

# 2.2

# CHROMOSOMES

# GENES &

# DNA

Name \_\_\_\_\_

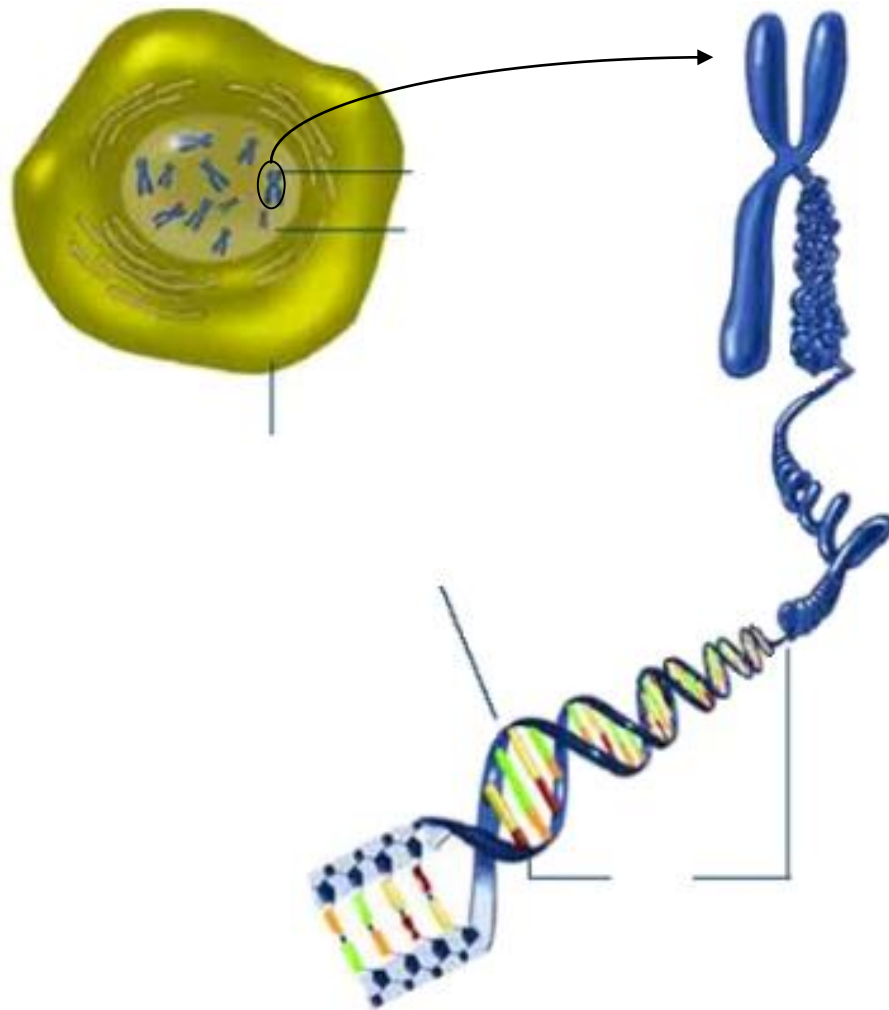
**LEARNING OUTCOMES**  
**CCEA GCSE BIOLOGY: 2.2.1 - 2.2.7, & 2.54**  
**UNIT 2.2 Chromosomes, Genes & DNA**

	LEARNING OUTCOMES	PUPIL SELF-EVALUATION		
		Good	Average	Requires Attention
	Pupils should be able to:			
2.2.1	Identify and describe chromosomes as genetic structures in the nucleus of a cell			
2.2.2	Know that chromosomes occur as functional pairs (except in sex cells)			
2.2.3	Identify and describe genes as sections of chromosomes that operate as functional units to control characteristics			
2.2.4	Know that genes are short lengths of DNA			
2.2.5	Understand the structure of DNA to include:			
	• a phosphate and sugar (deoxyribose) backbone with interlinking bases to form a double helix;			
	• base pairing rules and the unique nature of an individual's DNA;			
	• <b><i>the link between the DNA code and the building up of amino acids in the correct sequence to form protein – the base triplet hypothesis (transcription and translation not required)</i></b>			
2.2.6	<b><i>Describe how the work of Chargaff, Franklin and Wilkins, and Watson and Crick (in outline only), using different lines of evidence, led to the discovery of the structure of DNA.</i></b>			
2.2.7	<b><i>Know that the development of the scientific theory of the structure of DNA is an example of the collaborative nature of science, that many scientific theories are developed in stages using different lines of evidence, and how new scientific knowledge is validated (for example peer review).</i></b>			

Terminology
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UNIT TEST RESULT:	%	GRADE:	
COMMENT			

# Chromosomes Genes and DNA



**Chromosomes** are genetic structures found in the nucleus of a cell.

They are made of **DNA (deoxyribonucleic acid)** and occur as functional pairs **except in sex cells** (sperm and eggs).

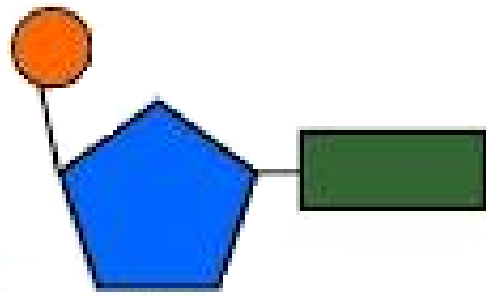
Genes are short sections of chromosomes that operate as functional units to control characteristics. **Genes are short lengths of DNA.**

There are hundreds of genes contained in a chromosome.

# DNA Structure

DNA is made up of units called **nucleotides** which contain:

- A deoxyribose sugar
- A phosphate group
- A base



Nucleotides join together to form long chains.

Two chains are joined together by their bases.

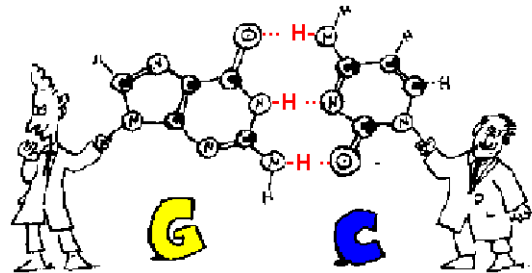
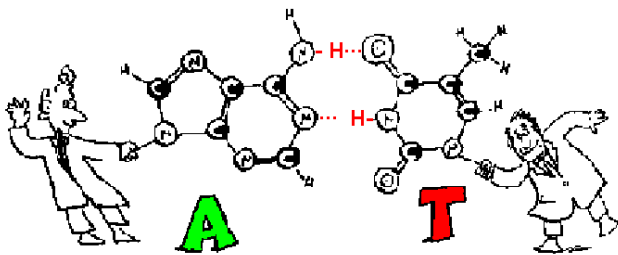
There are four types of bases

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

Bases joined on opposite chains are called **base pairs**.

**Adenine** always binds with **Thymine**

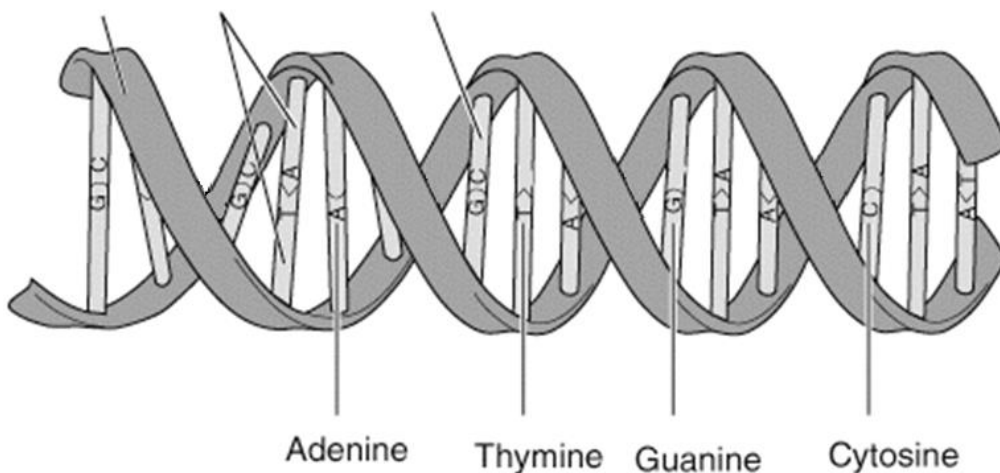
**Guanine** always binds with **Cytosine**



**AT Glenlola Collegiate**

The two chains run in opposite directions (**antiparallel**).

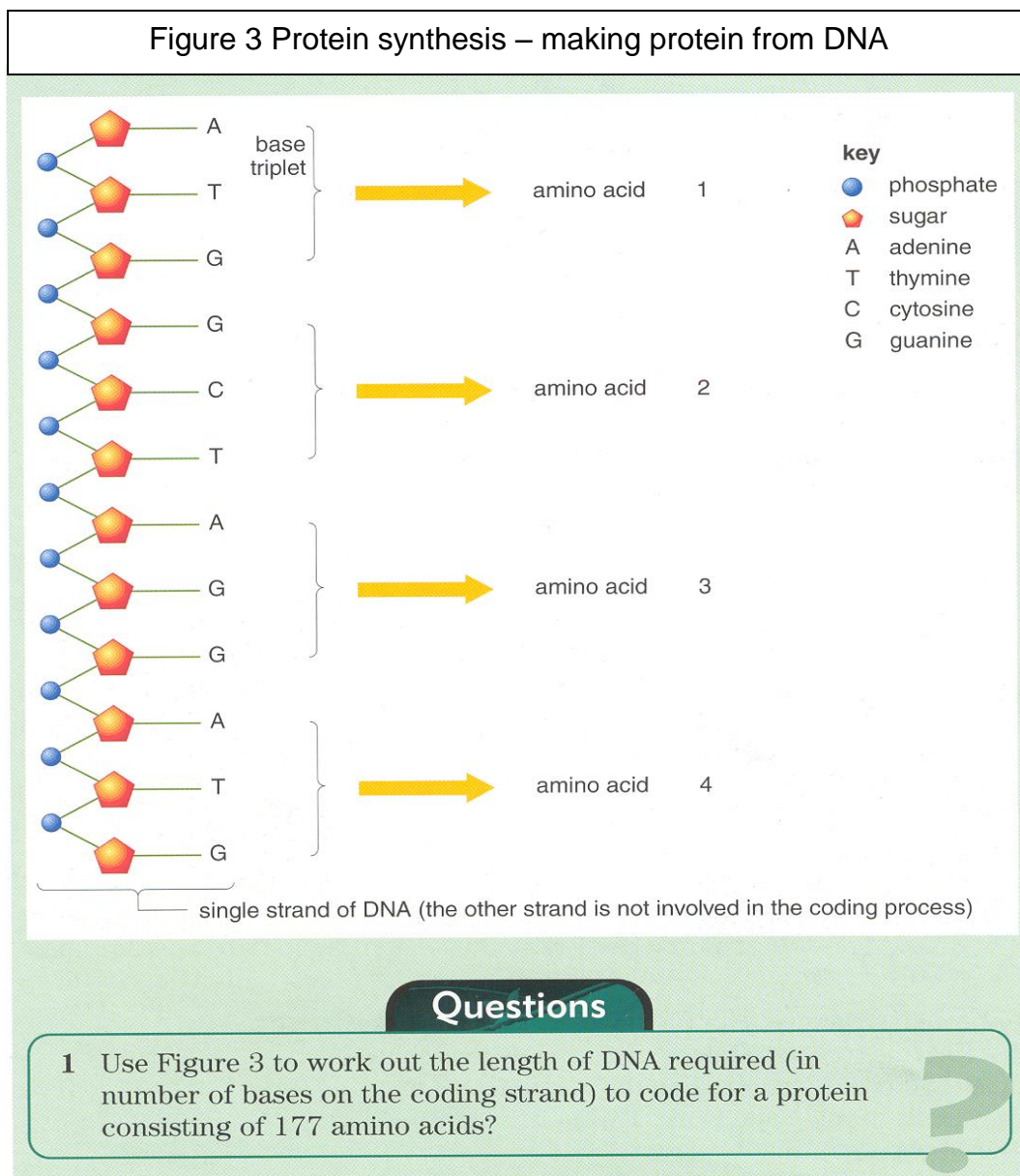
The DNA chains twist to form a **double helix**.



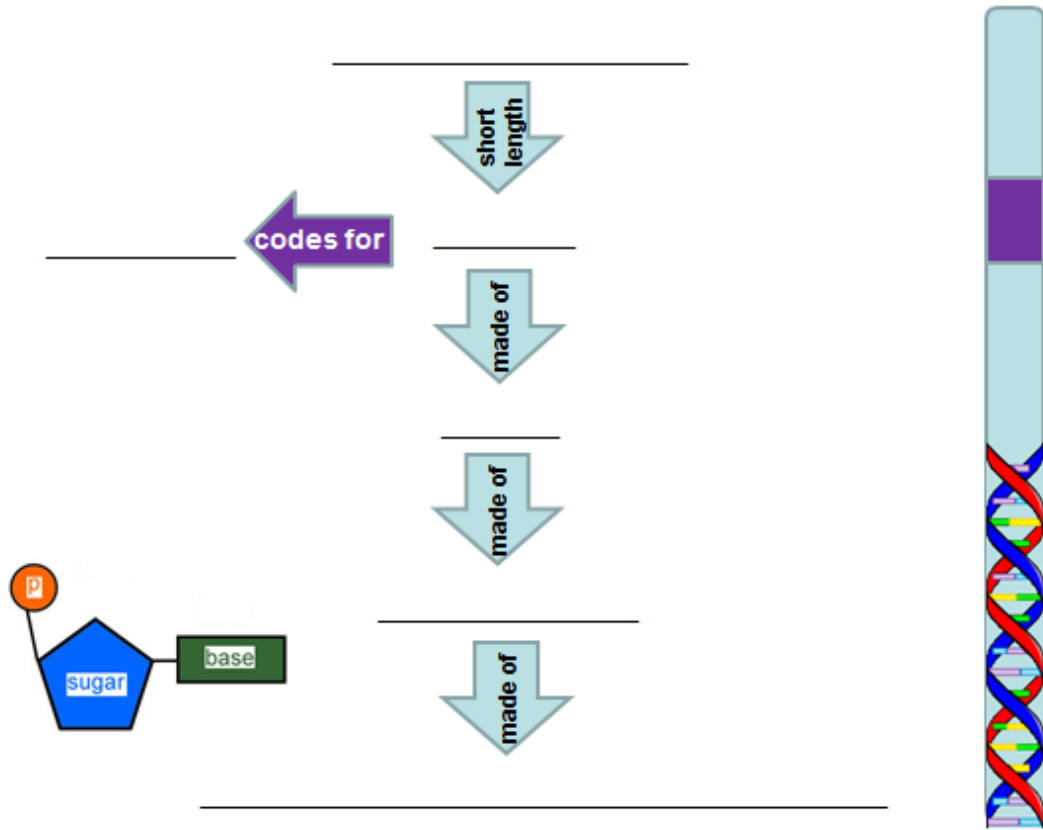
Highlight the base names in 4 different colours and then colour in the base pairs

# How does DNA work?

- DNA provides **a code** which allows the cell to make **protein**.
- The most common proteins that the DNA makes are **enzymes**.
- By making enzymes DNA controls **the development of the cell**.
- The bases along **one side** of the DNA molecule form **the genetic code**.
- Each sequence of **three bases** is called a **base triplet**.
- Each base triplet **codes for an amino acid**. Amino acids are the building blocks of **proteins**.



# SUMMARY



# Who discovered DNA?

# Development of the scientific theory of the structure of DNA



The scientific paper published by Watson and Crick in Nature magazine in 1951 and the model that they built was the result of scientists sharing their scientific knowledge.

The scientific theory of the structure of DNA was **developed in stages, with input from a number of different lines of evidence.**

The theory was **validated by peer review.**

Scientists working in this field reviewed the scientific paper and the model.

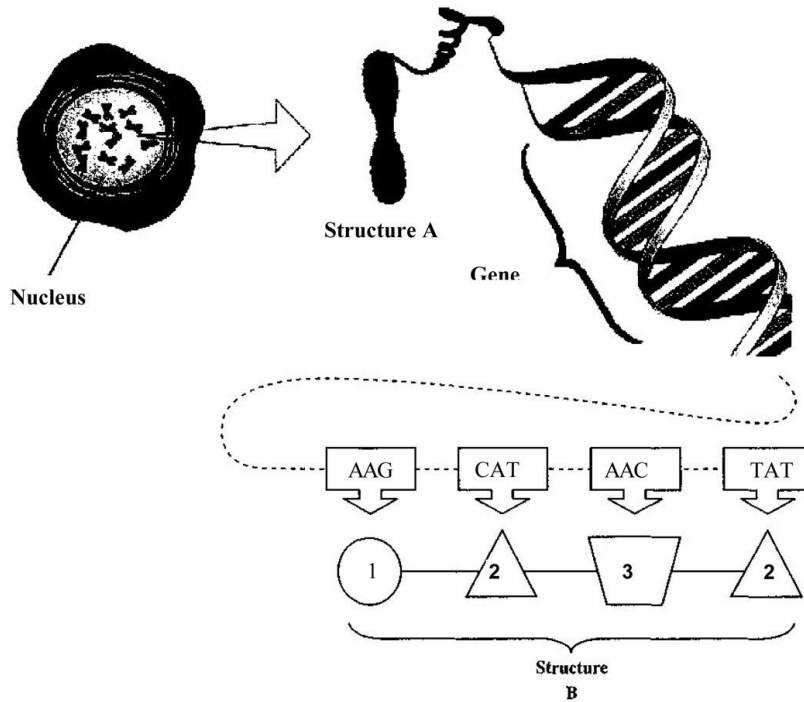
This is an example of the **collaborative nature of science.**



What is a chromosome?

[2]

The diagram shows the location and function of DNA in a cell.



Source: [http://www.bbc.co.uk/schools/gcsebitesize/science/ocr\\_gateway/ourselves/6\\_gene\\_control.shlml](http://www.bbc.co.uk/schools/gcsebitesize/science/ocr_gateway/ourselves/6_gene_control.shlml)

(i) Name structures A and B.

A \_\_\_\_\_ [1]

B \_\_\_\_\_ [1]

(ii) Describe the effect on structure B of a mutation, where G (guanine) was replaced by C (cytosine), in the DNA strand.

[2]

Early workers used X-ray crystallography to help determine the shape of a DNA molecule.

(i) Name the scientist who used X-ray crystallography.

\_\_\_\_\_ [1]

(ii) What term is used to describe the shape of a DNA molecule?

\_\_\_\_\_ [1]