STE homework

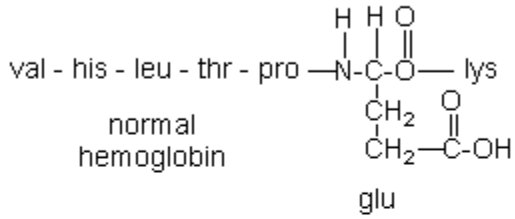
Genetics: Protein Synthesis

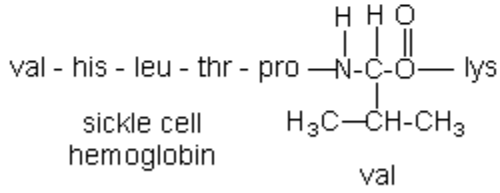
1. Choose from column2(matching)	**Column 2: Possible answers**
a) Enzymes (make important reactions occur faster) 1	1. Mostly or exclusively protein
b) Chromosomes 2 (mostly DNA but with histones(proteins))	2. Mostly or exclusively DNA
c) Ribosomes 3	3. Mostly or exclusively RNA
d) dried muscle 1	
e) a string of amino acids 1	
f) transfer RNA 3	
g) uracil, adenine, guanine, cytosine found in 2 and 3	
h) genes 2	

2. Shown are the tail ends of two proteins: one is part of normal hemoglobin and the other is part of sickle-cell anemia.

a) Instead of the amino acid "glu"= glutamic acid, which amino acid does the sickle cell anemia hemoglobin have? (see diagram)

Val (valine)





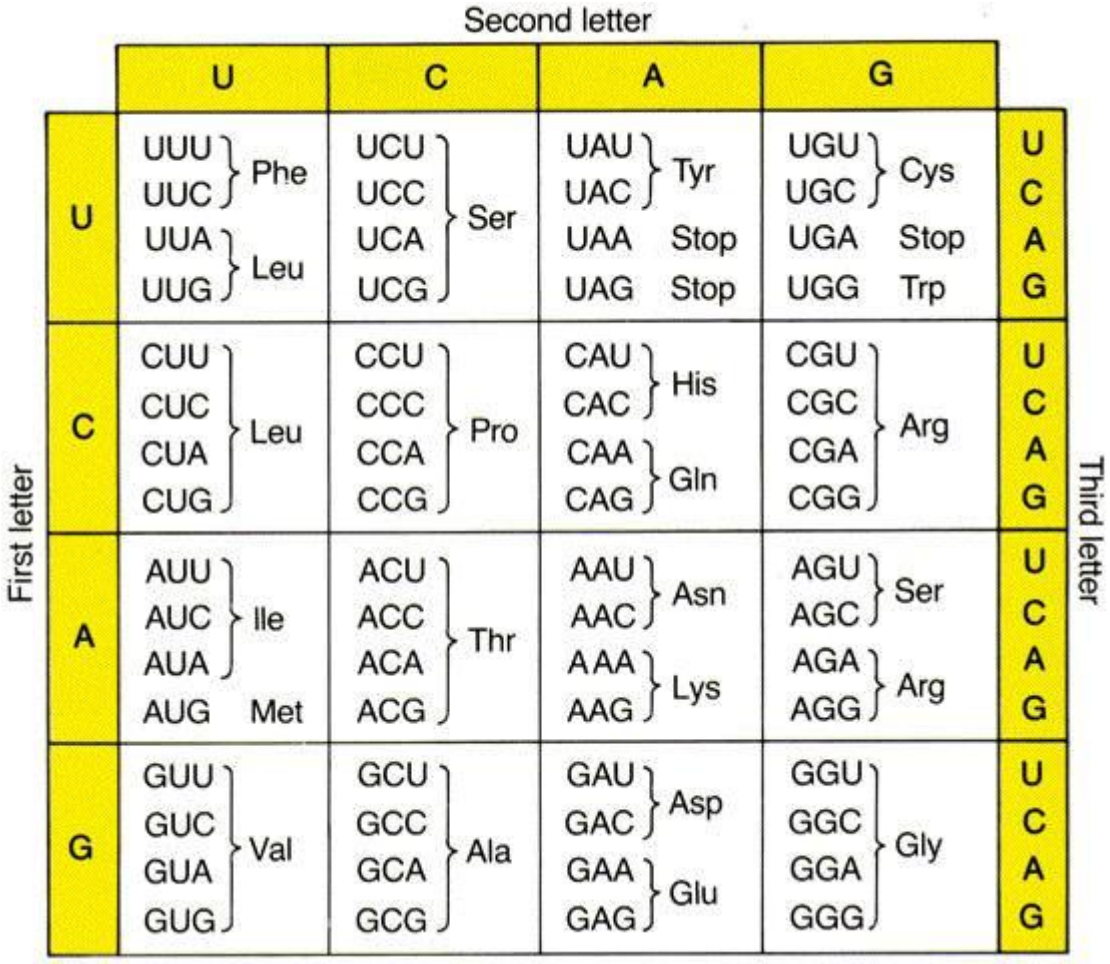
b) Consult the genetic code table on the next page and give the transfer RNA codes for valine. Repeat for glutamic acid.

Amino acid	Possible t-RNA codes	Corresponding m-RNA codes	Corresponding DNA codes
Valine(val)	CAA	GUU	CAA
	CAG	GUC	CAG
	CAU	GUA	CAT
	CAC	GUG	CAC
	Possible t-RNA codes	Corresponding m-RNA codes	Corresponding DNA codes
Glutamic acid(glu)	CUU	GAA	CTT
	CUC	GAG	CTC

c) For each amino acid, give the corresponding code for tRNA and then for DNA. Recall the following pairings: see above for answers

d) For DNA: A--T G--C

For RNA: A—U G—C



3. What name is given for all the triplets needed to code for the entire haemoglobin molecule? (It's a part of a chromosome!) gene

4. If you go back to the original transfer RNA codes, which codes resemble each other when you compare those of valine to those of glutamic acid?

   Glutamic acid's codes of GAA and GAG resemble valine's codes of GUA and GUG

5. This substitution of valine for glutamic acid creates a hydrophobic(water-avoiding) spot on the outside of the protein structure that sticks to the hydrophobic region of an adjacent hemoglobin molecule's beta chain. This clumping together (polymerization) into rigid fibers causes the "sickling" of red blood cells.

What caused the wrong code and therefore the wrong amino acid that leads to this molecular disease known as sickle-cell anemia?

Glu→val

CTT→CAT (see DNA codes)

A mutation causes the thymine(T) base to be replaced by adenine(A) in one single spot on the gene.