Name _____ Date _____

Limiting Factors and Carrying Capacity: A Duckweed Investigation

Directions: Read the passage and study the table. Then answer each question.

How Much Duckweed Fits?

A single duckweed plant is smaller than a grain of rice, yet a few of them can cover a pond in weeks. Each plant is made of one or a few tiny, leaf-like parts called fronds that float on still water. New fronds bud off the old ones, so the number of fronds can grow quickly. Duckweed floats on the surface, and each frond needs open water and light to grow.

No population can keep growing forever. Anything in the environment that keeps a population from growing larger is a limiting factor. Food, water, space, light and nutrients can all be limiting factors. The largest population that a place can keep supporting over time is called its carrying capacity. As a population gets close to its carrying capacity, its growth slows down.

A class tested how the size of the water surface affects a duckweed population. They set up 3 narrow containers, each with a water surface of 50 square centimeters, and 3 wide containers, each with a water surface of 100 square centimeters. Every container held 300 mL of the same pond water mixed with the same amount of plant food. All 6 containers started with 20 fronds and sat under the same lamp in the same room. Every 4 days for 28 days, the class counted the fronds in each container.

Mean number of duckweed fronds in each kind of container (3 containers of each kind)

Day	Narrow containers, 50 square centimeters (mean fronds)	Wide containers, 100 square centimeters (mean fronds)
0	20	20
4	42	44
8	90	94
12	180	196
16	300	380
20	380	620
24	410	780
28	420	830

1. As the passage uses the term, what is a limiting factor?

A. The number of days it takes a population to double
B. The largest population a place can keep supporting over time
C. Anything in the environment that keeps a population from growing larger
D. The number of fronds a container starts with

2. Which factor was the independent variable in this investigation, the one the class set differently on purpose?

A. The number of fronds counted on day 28
B. The amount of pond water in each container
C. The size of each container's water surface
D. The lamp the containers sat under

3. Why did every container hold 300 mL of the same pond water with the same amount of plant food?

A. So the fronds would bud off more slowly
B. So every container would end up with the same number of fronds
C. So the water and nutrients would match, letting the class compare the two surface sizes
D. So the duckweed could grow without needing light

4. By how many fronds did the mean in the wide containers grow from day 16 to day 20?

_____ fronds

5. Which evidence from the table shows that, early in the investigation, the size of the water surface was not yet limiting growth?

A. From day 24 to day 28, the narrow containers grew by 10 fronds.
B. Every container started with 20 fronds.
C. Through day 8, both kinds of containers had nearly the same mean, 90 and 94 fronds.
D. On day 28, the wide containers had a mean of 830 fronds.

6. Based on the table, which number is closest to the carrying capacity of the narrow containers?

A. About 830 fronds B. About 180 fronds C. About 420 fronds D. About 20 fronds

7. Which choice uses the passage to give the most likely reason the narrow containers leveled off at fewer fronds than the wide containers?

A. Duckweed in narrow containers made new fronds more slowly from the very start.
B. Snails in the narrow containers ate the new fronds.
C. The narrow containers had less water, so they ran out of water first.
D. Their smaller water surface filled up, leaving little open water and light for new fronds.

8. Which claim do the frond counts support?

A. In this investigation, the narrow containers ran out of plant food before they ran out of space.
B. Every pond can hold exactly 420 duckweed fronds.
C. In this investigation, the wide containers held about twice as many fronds as the narrow containers by day 28.
D. Duckweed populations keep doubling every 4 days no matter how much space they have.

9. If the class kept counting the narrow containers until day 40, what would their mean most likely be?

A. Back down to 20 fronds
B. About 1,700 fronds, after doubling a few more times
C. About 830 fronds, like the wide containers
D. Close to 420 fronds