

Exercise walk-through

Genetic modification ■ 21.3

eXercise

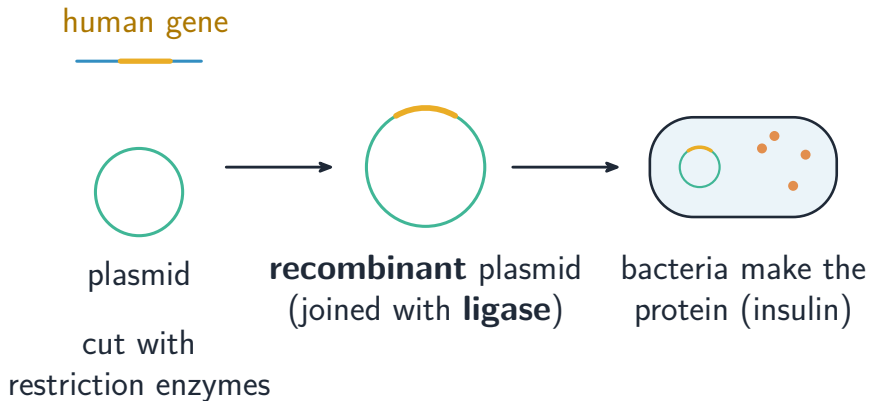
You must be able to

- describe the steps of inserting a human gene into a bacterium
- name the enzymes used (restriction enzymes, ligase)
- give the uses and concerns of genetic modification

Method — Making insulin in bacteria

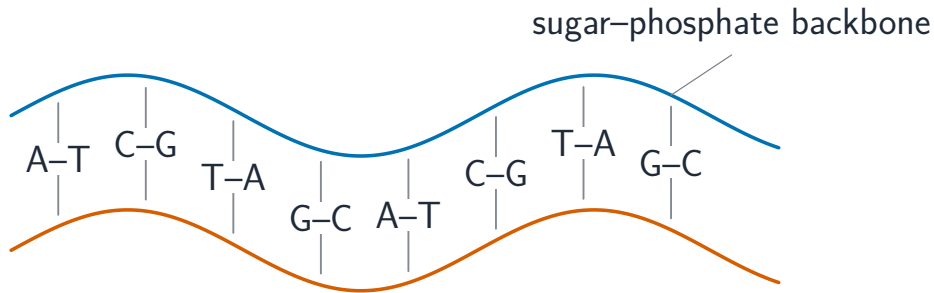
- **uses:** human proteins (insulin); herbicide/pest resistance; better nutrition in crops.

Method — Making insulin in bacteria



A human gene joined into a plasmid; bacteria make the protein

Method — Making insulin in bacteria



two strands form a double helix; bases pair A-T and C-G

Genetic modification edits the DNA double helix

Practice 2.1 ■ 1 mark

Name the enzymes used to cut a gene out of DNA.

Solution 2.1

Method: Making insulin in bacteria

Worked steps

restriction enzymes **B1**.

Practice 2.2 ■ 1 mark

Name the enzyme that joins the gene into a plasmid.

Solution 2.2

Method: Making insulin in bacteria

Worked steps

(DNA) ligase **B1**.

Exam-style 3.1 ■ 1 mark

A plasmid carrying an inserted human gene is called a:

A recombinant plasmid

B restriction enzyme

C ribosome

D chromosome

Solution 3.1

Method: Making insulin in bacteria

A recombinant plasmid



B restriction enzyme

C ribosome

D chromosome

Worked steps

A. A plasmid with an inserted gene is a recombinant plasmid.

Exam-style 3.2 ■ 3 marks

Human insulin can be made by genetically modified bacteria.

- (a) Describe how the human gene is inserted into a bacterium.
- (b) State one concern people have about GM crops.

Solution 3.2

Method: Making insulin in bacteria

Worked steps

- (a) cut the human gene out with restriction enzymes, leaving sticky ends **M1**; cut a plasmid with the same enzyme and join the gene in with ligase **M1**; put the recombinant plasmid into a bacterium, which expresses the gene **A1**.
- (b) any of: concerns about health; effects on wild species; the cost of GM seeds **B1**.