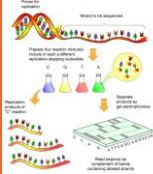
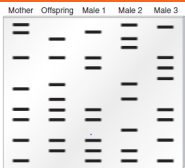
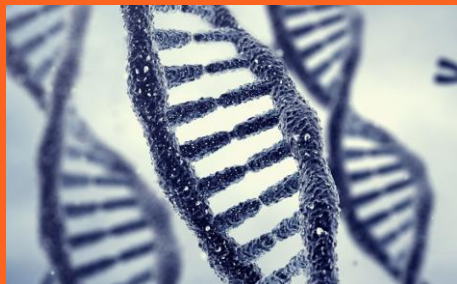


6.8 Biotechnology



ENDURING UNDERSTANDING

IST-1 Heritable information provides for continuity of life.



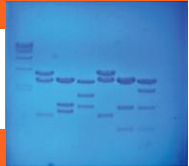
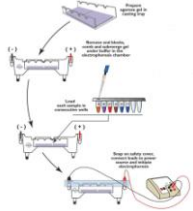
IST-1.P Explain the use of genetic engineering techniques in analyzing or manipulating DNA.

Genetic engineering techniques can be used to analyze and manipulate DNA and RNA



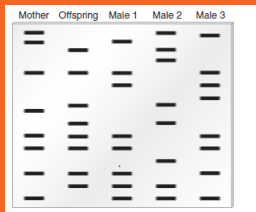
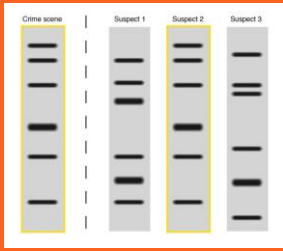
Electrophoresis

- Electrophoresis separates molecules according to size and charge.
 - DNA is amplified (PCR) and cut with restriction enzymes
 - DNA is negatively charged due to 5' end (P)
 - Loaded at negative terminal and run to positive end
 - Smaller bands travel farthest



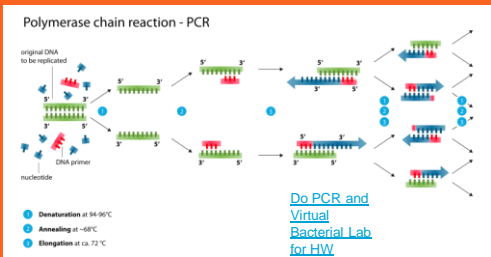
Electrophoresis

Analysis of DNA can be used for forensic identification.



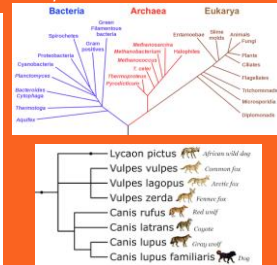
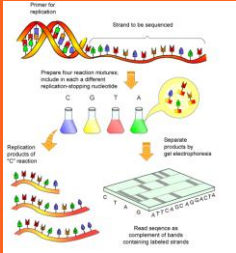
PCR

- During polymerase chain reaction (PCR), DNA fragments are amplified.
 - Steps are Denaturation, Annealing, and Elongation



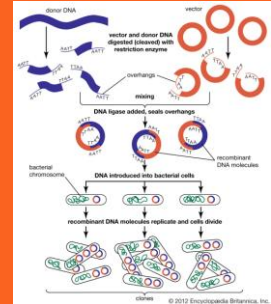
Sequencing

- DNA sequencing determines the order of nucleotides in a DNA molecule.
 - Amplified DNA fragments can be used to identify organisms and perform phylogenetic analyses.



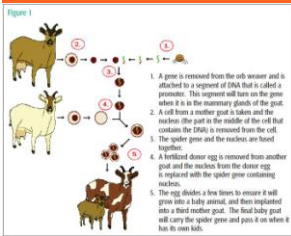
Transformation

- Bacterial transformation introduces DNA into bacterial cells.
 - Often utilizes plasmids to introduce genes
 - Cut DNA and plasmid w same restriction enzyme
 - Ligase sticky ends
 - Induce bacteria to take up plasmid w/gene
 - Separate and replicate transformed bacteria

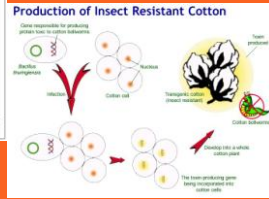


Transformation

- Genetically modified organisms include transgenic animals.



- A gene is removed from the cow and is attached to a segment of DNA that is called a promoter. This segment will turn on the gene when it is in the mammary glands of the goat.
- A cell from a mother goat is taken and the nucleus (the part in the middle of the cell that contains the DNA) is removed from the cell.
- The spider gene and the nucleus are joined together.
- A fertilized donor egg is removed from another goat and the nucleus from the donor egg is replaced with the spider gene containing nucleus.
- The egg divides a few times to ensure it will grow into a baby animal, and then implanted into a third mother goat. The final baby goat will carry the spider gene and pass it on when it has its own kids.



Cloning

- Gene cloning allows propagation of DNA fragments



Dolly- 1st cloned animal (1996)

