Pre-Lab Questions:

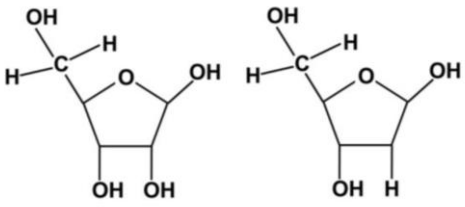
1. What are some of your traits?

2. What does DNA code for?

3. What does RNA stand for?

During-lab observations:

1. Look at the diagram below. Circle the difference between DNA and RNA:

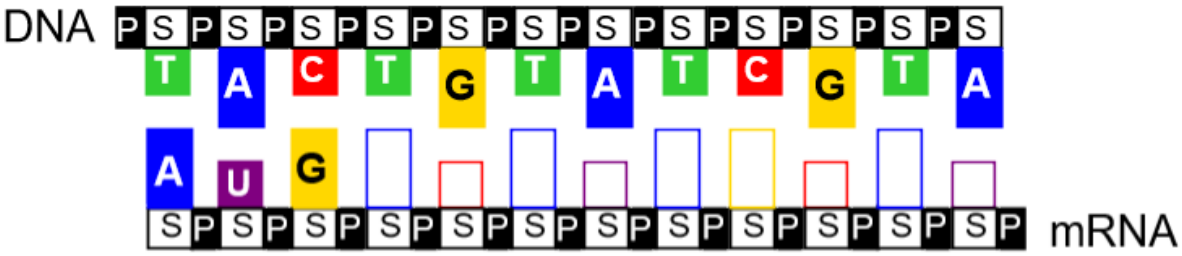


2. The bases of DNA are Adenine, Thymine, Guanine, and Cytosine. Are the bases of RNA the same? If not, how are they different?

3. What are the RNA "words" that are read by the ribosome called?

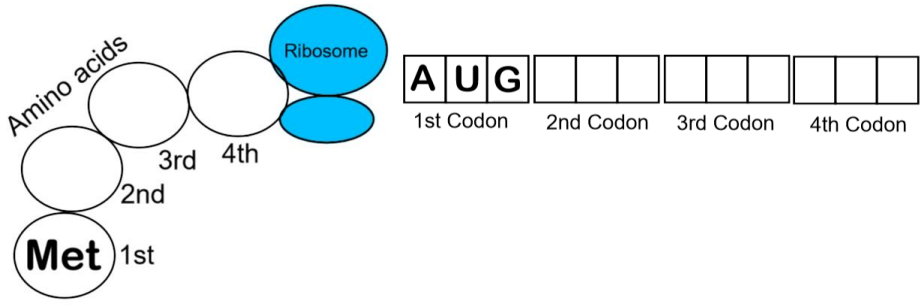
Post-lab questions:

1. In the diagram below, fill in the missing bases with the corresponding RNA bases (A-U, G-C).



2. Complete A and B below:

A. Using the RNA sequence from question 1, fill in the codons in the boxes below. The first codon was filled in for you.



B. Using the Genetic Code decoding chart, fill in the amino acids (represented by circles) that correspond to each codon.

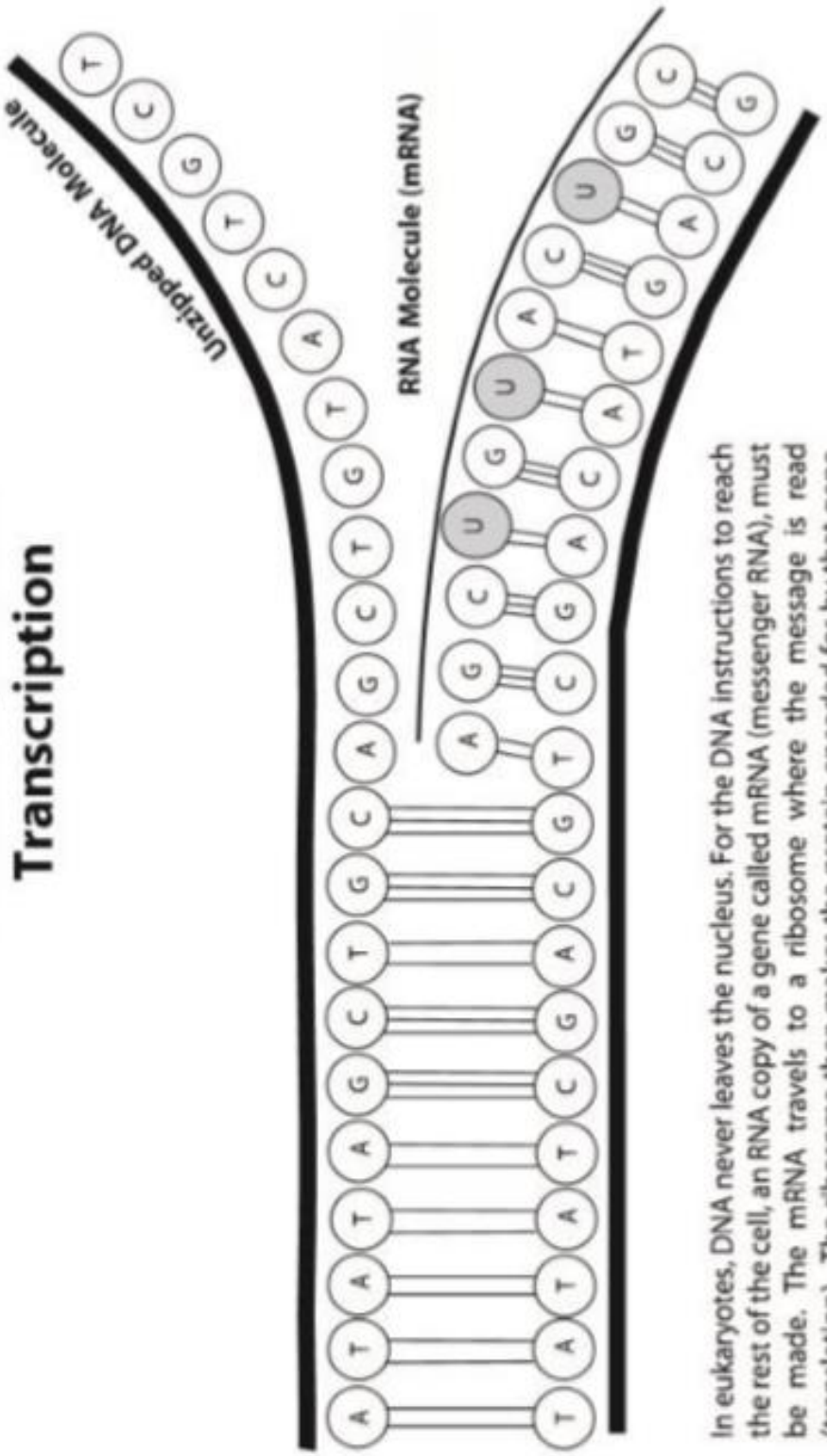
3. If the RNA makes a mistake during transcription, or if the ribosomes makes a mistake during translation, there is a chance that the protein will be made improperly. Does EVERY mistake result in changes in the protein? If not, then why?

Decoding the Genetic Code

1st Position ⇓	2nd Position ⇓ U	C	A	G	3rd Position ⇓
U	Phe	Ser	Tyr	Cys	U
	Phe	Ser	Tyr	Cys	C
	Leu	Ser	STOP	STOP	A
	Leu	Ser	STOP	Trp	G
C	Leu	Pro	His	Arg	U
	Leu	Pro	His	Arg	C
	Leu	Pro	Gln	Arg	A
	Leu	Pro	Gln	Arg	G
A	Ile	Thr	Asn	Ser	U
	Ile	Thr	Asn	Ser	C
	Ile	Thr	Lys	Arg	A
	Met	Thr	Lys	Arg	G
G	Val	Ala	Asp	Gly	U
	Val	Ala	Asp	Gly	C
	Val	Ala	Glu	Gly	A
	Val	Ala	Glu	Gly	G

Symbol		Name	Codons
A	Ala	Alanine	GCA GCC GCG GCU
C	Cys	Cysteine	UGC UGU
D	Asp	Aspartic Acid	GAC GAU
E	Glu	Glutamic Acid	GAA GAG
F	Phe	Phenylalanine	UUC UUU
G	Gly	Glycine	GGA GGC GGG GGU
H	His	Histidine	CAC CAU
I	Ile	Isoleucine	AUA AUC AUU
K	Lys	Lysine	AAA AAG
L	Leu	Leucine	UUA UUG CUA CUC CUG CUU
M	Met	Methionine	AUG
N	Asn	Asparagine	AAC AAU
P	Pro	Proline	CCA CCC CCG CCU
Q	Gln	Glutamine	CAA CAG
R	Arg	Arginine	AGA AGG CGA CGC CGG CGU
S	Ser	Serine	AGC AGU UCA UCC UCG UCU
T	Thr	Threonine	ACA ACC ACG ACU
V	Val	Valine	GUA GUC GUG GUU
W	Trp	Tryptophan	UGG
Y	Tyr	Tyrosine	UAC UAU

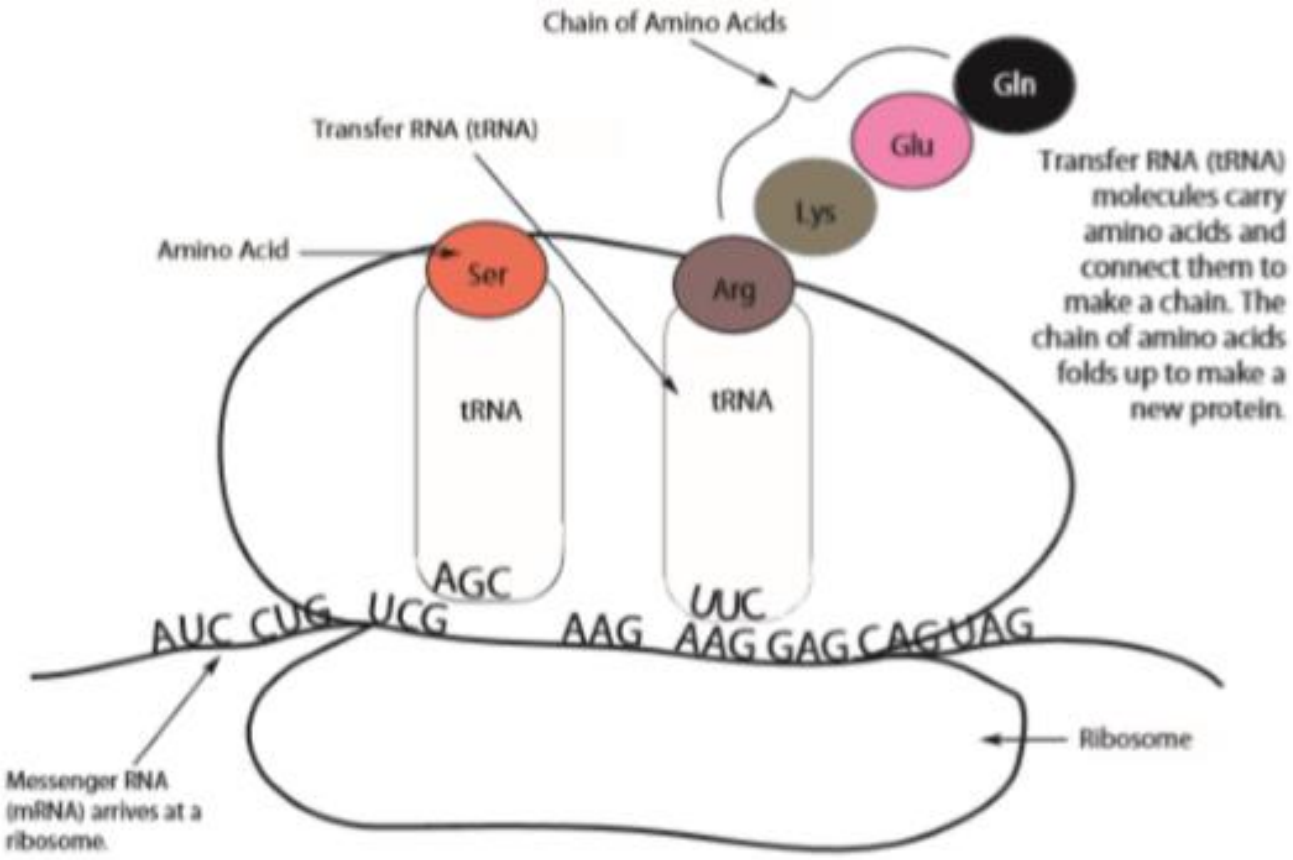
Protein Synthesis: Transcription



In eukaryotes, DNA never leaves the nucleus. For the DNA instructions to reach the rest of the cell, an RNA copy of a gene called mRNA (messenger RNA), must be made. The mRNA travels to a ribosome where the message is read (translation). The ribosome then makes the protein encoded for by that gene.

To make an RNA strand, the DNA first unzips, or pulls apart. RNA polymerase, an enzyme, builds an RNA strand complementary to the unzipped DNA. Notice that for every C in the DNA strand the RNA polymerase inserts a G; for every G a C; for every T an A. For every A, RNA polymerase inserts a U, or Uracil. RNA does not contain Thymine!

Protein Synthesis: Translation



Making a protein begins when RNA polymerase makes a copy of a gene, called mRNA or messenger RNA. This mRNA copy of the gene leaves the nucleus and enters the cytoplasm, where it reaches a ribosome.

At the ribosome, the message is "read" three letters at a time (translation). Each combination of three letters is called a "codon." For example, in the above diagram, "UCG" is an mRNA codon.

Codons code for amino acids, the building blocks of proteins. In our diagram, the UCG codon codes for the amino acid Serine (Ser).

Transfer RNA (tRNA) molecules deliver and attach the proper amino acids to create a long chain. This chain of amino acids folds up to form a protein.

How many ribosomes are in an average cell?