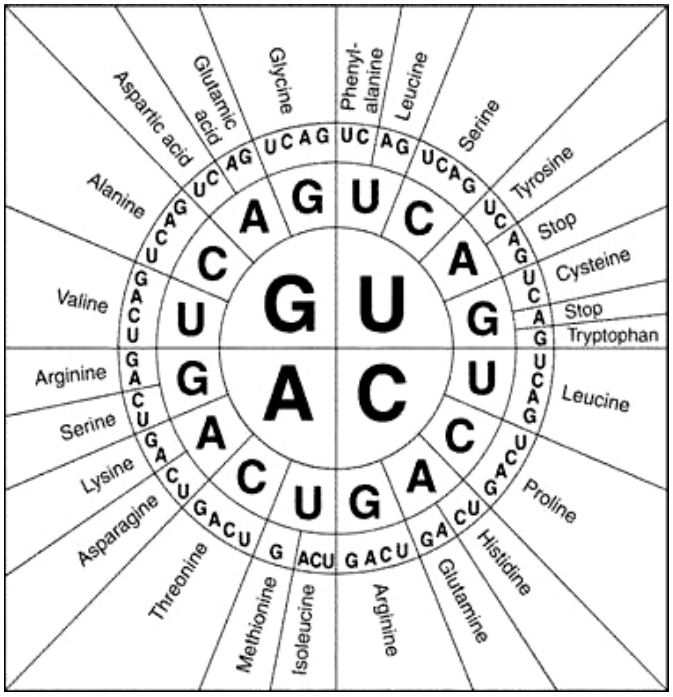
Name _____ Period _____ Date _____

Review and Practice: Protein Synthesis

Part 1. Practicing translation

1. Which amino acids do the following mRNA sequences code for?
   G G C
   U A C A C G
   C A G
   U A U A C G
   U A G
   U A G A C G



2. Which amino acids do the following DNA sequences code for?
   T A C
   A A T
   T C A
   G G C T A C

3. What sequence of mRNA could code for the following amino acids? (Give one possibility)
   Cysteine
   Tyrosine
   Stop

4. What sequence of DNA could code for the following amino acids? (Give one possibility)
   Arginine
   Tryptophan
   Stop

Part 2. How DNA controls the workings of the cell

Below are two partial sequences of DNA bases. Sequence 1 is from a human, and sequence 2 is from a cow. In both humans and cows, the sequence contains the gene to make the protein insulin. Insulin is necessary for the uptake of sugar form the blood. Without insulin, a person cannot digest sugars the same way others can, and they have a disease called diabetes.

Using the DNA sequence, make a complimentary mRNA strand for both the human and the cow. Write the mRNA directly below the DNA strand (remember to substitute Us for Ts in mRNA). Use a codon chart to determine what amino acids are assembled to make the insulin protein in both the cow and the human. Write your amino acid chain directly below the RNA sequence.

Table 1: Human insulin protein sequence

DNA Sequence	C C A T A G C A C G T T A C A A C G T G A A G G T A A
mRNA	
Amino Acids	

Table 2: Cow insulin protein sequence

DNA Sequence	C C G T A G C A T G T T A C A A C G C G A A G G C A C
mRNA	
Amino Acids	

Analysis: Answer the following questions completely.

1. Comparing the human gene to the cow gene, how many of the codons are exactly the same?

2. How many of the amino acids in the sequence are exactly the same?

3. Could two humans (or two cows) have some differences in their DNA sequences for insulin, yet still make the exact same insulin proteins? Explain.

4. Find ALL of the codons that can code for the amino acid leucine and list them. There are 6 total.

5. Often a person with diabetes has a defect in the sequence of DNA that codes for making the insulin protein.

   Suppose a person has a mutation in his or her DNA and the first triplet for the insulin gene reads T A T. The normal gene reads T A G. What amino acid does the mutant DNA and the normal DNA code for, and will the person with this mutation be diabetic? Explain.

   Another mutation changes the insulin gene to read T C T (instead of the normal T A G). Will this person be diabetic? Explain.

6. DNA sequences are often used to determine relationships between organisms. DNA sequences that code for a particular gene can vary, although organisms that are closely related will have very similar sequences. This table shows the amino acid sequences of 4 organisms. Based on these sequences, which two organisms are the most closely related? Explain.

Human: C C A T A G C A C C T A	Chimpanzee: C C A T A A C A C C T A
Pig: C C A T G T A A A C G A	Cricket: C C T A A A G G G A C G

7. An unknown organism is found in the forest, and the gene is sequenced as follows:

   Unknown Organism: C C A T G G A A T C G A

   What kind of animal do you think this is? Explain.