

PROTEIN SYNTHESIS ROLE PLAY

Synopsis:

After the teacher introduces protein synthesis to the students roles are assigned and students playing different parts of protein synthesis translate hemoglobin.

Materials:

- 32 laminated tRNA molecules (file Protein Synthesis Activity – tRNA.JPG)
- 32 Laminated Amino Acids (file Protein Synthesis Activity - Amino Acids.JPG)
- Tape
- DNA strand for Hemoglobin (file Protein Synthesis Activity – Codes.xls)
- tRNA anticodons (file Protein Synthesis Activity – Codes.xls)

Setup:

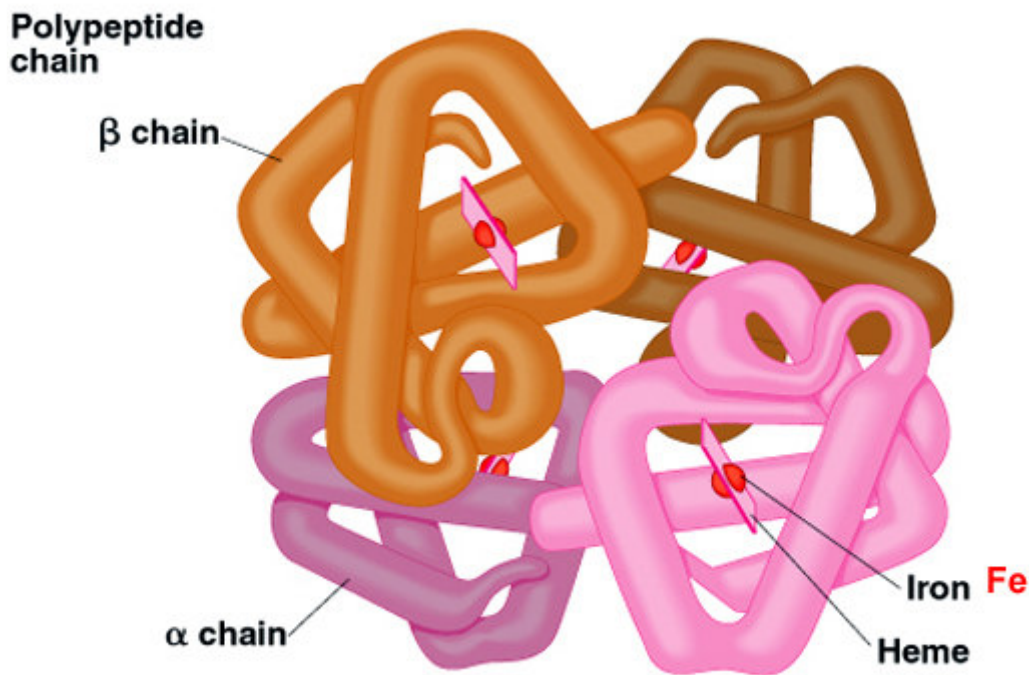
1. Take 32 tRNA pictures and write the anticodons 1-32 in the three blocks at the bottom.
2. Take the 32 amino acids and tape them to their tRNA. (see file Protein Synthesis Activity – Codes.xls). I write the name of the amino acid on the back tRNA that it codes to simplify putting it back together later on.
3. Print out the file Protein Synthesis Activity – Codes.xls for your own use

Instructions

1. Describe protein synthesis to the students.
2. Write the DNA code for the student on the board (file Protein Synthesis Activity – Codes.pdf).
3. Describe the cell location of transcription.
4. Block off codons and assign them to students to transcribe.
5. After all transcription has taken place pass out the tRNAs with their amino acids attached.
6. Choose a student to be the ribosome or you are the ribosome.
7. Describe the cell location of protein synthesis.
8. Have the ribosome read the mRNA code and ask the students “who has the tRNA match for the code”
9. Have the student come up with his/her tRNA and stand at the board.
10. Do this for two codons
11. Bond the first amino acid to the second with tape (describing what is happening)
12. Have the first tRNA sit back down.
13. Repeat until finished at STOP
14. Describe how Methionine is cut off and then wrap the protein around to fold to describe different levels of protein structure.

PROTEIN SYNTHESIS ROLE PLAY

Protein Synthesis Activity – Hemoglobin Graphic



(b) Hemoglobin

Protein Synthesis Activity – Hemoglobin Sickle Cell 6

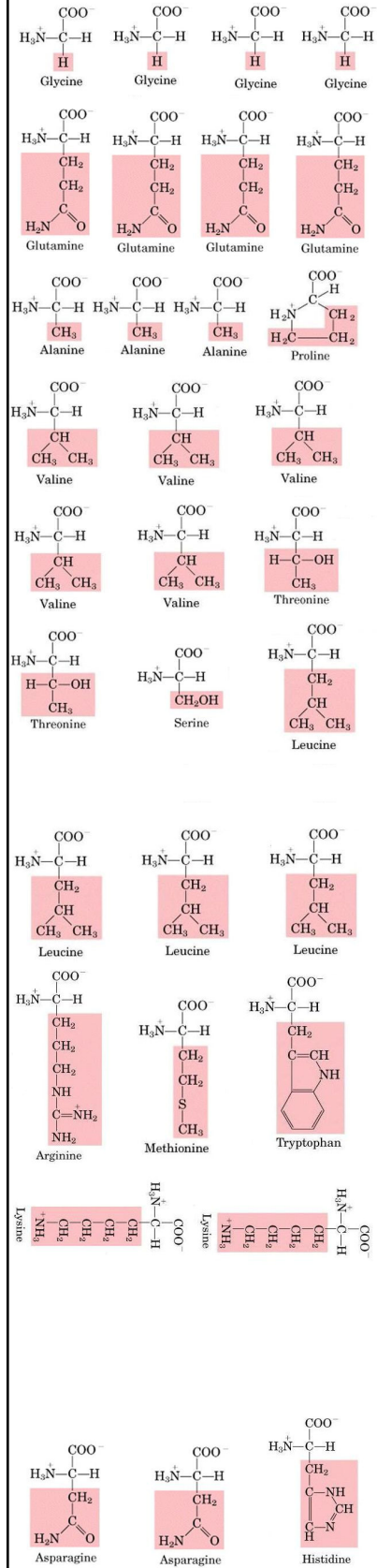
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1 2 3 4 5 6 7 8 9 10
val-his-leu-thr-pro- glu - glu -lys-ser-ala
                    lys-C gly-G
                    val-S

11 12 13 14 15 16 17 18 19 20 21
-val-thr-ala-leu-try-gly-lys-val-asp-val-asp

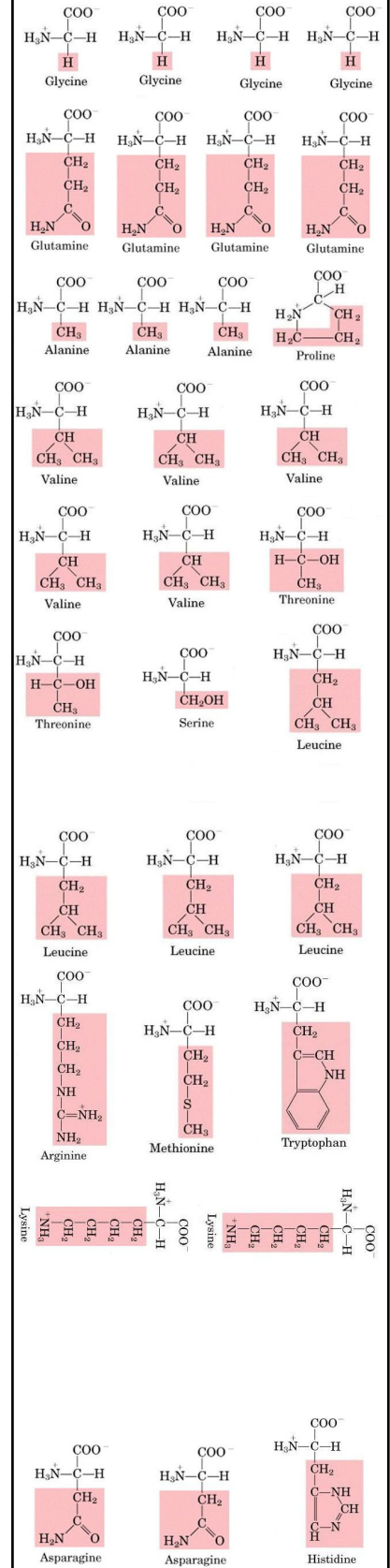
22 23 24 25 26 27 28 29 30 31
-glu-val-gly-gly- glu -ala-leu-gly-arg-leu-
ala-A2          lys-E
```

PROTEIN SYNTHESIS ROLE PLAY

**Protein
Synthesis
Activity –
tRNA.JPG**



**Protein
Synthesis
Activity –
AminoAcids.JPG**



PROTEIN SYNTHESIS ROLE PLAY

Protein Synthesis Activity – codes.pdf

HEMAGLOBIN

	Amino Acid	Symbol	mRNA	DNA	tRNA
0	Methionine	met	AUG	TAC	UAC
1	Valine	val	GUU	CAA	CAA
2	Histidine	his	CAU	GTA	GUA
3	Leucine	leu	CUU	GAA	GAA
4	Threonine	thr	ACU	TGA	UGA
5	Proline	pro	CCU	GGA	GGA
6	Glutamine	glu	GAA	CTT	CUU
7	Glutamine	glu	GAG	CTC	CUC
8	Lysine	lys	AAA	TTT	UUU
9	Serine	ser	AGU	TCA	UCA
10	Alanine	ala	GCU	CGA	CGA
11	Valine	val	GUC	CAG	CAG
12	Threonine	thr	ACC	TGG	UGG
13	Alanine	ala	GCC	CGG	CGG
14	Leucine	leu	CUC	GAG	GAG
15	Tryptophan	try	UAU	ATA	AUA
16	Glycine	gly	GGU	CCA	CCA
17	Lysine	lys	AAG	TTC	UUC
18	Valine	val	GUA	CAT	CAU
19	Asparagine	asp	GAU	CTA	CUA
20	Valine	val	GUG	CAC	CAC
21	Asparagine	asp	GAC	CTG	CUG
22	Glutamine	glu	GAA	CTT	CUU
23	Valine	val	GUU	CAA	CAA
24	Glycine	gly	GGC	CCG	CCG
25	Glycine	gly	GGA	CCT	CCU
26	Glutamine	glu	GAU	CTA	CUA
27	Alanine	ala	GCA	CGT	CGU
28	Leucine	leu	UUA	AAT	AAU
29	Glycine	gly	GGU	CCA	CCA
30	Arginine	arg	CGU	GCA	GCA
31	Leucine	leu	UUG	AAC	AAC
0	STOP	STOP	UAG	ATC	AUC

This is the amino acid sequence for Hemoglobin. mRNA reverse transcribed to DNA and then tRNA gene

Valine	5
Histidine	1
Leucine	4
Threonine	2
Proline	1
Glutamine	4
Lysine	2
Serine	1
Alanine	3
Tryptophan	1
Glycine	4
Asparagine	2
Arginine	1
Total	31

Steve Tester 2005