

Exercise walk-through

6.8

Biotechnology

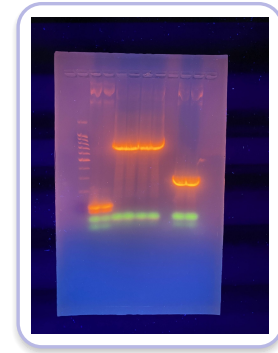
AP Biology

Biotechnology

Tools to study, copy, and move genes:

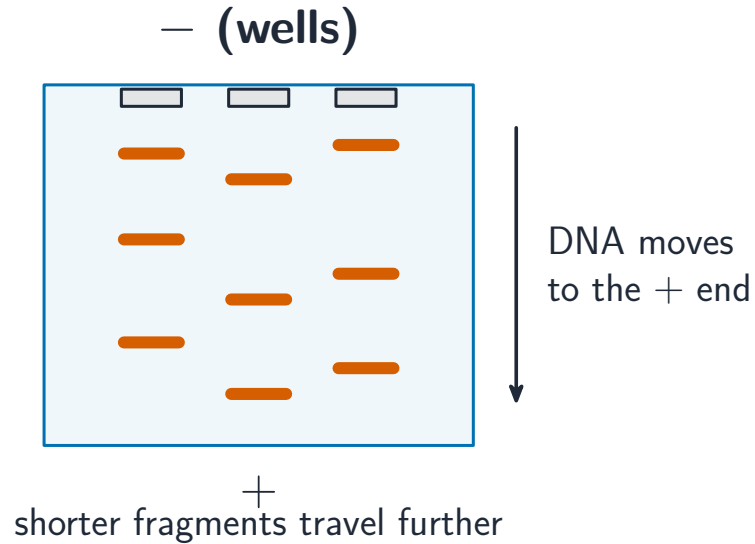
- **gel electrophoresis** sorts DNA by size
- **PCR** amplifies a target
- **restriction enzymes** and cloning
move genes between organisms
- **CRISPR** edits a sequence in place
- **genetic engineering** makes a GMO

They enable genetic testing, engineered organisms and medical treatments.



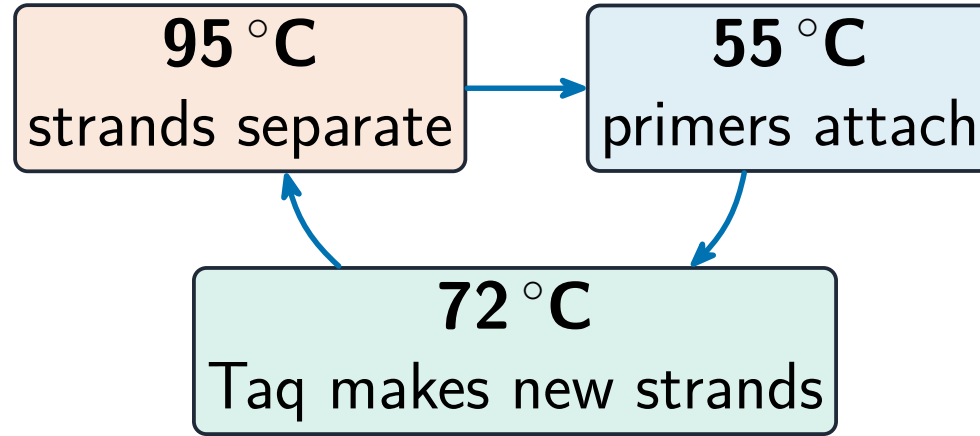
Gels sort DNA; PCR amplifies a target

Gel electrophoresis separates DNA fragments – one



Gel electrophoresis separates DNA fragments by length

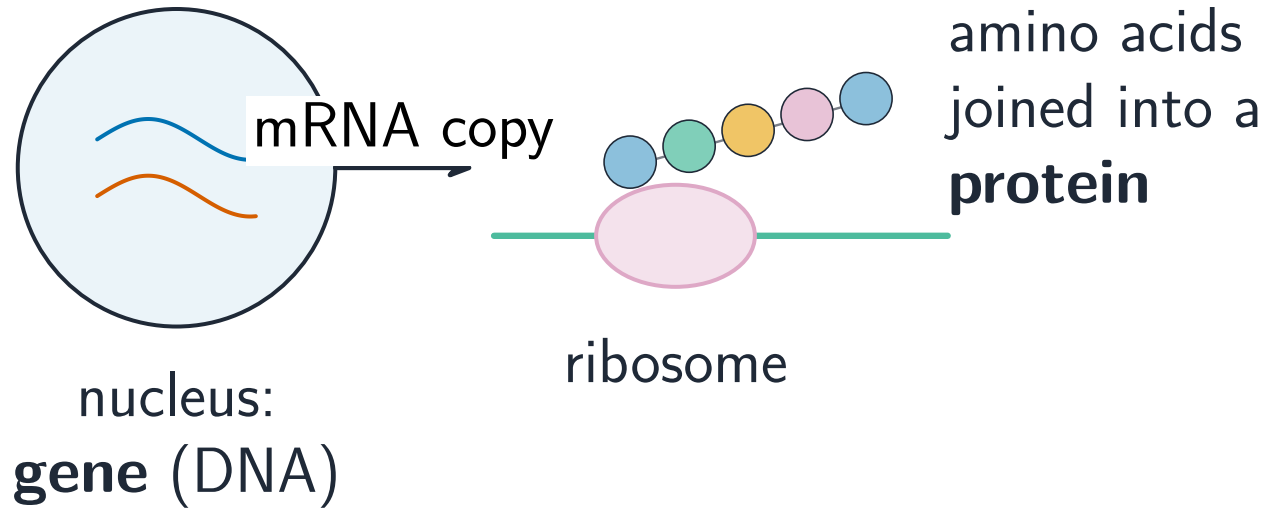
Gel electrophoresis separates DNA fragments – two



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

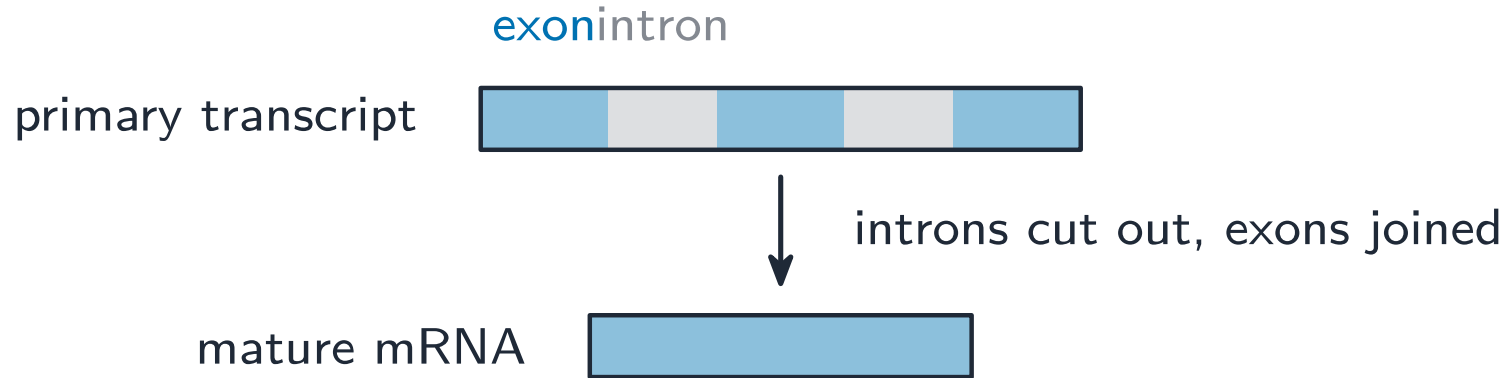
The polymerase chain reaction doubles the DNA each cycle

Translation, continued



mRNA is read by a ribosome to build a protein from amino acids

Transcription and RNA Processing, continued



Introns are removed and exons joined to make mature mRNA

Exercises 2.1-2.3

2.1 What does PCR do?

[1]

2.2 What property separates DNA in gel electrophoresis?

[1]

2.3 Which fragments travel farther in a gel?

[1]

Exercises 2.1-2.3

2.1 What does PCR do? [1]

2.1

- Makes many copies of a DNA segment
-

2.2 What property separates DNA in gel electrophoresis? [1]

2.2

- Size (length) of the fragments
-

2.3 Which fragments travel farther in a gel? [1]

2.3

- The smaller fragments

Exercise 3.1

3.1 Gel electrophoresis separates DNA fragments according to their

[1]

☐

A color

B size

C base sequence only

D temperature

Exercise 3.1

3.1 Gel electrophoresis separates DNA fragments according to their

[1]

☐

A color

B size

C base sequence only

D temperature

3.1 B

- size

Exercise 3.2 (a)

3.2 Bacteria are engineered to produce human insulin.

(a) Name the technique used to insert the human gene.

[1]

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3.2 Bacteria are engineered to produce human insulin.

(a) Name the technique used to insert the human gene.

[1]

(a)

- Genetic engineering (using a plasmid/vector)

Exercise 3.2 (b)

3.2 Bacteria are engineered to produce human insulin.

(b) Explain why bacteria can make a human protein from this gene.

[2]

Exercise 3.2 (b)

3.2 Bacteria are engineered to produce human insulin.

(b) Explain why bacteria can make a human protein from this gene. [2]

(b)

- The genetic code is universal, so the bacterium's ribosomes read the human gene's codons and translate it into human insulin

Exercise 3.3

3.3 A crime-scene DNA sample is tiny. Explain how PCR and gel electrophoresis together could help identify a suspect. [3]

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3.3 A crime-scene DNA sample is tiny. Explain how PCR and gel electrophoresis together could help identify a suspect. [3]

3.3

- PCR amplifies the tiny sample into many copies; gel electrophoresis separates the DNA into a band pattern; matching the pattern to a suspect's DNA can identify them