Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **Protein Synthesis**

**A. Protein Synthesis**

1. Protein synthesis occurs at organelles known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ which are made of \_\_\_\_\_\_\_\_\_\_\_\_\_
2. The instructions that code for the protein is known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and is located in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cannot leave the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ protein synthesis must be broken up into 2 steps \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. The first step is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and occurs in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. During this process a DNA template is used to create a strand of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. This strand carries the information to synthesize ONE protein and is known as a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
5. A group of 3 nucleotides (triplet) on DNA is called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and on the mRNA it is called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. The second step of protein synthesis is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. This process takes place at the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The mRNA codons travel from the nucleus, through the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to the ribosome where each codon is matched with is complimentary \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Each anticodon is at the base of a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ molecule that is carries a specific \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. As the tRNA molecules attach to the mRNA in the ribosome they leave behind the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ they were carrying. These amino acids are bonded together by strong \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ bonds. As more and more amino acids are bonded together a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is formed.

**B. Proteins**

1. A proteins \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ determines its function
2. Its shape is based on its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ sequence
3. Its amino acid sequence is based on its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ sequence (codons)

List 4 compounds in the body that are made of proteins

**C. Gene mutations**

1. Any change in an organism’s DNA codes is known as a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Gene mutations occur when only one gene on the chromosome is affected. This means that the production of only one \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is potentially altered.

There are four basic types of gene mutations: (complete the example of each below)

1. A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mutation occurs when one nitrogenous base is replaced by a different one.

Original DNA template AAT TGC CCC AGG

Mutated DNA template

1. An \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mutation occurs when two adjacent nucleotides switch position

Original DNA template AAT TGC CCC AGG

Mutated DNA template

1. An \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ occurs when an extra nucleotide is added to the original DNA code.

Original DNA template AAT TGC CCC AGG

Mutated DNA template

1. A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mutation occurs when a nucleotide is dropped from the original DNA code

Original DNA template AAT TGC CCC AGG

Mutated DNA template

1. Describe what a frame shift mutation is
2. Which two types of gene mutations cause frame shifts?
 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. A mutation is a change in the DNA sequence. This sequence is then \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ into mRNA codons, these codons are then \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ into amino acids. So a change in a DNA (triplet) \_\_\_\_\_\_\_\_\_ changes the mRNA \_\_\_\_\_\_\_\_\_\_ which can then code for a different \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. A different amino acid sequence will create a different \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Describe how a mutation can end up not affecting the protein produced.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**D. Transcription and Translation Practice**

DNA Template TAC GCG GTA CAT CCA TAG GAT GAA TTA ACT

mRNA codons \_\_\_\_\_\_ \_\_\_\_\_\_ \_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_

tRNA anticodons \_\_\_\_\_\_\_ \_\_\_\_\_\_ \_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_

Amino acids \_\_\_\_\_\_\_ \_\_\_\_\_\_ \_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_ \_\_\_\_\_\_\_

**E. Gene Expression**

1. Every cell in your body contains ALL of your genetic information, this means every cell has the genes for every protein that your cells make. To be **efficient** cells only **express** or use certain genes to make the proteins that they need to carry out their function.
2. Identify the tRNA, mRNA, codons, anticodons, ribosome and polypeptide.



1. Pay attention to what way the mRNA is traveling through the ribosome, what are the 4 amino acids, in order, that are coded for? (hint: the first codon is UCC)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. List 3 ways in which DNA and RNA differ

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. What are the three types of RNA and what is the role of each?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Where are all three types of RNA manufactured? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Use the next two pages to draw out each of the processes involved in protein synthesis*

**Transcription**

**Translation**