

## Exercise session: Evolution 1

1. Imagine two species that are thought to have a recent common ancestor. If this idea is correct, these two species most likely have \_\_\_\_\_.
  - a. no morphological similarities
  - b. few biochemical similarities
  - c. several homologous structures
  - d. a shared habitat
2. You discover fish living in a cave with no natural light. The fish have no eyes, but they do have eye sockets. Using a Lamarckian thought process, which of the following would be the reason for this?
  - a. The fish were in a dark environment and therefore didn't need eyes. Over time, they used their developmental energy for other more useful features, so because they didn't use their eyes, they lost them.
  - b. The fish never had eyes but are slowly evolving to have them because they will need them someday.
  - c. Originally, all fish in the population had eyes and could see. However, in the dark, there was no longer selection for sight, and eyes were eventually lost due to random mutations.
3. You discover fish living in a cave with no natural light. The fish have no eyes, but they do have eye sockets. Using a Darwinian thought process, which of the following would be the reason for this?
  - a. The fish were in a dark environment and therefore didn't need eyes. Over time, they used their developmental energy for other more useful features, so because they didn't use their eyes, they lost them.
  - b. The fish never had eyes but are slowly evolving to have them because they might need them in the future.
  - c. Originally, all fish in the population had eyes and could see. However, in the dark, there was no longer selection for sight, and eyes were eventually lost due to random mutations.
4. Using the Galápagos finches example from class, which of the following best explains the Darwinian reason why the insect-eating finch has such a long, narrow beak?
  - a. Variation existed in the finch population. Those that naturally had longer, narrower beaks could reach their food more easily, allowing finches with these features to survive and reproduce more often than those that did not.
  - b. Every day, finches who needed to eat insects would squeeze their beaks into tiny holes to reach insects, eventually changing the shape of their beaks; this shape was then passed on to future generations.
  - c. Those with longer, narrower beaks carried the dominant gene for that trait, causing it to become more prevalent.
5. Multiresistant *Staphylococcus aureus* (MRSA) infections are occurring at alarming rates. One reason for this could be that people do not finish their antibiotics. Which of the following is the most likely reason that this could lead to something like MRSA?

- a. Antibiotics take some time to start working, giving the bacteria time to mount defenses against the antibiotics over a few days.
  - b. Because antibiotics are often taken when there is no bacterial infection, the antibiotics aren't using their medicinal/antibacterial properties and are losing them.
  - c. The first few days of antibiotics kill off the susceptible bacteria, making people feel better. Then, when people stop taking the antibiotics, the resistant bacteria that survived reproduce to create a more resistant population.
6. The Lamarckian and Darwinian views of evolution share all of the following ideas except:
- a. life evolves over time.
  - b. the environment plays a role in evolution.
  - c. inheritance from generation to generation is a key factor in evolution.
  - d. organisms have an innate drive to become more complex.
7. Artificial selection (breeding) was a very important factor in the development of Darwin's ideas on natural selection. In which of the following respects is artificial selection distinct from natural selection?
- a. Artificial selection does not require heritable variation.
  - b. Artificial selection does not result in evolutionary change.
  - c. Artificial selection does not rely exclusively on the environment to determine relative survival and reproduction rates.
  - d. Artificial selection does not result in an increase in favorable characteristics.
8. Under which of the following conditions could evolution by natural selection not occur?
- a. no genetic variation in a population
  - b. very long generation times
  - c. very short generation times
  - d. very stable environment
  - e. no predation
9. Should bat wings be considered homologous to whale flippers? Which of the following is the best answer and argument?
- a. Yes. They are both limbs and are both used for locomotion.
  - b. No. They have very different uses—flight versus swimming.
  - c. Yes. They have similar bone structure inherited from a common ancestor.
  - d. No. There is no common ancestor of bats and whales.
10. Suppose two species have a similar feature, and you are trying to decide whether the feature is homologous or convergent. What is the best strategy to use?
- a. Determine if the feature is shared with a third species.
  - b. Determine if their common ancestor also had the feature.
  - c. Determine if the feature is used for the same purpose in the two species.
  - d. Determine if the feature is vestigial.
  - e. Determine if the two species also share other features.
11. The cichlid *Cynotilapia afra*, introduced at West Thumbi Island in Lake Malawi in the 1960s, has split into two genetically distinct populations, located at the north and south ends of the island. How can scientists determine whether these populations are now different species, according to the biological species concept? \* *Slightly harder question but you can do it!* 😊

- a. See whether the two populations are morphologically different from each other: coloring, bone structure, and so on.
- b. Determine whether captured individuals from the two different populations will mate and produce offspring in a laboratory fish tank.
- c. Determine whether individuals from one population will interbreed with individuals from the other population when introduced into each other's native habitats.

12. Sea urchins are broadcast spawners: They release their gametes into the water without courtship. Which of these reproductive isolation mechanisms is most likely to occur between sea urchins in the same area?

- a. behavioral isolation
- b. gametic isolation or temporal isolation
- c. habitat isolation
- d. mechanical isolation

13. You spot a sea snake while you are in a boat on the Atlantic Ocean and remark about how similar it looks to a snake that lives in Arizona. However, you know that they are most likely separate species due to which of the following reproductive barriers?

- a. behavioral isolation
- b. gametic isolation
- c. habitat isolation
- d. temporal isolation

14. Microevolution occurs within populations. Macroevolution is thought of as the patterns of change that occur between taxa. Which is an example of speciation?

- a. microevolution
- b. macroevolution
- c. both
- d. neither

15. The biological species concept relies on a disruption of which aspect of population genetics

- a. mutation
- b. selection
- c. gene flow
- d. genetic drift
- e. all of the above

16. Which of the following could facilitate allopatric speciation?

- a. mountain range
- b. river
- c. isthmus
- d. ocean strait
- e. all of the above, depending on the species

17. The rutabaga (*B. napobrassica*) is an allopolyploid species that originated in northeastern Europe as a cross between its two "parent" species: cabbage (*B.*

oleracea), with a  $2n = 18$  karyotype, and turnip (*B. rapa*), with a  $2n = 20$  karyotype. How many chromosomes should rutabaga have? \* 😊

- a. either 18 or 20
- b. 19
- c. 38
- d. 76

18. Imagine a hybrid zone between two sister species that occasionally interbreed. Which of the following is a likely consequence of the hybrid zone? \* 😊

- a. The hybrid forms a new species, reproductively separate from the original two species.
- b. The hybrid is less fit, reinforcing the separation of the two original species.
- c. The hybrid continues to mate with both original species, leading to fusion of the two original species.
- d. The hybrid survives and continues to be produced, forming a stable hybrid zone along with the two original species.
- e. All of the above could occur.