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

GTATGAAAAAATCTAAATGGTGGTCTTACAGCTGTAGCCCTAATGGGTGTTTCAGGTGTA

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.