AP BIOLOGY • EXERCISE SHEET

6.4 Translation

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

Objective

Build the skills to answer exam questions on **translation** —building a protein from mRNA.

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

1 Worked examples

Study these first. Each one shows the method for a question type used later —follow the steps and you can do the Practice and Exam-style questions yourself.

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).

The players

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

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.

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.

2 Practice

Now apply the methods above.

2.1 How many bases make one codon? [1]

2.2 What is the start codon? [1]

2.3 What part of a tRNA pairs with the mRNA codon? [1]

3 Exam-style questions

3.1 During translation, the amino acids are joined by the [1]

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

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

(a) Give the amino-acid sequence made. [2]

(b) Explain what happens at the UAA codon. [1]

3.3 Explain why the near-universal genetic code allows a human gene to be expressed in a bacterium. [2]

4 Go further

You are now ready for the real exam questions on this subtopic:

- work through the **6.4 Translation** lesson on the **Learn** page;
- read the **Translation** section of the AP Biology handout on the **Know** page.

Solutions

2.1 Three.

2.2 AUG.

2.3 The anticodon.

3.1 B —the ribosome.

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

3.3 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.