CCEA GCE A2 BIOLOGY: UNIT 2

GENE TECHNOLOGY

- Gene Technology
  - PCR (Polymerase Chain Reaction)
    - Amplifies DNA
    - 3 steps: denature, anneal primers, extend with DNA polymerase
  - DNA Probes
    - Short DNA strands with known sequences
    - Bind to complementary DNA (fluorescent markers)
  - Detecting Variation
    - Sequence differences (MRSs, SNPs)
    - Microarrays: gene expression profiling, hybridization signals
  - Genetic Fingerprinting
    - Cut DNA with restriction enzymes
    - Gel electrophoresis separates fragments
    - DNA probes identify specific sequences
  - Gene Transfer
    - Donor DNA via restriction enzymes or reverse transcriptase
    - DNA inserted into vectors (plasmids, bacteriophages)
    - Transformation of host cells (e.g. E. coli)
    - Marker genes for selection
  - GM Microorganisms
    - Produce useful substances
    - GM viruses in therapy (e.g. cancer, infections)
  - Transgenic Organisms
    - Animals: growth, pharma products, disease models
    - Plants: yield, resistance, survival
  - Gene Therapy
    - Adds functional genes for treatment
    - Somatic cell therapy and issues
    - Germ-line therapy: ethical and technical concerns
  - Gene Sequencing
    - Determines complete genome sequence
    - Used for extinct organisms, human genome mapping
  - Gene Function Study
    - Knockout/knockin models (e.g. mouse)
    - Understand disorders, test drugs
  - Pharmacogenetics
    - Personalised medicine based on genotype
    - Microarrays for drug response profiling
    - Designer drugs tailored to patients
  - Ethical/Social Issues
    - Risks of GMOs
    - Bioethics, safety measures (e.g. suicide genes)
  - Practical Work
    - Gel electrophoresis
    - DNA extraction