1. Describe the structure of DNA (include the following terms: antiparallel strands, 3'-5' linkages, hydrogen bonding, purine and pyridimidine bases). (p. 54-57 Bio Course Companion & p. 463-465 textbook)

   - 2 strands of DNA twisted around each other (double helix)
   - strands are formed from alternating sugar-phosphate groups + formed by covalent bonds between nucleotides
   - strands are held together by hydrogen bonds between complementary bases (3 hydrogen bonds between G + C and 2 hydrogen bonds between A + T)
   - complementary base pairing: purine guanine with pyrimidene cytosine while
     purine adenine with pyrimidene thymine always pair up
   - strands are antiparallel to one another with one strand oriented 5' to 3'
     and the other strand is oriented 3' to 5'
   - DNA is made up of many nucleotides joined together by covalent bonds
   - each nucleotide consists of a sugar group, a phosphate group + a nitrogenous base

2. What is the difference between single copy genes and highly repetitive sequences of DNA? (p. 68 Bio Course Companion)

   - highly repetitive sequences: repeated several times in DNA, can be 5-900
   - base pairs long, forms between 5-45% of the DNA
   - single copy genes: present only once in DNA

3. What is the difference between DNA replication in prokaryotes and eukaryotes? (p. 60-61 Bio Course Companion)

   - prokaryotes have one origin of replication, eukaryotes have many

4. What is the difference between a nucleoside monophosphate and a nucleoside triphosphate? (p. 61 Bio Course Companion)

   - a nucleoside triphosphate bonds to a complementary base on the DNA template
   - hydrolysis of a molecules of phosphate occurs to convert the nucleoside
     triphosphate to a nucleoside monophosphate (or also known as a nucleotide)
   - the hydrolysis reaction provides the energy needed to add the nucleotide
5. Match the term with its correct function or definition (p. 60–64 Bio Course Companion)

- helicase a. enzyme that removes RNA primer and replaces it with DNA
- ligase b. a sequence of 3 bases on the tRNA that corresponds to the amino acid it is carrying
- RNA polymerase c. coding portions of mRNA that are spliced together to form the mature RNA which will leave the nucleus
- SSB proteins d. the mRNA strand is identical to this strand of DNA except uracil replaces thymine
- DNA polymerase III e. a sequence of 3 bases on the mRNA that codes for a specific amino acid
- DNA polymerase I f. enzyme that joins the Okazaki fragments
- primase g. prevents the 2 strands of DNA from reannealing during replication
- sense strand h. enzyme that links the phosphate of one nucleotide to the sugar of the previous nucleotide by covalent bonds during replication
- antisense strand i. intervening sequences in the mRNA that are removed because they do not contribute to the formation of the protein
- exon j. enzymes bind to DNA at a site called the promoter where transcription will start
- intron k. DNA strand that acts as the template during transcription
- codon l. assists in DNA unwinding & unzipping during replication
- anticodon m. enzyme that creates the RNA primer

6. Describe 3 functions of RNA polymerase in transcription. (p. 64 Bio Course Companion)
- binds at a site called the promoter on the DNA molecule
- unwinds the DNA
- catalyzes covalent bond formation between RNA nucleotides so the RNA molecule elongates
- moves along the DNA from 3' to 5' so RNA is produced in 5' to 3' orientation
7. The DNA code is described as being "universal" and "degenerate." Why? (p. 65 Bio Course Companion and p. 468 – 469 textbook) "universal"

"degenerate" since there are some amino acids that have more than one codon.

8. What is the purpose of the tRNA-activating enzymes? (p. 65 Bio Course Companion)
   - Each tRNA is recognized by a specific tRNA activating enzyme that uses energy to bind a specific amino acid to the tRNA's 3' end.

9. Describe the structure of ribosomes. (p. 65 Bio Course Companion)
   - Consist of ribosomal RNA (rRNA) + protein
   - Each ribosome is made up of a small + large sub-unit
   - 3 binding sites on each ribosome: E (exit) site, P (peptidyl) site, A (aminoacyl) site

    - A 2nd tRNA binds to the A site of the ribosome.
    - A peptide bond is formed between the amino acid on the tRNA in the A site and the amino acid on the tRNA in the P site.
    - The ribosome translocates, moving the 1st tRNA to the E site, the 2nd tRNA to the P site, and then opening up the next codon to the appropriate tRNA.