Assignment 2 is due Mon 18 Jan

Please hand in hard copy

Assignment 2. Please read https://en.wikipedia.org/wiki/Genetic_code Sections 1 through 2 if necessary.

2.1 Then, use the "Standard Genetic Code" table on the last page to generate the **six-frame translations** of the following sequence

5' AUGUCGCAGCAG 3'

(U is uracil – RNA uses Uracil in place of T, thymine, which is used by DNA)

Feel free to get help from classmates or from an on-line translation program, but a short example will be part of a quiz, so make sure you can do this. (Of course you will be able to use the table of the genetic code for the quiz.)

For example

```
5' ACCUACU 3'    complementary strand is
3' UGGAUGA 5'

Frame 1: ACC|UAC|U     amino acids TY (U alone is not a codon)
Frame 2: A|CCU|ACU                 PT (A alone is not a codon)
Frame 3: AC|CUA|CU                 L  (AC and CU alone are not codons)

The reverse of the complementary strand is

5' AGUAGGU 3'

Frame -1: AGU|AGG|U    SR
Frame -2: A|GUA|GGU    VG
Frame -3: AG|UAG|GU    * (stop --UAG tells the ribosome to stop
translating the mRNA into protein)
```

2.2 If we change the input sequence to

5' AUGUCGCA**A**CAG 3'

which translations change, and what do they change to?

Amino acids biochemical properties	nonpolar	polar	basic	acidic		Termination: stop codon

Standard genetic code

1st base	2nd base								3rd base
	U		**C**		**A**		**G**		
U	UUU	(Phe/F) Phenylalanine	UCU	(Ser/S) Serine	UAU	(Tyr/Y) Tyrosine	UGU	(Cys/C) Cysteine	U
	UUC		UCC		UAC		UGC		C
	UUA	(Leu/L) Leucine	UCA		UAA	Stop (Ochre) [B]	UGA	Stop (Opal) [B]	A
	UUG		UCG		UAG	Stop (Amber) [B]	UGG	(Trp/W) Tryptophan	G
C	CUU	(Leu/L) Leucine	CCU	(Pro/P) Proline	CAU	(His/H) Histidine	CGU	(Arg/R) Arginine	U
	CUC		CCC		CAC		CGC		C
	CUA		CCA		CAA	(Gln/Q) Glutamine	CGA		A
	CUG		CCG		CAG		CGG		G
A	AUU	(Ile/I) Isoleucine	ACU	(Thr/T) Threonine	AAU	(Asn/N) Asparagine	AGU	(Ser/S) Serine	U
	AUC		ACC		AAC		AGC		C
	AUA		ACA		AAA	(Lys/K) Lysine	AGA	(Arg/R) Arginine	A
	AUG[A]	(Met/M) Methionine	ACG		AAG		AGG		G
G	GUU	(Val/V) Valine	GCU	(Ala/A) Alanine	GAU	(Asp/D) Aspartic acid	GGU	(Gly/G) Glycine	U
	GUC		GCC		GAC		GGC		C
	GUA		GCA		GAA	(Glu/E) Glutamic acid	GGA		A
	GUG		GCG		GAG		GGG		G

A The codon AUG both codes for methionine and serves as an initiation site: the first AUG in an mRNA's coding region is where translation into protein begins.[43]

B ^ ^ ^ The historical basis for designating the stop codons as amber, ochre and opal is described in an autobiography by Sydney Brenner[44] and in a historical article by Bob Edgar.[45]