

Protein Synthesis and Codons Practice

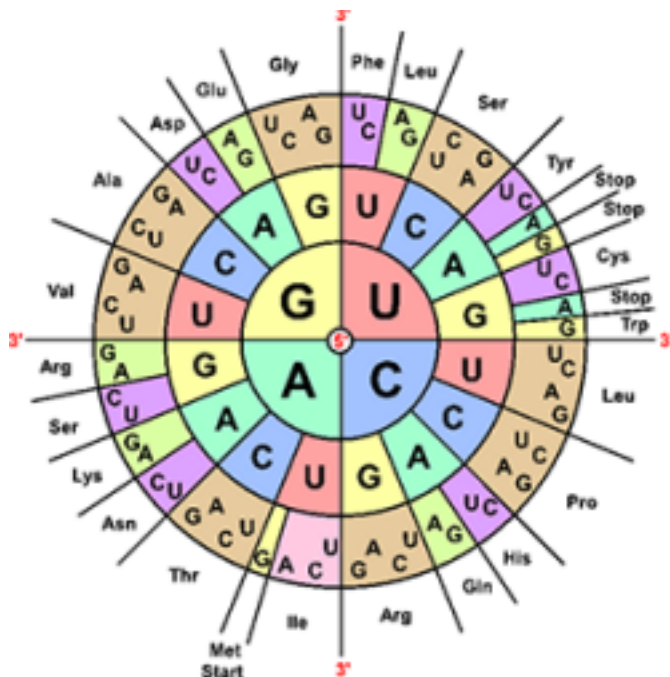
Protein synthesis is the process where a sequence of DNA is used to build a protein from individual amino acids. The first step in this process is called **TRANSCRIPTION**, where a coding region of DNA is converted to messenger RNA (mRNA). During transcription, mRNA is made from the DNA sequence following the base pair rule, except RNA does not contain the base **Thymine**, but instead has **Uracil**. The mRNA then leaves the nucleus and goes to a ribosome in the cell's cytoplasm. The ribosome reads the message three bases at a time, called a **CODON**. Each codon will specify a single amino acid. The amino acids are joined together and folded into a protein, a process called **TRANSLATION**

Key Points

- DNA is used to make a copy of mRNA (transcription)
- mRNA leaves the nucleus and goes to ribosomes
- 3 bases = codon
- 1 codon = a single amino acid
- A chain of amino acids = a protein
- Protein synthesis is also called translation

Biologists use a codon chart or a codon wheel to determine the amino acids. Amino acids are usually abbreviated on these charts as three letter words, like Cys and Ser.

		Second base in codon				
		U	C	A	G	
First base in codon	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 in codon



1. Use the codon chart to write the amino acid that corresponds to each codon found in mRNA:

C C C _____ A G U _____
 C A G _____ U A C _____
 G A A _____ C G U _____
 U U U _____ C C A _____

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2. Write the CODON that corresponds with each amino acid. There may be more than one. The full names are written, but the codon chart only shows the first three letters.

proline _____ **glycine** _____
valine _____ **phenylalanine** _____
histidine _____ **arginine** _____

3. A single codon is used to signal the beginning of protein synthesis. It is commonly called the START CODON.

Locate the start codon on the chart. What are the three bases of this codon? _____

4. There are three codons that signal the end of synthesis, these are called STOP codons.

What are the three stop codons? _____

5. For each sequence of DNA is shown. Write the complementary RNA sequence underneath the letters, then use the codon chart to determine the amino acid sequence:

DNA → **TACCATGGAATTACT**

RNA →

Amino Acids →

DNA → **TTCAATGGTCTAGGG**

RNA →

Amino Acids →

DNA → **ACATTCAGACCGTC**

RNA →

Amino Acids →