

6 Gene regulation, mutations, and biotechnology – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English	Write it 3 times (English)		
operon	_____	_____	_____
differential gene expression	_____	_____	_____
mutation	_____	_____	_____
PCR	_____	_____	_____
gel electrophoresis	_____	_____	_____

Recall

In Part A you saw how a cell reads DNA to make proteins. Now two important extras:

- Every cell has the same DNA, yet a muscle cell and a nerve cell are very different.
- DNA can change – a mutation – and scientists can now read and copy DNA.

Each idea has a short worked example before the Practice.

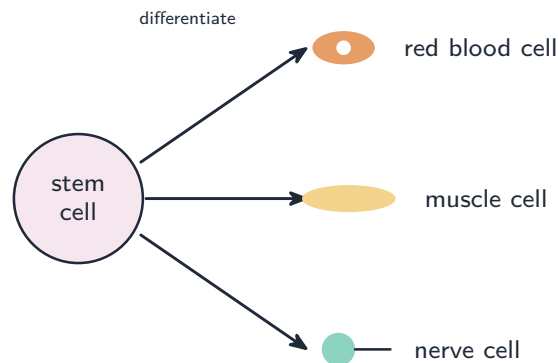
New ideas

■ 1 Controlling genes

Cells control **which** genes are switched on and when – so they use only the genes they need. In bacteria, an **operon** switches a group of genes on or off together.

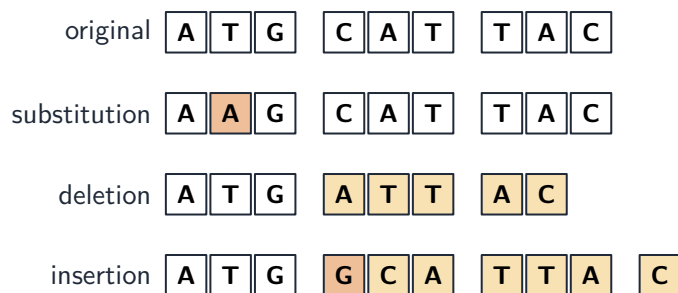
■ 2 Why cells differ

Every cell in your body has the **same** DNA, but different cells switch on **different** genes – **differential gene expression**. This is how one fertilised egg builds muscle, nerve, and skin cells.



■ 3 Mutations

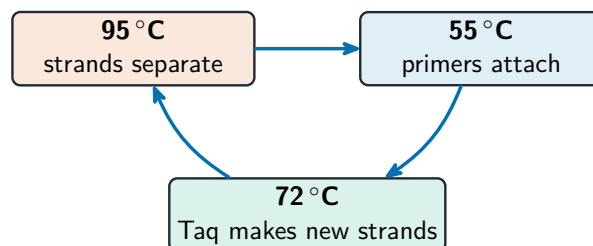
A **mutation** is a change in the DNA sequence. It may be harmful, neutral, or beneficial – and beneficial ones give the variation that natural selection acts on.



red = changed base; shaded = shifted by a frameshift (deletion or insertion)

■ 4 Biotechnology

Scientists can work with DNA directly: **PCR** copies DNA many times, and **gel electrophoresis** separates DNA pieces by size.



each cycle **doubles** the DNA → millions of copies

Watch out: all your cells share the **same** DNA – a skin cell and a brain cell differ only because they switch on **different genes**, not because they have different DNA.

Practice

Try these in order. The methods are all above.

2.1 Explain why a muscle cell and a nerve cell are different, even though they have the same DNA. [2]

2.2 State what a mutation is. [1]

2.3 State whether a mutation is always harmful, and explain. [2]

2.4 State what PCR is used for. [1]

2.5 State what gel electrophoresis separates DNA pieces by. [1]
