Everything you need to know about…

DNA

GCSE recap:

1. What is a gene?
2. Where do you find one?
3. What is a gene made of?

DNA & Genes

A gene is a sequence of _____ that codes for a specific _____/_____ (or_____)
They are found within the _____ of _____ .

DNA is a long molecule consisting of **Deoxyribose**, **Phosphate**, and a **nitrogenous base**. One of each of these components bonded together correctly forms a **nucleotide**. The whole DNA molecule has **two strands**, and twists together to form a _____ _____.

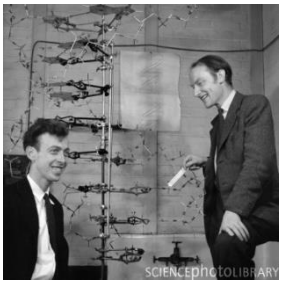
There are __ different nitrogenous bases, _____, _____, _____, _____.

These are shortened to their respective letters, ___, ____, ___, ___.

The bases form weak bonds between the two strands, which holds the whole structure together. There are very strict rules governing which base bonds with which base:

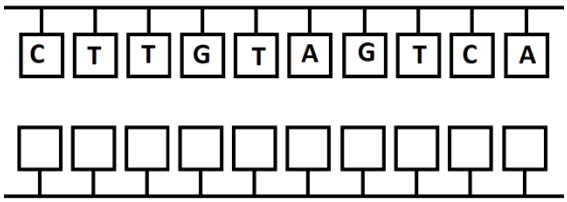
Adenine will always bond with _____

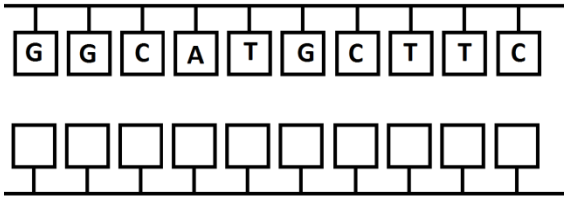
Guanine will always bind with _____



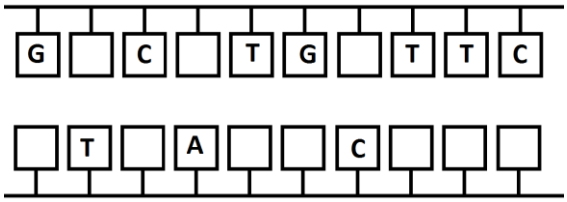
James Watson (left) discovered which base bonded to which other by using X ray crystallography. Although Rosalin Franklin has a massive part to play she did not win a nobel prize. (Maybe have a good read about her, she is one of the unsung heroes of modern biology)

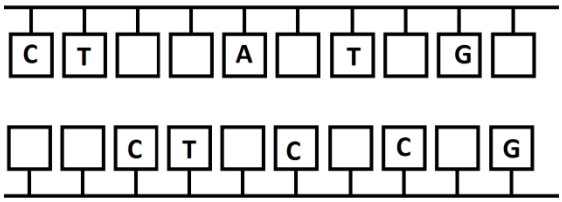
With your knowledge of base pairing, correctly work out the complementary strand for the given DNA molecules:





Extension: Fill in the missing bases. Colour in each base , ACGT an original colour.





DNA Replication

DNA is used to store information because it is:

a) Durable
b) Easily copied

It is easy to copy DNA due to the base pairing rule, as any free Cytosine will make a link with a free _____ and so on.

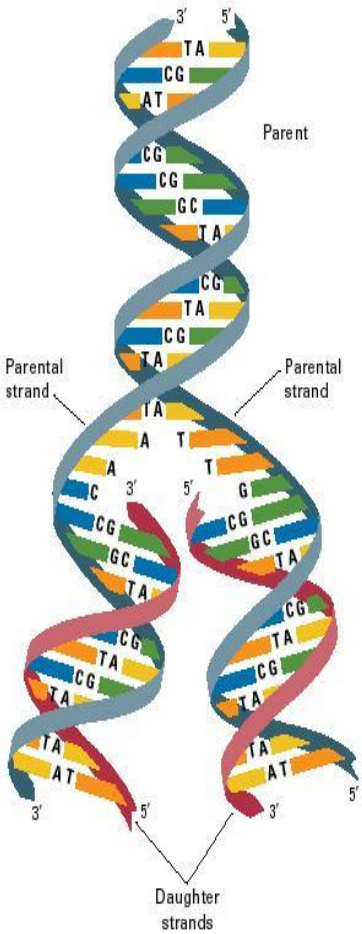
When DNA replicates, the **double helix strand is split in half** by DNA Helicase (an enzyme which effectively 'unzips' the molecule breaking _____ bonds).

Free nucleotides rush in and bond with their opposite bases, creating a new complementary DNA strand.

As you can see, when one DNA is replicated, half of the original DNA is in one new strand and half is in the other.

This process is technically known as 'semiconservative replication', explain why.

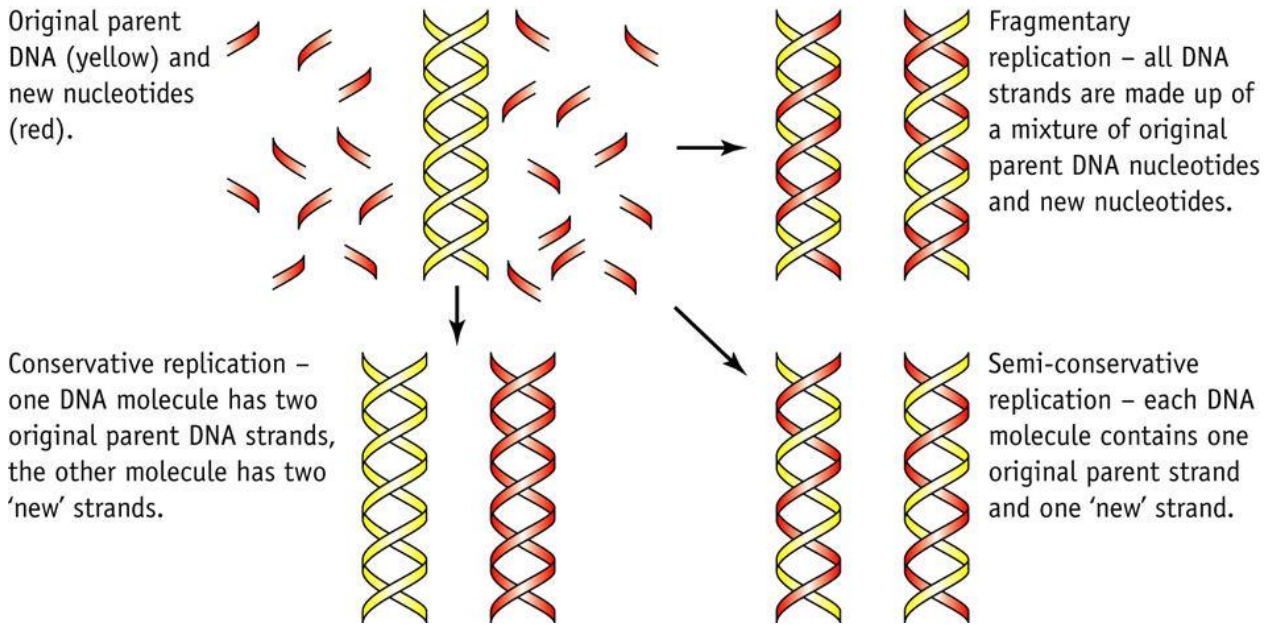
_____
_____
_____
_____
_____
_____



Evidence for DNA replication - What you need to know.

The specification says:

Describe DNA replication (including the role of DNA polymersase), and explain how Meselson ans Stahl's classic experiment provided new data that supported the accepted theory of replication of DNA and refuted other theories.



There are three models we now know that the semi conservative model is correct. **But why?**

In the conservative model = two whole new strands of DNA are produced

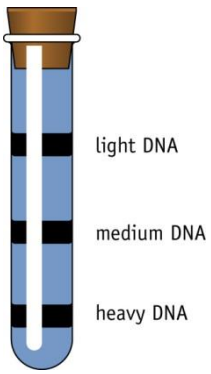
In the semi conservative model = one parent strand and one new strand

Fragmentary model = DNA is made up of a mixture of parent DNA and new DNA nucleotides.

YOU DO NOT NEED TO KNOW THE OTHER TWO REPLICATION THEORIES IN DETAIL JUST WHY THEY EXIST AND WHAT EVIDENCE FROM MESELSON AND STAHL PROVED THEIR THEORY CORRECT.

Meselson ans Stahl used heavy and light nitrogen atoms to prove their theory correct. Bacteria will take in nitrogen from their environment and incorporate it into their DNA.

This principle meant that they could see which theory was correct as once centrifuged (or sorting out the strands into 'heaviness') they could see which nitrogen atoms had been incorporated into the DNA during replication.



When the scientists centrifuged they found a single band of medium DNA after one replication. This must mean that there was one original strand plus one heavy strand N14 + N15. This means that the conservative model can be ruled out as this would mean there would be two heavy strands

When they centrifuged for a second time they found a light and a medium band. This means that as the DNA strand split into heavy and normal there would be two strands that were N14 +N14 and two strands that were N14+ N15.

This refuted the fragmentary model as all of the DNA would have been of medium density even on the second replication.

4. (a) Name a component of DNA that contains nitrogen.

.....

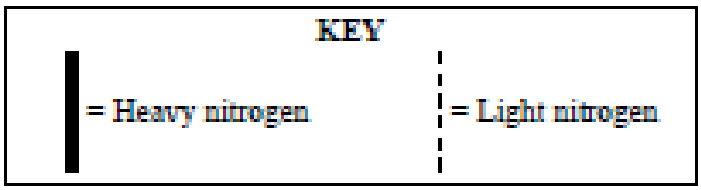
(1)

(b) When bacteria are grown in conditions containing a heavy form of nitrogen, they will incorporate the heavy nitrogen into their DNA each time DNA replication occurs. After many replications in these conditions, all the nitrogen in the bacterial DNA will be of the heavy form.

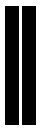
If the bacteria are then switched to conditions containing a light form of nitrogen, this will become incorporated each time DNA replication occurs.

The diagram below shows the changes in the DNA composition, over two DNA replications, after the bacteria have been transferred from conditions containing heavy nitrogen to conditions containing light nitrogen.

Complete the diagram to show the DNA composition in the third generation.



DNA before replication in light nitrogen conditions



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DNA after the first replication in light nitrogen conditions

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DNA after the second replication in light nitrogen conditions

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DNA after the third replication in light nitrogen conditions

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(2)