

A2 Level Paper 2 and 3 - Topics 5-8

Section 3.5: Energy transfers in and between organisms

3.5.1 Photosynthesis

3.5.2 Respiration

3.5.3 Energy and ecosystems

3.5.4 Nutrient cycles

Section 3.7: Genetics, populations, evolution and ecosystems

3.7.1 Inheritance

3.7.2 Populations

3.7.3 Evolution may lead to speciation

3.7.4 Populations in ecosystems

Section 3.6 Organisms respond to changes in their internal and external environments

3.6.1 Stimuli, both internal and external, are detected and lead to a response

3.6.1.1 Survival and response

3.6.1.2 Receptors

3.6.1.3 Control of heart rate

3.6.2 Nervous co-ordination

3.6.2.1 Nerve impulses

3.6.2.2 Synaptic transmission

3.6.3 Skeletal muscles are stimulated to contract by nerves and act as effectors

3.6.4 Homeostasis is the maintenance of a stable internal environment

3.6.4.1 Principles of homeostasis

3.6.4.2 Control of blood glucose concentration

3.6.4.3 Control of blood water potential

Section 3.8 The control of gene expression

3.8.1 Alteration of the sequence of bases in DNA can alter the structure of proteins

3.8.2 Gene expression is controlled by a number of features

3.8.2.1 Most of a cell's DNA is not translated

3.8.2.2 Regulation of transcription and translation

3.8.2.3 Gene expression and cancer

3.8.3 Using genome projects

3.8.4 Gene technologies allow the study and alteration of gene function allowing a better understanding of organism function and the design of new industrial and medical processes

3.8.4.1 Recombinant DNA technology

3.8.4.2 Differences in DNA between individuals of the same species can be exploited for identification and diagnosis of heritable conditions

3.8.4.3 Genetic fingerprinting

Topic 8: The control of gene expression - 3.8.1 Alteration of the sequence of bases in DNA can alter the structure of proteins (p500)

Can you describe the types of gene mutation?

Substitution:

Silent:

Missense:

Nonsense:

Deletion:

Addition:

Duplication:

Inversion:

Translocation:

What are mutagenic agents? What do they do?

Explain why some mutations do not result in a changed amino acid sequence:

Explain how each type of gene mutation results in different amino acid sequences in polypeptides:

Topic 8: The control of gene expression - 3.8.2.1 Most of a cell's DNA is not translated (p504)

What is a totipotent cell?

Explain how cells lose their totipotency and become specialised:

Describe cell differentiation and cell specialisation:

Describe the origins and types of stem cells. Explain the difference between totipotent, pluripotent, multipotent and unipotent.

Explain how pluripotent stem cells can be used to treat human disorders:

Explain the growth of plant tissue cultures:

What are induced pluripotent stem cells?

Topic 8: The control of gene expression - 3.8.2.2 Regulation of transcription and translation (p510)

Can you explain how oestrogen affects gene transcription? Draw a diagram in your answer to help you explain.

What is small interfering RNA?

How does small interfering RNA affect gene expression?

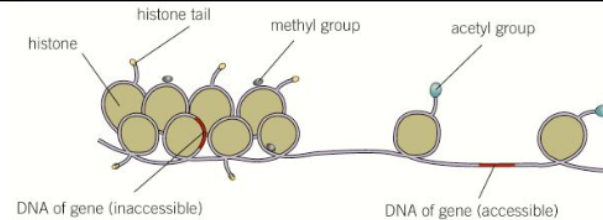
Topic 8: The control of gene expression - 3.8.2.2 Regulation of transcription and translation (p513)

What is meant by epigenetics?

Can you describe the nature of the epigenome?

Can you explain the effects of decreased acetylation of histones?

Can you explain the effect of epigenetic factors on DNA and histones?



Can you explain the effects of increased methylation of DNA?

How is it thought that epigenetic inheritance takes place?

How could epigenetics and disease be linked? How might diseases be treated with epigenetic therapy?

Topic 8: The control of gene expression - 3.8.2.3 Gene expression and cancer (p519)

Can you distinguish between benign and malignant tumours?

Can you explain the role of oncogenes and tumour suppressor genes in the development of tumours??

Can you explain the effects of abnormal methylation of tumour suppressor genes and oncogenes?

Can you explain how increased oestrogen levels can cause breast cancer?

Topic 8: The control of gene expression - 3.8.3 Using genome projects (p525)

Outline the importance of genome sequencing projects:

Describe how to determine the genome and proteome of simple organisms:

Describe how to determine the genome and proteome of complex organisms:

Describe the nature of the proteome:

Topic 8: The control of gene expression - 3.8.4.1 Recombinant DNA technology (p530)

Can you explain the main stages of DNA technology?

Can you explain how restriction endonucleases can be used to isolate a gene?

Can you explain how reverse transcriptase can be used to isolate a gene?

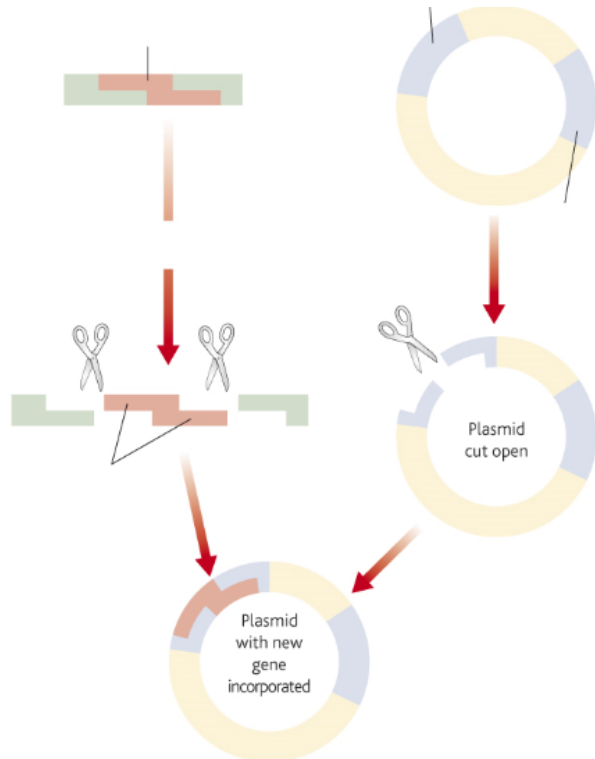
Can you explain how a gene machine can be used to manufacture a gene?

Topic 8: The control of gene expression - 3.8.4.1 Recombinant DNA technology – In vivo gene cloning (p535)

How would you prepare the DNA fragment for insertion?

Can you explain how the DNA of the vector is introduced into host cells?

Can you explain why sticky ends are important and how a DNA fragment can be inserted into a vector?



Can you explain what gene markers are and how they work?

Antibiotic resistance markers:

Fluorescent markers:

Enzyme markers:

Topic 8: The control of gene expression - 3.8.4.1 Recombinant DNA technology – In vitro gene cloning (p540)

Describe the polymerase chain reaction and what the process requires:

Explain the advantages and disadvantages of in vitro cloning:

Explain how the polymerase chain reaction is carried out:

Explain the advantages and disadvantages of in vivo cloning:

Topic 8: The control of gene expression - 3.8.4.1 Recombinant DNA technology (p542)

Can you explain how severe combined immunodeficiency could be treated using gene therapy:

Give some benefits of recombinant DNA technology:

Give some risks of recombinant DNA technology:

Topic 8: The control of gene expression - 3.8.4.2 Differences in DNA between individuals of the same species can be exploited for identification and diagnosis of heritable conditions (p545)

Can you describe what DNA probes are and explain how they work?

Can you explain how DNA hybridisation is used to locate specific alleles of genes? Can you summarise the process using diagrams?

What is genetic screening? Can you describe how labelled DNA probes could be used to screen for heritable conditions or health risks and could be used for personalised medicine?

Can you consider the use of genetic screening in genetic counselling?

Topic 8: The control of gene expression - 3.8.4.3 Genetic fingerprinting (p550)

What is genetic fingerprinting?

Explain how the technique of gel electrophoresis works:

How are the results of genetic fingerprinting be interpreted?

What are some uses of genetic fingerprinting?

Explain how the technique of genetic fingerprinting is carried out:

Extraction:

Digestion:

Separation:

Hybridisation:

Development: