

Lab # _____

Name: _____



DNA / RNA / PROTEIN SYNTHESIS / AP Biology

Purpose:

To understand how DNA is replicated; How RNA is made from DNA and the process of how proteins are synthesized (made) from DNA, mRNA, tRNA and rRNA.

Materials:

Scissors, construction paper, mRNA Codon Chart, Templates for bases, phosphates & sugars.

Procedure:

From each template, trace around it and cut out 12 of each; if you are lucky this was already done for you by previous classes. ☺

A = Adenine = Yellow

C = Cytosine = Orange

T = Thymine = Green

G = Guanine = Red

U = Uracil = Light Blue

D = Deoxyribose = Purple (cut 24)

R = Ribose = Pink

P = Phosphate = Tan (cut 24)

DP = DNA Polymerase = Black

DL = DNA Ligase = White

H = Helicase = Brown

To = Topoisomerase = Dark Blue

DPr = DNA Primase = Black/White Striped

RP = RNA Primase = Red / White Striped

Mark each with the proper letter on BOTH sides; With your newly cut nucleotides = (base, sugar & phosphate) construct the following DNA and RNA molecules; transcribe the message into RNA when asked to do so; and translate the message into amino acids (protein) when directed.

- 1) Construct (lay out) the following DNA molecule on one side of your lab table; then find the matching letters (complement strand) of DNA bases and lay it out across from it. Be sure to also include the "backbone" the 'D' and 'P' along both sides; and the enzymes involved with DNA Replication. **WRITE DOWN THE COMPLEMENT STRAND IN THE TABLE BELOW.** Remember to have it initialed before you disassemble

	DNA Parental Strand					Teachers Initials
a.	ACT	CGG	CAT	ACA	GGT	
b.	TCT	TGA	CGG	GAA	TAG	
c.	AAT	GCC	TAC	TTA	CCC	

#1	DNA Complement Strand				
a.					
b.					
c.					

- 2) RNA from DNA. Construct the following DNA molecule; then find the matching RNA letters; place them on the opposite side – similar to #1 above but using RNA (remember you must have one side with DNA (sugar= purple) and the other side with RNA (sugar = pink). Be sure to also include the "backbone" the 'D' and 'P' along one side and 'R' and 'P' along the other side; and the enzymes involved with DNA to RNA transcription. **WRITE DOWN THE COMPLEMENT STRAND OF RNA IN THE TABLE BELOW before you disassemble it.**

	DNA Parental Strand					Teachers Initials
a.	GAG	CTA	TTC	CAT	GGA	
b.	TAG	TTT	AAA	GGG	CCC	
c.	CTA	GTT	AAC	TAC	AAA	
#2	RNA Complement Strand					
a.						
b.						
c.						

- 3) **Design your own DNA.** Write it down in the table below. It must be five "codons" long and cannot be all the same letter. **Produce RNA from your DNA.** What tRNA and **Amino Acids** did you produce? (*note: you will not all have the same answer*).

	Design your Own DNA					Teachers Initials
DNA						
mRNA						
tRNA						
Amino Acids						

a) What type of bond joins the Amino Acids? _____

- 4) **DNA directs Protein Synthesis through mRNA.** What will be the Amino Acids produced from the following DNA molecule? (Hint: remember amino acids are coded from mRNA not DNA); Be sure to include all the enzymes, bonds, that are involved with this process.

	DNA Parental Strand				
a.	GTC	GTC	AAG	TTT	CAG
b.	TTT	GGG	ACA	CAC	GAG
c.	GAG	CAT	TAG	TAT	TTG
	mRNA Strand (from above)				
a.					
b.					
c.					

	AMINO ACIDS PRODUCED				
a.					
b.					
c.					

- 5) The following protein (long chain of Amino Acids joined by a Peptide Bond) has been produced. What would the **mRNA and the DNA strands read if the Amino Acids are as follows**: (NOTE: there is more than one correct answer – each of you may choose a different codon for the Amino acid)

	AMINO ACIDS PRODUCED				
a.	Leucine	Histidine	Lysine	Glutamic Acid	Threonine
b.	Methionine (Start)	Tryptophan	Serine	Cysteine	Valine
c.	Aspartic Acid	Phenylalanine	Tyrosine	Glycine	Stop

	mRNA Strand (from above)				
a.					
b.					
c.					

	DNA Strand (from above)				
a.					
b.					
c.					

6) Using your Amino Acids, mRNA from #5 above:

- a. What change (Amino Acids produced) would take place if an **"A"** was inserted before the first codon on **"a"**? Write down the new Amino Acids from this mutation in the table below.

What type of mutation is this? _____

- b. How would the **"b"** strand change if a **"G"** was deleted in the second codon? Write the Amino Acids below:

What type of mutation is this? _____

- c. What would the **"c"** strand read if the fifth base was changed from a **"U"** to an **"A"**?

What type of mutation is this? _____

	AMINO ACIDS PRODUCED				
a.					
b.					
c.					

7) **EXTRA CREDIT: What would the tRNA (anti-codon) sequence be from #1 "a" ?**

tRNA					
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8) Why does your body go through the trouble of making proteins? What is the purpose of this?

9) What is **TRANSCRIPTION**?

10) What is **TRANSLATION**?

11) What is:

a. EXON:

b. INTRON:

12) How does Protein Synthesis differ from **Prokaryotes and Eukaryotes**?