

Biotechnology *Checklist*

Reprogramming Microbes (* = Credit outcomes)

1. **Genetic engineering** involves transferring genes from one organism to another (often a bacterium).
2. Genetic engineering is better than selective breeding in that it produces new genotypes **quickly** and produces the **best organism** for a **particular function**. **Large quantities** of product can be produced relatively quickly.
3. Genes are 'cut' from chromosomes using **special enzymes** and inserted into a **plasmid** (a small chromosome - like structure taken from a bacterium). The plasmid is then put back into another bacterium. When the bacterium grows and reproduces the inserted gene makes a product.
4. Products of genetic engineering include **insulin**. Previously, insulin had to be extracted from the pancreases of pigs and cattle. It was **very expensive** and was **not pure** human insulin.
5. As more **diabetics** are being diagnosed, the need for insulin is **increasing**.
6. **Antibiotics** can be produced by genetic engineering. These are chemicals which **kill** disease-causing bacteria. The best known is **penicillin**. Many bacteria are becoming **resistant** to antibiotics so new ones are constantly being developed.
7. **Biological detergents** are made using **enzymes** extracted from bacteria. These enzymes **digest** stains like blood and grass that ordinary detergents have trouble removing. They can work at low temperatures so **save energy**.
8. **Continuous flow processing** is used in many industries including brewing. This uses **immobilised enzymes** or **immobilised cells** such as yeast.
9. Immobilised enzymes or cells are trapped on **jelly beads** so that they still work as catalysts and the products flow out without the enzymes or cells. It is **easy to separate** the products from the unreacted raw materials and catalysts.