

47. Which of the following are **necessary** for evolution by natural selection to take place?

1. Offspring resemble their parents more than other individuals in the population.
2. Differences among individuals exist and lead to different numbers of successful offspring being produced.
3. Individuals adjust their development depending on the environment.
4. Every individual has a desire to have many offspring.

- ☐ A. 1 and 2
☐ B. 1 and 3
☒ C. 1, 2, and 4
☐ D. 3 and 4
☐ E. All of 1, 2, 3 and 4 are necessary.

48. A new chemical was discovered and introduced into a culture containing one species of bacteria. Within a day, most of the bacteria were dead, but a few remained alive.

Which statement best explains why some of the bacteria survived?

- ☐ A. They had a genetic variation that gave them resistance to the chemical.
☐ B. They were exposed to the chemical long enough to develop a resistance to it.
☐ C. They mutated and became a different species after exposure to the chemical.
☐ D. They absorbed the chemical and broke it down in their digestive systems.
☐ E. They needed to survive and reproduce in order to maintain high fitness, and subsequently, acquired the resistance.

49. The reason spontaneous mutations do not have an immediate effect on allele frequencies in a large population is that:

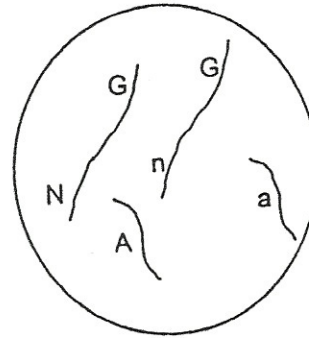
- ☐ A. mutations are random events, and mutations may be either beneficial or harmful.
☐ B. many mutations exert their effects after an organism has stopped reproducing.
☒ C. mutations are so rare that mutated alleles are greatly outnumbered by non-mutated alleles.
☐ D. mutations usually occur in males and have little effect on eggs.
☐ E. spontaneous mutations are not expressed in phenotypes, only genotypes.

50. What level of biological organization evolves by natural selection?

- ☐ A. alleles
☐ B. genotypes
☐ C. phenotypes
☐ D. individuals
☒ E. populations

Bonus Question

51. The figure below is the nucleus of a cell taken from a diploid, sexually reproducing, multicellular animal. What are all the kinds of gametes that this organism can produce?



- ☐ A. AaGGNn
☐ B. AGN, AgN, Agn, AGn, aGN, agN, agn
☐ C. AGN, aGN
☐ D. GN, Gn, A, a
☒ E. AGN, AGn, aGN, aGn