Takehome Exam 7

Question 1.
A substitution is a mutation that was fixed in a population.

True
False

Question 2.
Models used to describe sequence evolution frequently use the Gamma distribution, using the alpha parameter. Which process is frequently modeled using the Gamma distribution?

Size of gaps to be inserted in the sequences during the alignment process
Among site rate variation
The choice of substitution matrix
The overall length of a sequence

Question 3.
Models used to describe sequence evolution frequently use the Gamma distribution, using the alpha parameter. Why is the Gamma distribution more suitable than the normal distribution?

Its shape is characterized by a single parameter that can be estimated from the data.
It can take the shape of many different distributions
It is faster to approximate that the normal of the Poison distribution

Question 4.
The mutation rate _____ the substitution rate for a mutation that provides a selective disadvantage?

Is equal to
Is less than
Is greater than
proportional to
Is unrelated to

Question 5.
The mutation rate _____ the substitution rate for a selective neutral mutation?

Is equal to
Is less than
Is greater than
proportional to
Is unrelated to

Question 6.
The mutation rate is _____ the substitution rate for a mutation that provides a selective advantage?

equal to
less than
greater than
proportional to
Is unrelated to

Question 7.
The probability for fixation for a single neutral mutation in a population of 15 million individuals as compared to a population of 1,000 individuals is

A. the same,
B. lower,
C. higher

Question 8.
The time till fixation for a single neutral mutation in a population of 15 million individuals as compared to a population of 1,000 individuals is

A. the same,
B. shorter,
C. longer

Question 9.
The size of successive populations is 500, 10000, 1 billion, 4 billion, 8 billion. What is the "effective population size" for the 5 generations (ignoring spatial heterogeneity, mating etc.) ?

5/ ((1/500) + (1/10,000) + (1/1,000,000,000) + (1/4,000,000,000) +(1/8,000,000,000)) =2380

Question 10.
Most mutations disappear in a few generations due to random drift.

True
False

Question 11.
The neutral theory states that all evolution is neutral and everything is only due to genetic drift.

True
False

Question 12.

If the mutant allele reaches a frequency of 50% in a population, it will almost always go on to fixation, even if the mutation does not provide a selective advantage.

True
False

Question 13.

What is the chance (probability) that a mutation that arose in a single copy and that provides no selective advantage or disadvantage is fixed in population of 1000 haploid organisms?

P=1/1000=0.1%=0.001

Question 14.

What is the chance (probability) that a mutation that arose in a single copy and that provides no selective advantage or disadvantage is fixed in population of 1000 diploid organisms?

P=1/2000=0.05%=0.0005

Question 15.

Which value of non-synonymous/synonymous rate ratio (+omega or dN/dS) would you expect for a protein-coding gene that encodes an enzyme vital for photosynthesis?

A. 0.01 or smaller
B. about 1.0
C. 1.2 or larger

Question 16.

Which of the following is a tree reconstruction artifact?

A. Incomplete lineage sorting
B. Horizontal gene transfer
C. Insufficient phylogenetic signal
D. Long branch attraction
E. Unrecognized paralogy