

Edexcel (A) Biology A-level

2.5 to 2.8 + 2.11 + 2.15 + 2.16 - DNA and Genetics

Flashcards

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What are the three components of nucleotides?



What are the three components of nucleotides?

A pentose sugar (either ribose or deoxyribose), a phosphate group, an organic base (either adenine, guanine, cytosine, thymine or uracil).



Describe the structure of DNA.



Describe the structure of DNA.

Double stranded. Made up of deoxyribose mononucleotides, linked through condensation reactions.

Possible bases are A, C, G and T. C pairs with G, A pairs with T.



How does DNA form a double stranded helix?



How does DNA form a double stranded helix?

- Bases form hydrogen bonds with each other, holding the two strands together.
- Stacking of many mononucleotides results in a helix (twisted) shape.



Describe the structure of RNA.



Describe the structure of RNA.

Single stranded. Made up of ribose mononucleotides, linked through condensation reactions. Possible bases are A, C, G and U. C pairs with G, A pairs with U.



How is the DNA sequence converted into proteins?



How is the DNA sequence converted into proteins?

1. Transcription; reads DNA sequence and produces mRNA.
2. Translation; reads mRNA sequence and produces proteins.



Outline the process of transcription.



Outline the process of transcription.

- DNA uncoils into two strands with exposed bases. One used as a template.
- Free nucleotides line up next to their complementary bases, and are joined together by RNA polymerase.



What happens to mRNA after transcription?



What happens to mRNA after transcription?

It moves out of the nucleus into the cytoplasm and attaches to a ribosome, ready for translation.



Outline the process of translation.



Outline the process of translation.

- The anti-codon of transfer RNA attaches to complementary bases on the mRNA.
- Amino acids bonded to tRNA form peptide bonds, continuing to form a polypeptide chain until a stop codon is reached.
- This process requires ATP.



Identify features of the genetic code.



Identify features of the genetic code.

- A triplet of bases codes for a particular amino acid.
- Non-overlapping = each triplet is only read once.
- Degenerate = more than one triplet codes for the same amino acid (64 possible triplets for 20 amino acids).



What is a gene?



What is a gene?

A sequence of bases on a DNA molecule that codes for a specific sequence of amino acids in a polypeptide chain.



Summarise the process of DNA replication.



Summarise the process of DNA replication.

1. Double helix unwinds and the hydrogen bonds break, catalysed by DNA helicase.
2. Complementary base pairing occurs between the template strand and free nucleotides.
3. The nucleotides are joined by phosphodiester bonds, catalysed by DNA polymerase.



Explain how experimental data has supported the theory of DNA replication.



Explain how experimental data has supported the theory of DNA replication.

Meselson and Stahl: grew DNA in a culture containing a nitrogen isotope (^{15}N), then grew it in standard nitrogen (^{14}N). The resulting DNA had one strand containing ^{15}N and one strand containing ^{14}N , demonstrating semi-conservative replication.



What is meant by genetic screening?



What is meant by genetic screening?

Determining if an individual's DNA contains a certain allele, usually one that may result in a genetic disorder. This can allow prenatal diagnosis, and for treatment to be started earlier.



Describe the process of chorionic villus sampling.



Describe the process of chorionic villus sampling.

A sample of embryonic tissue is taken from the placenta at around 8 to 12 weeks of pregnancy. Screened for various disorders, and results are available quickly.



Describe the process of amniocentesis.



Describe the process of amniocentesis.

A sample of amniotic fluid is taken at around 14 to 16 weeks of pregnancy.

The foetal cells have to be grown for 2-3 weeks before screening can take place, meaning results are slower than CVS.



Give some social and ethical issues surrounding prenatal genetic screening.



Give some social and ethical issues surrounding prenatal genetic screening.

- Procedures carry risk of harming foetus.
- May result in abortion, which many people object to.
- High cost of bringing up a baby with a genetic disorder.
- Emotional and mental stress on parents.

