

Genetic engineering What is genetic engineering?	Genetic engineering Give an example of genetic engineering in medicine.
Genetic engineering Higher tier What does a restriction enzyme do?	Genetic engineering Higher tier What are sticky ends?
Genetic engineering Higher tier What does ligase do?	Genetic engineering Higher tier What is a vector in genetic engineering?
Genetic engineering Higher tier Give the main stages of genetic engineering in order.	Genetic engineering Triple only What does the Bt gene from <i>Bacillus thuringiensis</i> do in a crop plant?

Bacteria given the human gene for insulin, so they make human insulin.

A process which involves modifying the genome of an organism to introduce desirable characteristics.

Short, unpaired strands of DNA left at the ends of a cut, which join with complementary sticky ends.

Cuts DNA at a specific base sequence.

A carrier, such as a plasmid or virus, used to insert a gene into another organism's cells.

Joins pieces of DNA together, for example the gene and the vector.

Codes for a toxin that kills insect pests, giving the plant insect resistance.

Cut out the gene (restriction enzyme), cut the vector (same enzyme), join with ligase, insert the vector into the target cells.

Genetic engineering **Triple only**

Give two advantages of GM crops.

Genetic engineering **Triple only**

Give two disadvantages of GM crops.

Possible risk to human health; genes may spread to wild plants; expensive seeds; ethical concerns.

Higher yield because less is lost to pests, and less insecticide is needed. They can also have extra characteristics such as greater nutritional value.