

Name _____

Modeling the Flow of Genetic Information

This worksheet accompanies the Jmol exploration Protein Synthesis available at:
<https://crestresources.org/tutorials/proteinSynthesis.html>

Part I: Transcription

1. Fill in the correct base pairs in the non-template and template strands below.

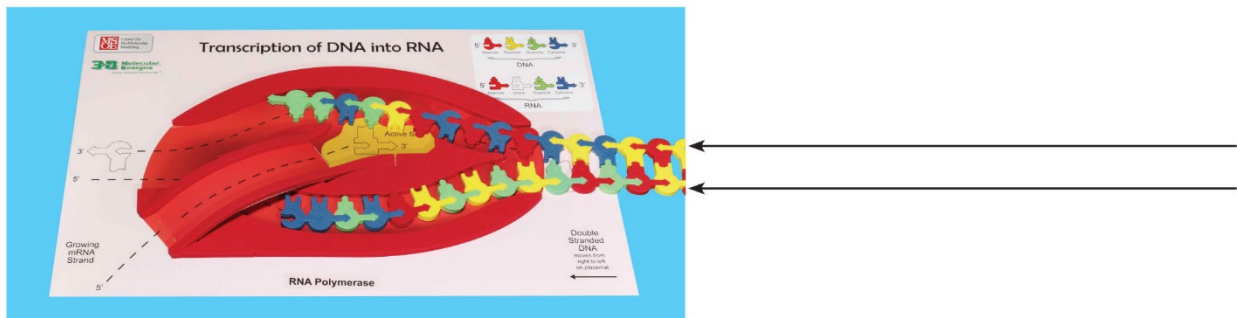
Template strand: 3' ← _____ 5'

Non-template strand: 5' _____ → 3'

2. Recalling from the lesson on DNA structure identify the type of bond that holds the two strands of DNA together.
3. Identify two similarities and two differences between these models.

Transcription: Initiation

4. Label the DNA template strand and non-template strand in the image below.



Transcription: Elongation and Termination

5. Using the mRNA model you just made record the correct sequence of mRNA base pairs:

5'

→ 3'

6. What type of intermolecular force (NOT bond) is broken when mRNA separates from DNA and what characteristic of this allows for this separation?

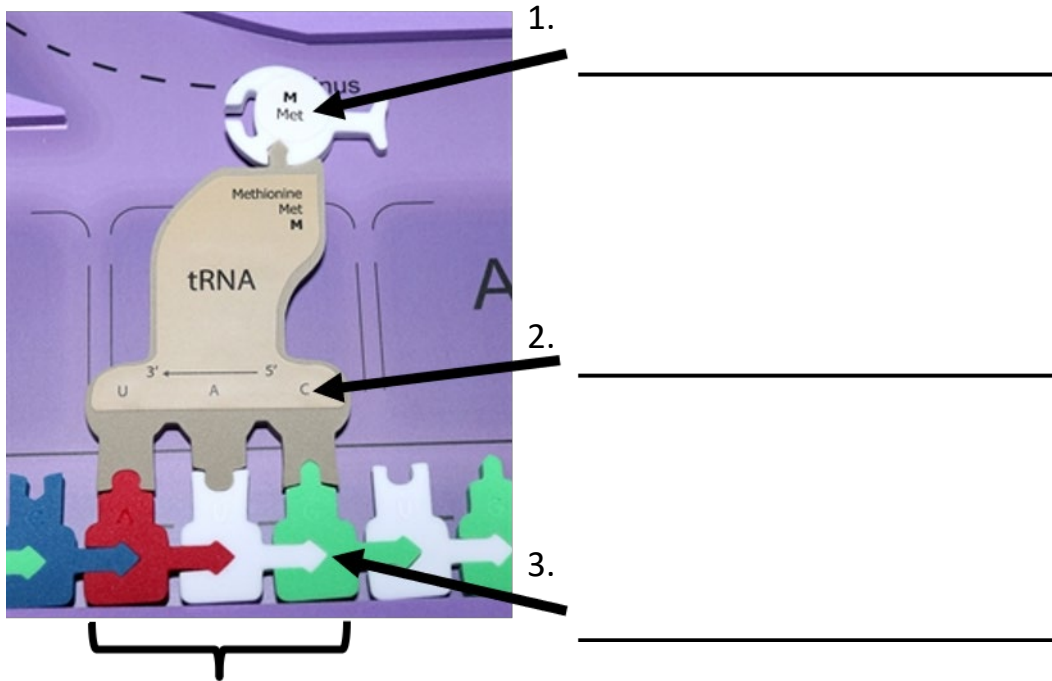
Part II: Translation

7. What part of mRNA contains the information to make a protein?

		Second base				
		U	C	A	G	
First base (5' end)	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	
						Third base (3' end)

Translation: Initiation

8. Translation begins at a specific codon on the mRNA. What is the three base sequence of the initiation codon?
9. What amino acid is associated with the tRNA that will bind to the mRNA codon AUG?
10. What would be the anticodon for the mRNA codon AUG? Label the 5' and 3' ends of the anticodon.
11. Label the codon, anticodon and the amino acid on the figure below.

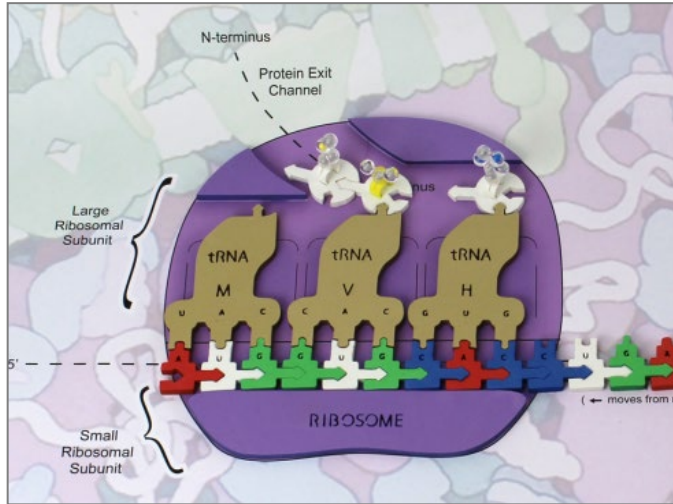


12. Does the 5' end or the 3' end of the mRNA strand attach to the small ribosomal subunit?
13. Which tRNA anticodon and accompanying amino acid will attach first in this P site?

Translation: Elongation

14. Which tRNA-amino acid complex will attach into the A site at this time?

15. Circle and label the peptide bond in the photo below.



16. Which mRNA codon is now located in the A site?

Translation: Termination

17. Using the mRNA Codon/Amino Acid Chart list all stop codons.

18. What was the stop codon in the mRNA sequence that you translated?

19. What is the order of amino acids in your polypeptide? (Use the three letter and one letter abbreviations for each amino acid.)

Met M										
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20. When you reach the end of the mRNA strand describe what has happened to the polypeptide.

21. What will happen next to the polypeptide?

22. As you have followed this process of translation what steps are now left to be completed?

23. What will happen to the mRNA, tRNA, and the ribosome at the end of this process?

24. How long did this process of translation take for you and your lab group?

25. Do you think the cell could operate at this rate?

26. At this rate, how long would it take to make a protein such as actin which is 375 amino acids long?