

6.5 Regulation of Gene Expression

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS promoters 启动子 • transcription 转录 • ribosome 核糖体

Objective

Build the skills to answer exam questions on the **regulation of gene expression**.

You must be able to:

- explain that cells control **which genes** are expressed and when
- describe regulation by **promoters** 启动子 and regulatory proteins
- give the example of an inducible/repressible operon idea

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.

■ Genes are switched on and off

A cell does not express all its genes at once. **Gene regulation** controls **which** genes are turned on, **when**, and **how much** — saving energy and allowing different cell types.

■ Promoters and regulatory proteins

RNA polymerase binds a gene's **promoter** to start transcription. **Regulatory proteins** can block or help this binding — acting as switches.

■ Turning genes on or off

- A **repressor** protein can bind and **block** transcription (off).
- An **activator** can **help** transcription (on).

Signals from the environment can control these proteins, so gene expression responds to conditions.

■ A worked idea

A bacterium turns on genes for digesting lactose only **when lactose is present**, saving resources when it is absent — efficient, controlled expression.

2 Practice

Now apply the methods above.

2.1 Does a cell express all its genes at once? [1]

2.2 Where does RNA polymerase bind to begin transcription? [1]

2.3 What does a repressor protein do? [1]

3 Exam-style questions

3.1 A protein that blocks transcription of a gene is a(n) [1]

A	B
C	D

- A activator
B repressor
C ribosome
D polymerase

3.2 A bacterium expresses lactose-digesting genes only when lactose is present.

(a) Explain the advantage of this control. [2]

(b) State the general role of regulatory proteins in this. [1]

3.3 Explain why gene regulation is essential for a multicellular organism to have different cell types. [2]