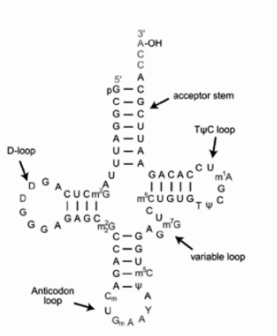
Topic 4 Notes: Translation



Translation

Translation:

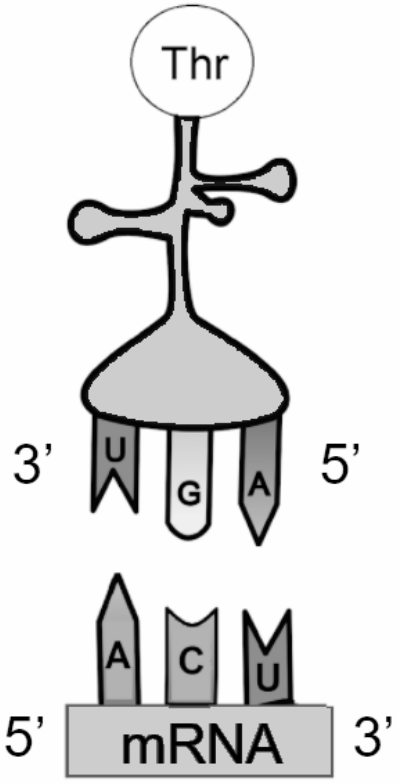
Occurs:

A nucleotide sequence becomes:

_____ is a key player in translating mRNA to a(n) _____ _____ sequence.

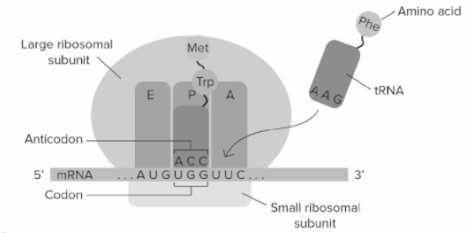
Transfer RNA

- tRNA has an _____ region which is complementary and _____ to mRNA.
- tRNA carries the _____ _____ that the mRNA _____ codes for.
- The _____ aminoacyl-tRNA synthetase is responsible for attaching _____ _____ to _____.



➔Questions?
➔Textbook chapters/pages to review

Ribosomes



_____ occurs at the ribosome

Prokaryotes:

Eukaryotes:

The large subunit has three sites:

A site:

P site:

E site:

Quick Check

1. How does the tRNA interact with the mRNA?

2. What codes for the amino acid?

3. What are the three sites on the large ribosomal subunit?

➔Questions?
➔Textbook chapters/pages to review

Translation

Translation occurs in three stages

1.

2.

3.

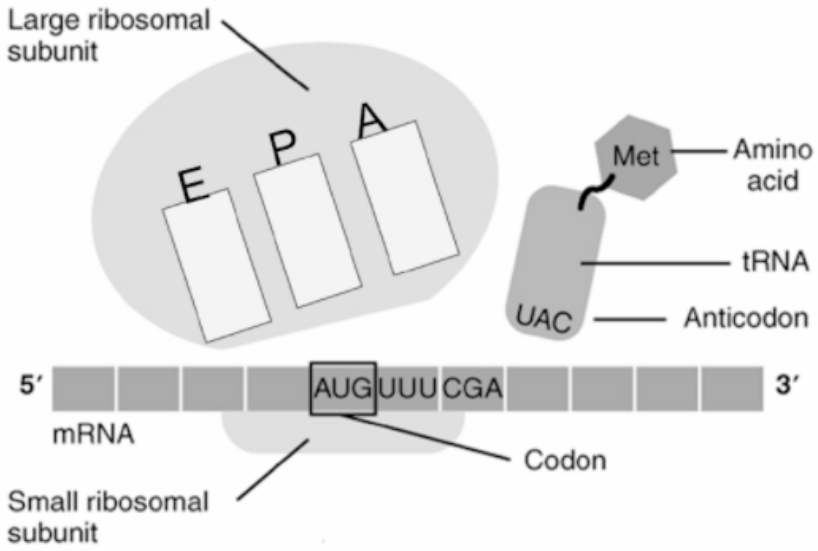
Step 1: _____

Translation begins when:

The tRNA carries _____

Next, the _____ subunit binds.

Note: the first tRNA carrying Met will go to the P site, every other tRNA will go to the A site first



➔Questions?
➔Textbook chapters/pages to review

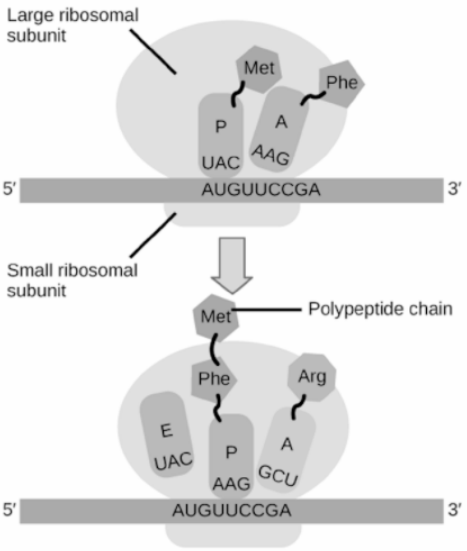
Step 2: _____

Elongation starts when:

Since all organisms use the same genetic code, it supports the idea of:

Elongation occurs in steps:

1. Codon recognition:



2. Peptide bond formation:

3. Translocation:

➔Questions?
➔Textbook chapters/pages to review

Step 3: _____

Termination occurs when:

The stop codon signals for a _____ _____

Think, Pair, Share

Take a few minutes to review the three stages of translation with a partner.

Quick Review

Before we move on to protein folding, take a minute to review primary, secondary, tertiary, and quaternary protein structures.

Primary:

Secondary:

Tertiary:

Quaternary:

➔Questions?
➔Textbook chapters/pages to review

Protein Folding

As translation takes place, the growing polypeptide chain begins to coil and fold.

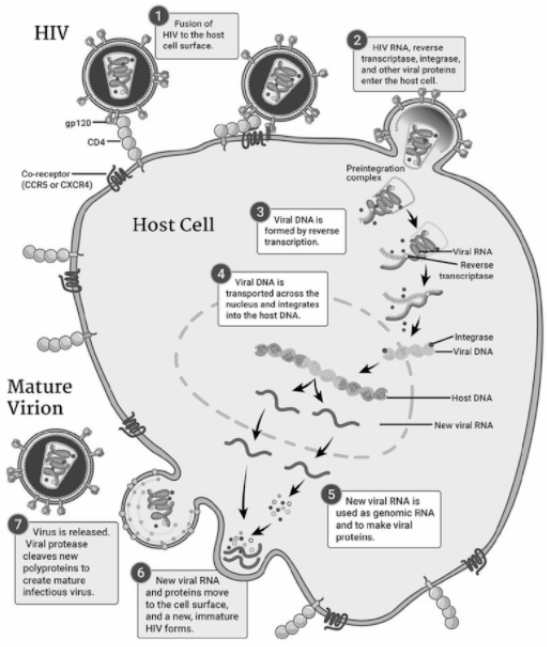
_____ determine the _____

Some polypeptides require _____ proteins to _____ correctly and some require _____ before it can be _____ in the cell.

Retroviruses

Retroviruses, like _____, are an exception to the standard flow of genetic information.

Information flows from _____ to _____.



➔Questions?
➔Textbook chapters/pages to review

Practice FRQ

1. All living organisms need a transfer of information to allow for genes to direct the synthesis of proteins. Explain how genes are transcribed and translated to produce a functional protein.

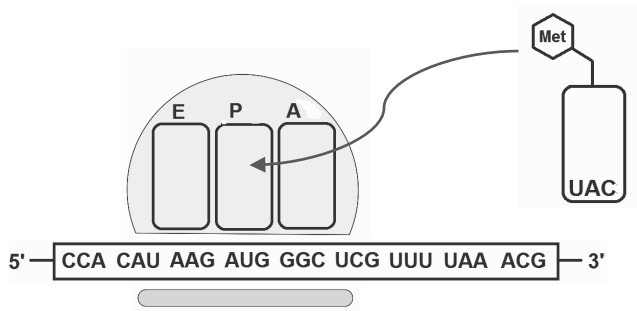
2. Compare and contrast translation in prokaryotes and eukaryotes.

➔Use this space to reflect on Topic 4
➔Textbook chapters/pages to review

The Steps in Translation

There are 10 images on this worksheet representing the process of translation. Use the open space to the right of each image (next to each arrow) to describe what is taking place during each step of translation.

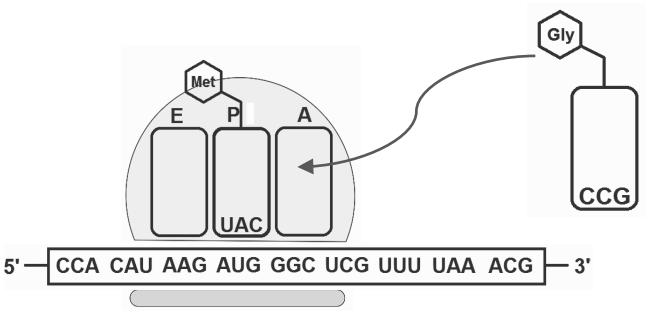
1



Step 1: _____

On the image to the left, label the following: large and small ribosomal unit, mRNA, tRNA, amino acid, anticodon, and codon.

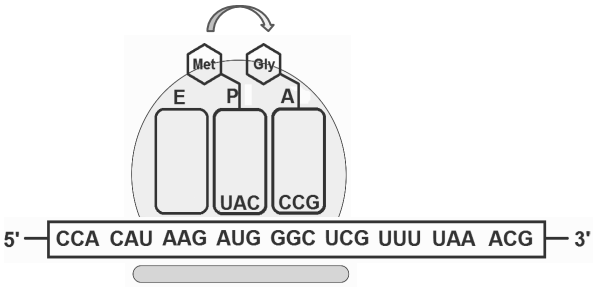
2



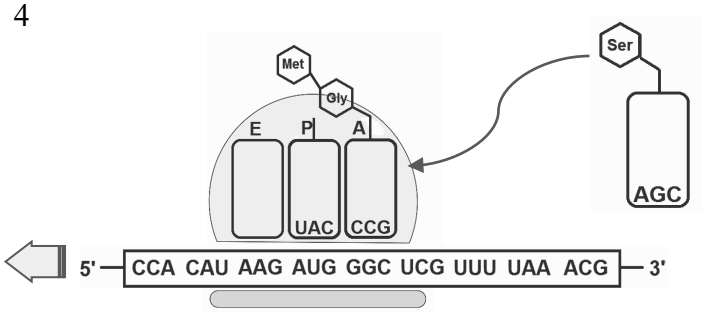
Images 2-7 refer to Step 2.

Step 2: _____

3



4



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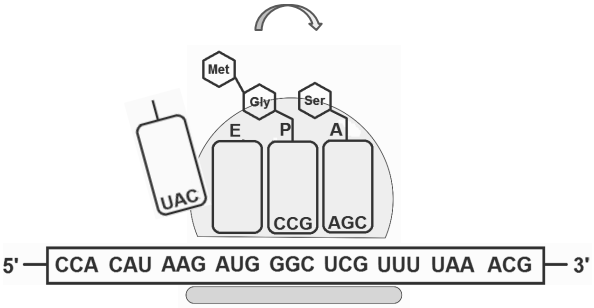

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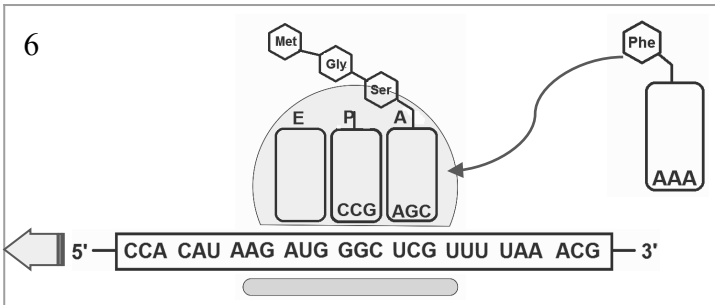

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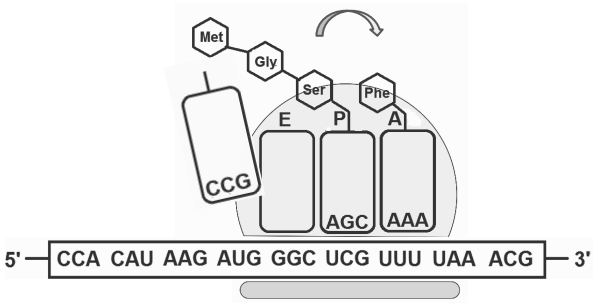

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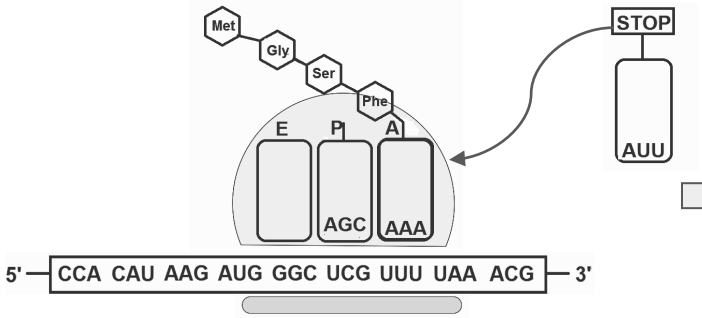
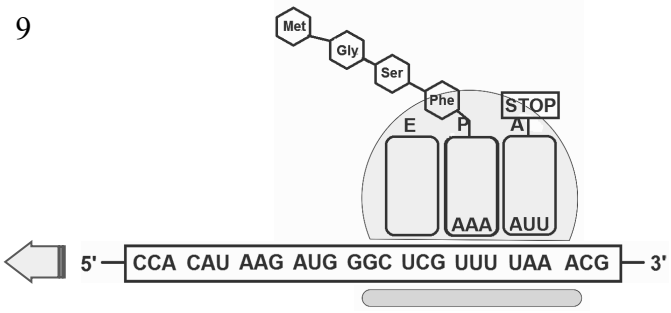


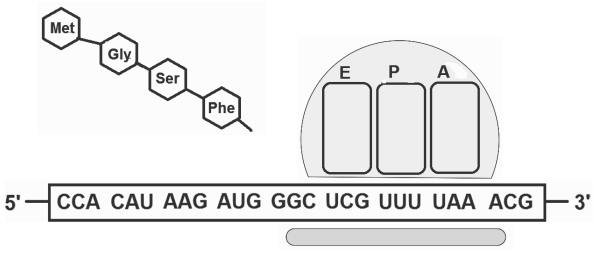
Images 8-10 refer to Step 3.

Step 3: _____

9



10



Gene Expression: Understanding the Genetic Code

Part 1: For each sequence fill in the missing DNA, mRNA, tRNA anticodon, and/or amino acid sequence. Assume all sequences are downstream of the start codon. Remember, if you see a stop codon, then STOP.

1.

DNA Template strand	TAC	AAT	CAG	GGC	TAA	TCA	AAC
mRNA							

2.

DNA coding strand	CCG	GAC	CGA	AAA	ATC	TTA	GAT
DNA Template strand							
mRNA							

3.

DNA Template strand	CCA	TAA	ATA	GAA	CAT	TTC	GTA
mRNA							
tRNA anticodon							

4.

DNA Template strand	CCT	GGA	GAT	CGA	TAT	AAA	TTT
mRNA							
Amino acid							

5.

mRNA	CCU	AUA	GGG	CAC	CGG	UUA	UAU
tRNA anticodon							
Amino acid							

6.

DNA Template strand							
mRNA	AUA	CCG	GUA	AGG	ACA	UAC	CAG

7.

mRNA							
tRNA anticodon	CCA	AAC	GAC	UAA	ACC	GGG	CCG
Amino acid							

8. More than one option can be correct

DNA Template strand							
mRNA							
Amino acid	Tyr	Ser	Asn	Gly	Val	Arg	Cys

9. More than one option can be correct

DNA Template strand							
mRNA							
Amino acid	Phe	Leu	Val	Pro	Asp	Glu	Trp

10. Make your own DNA strand. Use a variety of nucleotides!

DNA Template strand							
mRNA							
tRNA anticodon							
Amino acid							

Part 2: In this section you will now be examining DNA sequences from dragons (this is fictitious, of course). Scientists recently unearthed a dragon cave deep in the mountains of Europe. As it turns out, some dragons originated in Europe and some migrated to Europe from North America during the early 19th century. Thankfully, these dragons were nice, and allowed the scientists to obtain DNA samples from their scales to study their genetic code. The DNA samples revealed that the dragons are diploid organisms with a chromosome number of 20. The data below is taken only from chromosome 1, where the scientists have been able to map out nine genes thus far. Each gene has two alleles, or alternative versions, that result in a different phenotype. For the sake of this activity, the gene sequences have been shortened; in reality genes can be a few hundred base pairs in length to over two million base pairs in length. Examine the nine genes below, their resulting amino acid sequence, and the trait that is expressed based upon the amino acid sequence.

Genes	Amino Acid Sequence	Phenotype
Gene 1: Body scale coloring	serine-glutamine-alanine-valine	Green scales
	serine-glutamine-valine-alanine	Red scales
Gene 2: Breathing abilities	proline-histidine-arginine	Fire breathing
	glycine-histidine-arginine	Acid breathing
Gene 3: Belly coloring	threonine-alanine-lysine-leucine	Yellow belly
	isoleucine-alanine-serine-leucine	Black belly
Gene 4: Front claws	phenylalanine-glycine-serine	Four claws
	phenylalanine-glycine-proline	Five claws
Gene 5: Horns	histidine-tyrosine-proline-serine	Straight horns
	serine-tyrosine-proline-valine	Curved horns
Gene 6: Tail shape	glutamine-lysine-histidine-cysteine	Pointed tail
	proline-lysine-histidine-cysteine	Rounded tail
Gene 7: Eye color	threonine- tryptophan-histidine	Ice blue eyes
	threonine-alanine-histidine	Glowing orange eyes
Gene 8: Wings	glycine-tyrosine-alanine	Feathered wings
	alanine-tyrosine-glycine	Scaly wings
Gene 9: Spine spikes	cysteine-cysteine-isoleucine	Pointed spikes on the spine
	histidine-leucine-isoleucine	Rounded spikes on the spine

Directions: 1) Transcribe each gene to its complementary mRNA sequence. 2) Highlight each of the nine genes in the sequence; the genes are in order from one to nine. 3) Translate the mRNA codons to amino acids; note: you do not need to include the start and stop codons in your mRNA sequence.. 4) Determine the phenotypes. 5) Sketch the appropriate traits on the dragon to complete the drawing. *Remember AUG is the start codon, which signals the beginning of each gene, and UAA, UAG, and UGA are stop codons, which signal the end of a gene.*

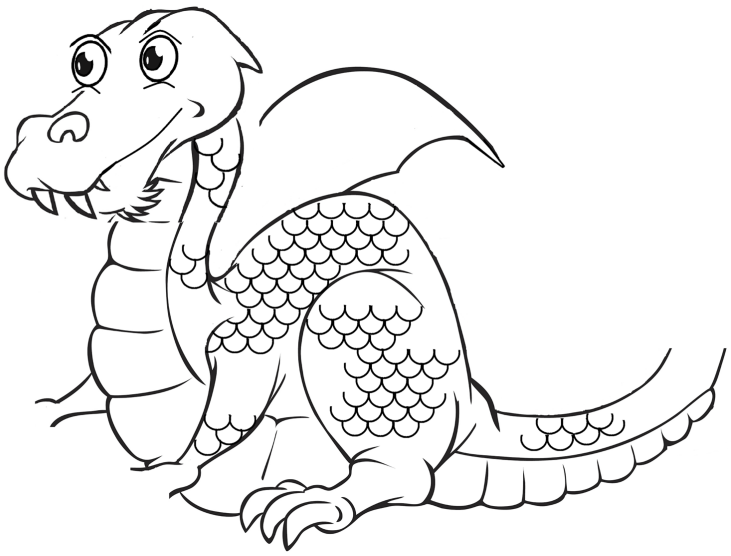
European Dragon

DNA Sequence: 3'-AAA TCA TAC AGG CTT CGG CAT ATT GCA CCA TAC CCG GTA GCA ACT ATA AAC TAT TAC TGT CGA TTT GAC ATC TAC AAA CCC GGG ATT CAA CAC GAC TAC GTA ATA GGA TCA ACT GGA CTG TAC GGC TTT GTG ACA ATC GCC TAC TGA ACC GTA ATT TGC GGT TAC CGA ATA CCC ATT TAC GTG GAC TAT ATT-5'

mRNA codons: _____

Amino acids: _____

Phenotypes: _____



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American Dragon

DNA Sequence: 3'- GAA TAC TCA CTT CAC CGC ATC CGC GCA CCA TAC GGG GTG TCC ATT TCA CCA TAC TAG CGT AGG AAT ATC CCG CCC CTG TAC AAG CCG GGC ATT CTA TGA TAC AGT ATA GGC CAT ATC CAC TAC CTC TTT GTA ACA ATT GGT ATA TAC TGA CGT GTA ATT TAC CCC ATA CGA ATC TAC ACG ACG TAA ATC- 5'

mRNA codons: _____

Amino acids: _____

Phenotypes: _____