University of Pennsylvania

BIOL4536 Fall 2023

Professor: Gregory R. Grant

QUIZ#3 (MAKEUP)

(Alignment)

October 16th, 2023 Name: _____

Question 1. (1 pt.) True or False. Substitution matrices are used for both protein alignment, DNA/RNA alignment.

Question 2. (1 pt.) True or False. In a substitution matrix, off diagonal entries can be positive.

Question 3. (1 pt.) True or False. PAM and BLOSUM substitution matrices are symmetric.

Question 4. (2 pts.) Suppose the rows of a block of data have been clustered to generate a BLOSUM60 matrix. Suppose two rows of the block are in the same cluster. Which of the following are possible? Circle *all* that apply:

(A) The two rows are more than 70% identical.
(A) The two rows are more than 60% identical.
(B) The two rows are less than 50% identical.
(C) The two rows are less than 40% identical.

Question 5. (2 pt.) Suppose there were only three amino acids A, B and C (as opposed to 20). The matrix below could be which of the following? Circle the ones that apply.

(A) A Matrix of counts.
(B) A Markov Chain Probability Transition matrix.
(C) A Substitution matrix.
(D) None of the above.

$$\begin{array}{c} \\ A \\ B \\ C \end{array} \begin{array}{c} \begin{array}{ccc} A & B & C \end{array} \\ \begin{bmatrix} 0.3 & 0.1 & 0.2 \\ 0.4 & 0.1 & 0.3 \\ 0.3 & 0.8 & 0.5 \end{bmatrix} \end{array}$$

FLIP OVER FOR LAST QUESTION.

Question 6. (3 pts.) Suppose the following block of data has been clustered into four clusters (in order to construct a BLOSUM matrix), so that the first four sequences comprise one cluster and the bottom three are each in their own cluster. So one cluster of size 4 and three clusters of size 1.

Count the number of times a B aligns with a C for the goal of constructing a BLOSUM matrix. So you have to count properly taking into account the clusters, as is done in the BLOSUM method.

A	B	A	A
A	B	A	A
A	A	A	A
A	B	A	A
A	A	B	D
A	C	B	A
D	A	B	A

Answer: _____