							Date	:		Period:	
		Gene	Mut	tatio	ns V	Vork	shee	et			
There are two types of mutations, small-scale gene mutations and large-scale chromosomal mutations. You will do gene (point) mutations in this handout. Since mRNA is read in threes (codons), an addition or deletion of a base changes the reading frame of the sequence.											
FRAMESHIFT MUTATIONS											
DNA Sentence	THE E	OY CU	T HIS	LIP AN	ID ATE	THE	OT DO)G			
Insertion Example THE BOY CUT HIS SLI PAN DAT ETH EHO TDO Insert a base											
					Delete	a bas	е				
DNA Sentence	THE B	OY CU	T HIS I	LIP AN	D ATE	THE H	OT DO	G			
Deletion Example	THE B	OY CU	T HIS L	IP AN	A TET	HEH C	TD OG	ì			
The insertion shifts the reading frame to the right. The deletion frame shifts the reading frame to the left. <i>Insert a letter C for the two insertion questions and for the deletion questions, delete the H or one base letter.</i>											
Write each codon pe	er line.										
DNA Sentence	THE I	BOY C	UT HI	IS LI	P AN	D ATE	E THI	Е НО	T DOG		
Insertion	THE I	BOY _									
Deletion	THE I	BOY C	UT _								
Now use real DNA code and translate it into the correct amino acids. Decide where in the original DNA code to cause a mutation on the rest of the questions. Please use the codon table on the last page to find the corresponding amino acids.											
Write each codon pe Original DNA						A base GAG				ok place.	
Insertion DNA					-	-	<u> </u>	· 			
Mutated mRNA											
Mutated Amino Acids	S						***************************************	-			
Original Amino Acid											

Name: _____ Row: ____

Write each codon pe Original DNA						A base GAG			
Deletion DNA						-	-		
Mutated mRNA							1		-
Mutated Amino Acids)								
Original Amino Acid	Met	Pro	Ala	Arg	Val	Leu	Gly	Tyr	STOP
Usually a frame shift is Why do you think you								al prote	ein.
BASE SUBSTITUTION For simplicity, change A different type of gen mutation where a nucle	only on one muta	<i>ne base</i> tion is o	for all	oase su	bstituti	on. It i	s the si	mplest	
Base Substituti One type of base subst happens when one pur	on itution ine (A,	is calle	d <i>trans</i>	GAC eversion d with a	\rightarrow G G in mutan a pryim	C tion. Traidine (ansvers		utation
Purine \rightarrow Pyrin Pyrimidine \rightarrow					\rightarrow TA \rightarrow GA				
Use the DNA code bel All you have to do is c					→ pyri	midine	transv	ersion 1	nutation.
Write each codon per Original DNA								TTC	ATC
Transversion DNA							<u> </u>		
Mutated mRNA									
Mutated Amino Acid _									
Original Amino Acid	Met	Val	Arg	Leu	Asp	Arg	Val	Lvs	STOP

The opposite of transversion mutations is happens when one purine is swapped wit pyrimidine.	s transition mutations. A transition mutation the other purine or pyrimidine with
Purine \rightarrow Purine Pyrimidine \rightarrow Pyrimidine	$GAC \rightarrow AAC$ $GAC \rightarrow GAT$

Use the DNA code below to demonstrate a purine \rightarrow purine transition mutation. All you have to do is change one DNA base.

Write each codon per line and circle the mutated amino acid.											
Original DNA	TAC	GTC	GCT	CAA	CGG	GAC	CTG	ACC	ACT		
Transition DNA			-	-			V 				
Mutated mRNA		-									
Mutated Amino Acid					-						
Original Amino Acid	Met	Gln	Arg	Val	Ala	Leu	Asp	Trp	STOP		
A third type of base substitution is called <i>silent mutation</i> . Silent mutation happens when one base in a codon is changed but both code for the same amino acid. DNA CTT → CTG Amino Acid Leu → Leu Use the DNA code below to demonstrate a silent mutation. All you have to do is change one DNA base but the amino acid stays the same.											
Write each codon per line and circle the mutated DNA base.											
Original DNA	TAC	CAT	TCT	CGG	TGT	AAA	AGG	GCG	ATT		
Silent DNA			10-11-110-1								
Mutated mRNA								W			
Mutated Amino Acid											
Original Amino Acid	Met	Val	Arg	Ala	Thr	Phe	Ser	Arg	STOP		

A base mutation that creates a new stop codon in place of an amino acid is called a *nonsense mutation*.

DNA

 $TGT \rightarrow TGA$

Amino Acid

Cys \rightarrow STOP

Use the DNA code below to demonstrate a nonsense mutation. All you have to do is change one DNA base to create a new stop codon.

Write each codon per line and circle the mutated amino acid.

Original DNA	TAC	GGT	AAT	CAA	ATA	GAA	CCT	GAG	ACT
Nonsense DNA								· ———	-
Mutated mRNA									
Mutated Amino Acid	·								-
Original Amino Acid	Met	Pro	Leu	Val	Tyr	Leu	Gly	Leu	STOP
Please explain the diff mutation.	erence	betwee	n a frai	me shif	t mutat	ion and	a base	substi	tution

Codon Table											
		Phe	Ser	Tyr	Cys	U					
	U	Phe	Ser	Tyr	Cys	C					
	_	Leu	Ser	STOP	STOP	A					
		Leu	Ser	STOP	Trp	G					
		Leu	Pro	His	Arg	U					
1 C s t	_	Leu	Pro	His	Arg	C	2				
	C	Leu	Pro	Gln	Arg	Α	<u>ي</u>				
		Leu	Pro	Gin	Arg	G	3 r d				
B a A s	He	Thr	Asn	Ser	U						
		Ile	Thr	Asn	Ser	С	В				
	A	Ile	Thr	Lys	Arg	Α	а				
e		Met	Thr	Lys	Arg	G	s e				
		Val	Ala	Asp	Gly	U					
	G	Val	Ala	Asp	Gly	C					
	G	Val	Ala	Glu	Gly	Α					
		Val	Ala	Glu	Gly	G					
		U	С	Α	G						
2nd Base											