

1. Which of the following would be the *least* likely trigger for an adaptive radiation in a given clade of lizards?
 - A. They arrive on an island that has no ecologically similar species
 - B. Small snakes that compete with the lizards arrive on their island
 - C. Large snakes that eat the lizards arrive on their island
 - D. A new mutation in the lizards that opens the way for further mutations
 - E. A new mutation in the plants on their island that opens the way for further mutations

2. A certain valley has more fossils of snails than of slugs. Which of the following is *not* a likely reason for this pattern?
 - A. The valley had more snails than slugs over the relevant period of time
 - B. The snails fossilize better because of their hard shells
 - C. The snails lived in a wetter part of the valley
 - D. The snails spent less time underground than the slugs

3. Hox genes are genes that control _____; we discussed how Hox mutations can set the stage for _____.
 - A. immune responses; coevolution
 - B. immune responses; adaptive radiations
 - C. body plans; coevolution
 - D. body plans; adaptive radiations

4. Polyploidy events, where a new organism has twice as many chromosomes as the parents, are usually _____, but sometimes _____.
 - A. beneficial; lead to speciation events
 - B. beneficial; lead to extinction events
 - C. deleterious; create more efficient offspring
 - D. deleterious; create opportunities for new beneficial mutations

5. A researcher wants to test the effects of supplementing flies' diets with vitamin E. They raise groups of flies in 8 different dishes. 4 of the dishes have standard diets, and 4 have supplemented diets. There are 10 flies in each dish. In this experiment, each treatment (standard and supplemented) has how many *replicates*?
 - A. 1
 - B. 4
 - C. 10
 - D. 40

6. 80% of a frog population is destroyed by a fungal outbreak after a mild winter. What else do you need to know to determine if this was a selection event?

- A. Nothing. It was definitely a selection event.
- B. Nothing. It was definitely *not* a selection event.
- C. Whether on average the frogs that survived were in better condition (e.g., fatter or stronger) than those that died
- D. Whether on average the frogs that survived were different genetically than those that died

7. A spring storm kills almost all of the chipmunks in Hamilton. After 10 years it is found that the population is back to the original level, but has several deleterious alleles present at high frequency that were rare before the storm. This is an example of:

- A. gene flow
- B. speciation
- C. a bottleneck
- D. natural selection
- E. assortative mating

8. Hawthorn flies have genes that attract them to either apple or hawthorn plants, and also attract them to other flies that smell like they were raised on those plants. If a population of flies lives in a place with similar amount of hawthorn and apple resources, we would expect these genotype frequencies in these attraction genes to:

- A. Be in Hardy-Weinberg equilibrium
- B. Be close to, but not in, Hardy-Weinberg equilibrium
- C. Have more homozygotes than predicted by HW
- D. Have more heterozygotes than predicted by HW

9. Scientists studying hominin skeletons from different taxa are particularly interested in evidence of _____ but it likely reflects _____.

- A. less robust jaws; larger brains
- B. slow development; larger brains
- C. less robust jaws; a long learning period
- D. slow development; a long learning period

10. Two related species of plant produce flowers at different times. This likely represents

- A. gene flow
- B. balancing selection
- C. reinforcement
- D. hybridization
- E. fusion

Short-answer questions

Answer questions *in pen*. *Briefly* show necessary work and equations. Points may be *deducted* for wrong information, even when the correct information is also there.

11. Early hominins have a posture that is strikingly upright compared to other apes.

a) (2 points) List *two* theories for why natural selection might have favored this change.

b) (1 point) For one of the theories above, explain a possible change in the physical environment, the biological environment, or in the early hominins that may have created the context for selection to move in that direction

12. (2 points) Modern humans are biological organisms, but have important differences with other organisms

a) What is a sense in which the principles of evolution by natural selection apply directly to modern humans?

b) What is a reason why adaptive principles apply less directly to modern humans than to many other organisms?