Edexcel Biology GCSE

Topics 3.4 to 3.11B - The genome

Flashcards

What is DNA?

What is DNA?

A double-stranded polymer of nucleotides, wound to form a double helix

What are the monomers of DNA?

What are the monomers of DNA?

Nucleotides

What are DNA nucleotides made up of?

What are DNA nucleotides made up of?

- Common sugar
- Phosphate group
- One of four bases: A, T, C or G

State the full names of the four bases found in nucleotides

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- **A**denine
- **T**hymine
- **C**ytosine
- **G**uanine

Describe how nucleotides interact to form a molecule of DNA

Describe how nucleotides interact to form a molecule of DNA

- Sugar and phosphate molecules join to form a sugar-phosphate backbone in each DNA strand
- Base connected to each sugar
- Complementary base pairs (A pairs with T, C pairs with G) joined by weak hydrogen bonds

Define genome

Define genome

The entire genetic material of an organism

What is a chromosome?

What is a chromosome?

A long, coiled molecule of DNA that carries genetic information in the form of genes

Define gene

Define gene

A section of DNA that codes for a specific sequence of amino acids which undergo polymerisation to form a protein

Describe the method used to extract DNA from fruit

Describe the method used to extract DNA from fruit

1. Place a piece of fruit in a beaker and crush it
2. Add detergent and salt, mix
3. Filter the mixture and collect the liquid in a test tube
4. Pour chilled ethanol into the test tube
5. DNA precipitates forming a fibrous white solid
6. Use a glass rod to collect the DNA sample

Why is detergent added to the crushed fruit?

Why is detergent added to the crushed fruit?

It disrupts the cell membranes, releasing DNA into solution

Why is salt added to the crushed fruit?

Why is salt added to the crushed fruit?

Salt encourages the precipitation of DNA

Why is chilled ethanol added rather water?

Why is chilled ethanol added rather water?

DNA is insoluble in ethanol, encouraging its precipitation

Explain how a gene codes for a protein (biology only/higher)

Explain how a gene codes for a protein (biology only/higher)

- A sequence of three bases in a gene forms a triplet
- Each triplet codes for an amino acid
- The order of amino acids determines the structure (i.e. how it will fold) and function of protein formed

Why is the ‘folding’ of amino acids important in proteins such as enzymes? (biology only/higher)

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The folding of amino acids determines the shape of the active site which must be highly specific to the shape of its substrate.

What is protein synthesis?
(biology only/higher)

What is protein synthesis? (biology only/higher)

The formation of a protein from a gene

What are the two stages of protein synthesis? (biology only/higher)

What are the two stages of protein synthesis?
(biology only/higher)

1. Transcription
2. Translation

What does transcription involve?
(biology only/higher)

What does transcription involve?

(biology only/higher)

The formation of mRNA from a DNA template

Outline transcription (biology only/higher)

Outline transcription (biology only/higher)

1. DNA double helix unwinds
2. RNA polymerase binds to a specific base sequence of non-coding DNA in front of a gene and moves along the DNA strand
3. RNA polymerase joins free RNA nucleotides to complementary bases on the coding DNA strand
4. mRNA formation complete. mRNA detaches and leaves the nucleus.

Describe the differences between mRNA and DNA (biology only/higher)

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- mRNA is single stranded whereas DNA is double stranded
- mRNA uses U whereas DNA uses T

Why is mRNA used in translation rather than DNA? (biology only/higher)

Why is mRNA used in translation rather than DNA? (biology only/higher)

DNA is too large to leave the nucleus so cannot reach the ribosome.

What does translation involve?
(biology only/higher)

What does translation involve? (biology only/higher)

A ribosome joins amino acids in a specific order dictated by mRNA to form a protein.

Outline translation (biology only/higher)

Outline translation (biology only/higher)

1. mRNA attaches to a ribosome
2. Ribosome reads the mRNA bases in triplets. Each triplet codes for one amino acid which is brought to the ribosome by a tRNA molecule
3. A polypeptide chain is formed from the sequence of amino acids which join together

How is a tRNA molecule adapted to its function? (biology only/higher)

How is a tRNA molecule adapted to its function? (biology only/higher)

Each tRNA molecule has an anticodon which is specific to the codon of the amino acid that it carries.

What is a mutation?
(biology only/higher)

What is a mutation? (biology only/higher)

A random change in the base sequence of DNA which results in genetic variants

Describe the effect of a gene mutation in coding DNA (biology only/higher)

Describe the effect of a gene mutation in coding DNA

(biology only/higher)

- If a mutation changes the amino acid sequence, protein structure and function may change
- If a mutation does not change amino acid sequence, there is no effect on protein structure or function

What is non-coding DNA?
(biology only/higher)

What is non-coding DNA? (biology only/higher)

DNA which does not code for a protein but instead controls gene expression

Describe the effect of a gene mutation in non-coding DNA (biology only/higher)

Describe the effect of a gene mutation in non-coding DNA (biology only/higher)

- A mutation may affect the ability of RNA polymerase to bind to non-coding DNA
- This may affect protein production and the resulting phenotype of the organism

Outline how the work of Mendel helped scientists to develop their understanding of genetics (biology only)

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- Mendel studied the inheritance of different phenotypes of pea plants
- He established a correlation between parent and offspring phenotypes
- He noted that inheritance was determined by ‘units’ passed on to descendants
- Using gene crosses, he devised the terms ‘dominant’ and ‘recessive’

Why was Mendel's work initially overlooked? (biology only)

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Scientist's didn't understand Mendel's work as there was no knowledge of genes or DNA at the time.