

**Year 12 Human Biology**

**Extended Response: Evidence for Evolution**

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| Name: |
| Teacher: |

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| --- | --- | --- | --- |
|  | Marks Received | Marks Available | Percentage |
| Total |  | 25 |  |

Assessment Time: 55 minutes

Weighting: 5%

You must **answer all questions** on the lined paper provided. Please clearly number questions and use the paper at the back of the booklet if you wish to plan your answer. Clearly label your plan.

Human Biological Sciences Unit 4

Extended Response

1. Radiocarbon dating and potassium-argon dating are two methods scientists use to determine the age of fossils. Compare and contrast these two techniques.

(9 marks)

*Similarities:*

|  |  |
| --- | --- |
| *They are both absolute dating methods* | *3* |
| *They both use the decay of radioisotopes* |
| *Based on the half life of the isotope.* |
| *Ratio of isotopes before and after decay.* |

*Differences:*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | *Radiocarbon dating* | | *Potassium-argon dating* | |
| *Isotopes* | *Carbon 14 to Nitrogen* | *1 mark* | *Potassium to Argon* | *1 mark* |
| *Material used* | *Living things which contain carbon* | *1mark* | *Rock samples* | *1mark* |
| *Time frame* | *0 to 50,000 years* | *1mark* | *Must be older than 100,000 to 200,000 years* | *1mark* |

1. Examining fossils and their surroundings is one method by which evolution can be shown to have occurred. However there are also many types of comparative studies that can be used to support the theory of evolution. Two of these involve studies in biochemistry, namely protein sequences and DNA.

a) Describe the two comparative studies of protein sequences and DNA, and explain how they can be used to provide evidence for evolution. (11 marks)

*DNA*

|  |  |
| --- | --- |
| *Determine the sequence of bases in genome* | *Any 5 points for 5 marks* |
| *Compare genomes of different species* |
| *Form hybrid DNA from different species* |
| *Compare non-coding sequences* |
| *Compare endogenous retroviruses* |
| *Compare mitochondrial DNA* |
| *The more similar the DNA, the more closely related the species* | *Must allow 1 mark for this* |
| *The more different the DNA, the more time has passed since common ancestry.* |

*Protein Sequences*

|  |  |
| --- | --- |
| *Proteins are made of long chains of amino acids* | *4 points for 4 marks* |
| *Determine type and sequence of amino acids* |
| *Compare similar / ubiquitous proteins* |
| *Compare sequences in different species* |
| *Species that are more distantly related have more differences in their amino acid sequence / closely related species have more similar amino acid sequences* | *Must allow 1 mark for this* |

b) The table below shows differences in the amino acid sequence of haemoglobin between humans and other species. Use this to construct a phylogenetic tree of these organisms on the graph paper provided.

(5 marks)

|  |  |
| --- | --- |
| **Species compared with humans** | **Number of differences from human beta haemoglobin** |
| Chimpanzee | 0 |
| Gorilla | 1 |
| Rhesus monkey | 8 |
| Squirrel Monkey | 9 |
| Dog | 15 |
| Horse | 25 |
| Mouse | 27 |
| Grey Kangaroo | 38 |
| Chicken | 45 |
| Frog | 67 |

Subtract 1 mark for any of the following missing.

*Axes correct way around*

*Species have correct location on phylogenetic tree*

*All species present*

*Scale on vertical axis*

*Title and labelled axes.*

*Species lines must reach to the top of the graph.*

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