GENERAL BIOLOGY Lecture 13 - DNA Replication & Comparison to Transcription

I. DNA - The Watson - Crick Double Helix
- A. Two helical polynucleotide chains coiled around a common axis
  - 1) 3' to 5' and 5' to 3'
- B. Purines & pyrimidines on the inside; phosphate & deoxyribose outside
- C. Two chains held together by hydrogen bonds
- D. The precise sequence of bases carries the genetic information

II. DNA replication
- A. Semiconservative replication
  - 1. Produces two DNA molecules that each have one "half-old (mother)" and one "half-new (daughter)" strands
- B. Where does replication begin?
  - 1. Viruses and bacteria - one site
  - 2. Eucaryotes - several sites
- C. Process
  - 1. DNA polymerases
    - a) Catalyze step-by-step addition of deoxyribonucleotide units to DNA chain
    - b) Proofread newly synthesized strands
  - 2. A primer is required
  - 3. DNA template is essential
  - 4. DNA must be unwound (helicase) and positive supercoiling (gyrase) must be removed
  - 5. Elongation proceeds in the 5' to 3' direction
  - 6. The "other" strand is synthesized with help of Okazaki fragments
- D. Problems - mutations
  - 1. Substitution (most common)
  - 2. Deletion
  - 3. Insertion

III. What DNA encodes
- A. Ultimately (through transcription & translation) - protein
- B. DNA is like instructions in a book
- C. The alphabet A, T, G, & C

IV. Transcription
- A. DNA to RNA
- B. Types of RNA
  - 1. Ribosomal RNA (rRNA) - combines with proteins to form ribosomes
  - 2. Messenger RNA (mRNA) - the "blueprint" delivered to the ribosome which is translated into protein
  - 3. Transfer RNA (tRNA) - matches proteins with triplets encoded by mRNA
- C. How transcription differs from DNA replication
  - 1. RNA polymerases assemble transcripts
  - 2. Several stands can be synthesized at one time
  - 3. Only ONE of the two unwound DNA strands is transcribed