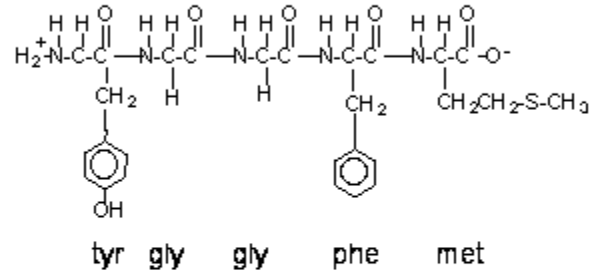


## In Class Examples

### Protein Synthesis

- a) Enkephalins (penta-peptides, simple proteins) have been discovered as regulators of nerve impulses involving pain in the brain. Apparently these peptides act as natural analgesics (pain-killers) and their action mimics that of morphine and other opiates.

### Enkephalins



Alternate molecule:

tyr - gly - gly - phe - leu

		Second letter					
		U	C	A	G		
First letter	U	UUU } Phe UUC } UUA } Leu UUG }	UCU } UCC } Ser UCA } UCG }	UAU } Tyr UAC } UAA Stop UAG Stop	UGU } Cys UGC } UGA Stop UGG Trp	U	C
	C	CUU } CUC } Leu CUA } CUG }	CCU } CCC } Pro CCA } CCG }	CAU } His CAC } CAA } Gln CAG }	CGU } CGC } Arg CGA } CGG }	U	C
	A	AUU } Ile AUC } AUA } AUG Met	ACU } ACC } Thr ACA } ACG }	AAU } Asn AAC } AAA } Lys AAG }	AGU } Ser AGC } AGA } Arg AGG }	U	C
	G	GUU } GUC } Val GUA } GUG }	GCU } GCC } Ala GCA } GCG }	GAU } Asp GAC } GAA } Glu GAG }	GGU } GGC } Gly GGA } GGG }	U	C
						A	G

Consult the genetic code above and give the transfer RNA codes for tyr(tyrosine). Fill in answers on next page.

b) For each amino acid, give the corresponding code for mRNA and then for DNA. Recall the following pairings:

For DNA:    A--T            G--C

For RNA:    A—U            G—C

Amino acid	Possible t-RNA codes	Corresponding m-RNA codes	Corresponding DNA codes

c) Repeat (a) and (b) for gly (glycine)

Amino acid	Possible t-RNA codes	Corresponding m-RNA codes	Corresponding DNA codes

## Protein Synthesis Homework

1. Choose from column2(matching)	Column 2: Possible answers
a) Enzymes (make important reactions occur faster)	1. Mostly or exclusively protein
b) chromosomes	2. Mostly or exclusively DNA
c) ribosomes	3. Mostly or exclusively RNA
d) dried muscle	
e) a string of amino acids	
f) transfer RNA	
g) uracil, adenine, guanine, cytosine	
h) genes	

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

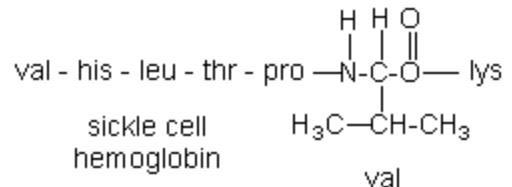
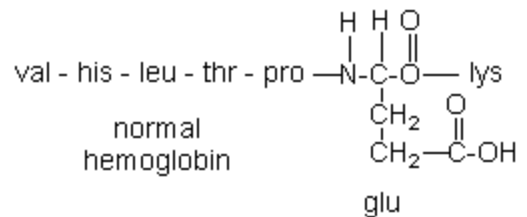
c) Instead of the amino acid "glu"= glutamic acid, which amino acid does the sickle cell anemia hemoglobin have? (see diagram)

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

e) For each amino acid, give the corresponding code for mRNA and then for DNA. Recall the following pairings:

f) For DNA: A--T            G--C

For RNA: A—U            G—C



C. Ophardt, c. 2003

		Second letter				
		U	C	A	G	
First letter	U	UUU } Phe UUC } UUA } Leu UUG }	UCU } UCC } Ser UCA } UCG }	UAU } Tyr UAC } UAA Stop UAG Stop	UGU } Cys UGC } UGA Stop UGG Trp	U C A G
	C	CUU } CUC } Leu CUA } CUG }	CCU } CCC } Pro CCA } CCG }	CAU } His CAC } CAA } Gln CAG }	CGU } CGC } Arg CGA } CGG }	U C A G
	A	AUU } AUC } Ile AUA } AUG Met	ACU } ACC } Thr ACA } ACG }	AAU } Asn AAC } AAA } Lys AAG }	AGU } Ser AGC } AGA } Arg AGG }	U C A G
	G	GUU } GUC } Val GUA } GUG }	GCU } GCC } Ala GCA } GCG }	GAU } Asp GAC } GAA } Glu GAG }	GGU } GGC } Gly GGA } GGG }	U C A G

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

## STE/Mendelian Genetics HW

Use the following tables to answer questions 1 to 6.

	<b>Dominant Trait in Animals</b>	<b>Recessive Trait in Animals</b>
Cats	Tabby coat(T)	Black coat(t)
cattle	Horned(H)	Hornless (h)
Sheep	White fleece(W)	Black fleece(w)
swine	Uncleft hoof (U)	Normal hoof(u)

<b>Dominant Trait in Humans</b>	<b>Recessive Trait in Humans</b>
Pigmented skin(P)	Albinism(p)
Detached Earlobes(D)	Attached earlobes(d)
Short fingers (S)	Normal fingers (s)
Widow's Peak (W)	Straight hairline(w)
Freckled skin (F)	Unfreckled skin (f)
Straight thumb(T)	Hitchhiker's thumb(t)

- Show that if two black cats mate their litter will always be black.
- Suppose that a homozygous white sheep mates with a black sheep. What is the probability that they will have white sheep?
- If a hornless cow gave birth to one horned calf and a hornless one, what was the genotype of the bull?
  - If the horned calf from part (a) went to college and met a nice heterozygous cow who gave him babies, what are the chances that they had a horned calf? A hornless calf?
- Two unfreckled sisters love milk. Both parents have freckles and argue a lot. Is the freckled milkman, who is the only freckled man in the neighbourhood, necessarily the real father of the sisters?



5. a) A widow with a widow's peak marries a straight-hairlined man. If her father's hair looked like her husband's, what is the likelihood that her son will have a widow's peak?
- b) Is the widow's mother someone with a straight hairline?
6. If a short-fingered woman marries a long-fingered man, what are the possible genotypes and phenotypes of the children? Draw two separate squares.
7. Assume that the genes for albinism and attached earlobes are on separate chromosomes. What are the chances that a man whose genotype is  $DdPp$  and a  $Ddpp$  woman will have an albino child with attached earlobes?