

Chromosomes, genes and proteins: practice questions

7 questions • 21 marks • mark scheme at the back

For Cambridge IGCSE Biology 0610 (and 0970, which has the same content). **Supplement** is Extended content, only examined on Papers 2 and 4.

Name

Total / 21

- 1** Which combination of gametes can produce a male baby? [1 mark]
- A. ☐ egg with X and sperm with X
- B. ☐ egg with X and sperm with Y
- C. ☐ egg with Y and sperm with X
- D. ☐ egg with Y and sperm with Y
- 2** (a) State what chromosomes are made of. [1] (b) Define the term allele. [1] (c) A gene codes for a protein. State what is meant by the term gene. [1] [3 marks]
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- 3** Describe how the sex of a human baby is inherited. Use the terms X chromosome and Y chromosome in your answer. [4 marks]
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- 4** **Supplement** [1 mark]
- What determines the shape of a protein molecule?
- A. ☐ the sequence of amino acids
- B. ☐ the number of ribosomes in the cell
- C. ☐ the number of chromosomes in the nucleus
- D. ☐ the sequence of bases in a different gene

5

Supplement

[5 marks]

Explain how a protein is made in a cell. Your answer should refer to the nucleus, mRNA and ribosomes.

6

Supplement

[4 marks]

A skin cell and a cell in the pancreas contain the same genes. The pancreas cell makes insulin but the skin cell does not. (a) Explain why the skin cell does not make insulin. [2] (b) State what determines the order of amino acids in a protein such as insulin. [1] (c) Suggest what could happen to a protein if one amino acid in its sequence is changed. [1]

7

Supplement

[3 marks]

(a) Describe what is meant by a diploid nucleus. [1] (b) State the number of pairs of chromosomes in a human diploid cell. [1] (c) A human sperm cell has a haploid nucleus. State the number of chromosomes in this nucleus. [1]

Mark scheme

One mark for each point unless a maximum is given. Words in brackets are not needed for the mark.

1. [1]

B B (1)

2. [3]

- (a) DNA (1)
- (b) an alternative form of a gene (1)
- (c) a length of DNA that codes for a protein (1)

3. [4]

- females have two X chromosomes / are XX and males have X and Y chromosomes / are XY (1)
- all eggs carry an X chromosome (1)
- half of the sperm carry X and half carry Y (1)
- the sex depends on which sperm fertilises the egg / sperm with X gives a girl and sperm with Y gives a boy (1)
- allow marks for a correct genetic diagram or Punnett square showing parents XX and XY, gametes X, X and X, Y, and offspring XX : XY in a 1 : 1 ratio

4. [1] **Supplement**

A A (1)

5. [5] **Supplement**

- the gene (for the protein) stays in the nucleus (1)
- mRNA is a copy of the gene / mRNA is made in the nucleus (1)
- mRNA moves to the cytoplasm (1)
- mRNA passes through a ribosome (1)
- the ribosome assembles amino acids into a protein (1)
- the sequence of amino acids is determined by the sequence of bases in the mRNA (1)
- Max 5

6. [4] **Supplement**

- (a) the gene for insulin is not expressed in the skin cell (1)
- the cell only makes the proteins it needs (1)
- (b) the sequence of bases in the gene (1) allow in the mRNA
- (c) the shape of the protein changes / the protein may not work (1)

7. [3] **Supplement**

- (a) a nucleus containing two sets of chromosomes (1)
- (b) 23 (pairs) (1)
- (c) 23 (1)