Name _____ Date _____

Evolutionary Trees and Speciation Unit Review: From Shared Traits to New Species

Directions: Answer the questions on evolutionary trees and how new species form. The last two groups of questions use a table of animal traits and a table listing the branch points of a tree built from it.

1. On an evolutionary tree, what does each branch point stand for?

A. A species alive today that gave rise to the species drawn next to it

B. A common ancestor of all the groups that branch off from that point

C. A moment when one species decided to change into a new kind of species

D. A trait that every species on the tree needed in order to stay alive

2. How do biologists decide which two groups on an evolutionary tree are most closely related?

A. They find the two groups that look the most alike when they are fully grown.

B. They find the two groups that live in the most similar kinds of habitats.

C. They find the two groups drawn closest together at the tips of the tree.

D. They find the two groups that share the most recent common ancestor.

3. Use the word bank to finish this definition of a species, which applies to organisms that reproduce sexually.

Word bank
migrate • compete • sterile • interbreed • fertile

Under the biological species concept, a species is a group of organisms that can _____ in nature and produce _____ offspring.

4. A horse and a donkey can mate and produce a mule, but mules are almost always sterile. Under the biological species concept, what does this show?

A. Horses and donkeys are separate species, because their offspring are almost always sterile.

B. Mules form a third species, because a new kind of animal can be born from the cross.

C. Horses and donkeys are one species, because they look and act so much alike.

D. Horses and donkeys are one species, because they are able to produce offspring.

5. Over a very long time, a river cuts a deep canyon that splits a population of squirrels into two groups. After many generations apart, squirrels from the two sides are brought together, and they no longer produce fertile young. What has most likely happened?

A. The groups are still one species, since they share a common ancestor.

B. The two groups have become separate species after evolving apart.

C. The squirrels chose to stop mating so that each group could adapt.

D. The canyon changed each squirrel's genes during its own lifetime.

6. Match each example to the kind of reproductive isolation it shows.

Write the letter of the matching answer on each line.

1. _____ Two kinds of flowering plants grow side by side, but one flowers in early spring and the other in late summer.
2. _____ A river changes course and splits a population of beetles into two groups that can no longer reach each other.
3. _____ Two kinds of frogs share a pond, but each female responds only to the mating call of males of her own kind.

Choices for question 6

A. Geographic isolation

B. Temporal isolation

C. Hybrid sterility

D. Behavioral isolation

7. Why is the biological species concept hard to use for bacteria?

A. Bacteria interbreed freely with every other kind of living organism.

B. Bacteria are far too small to belong to any species of living thing.

C. Most bacteria reproduce asexually, so there is no interbreeding to test.

D. Bacteria never change over time, so they cannot form new species.

Building a Tree from Traits

The table shows which of six traits seven animals have. The lancelet is a small, fishlike sea animal, the lamprey is an eel-shaped fish, and the lungfish is a fish that can breathe air. In a tree built from such a table, animals that share a trait are grouped as descendants of a common ancestor that had it.

Traits of seven animals (Yes means the animal has the trait; an amnion is a fluid-filled sac around a developing embryo, inside an egg or inside the mother)

Animal	Backbone	Jaws	Lungs	Four legs	Embryo in an amnion	Hair
Frog	Yes	Yes	Yes	Yes	No	No
Lamprey	Yes	No	No	No	No	No
Mouse	Yes	Yes	Yes	Yes	Yes	Yes
Perch	Yes	Yes	No	No	No	No
Lungfish	Yes	Yes	Yes	No	No	No
Lancelet	No	No	No	No	No	No
Lizard	Yes	Yes	Yes	Yes	Yes	No

8. In a tree built from this table, which animal branches off first, at the branch point closest to the root?

A. Lancelet B. Mouse C. Perch D. Lamprey

9. In a tree built from this table, which option lists all of the animals that descend from the earliest common ancestor that had four legs?

A. The lizard and mouse only
B. The lungfish, frog, lizard and mouse
C. The perch, lungfish and frog
D. The frog, lizard and mouse

10. In a tree built from this table, each of these traits first appears at a different branch point. Put the traits in order from the root of the tree toward the mouse, labeling each one First, Second, Third or Fourth.

Write the letter of the matching answer on each line.

1. _____ Lungs
2. _____ Embryo in an amnion
3. _____ Jaws
4. _____ Four legs

A. Fourth
B. Second
C. First
D. Third

Reading the Tree

This table lists the branch points of the tree built from the trait table. Each branch point stands for a common ancestor, and each animal descends from every branch point whose row lists it. Higher-numbered branch points are more recent ancestors.

Branch points of a tree built from the trait table, each listed with all of the animals that descend from that common ancestor (branch point 1 is the root)

Branch point	Animals that descend from this common ancestor
1	Lancelet, lamprey, perch, lungfish, frog, lizard, mouse
2	Lamprey, perch, lungfish, frog, lizard, mouse
3	Perch, lungfish, frog, lizard, mouse
4	Lungfish, frog, lizard, mouse
5	Frog, lizard, mouse
6	Lizard, mouse

Use “Traits of seven animals (Yes means the animal has the trait; an amnion is a fluid-filled sac around a developing embryo, inside an egg or inside the mother)” above.

11. Which branch point stands for the most recent common ancestor of the frog and the mouse?

A. Branch point 4 B. Branch point 5 C. Branch point 6 D. Branch point 1

12. Is the lungfish more closely related to the frog or to the perch, and why?

A. To the frog: the lungfish shares a more recent common ancestor with the frog than with the perch

B. To the perch, because the lungfish and the perch are both fish that spend their whole lives in water

C. To the perch, because neither the lungfish nor the perch has four legs, while the frog does have them

D. Equally to both, because the lungfish, the frog and the perch all have both jaws and a backbone

13. One drawing of this tree lists its tips from left to right as: lancelet, lamprey, perch, mouse, lizard, frog, lungfish. In that drawing the mouse sits next to the perch. What does this tell you about how closely the mouse and the perch are related?

A. The mouse and the perch share the most recent common ancestor of any two of the animals shown in the drawing.

B. The drawing must be wrong, since the tips of a tree can be listed in only one correct order from left to right.

C. Nothing: tips can be rotated at branch points, and the mouse's closest relative is still the lizard.

D. The mouse is more closely related to the perch than to the lizard, since the two of them sit side by side.

14. Using both tables, which traits did the common ancestor at branch point 5 most likely have?

A. A backbone, jaws, lungs, four legs and hair

B. A backbone, jaws, lungs, four legs and an amnion

C. A backbone and jaws, but no lungs or legs

D. A backbone, jaws, lungs and four legs