

HOMEWORK 1

Download the .rtf file and use a word processor to type your answers in the correct places. Then you will be able to do some cutting and pasting to answer question 2, and it will be much easier to grade. Print the document with your answers and hand it in.

Tentative point values for each question are in parentheses.

1. (4) Below are three double-stranded DNA fragments from a bacterial gene (NOT the whole gene). Remember that the coding strand of the gene may be either the top or bottom strand of the DNA; you have to figure this out.

A. 5' GCGCAACGGAGCTAATAGACGTT
CGCGTTGCCTCGATTATCTGCAA

B. 5' GTTACTCGCGACCATCGTGGCC
CAATGAGCGCTGGTAGCACCGG

C. 5' CGCAGGAACACCGTATCCACCGT
GCGTCCTTGTGGCATAGGTGGCA

One fragment is at the beginning of the gene, one is at the end, and one is somewhere in between.

- (a) Which fragment is most likely to be at the beginning? B Underline the codon(s) that gave you the answer.
- (b) Which fragment is most likely to be at the end? A Underline the codon(s) that gave you the answer.

How to do it:

Remember to look for start and stop codons on both strands, beginning at the 5' end of each. A, top strand, has two stop codons (TAA and TAG, corresponding to UAA and UAG) in a row, and no ATG (AUG) start codon. Bottom strand has one TAG and no start. B, bottom strand, has a start codon and no stops. Top strand has neither a start nor a stop. C has neither start nor stop codons on either strand.

2. (6) The sequence of parts of the wild type and two mutant alleles of the human β -globin are shown below.

- Write the amino acid sequence that corresponds to the wild type allele on the line below it; use the one-letter names of the amino acids.
- For each of the two mutant alleles, circle the base(s) that are changed. In the case of an insertion, circle the inserted base; for a deletion, circle the bases that flank the deletion.
- In the space below the sequenced, write the amino acid sequence of the protein encoded by the mutant allele. Circle the amino acid(s) that are different from the wild type HbA protein.
- For each of the two mutant alleles, tell what kind of mutation it is (synonymous substitution, missense substitution, nonsense substitution, insertion frameshift, or deletion frameshift).
- You can use a pen to draw the circles on the printed document, or use Word to box them.

HbA (wild type)

1 13 106
ATG.....ACTCCTGAGGAG.....TACCCTTGGACCCAG

AA sequence:

M.....TPEE.....YPWTQ

HbC

1 13 106
ATG.....ACTCCTAAGGAG.....TACCCTTGGACCCAG

AA sequence:

M.....TPKE.....YPWTQ

Kind of mutation: missense

beta-Thalassemia minor

1 13 106
ATG.....ACTCCTGAGGAG.....TACCCTTAGACCCAG

AA sequence:

M.....TPEE.....YPW

Kind of mutation: Nonsense substitution or stop