# 19.2 Genetic technology applied to medicine

Name: _____ Class: _____ Date: _____ **Total: 25 marks**

**KEY WORDS** breast cancer • gene therapy • genetic screening • insulin • recombinant human proteins

## Objective

Build the skills to answer exam questions on **genetic technology applied to medicine – recombinant human proteins , genetic screening , gene therapy** , and their ethical issues.

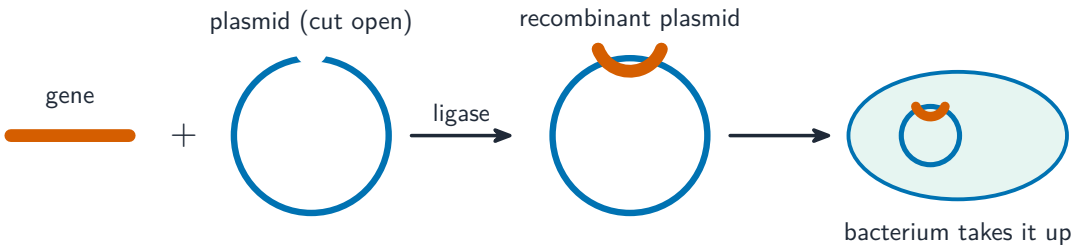
**You must be able to:**

- explain the advantages of recombinant human proteins (insulin, factor VIII, ADA)
- outline genetic screening (BRCA, Huntington's, cystic fibrosis) and gene therapy (SCID)
- discuss social and ethical considerations

## 1 Key knowledge and worked examples

### ■ Recombinant human proteins

*The insulin gene goes into bacteria, which become living factories – an exact human copy, never in short supply*




*A plasmid vector carries the human gene into bacteria*

A human gene is placed in bacteria so they make a **recombinant** human protein – an exact copy. Advantages: it is identical to the human protein, never in short supply, and avoids using animal/donor proteins (so fewer allergic reactions or infections). Examples: **insulin** (diabetes), **factor VIII** (haemophilia), **adenosine deaminase** (a faulty immune system).

### Genetic screening and gene therapy

**Genetic screening** tests DNA for disease alleles before symptoms appear – e.g. **BRCA1/BRCA2** (breast cancer risk), **Huntington's disease**, **cystic fibrosis** . **Gene therapy** puts a working gene into a patient's cells – used for **SCID** (failed immune system) and some inherited eye diseases.

### Ethics

Concerns: who may see your results; misuse by insurers/employers; safety and permanence of changes; who decides. These are weighed against the benefits.

## 2 Practice

**2.1** State **two** advantages of using recombinant human insulin rather than insulin from animals. [2]

**2.2** Name **one** disease that can be detected by genetic screening. [1]

## 3 Exam-style questions

**3.1** Gene therapy treats a genetic disease by: [1]

- **A** giving the patient a recombinant protein
- **B** putting a working copy of a gene into the patient's cells
- **C** screening the patient's DNA
- **D** removing the faulty allele from all body cells permanently

**3.2** Which is an advantage of making insulin from genetically engineered bacteria? [1]

- **A** it is slightly different from human insulin
- **B** it is identical to human insulin and never in short supply
- **C** it must be extracted from animal pancreases
- **D** it cannot be purified

**3.3** (a) Explain **one** advantage of genetic screening for a person with a family history of Huntington's disease. [2]

(b) Discuss **one** ethical concern raised by genetic screening. [2]

**3.4** Explain how gene therapy could help a child with SCID. [2]

**3.5** Human insulin for treating diabetes is produced by genetically modified bacteria.

(a) Describe how the human insulin gene is obtained and inserted into a bacterium, naming the enzymes and the vector used. [5]

(b) Explain why a marker gene is included, and describe how it is used. [3]

(c) Explain **two** advantages of using recombinant human insulin rather than insulin extracted from animals. [2]

(d) Distinguish between genetic screening and gene therapy, and state one ethical concern raised by each. [4]