- RNA contains ribose and uracil instead of deoxyribose and thymine; consists of a singe 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 0 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 polyphtide chain 0
  - Initiation: brings together mRNA, a tRNA with the aming acd and the ribosome at the
  - start codon
    Elongation: more tRNA brings amino tells that are added and linked together
    Termination: occurs when a stop, of on is reached and the protein is released

- Chapter 14 and 15.4 from Pulaton – 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  $\rightarrow$  nonfunctional protein
    - Addition/Deletion results in a frameshift mutation
      - Frameshift mutation genes are added or deleted causes all subsequent nucleotides to be improperly grouped  $\rightarrow$  the wrong amino acids are made  $\rightarrow$ 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) hay drastically reduce the size of a population  $\rightarrow$  smaller gene pool
  - Founder Effect a few individuals become isolated from a larger population and form a new colony in a new location → smaller prepion
- Gene flow genetic exchange due to the nigration of fertile individuals or gametes between populations; enhances general variation
- Random mating occurs when the probability is be same for all individuals
- Nonrandoin noting occurs when the probability that 2 individuals in a population will mate is not the same for all polyclological 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  $\rightarrow$  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