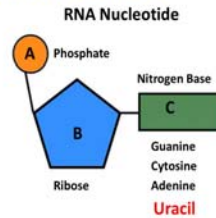


DNA to Protein via RNA

- Sequence of nucleotides in DNA contain info to make proteins
 - Each gene contains info for assembling an amino acid chain
 - Human cells contain ~20,000 - 40,000 genes
- RNA "reads" DNA to create amino acid sequence to create proteins

- RNA Nucleotide (single helix)
 - Ribose Sugar
 - N Bases: A, U (uracil), G, C
 - Phosphate



3 Types of RNA:

- 1. Messenger RNA (mRNA)**
 - Reads DNA sequence in the nucleus & goes to the cell's cytoplasm
 - Carries info (message) to make a protein
- 2. Ribosomal RNA (rRNA)**
 - Clamps onto the mRNA and uses the message to assemble amino acids in the correct order (to form a protein)
- 3. Transfer RNA (tRNA)**
 - Transfers amino acids to the ribosome to be assembled into a protein

DNA to Protein

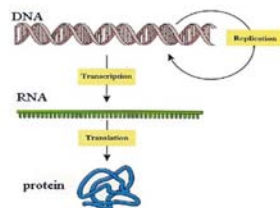
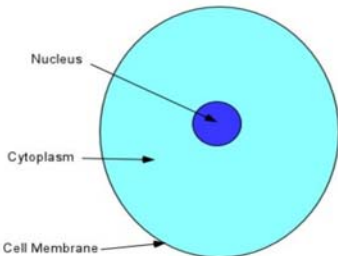
2 Steps:

1. Transcription (in the nucleus)

DNA → mRNA

2. Translation (in the cytoplasm of the cell)

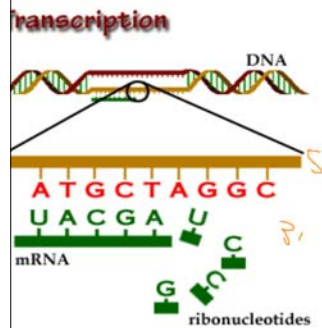
mRNA → polypeptide
(AA chain)



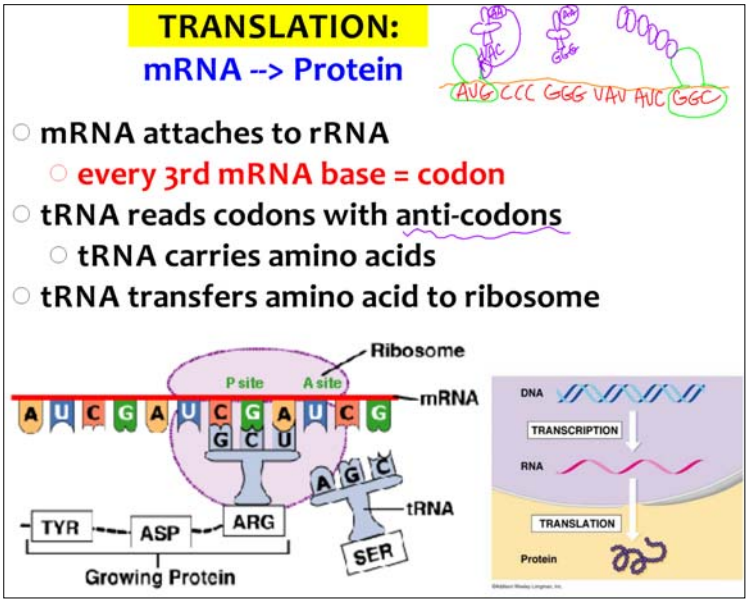
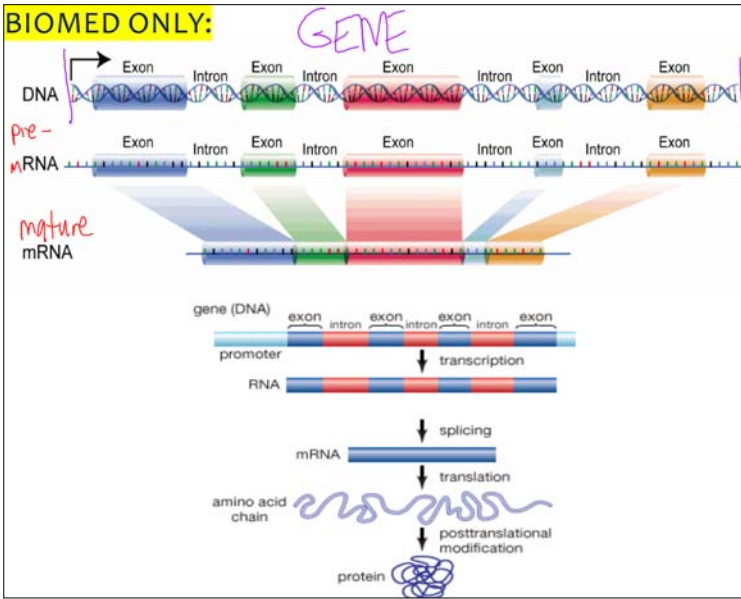
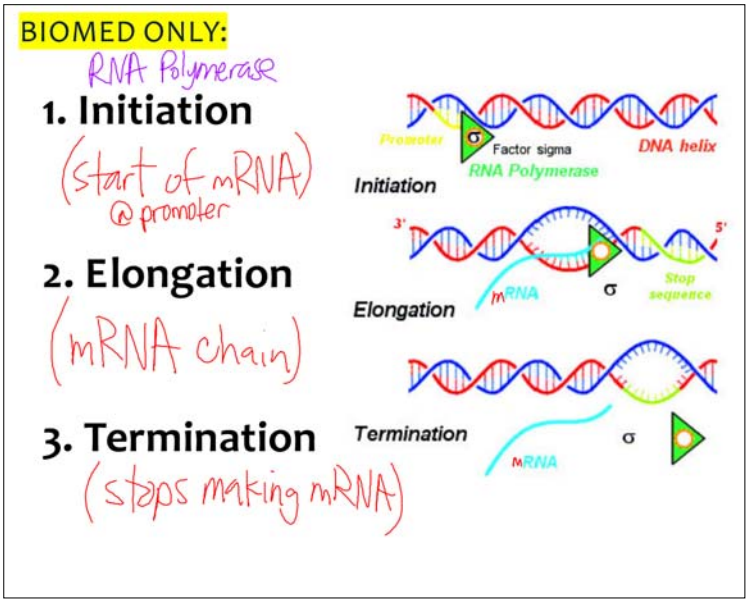
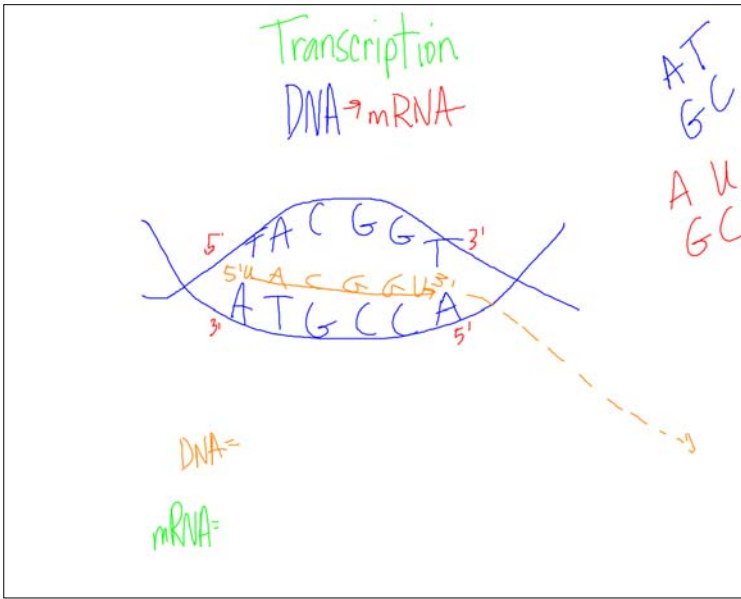
TRANSCRIPTION:

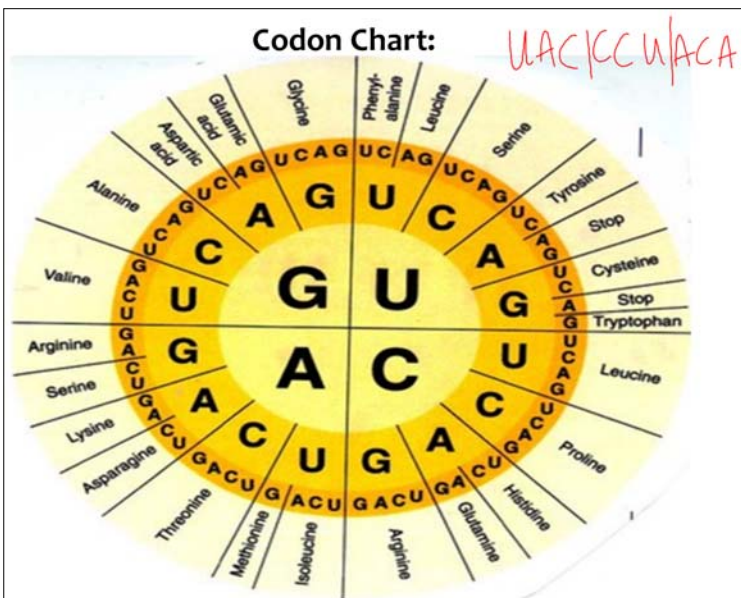
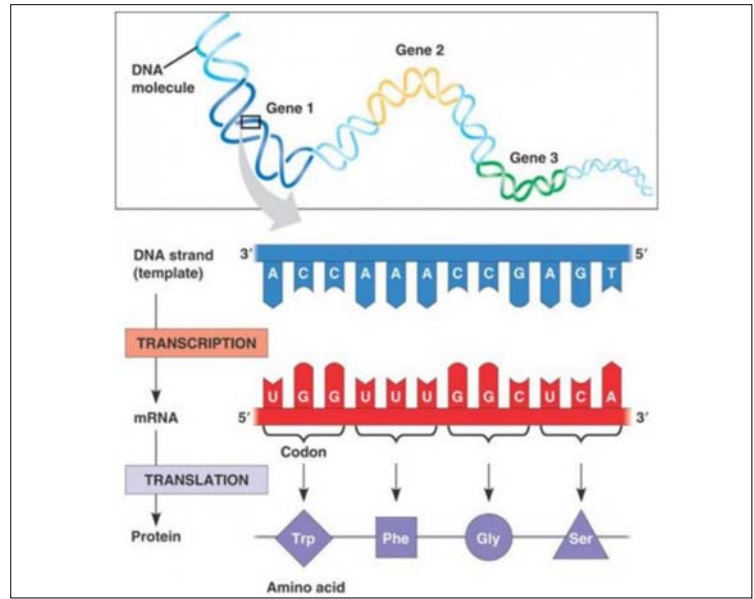
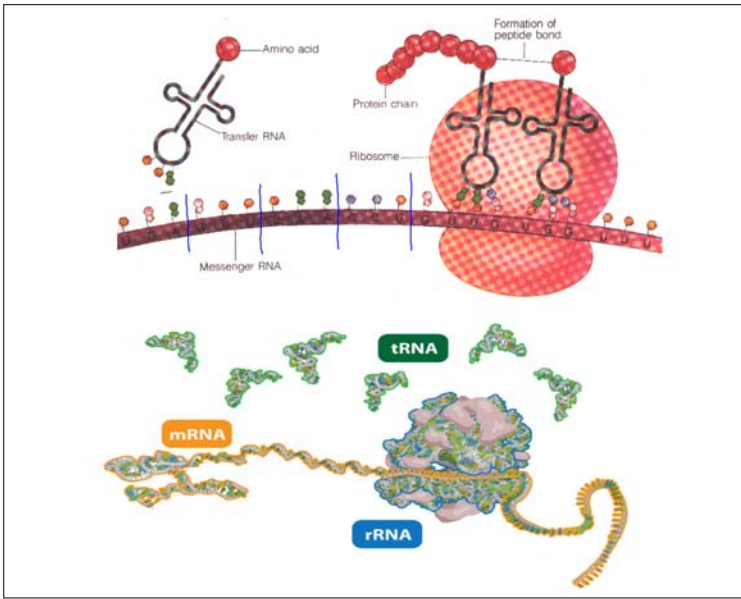
DNA → mRNA

nucleus → cytoplasm



1. Helicase unzips DNA
2. Free RNA nucleotides pair with complementary DNA nucleotides with RNA Polymerase to create mRNA 5' → 3'
3. DNA strands recoil, mRNA leaves the nucleus and enters the cytoplasm (through nuclear pores)





Protein Synthesis

AUGCCCGCUAA

1 st letter	2 nd letter				3 rd letter
	U	C	A	G	
U	phenylalanine	serine	tyrosine	cysteine	U
			STOP	STOP	A
C	leucine	proline	histidine	arginine	U
			glutamine		G
A	isoleucine	threonine	asparagine	serine	U
	methionine (START)		lysine	arginine	C
G	valine	alanine	aspartate	glycine	A
			glutamate		G

mRNA to amino acids

DNA --> mRNA --> Protein

DNA template strand:

TACGGTATCACTGGGAAATAT

mRNA:

ATG, CCA

Amino Acids:

start, proline

First Letter	Second Letter				Third Letter
	U	C	A	G	
U	phenylalanine	serine	tyrosine	cysteine	U
	phenylalanine	serine	tyrosine	cysteine	C
	leucine	serine	stop	stop	A
	leucine	serine	stop	tryptophan	G
C	leucine	proline	histidine	arginine	U
	leucine	proline	histidine	arginine	C
	leucine	proline	glutamine	arginine	A
	leucine	proline	glutamine	arginine	G
A	isoleucine	threonine	asparagine	serine	U
	isoleucine	threonine	asparagine	serine	C
	isoleucine	threonine	lysine	arginine	A
	isoleucine	threonine	lysine	arginine	G
G	valine	alanine	aspartate	glycine	U
	valine	alanine	aspartate	glycine	C
	valine	alanine	glutamate	glycine	A
	valine	alanine	glutamate	glycine	G