AQA Biology A-level

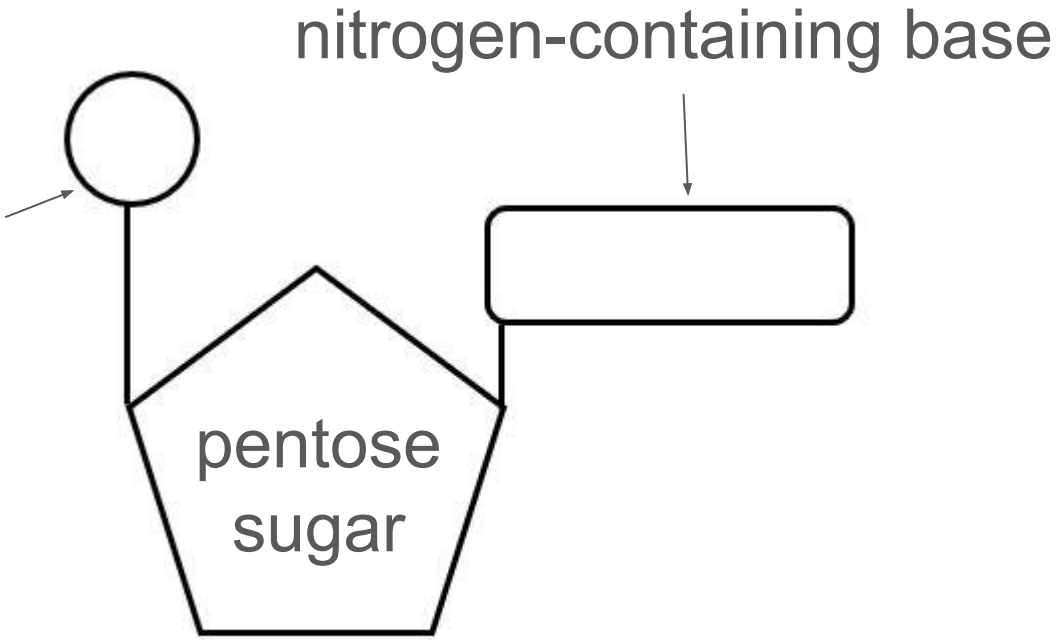
1.5 - Nucleic acids

1.6 - ATP

Flashcards

Draw the structure of a nucleotide.

Draw the structure of a nucleotide.



Name the pentose sugars in DNA & RNA.

Name the pentose sugars in DNA & RNA.

DNA: deoxyribose

RNA: ribose

State the role of DNA in living cells.

State the role of DNA in living cells.

Base sequence of genes codes for functional RNA & amino acid sequence of polypeptides.

Genetic information determines inherited characteristics = influences structure & function of organisms.

State the role of RNA in living cells.

State the role of RNA in living cells.

mRNA: Complementary sequence to 1 gene from DNA with introns (non-coding regions) spliced out. Codons can be translated into a polypeptide by ribosomes.

rRNA: component of ribosomes (along with proteins)

tRNA: supplies complementary amino acid to mRNA codons during translation

How do polynucleotides form?

How do polynucleotides form?

Condensation reactions between nucleotides form strong phosphodiester bonds (sugar-phosphate backbone).

Describe the structure of DNA.

Describe the structure of DNA.

double helix of 2 polynucleotide strands (deoxyribose)

H-bonds between **complementary** purine & pyrimidine base pairs on opposite strands:
adenine (**A**) + thymine (**T**)
guanine (**G**) + cytosine (**C**)

Which bases are purine and which are pyrimidine?

Which bases are purine and which are pyrimidine?

A & G = **2-ring purine** bases

T & C & U = **1-ring pyrimidine** bases

Name the complementary base pairs in DNA.

Name the complementary base pairs in DNA.

2 H-bonds between

adenine (**A**) + thymine (**T**)

3 H-bonds between

guanine (**G**) + cytosine (**C**)

Name the complementary base pairs in RNA.

Name the complementary base pairs in RNA.

2 H-bonds between

adenine (**A**) + uracil (**U**)

3 H-bonds between

guanine (**G**) + cytosine (**C**)

Relate the structure of DNA to its functions.

Relate the structure of DNA to its functions.

- sugar-phosphate backbone & many H-bonds provide stability
- long molecule stores lots of information
- helix is compact for storage in nucleus
- base sequence of triplets codes for amino acids
- double-stranded for semi-conservative replication
- complementary base pairing for accurate replication
- weak H-bonds break so strands separate for replication

Describe the structure of messenger RNA (mRNA).

Describe the structure of messenger RNA (mRNA).

- Long ribose polynucleotide (but shorter than DNA).
- Contains uracil instead of thymine.
- Single-stranded & linear (no complementary base pairing).
- Codon sequence is complementary to exons of 1 gene from 1 DNA strand.

Relate the structure of messenger RNA (mRNA) to its functions.

Relate the structure of messenger RNA (mRNA) to its functions.

NB: functions given in same order as related structural feature on previous slide

- Breaks down quickly so no excess polypeptide forms.
- Ribosome can move along strand & tRNA can bind to exposed bases.
- Can be translated into a specific polypeptide by ribosomes.

Describe the structure of transfer RNA (tRNA).

Describe the structure of transfer RNA (tRNA).

- Single strand of about 80 nucleotides.
- Folded into clover shape (some paired bases).
- Anticodon on one end, amino acid binding site on the other:

a) anticodon binds to complementary mRNA codon

b) amino acid corresponds to anticodon

Order DNA, mRNA and tRNA according to increasing length.

Order DNA, mRNA and tRNA according to increasing length.

tRNA

mRNA

DNA

Why did scientists initially doubt that DNA carried the genetic code?

Why did scientists initially doubt that DNA carried the genetic code?

Chemically simple molecule with few components.

Why is DNA replication described as ‘semiconservative’?

Why is DNA replication described as ‘semiconservative’?

- Strands from original DNA molecule act as a template.
- New DNA molecule contains 1 old strand & 1 new strand.

Outline the process of semiconservative DNA replication.

Outline the process of semiconservative DNA replication.

1. **DNA helicase** breaks H-bonds between base pairs.
2. Each strand acts as a template.
3. Free nucleotides from nuclear sap attach to exposed bases by complementary base pairing.
4. **DNA polymerase** catalyses condensation reactions that join adjacent nucleotides on new strand.
5. H-bonds reform.

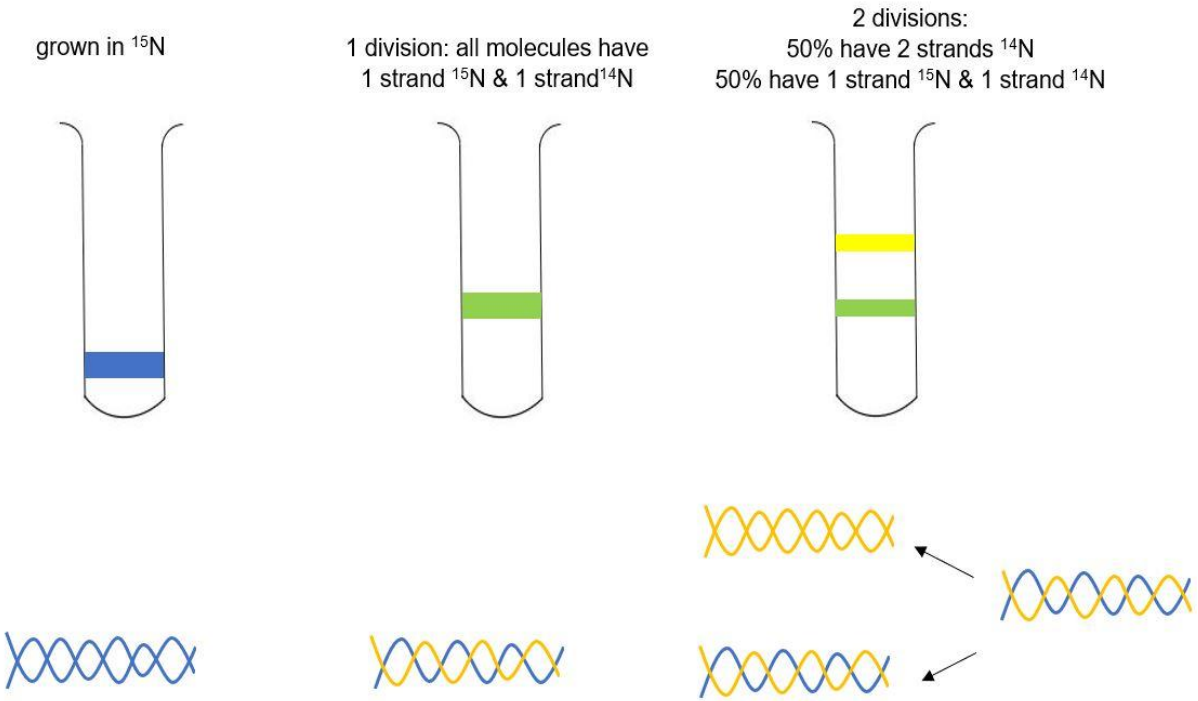
Describe the Meselson-Stahl experiment.

Describe the Meselson-Stahl experiment.

1. Bacteria were grown in a medium containing heavy isotope ^{15}N for many generations.
2. Some bacteria were moved to a medium containing light isotope ^{14}N. Samples were extracted after 1 & 2 cycles of DNA replication.
3. Centrifugation formed a pellet. Heavier DNA (bases made from 15N) settled closer to bottom of tube.

Explain how the Meselson-Stahl experiment validated semiconservative replication.

Explain how the Meselson-Stahl experiment validated semiconservative replication.



Describe the structure of adenosine triphosphate (ATP).

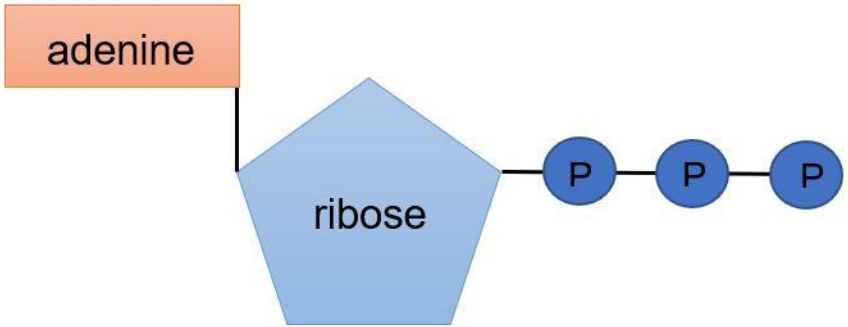
Describe the structure of adenosine triphosphate (ATP).

nucleotide

derivative of

adenine with 3

phosphate groups



Explain the role of ATP in cells.

Explain the role of ATP in cells.

ATP hydrolase catalyses **ATP → ADP + Pi**

- Energy released is **coupled** to metabolic reactions.
- Phosphate group **phosphorylates** compounds to make them more reactive.

How is ATP resynthesised in cells?

How is ATP resynthesised in cells?

- **ATP synthase** catalyses condensation reaction between ADP & Pi
- during photosynthesis & respiration

Explain why ATP is suitable as the ‘energy currency’ of cells.

Explain why ATP is suitable as the ‘energy currency’ of cells.

- High energy bonds between phosphate groups.
- Small amounts of energy released at a time = less energy wasted as heat.
- Single-step hydrolysis = energy available quickly.
- Readily resynthesised.