

- RNA contains ribose and uracil instead of deoxyribose and thymine; consists of a single strand.
- **Messenger RNA (mRNA)** – the transcript of the coding strand of DNA involved in “carrying” the protein-building instruction; template for protein synthesis
- **Ribosomal RNA (rRNA)** – major component of ribosomes involved in the process of assembling amino acids into proteins
- **Transfer RNA (tRNA)** – delivers amino acids to ribosomes for the process of assembling amino acids into proteins
- **Transcription** – the process of using DNA as a template to synthesize mRNA
 - Initiation: a promoter allows RNA polymerase to bind to the nucleotide sequence of the gene and begin transcription
 - Elongation: RNA polymerase unwinds the DNA, reads the nucleotides, and adds on RNA base pairs to the 3' end of the strand
 - Termination: RNA polymerase transcribes a terminator sequence of nucleotides and transcription has ended
- The order of nucleotides of the DNA determines the order of amino acids in a protein
- The genetic code is read in 3 nucleotide base sequences called **codons** (64 possible codons)
- Each codon specifies one of 20 amino acids
- **Translation** – the process of making a polypeptide chain from mRNA
 - The tRNA are attached to a specific amino acid at one end and have an anticodon on the other end
 - The rRNA brings the tRNA and joins them together to form the polypeptide chain
 - Initiation: brings together mRNA, a tRNA with the amino acid and the ribosome at the start codon
 - Elongation: more tRNA brings amino acids that are added and linked together
 - Termination: occurs when a stop codon is reached and the protein is released

Chapter 14 and 15.4

- **Mutation** – a heritable change in the genetic material
- Mutations produce positive or negative changes in population
- **Point mutation** – a mutation that alters a single base
 - **Base substitution** – 1 base is wrongly paired with another base during DNA replication; may have little or no impact on protein function or could have drastic effect; Can result in 3 types of mutations to the codons of mRNA: silent, missense, or nonsense; can cause translation to be terminated too early → nonfunctional protein
 - **Addition/Deletion** – results in a frameshift mutation
 - **Frameshift mutation** – genes are added or deleted causes all subsequent nucleotides to be improperly grouped → the wrong amino acids are made → nonfunctional protein
- Chromosomal mutations can cause serious disorders. 4 types of structural changes:
 - **Deletion** – loss of entire portions of chromosomes
 - **Duplication** – gene sequences repeated 2+ times (Down Syndrome)
 - **Inversion** – segment of chromosome is broken in two places, reversed, and put back together
 - **Translocation** – a piece of 1 chromosome is broken off and becomes attached to a different chromosome
- **Spontaneous mutations** – occur as a result of problems during DNA replication or repair; no outside causes/influences
- **Induced mutations** – occur as a result of exposure to mutagens
- **Mutagen** – a chemical or physical agent that interacts with DNA to cause mutations (Examples: chemicals, radiation, viruses)

- chimps and humans share 98% chromosome make-up
 - Most proteins for all organisms are based on the same 20 amino acids and the same genetic code
 - To determine molecular homology relationships, DNA, RNA, or proteins are compared by aligning their sequences and counting the differences between them
- Evolution also occurs at the molecular level involving changes in chromosome structure and number

Chapter 24

- **Population genetics** - the study of genes and genotypes in a population; studies genetic make-up and variations over time
- **Gene pool** – all the alleles for every gene in a given population
- **Microevolution** – change in the genetic makeup of a population from generation to generation (small scale)
- **Intrasexual selection** – between members of the same sex; males competing for mates and territory
- **Intersexual selection** – between members of opposite sex; females choose favorable traits
- **Genetic Drift** – genetic fluctuation due to random chance from one generation to the next; **reduces genetic variation**
 - Bottleneck Effect – a sudden change in environment (natural disaster) may drastically reduce the size of a population → smaller gene pool
 - Founder Effect – a few individuals become isolated from a larger population and form a new colony in a new location → smaller gene pool
- **Gene flow** – genetic exchange due to the migration of fertile individuals or gametes between populations; **enhances genetic variation**
- Random mating occurs when the probability is the same for all individuals
- Nonrandom mating occurs when the probability that 2 individuals in a population will mate is not the same for all possible pairs of individuals
 - **Inbreeding** – individuals are more likely to mate with close relatives; common in small populations; **reduces genetic variation**
 - **Outbreeding** – individuals are more likely to mate with distant relatives; less common; **enhances genetic variation and fitness**
 - Even though there is movement and racial mixing, people tend to marry in their ethnic group → certain diseases become more common in one group or another

Chapter 25

- **Macroevolution** – the study of evolutionary changes that create new species and groups of species
- **Species** – a group of related organisms that share a distinctive set of attributes in nature
- **Speciation** – the process of generating a new species

Chapter 54

- **Ecology** – the study of interactions of organisms with each other and their environment; the study of biotic and abiotic interactions
- **Organismal Ecology** – individual organisms' behavior, physiology, morphology etc., in response to interactions with the abiotic environment
 - Physiological ecology – physiologically adapted to environment and how the environment impacts the distribution of species