THE VIRTUAL EVOLUTION STICKLEBACK LAB

As you complete each part of the virtual lab, answer the questions below in the space provided.

QUESTIONS

INTRODUCTION
1. Define “model organism.”
2. How do spines protect ocean stickleback fish?
3. How did ancestral populations of ocean-dwelling fish come to live in freshwater lakes?
4. Watch the video about pelvic reduction in freshwater stickleback. The loss of stickleback pelvic spines is similar to the loss of which body parts in some other four-legged vertebrates?
5. From a researcher’s perspective, what is the benefit of having access to hundreds of postglacial lakes?
6. Watch the video with evolutionary biologist Dr. Michael Bell. Why is the threespine stickleback a model organism for studies in evolution? (List at least two reasons.)
7. Watch the video with Dr. David Kingsley explaining hind-limb reduction. Name two other vertebrate animals whose evolutionary histories included the loss of hind limbs.

OVERVIEW
1. Click on the interactive stickleback fish. Describe where its spines are located.
2. What is the difference between marine, sea-run, and freshwater stickleback fish populations? Be specific.
3. Watch the video about the stickleback fish armor.
   a. In addition to the spines, what is another component of the “armor” of a stickleback fish?
   b. Explain how the stickleback armor protects the fish from some predators.
TUTORIAL 1
1. Describe the following structures:
   a. Complete pelvis:
   b. Reduced pelvis:
   c. Absent pelvis:

2. **Start Tutorial 1.** Continue to practice scoring fish until you have mastered the technique; then proceed to Experiment 1.

EXPERIMENT 1
1. Explain in your own words the overall objective of Experiment 1.

2. **Click on the link to the map of Alaska, then click on the blue pin “A” on the larger map.** What lake is located between Bear Paw Lake and Frog Lake just to the north?

3. In a population, what happens to organisms that are better adapted to the environment in which they live?

4. **In the virtual lab window, complete Part 1: Staining the Fish.**
   a. Why do you think it is important to empty the used stain, destaining solution, and water under a fume hood?
   b. How were the fish you will be using in this virtual lab caught?

5. **In the virtual lab window, proceed to Part 2: Scoring the Fish.**
6. **Before scoring the fish, watch the short video on Bear Paw and Frog Lakes.**
   According to Dr. Bell, what is an important difference between Bear Paw Lake and Frog Lake?

7. **In the window on the right, click on the link to read more about random sampling.** Why are random samples, rather than entire populations, used in most research studies?

8. What is one advantage of studying larger-sized samples?

9. Give an example of sampling bias.
10. **Complete Part 2 of the lab in the window on the left.**
11. Why is it important that the labels included in specimen jars be made of special paper that does not disintegrate in alcohol over time?

12. Examine the pelvic score data you just collected. Does the pelvic phenotype differ between Bear Paw Lake and Frog Lake fish? Explain.

13. **Complete the graphing exercise as instructed by your teacher. After graphing, verify your data.** How do your data compare to those obtained by Dr. Bell and colleagues?

14. **Complete the Experiment 1 Quiz. Take time to read the explanation for each correct choice provided after each question.**
15. Explain why the stickleback fish in Frog Lake are more similar to ocean and sea-run stickleback than they are to the stickleback fish in Bear Paw Lake.

16. In addition to predators, what other environmental factors might be responsible for the differences between Bear Paw Lake and Frog Lake stickleback populations? How would you test your prediction?

17. **After completing the quiz, click on Experiment 1 Analysis.**
18. For this analysis, what is your null hypothesis?