



Education
Services Ltd

EB Education Revision Guide



BELIEVE YOU CAN
and you're halfway there

Theodore Roosevelt –

How to work with DNA

...helping everybody achieve Even Better

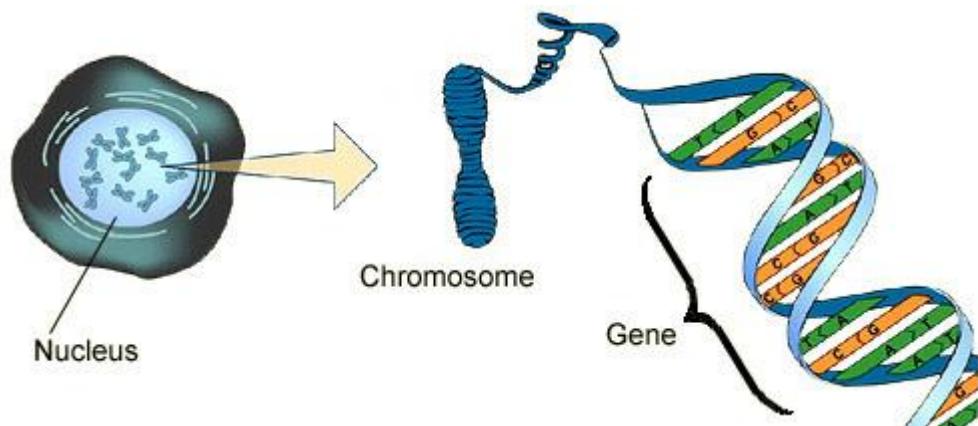
What is DNA?

DNA molecules are large and complex. They carry the instructions for your characteristics. Everyone's DNA is unique (except for identical twins).

DNA is stored as long threads called **chromosomes** in the nucleus of eukaryotic cells.

A **gene** is a section of DNA on a chromosome that codes for a specific protein.

Diagram





Structure of DNA

What is DNA made of?

DNA is made of two strands, coiled together in the shape of a **double helix**.

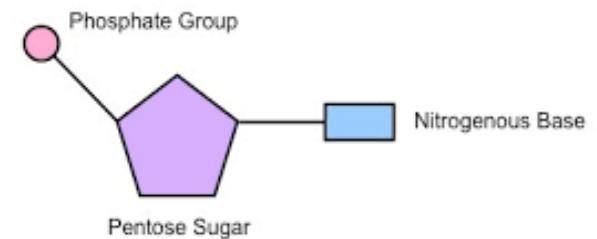
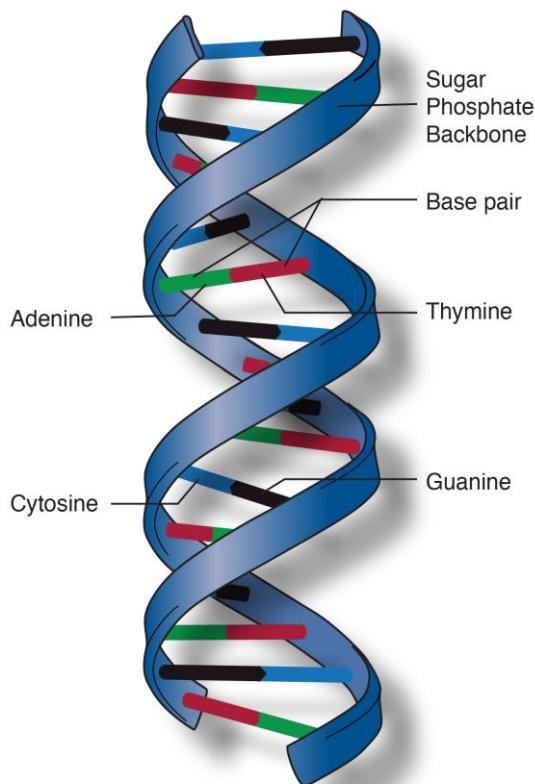
The strands of DNA are made of many repeating units called **nucleotides**.

Each nucleotide is made of

- 1 sugar molecule
- 1 phosphate molecule
- 1 base

The sugar and phosphate molecules form the backbone of the DNA strands. The bases link the two strands together.

Diagram





Structure of DNA

What is DNA made of?

There are four different bases:

- Adenine (A)
- Thymine (T)
- Guanine (G)
- Cytosine (C)

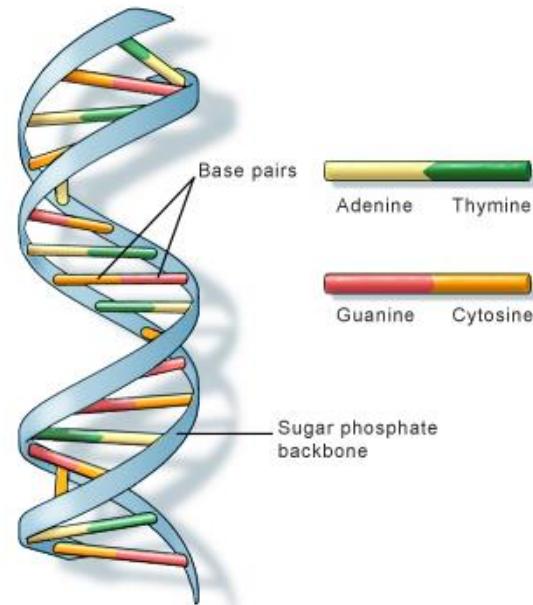
They always pair up in a particular way, called **complementary base pairing**.

Adenine always pairs with thymine.

Cytosine always pairs with guanine.

The complementary base pairs are joined together by **weak hydrogen bonds**.

Diagram





Extracting DNA

How to extract DNA from fruit

You can extract DNA from fruit cells with a simple practical.

- Mash some fruit like strawberries or kiwi and place into a beaker
- Add a teaspoon of salt and a small volume of washing up liquid to the fruit and mix it all up

The detergent breaks down the cell membranes to allow the DNA to get out.

The salt makes the DNA stick together.

- Filter the mixture to remove the large insoluble pieces of cell.
- Add some ice-cold alcohol to the filtrate.

The alcohol allows the DNA to precipitate out of the solution as it is not soluble in cold alcohol.

- Use a glass rod to extract the stringy white precipitate of DNA.

Diagram





Your turn:

(b) The sperm cell contains DNA.

Describe the structure of DNA.

(3)

2 A DNA molecule consists of two strands coiled to form a double helix.

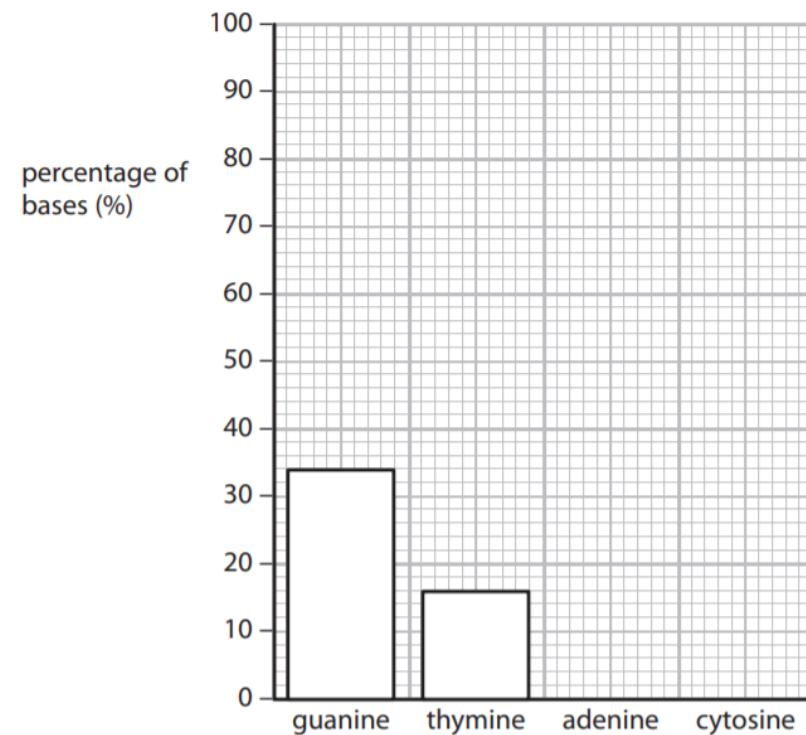
(a) Describe how the two strands of a DNA molecule are linked together.

(2)

(b) The bar chart shows the percentage of guanine and thymine in a sample of DNA.

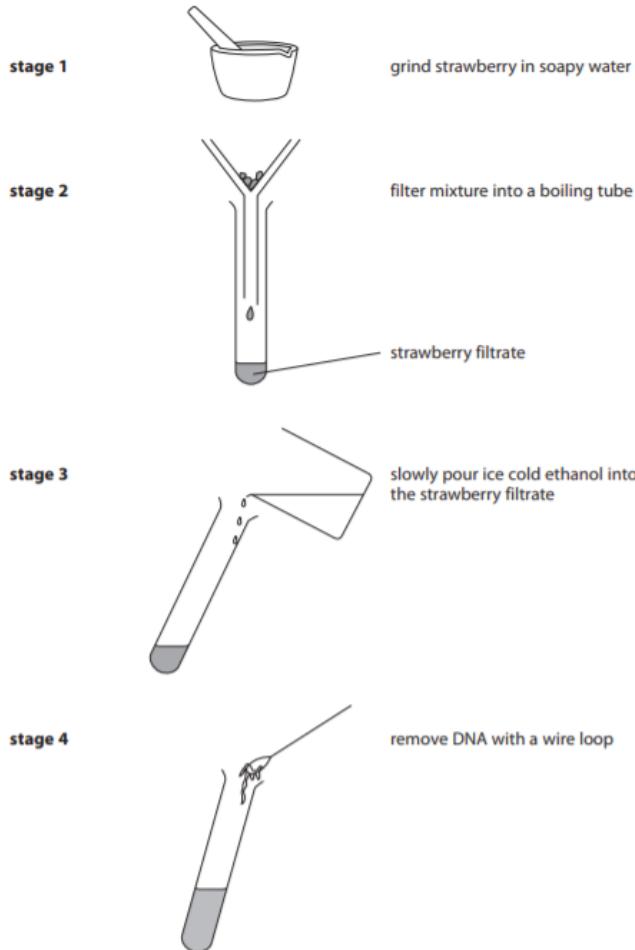
Complete the bar chart to show the percentage of adenine and cytosine in the sample.

(2)





(b) Some students extracted DNA from strawberries.
The diagram shows the method used.



Suggest the purpose of stages 1 and 3 in the DNA extraction.

(2)

stage 1

stage 3

This question tests some additional knowledge about another nucleic acid, mRNA. Can you answer it? If not – have a look at our blog and new guide to protein synthesis next week!

(c) The diagram shows part of one DNA strand.

(i) Complete the empty boxes to show the mRNA strand coded for by this DNA strand.

(2)

DNA strand

G	G	C	T	A	G	T	T	G
---	---	---	---	---	---	---	---	---

mRNA strand

--	--	--	--	--	--	--	--	--

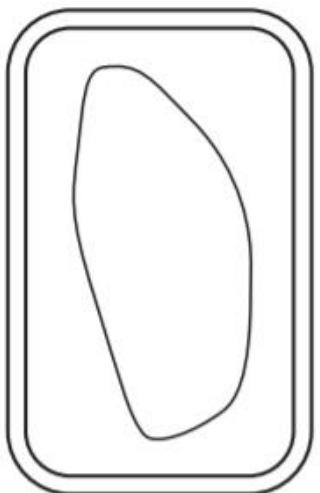


Your turn:

(ii) This DNA is found in a structure within a cell of a strawberry plant.

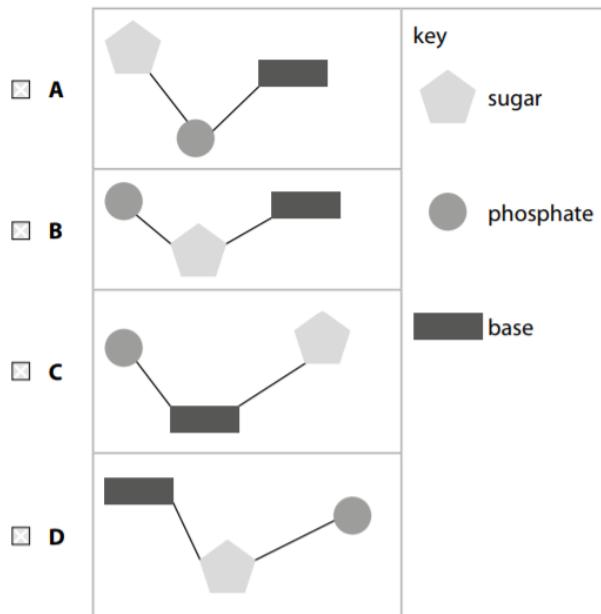
On the diagram of a plant cell, draw and name the structure containing DNA.

(2)



(i) Which diagram represents the arrangement of the sugar, phosphate and the base in a DNA nucleotide?

(1)



(ii) An allele starts with the DNA sequence ATGCATGTACCG.

Give the sequence of the complementary DNA sequence.

(1)



Answers:

(b) The sperm cell contains DNA.

Describe the structure of DNA.

(3)

DNA is a double helix

The strands are made of sugar and phosphate molecules forming a sugar-phosphate backbone

The strands are held together by complementary base pairings, A and T, and C and G

Base pairings are held together by weak hydrogen bonds

2 A DNA molecule consists of two strands coiled to form a double helix.

(a) Describe how the two strands of a DNA molecule are linked together.

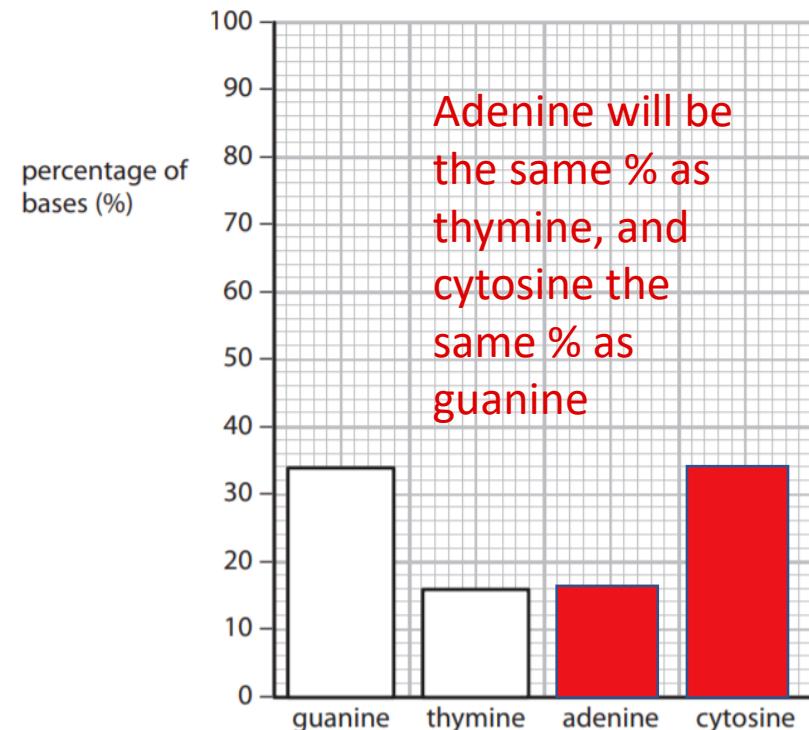
(2)

Hydrogen bonds between the complementary base pairs

(b) The bar chart shows the percentage of guanine and thymine in a sample of DNA.

Complete the bar chart to show the percentage of adenine and cytosine in the sample.

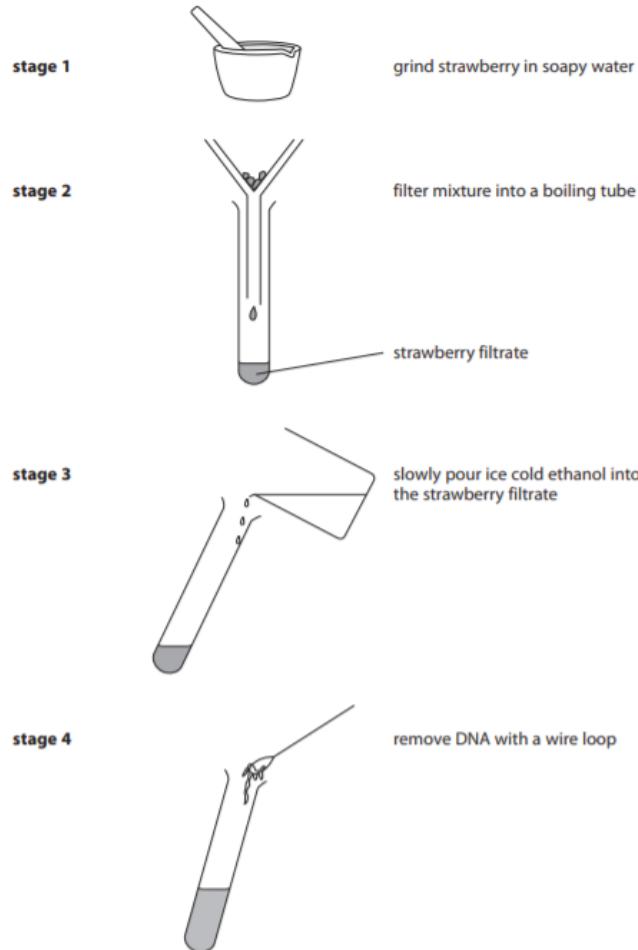
(2)





Answers:

(b) Some students extracted DNA from strawberries.
The diagram shows the method used.



Suggest the purpose of stages 1 and 3 in the DNA extraction.

(2)

stage 1 **To break down the cell membranes and release the DNA**

stage 3 **To precipitate the DNA from the solution**

(c) The diagram shows part of one DNA strand.

(i) Complete the empty boxes to show the mRNA strand coded for by this DNA strand.

(2)

DNA strand	G	G	C	T	A	G	T	T	G
mRNA strand	C	C	G	A	U	C	A	A	C

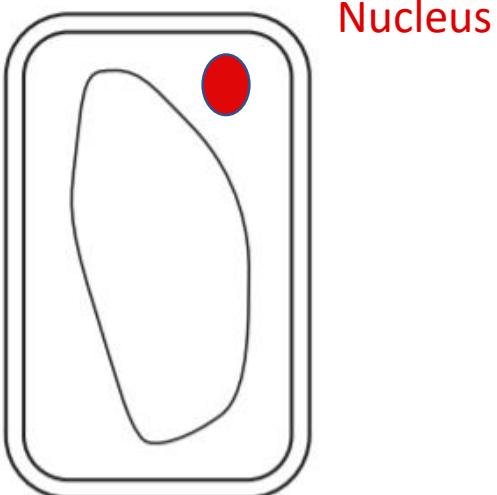


Answers:

(ii) This DNA is found in a structure within a cell of a strawberry plant.

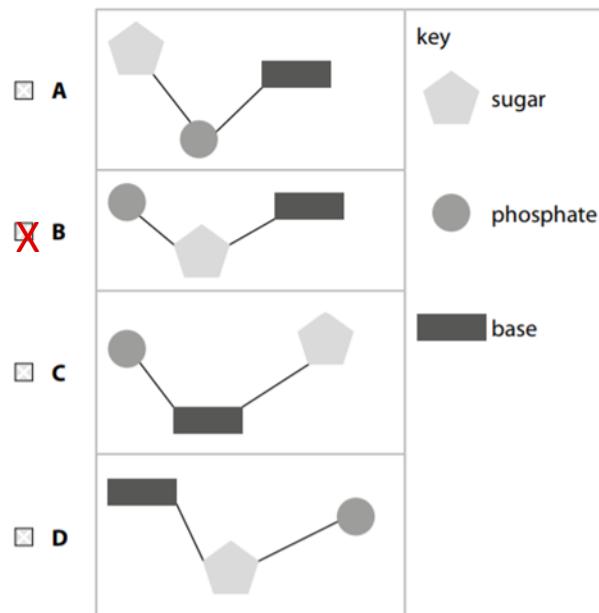
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(ii) An allele starts with the DNA sequence ATGCATGTACCG.

Give the sequence of the complementary DNA sequence.

(1)

TACGTACATGGC



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