Supplemental Test Items to accompany OpenStax College *Concepts of Biology*. Note that not all chapters of OpenStax College *Concepts of Biology* have accompanying test items. Building on the community-oriented nature of OpenStax College resources, we invite you to submit items to be considered for future inclusion.

**Chapter 11: Evolution and Its Processes**

1. Which of the following best describes evolution? (Outceom #4a) (DOK 1)
   1. It is the tendency for species to remain unchanged over successive generations.
   2. It is the change in heritable traits in living populations over a single generation.
   3. It is the change in heritable traits in living populations over successive generations.\*
2. The primary pressure on species to change over time is what? (Outcome #4a) (DOK 1)
   1. natural selection\*
   2. mutation
   3. adaptation
3. The development of evolutionary theory is credited to Charles Darwin and \_\_\_\_\_\_. (Outome #I4a) (DOK 1)
   1. James Hutton
   2. Alfred Russell Wallace\*
   3. Jean-Baptiste Lamarck
4. “Survival of the fittest,” or the reproductive advantage in individuals who inherit traits that help it adapt to a changing environment was something Darwin called \_\_\_\_\_\_\_\_. (Outcome #4a) (DOK 1)
   1. inheritance
   2. adaptation
   3. natural selection\*
5. Individual differences with a genetic basis lead to \_\_\_\_\_\_ in successive generations. (Outcome #4a) (DOK 1)
   1. variation\*
   2. normalization
   3. extinction
6. A heritable trait that confers on an individual a survival and reproduction advantage in its current environment is called what? (Outcome #4a) (DOK 1)
   1. a handicap
   2. an adaptation\*
   3. a mutation
7. Evidence believed to support the theory of evolution fall into which major categories? (Outcome #4a) (DOK 1)
   1. fossil record, homologous structures, biogeography, and astrobiology
   2. fossil record, homologous structures, astrobiology, and geophysics
   3. fossil record, homologous structures, biogeography, and molecular biology
8. For variation to be a meaningful contribution to evolution, what must be true? (Outcome #4a) (DOK 2)
   1. The traits that vary in ways meaningful to evolution have genetic components.\*
   2. The traits that vary in ways meaningful to evolution have purely non-genetic components.
   3. The variation must only happen as a result of genetic mutation.
9. Two populations of crickets have stopped interbreeding over time, although they reside in the same geographic region. What is one possible explanation? (Outcome #4a) (DOK 2)
   1. They have experienced reinforcement because of reconnection at a hybrid zone.
   2. They have developed a temporal isolation, a kind of prezygotic barrier.\*
   3. Autopolyploidy has occurred, and the species are separated by a sympatric barrier.
10. Consider Mendel’s pea plants in which a single gene determines whether the peas are yellow from the dominant allele Y or green from the recessive allele y (when both alleles are y). According to the Hardy-Weinberg Principle of Equilibrium, what is the frequency of heterozygous individuals in a population under low selective pressure? (Outcome #4a) (DOK 2) (Paired Item 1)
    1. p + q = 1
    2. p2
    3. 2pq\*
11. Mendel discovered that whether his peas were yellow or green is determined by a single gene in which yellow (Y) is dominant over green (y). Assuming low selective pressure, what does the Hardy-Weinberg Equilibrium frequency term 2pq represent in the peas? (Outcome #4a) (DOK 2) (Paired Item 2)
    1. heterozygous, Yy\*
    2. homozygous recessive, yy
    3. homozygous dominant, YY
12. A scientist finds what she thinks is a new species of rodent on a small Pacific island. However, some similar-looking rodents inhabit some nearby islands. She mates the new rodent with the nearby rodents and gets viable but infertile offspring. Why? (Outcome #4a) (DOK 3) (Paired Item 1)
    1. The old and new rodents underwent vicariance, and their hybrid offspring were sterilized by adaptive radiation.
    2. The new rodents probably derive from fairly recent ancestors that experienced dispersive allopatric speciation.\*
    3. The new and old rodents are both allopolyploid after undergoing sympatric speciation.
13. Two very similar rodent populations are found on two Pacific islands near to one another. A scientist decides to mate some of the rodents and gets viable but sterile offspring. Why? (Outcome #4a) (DOK 3) (Paired Item 2)
    1. The rodents on one island are from recent ancestors that experienced allopatric speciation after a dispersive separation from the rodents on the other island.\*
    2. The rodents on one island are from recent ancestors that experienced sympatric speciation after allopolyploidy developed in their recent ancestors.
    3. The offspring were rendered infertile by adaptive radiation, and their parents experienced vicariance.
14. No one is quite sure how eukaryotic cells first appeared on Earth. Three hypotheses have been proposed for ongoing study: the eukaryote-first hypothesis, the nucleus-first hypothesis, and \_\_\_\_\_\_\_\_\_. (Outcome #4b) (DOK 2)
    1. an hypothesis that begins with mitochondria changing into a nucleus in a prokaryotic cell
    2. an hypothesis that begins with mitochondria developing in a eukaryotic cell that later lost its nucleus
    3. an hypothesis that begins with mitochondria developing in a prokaryotic cell that later acquired a nucleus\*
15. Endosymbiont theory is well-accepted for one evolutionary process but controversial for explaining another. What are these two processes, respectively? (Outcome #4b) (DOK 2)
    1. eukaryotic nucleus development and horizontal gene transfer via gene fusion
    2. horizontal gene transfer via gene fusion and eukaryotic nucleus development\*
    3. horizontal gene transfer via gene fusion and mitochondria formation
16. A scientist has discovered a new organism and wishes to classify it based on morphology and genetics. While he is waiting on the genomic data, he analyzes the morphological data. The new organism has homologous structures to birds and analogous structures to bats. However, he observes one trait that is shared with bats but not birds. What should he do? (Outcome #4b) (DOK 3) (Paired Item 1)
    1. tentatively group it with bats and speculate that the trait shared only with bats is an ancestral rather than a derived trait.
    2. tentatively group it with birds and speculate that the trait shared only with bats is a derived rather than an ancestral trait\*
    3. tentatively group it with bats because he observes both analogous traits with bats and a shared ancestral trait with bats.
17. A scientist finds a new organism that may be either a bird or a bat, but it is not clear which group it belongs to. He is pretty sure that the organism has analogous structures with bats and homologous structures with birds, as suggested by genomic data. The organism has one trait that is shared with bats but not birds. Which group should he choose for the new organism and why? (Outcome #4b) (DOK 3) (Paired Item 2)
    1. bats because of the analogous structures; the trait shared only with bats is ancestral
    2. birds because of the homologous structures; the trait shared only with bats is ancestral
    3. birds because of the homologous structures; the trait shared only with bats is derived\*
18. The theory of evolution states that: (Outcome #4) (DOK 2)
    1. better adapted organism reproduce at a higher rate
    2. organisms change by acquired characteristics
    3. organism populations can change physically over long periods of time\*
19. Who else discovered natural selection at the time Darwin was ready to publish his theory? (Outcome #4) (DOK 1)
    1. Mendel
    2. Wallace\*
    3. Watson
20. The wing of a bird and the wing of an insect are examples of \_\_\_\_\_\_\_\_\_ structures (Outcome #4) (DOK 1)
    1. homologous
    2. analogous\*
    3. isologous
21. Two organisms mate and have offspring. How could you test to see if the parents were the same species? (Outcome #4) (DOK 3)
    1. Test to see if the offspring have characteristics intermediate to both parents
    2. Test to see if the offspring resembles one of the parents or the other more
    3. Test to see if the offspring are fertile\*