

**Questions**

Q1.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ~~☒~~ and then mark your new answer with a cross ☒.

(i) What is the correct definition of a genome?

(1)

- A all the cells of an organism
- B all the enzymes of an organism
- C all the genetic material of an organism
- D all the cytoplasm of an organism

(ii) A new project called the Earth BioGenome Project aims to discover the sequence of bases in the DNA for all plants and animals.

State **two** benefits of discovering the sequence of bases for all plants and animals.

(2)

1 .....

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2 .....

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**(Total for question = 3 marks)**



Q3.

Figure 2 shows part of a DNA molecule.

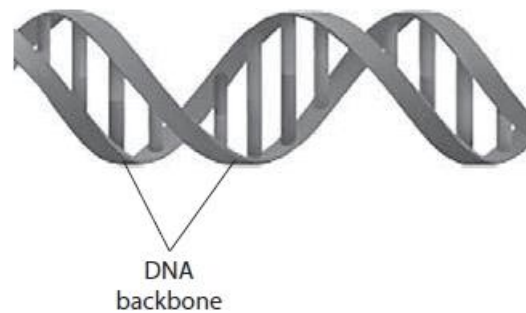


Figure 2

In 2003, scientists finished sequencing the 3 billion base pairs in the human genome.

State **two** benefits that the Human Genome Project could have for medicine.

(2)

- 1 .....
- .....
- 2 .....
- .....

**(Total for question = 2 marks)**

**Q4.**

One cause of colour blindness is a change in the DNA sequence of a gene.

This results in the production of a different protein in cone cells in the retina of the eye.

Explain how a change in the DNA sequence of a gene can result in the production of a different protein.

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**(Total for question = 4 marks)**

**Mark Scheme**

Q1.

Question number	Answer	Mark
(i)	<p>C all the genetic material of an organism</p> <p><b>The only correct answer is C</b></p> <p><i>A is not correct because a genome is not all the cells of an organism</i></p> <p><i>B is not correct because a genome is not all the enzymes of an organism</i></p> <p><i>D is not correct because a genome is not all the cytoplasm of an organism</i></p>	<p><b>(1)</b></p> <p>AO1 1</p>
Question number	Answer	Mark
(ii)	<p>Any two from:</p> <ul style="list-style-type: none"> <li>• identify useful genes (1)</li> <li>• track evolution/ identify new species to show which species are more closely related (1)</li> <li>• understand diseases (of crop plants and animals) (1)</li> <li>• discover new medicines / find a cure for diseases (1)</li> <li>• identify the sequences that allow some plants and animals to cope with environmental change (1)</li> </ul>	<p><b>(2)</b></p> <p>AO2 1</p>

Q2.

Question Number	Answer	Mark
(i)	<p>C sugar</p> <p><b>1. The only correct answer is C</b></p> <p><i>A is not correct because the base is the rectangle</i></p> <p><i>B is not correct because the phosphate is the circle</i></p> <p><i>D is not correct because a polymer is composed of repeated subunits</i></p>	<p><b>(1)</b></p> <p>AO 1 1</p>

Question Number	Indicative content	Mark
* (ii)	<p>Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>The indicative content below is not prescriptive and candidates are therefore not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <p><b>DNA sequences</b></p> <ul style="list-style-type: none"> <li>• DNA has 4 different bases</li> <li>• changes in the DNA are mutations</li> <li>• results in different alleles for these genes</li> <li>• affects the phenotype / produces variation</li> </ul> <p><b>Outcome of DNA sequencing for the individual</b></p> <ul style="list-style-type: none"> <li>• identify genetic diseases</li> <li>• identify the risk of developing diseases</li> <li>• impact of knowing that a disease could develop</li> <li>• allow the individual to modify their lifestyle to reduce risk</li> </ul> <p><b>Impact on medical treatment</b></p> <ul style="list-style-type: none"> <li>• HGP has determined the location of genes/determined the function of proteins</li> <li>• we have a better understanding of some diseases</li> <li>• take preventative medicine</li> <li>• provide tailor-made medical treatments/personalised medicines</li> </ul>	(6) AO 1 1

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-2	<ul style="list-style-type: none"> <li>• Demonstrates elements of biological understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1)</li> <li>• Presents an explanation with some structure and coherence. (AO1)</li> </ul>
Level 2	3-4	<ul style="list-style-type: none"> <li>• Demonstrates elements of biological understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1)</li> <li>• Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)</li> </ul>
Level 3	5-6	<ul style="list-style-type: none"> <li>• Demonstrates accurate and relevant biological understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1)</li> <li>• Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)</li> </ul>

Q3.

Question Number	Answer	Additional guidance	Mark
	Any two from: <ul style="list-style-type: none"> <li>• locate genes associated with diseases (1)</li> <li>• treat (genetic) disorders (1)</li> <li>• personalised medicine (1)</li> </ul>	accept genetic screening(1)  accept genetic counselling/named disorders(1) accept develop new treatment/medicine (1)	<b>(2)</b> AO 1 1

Q4.

Question number	Answer	Additional guidance	Mark
	An explanation linking four of the following: <ul style="list-style-type: none"> <li>• changes the sequence of the mRNA (1)</li> <li>• produced in transcription (1)</li> <li>• leads to a different amino acid (in the polypeptide sequence) (1)</li> <li>• which is added {by tRNA/during translation/at the ribosome} (1)</li> <li>• changes the <b>shape/function</b> of the protein / a cone cell does not detect the coloured light correctly (1)</li> </ul>	accept mRNA produced from the DNA sequence  accept the (mRNA) determines the amino acid sequence  ignore a different protein is produced	<b>(4)</b> AO2 1