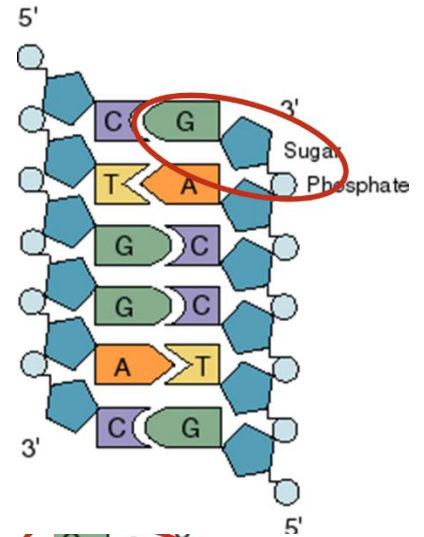


Unit 5: DNA/RNA Notes

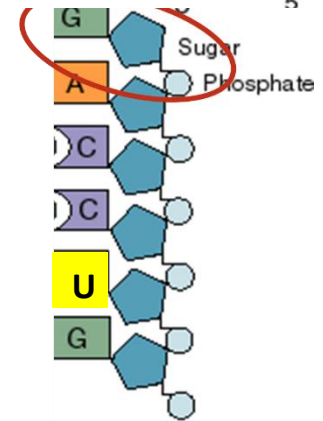
DNA Review (Deoxyribonucleic Acid)

- ▶ Nucleotide: _____ of a nucleic acid
- ▶ Made of 3 parts:
 1. _____ (DNA)
 2. Phosphate
 3. Nitrogenous Base (A-T C-G) Held by _____
- ▶ Shape
DNA = _____
- ▶ Function of Nucleic Acids
DNA _____ genetic information



RNA (Ribonucleic Acid)

- ▶ Nucleotide: _____ of a nucleic acid
- ▶ Made of 3 parts:
 1. _____ (RNA)
 2. Phosphate
 3. Nitrogenous Base (A-U C-G)
- ▶ Shape
RNA = _____
- ▶ Function of Nucleic Acids
RNA _____ (delivers or passes on) genetic information



	Polymers	
	DNA	RNA
# of Strands		
Shape	Double helix	
Monomers		Nucleotide
Sugar	Deoxyribose	Ribose
Bases		
Location	Nucleus only	

Unit 5: Protein Synthesis Notes

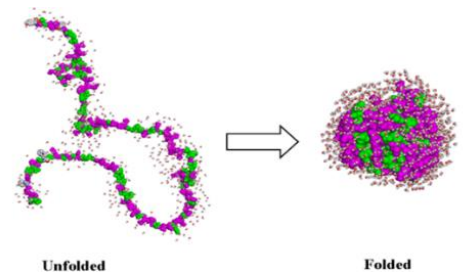
Structure and Function of Proteins

Structure of Proteins:

- Monomers are _____
- Contain the elements Carbon (C), Hydrogen (H), Oxygen (O), and _____ (N)

Function of Proteins:

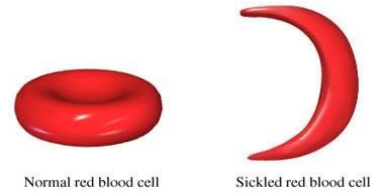
- _____ and repair
- _____ from one cell to another
- _____ channels in cell membranes
- _____ against invaders



- Catalyzing chemical reactions (_____ are proteins)
- **Protein** _____ **Determines** _____ - **If the protein folds incorrectly it will not work properly!*

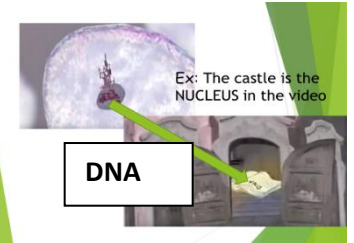
Protein Problem Example:

When the oxygen carrying protein _____ by _____ amino acid then it can cause the _____ cell's _____ to change. The blood cell is now inefficient at carrying _____.



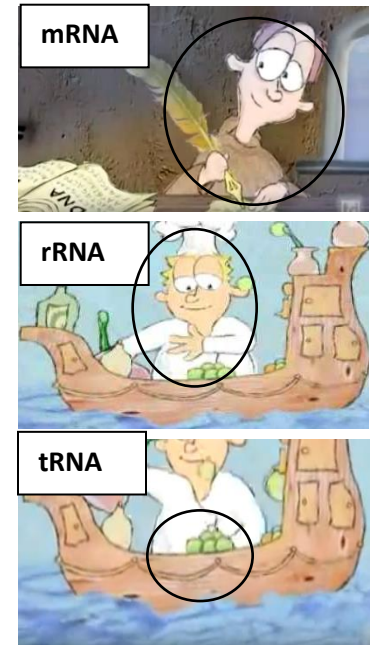
Protein Synthesis Background

- Also called _____
- Process of cells making new _____ to show genetic _____ using _____
- _____ → _____ → _____ → _____ → _____ (_____)
- Genes- _____ of _____ (DNA) that control the production of _____ and activities within a cell.



3 Types of RNA used in Protein Synthesis

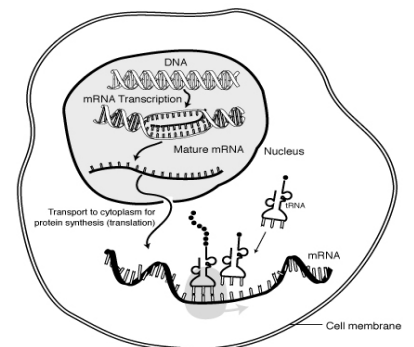
1. Messenger RNA (mRNA) - _____ copies of instructions for _____ from DNA to _____ in _____. (Because DNA _____ leave the _____ or it may get _____)
Ex: The **SCRIBE (writer/copier)** in the video
2. Ribosomal RNA (rRNA)- makes up the _____ (small _____) and is the _____ (_____) of protein synthesis.
Ex: The **CHEF** in the video
3. Transfer RNA (tRNA)- _____ to the _____ and matches them to the _____ message. tRNA gets _____ / _____ after it drops off amino acid.
Ex: The **INGREDIENTS** in the video



Protein Synthesis:

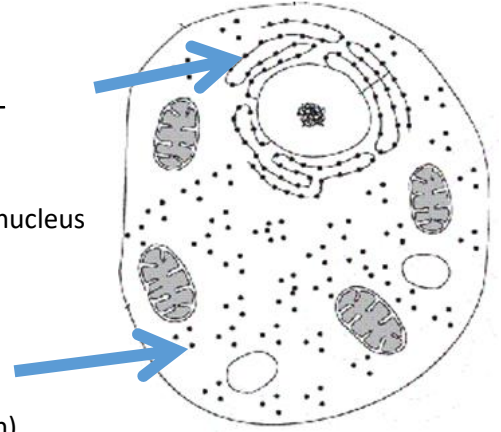
Part 1: _____ (occurs in the _____)

- When complementary _____ (mRNA) molecules are produced by _____ segments of the DNA sequence
- Free floating _____ match up with the DNA template in groups of _____ bases (_____)
- 3 mRNA bases is a codon (A- _____ and C-G)
- Each _____ codes for a _____ (Ex. 2 codons = 2 amino acids= 6 nitrogen bases)
- Single new strand of mRNA leaves the _____ and _____ the _____ to the _____ where proteins are assembled
- mRNA _____ to the _____ and _____ for the tRNA



Transcription Summary

- Transcription _____ the instructions to make proteins from the _____ to the _____ in the form of _____



Part 2: _____ (occurs in the _____)

- Ribosomes: _____ using instructions from the nucleus
Ribosomes can be:
 - Free _____
 - Attached to _____
- Decoding of an _____ into a _____ chain (protein)
- tRNA (_____) is composed of _____ bases
- tRNA picks up a _____ amino acid in the _____ and takes it to the _____.
- tRNA will “read” the _____ and drop off the _____ in the correct _____ to build the protein needed
- 20 _____ amino acids - 64 possible _____ combinations (there are multiple ways to code for the same amino acid in some instances to help _____)

Translation Summary

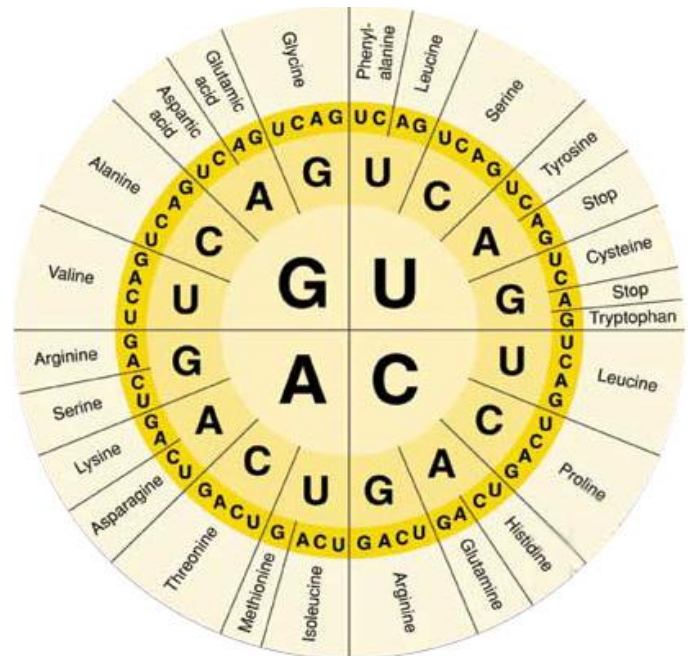
- The _____ (mRNA codons) matches up with tRNA _____ in the cytoplasm to put the amino acids in the correct order. This happens on the ribosome, rRNA.
- Amino acids form a _____ chain held together by _____ bonds; this is a _____.

DNA:	GAC	CCT	TAT
mRNA:	_____	_____	_____
Amino Acid:	_____	_____	_____
tRNA:	_____	_____	_____

mRNA Codon Chart

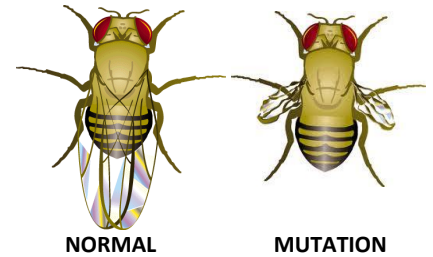
		Second letter			
		U	C	A	G
First letter U	UUU } Phe	UCU } Ser	UAU } Tyr	UGU } Cys	U
	UUC } Phe	UCC } Ser	UAC } Tyr	UGC } Cys	C
	UUA } Leu	UCA } Ser	UAA } Stop	UGA } Stop	A
	UUG } Leu	UCG } Ser	UAG } Stop	UGG } Trp	G
C	CUU } Leu	CCU } Pro	CAU } His	CGU } Arg	U
	CUC } Leu	CCC } Pro	CAC } His	CGC } Arg	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	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

mRNA Codon Circle



Unit 5: Mutations Notes

- Mutations – heritable _____ in the _____
_____;
- Happen when a change occurs in _____ bases
- Are a source of _____
- Are _____ events
- Positive Mutations - produce proteins with _____ or _____ functions that can be _____ to organisms in different or changing environments.
Ex. _____
- Negative Mutations- when proteins are dramatically changed in _____ or _____; _____ normal biological activities. Ex. Cancer, sickle cell anemia
- Neutral Mutations- _____ or _____ on function of proteins



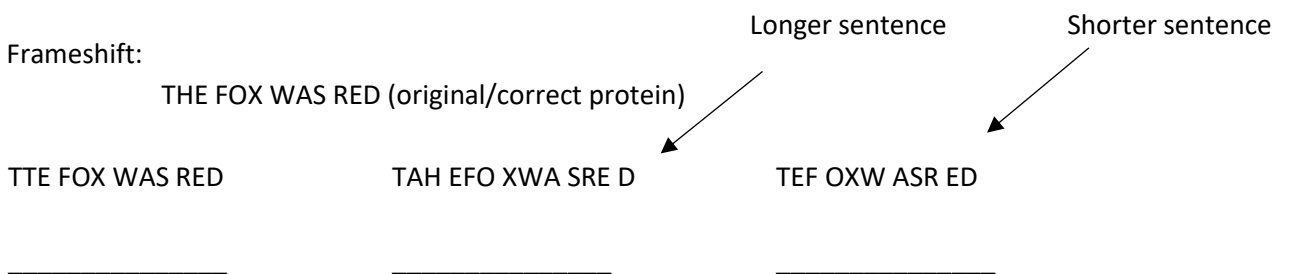
Causes of Mutations

- Mistake made during DNA _____ or _____ during _____.
- Mutagens: _____ or _____ agents in the environment EX: X rays, UV light, nuclear radiation, asbestos, cigarette smoke, _____
- Can you give a mutation to your kids?
YES, if a mutation occurs in a _____ or _____ cell
NO, if a mutation occurs in a _____ (example skin cell)

Types of Mutations: Point Mutations

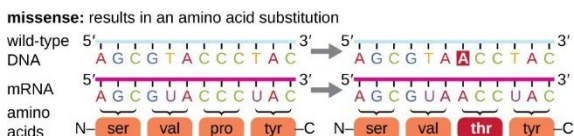
- Point Mutations that occur at a _____ in the _____ and _____ only one or a few _____. This affects a _____ gene.
- Substitutions - _____ base is changed to a _____ base
Ex. TAC **G**GT AGA → TAC **T**T AGA
 - Frame shift mutations - _____ the _____ of the rest of the DNA sequence
 - Insertion - one base is added
Ex. TAC GCT AGA → **T**TA CGC TAG A
 - Deletion - one base is removed
Ex. **T**AC GCT AGA → TCG CTA GA

Substitution vs. Frameshift:



Substitution Effects:

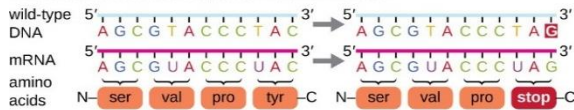
- Missense: _____ the amino acid and therefore changes the protein, usually _____
CAC = histidine → **CC**C= proline



- Nonsense: codes for a _____, stops the production of the _____, usually _____

UAU = tyrosine → UAG = stop

nonsense: substitutes a stop codon for an amino acid

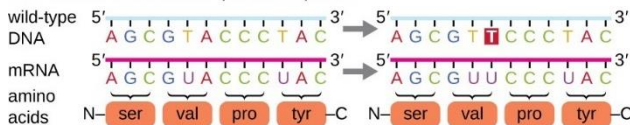


frameshift mutation: insertion or deletion of one or more bases

- Silent: does _____ the amino acid, not harmful, (alters DNA sequence, but has no detectable effect on a phenotype or function).

CAC = histidine → CAU = histidine

silent: has no effect on the protein sequence



Examples of Point Mutations (Substitutions):

1. _____
2. _____
3. _____

Frameshift Affects:

- Bases are _____ (put in) or _____ (take out)
- Very _____ because a mistake in DNA is carried into mRNA and results in _____ amino acids

- For example, read the following sentence

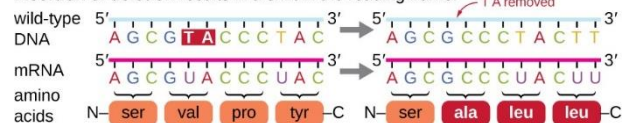
Original: The fat cat ate the wee rat.

Frame Shift: The fat caa tet hew eer at.

The "t" in cat was deleted causing most of the sentence to be wrong!

frameshift mutation: insertion or deletion of one or more bases

Insertion or deletion results in a shift in the reading frame.



Types of Mutations: Chromosomal Mutations (*not just a base)

- Produces change in _____
- _____ break or are lost
- Broken chromosomes may rejoin incorrectly
- _____ (_____) when it occurs in a zygote (fertilized egg that will become a baby)
- Results in _____ changes to proteins produced
- Examples
 - Deletion - _____ of all or part of a chromosome
 - Duplication - _____ copies of a chromosome.
 - Also called _____
 - Inversion - reverse the _____ of chromosomes
 - Translocation - when part of a chromosome _____ and attaches to another chromosome

Chromosomal Mutation

