

Grade 9 Science

Unit 2: Reproduction

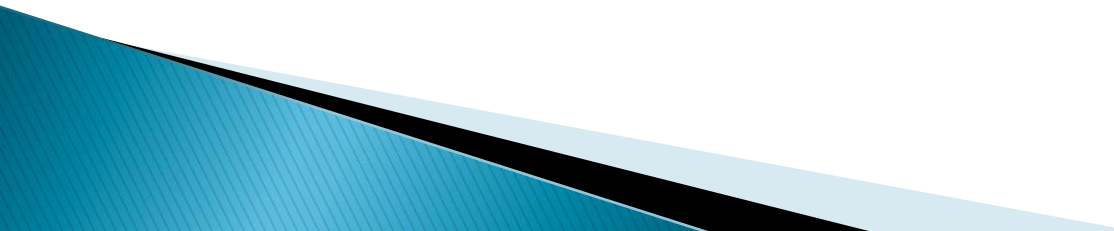
Chapter 4: *“The nucleus controls the functions of life.”*

The Function of the Nucleus

- ▶ the organelle that is responsible for heredity and for controlling the functions of the cell.
- ▶ the **control centre** of the cell

- ▶ The nucleus contains the master set of instructions that determines what each cell will become, how it will function, when it will grow and divide and when it will die.

Responsible for Heredity

- ▶ **Trait**: a particular feature that can vary in size or form from individual to individual within a species.
 - ▶ Inherited from biological parents.
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Dominant Traits

Recessive Traits



Finger hair



No finger hair



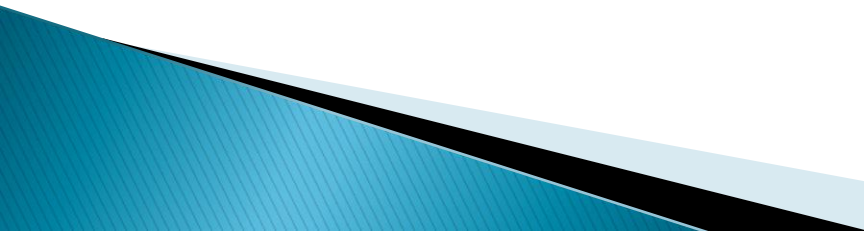
Freckles



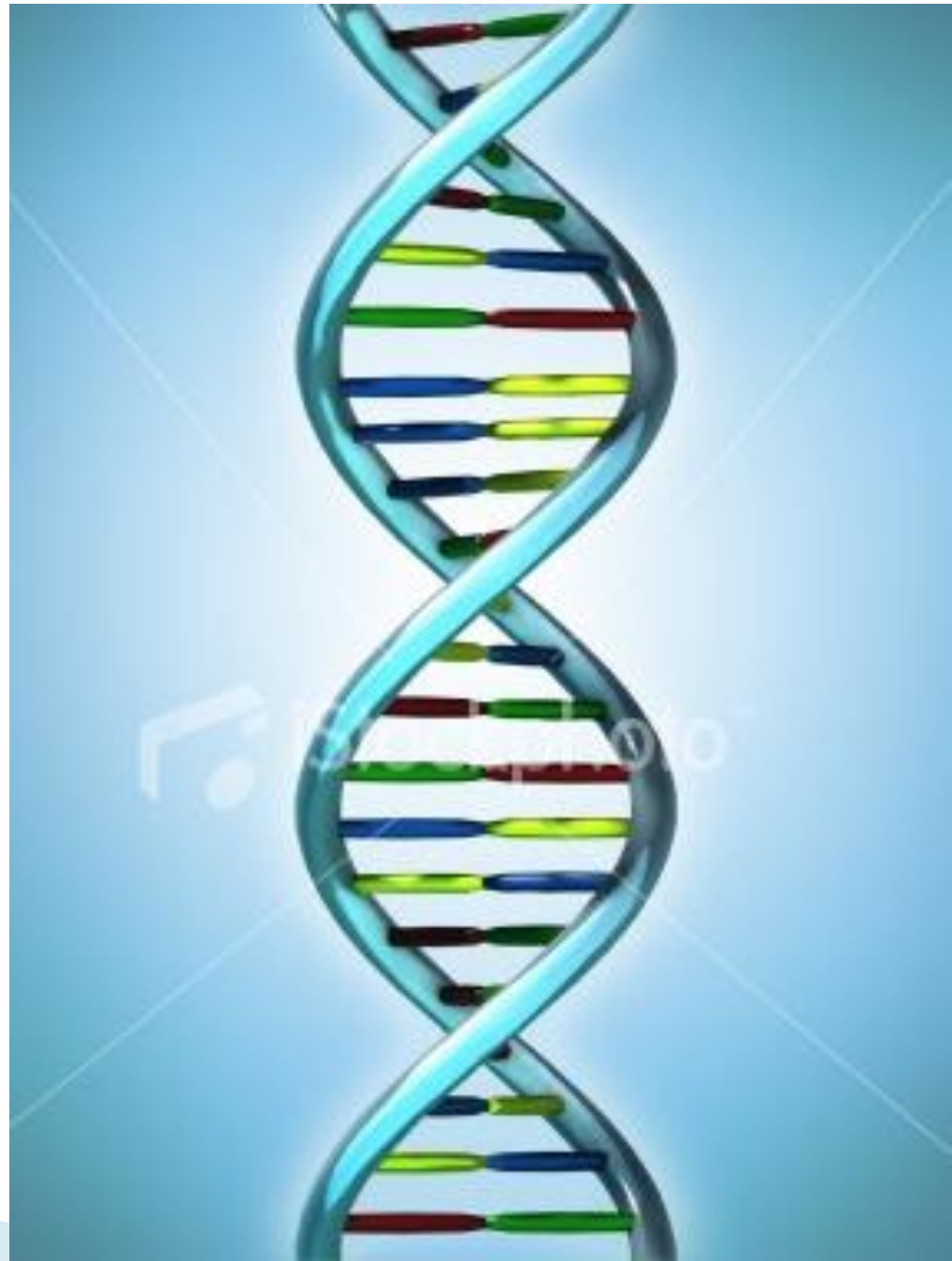
No freckles

- ▶ **Heredity**: the process through which patterns of traits are passed on from an individual to its offspring.

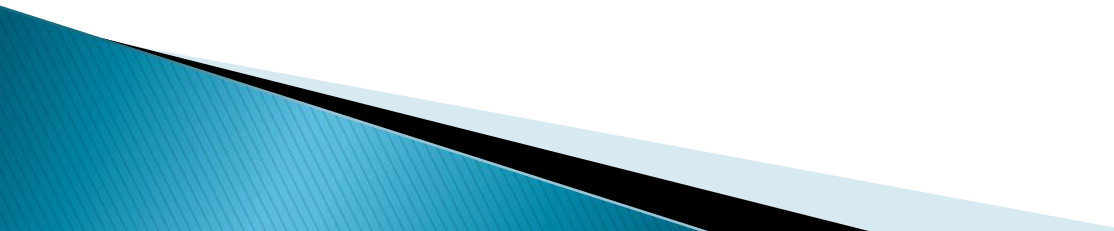
DNA...

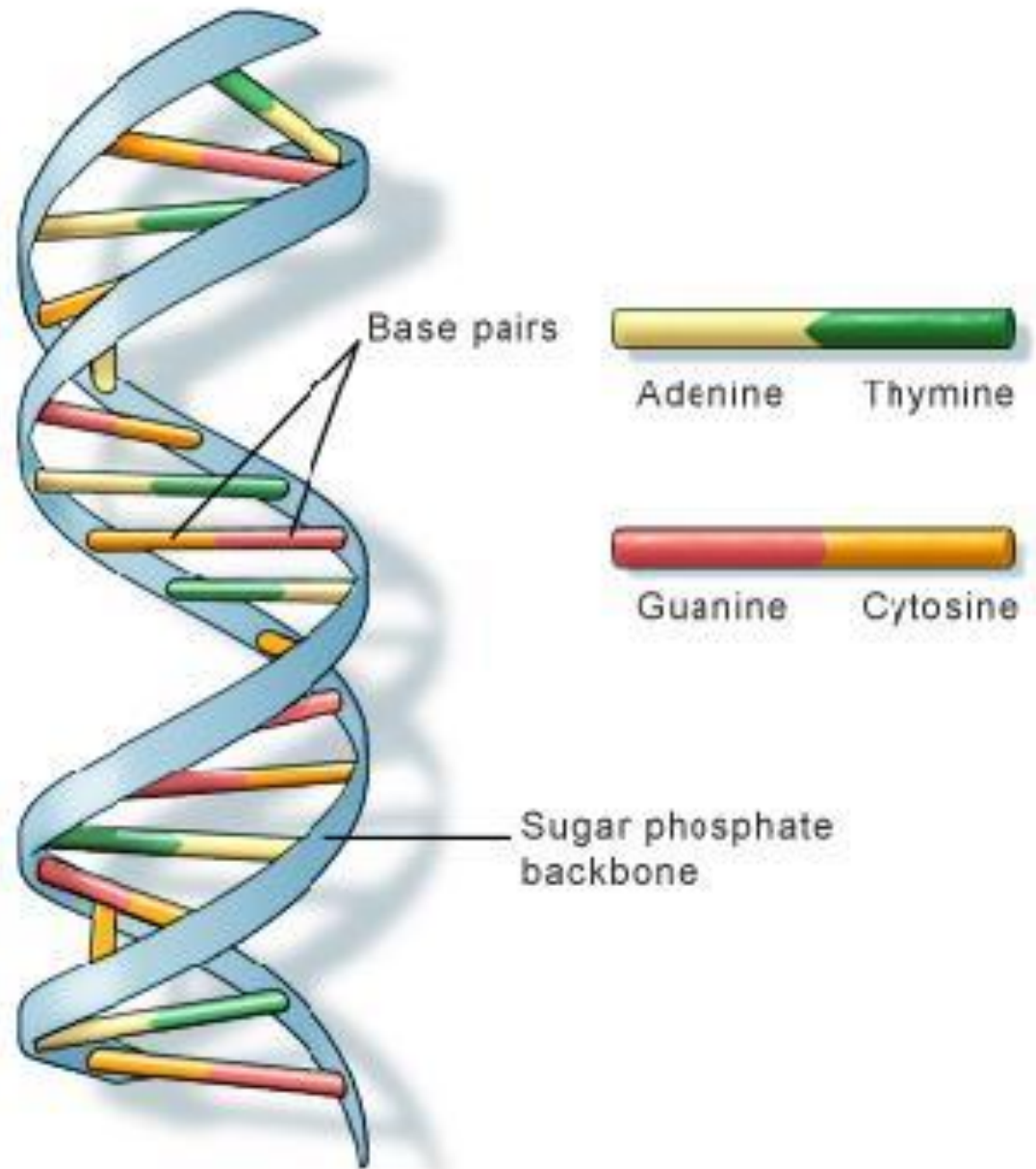
- ▶ Carries the instructions in the nucleus.
 - ▶ A long, double-stranded molecule
 - ▶ Forms a helix structure (a twisted ladder).
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The DNA Molecule

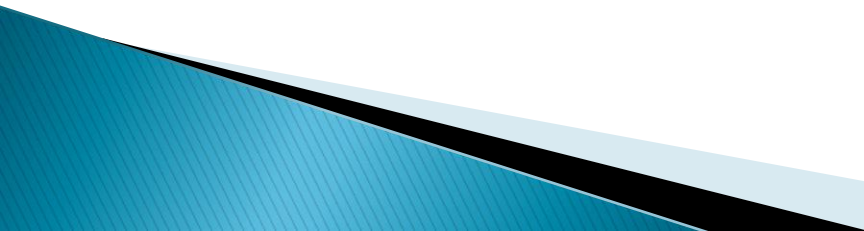


- ▶ The **sides** of the DNA ladder are made of sugar and phosphate.
- ▶ The **steps** are made up of four nitrogen bases.
 1. adenine (A)
 2. guanine (G)
 3. cytosine (C)
 4. thymine (T)


- ▶ The bases in a DNA molecule always join in a specific way:
 - A always joins with T
 - G always joins with C
- 




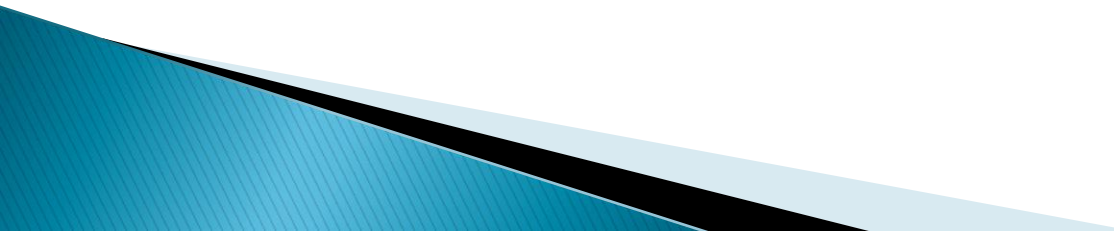
- ▶ When a cell is ready to divide, each strand of loosely coiled DNA folds up further into a compact, X-shaped structure called a **chromosome**.

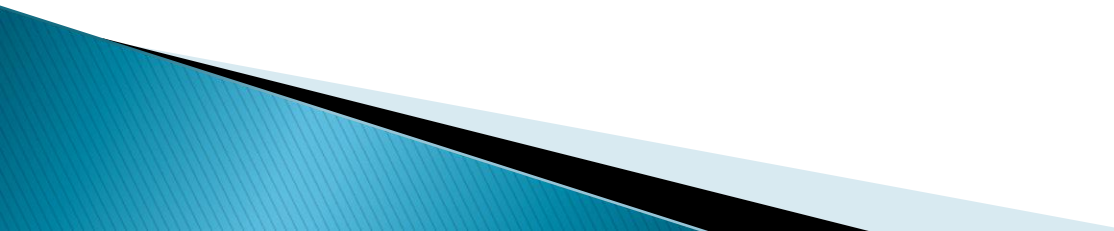
- ▶ Chromosomes within the nucleus are found in pairs.
 - ▶ Most humans have 23 pairs of chromosomes including one pair that determines gender.
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Genes...

- ▶ found on chromosomes.
 - ▶ small segments of DNA located at specific places on a chromosome.
 - ▶ store information needed to produce proteins used by body cells.
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- ▶ Genes can vary in length from hundreds to thousands of bases.
 - ▶ The arrangement of bases will determine the protein produced.
 - ▶ Each chromosome contains thousands of genes.
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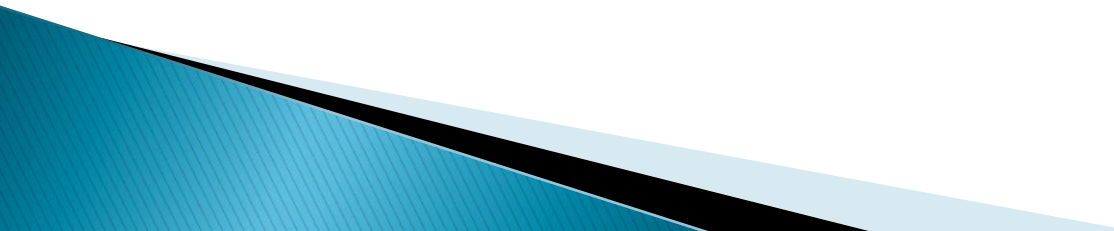
- ▶ Proteins determine what body cells will become and how they will function.
 - ▶ Specialize cells will form tissues; tissues will form organs.
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- ▶ Specialized proteins called enzymes speed up the hundreds of chemical reactions that occur within each cell.
 - Ex. Digestive enzymes
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- ▶ Some proteins act as chemical messengers called **hormones**.
 - Ex. Growth hormone

Mutations

- ▶ A gene mutation is a change in the specific order of the bases that make up a particular gene.

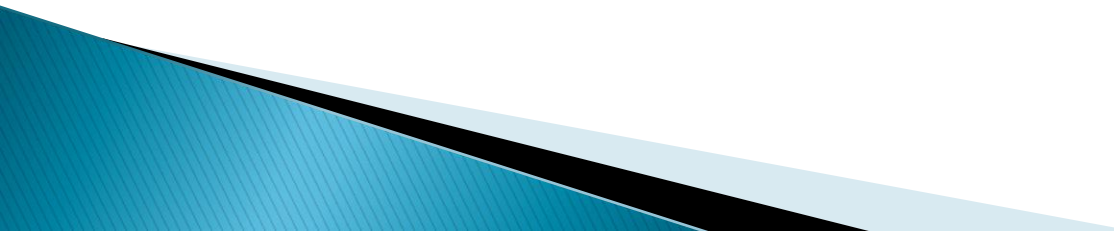
- ▶ A base may be:
 - Added
 - Deleted
 - Substituted for another
- 

Effects of Mutations

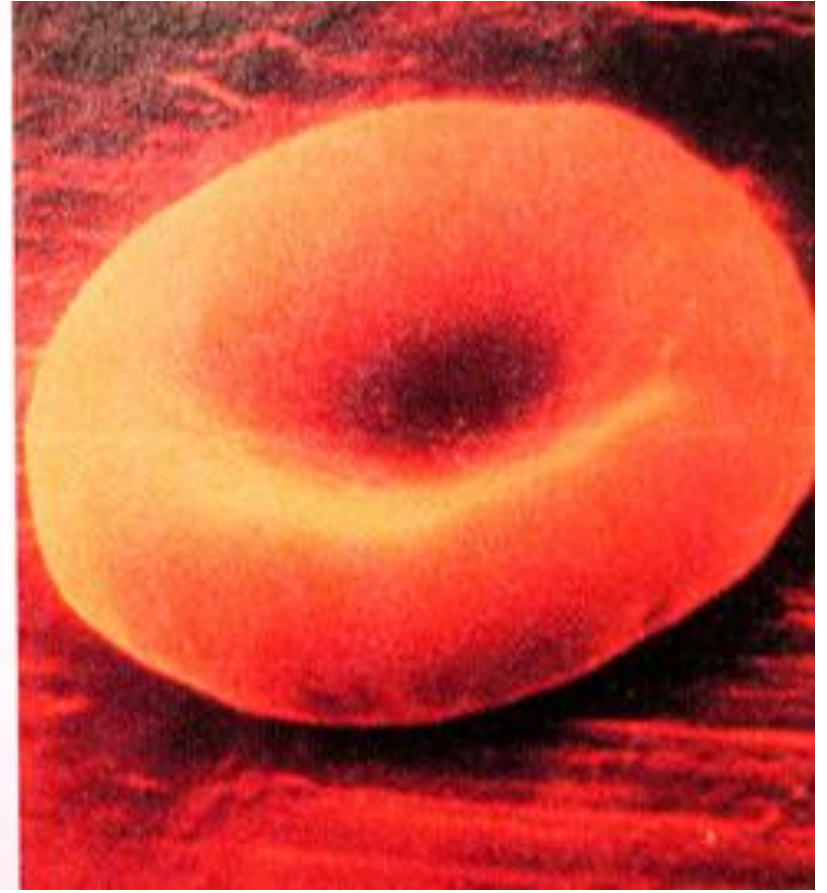
1. Positive Mutation

- ▶ Benefits an individual
 - Ex. Resistance to disease

2. Negative Mutation

- ▶ Harms the individual
 - ▶ Reduce the probability that the individual will produce offspring or survive in their environment.
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- Ex. Sickle cell anemia



- Ex. Cystic Fibrosis



3. Neutral Mutation

▶ Does not affect the individual

- Ex. Coat Color



Mutagens...

- ▶ Substances or factors that can cause mutations in DNA.
 - Ex. Cigarette smoke, X-rays, pollutants

Mutations can be caused by...

- ▶ Nature

 - Ex. Solar radiation

 - Radioactive gases

- ▶ Human Activity

 - Ex. Chemicals

 - Nuclear Radiation