Terms you should know:

- bases (A, C, G, T)
- DNA backbone
- DNA strands
- hydrogen bonds
- base pairing
- gene
- codon
- mutation
- DNA polymerase
- origin
- gene expression
- transcription
- messenger RNA (mRNA)
- RNA polymerase
- promoter
- terminator
- translation
- transfer RNA (tRNA)
- anticodon
- ribosome binding site
- start codon (AUG)
- stop codon (UAG, UAA, UGA)

Questions you should be able to answer:

- What is a gene? How do the nucleotides of a gene relate to the amino acids of the protein?
- Why are the base-pairing rules important in DNA replication?
- What is meant by gene expression, and what are the two parts of this process?
- What two kinds of RNA molecules are needed for gene expression, and how are they used?
- What are the start and stop signals for transcription and translation?
- How does a ribosome know which three-nucleotide groups to read?

Lecture outline:

I. DNA structure:
   A. Nucleotides (bases): A, C, G, T
   B. Two strands joined by hydrogen bonds between base-paired bases (A with T, G with C)
   C. A gene is the nucleotide sequence representing one protein
   D. Three-nucleotide groups (codons) represent amino acids
   E. Mutation is a change in the DNA sequence, which changes amino acids

II. DNA replication:
   A. DNA polymerase “unzips” the two strands and makes new strands by base-pairing
   B. Because of the base-pairing rules, two identical double-stranded molecules are made
   C. Replication begins at the origin and continues until the whole molecule is duplicated

III. Gene expression:
   A. Transcription
      1. Synthesis of an mRNA copy of one gene by RNA polymerase
      2. In RNA, U replaces T and the molecule is single-stranded
      3. Begins at a promoter (specific base sequence), ends at a terminator
   B. Translation
      1. Synthesis of the protein by the ribosome
      2. Requires tRNA: has an anticodon to match a codon of mRNA and the matching a.a.
      3. Binds to a ribosome binding site and begins with a start codon (AUG)
      4. Joins amino acids brought in by tRNAs
      5. Stops at a stop codon (UAG, UGA, UAA) with no matching tRNA