Name: _____

Period: _____

Gen-Elephant Encounter: A Mutation Lab

Purpose:

To practice skills related to transcription and translation (protein synthesis) and express the results of these processes.

Background:

There are small changes that do occur in the DNA molecule. Some cause problems to the organism's survival while others may not even be seen. Today, you will have the opportunity to review protein synthesis and include the possibility for mutation. This lab is not an example of actual living conditions as it has too many exaggerated effects. It does help, however, in explaining small changes that do occur in some organisms. Scientists find some mutations, such as these, in nature.

Procedure:

1) Roll the dice for each segment of the DNA molecule. A roll of numbers 2, 3, 4, or 6 produces a segment of normal DNA. A roll of 1 or 5 produces an abnormal segment.
2) If the roll is abnormal, write the letters "ABN" on the first line and change one (1) of the letters in the DNA sequence.
3) Using Figure 1, complete the complementary bases in transcription, translation and protein synthesis to find the amino acid sequence. It is possible to change a base in the sequence and not change the amino acid. Therefore, for purposes of comparison, copy the original normal sequence on a separate sheet of paper and complete the same steps to determine what amino acid would have been produced had the mutation not occurred.
4) Fill out the data chart indicating the mRNA, tRNA, and amino acids coded for by the DNA master strand listed, with the appropriate changes made for the abnormal rolls of the dice. Note: In order to translate the codons into amino acids using the chart on the following page, be sure to use the mRNA bases, not the tRNA anti-codons. If the amino acid changed from what it should have been originally, "mutate" that fly part to whatever you'd like to illustrate that alteration.
5) On a separate sheet of plain white paper, draw your new "Gen-Elephant" using the normal structures given and abnormal structures you developed yourself. Be sure to label all seven (7) structures to eliminate confusion.
6) On the same sheet of paper as your drawing, make an appropriate conclusion to demonstrate what you have learned about the potential effects of changes in the base sequence in your Gen-elephant Encounter!

(ABN) / (N)	Master DNA	mRNA	tRNA	Amino Acid	Structure
1)_____	G A T C C C	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____	_____ _____	 **Trunk**
2)_____	G G G C A T	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____	_____ _____	 **Ears**
3)_____	A A A T T T	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____	_____ _____	 **Tail**
4)_____	C T A T A C	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____	_____ _____	 **Body**
5)_____	A A G A T C	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____	_____ _____	 **Legs**
6)_____	G A A C T T	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____	_____ _____	 **Toenails**
7)_____	G A T T A G	_____ _____ _____ _____ _____ _____	_____ _____ _____ _____ _____ _____	_____ _____	 **Tusk**

FIRST POSITION	SECOND POSITION								THIRD POSITION
	U		C		A		G		
	Codon	Amino Acid	Codon	Amino Acid	Codon	Amino Acid	Codon	Amino Acid	
U	UUU	phe	UCU	ser	UAU	tyr	UGU	cys	U
	UUC		UCC		UAC		UGC		C
	UUA	leu	UCA		UAA	STOP	UGA	STOP	A
	UUG		UCG		UAG	STOP	UGG	trp	G
C	CUU	leu	CCU	pro	CAU	his	CGU	arg	U
	CUC		CCC		CAC		CGC		C
	CUA		CCA		CAA	gln	CGA		A
	CUG		CCG		CAG		CGG		G
A	AUU	ile	ACU	thr	AAU	asn	AGU	ser	U
	AUC		ACC		AAC		AGC		C
	AUA		ACA		AAA	lys	AGA	arg	A
	AUG	met	ACG		AAG		AGG		G
G	GUU	val	GCU	ala	GAU	asp	GGU	gly	U
	GUC		GCC		GAC		GGC		C
	GUA		GCA		GAA	glu	GGA		A
	GUG		GCG		GAG		GGG		G

Analysis Questions

1) A "silent" mutation is where a substitution occurs but results in the same amino acid. What would result in the pheno type in this case? Explain your reasoning.

2) Elephants in certain areas in Africa have been found to be born tuskless where poaching seems to have had a great impact on wild populations. Could this be the result of a mutation? Explain why this trait could become more prevalent in these wild populations

3) If a mutation resulted in a stop codon at a point in the gene where it should not occur, what would result? Explain your reasoning.

4) Some mutations are the result of the deletion or addition of a base to the gene sequence. How does this affect the translation of the gene into amino acids? Be thorough in your explanation and feel free to use an example if it will help explain your answer.