 3

Answer: A

Explanation:

Examination of stratification cannot determine absolute age and therefore only the relative age would be suggested.

Question 4

Answer: C

Explanation:

The layering of the rock occurs with the oldest rocks at the bottom and the youngest at the top. Unless movement occurs, this is the correct understanding of the principal of superposition.

Question 5

Answer: B

Explanation:

Hard exoskeletons are able to withstand greater pressure from the environment and thus would be more likely to allow greater imprint in the shale.

Question 6

Answer: D

Explanation:

The other dating techniques listed would not be suitable for the determination of the age and thus electron spin resonance would be need to be implemented. It is useful for carbon based fossils from 50,000 to 500,000 years ago.

Question 7

Answer: A

Explanation:

Trace fossils are indicators of life being present, however, are not the actual fossil of the organism directly.

Question 8

Answer: D

Explanation:

Mammals 4 and 1 share the most similarities in proteins present

Question 9

Answer: A

Explanation:

Comparative genomics and DNA hybridisation are both examples of tests used in molecular homology and neither of them analyse the proteins directly.

SECTION B – Short-answer solutions

Question 1

- a. Genetic changes that occur within a species that allows it to survive in its environment. 1 mark
- b. Divergent evolution 1 mark
- c. Biogeography 1 mark
- d. The meiotic production of gametes and the fusion of gametes in sexual reproduction increases the variation within the gene pool. 1 mark

AND

This would reduce the chance of reduced gene pool occurring and possible selection against the current traits.

1 mark

Total 5 marks

Question 2

- a.
 - i. An absolute dating technique for this sample is not currently possible. 1 mark
 - ii. Carbon 14 dating 1 mark
- b. Pollen
Or
Imprints in rock sediment 1 mark
- c. Fossils best form in moist conditions and do not readily form in extensively dry environments. 1 mark
- d. Thicker vascular tissue breaks down at a slower rate and preserves longer during the fossilization process. 1 mark
- e. Relative dating is a comparative technique that uses indicator fossils and known information to determine the age of a fossil. 1 mark

AND

Absolute dating is a direct scientific chemical analysis of the specimen that is used to determine the exact age of the sample.

1 mark

- f. There is a greater chance of reaching another plant for fertilization and increasing the variation within the gene pool

1 mark

Total 8 marks

Question 3

- a.** Individuals with favoured traits within a population are more likely to survive and reproduce.

1 mark

AND

Their offspring will also have these traits and become less like the generations before.

1 mark

- b.** Phylogenic tree

1 mark

- c.** The phylogenic tree demonstrates, which organisms evolved first.

1 mark

AND

And which organisms are more closely related over a period of time.

1 mark

- d.** A, C and B

1 mark

- e.** Both had shared the same common ancestor and evolved at approximately the same time.

1 mark

- f.** Convergent evolution

1 mark

AND

Despite having a common ancestor, the two species actually diverged with different traits earlier on. They then convergently evolved to produce similar traits again due to external pressures.

1 mark

- g.** B

1 mark

- h.**

- i.** DNA hybridisation is used to determine the degree at which hybrid DNA takes to separate. The closer the species is related, the greater the temperature required for denaturation to occur.

1 mark

- ii.** Amino acid sequencing

1 mark

AND

Determining the sequence of amino acids from two species to find similarities or differences would be used to determine which cave fish are most closely or distantly related.

1 mark

- iii.** There may have been a small sample sized used to find the differences that were made apparent and the variation found may have been naturally occurring and not indicative of a new species.

1 mark

- i. Within the species B population variation existed, this may have been due to a mutation that gave rise to the absence of the eye.

1 mark

AND

The absence of the eye gave a selective advantage to the affected species B individuals living in the cave environment.

1 mark

AND

Individuals with this mutation were more likely to survive and reproduce in their environment, over time they became a separate species to the B population.

1 mark

Total 17 marks

Question 4

- a. Homologous structure

1 mark

- b. Divergent evolution

1 mark

- c. A common ancestor diverges into two separate species that can no longer interbreed to produce viable offspring.

1 mark

- d. Analogous structures

1 mark

- e. Convergent evolution

1 mark

Total 5 marks