

# Protein Synthesis

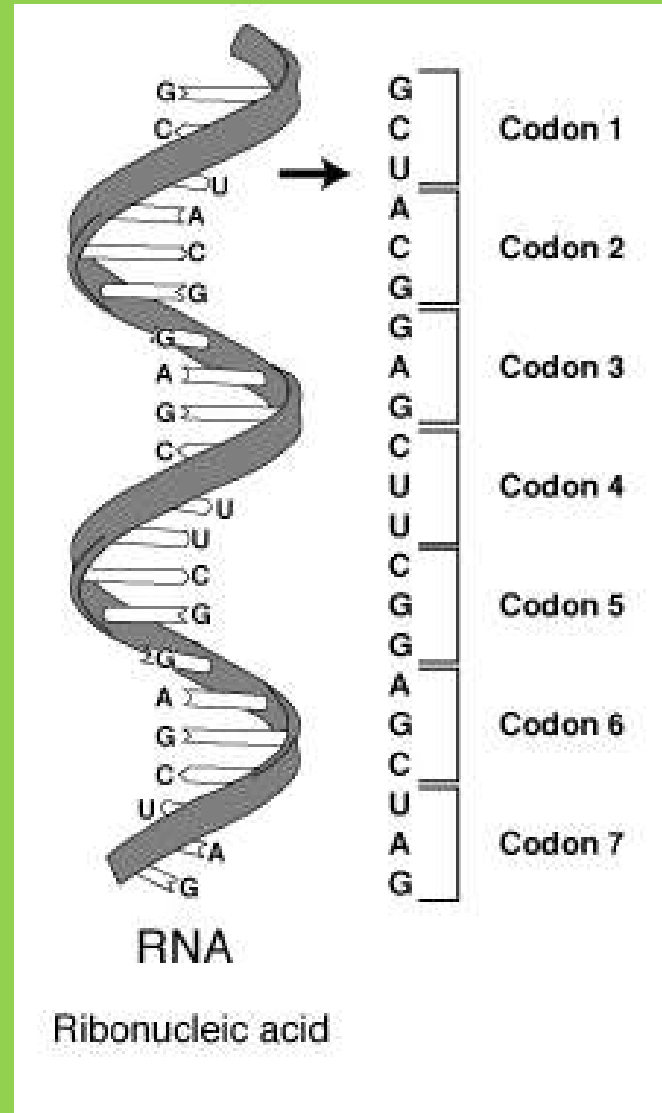
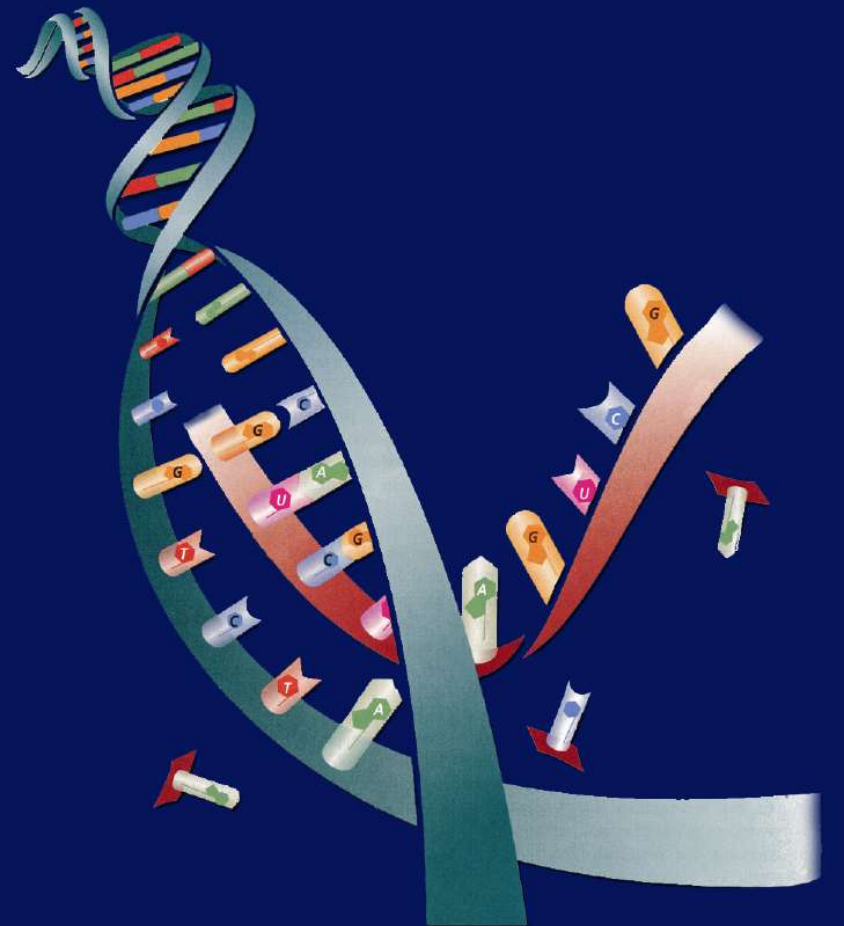
Transcription Practice p. 69NB

- **Directions:** Using the DNA strand as a template, transcribe mRNA. Make sure to use the correct Nitrogen bases.
1. ATA CCT TAA CGC GTC
  2. TAT TAG GCA AAA TTC
  3. GTG TGA TTA ATA GCC
  4. CTA AAG GAA TAG GAT
  5. GAT GAA TAC CCA CGA
  6. TAA TAT GCA CAT TAC
  7. GAA CCT TAC GGG GTG
  8. TAT AAC CAG GAG TTT
  9. ATC CGT AGT GTA AAT
  10. GGA TTA CCC TTA CCA

## 10/5 Protein Synthesis: Transcription 11.2

Obj. TSW explain the process of Protein Synthesis by transcribing and translating DNA sequences from their Mini Lab 11.1 P.68 NB

[Learn.genetics.utah.edu/](http://Learn.genetics.utah.edu/)



1. What is transcription?
2. Where does Transcription happen?
3. Why is a codon important to making a protein?

HW – Study for the DNA Quiz tomorrow

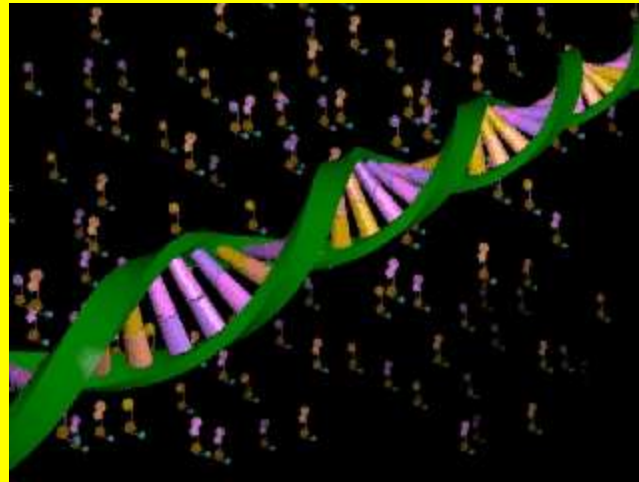
Cell Lab is due Thursday/ friday

# Cracking the Code

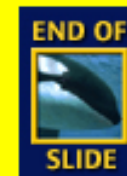
- Students will take a page of notes on Notebook Paper and tape into their NB page 69NB

# Transcription

In the nucleus, enzymes make an RNA copy of a portion of a DNA strand in a process called **transcription**.

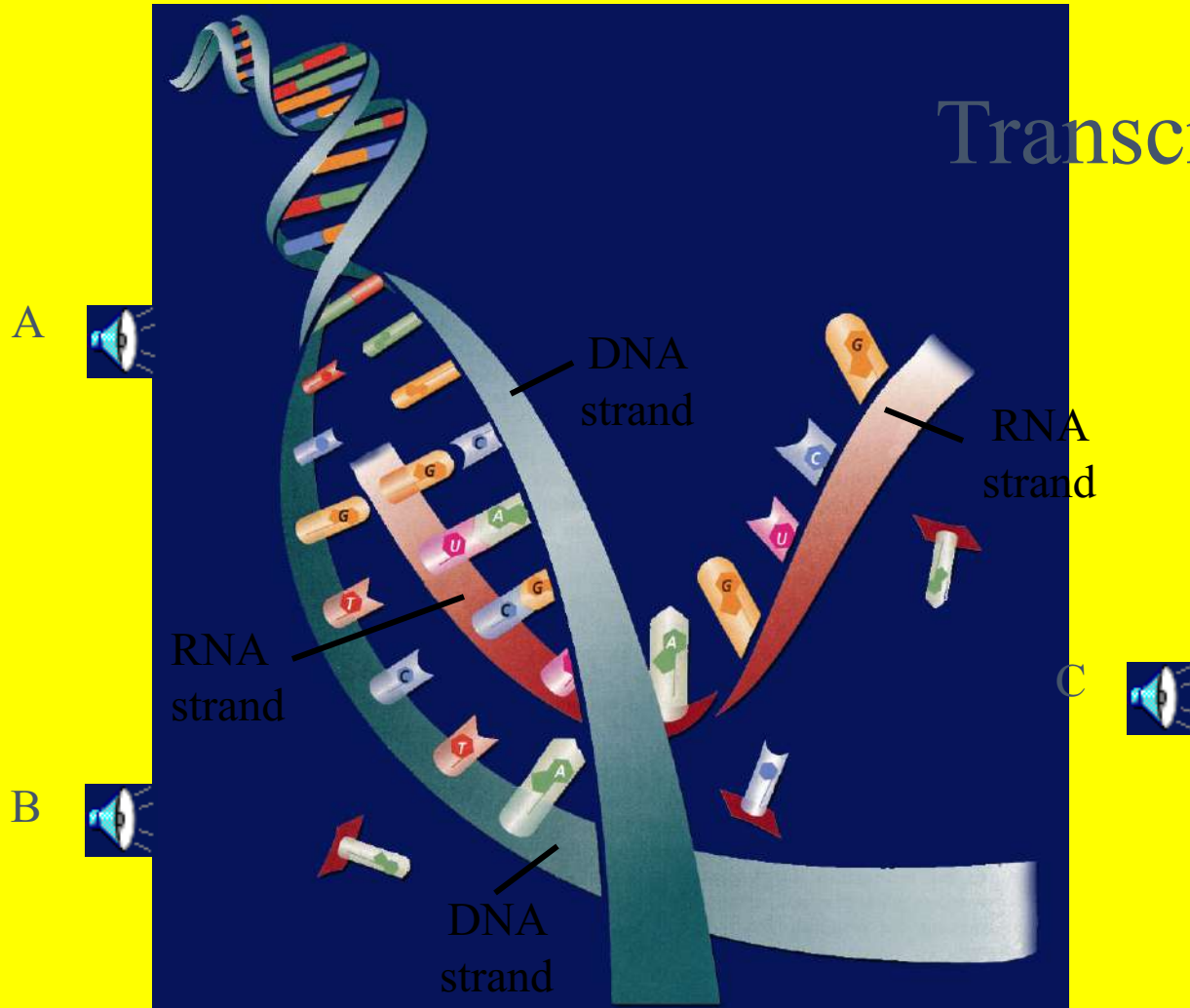


Click image to view movie



RESOURCES

## Transcription



END OF SLIDE



RESOURCES

# Transcription

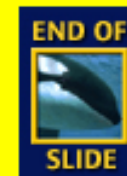
The main difference between transcription and DNA replication is that transcription results in the formation of one single-stranded RNA molecule rather than a double-stranded DNA molecule.



## RNA Processing = Gene Expression

Not all the nucleotides in the DNA of eukaryotic cells carry instructions—or code—for making proteins.

Genes usually contain many long noncoding nucleotide sequences, called introns, that are scattered among the coding sequences.



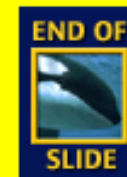
# Protein Synthesis Honors Biology

- 1 large bag M &M's – Maria
- 1 large bag of Gummy Bears – Yanna
- 4 Bags of Marshmallows – Claudia, Sarahi, Fabio, Aisha
- 1 Box of Rice Krispies Cereal – Abby
- 1 stick of Butter – Dru & Sopear



How does DNA control the structures and functions of a cell?

DNA determines the structure of proteins. Some proteins become important cell structures. Other proteins, such as enzymes, control chemical reactions that perform key life functions.



CA: Biology/Life Sciences  
5a



**RESOURCES**

# HW CH 11 DNA & Genes p.41 NB

1. Deoxyribose
2. Nitrogenous Base
3. Nucleotide
4. Base Pair
5. Hydrogen Bond
6. Phosphate
7. Adenine (A) & Nitrogen Bases
8. Cytosine
9. \*Nucleotides
10. DNA Replication
11. Double Helix

# HW CH 11 DNA & Genes\*

1. DNA – Double RNA – single
2. DNA – Deoxyribose RNA – Ribose
3. DNA – ATCG RNA – AUCG
4. Amino Acids
5. Amino Acids
6. Proteins
7. Codon\*
8. Threonine

# QUIZ

8. What is DNA Replication?

9. What are the two functions of DNA?

10. What are three differences of RNA from DNA?

11. What RNA has stop codons, and what is their function?

12. How are codons and anticodons different?

13. Write the equation for Protein Synthesis.

14. Transcribe & Translate the DNA sequence: ATC, TCA, TAC

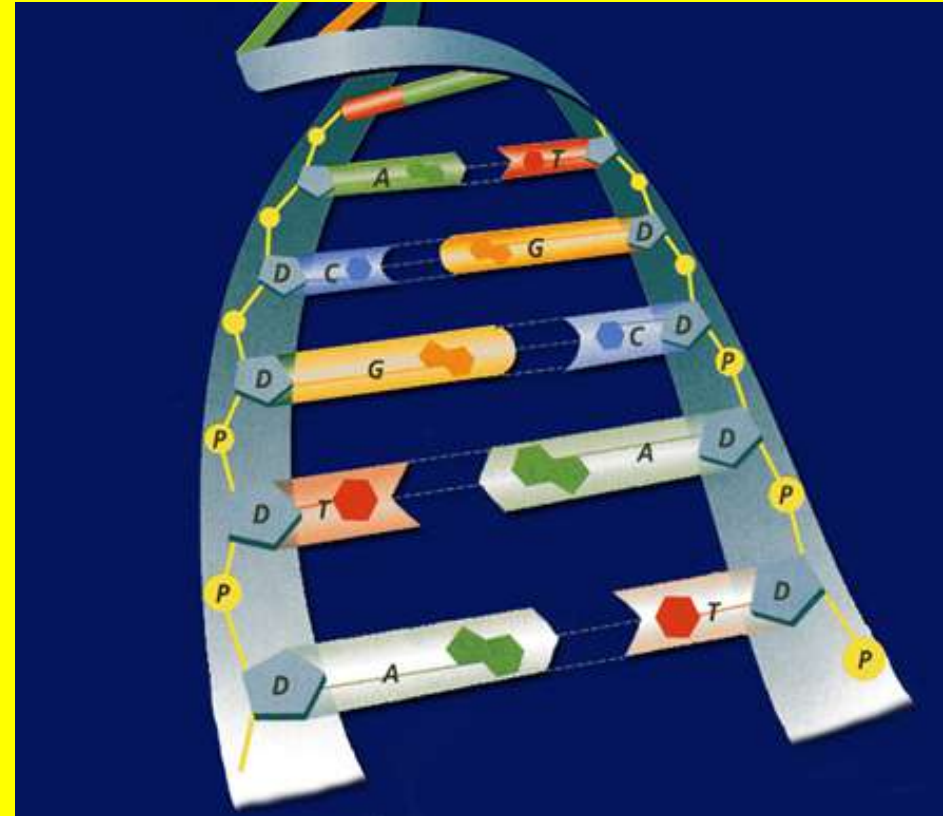
# DNA Quiz

7. What is the backbone of the molecule made of?
8. What is a gene?
9. What does DNA code for? What is it's purpose?
10. Write the formula for Protein Synthesis

When you are finished turn you paper upside down and wait quietly to have me pick it up.

**POP QUIZ** Write your name on your binder paper.

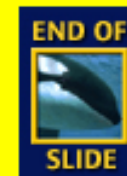
1. What is this molecule? Spell it out.
2. What is the shape of the molecule?
3. What are the two purposes/ functions of this molecule?
4. Write the three names for the parts of a nucleotide. Be specific.
5. The Nitrogen bases are: Adenine, Cytosine, Guanine, & Thymine – Base Pair them together correctly.
6. What holds the Nitrogen bases together?
7. DNA is a Nucleic Acid, write an example of another one.
8. Can a Nucleic Acid leave the nucleus?
9. What is DNA Replication?
10. What is the name for how DNA Replications?



The process through which the order of bases in messenger RNA codes for the order of amino acids in a protein is:

- A. transcription
- B. translation
- C. replication
- D. point mutation

The answer is B.



Why would scientists use nucleotide sequences to identify bodies of crime victims?

In comparing nucleotide sequences in the DNA of a crime victim with nucleotide sequences from a possible close relative of the crime victim, scientists can determine if the two are related.





# HW CH 11

9. Phenylalanine Codon are (UUU) (UUC)

10. Codon

11. Amino Acid

12. Amino Acid

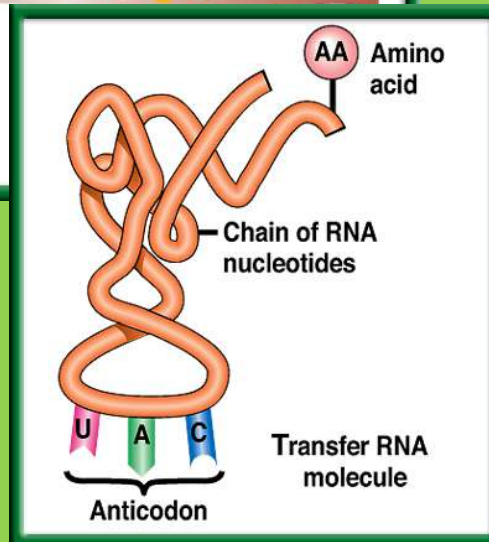
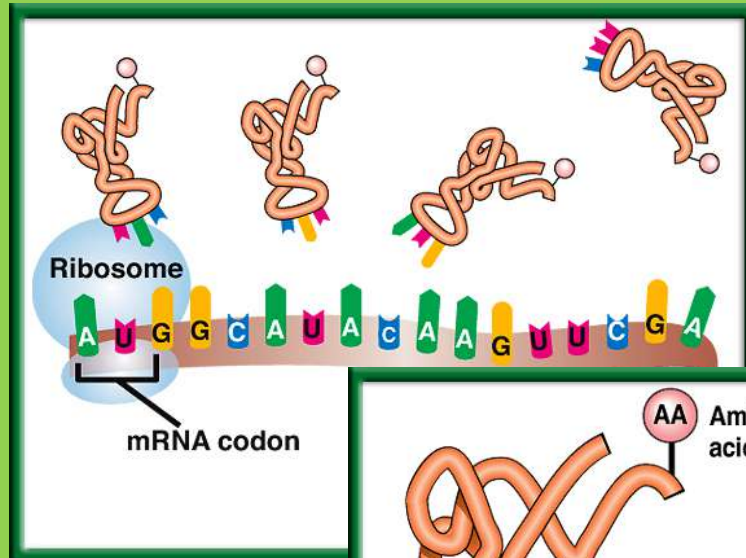
13. Stop codons = UGA, UAG, UAA

14. Tryptophan & Methionine

## 10/6 Protein Synthesis: Translation 11.2

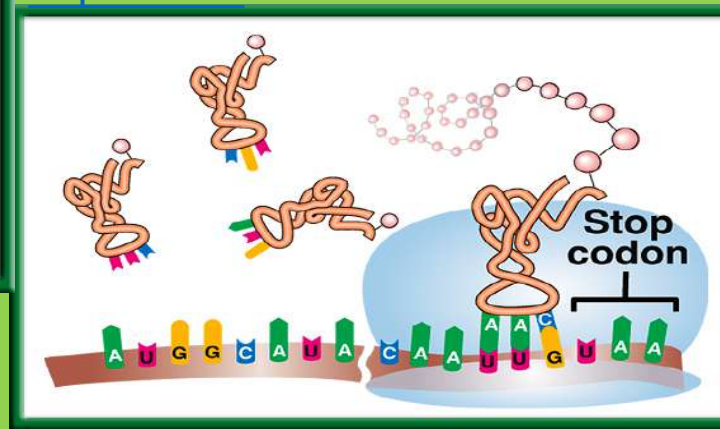
Obj. TSW explain the process of Protein Synthesis by drawing it in their notebooks. p.70NB

[Learn.genetics.utah.com.edu/](http://Learn.genetics.utah.com.edu/)

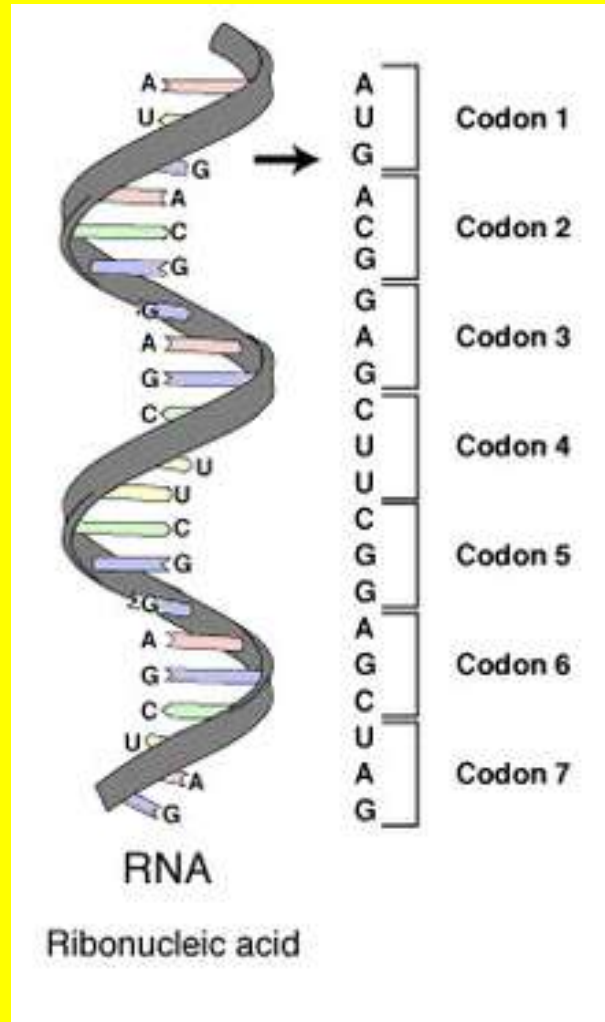


1. Compare & Contrast Codon and Anticodon.
2. What is the role of tRNA in Protein Synthesis?
3. Why are Stop Codons important in Translation?

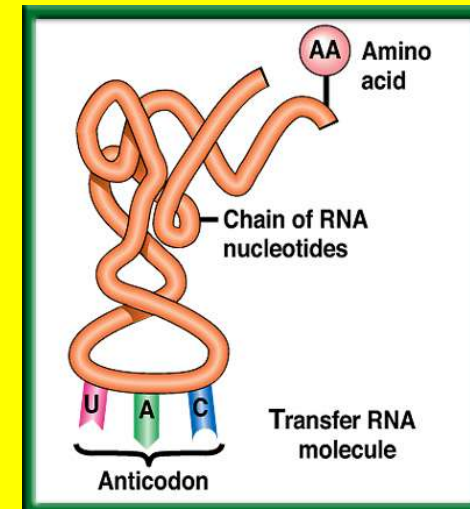
<http://www.dnatube.com/video/3448/DNA-Replication>



# #1. Codon & Anticodon



- A **Codon** is a nucleotide triplet sequence on mRNA, it codes for an amino acid.
  - AUG ACG GAG
- An **Anticodon** is a nucleotide triplet sequence on tRNA that carries the Amino acid
  - UAC
- Both are RNA & Each triplet pairs to code for a particular Amino acid to form a protein.

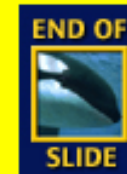
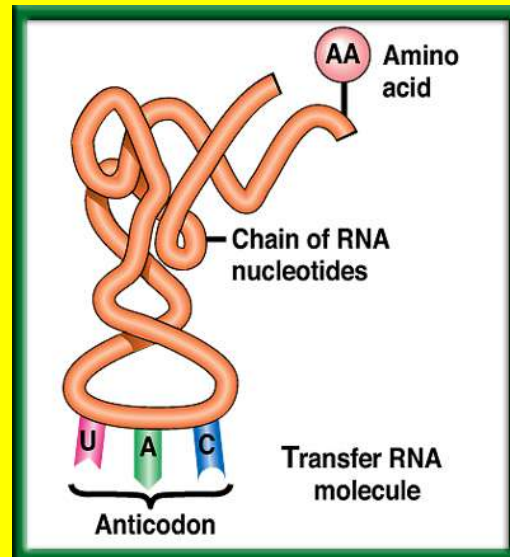


## #2. The role of transfer RNA - tRNA

As **translation** begins, a ribosome attaches to the starting end of the mRNA strand. Then, **tRNA** molecules, each **carrying a specific amino acid**, approach the ribosome.

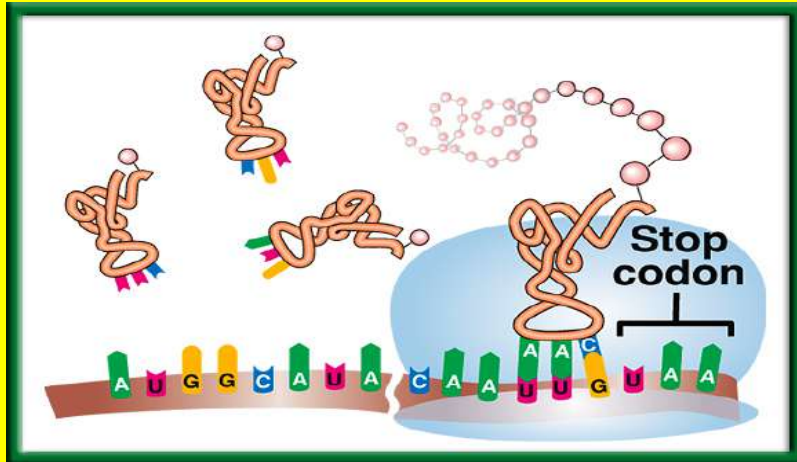
When a **tRNA anticodon pairs with the first mRNA codon**, the two molecules temporarily join together.

Usually, the first codon on mRNA is AUG, which codes for the amino acid methionine.



RESOURCES

# #3. Stop Codons



- Without the stop codon, the protein would continuously be made.
- More Protein is not necessarily better.
- Name the 3 codons for STOP:
  - UAA, UAG, UGA

## The Genetic Code P.292 BB

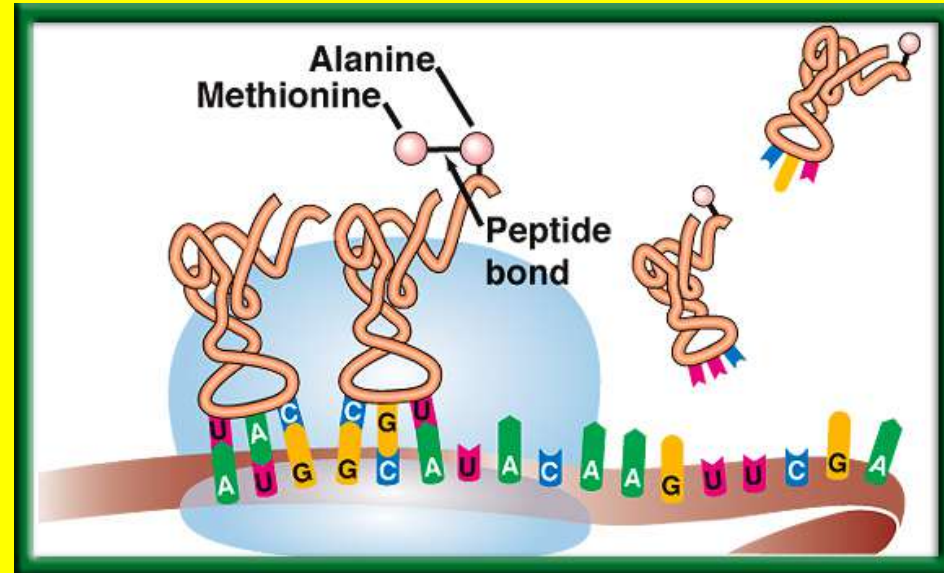
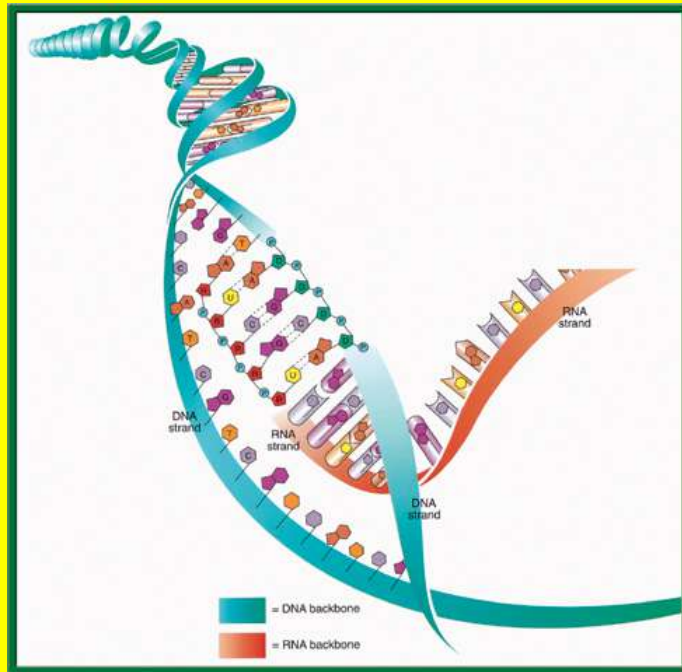
## The Messenger RNA Genetic Code

First Letter	Second Letter				Third Letter
	U	C	A	G	
U	Phenylalanine (UUU)	Serine (UCU)	Tyrosine (UAU)	Cysteine (UGU)	U
	Phenylalanine (UUC)	Serine (UCC)	Tyrosine (UAC)	Cysteine (UGC)	C
	Leucine (UUA)	Serine (UCA)	Stop (UAA)	Stop (UGA)	A
	Leucine (UUG)	Serine (UCG)	Stop (UAG)	Tryptophan (UGG)	G
C	Leucine (CUU)	Proline (CCU)	Histadine (CAU)	Arginine (CGU)	U
	Leucine (CUC)	Proline (CCC)	Histadine (CAC)	Arginine (CGC)	C
	Leucine (CUA)	Proline (CCA)	Glutamine (CAA)	Arginine (CGA)	A
	Leucine (CUG)	Proline (CCG)	Glutamine (CAG)	Arginine (CGG)	G
A	Isoleucine (AUU)	Threonine (ACU)	Asparagine (AAU)	Serine (AGU)	U
	Isoleucine (AUC)	Threonine (ACC)	Asparagine (AAC)	Serine (AGC)	C
	Isoleucine (AUA)	Threonine (ACA)	Lysine (AAA)	Arginine (AGA)	A
	Methionine; Start (AUG)	Threonine (ACG)	Lysine (AAG)	Arginine (AGG)	G
G	Valine (GUU)	Alanine (GCU)	Aspartate (GAU)	Glycine (GGU)	U
	Valine (GUC)	Alanine (GCC)	Aspartate (GAC)	Glycine (GGC)	C
	Valine (GUA)	Alanine (GCA)	Glutamate (GAA)	Glycine (GGA)	A
	Valine (GUG)	Alanine (GCG)	Glutamate (GAG)	Glycine (GGG)	G


[RESOURCES](#)

# Protein Synthesis p. 71 NB

DNA -> **transcription** -> RNA -> **translation** -> Proteins



# Molecular Genetics p. 71NB

**DNA Replication** – make more DNA for more cells to replace other cells.

## DNA-DNA

A = T

T = A

C ≡ G

G ≡ C

## **Protein Synthesis**

**DNA:** TAC CAC AAC

*Transcription (nucleus)*

**mRNA:** AUG GUG UUG

*Translation (ribosome)*

**Protein:** Methionine, \_\_\_\_\_, \_\_\_\_\_ Amino Acid Sequence

**Protein Synthesis** – to make proteins

## DNA RNA

A = U

T = A

C ≡ G

G ≡ C



# Protein Synthesis – Gene Expression Practice

## P. 71NB

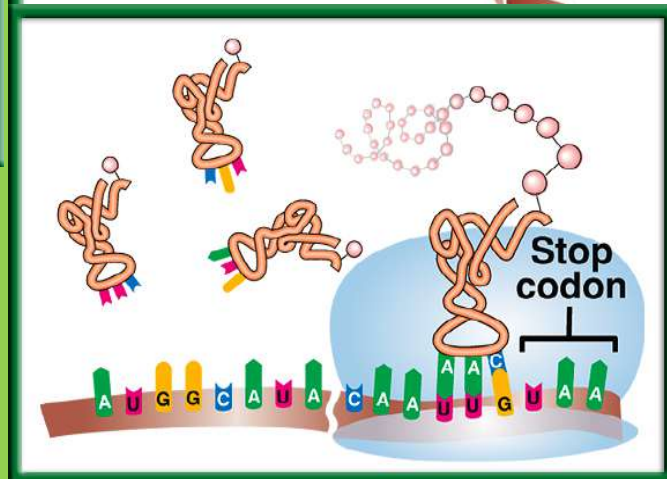
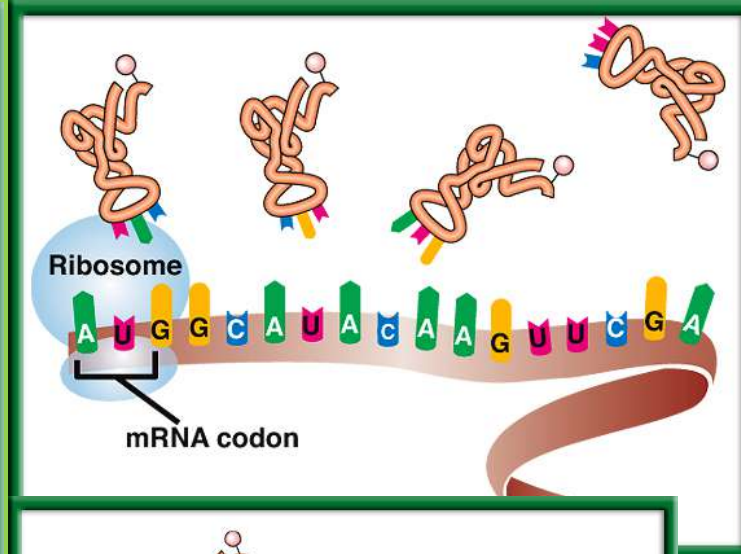
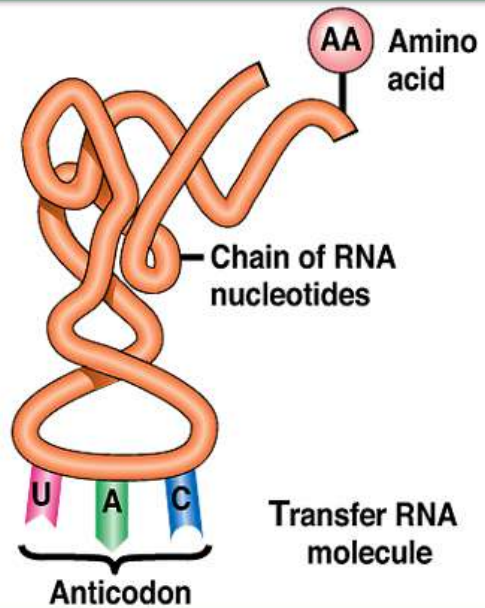
1. DNA: ATA CCT TAA CGC GTC

2. DNA: TAT TAG GCA AAA TTC

# 10/7 Protein Synthesis: Translation 11.2

Obj. TSW explain the process of Protein Synthesis by making Rice Krispie treats through the process of Protein Synthesis. P. 72NB

[Learn.genetics.utah.edu/](http://Learn.genetics.utah.edu/)



1. When making proteins, If a template DNA strand read TAC GGT, AGT what would a complementary strand of mRNA be?
2. What Amino Acids would the 3 codons code for?
3. Do the same for: GCA, TGC, ATC (DNA).

HW – Cell Lab is due tomorrow/ Friday.

# Mini Lab 11.1 P. 75NB P. 293 BB

DNA → transcription → RNA → translation → Protein

	A	B	C	D	E
DNA Base Sequence	Process	mRNA Codon	Process	tRNA Anticodon	Amino Acid
AAT					
GGG					
ATA					
AAA					
GTT					

# Mini Lab 11.1 P. 75NB P. 293 BB

DNA → transcription → RNA → translation → Protein

	A	B	C	D	E
DNA Base Sequence	Process	mRNA Codon	Process	tRNA Anticodon	Amino Acid
AAT	Transcription	UUA	Translation	AAU	Leucine
GGG		CCC		GGG	Proline
ATA		UAU		AUA	Tyrosine
AAA		UUU		AAA	Phenylalanine
GTT		CAA		GUU	Glutamine

## Answer Analysis Questions 1 – 3

1. A. DNA instructions are located in the nucleus.
- b. Transcription happens in the nucleus.
- c. Translation happens in the Ribosome.
4. tRNA looks like a triangle with an Amino Acid on the end, and the other side has the Anticodon that base pairs with the codon on the mRNA.
5. Mutations would be more common, if the sequence of DNA was not strictly adhered to.

# The Genetic Code

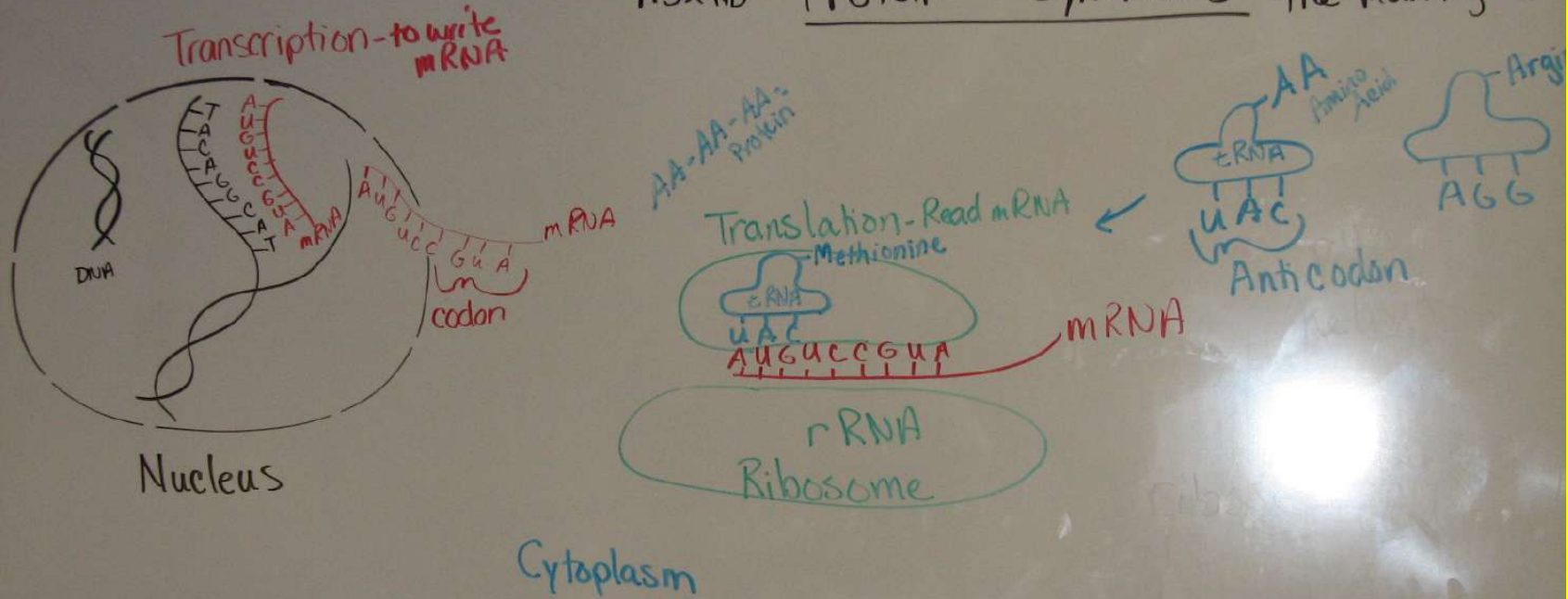
	U	C	A	G	
U	<p><b>UUU</b> Phenylalanine</p> <p><b>UUC</b> Phenylalanine</p> <p><b>UUG</b> Leucine</p> <p><b>UUA</b> Leucine</p>	<p><b>UCU</b> Serine</p> <p><b>UCC</b> Serine</p> <p><b>UCA</b> Serine</p> <p><b>UCG</b> Serine</p>	<p><b>UAU</b> Tyrosine</p> <p><b>UAC</b> Tyrosine</p> <p><b>UAA</b> Stop</p> <p><b>UAG</b> Stop</p>	<p><b>UGU</b> Cysteine</p> <p><b>UGC</b> Cysteine</p> <p><b>UGA</b> Stop</p> <p><b>UGG</b> Tryptophan</p>	U C A G
C	<p><b>CUU</b> Leucine</p> <p><b>CUC</b> Leucine</p> <p><b>CUA</b> Leucine</p> <p><b>CUG</b> Leucine</p>	<p><b>CCU</b> Proline</p> <p><b>CCC</b> Proline</p> <p><b>CCA</b> Proline</p> <p><b>CCG</b> Proline</p>	<p><b>CAU</b> Histidine</p> <p><b>CAC</b> Histidine</p> <p><b>CAA</b> Glutamine</p> <p><b>CAG</b> Glutamine</p>	<p><b>CGU</b> Arginine</p> <p><b>CGC</b> Arginine</p> <p><b>CGA</b> Arginine</p> <p><b>CGG</b> Arginine</p>	U C A G
A	<p><b>AUU</b> Isoleucine</p> <p><b>AUC</b> Isoleucine</p> <p><b>AUA</b> Isoleucine</p> <p><b>AUG</b> Methionine</p>	<p><b>ACU</b> Threonine</p> <p><b>ACC</b> Threonine</p> <p><b>ACA</b> Threonine</p> <p><b>ACG</b> Threonine</p>	<p><b>AAU</b> Asparagine</p> <p><b>AAC</b> Asparagine</p> <p><b>AAA</b> Lysine</p> <p><b>AAG</b> Lysine</p>	<p><b>AGU</b> Serine</p> <p><b>AGC</b> Serine</p> <p><b>AGA</b> Arginine</p> <p><b>AGG</b> Arginine</p>	U C A G
G	<p><b>GUU</b> Valine</p> <p><b>GUC</b> Valine</p> <p><b>GUA</b> Valine</p> <p><b>GUG</b> Valine</p>	<p><b>GCU</b> Alanine</p> <p><b>GCC</b> Alanine</p> <p><b>GCA</b> Alanine</p> <p><b>GCG</b> Alanine</p>	<p><b>GAU</b> Aspartic acid</p> <p><b>GAC</b> Aspartic acid</p> <p><b>GAA</b> Glutamic acid</p> <p><b>GAG</b> Glutamic acid</p>	<p><b>GGU</b> Glycine</p> <p><b>GGC</b> Glycine</p> <p><b>GGA</b> Glycine</p> <p><b>GGG</b> Glycine</p>	U C A G

# Rice Krispie Treat

## Protein Synthesis Lab – Thursday

- 1 Boxes of **Rice Krispies**
- 4 Bags of **LARGE MARSHMELLOWS**
- 1 large bag of Mini **M&M's**
- 1 large bag of **Gummy Bears**
- 1 stick of **Butter**
- **1 Microwave?**

# P.52 NB Protein Synthesis - the making of



# 1st Period P. NB

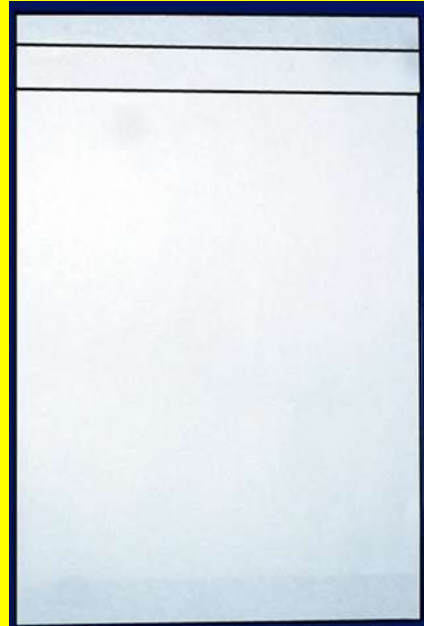
- Write a paragraph after building your DNA molecule that include the vocabulary words: Double helix, Nitrogen bases, Hydrogen bond, Nucleotide, Backbone, Deoxyribose, Phosphate, Adenine, Thymine, Cytosine, Guanine.



## STEP 1

**Collect** 3 sheets of paper and layer them about 1.5 cm apart vertically. Keep the edges level.

P. 53 NB

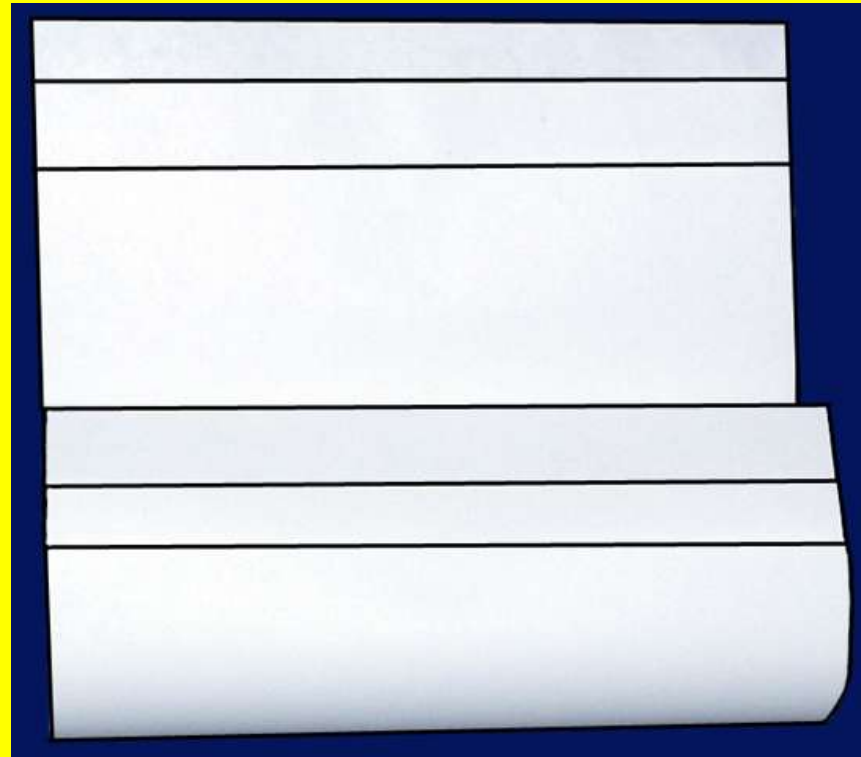


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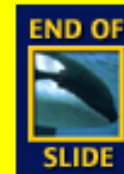


## STEP 2

**Fold** up the bottom edges of the paper to form 6 equal tabs. P. 53NB



To return to the chapter summary click escape or close this document.



## STEP 3

**Fold** the papers and crease well to hold the tabs in place. Staple along the fold. **Label** each tab. P. 53NB

<b>RNA</b> – draw & label 3 differences from DNA	p. 289
<b>TRANSCRIPTION:</b> from DNA to RNA	P. 290
<b>RNA Processing</b> (Introns & Exons)	P.291
<b>The Genetic Code</b>	p. 291 - 292
<b>TRANSLATION:</b> from mRNA to PROTEIN	p. 294 11.9A
<b>PROTEIN SYNTHESIS</b> DNA->transcription->RNA ->translation->Protein	

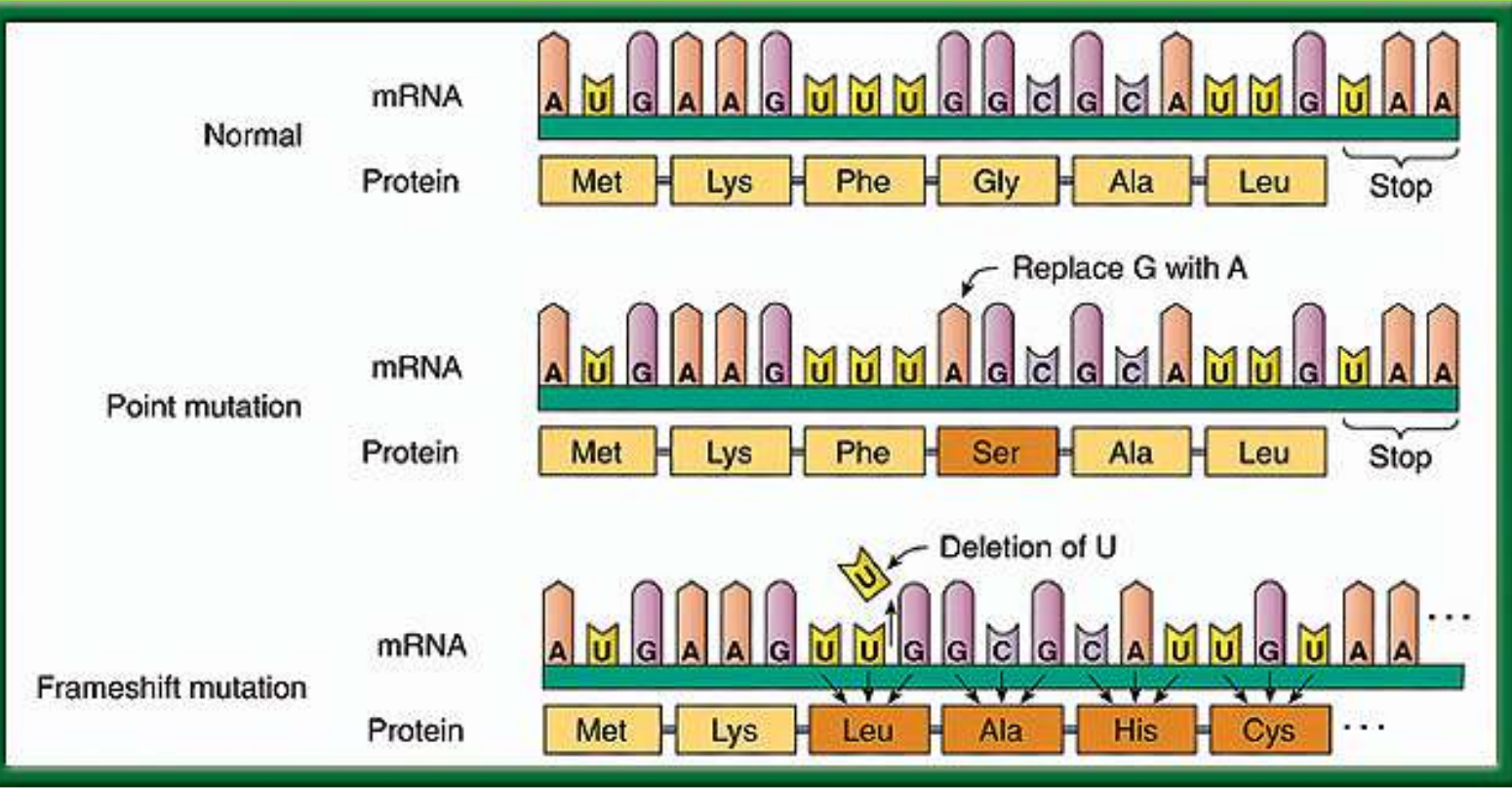
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# 10/9 Mutations: A change in a gene 11.3

Obj. TSW learn how mutations happen, and explain the difference between point & Frameshift mutation from WU, notes & conclusion of Protein Synthesis Lab. P. 74 NB

1. What are some causes of mutations?
2. Compare & Contrast the effects of a [point mutation](#) & a frameshift mutation.
3. Which mutation is worse and why?

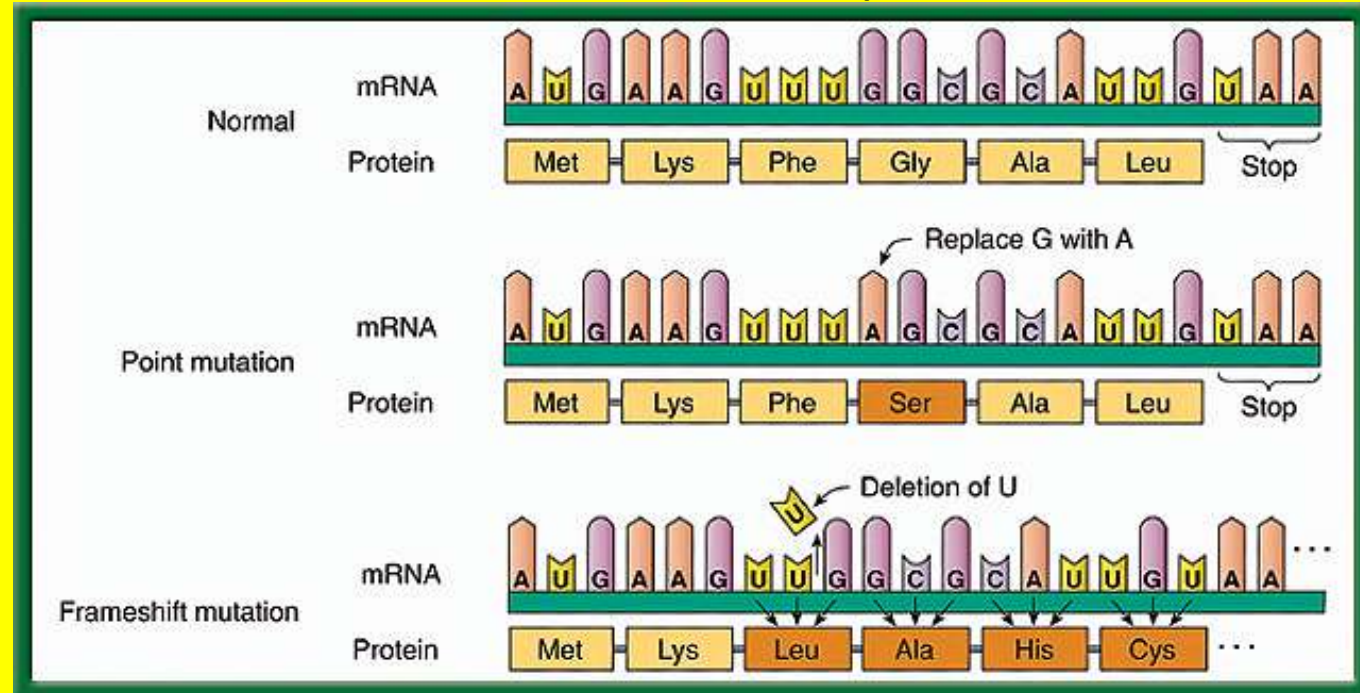


# #1. Causes of Mutations

- **Mutagens**- change in the DNA caused by the Environment – Pollution, UV Radiation, Drugs, Stress
- **Random mistakes**- proofreading enzymes are not working

## #2. Gene Mutations – Point & Frameshift Mutations p.298 BB

Which  
mutation is  
worse?  
Why?



**#3. Frameshift Mutation** is worse because it changes every amino acid after the deletion or addition of the nucleotide.

# Rice Krispy Protein Synthesis P.55NB

1. My protein looks like: Round, Flat, Color, M&M or Gummi Bears
2. Deleting the fifth nucleotide of your DNA will cause a **frameshift** mutation that changes every amino acid after the deletion. Change how many marshmallows were used.
3. Changing the 11<sup>th</sup> nucleotide of your DNA sequence from G to T would be a **point mutation** and will change the amino acid **Serine** to **STOP codon**, however, this is bad because the protein is not complete. Marshmallows would not be smooth.
4. If the 19<sup>th</sup>, 20<sup>th</sup>, 21<sup>st</sup> nucleotides of your DNA sequence were deleted the 7<sup>th</sup> codon were deleted the rice krispie treat would not have color.
5. Two proteins are different by some were flat, round, some were red, some blue, some M&M's &/ gummy bears.

## Conclusion

- 1.If you were given the

# Classwork – Transcription & Translation p. 53

## NB

- Work on worksheet about Protein Synthesis.
- Transcribe the DNA sequence.
- Then, translate the Amino Acid sequence to the right of the Codons.

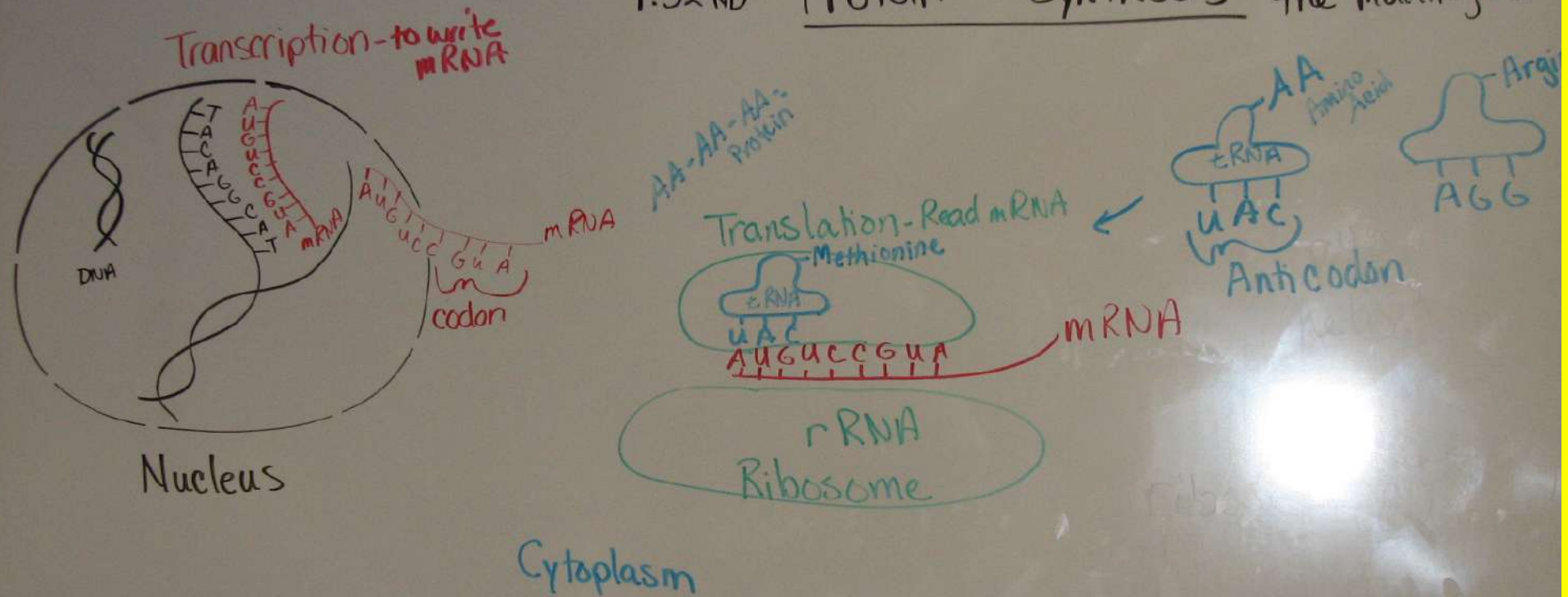
# Draw Protein Synthesis

- P. 55 NB

- Turn your book Landscape Style ←-----→
- Have 4 different colored pencils.
- Write on the **RED** line at the top: **Protein Synthesis: the making of Proteins**
- Use  $\frac{3}{4}$  of the page
- The last  $\frac{1}{4}$  of the page will be a summary/ AXES paragraph.

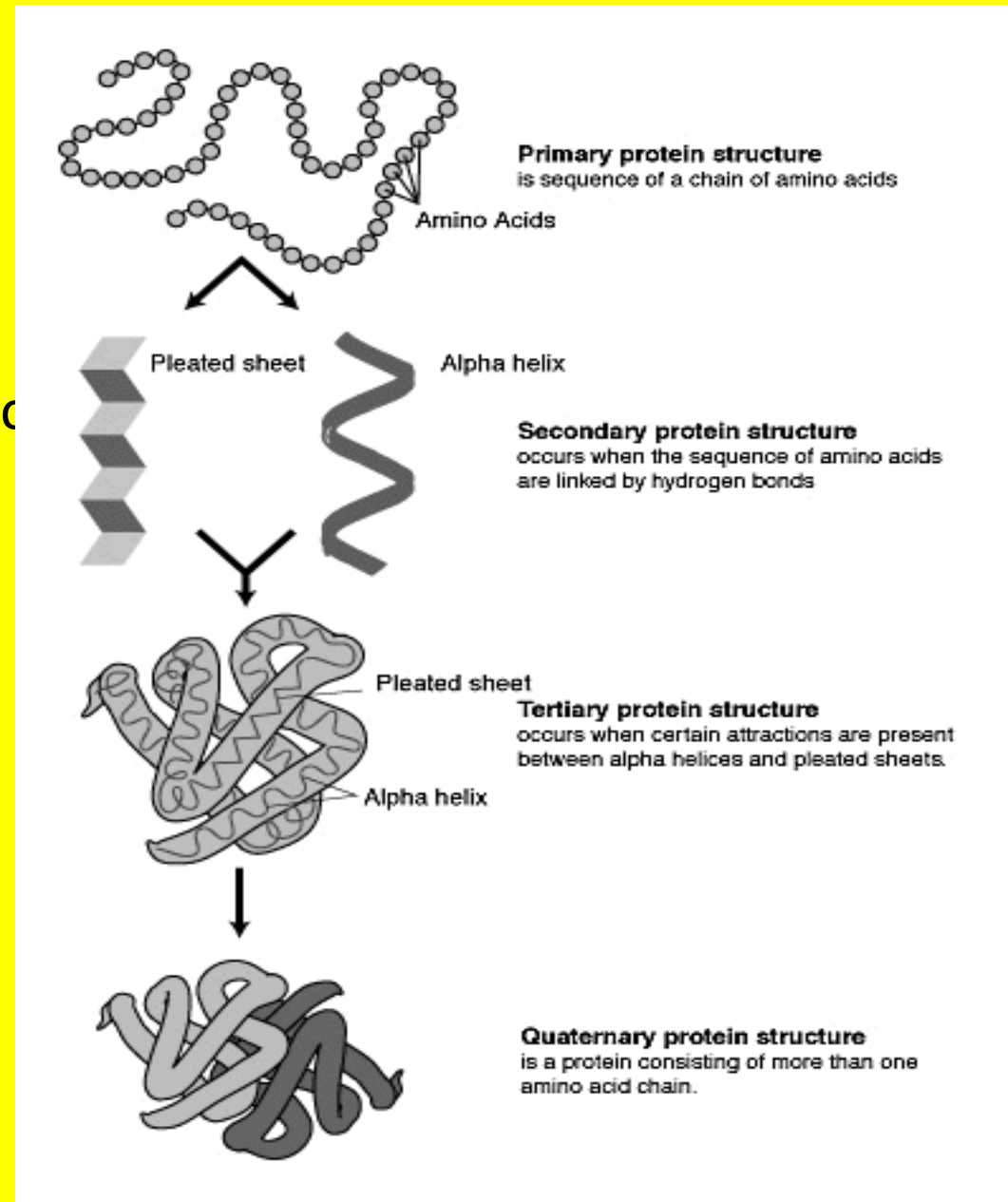


# P.52 NB Protein Synthesis - the making of



## Proteins Notes P. 57 NB

- Proteins can come in many different shapes and sizes
- The number & sequence of amino acids determine its a proteins shape.
- An example of proteins: ENZYMES!
- Proteins must have a specific structure in order to function properly.



# Schematic of protein synthesis

(© 1999, Addison Wesley Longman Inc.)

