A fossil specimen of a young woman was found in a cave in China that showed characteristics of both Neanderthals and Denisovans (another fossil group). A small amount of DNA was retrieved from her bones and analysed using DNA electrophoresis.

These three specimens as well as *Homo sapiens* were studied in order to determine the evolutionary

relationships between the specimens. The table below shows a portion of the amino acid sequence for the

same gene from each specimen.

Table 1: Amino acid sequence for one gene

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Amino acid sequence in one gene** | | | |
| Young woman | ile | trp | cys | his |
| Neanderthal | glu | val | iso | ser |
| Denisovan | ile | asn | ala | his |
| *Homo sapiens* | ile | trp | cys | phe |

(i) Name one gene on which this comparison could have been made. (1 mark)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Cytochrome C | 1 |
| Haemoglobin |
| **Total** | **1** |

(ii) According to the table of amino acid sequence data above, who is most closely related to the young woman? (1 mark)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| *Homo sapiens* | 1 |
| **Total** | **1** |

(iii) The scientists also studied the DNA of this amino acid sequence. Would comparative DNA or comparative proteins provide more accurate data about their relationship? Justify your answer. (2 marks)

|  |  |
| --- | --- |
| **Description** | **Marks** |
| Comparative DNA | 1 |
| Comparative proteins may not show null mutations in nitrogen base sequence which do not affect the amino acid produced | 1 |
| Comparative DNA will show mutations in nitrogen base sequence that do not affect the amino acid determined by that codon |
| **Total** | **2** |

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| Haemoglobin |
| **Total** | **1** |

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|  |  |
| --- | --- |
| **Description** | **Marks** |
| *Homo sapiens* | 1 |
| **Total** | **1** |

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