

Imagine that each word in a sentence is a different gene.

Next to each sentence, write whether the mutation was caused by a **substitution, deletion, insertion or inversion**.

Original meaning, no mutations: It's raining cats and dogs outside.

Mutated sentence	Mutation Type (substitution, deletion, insertion, inversion)
1. It's ragning cats and dogs outside.	
2. It's raining cats and logs outside.	
3. It's raining raining cats and dogs outside.	
4. It's raining dogs outside.	
5. It's raining edistuo sgod dna stac.	
6. It's raining cats anfrogsd dogs outside.	
7. It's raining rats and dogs outside.	
8. It's raining cats and dogs.	

Name: _____ Date: _____ Period: _____

Mutations Worksheet

There are several types of mutation:

DELETION (a base is lost)

INSERTION (an extra base is inserted)

Deletion and insertion may cause what's called a **FRAMESHIFT**, meaning the reading "frame" changes, changing the amino acid sequence.

SUBSTITUTION (one base is substituted for another)

If a substitution *changes* the amino acid, it's called a **MISSENSE** mutation.

If a substitution *does not change* the amino acid, it's called a **SILENT** mutation.

If a substitution *changes the amino acid to a "stop,"* it's called a **NONSENSE** mutation.

➡ Complete the boxes below. Classify each as either Deletion, Insertion, or Substitution **AND** as either frameshift, missense, silent or nonsense (hint: deletion or insertion will always be frameshift). See page 367 in text for genetic code

Original DNA Sequence: **T A C A C C T T G G C G A C G A C T**

mRNA Sequence: _____

Amino Acid Sequence: _____

Mutated DNA Sequence #1: **T A C A T C T T G G C G A C G A C T**

What's the mRNA sequence? _____ (Circle the change)

What will be the amino acid sequence? _____

Will there likely be effects? _____ What kind of mutation is this? _____

Mutated DNA Sequence #2: **T A C G A C C T T G G C G A C G A C T**

What's the mRNA sequence? _____ (Circle the change)

What will be the amino acid sequence? _____

Will there likely be effects? _____ What kind of mutation is this? _____

Mutated DNA Sequence #3: **T A C A C C T T A G C G A C G A C T**

What's the mRNA sequence? _____ (Circle the change)

What will be the amino acid sequence? _____

Will there likely be effects? _____ What kind of mutation is this? _____

Mutated DNA Sequence #4: **T A C A C C T T G G C G A C T A C T**

What's the mRNA sequence? _____ (Circle the change)

What will be the amino acid sequence? _____

Will there likely be effects? _____ What kind of mutation is this? _____

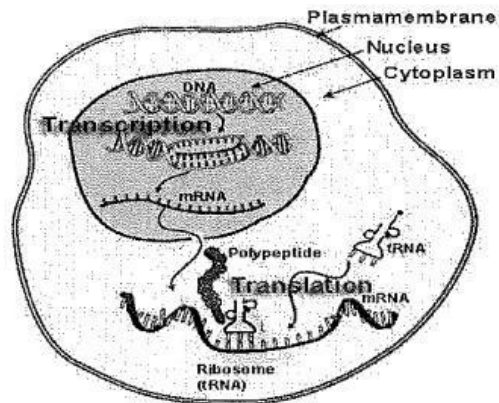
Name _____

Date _____

Period _____

Nucleic Acids and Protein Synthesis OVERVIEW

	DNA	RNA
Sugar		
# Strands		
Bases Present		



	? » ?	Where?
Replication		
Transcription		
Translation		

1. Where (in the cell) does mRNA copy the message from the DNA template?
2. Where does the mRNA go next?
3. The strand below is DNA/RNA
UUU ACA GGA
4. What is the protein that would result from the sequence in #3?
5. The strand below is DNA/RNA
ACC GTG CCA
6. What is the protein that would result from the sequence in #5?

Codon Chart

		Second base				
		U	C	A	G	
First base	U	UUU } Phe	UCU } Ser	UAU } Tyr	UGU } Cys	U
		UUC } Phe	UCC } Ser	UAC } Tyr	UGC } Cys	C
		UUA } Leu	UCA } Ser	UAA Stop	UGA Stop	A
		UUG } Leu	UCG } Ser	UAG Stop	UGG Trp	G
	C	CUU } Leu	CCU } Pro	CAU } His	CGU } Arg	U
		CUC } Leu	CCC } Pro	CAC } His	CGC } Arg	C
		CUA } Leu	CCA } Pro	CAA } Gln	CGA } Arg	A
		CUG } Leu	CCG } Pro	CAG } Gln	CGG } Arg	G
	A	AUU } Ile	ACU } Thr	AAU } Asn	AGU } Ser	U
		AUC } Ile	ACC } Thr	AAC } Asn	AGC } Ser	C
		AUA } Ile	ACA } Thr	AAA } Lys	AGA } Arg	A
		AUG Met or start	ACG } Thr	AAG } Lys	AGG } Arg	G
	G	GUU } Val	GCU } Ala	GAU } Asp	GGU } Gly	U
		GUC } Val	GCC } Ala	GAC } Asp	GGC } Gly	C
		GUA } Val	GCA } Ala	GAA } Glu	GGA } Gly	A
		GUG } Val	GCG } Ala	GAG } Glu	GGG } Gly	G

Ala = alanine	Gln = glutamine	Leu = leucine	Ser = serine
Arg = arginine	Glu = Glutamate	Lys = lysine	Thr = threonine
Asn = asparagine	Gly = glycine	Met = methionine	Trp = tryptophan
Asp = aspartate	His = histidine	Phe = phenylalanine	Tyr = tyrosine
Cys = cysteine	Ile = isoleucine	Pro = praline	Val = valine