Question 1
Complete
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Flag question

Indicate which of the following statements about mutation is false:

- a. As an evolutionary force, mutation alone is a weak force and allele frequency changes will take a long time
- b. In a mutation-selection equilibrium the frequency in the population of a deleterious allele generated by mutation with a constant rate, will be higher if the deleterious allele is dominant
- c. Mutations occur randomly
- d. All variants found as polymorphisms in populations were generated by mutation as errors during DNA replication or repair in germ line cells

Question 2
Complete
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Flag question

If a population is NOT in Hardy-Weinberg equilibrium, it means that:

- a. This population does not fulfill some of the assumptions of an ideal population: diploid organism, sexual reproduction, same allele frequencies in both sexes, or random mating
- b. This population does not fulfill some of the assumptions of an ideal population: diploid organism, sexual reproduction, same allele frequencies in both sexes, or random mating
- c. The observed genotype frequencies cannot be calculated from allele frequencies as p^2, 2pq and q^2
- d. The three previous answers are true

Question 3
Complete
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Flag question

Indicate if the following statements about migration among populations are true or false: (1) The allele frequency in a small population receiving migrants from a large population with constant allele frequency will eventually be the same than in the large population. (2) All populations involved in sending and receiving migrants will have the same intermediate allele frequency when they reach equilibrium.

- a. Both false
- b. 1 false and 2 true
- c. Both true
- d. 1 true and 2 false

Question 4
Complete
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Flag question

Tay-Sachs disease is a fatal disorder in children causes a progressive degeneration of the central nervous system. It is caused by the absence of an enzyme called hexosaminidase A. This disease occurs in 1 in 27 newborns in persons of European Ashkenazi Jewish ancestry. Indicate the false answer:

- a. The allele frequency of the Tay-Sachs allele in Ashkenazi Jews is 0.037
- b. The frequency of carrier individuals in Ashkenazi Jews is 0.3108
- c. A 32.3% of healthy individuals are carriers of the disease allele in the Ashkenazi Jews populations
- d. We cannot test if the population is in Hardy-Weinberg equilibrium

Question 5
Complete
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Flag question

Indicate the true sentence. An allele with a frequency of 0.12 in a population of 25 individuals:

- a. Is more likely to be fixed than lost by genetic drift
- b. Has a probability of fixation over time of 12%
- c. Will have the same exact allele frequency in the next generation because no evolutionary mechanism is acting on this population
- d. None of the other answers are true

Question 6
Complete
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Flag question

Indicate the false option among these statements about population structure:

- a. If there is migration, the effects of genetic drift will be minimized and allele frequencies among different populations cannot diverge
- b. The F_{ST} value will be higher with migration than without
- c. Without migration, allele frequencies in different populations will become different over time by the effects of genetic drift
- d. An F_{ST} value of 1 indicates the maximum differentiation among populations

Question 7
Complete
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Flag question

In a small population of 5 individuals there are two neutral alleles, *B* and *b*. In a particular generation, the frequency of *B* is 0.8. Indicate the false option:

a. The probability that allele *B* frequency is exactly the same in the next generation is 0.00671
b. The probability that allele *B* is fixed in the next generation is 0.1073
c. The probability that allele *B* is lost in the next generation is extremely low
d. The probability that the population is still polymorphic in the next generation is high

Question 8
Complete
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Flag question

In a population there is a gene with two alleles, *A* and *a*. Allele frequency of dominant allele *A* is 0.3. If, due to an environmental change, relative fitness values of genotypes *AA*, *Aa*, and *aa* become respectively 1, 1, and 0.36, which of the following statements is false?

a. Allele *a* is recessive and detrimental
b. After the first round of selection, the frequency of *aa* individuals will be 0.1764
c. After the first round of selection, the frequency of allele *A* will be 0.437
d. When a new equilibrium is reached, allele frequencies will be 1 for allele *A* and 0 for allele *a*

Question 9
Complete
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Flag question

Indicate the true sentence. The effective size (N_e) of a population will be smaller than the census if:

a. There is a different number of males and females in the population
b. Bottlenecks have occurred in the population
c. The number of individuals fluctuates in different generations
d. All of the previous answers are correct

Question 10
Complete
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Flag question

A SNP with the alleles C and T in position 478 of human *MC1R* gene is responsible for the homozygote TT individuals having freckles and red hair. This gene encodes the melanocortin receptor and is involved in the synthesis of the melanin pigment in skin cells. In a random sample of 30 individuals of the United States with European origin we find 25 individuals with the CC genotype, 5 with the CT genotype, and none with the TT genotype. Indicate the false option:

a. The observed frequency of heterozygotes in this population is 0.167
b. The allele frequency of the red-haired allele T is 0.0833
c. This population is not in Hardy-Weinberg equilibrium
d. The expected frequency of red-haired individuals is 0.00694

Question 11
Complete
Marked out of 1.00
Flag question

The fitness values for the genotypes *AA*, *Aa*, and *aa* in a population are 0.8, 1, and 0.4, respectively. Indicate the false sentence:

a. This population is evolving by balancing selection favoring the heterozygote
b. At equilibrium the population will have p = 0.75 and q = 0.25
c. At equilibrium the average fitness of the population will be lower than 1
d. At equilibrium the frequency of heterozygotes will be 1

Question 12
Complete
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Flag question

Which of the following is false?

a. Variants with alleles with frequencies higher than 1% are considered polymorphic
b. Copy number variants (CNVs) can have multiple alleles with different number of copies of a gene
c. SNPs, indels and inversions are mostly variants with two alleles
d. Variants located outside of coding regions cannot affect phenotype