

Topic 6: Mechanisms of Evolution

Level 1

1. B
2. C
3. B
4. D
5. B
6. A
7. C
8. A
9. C
10. C
11. C

Level 2

1. A
2. D
3. C
4. C
5. B
6. D
7. A
8. C
9. C
10. D
11. D
12. B
13. C
14. B
15. D

Grid-in

1. 2.6
2. 45.2%
3. 7.8

FRQ

3. **The answer is 7.8.** Note that the dominant allele (p) is given, meaning the frequency of the recessive allele (q) can be found by $1.0 - 0.72 = 0.28$. The genotype for the recessive phenotype is q^2 or $(0.28)^2$, which equals 0.078. This number times 100 yields the percent that will have red shells.

stions

- (a) Miller demonstrated the formation of organic molecules by using an apparatus that mimicked the conditions thought to have existed on the early Earth. Using electricity sparks to mimic the energy from lightning, and an atmosphere containing a mixture of hydrogen gas, methane, ammonia, and water vapor, Miller generated a variety of organic molecules that are common in organisms. This was a demonstration that abiotic synthesis of organic molecules was possible.
- (b) RNA has two important features that make it likely to have been the earliest genetic material. RNA can function as an enzyme, known as a ribozyme. Some ribozymes can make complementary copies of short pieces of RNA so RNA can be self-replicating. This combination of catalytic and self-replicating ability makes it likely it was the earliest genetic material.
- (c) Because the earliest prokaryotes evolved in an atmosphere without oxygen, it is likely that most species were anaerobic and the development of oxygen in the atmosphere may have resulted in a mass extinction of species that were not able to tolerate some level of oxygen. This would have opened many niches and made it a time of adaptive radiation for organisms capable of dealing with oxygen in the atmosphere.

Note that this question has three parts, and these are clearly labeled on the response. The student chose to describe the Miller experiment but might also have discussed reactions on solid reactive surfaces. The formation of vesicles would also have been appropriate in this discussion. Essay questions on evolution are common occurrences on the AP Biology exam. When answering essay questions on evolution, avoid clichés like "survival of the fittest" because the phrase does not convey any specific information about evolution. Be descriptive in your discussions of evolution and remember to define key terms as they are used.

Topic 7: The Evolutionary History of Life