

**YEAR 12 UNIT 4 HUMAN BIOLOGY**

**TEST 3 Evidence for Evolution**

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| **Name:** | **Teacher:**  Ms Langford-Davis | **Mark:** |

**Assessment Type:** Test

**Conditions:**

Time for the task: 55 minutes

**Task Weighting: 5%**

|  |  |  |
| --- | --- | --- |
| **Sections** | **Marks Allocation** | **Your Total** |
| **1 - Multiple Choice** | 8 |  |
| **2 – Short Answer** | 33 |  |
| **3 – Extended Response** | 14 |  |
| **TOTAL** | 55 |  |

**Section One: Multiple-choice (8 marks)**

Suggested working time: 10 minutes

1. Scientists use comparative studies to provide evolutionary evidence that organisms could share a common ancestor. Which of the following comparative study methods would provide the most precise genetic evidence of a common ancestor?
2. Embryology
3. Vestigial organs
4. Non-functional DNA
5. Homologous structures
6. Homologous structures are used as evidence for evolution because:
7. their similar functions suggest a common ancestor.
8. their lack of similarities suggests that natural selection has occurred.
9. it shows their common ancestor was able to survive in many different environments.
10. their similar design suggests divergence from a common ancestor, with modifications to suit different environments.
11. Index fossils are useful in comparing the ages of different fossil sites because they:
12. were easily fossilised under many different conditions and in many areas.
13. are easily recognised and don’t vary much over time and places.
14. existed over a relatively short geological time and were widespread across many regions.
15. are not destroyed by exposure to air or by earth movements such as earthquakes.
16. Which of the following represent ideal conditions for the formation of fossils?
17. Rapid burial, soil at a low pH and high oxygen levels.
18. Low oxygen levels, alkaline soil and rapid burial.
19. Warm, moist soil accompanied by slow burial.
20. Moist soil at cold temperatures with rapid burial.
21. The list which contains only fossils is:
22. petrified wood, stone tool, sandstone, footprint.
23. petrified faeces, a sea shell embedded in limestone, impression of a leaf in mudstone.
24. the shape of a sea shell left in limestone, centipede track on mudstone, glacial scratch marks on a rock face.
25. rock painting, kitchen mitten, cooking hearth, limestone cave.
26. Cytochrome-c is a protein found in most organisms. The amino acid sequence of this protein varies between species. The numbers of differences in the amino acid sequences in the protein of cytochrome-c between three species of vertebrate A, B and C are shown in the table below.

Table

Description automatically generated

Based on this evidence, the phylogenetic tree that best represents the possible evolutionary relationships between the three species is?

Diagram

Description automatically generated

1. A commentator on the radio was overheard saying that the samples of stone tools found at a site in East Africa associated with the earliest Hominin fossils, had been sent for radiocarbon testing. What is wrong with the commentator's statement?
2. Radiocarbon dating can only be carried out on organic materials not stone tools.
3. The fossils in East Africa are in deposits containing high levels of radioactive materials so this dating technique does not work.
4. The amount of carbon breakdown is not enough to be detected by even the most sensitive instruments.
5. Radiocarbon dating is only useful on materials that are older than the fossils found at this site.
6. Bodies are sometimes found preserved in acidic peat bogs. In relation to these finds, which of the following is correct?

|  |  |  |
| --- | --- | --- |
|  | **Preservation of Soft tissues** | **Preservation of bone** |
| a) | Well preserved | Soft and demineralised |
| b) | Poorly preserved | Demineralised and poorly preserved |
| c) | Little alteration | Little alteration |
| d) | Total decomposition | Mineralised and well preserved |

**Section Two: Short Answer (33 marks)**

Write your answers in the spaces provided

1. Complete the table below providing an outline and example of the different lines of evidence that support the theory of evolution.

|  |  |  |
| --- | --- | --- |
| **Evidence** | **Support for Evolution** | **Example** |
| Protein Sequence Analysis |  |  |
|  |  | Nictitating membrane |
|  | The presence of similarities and specific features during early stages of development that are not present in later development suggest a common ancestor. |  |

(6 marks)

1. The fossil record can provide evidence for the process of evolution. A complete fossil record exists for some species but not others.
2. What is a fossil?

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(1 mark)

1. Suggest 3 reasons why the fossil record is incomplete for some species.

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1. marks)

One method of relative dating scientists use to date fossils is comparative stratigraphy. The diagram below shows the various layers of three core samples taken from different locations.

Diagram, engineering drawing

Description automatically generated

The samples were brought back to the laboratory for analysis.

1. Name three strata that were laid down at the same time.

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(1 mark)

1. Which site contains the oldest fossils?

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(1 mark)

1. Describe the 2 principles that suggest this layer is the oldest?

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(2 mark)

1. Describe the way in which specimens, such as those shown in the diagram above, might have become fossilised.

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(4 marks)

1. A palaeontologist who is completing excavations at an East African dig site unearths a fossil and believes he has discovered a lost primate. To determine where this fossil sits on the evolutionary line, they decide to complete a comparative study of DNA.
2. Due to the severe degradation of the fossil’s genetic material the laboratory needs to create more DNA.

Explain the 3 key stages of the PCR process used to create more DNA.

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(6 marks)

1. Describe the process used to determine the DNA sequence after having produced the master mix(s) of DNA of varying lengths.

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(6 marks)

1. Explain how this shows evolutionary relationships between primates and therefore how he can determine where the fossil sits on the evolutionary line.

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(2 marks)

1. Mitochondrial DNA can also be used as evidence for evolution. Explain why this data can only be used to show evolutionary relationships of maternal ancestry.

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(1 mark)

**Section Three: Extended answer (14 Marks)**

1. Bone tools have been discovered very recently in South America and are believed to be 53,000 years old. Identify and explain the type of dating technique used to determine the age of these tools and describe two of its limitations.

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(10 marks)

1. Potassium-40 (K40) is another radio-isotope used in dating objects. Given that the half-life of K40 is approximately 1.3 billion years and what you know about this dating method, explain the circumstances under which you would use K40 to estimate the age of fossils and artefacts.

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(4 marks)