19.3 Genetically modified organisms in agriculture

Name: _____ Class: _____ Date: _____ **Total: 11 marks**

KEY WORDS herbicide • gm salmon • gmos • genetic engineering • soybean

Objective

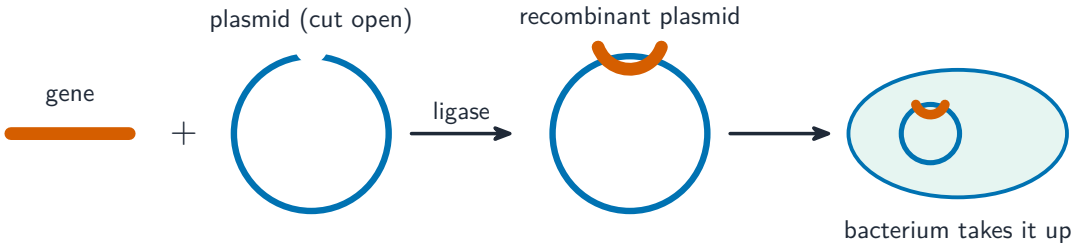
Build the skills to answer exam questions on **genetically modified organisms in agriculture** – how **GMOs** improve crops and farm animals, and their ethical and social implications.

You must be able to:

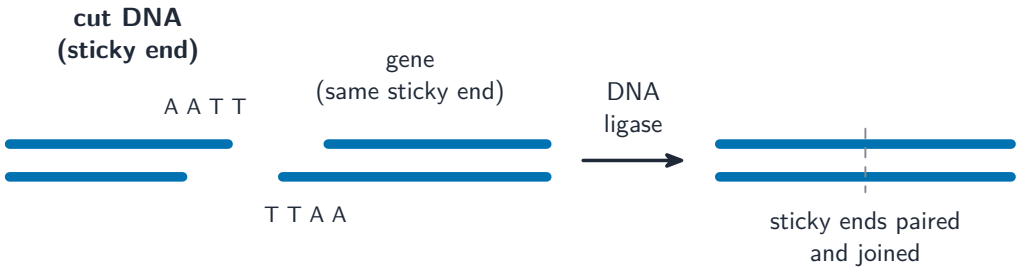
- explain how genetic engineering can improve the quality and productivity of crops and animals
- give the examples of GM salmon, herbicide-resistant soybean and insect-resistant cotton
- discuss the ethical and social implications of GMOs in food production

1 Key knowledge and worked examples

■ Improving crops and animals



The same gene-transfer tools are used to make a genetically modified organism



Restriction enzymes and ligase build the recombinant DNA

Genetic engineering can help feed a growing world by adding useful genes:

- **GM salmon** – grow to size faster.
- herbicide-resistant **soybean** – weeds can be sprayed with a **herbicide** without harming the crop.
- insect-resistant **cotton** – makes a protein that kills the insect **pests** .

■ Ethical and social implications

Concerns include: whether GMOs are safe to eat; their effect on the environment and wild species; whether the engineered genes might spread to wild plants; and whether a few large companies should control the food supply. These must be weighed against the benefits of higher yields.

2 Practice

2.1 State the advantage to a farmer of growing herbicide-resistant soybean. [2]

2.2 State how insect-resistant cotton protects itself from pests. [1]

3 Exam-style questions

3.1 GM salmon have been engineered mainly to: [1]

- ☐ **A** resist herbicides
- **B** grow to market size faster
- **C** kill insect pests
- **D** survive in fresh water

3.2 A concern about growing herbicide-resistant crops is that: [1]

- **A** the crop cannot photosynthesise
- **B** the resistance gene might spread to wild plants (weeds)
- **C** the crop needs no water
- **D** the crop produces no seeds

3.3 (a) Explain how insect-resistant cotton increases the yield of a crop. [2]

(b) Discuss **one** environmental and **one** social concern about growing GM crops. [2]

3.4 Suggest why some people are cautious about eating food made from GMOs. [2]