

6.1.3 Manipulating genomes

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| (a) the principles of DNA sequencing and the development of new DNA sequencing techniques | To include the rapid advancements of the techniques used in sequencing, which have increased the speed of sequencing and allowed whole genome sequencing e.g. high-throughput sequencing.

HSW7 |
| (b) (i) how gene sequencing has allowed for genome-wide comparisons between individuals and between species | With reference to bioinformatics and computational biology and how these fields are contributing to biological research into genotype–phenotype relationships, epidemiology and searching for evolutionary relationships. |
| (ii) how gene sequencing has allowed for the sequences of amino acids in polypeptides to be predicted | PAG10 HSW7, HSW9 |
| (iii) how gene sequencing has allowed for the development of synthetic biology | |
| (c) the principles of DNA profiling and its uses | To include forensics and analysis of disease risk.

HSW9 |
| (d) the principles of the polymerase chain reaction (PCR) and its application in DNA analysis | |
| (e) the principles and uses of electrophoresis for separating nucleic acid fragments or proteins | Opportunity for practical use of electrophoresis.

PAG6

HSW4 |
| (f) (i) the principles of genetic engineering | To include the isolation of genes from one organism and the placing of these genes into another organism using suitable vectors. |
| (ii) the techniques used in genetic engineering | To include the use of restriction enzymes, plasmids and DNA ligase to form recombinant DNA with the desired gene and electroporation.

HSW2 |
| (g) the ethical issues (both positive and negative) relating to the genetic manipulation of animals (including humans), plants and microorganisms | To include insect resistance in genetically modified soya, genetically modified pathogens for research and ‘pharming’ i.e. genetically modified animals to produce pharmaceuticals AND issues relating to patenting and technology transfer e.g. making genetically modified seed available to poor farmers.

HSW10 |

(h) the principles of, and potential for, gene therapy in medicine. To include the differences between somatic cell gene therapy and germ line cell gene therapy.

HSW9, HSW12