Answers to Questions for Comprehension

Student Textbook page 680

Q1. A gene pool is made up of all the alleles of all the genes present in a population.

Q2. Genotype frequency is the proportion of a population with a given genotype. Phenotype frequency is the proportion of a population with a given phenotype. Allele frequency is the rate of occurrence of a particular allele in a population, with respect to a particular gene. Therefore, allele frequency contributes to genotype frequency and genotype frequency contributes to phenotype frequency. The three are different levels of scale for examining a population.

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Q3. The five conditions of the Hardy-Weinberg principle are as follows:

1. The population is large enough that chance events will not alter allele frequencies
2. Mates are chosen on a random basis
3. There are no net mutations
4. There is no migration
5. There is no natural selection against any of the phenotypes

Q4. p is the frequency of the dominant allele of a gene locus. p^2 is the frequency of the homozygous dominant genotype in the population.

Q5. The frequency of heterozygotes in a population can be found by multiplying the frequency of the dominant allele by the frequency of the recessive allele and doubling the result ($2pq$).

Answer to Question for Comprehension

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Q6. You can tell if a population is at genetic equilibrium if, from one generation to the next, allele frequencies do not change when calculated with the Hardy-Weinberg equation. More than one gene locus should be examined. You can tell if microevolution is occurring if the allele frequencies differ from one generation to the next and the four conditions of the Hardy-Weinberg principle not relating to natural selection have been tested and shown to be true.

Answer to Question for Comprehension

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Q7. The two equations based on the Hardy-Weinberg principle are used to measure allele frequencies in one generation and then again in another generation. If allele frequencies are different, there has been a change in the gene pool.

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Q8. The conditions of the Hardy-Weinberg principle describe conditions that must be met for equilibrium to occur. If allele frequencies are seen to change, then the conditions cannot all be met, and the gene pool will change.

Answer to Question for Comprehension

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Q9. A mutation may create an allele that didn't exist in the population before. This new allele, if maintained in the population, increases genetic diversity by adding something that wasn't there before.

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Q10. If gene flow brings in alleles that are in different proportion to existing frequencies, the ratio of alleles in the gene pool will change. If gene flow brings alleles into

the population that don't already exist there, the diversity of the gene pool will increase.

Q11. The two basic situations that result in gene flow are immigration and emigration; but anything that causes these, like deliberate or accidental human introduction, would also cause changes to the gene pool.

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Q12. Non-random mating refers to males or females having choice in accepting a mate. Most animal populations have some form of mate choice so most are mating in a non-random manner.

Q13. Effects may include selection of specific phenotypes, change in allele frequency, elimination of harmful alleles, hybrid vigour, or elimination of harmful alleles.

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Q14. There is an increased likelihood of chance events affecting allele frequencies in small populations.

Q15. The founder effect results when a small population of individuals colonizes a new habitat. They don't carry the entire gene pool of the original population, so some of the alleles are missing. The result can be adoption of a different phenotype, speciation, increased risk of genetically-based health problems, increase in frequency of rare alleles, or a reduction in genetic diversity.

Q16. The founder effect causes increased inbreeding because there are fewer choices of mates in the new habitat since the population is small.

Q17. Situations that result in the bottleneck effect include population decrease due to disease, starvation, human interference including over-hunting, natural disasters, climate change, and dispersal to new habitat. Students can choose any three.

Answers to Questions for Comprehension

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Q18. Mutations are changes in the DNA base sequence. Natural selection is the process that results in genetic combinations that are most suitable for survival and increased reproduction being retained in a population. Thus mutations provide the variations that the environment can act upon, resulting in natural selection.

Q19. Habitat fragmentation leads to decreased gene flow, and thus reduced genetic diversity within a population. It will also result in increased genetic diversity between or among populations. With fragmented populations, there is an increased impact of random genetic drift.

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Q20. Reduced genetic diversity decreases the species ability to withstand changes in the environment, like global warming. Decreased species diversity results in instability of ecosystems and more difficulty conserving communities.