More sample Molecular Biology problems for Bio 110, part 2

This document contains a few more sample problems to give you practice analyzing nucleic acids and proteins. Remember: if there is a term or concept you aren’t familiar with, you can always look it up! An answer key is provided in a separate document, but you should give these problems your best effort BEFORE looking at the answers.

Start with two multiple choice problems; as before, some of these are end-of-chapter problems from Campbell’s *Biology*; they focus on translation.

**Question 1:**

Which of the following is **not**true of a codon?

1. It consists of three nucleotides.
2. It may code for the same amino acid as another codon.
3. It never codes for more than one amino acid.
4. It extends from one end of a tRNA molecule.
5. It is the basic unit of the genetic code.

**Question 2:**

The anticodon of a particular tRNA molecule is:

1. complementary to the corresponding mRNA codon.
2. complementary to the corresponding triplet in rRNA.
3. the part of tRNA that bonds to a specific amino acid.
4. changeable, depending on the amino acid that attaches to the tRNA.
5. catalytic, making the tRNA a ribozyme.

**Question 3:**

A codon is found in the:

1. template strand of DNA
2. tRNA
3. rRNA
4. mRNA
5. ribosome

**Question 4:**

The enzyme peptidyl transferase, which catalyzes the transfer of the polypeptide chain attached to the tRNA in the \_\_\_\_\_\_\_\_\_\_ site to the aminoacyl-tRNA in the \_\_\_\_\_\_\_\_\_\_ site, is thought to be a(n) \_\_\_\_\_\_\_\_\_\_ molecule and not a protein.

1. P; A; sugar
2. P; A; rRNA
3. A; P; mRNA
4. P; A; tRNA
5. A; P; rDNA

**Question 5:**

A possible sequence of nucleotides in the **template strand of DNA** that would code for the polypeptide sequence Phe-Leu-Ile-Val would be:

1. 5’— TTG-CTA-CAG-TAG—3’
2. 3’— AAC-GAC-GUC-AUA—5’
3. 5’— AUG-CTG-CAG-TAT—3’
4. 3’— AAA-AAT-ATA-ACA—5’
5. 3’— AAA-GAA-TAA-CAA—5’

**Question 6:**

The wobble hypothesis states that:

1. an mRNA codon can only pair with a single transfer RNA.
2. there are too many transfer RNAs to account for the number of amino acids.
3. an mRNA codon may pair with more than one transfer RNA.
4. several mRNA codons may pair with a single transfer RNA.
5. transfer RNAs do not stably associate with mRNA codons.

**MORE PROBLEMS ON THE NEXT PAGE**

Next, try the following non-multiple choice problems…

**Question 7**: This problem was designed to help you think about the relationship between a DNA sequence and the protein it encodes. A copy of the genetic code table is below.

A segment of a polypeptide chain is Arg-Gly-Ser-Phe-Val-Asp-Arg. It is encoded by the following segment of DNA:

--G G C T A G C T G C T T C C T T G G G G A--

--C C G A T C G A C G A A G G A A C C C C T--

1. What is the sequence of the RNA encoding the protein? Be sure to label the 5’ and 3’ ends.
2. Which of the DNA strands shown above is the template strand?
3. Which of the DNA strands shown above is the non-template strand?
4. Label each strand with its correct polarity (5’ and 3’).

**Question 8**: This problem will give you practice analyzing DNA, RNA, protein and mutation.

The following sequence represents the mRNA of a very short prokaryotic gene.

5'- CGGAGAUGCACCUGAGCGGCUAUCCAUAGCGUUAUCC -3'

1. Circle the start codon and put a box around the appropriate stop codon.
2. When this mRNA is translated, how many amino acids will be in the resulting protein?
3. Translate this mRNA into its protein product. A copy of the genetic code table is below.
4. Write the sequence of the DNA molecule that serves as the template for this mRNA. Label the 5' and 3' ends of the DNA molecule.

