Introduction to biology
Assignment 1
Deadline - 20th July 2019

Q1. Construct a phylogenetic tree from the given sequence. Take mismatches as the distance metric for construction.

1. AGCCGTCGTA
2. AGCCGTAGTC
3. ACGGGTCGTA
4. AGTTCACGTA
5. AGCCGAGCAT

Q2. We have a bacterial species in a medium with all nutrients, oxygen, optimal temperature and pH. Initial bacteria population was 3.2×10^6 cells and their generation/doubling time is 30 mins what will we the population after 1.5 hrs (90 mins).

Q3. Describe briefly the differences between prokaryotic and eukaryotic cells.

Q4. The average formula for an amino acid is $N_1 C_5 O_2 H_8$. If a cell of radius 1 micon contains 15% of its mass as protein molecules, estimate the total number of protein molecules inside the cell. Assume a protein molecule has on average 300 amino acids.
If the cell is dividing in every 30 min, estimate the protein production rate (number of protein molecules produced per second).

Q5. There are 20,000 genes in an organism with an average length of 1000 nucleotides. How much storage space in Bytes (1 Byte=8 bits) will be needed to store the nucleotide sequences of the genes? How much storage space will be needed to store the sequences of the corresponding proteins?