Gene:

A gene is the basic physical and functional unit of heredity. Genes are made up of DNA. Some genes act as instructions to make molecules called proteins. However, many genes do not code for proteins. In humans, genes vary in size from a few hundred DNA bases to more than 2 million bases. An international research determine the sequence of the human genome between 20,000 and 25,000 genes.

Every person has two copies of each gene, one inherited from each parent. Most genes are the same in all people, but a small number of genes (less than 1 percent) are slightly different between people. Alleles are forms of the same gene with small differences in their sequence of DNA bases. These small differences contribute to each person's unique physical features.

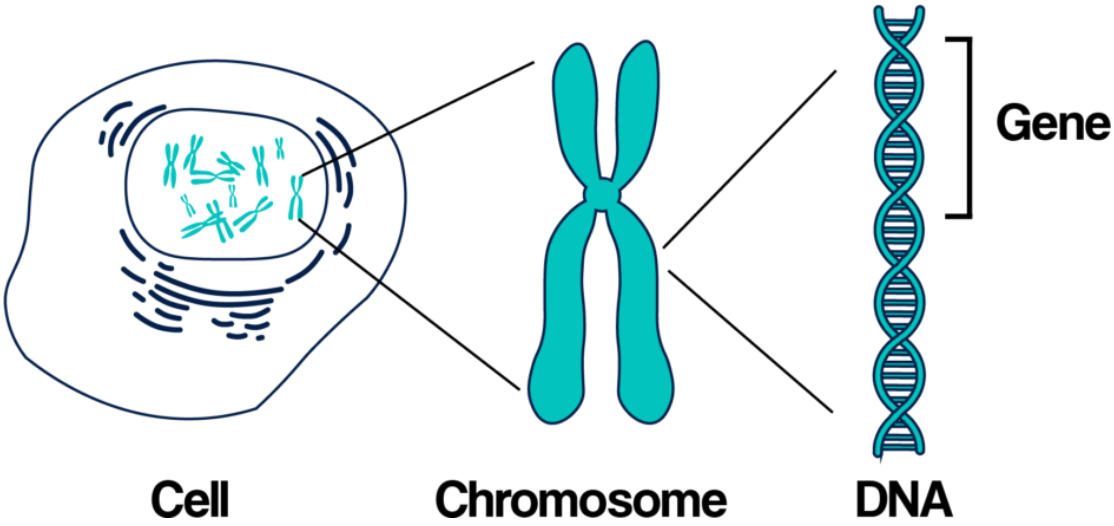
Scientists keep track of genes by giving them unique names. Because gene names can be long, genes are also assigned symbols, which are short combinations of letters (and sometimes numbers) that represent an abbreviated version of the gene name. For example, a gene on chromosome 7 that has been associated with cystic fibrosis is called the cystic fibrosis transmembrane conductance regulator; its symbol is *CFTR*.
DNA are the building blocks of genes within nearly every cell that contains the coded instruction for building and maintaining an organism. Genes are a portion of a cell's DNA that serves a specific purpose in making specific proteins.

Gene Action:

Gene action refers to the way in which certain genes exert their effects on the body. They could be dominant, or recessive, or they could be sex-linked or be involved in chromosomal

aberrations. A combination of such gene actions results in the observable phenotype of an organism.

There are four types of gene action: **additive, dominance, epistatic, and overdominance.** A gene (from genos (Greek) meaning generation or birth or gender) is a basic unit of heredity and a sequence of nucleotides in DNA that encodes the synthesis of a gene product, either RNA or protein.



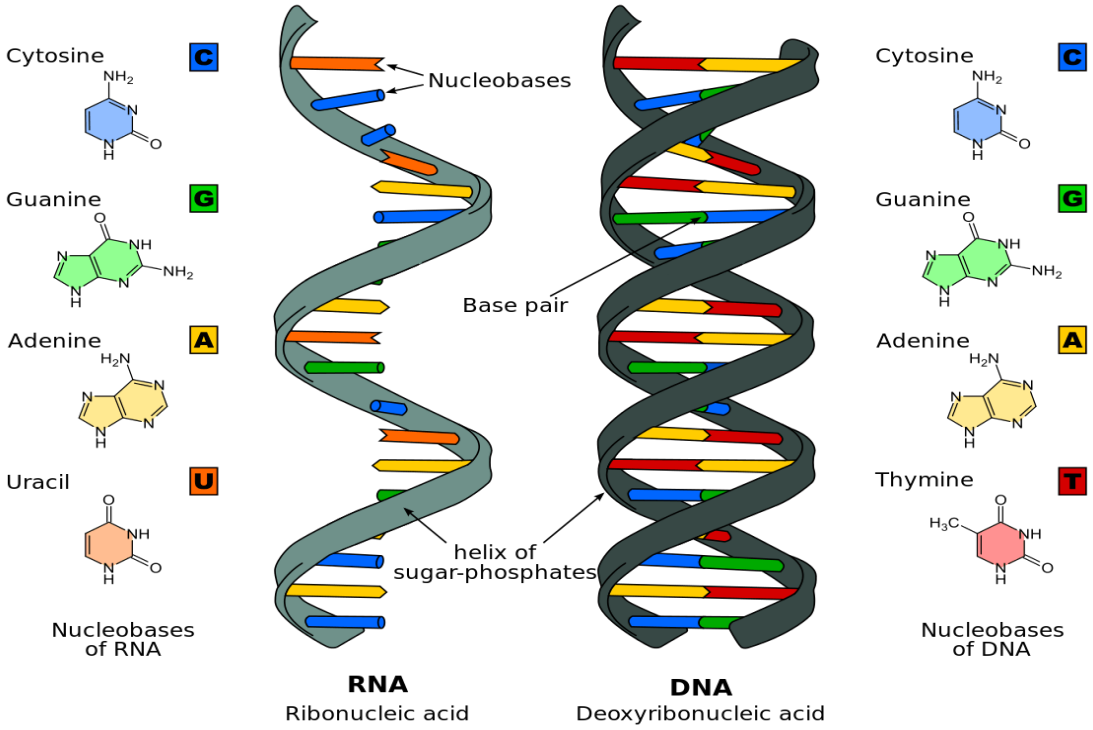
The transmission of genes to an organism's offspring is the basis of the inheritance of phenotypic traits. These genes make up different DNA sequences called genotypes. Genotypes along with environmental and developmental factors determine what the phenotypes will be. Some genetic traits are instantly visible, such as eye color or the number of limbs, and some are not, such as blood type, the risk for specific diseases, or the thousands of basic biochemical processes that constitute life.

Genes can acquire mutations in their sequence, leading to different variants, known as alleles, in the population. These alleles encode slightly different versions of a protein, which cause different phenotypical traits.

DNA and RNA Structures:

Deoxyribonucleic acid is a molecule composed of two polynucleotide chains that coil around each other to form a

double helix carrying genetic instructions for the development, functioning, growth and reproduction of all known organisms and many viruses. DNA and ribonucleic acid (RNA) are nucleic acids. Alongside proteins, lipids and complex carbohydrates (polysaccharides), nucleic acids are one of the four major types of macromolecules that are essential for all known forms of life.



The two DNA strands are known as polynucleotides as they are composed of simpler monomeric units called nucleotides. Each nucleotide is composed of one of four nitrogen-containing nucleobases (cytosine [C], guanine [G], adenine [A] and thymine [T]), a sugar called deoxyribose, and a phosphate group. The nucleotides are joined to one another in a chain by covalent bonds (known as the phospho-diester linkage) between the sugar of one nucleotide and the phosphate of the next, resulting in an alternating sugar-phosphate backbone. The nitrogenous bases of the two separate polynucleotide strands are bound together, according to base pairing rules (A with T and C with G), with hydrogen bonds to make double-stranded DNA. The complementary nitrogenous bases are divided into two groups, pyrimidines and purines. In DNA, the pyrimidines are thymine and cytosine; the purines are adenine and guanine.

Genetic Codes:

The **genetic code** is the set of rules used by living cells to translate information encoded within genetic material (DNA or mRNA sequences) into proteins. Translation is accomplished by the ribosome, which links proteinogenic amino acids in an order specified by messenger RNA (mRNA), using transfer RNA (tRNA) molecules to carry amino acids and to read the mRNA three nucleotides at a time.

The codons specify which amino acid will be added next during protein synthesis. The vast majority of genes are encoded with a single scheme. That scheme is often referred to as the genetic code, though variant codes (such as in mitochondria) exist.

Replication:

In molecular biology, **DNA replication** is the biological process of producing two identical replicas of DNA from one original DNA molecule. DNA replication occurs in all living organisms acting as the most essential part for biological inheritance. This is essential for cell division during growth and repair of damaged tissues, while it also ensures that each of the new cells receives its own copy of the DNA**.** The cell possesses the distinctive property of division, which makes replication of DNA essential.

DNA is made up of a double helix which is thus composed of two linear strands that run opposite to each other. During replication, these strands are separated. Each strand of the original DNA molecule then serves as a template for the production of its counterpart, a process referred to as semiconservative replication. As a result of semi-conservative replication, the new helix will be composed of an original DNA strand as well as a newly synthesized strand.

DNA replication (DNA amplification) can also be performed *in vitro* (artificially, outside a cell).

Transcription: Is the process of copying a segment of DNA into RNA. The segments of DNA transcribed into RNA

molecules that can encode proteins and produce messenger RNA (mRNA). Other segments of DNA are copied into RNA molecules called non-coding RNAs (ncRNAs). The quantity of mRNA is more than 10 times the quantity of ncRNA. The general preponderance of mRNA in cells is valid even though less than 2% of the human genome can be transcribed into mRNA, while at least 80% of mammalian genomic DNA can be actively transcribed.

Both DNA and RNA are nucleic acids, which use base pairs of nucleotides as a complementary language. During transcription, a DNA sequence is read by an RNA polymerase, which produces a complementary, antiparallel RNA strand called a primary transcript.

Mutation:

A **mutation** is a change in a DNA sequence. **Mutations** can result from DNA copying mistakes made during cell division, exposure to ionizing radiation.

In biology, a **mutation** is an alteration in the nucleotide sequence of the genome of an organism and virus. Viral genomes contain either DNA or RNA. Mutations result from errors during DNA of viral replication, mitosis, or meiosis or other types of damage to DNA, cause an error during other forms of repair, or cause an error during replication. Mutations may also result from insertion or deletion of segments of DNA due to mobile genetic elements.

Mutations may or may not produce detectable changes in the observable characteristics (phenotype) of an organism. Mutations play a part in both normal and abnormal biological processes including: evolution, cancer, and the development of the immune system. Mutation is the ultimate source of all genetic variation, providing the raw material.

Mutation can result in many different types of change in sequences. Mutations in genes can have no effect, alter the product of a gene, or prevent the gene from functioning properly or completely. Mutations can also occur in nongenic regions.