

Genetic engineering

Q1.a(2018)

An explanation linking two of the following:

- cut the {plasmid/gene/DNA} with a **restriction enzyme** (1)
- insert the gene into the plasmid using **ligase** (1)
- gene and plasmid have the same sticky ends / complementary sticky ends (1)

Q1.b(2018)

An evaluation that combines three of the following points:

At least one from benefits

- (yeast grows rapidly) increasing yield (1)
- it can be produced in a shorter time period (1)
- production is cheaper/easier to extract (1)
- takes up less space than growing plants (1)
- yeast growth is not weather dependent (1)

At least one from risks

- concerns over the genetically modified yeast being manufactured illegally (1)
- the painkillers may not be identical/as effective (1)
- concerns over GM organisms entering environment (1)

Q2.(2019)

An explanation linking the following:

- cut the gene (from the genome) using **restriction** enzymes (1)
- cut the plasmid with a **restriction** enzyme (1)
- to leave {complementary / matching} sticky ends (1)
- join the DNA using **ligase** (1)

Q3.(2021)

An explanation linking **three** from:

- **plasmid** is cut with **restriction** enzymes/ chymosin gene is cut with a **restriction** enzyme (1)
- sticky ends are complementary (1)
- ligase is used to connect the chymosin gene and the plasmid (1)
- recombinant plasmid is inserted back into the bacterial cell (1)

Q4.a(2022)

Any **one** from:

- pig kidneys cannot be used in humans (1)
- pig kidneys would be rejected (by humans) (1)
- to prevent competition between the pig and the human organ (1)
- so the human kidneys form properly (1)

Q4.b(2022)

An explanation linking **two** from:

- stem cells {are undifferentiated / are unspecialised / can differentiate / become specialised / form any type of cell} (1)
- so can produce the {kidney / kidney cells / kidney tissue} (1)
- that won't be rejected (when transplanted) (1)

Q5.(2022)

- the gene that codes for human insulin is identified
- in the human DNA
- this is removed using a restriction enzyme
- the plasmid of a bacterial cell is removed
- using lysosomes/lysozyme
- the plasmid is cut open
- using (the same) restriction enzyme
- leaving complementary sticky ends
- the human gene is inserted into the bacterial plasmid
- using the enzyme ligase
- the plasmid is returned to the bacterial cell
- the bacterial cell multiplies