OCR (A) Biology A-level

6.1.3 - Manipulating genomes

Flashcards

What is DNA sequencing?

What is DNA sequencing?

Identifying the base sequence of a DNA fragment.

How have sequencing methods changed over time?

How have sequencing methods changed over time?

- Used to be a manual process, however now it has become automated.
- Entire genomes can now be read.

Give some benefits of genome-wide comparisons.

Give some benefits of genome-wide comparisons.

- Comparing between species allows us to determine evolutionary relationships.
- Comparing between individuals of the same species allows us to tailor medical treatment to the individual.

How can DNA sequencing be used in synthetic biology?

How can DNA sequencing be used in synthetic biology?

Knowing the sequence of a gene allows us to predict the sequence of amino acids that will make up the polypeptide it produces. This in turn allows for development of synthetic biology.

What is DNA profiling?

What is DNA profiling?

Identifying the unique areas of a person's DNA, in order to create a profile that is individual to them.

Give uses of DNA profiling.

Give uses of DNA profiling.

- Forensics= DNA obtained during crime investigations can be compared to that of victims or suspects.
- Medicine= to screen for a particular base sequence in order to identify heritable diseases.

How can we amplify DNA fragments in order to sequence them?

How can we amplify DNA fragments in order to sequence them?

Using the polymerase chain reaction (PCR). Makes millions of a copies of a fragment, which are then cut at different lengths in order to be sequenced.

Describe the reaction mixture in the first stage of PCR.

Describe the reaction mixture in the first stage of PCR.

Contains the DNA fragment to be amplified, primers that are complementary to the start of the fragment, free nucleotides to match up to exposed bases, and DNA polymerase to create the new DNA.

Summarise the process of amplifying DNA fragments using PCR.

Summarise the process of amplifying DNA fragments using PCR.

1. Heated to break apart the DNA strands.
2. Cooled to allow primers to bind.
3. Heated again to activate DNA polymerase and allow free nucleotides to join.
4. New DNA acts as template for next cycle.

How is gel electrophoresis used in DNA profiling?

How is gel electrophoresis used in DNA profiling?

- DNA fragments of varying lengths are placed at one end of a slab of gel.
- Electric current is applied; DNA fragments move towards the other end of the gel.
- Shorter fragments travel further. The pattern of bands created is unique to every individual.

What is meant by genetic engineering?

What is meant by genetic engineering?

Where a DNA fragment from one organism is inserted into the DNA of another organism, sometimes across different species. This is done through use of a vector and a host cell.

Summarise the process of isolating a DNA fragment.

Summarise the process of isolating a DNA fragment.

Restriction enzymes (RE) cut DNA at specific sequences. Different REs cut at different points, but one RE will always cut at the same sequence. Therefore using particular REs allows you to cut out a certain gene of interest.

Summarise the process of inserting a DNA fragment into a vector.

Summarise the process of inserting a DNA fragment into a vector.

A plasmid (circular DNA from bacteria) is used as the vector, and is cut using the same restriction enzymes as the DNA, so that the ends are complementary. DNA ligase joins the fragment and plasmid together.

Summarise the process of inserting a vector into a host cell.

Summarise the process of inserting a vector into a host cell.

The host cells (bacteria) are mixed with the vectors in an ice-cold solution, then shocked to increase the permeability of the cell membrane (electroporation) which encourages the cells to take up the vectors.

Give some ethical issues around genetic engineering.

Give some ethical issues around genetic engineering.

+ Insect resistance can be introduced to crops.
+ GE animals used to produce pharmaceuticals (pharming).
+ GE pathogens can be produced for research
- GE seeds would be hard to acquire for poorer farmers.

What is gene therapy?

What is gene therapy?

Replacing a faulty allele (e.g. one that codes for a genetic disease) with a normal allele. The two types are somatic and germ line.

Differentiate between somatic gene therapy and germ line gene therapy.

Differentiate between somatic gene therapy and germ line gene therapy.

- Somatic= allele introduced to target cells only. Short-term, needs repeating.
- Germ line= allele introduced to embryonic cells so it is present in all resultant cells. Permanent, will be passed to offspring.