# Recombinant DNA and vectors

Student activity • observation and reasoning

YEAR 11 / LESSON 99 / BIOLOGY + SCIENCE (DOUBLE AWARD)

## The question

**How can a DNA sequence be joined into a vector and transferred?**

Use the supplied examples, record your reasoning and correct it using evidence.

## Equipment

- Student booklet, pencil and ruler
- Pre-cut paper DNA strips, plasmid loop and joining tape

Paper, modelling and written reasoning only. No chemicals or biological samples are handled.

Course coverage: Shared Biology / Double Award: 5.12–5.13. Restriction enzymes, ligase and vectors.

## Plan, model or apparatus sketch

**Draw and label the apparatus or biological model; identify one limitation.**

# Method and reasoning

Read the whole sequence before starting

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**1.** Use pre-cut paper DNA strips to mark matching restriction-enzyme recognition sites on the model gene and plasmid.

**2.** Represent cutting to produce compatible ends and distinguish this from cutting at any chosen random point.

**3.** Insert a model gene into a cut plasmid and show ligase joining the DNA backbone.

**4.** Explain how a plasmid or suitable viral vector can carry genetic material into a recipient cell.

**5.** Distinguish successful DNA entry from successful expression; appropriate control sequences and selection checks are also needed in real systems.

**6.** Evaluate the paper model's limits: it omits molecular scale, efficiency and many laboratory verification steps.

## Cleanup

• Return models and keep the corrected work.

# Record your evidence

Blank spaces are for your own work

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## Reference and task data

Restriction enzymes cut at specific recognition sequences; DNA ligase joins DNA fragments. A vector carries genetic material. The classroom activity uses paper only and does not instruct students to transform or culture organisms.

| Example / trial | Observation / evidence | Explanation / limit |
|---|---|---|
| Evidence / comparison | | |
| Explanation | | |
| Limit / correction | | |

**Show your calculations, labelled model or correction here.**

# Explain and evaluate

Use evidence and show calculation steps where relevant

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**1.** What does a restriction enzyme recognise?

**2.** What does ligase do?

**3.** What is a plasmid?

**4.** What is a vector’s role?

**5.** Does every treated cell necessarily take up the construct?

**6.** Does transfer alone guarantee useful protein production?