SNS COLLEGE OF TECHNOLOGY

Coimbatore-35.
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Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

COURSE NAME : 19GET277 - Biology for Engineers

IV YEAR/ VII SEMESTER

UNIT – I INTRODUCTION TO LIFE

Topic: Nucleic acids vitamins and enzymes-genes and chromosome

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Nucleic Acids:

- **Definition**: Polymers composed of nucleotides, which consist of a sugar, a phosphate group, and a nitrogenous base.
- **Function**: Store and transmit genetic information and facilitate the synthesis of proteins.
- **Examples**: DNA (deoxyribonucleic acid), RNA (ribonucleic acid).

Vitamins: Organic molecules that are necessary in small quantities for normal metabolism and cannot be synthesized by the body in sufficient amounts.

Minerals: Inorganic elements that play crucial roles in various physiological functions.

Genes

Definition: Genes are segments of DNA (deoxyribonucleic acid) that contain the instructions for building and maintaining the cells of an organism. They are the basic units of heredity.

Key Points:

- **Structure**: A gene is composed of a sequence of nucleotides in the DNA. These sequences are arranged in a specific order, which determines the genetic information carried by the gene.

Function: Genes encode for proteins or functional RNA molecules. The process of gene expression involves transcription (copying DNA into RNA) and translation (using RNA to synthesize proteins).

Regulation: Gene expression is tightly regulated to ensure that genes are turned on or off at the right times, in the right cells, and in the appropriate amounts.

Inheritance: Genes are inherited from parents to offspring, and they determine inherited traits. They can exist in different forms called alleles, which contribute to genetic diversity.

Examples:

- BRCA1: A gene associated with breast cancer susceptibility.
- HBB: The gene that codes for the beta-globin subunit of hemoglobin, mutations of which can cause sickle cell anemia.

Chromosomes: Chromosomes are long, thread-like structures composed of DNA and proteins (histones) that package and organize genetic material in the cell nucleus.

Key Points:

- **Structure**: Chromosomes consist of tightly coiled DNA wrapped around histone proteins. Each chromosome contains many genes.
- **Number**: The number of chromosomes varies between species. Humans have 46 chromosomes, arranged in 23 pairs.
    - **Autosomes**: 22 pairs of non-sex chromosomes.
    - **Sex Chromosomes**: 1 pair of sex chromosomes (XX in females, XY in males).

Function: Chromosomes ensure accurate replication and distribution of genetic material during cell division (mitosis and meiosis).

Types:

- **Eukaryotic Chromosomes**: Linear chromosomes found in the nucleus of eukaryotic cells.
- **Prokaryotic Chromosomes**: Typically circular chromosomes found in prokaryotic cells (e.g., bacteria).

Key Processes:

- **Replication**: Chromosomes duplicate during cell division to ensure each daughter cell receives a complete set of genetic information.
- **Segregation**: Chromosomes are segregated into daughter cells during mitosis (somatic cell division) and meiosis (reproductive cell division).

Examples:

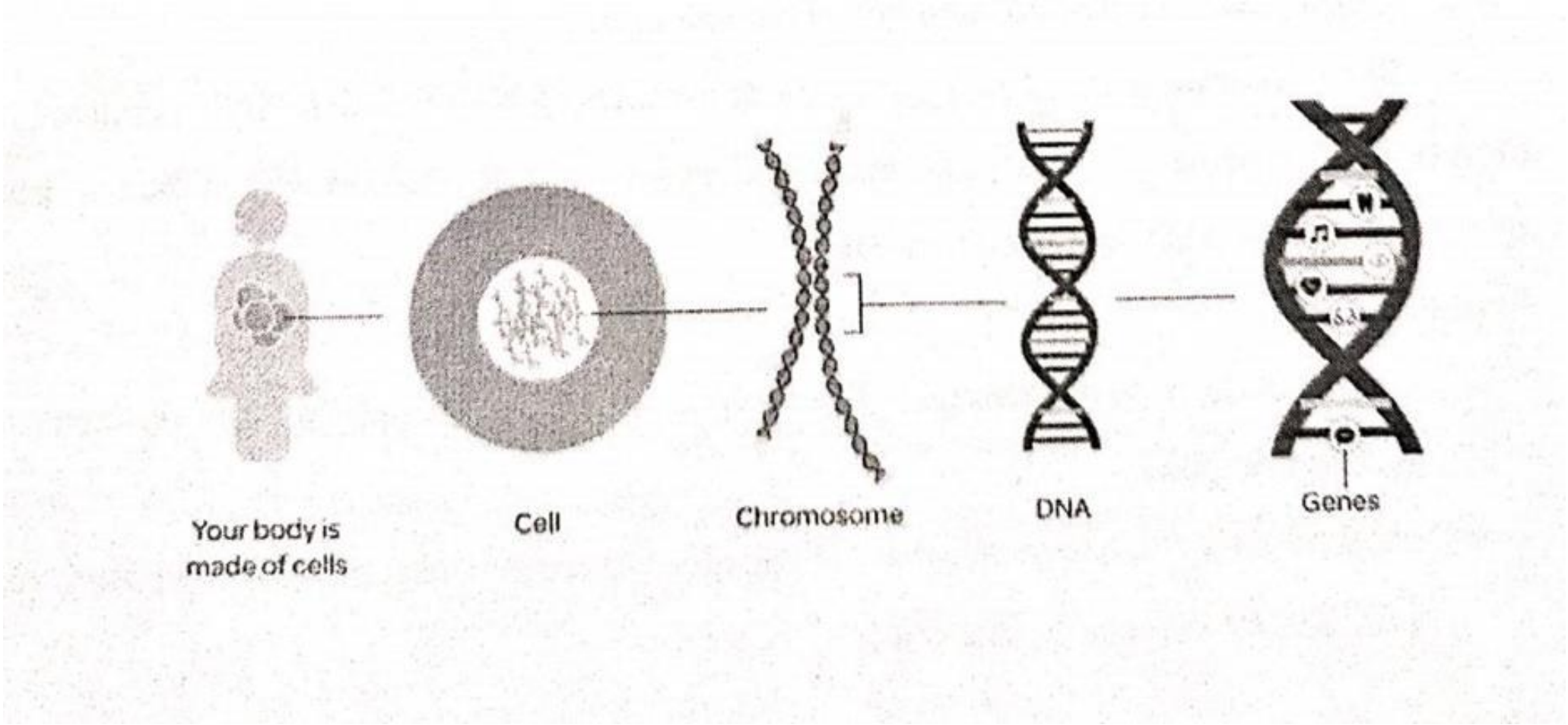
- **Human Chromosome 1**: The largest human chromosome, containing about 2,000 to 2,100 genes.
- **Human Chromosome Y**: The sex chromosome responsible for male sex determination.

Interrelationship

- **DNA**: The molecule that carries genetic information in both genes and chromosomes.
- **Genes on Chromosomes**: Genes are located on chromosomes. Each chromosome carries many genes that code for various proteins and RNA molecules.

Importance

Understanding genes and chromosomes is crucial for fields like genetics, medicine, and biotechnology. They provide insights into hereditary diseases, genetic variation, and the mechanisms of life at a molecular level.


Your body is made of cells
Cell
Chromosome
DNA
Genes


THANK
YOU!