Key to Lecture Quiz #3

1. **Define DNA replication**, explain why the process is semiconservative, and describe where it begins in both prokaryotic and eukaryotic cells.

   DNA replication is the process used by cells to reproduce their DNA molecules (it can also be accomplished in vitro via the PCR). The process is semi-conservative because every new DNA molecule formed contains one strand from the "parent" strand (the one being copied) and one new, complementary strand (the one being synthesized). DNA replication begins at regions called "origins of replication" and proceeds in both directions away from these. There is one **origin of replication** in the ccc-DNA of prokaryotic cells, and multiple origins along the linear chromosomes of eukaryotic cells.

2. **Define transcription** and explain how it is similar to replication in terms of requirements (both require three things, what are they).

   Transcription is RNA synthesis. It is the process cells use to copy information stored in DNA nucleotide sequences as RNA nucleotide sequences (all cellular RNA is made via transcription). Transcription is similar to replication in that it requires DNA as a **template, enzymes** (e.g., RNA-polymerase, but also helicase and gyrase enzymes) and **energy**. During transcription the energy is supplied by rNTP molecules.

3. **Define peptidyl transferase** – Include where it is found, what it is made of (both prokaryotic and eukaryotic cells) and what it does.

   Peptidyl transferase is the biochemical catalyst cells use to form the peptide bonds between amino acids during protein synthesis (translation). Peptidyl transferase is a **ribozyme** (it is RNA). It is found within the large ribosomal subunits of complete ribosomes and is made of 23S rRNA in prokaryotes and the 28S rRNA in eukaryotes.

4. Thymine/ deoxyribose

5. Antiparallel

6. Polymerase/ helicase

7. Okazaki fragments/ ligase

8. Phosphodiester/ codon and anticodon regions

9. Polycistronic/ promoter

10. Exons/ spliceosomes

11. The very small guide-RNA (gRNA) molecules made within bacteria and archaea (formerly called crRNA) function as guides for CRISPR associated proteins (Cas proteins). The Cas proteins that have endonuclease activity can be guided to viral DNA that has entered the prokaryotic cell, and they will chop into pieces. This helps prokaryotic cells defend themselves against viral invasion, because when viruses are allowed to enter and take over cells they often kill them.

12. Translation/ transfer-RNA/ aminoacyl-tRNA-synthetase

13. *Streptococcus pneumoniae*

    Some of you lost points on this quiz due to spelling errors, but spelling matters. A ribozyme is not the same as a ribosome, ligase is not the same enzymes as primase, and codons do not form hydrogen bonds with other codons (you must have both codons and anticodons).

    Some of you lost points because you are not reading the questions accurately. Please **read beyond the blanks** before writing your answers.

    Please study this material more thoroughly before the midterm because if you do not understand the basics about DNA, RNA, replication, transcription and translation, you are going to have significant difficulty answering questions about operons, genetic regulation and the impacts of mutation.