CMSC 858P. Homework 1

Handed out: 1/31/08
Due: 2/7/08

For this homework you will need to do a bit of research online. You'll have to look up IUB/IUPAC codes for DNA ambiguity codes as well as conversion tables between amino-acids and the corresponding codons (genetic code). **Please list your bibliographic (online, library, etc.) source for this information.**

1. What is the reverse complement of the following DNA sequences. Note that the third sequence contains IUB/IUPAC ambiguity codes (representing sets of 2 or more nucleotides):

```
ACAGGATGTTCATAGGCATTCCTCAGACTACAGTC
```

```
ACTTGCTAAGAATCTGATTCAGATTCTTAGCAAGT
```

```
GGCATGTCWAGACCTAMCYGACTCVGTAGGCCATG
```

2. What is the amino-acid sequence encoded in the following DNA sequence (assume gene starts at the first start codon and ends at first stop codon).

```
TTCGAGGGGCATGTTTGTTGCTATGAATGATAATAAAACAATGCTTTTTATTCCGGGGGCAACCAATTAAGTAATTC
```

3. Match the following amino-acid sequence to the corresponding location in the DNA string shown below.

```
KLFALTAVALMG
```

```
GTATGAAAAAACTAAAATTGTTTGCTCTTACAGCTGTAGCCCTAATGGGTGTTTCAGGTGTA
```

4. Define the following biological terms (look them up on the Internet and write out a one sentence definition in **your own words**):
   - Frameshift mutation

   - Silent mutation

5. The PCR techniques leads to three types of molecules being present in the solution:
- the initial DNA molecule (2 individual strands)
- molecules terminated at one end by a primer
- molecules terminated at both ends by a primer(the DNA we are trying to amplify)

How many of each type of molecule are present in the mix after the k-th denaturing step. Either provide a close-form equation for each type of molecule, or give the numbers for k = 5 and k = 6.