

Exercise walk-through

Chromosomes, genes and proteins ■ 17.1

eXercise

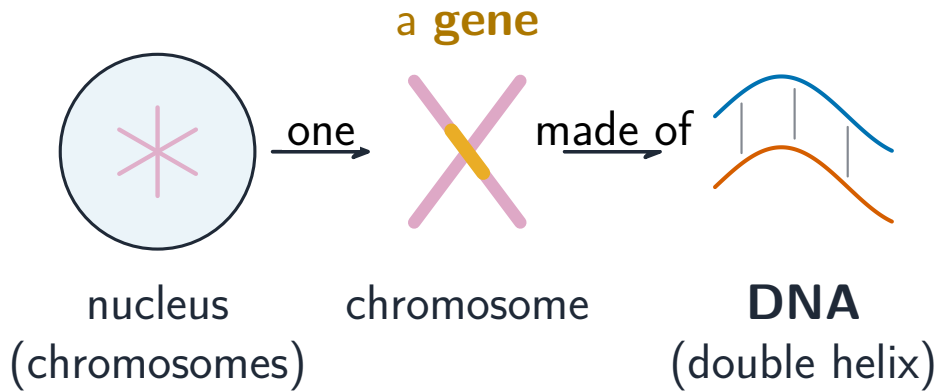
You must be able to

- define chromosome, gene and allele
- explain sex determination (XX/XY)
- describe how a gene's base sequence codes for a protein

Method — Genes and protein synthesis

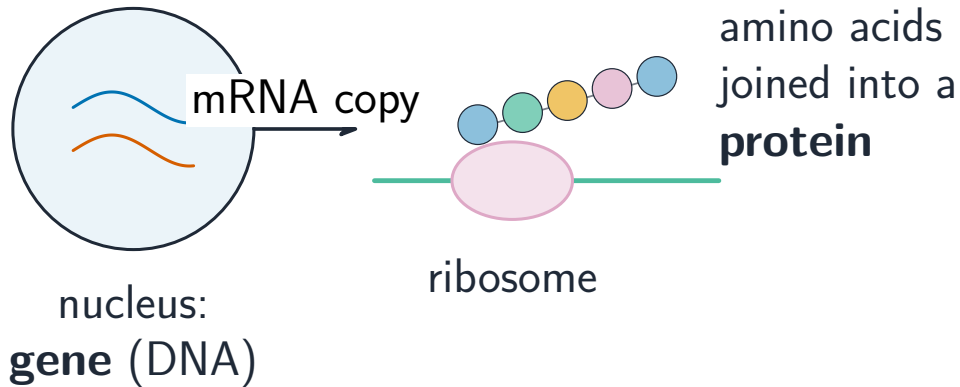
- **sex:** XX female, XY male; sperm (X or Y) decides the sex $\rightarrow$ 1:1 ratio.

Method — Genes and protein synthesis



Nucleus → chromosome → gene → DNA double helix

Method — Genes and protein synthesis



mRNA copies a gene; a ribosome builds a protein

Practice 2.1 ■ 1 mark

Define a gene.

Solution 2.1

Worked steps

a length of DNA that codes for one protein **B1**.

Practice 2.2 ■ 1 mark

State the sex chromosomes of a human female.

Solution 2.2

Worked steps

XX **B1**.

Exam-style 3.1 ■ 1 mark

An allele is:

- A** a whole chromosome
- B** an alternative form of a gene
- C** a protein
- D** a ribosome

Solution 3.1

- A** a whole chromosome
- B** an alternative form of a gene 
- C** a protein
- D** a ribosome

Worked steps

- B.** An allele is an alternative form of a gene.

Exam-style 3.2 ■ 2 marks

The sex of a baby is determined at fertilisation.

- (a) Explain why the sperm, not the egg, determines the sex.
- (b) State the ratio of males to females this produces.

Solution 3.2

Method: Genes and protein synthesis

Worked steps

(a) the egg always carries an X; the sperm carries either an X or a Y **M1**; so whether it is XX or XY depends on the sperm **A1**.

(b) 1:1 **B1**.

Exam-style 3.3 ■ 2 marks

Explain how the base sequence of a gene determines the protein made.

Solution 3.3

Method: Genes and protein synthesis

Worked steps

the base sequence sets the order of amino acids in the protein **M1**; this gives the protein its shape, which decides its job **A1**.