

Exercise walk-through

Transcription and RNA Processing ■ 6.3

eXercise

You must be able to

- describe **transcription** 转录 (DNA $\rightarrow$ mRNA) by RNA polymerase
- state the RNA processing steps (**cap**, **tail**, **splicing** 剪接)
- distinguish **introns** and **exons**

Method — Transcription

Transcription copies a gene from DNA into **messenger RNA (mRNA)**. **RNA polymerase** reads the DNA template and builds an mRNA strand with complementary bases (using **U** instead of T).

Method — A worked transcript

Template 3'-TACGGA-5' transcribes to mRNA 5'-AUGCCU-3'.

Method — RNA processing (in eukaryotes)

Before leaving the nucleus, the mRNA is processed: a **cap** and a **poly-A tail** are added for stability, and **introns** are removed by **splicing**, joining the **exons**.

Method — Introns and exons

- **Exons** — coding parts, kept in the final mRNA.
- **Introns** — non-coding parts, spliced out.

Practice 2.1 ■ 1 mark

What enzyme carries out transcription?

Solution 2.1

Worked steps

RNA polymerase **B1**.

Practice 2.2 ■ 2 marks

Transcribe the template 3'-TACG-5' into mRNA.

Solution 2.2

Worked steps

mRNA 5'-AUGC-3' **M1** **A1**.

Practice 2.3 ■ 1 mark

What is removed during splicing?

Solution 2.3

Method: RNA processing (in eukaryotes)

Worked steps

Introns **B1**.

Exam-style 3.1 ■ 1 mark

During RNA processing, the parts removed from the pre-mRNA are the

A exons

B introns

C caps

D tails

Solution 3.1

Method: RNA processing (in eukaryotes)

A exons

B introns



C caps

D tails

Worked steps

B — introns.

Exam-style 3.2 ■ 2 marks

A gene is transcribed and processed.

- (a) State two modifications made to the mRNA.
- (b) Distinguish introns from exons.

Solution 3.2

Method: RNA processing (in eukaryotes)

Worked steps

(a) Any two: adding a 5' cap, adding a poly-A tail, splicing out introns **B1** **B1**. (b) Exons are the coding parts kept in the mRNA; introns are non-coding parts spliced out **M1** **A1**.

Exam-style 3.3 ■ 2 marks

Explain why processing is needed before the mRNA leaves the nucleus.

Solution 3.3

Method: RNA processing (in eukaryotes)

Worked steps

Processing (cap, tail, splicing) stabilizes the mRNA and removes non-coding introns, so the mature mRNA can be exported and correctly translated **M1** **A1**.