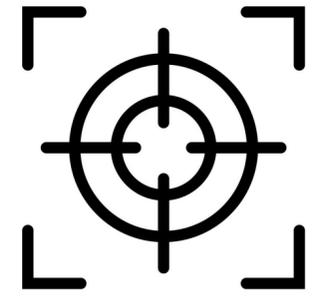




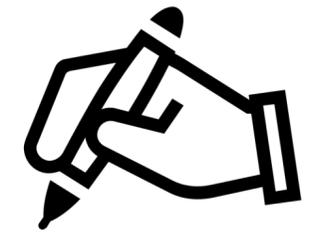
Topic 14: Molecular Genetics

Chapter Analysis



FOCUS

- may be an abstract topic for some
- linked to inheritance chapter



EXAM

- commonly tested in MCQ and structured questions
- tested once in section B in the past 5 years

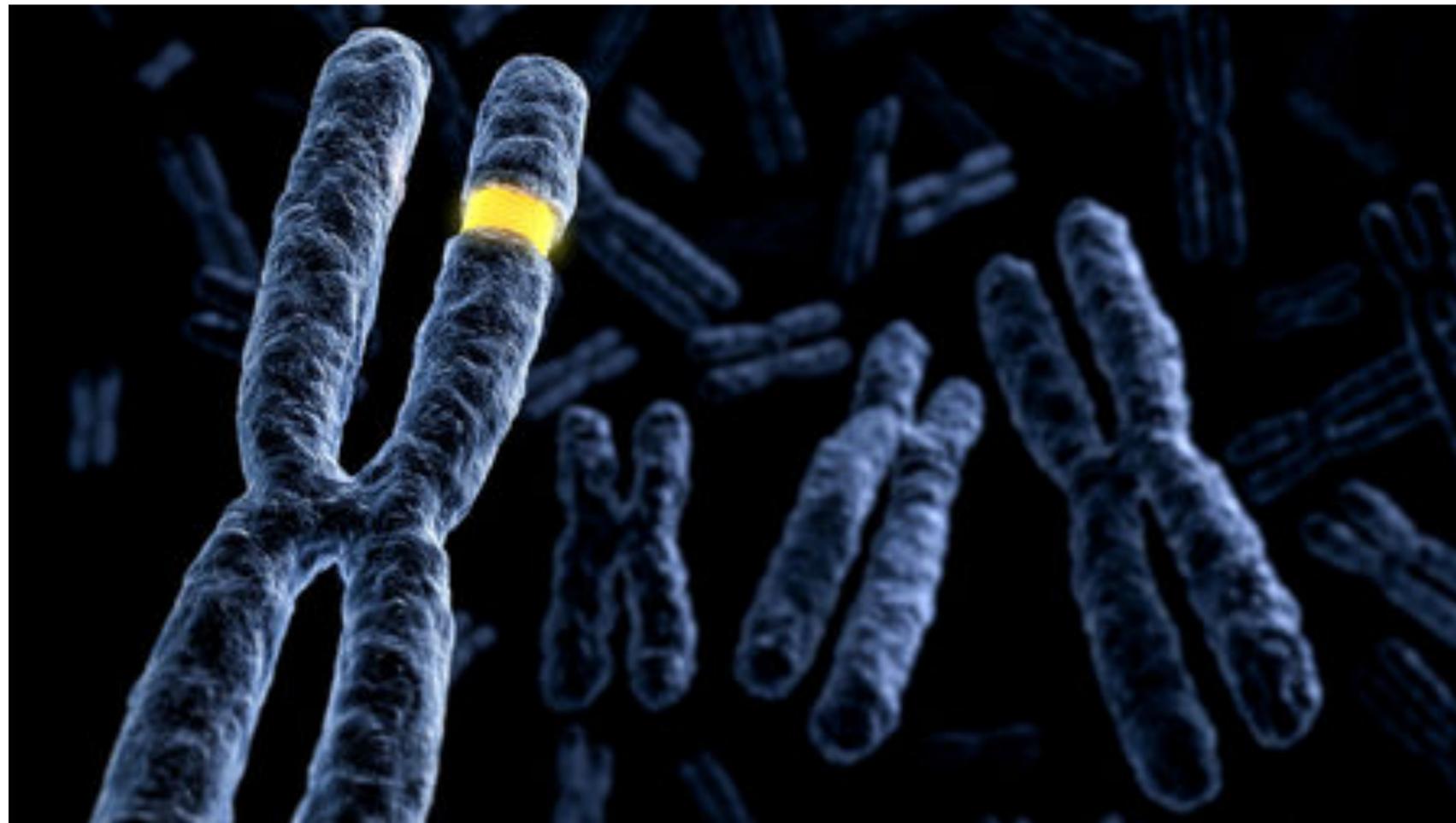


WEIGHTAGE

- Constitute to around 5% in Paper 2 in the past 5 years

Key Concept

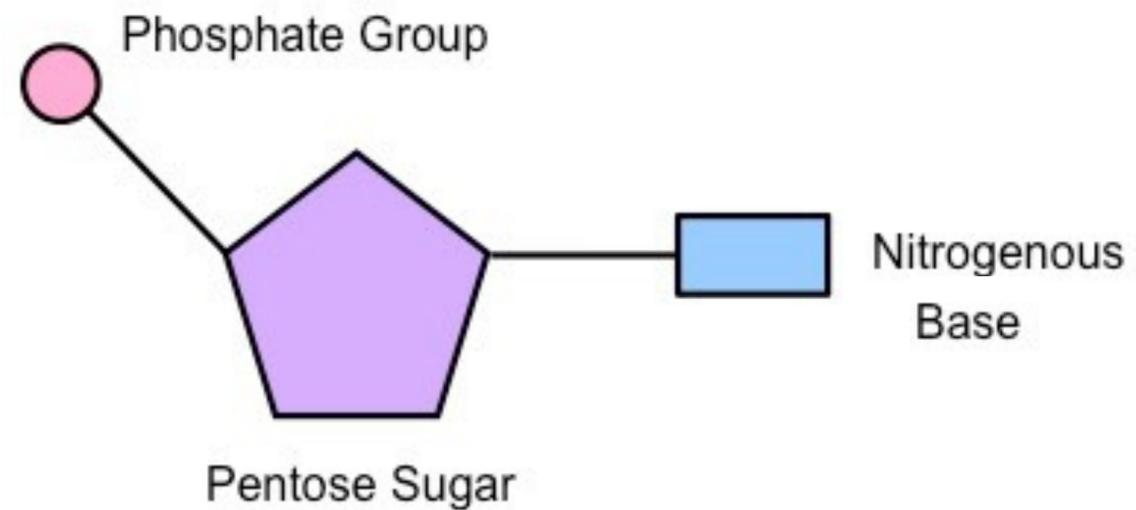
DNA, gene, chromosome



DNA

nucleotide

- Deoxyribonucleic acid (DNA) is a molecule that **carries genetic code** which is used to synthesise specific polypeptides
- DNA is a double stranded molecules that are twisted around each other to form **double helix structure** of DNA.
- The **basic units** of DNA is called **nucleotides**.



Each nucleotide consists of:

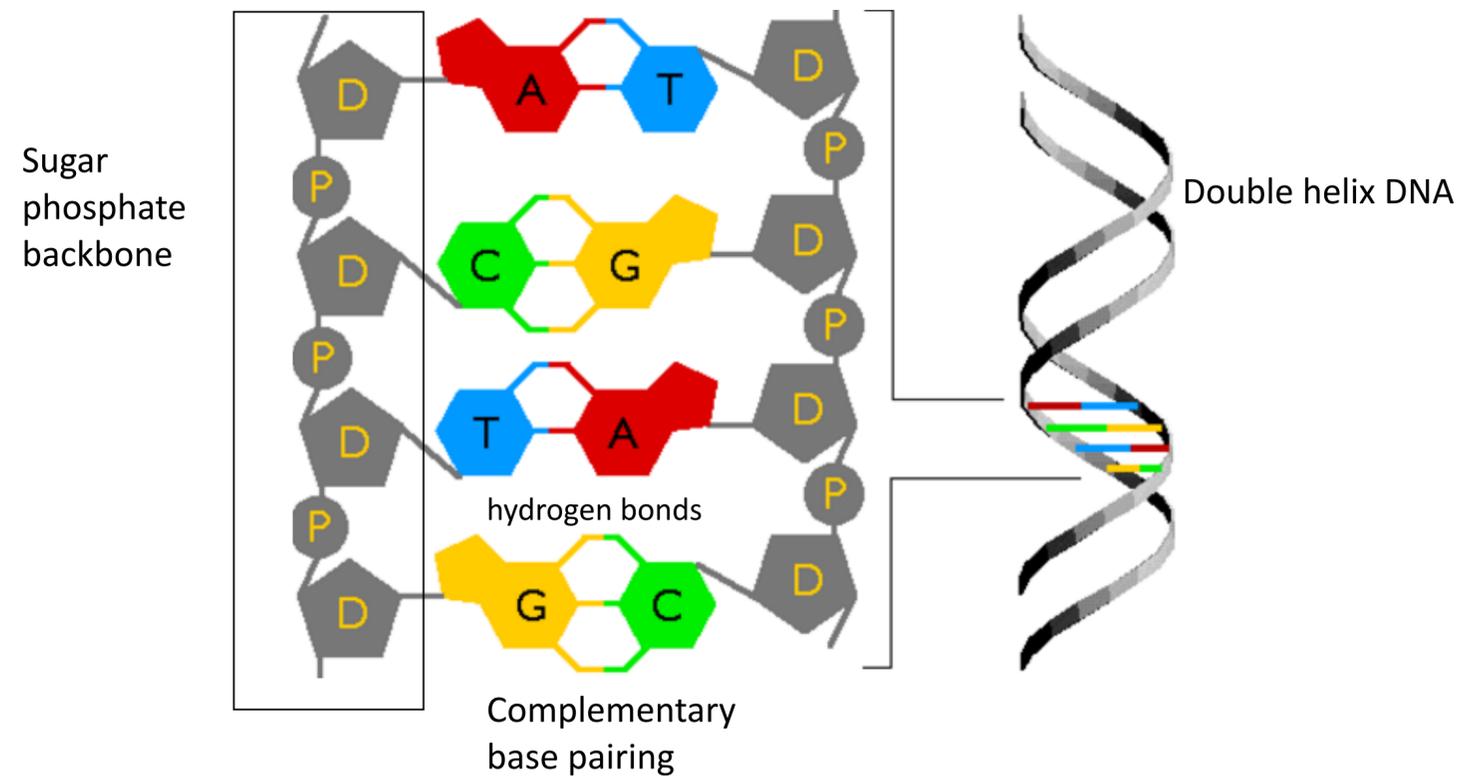
- A deoxyribose sugar
- A phosphate group
- A base containing nitrogen

There are **four types of nitrogenous bases**:

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

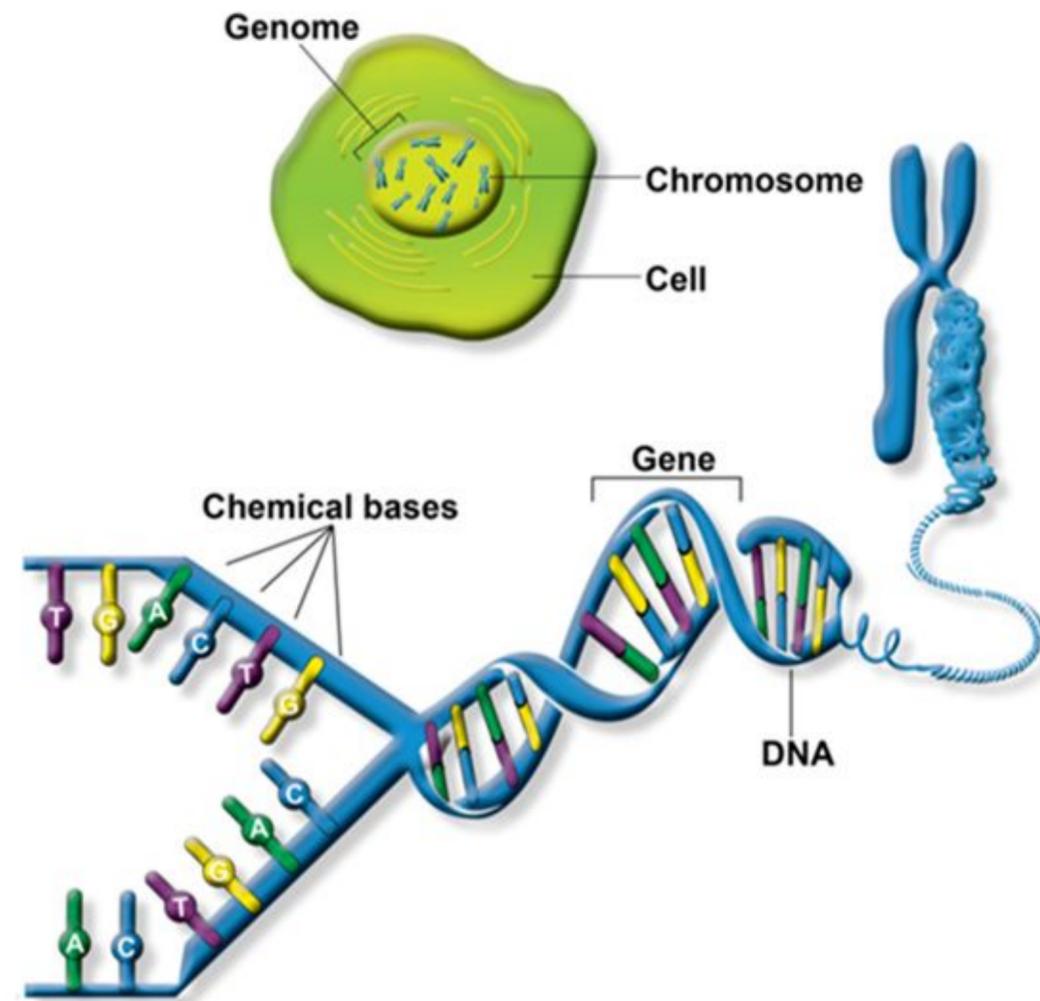
DNA

polynucleotide



- The nucleotides polymerise to form a polynucleotide when the deoxyribose sugars of the nucleotides are joined together by phosphate groups, forming the **sugar-phosphate backbone** of the DNA molecule.
- Double helix DNA strands are held together by **hydrogen bonds** between the **nitrogenous bases** by **complementary base pairing**
 - **Adenine** forms 2 hydrogen bonds with **Thymine**
 - **Cytosine** forms 3 hydrogen bonds to **Guanine**

gene & chromosome



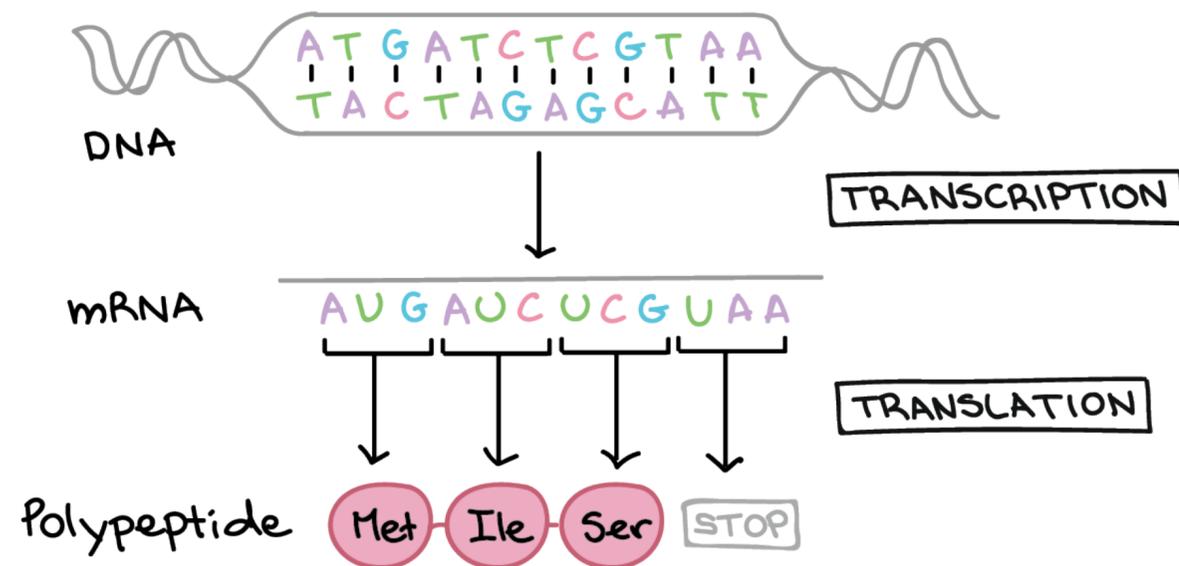
Gene

- Gene is **sequence of nucleotides** and **controls the production of a polypeptide**
- Gene forms **part of a DNA molecule**
- Eg, a DNA molecule contains **eye colour gene** which codes for **pigment protein** that gives our iris colour
- This involves transcription and translation

Chromosomes

- DNA is **wrapped around proteins** to form a chromatin fibre.
- The chromatin fibres **coil, condense, and shorten** to form the compact structures called chromosomes during **prophase** of cell division

transcription & translation



Transcription:

- Transcription is the process by which the DNA template is used to make a single-stranded molecule called messenger RNA (mRNA) by complementary base pairing
- There is no thymine in RNA, instead Adenine pairs with Uracil
- Thymine pairs with Adenine
- Guanine pairs with Cytosine, vice versa

Translation:

- Translation is the process by which the sequence of mRNA codons is used to make a polypeptide, which will fold into a protein
- **Ribosome is needed** for the process

Phenotype:

the protein formed from the gene are responsible for every aspect of a living organism

- appearance - protein that affect the pigment colour of iris
- disease - gene is faulty and doesn't produce insulin which causes Type 1 diabetes

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