

1. You are doing an experiment on the effects of daylight brightness on mice. You have 2 rooms, each with a bright side and a dark side. You put 3 cages on the bright side of each room, and 3 on the dark side of each room. Each cage has 12 mice. How many experimental replicates do you have in each of your treatment groups?
 - A. $216 = 2 \cdot 3 \cdot 3 \cdot 12$
 - B. $144 = 2 \cdot 2 \cdot 3 \cdot 12$
 - C. $72 = 2 \cdot 3 \cdot 12$
 - D. $6 = 2 \cdot 3$
 - E. 2

2. What sort of evidence would falsify the statement “No insects have interneurons”?
 - A. An insect without interneurons
 - B. An insect with interneurons
 - C. A tetrapod with interneurons
 - D. A tetrapod without interneurons
 - E. A tetrapod eating insects

3. Scientists advance science primarily by looking for hypotheses which explain observed facts and:
 - A. are consistent with other valuable hypotheses
 - B. can be proved to be true
 - C. are not falsified when tested in studies
 - D. suggest interesting experiments

4. Lamarck was a scientist who believed that giraffes developed from animals that looked more like horses over many generations of stretching their necks by reaching for leaves high up in trees. By today’s standards, we would say that Lamarck believed in
 - A. Neither evolution nor natural selection
 - B. Evolution but not natural selection
 - C. Natural selection but not evolution
 - D. Both natural selection and evolution

5. Genetic, developmental and structural homologies are found throughout the natural world. These provide evidence for:
 - A. Neither evolution nor natural selection
 - B. Evolution but not natural selection
 - C. Natural selection but not evolution
 - D. Both natural selection and evolution

6. A population of squirrels is observed. Grey- and black-colored squirrels mix freely. The grey-colored squirrels are more likely to survive to become adults, but there are no important differences in how the two color types reproduce. Under these conditions, we expect the proportion of grey-colored squirrels in the population to increase:

- A. as long as there is enough variation
- B. as long as the grey-colored squirrels have higher fitness
- C. as long as grey coloration is heritable
- D. as long as grey coloration is a dominant trait
- E. no matter what

7. A species of porpoise and a species of dolphin are both found to have a highly specialized muscle in their tail that helps them skim across the water. This is most likely to be an example of _____ if their common ancestor had a similar muscle and _____ if their ancestor did not have this muscle.

- A. homology; convergent evolution
- B. convergent evolution; homology
- C. neither; homology
- D. neither; convergent evolution
- E. convergent evolution; convergent evolution

8. Which of the following is *not* considered a fundamental component of organismal fitness?

- A. growth
- B. mutation
- C. reproduction
- D. survival

Use this information for the following two questions: Peppered moths with DD or DL alleles at the wing color locus look equally dark; scientists can't tell the two types apart without genetic sequencing. Peppered moths with LL alleles are much lighter.

9. The L allele is:

- A. homozygous
- B. diploid
- C. polyploid
- D. dominant
- E. recessive

10. Compared to LL moths, DL moths have _____ phenotypes and _____ genotypes:

- A. the same; the same
- B. the same; different
- C. different; the same
- D. different; different

Use the following information for the next 3 questions. A researcher measures pea genotypes in a population and finds 10 individuals of type LL, 30 individuals of type LS and 30 individuals of type SS.

11. It is known that LL individual produce long pods, and SS individuals produce short pods. If 30 of the measured individuals produced long pods, and 40 produced short pods, what would you conclude?

- A. The L allele is dominant
- B. The S allele is dominant
- C. L and S show incomplete dominance
- D. A mutation has occurred
- E. The population is under balancing selection

12. What is the estimated *genotype* frequency of the LL genotype in this population?

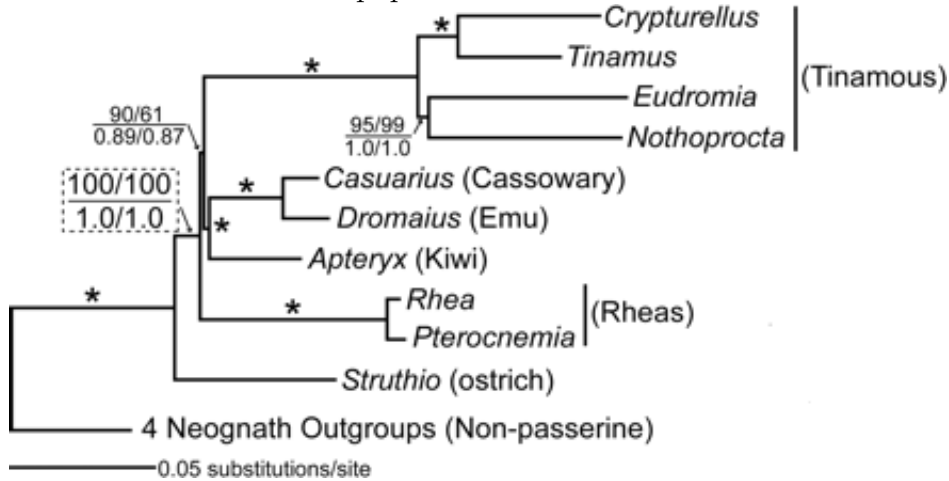
- A. 1/7
- B. 2/7
- C. 5/14
- D. 3/7

13. Based on the observed *allele* frequencies, approximately what genotype frequency of LL would you *expect* under the Hardy-Weinberg assumption?

- A. 8%
- B. 13%
- C. 18%
- D. 36%
- E. 38%

14. Which of the following is an advantage of the morphological species concept?

- A. It is well defined, in theory
- B. It is straightforward to apply
- C. It is appropriate for analyzing species known only from fossils
- D. It relates well to how populations evolve



Use the figure above for the next two questions. It shows a tree which changed the view of how this group of large birds (now called ratites) evolved. You can ignore the numbers and focus on the branching pattern shown.

15. According to this tree, the sister taxon of kiwis is

- A. Emus
- B. Emus and Cassowaries
- C. Emus, cassowaries and rhea (the species)
- D. Emus, cassowaries and rheas (the group)

16. The neognaths are not ratites. What is the most likely reason they were included in this analysis?

- A. To see if they were ratites
- B. To look for convergent evolution
- C. So that more traits could be studied
- D. To locate the "root" of the tree

17. In the end, scientists put more emphasis on similarities between hippos and whales, and less on similarities between hippos and cows, and concluded that hippos are more closely related to whales because the similarities between hippos and whales seemed _____ likely to be _____.

- A. more; morphological
- B. less; morphological
- C. more; basal
- D. less; basal

18. Which of the following is *least* likely to be involved in a “loop” that helped our pre-human ancestors develop big brains

- A. Adaptive foraging
- B. Sociality
- C. Tree-climbing
- D. Slow development of juveniles

19. Grasping feet is a primate characteristic, but humans don't really have them. The best explanation here is:

- A. Convergent evolution
- B. Secondary loss
- C. Humans have evolved and are no longer primates
- D. Vestigiality

20. Which of the following is *not* likely to lead to adaptive radiation?

- A. Species fusion
- B. Extinction of competitor species
- C. Co-evolution with interacting species
- D. Arrival in a new area
- E. Morphological innovation