

Exercise walk-through

Translation ■ 6.4

eXercise

You must be able to

- read **codons** 密码子 from mRNA using the genetic code
- describe the roles of the **ribosome** and **tRNA** 转运 RNA
- translate a short mRNA sequence into amino acids

Method — Codons

Translation reads the mRNA in three-base groups called **codons**. Each codon specifies one amino acid (or a stop). Translation starts at the **start codon AUG** (methionine).

Method — The players

- The **ribosome** reads the mRNA and joins amino acids.
- **tRNA** brings the correct amino acid; its **anticodon** pairs with the mRNA codon.

Method — A worked translation

mRNA 5'-AUG-GCU-UAA-3': AUG = Met (start), GCU = Ala, UAA = stop. So the chain is Met-Ala, then translation stops.

Method — The genetic code

The code is (nearly) **universal** — the same codons mean the same amino acids in almost all organisms, which is why genes can be transferred between species.

Practice 2.1 ■ 1 mark

How many bases make one codon?

Solution 2.1

Worked steps

Three **B1**.

Practice 2.2 ■ 1 mark

What is the start codon?

Solution 2.2

Method: Codons

Worked steps

AUG **B1**.

Practice 2.3 ■ 1 mark

What part of a tRNA pairs with the mRNA codon?

Solution 2.3

Method: The players

Worked steps

The anticodon **B1**.

Exam-style 3.1 ■ 1 mark

During translation, the amino acids are joined by the

- A** nucleus
- B** ribosome
- C** mitochondrion
- D** DNA polymerase

Solution 3.1

A nucleus

B ribosome



C mitochondrion

D DNA polymerase

Worked steps

B — the ribosome.

Exam-style 3.2 ■ 2 marks

An mRNA reads 5'-AUG-CCU-GGA-UAA-3' (AUG=Met, CCU=Pro, GGA=Gly, UAA=stop).

- (a) Give the amino-acid sequence made.
- (b) Explain what happens at the UAA codon.

Solution 3.2

Method: Codons

Worked steps

(a) Met-Pro-Gly **M1** **A1**. (b) UAA is a stop codon, so translation ends and the polypeptide is released **B1**.

Exam-style 3.3 ■ 2 marks

Explain why the near-universal genetic code allows a human gene to be expressed in a bacterium.

Solution 3.3

Method: The genetic code

Worked steps

Because the code is essentially universal, the bacterium's ribosomes read the same codons for the same amino acids, so a human gene is translated into the correct protein **M1** **A1**.