

Resources in Living Systems: Mastery Check

Learning target: I can tell resources from conditions, use data to show how a resource's availability affects individual organisms and populations, calculate a carrying capacity, and explain competition, biomes and the levels of organization.

Retrieval and mastery check

About 35 min

Individual

MS-LS2-1 · assesses

MS-LS2-2 · practice

independent practice

writing

data analysis

Name _____

Date _____

Period _____

Directions

Answer every item on your own. For multiple-choice items, circle one letter. For numeric items, show the calculation and give units. For the drawing, label every level. Items 4-6 use the seabird dataset. Finish with the synthesis paragraph in Part B. There are 12 items worth 30 points.

You will need: This worksheet, Pencil, Calculator (optional)

Part A: Retrieval (items 1-11)

1. Which of these is a **condition** rather than a resource for an oak seedling? 2 pts
 - ☐ A. Water in the soil around its roots
 - ☐ B. Sunlight reaching its leaves
 - ☐ C. The air temperature on a spring night
 - ☐ D. Nitrogen compounds in the soil
2. A tomato bed gets plenty of water and full sun, but its soil is low in nitrogen, and the plants are small and pale. What will most likely happen if the gardener doubles the water? 2 pts
 - ☐ A. The plants will grow much larger, because water is a resource.
 - ☐ B. Little will change, because nitrogen, not water, is the limiting resource.
 - ☐ C. The plants will grow larger, because extra water adds nitrogen to the soil.
 - ☐ D. The plants will die, because water is a condition, not a resource.
3. Suppose a fenced pasture grows 48,000 kg of forage a year that goats can eat without damaging the pasture, and each goat eats about 600 kg a year. (a) How many goats can the pasture support? (b) A drought cuts the forage by one quarter. What is the new carrying capacity? Show both calculations. 3 pts

A seabird colony and its food supply, six years (teaching dataset)

Simulated teaching dataset: the numbers are invented to be realistic, not measured.

Year	Small-fish index	Chicks raised per 100 nests	Average chick mass at 20 days (g)
1	80	72	610
2	95	78	640
3	30	25	430
4	60	60	560
5	20	15	400
6	90	75	630

Simulated data for teaching. The fish index is the average number of small fish (such as anchovies) caught per standard survey net near the colony. Chick mass is the average mass of chicks at 20 days old.

4. Which two years had the scarcest food? Describe what happened in those years to (a) individual chicks and (b) the number of chicks raised. Use numbers from the table for both. 3 pts

5. Calculate the percent change in chicks raised per 100 nests from Year 2 to Year 3. Show the formula and round to the nearest whole percent. 2 pts

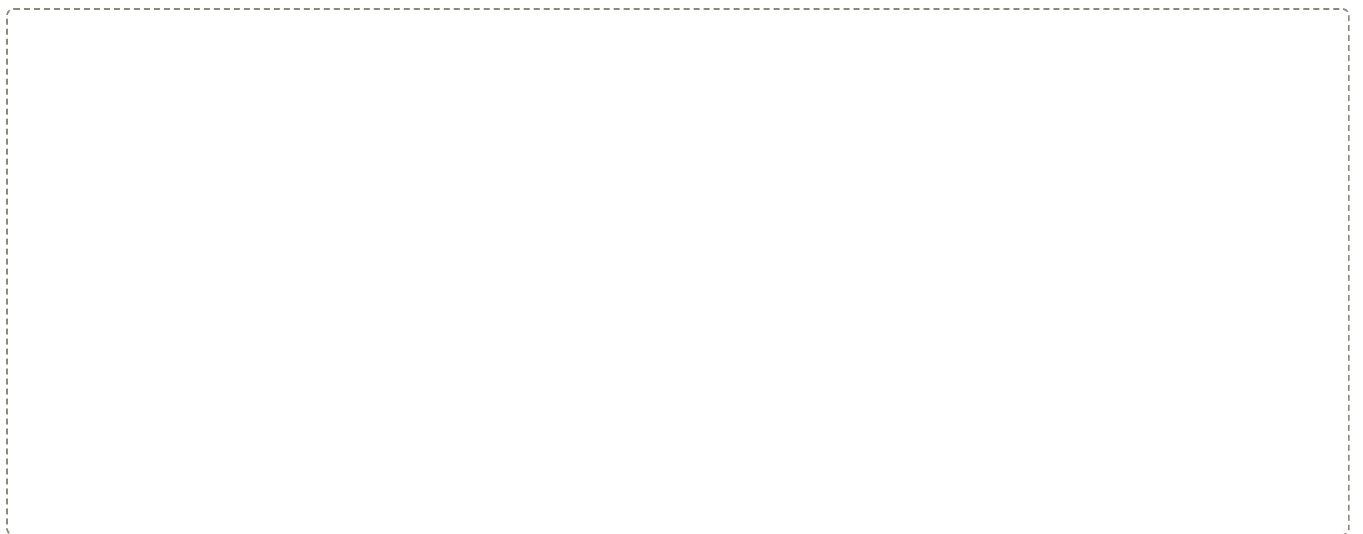
6. A scientist claims that the fish supply **caused** the poor chick numbers in Years 3 and 5. Which additional evidence would best support that cause-and-effect claim? 2 pts

- ☐ A. In Years 3 and 5, parents brought fewer fish to the nest per hour, and in a test, chicks given extra fish in those years grew to normal mass.
- ☐ B. Years 3 and 5 were also the years with the most boats near the island.
- ☐ C. Chick mass and chicks raised per 100 nests rose and fell together in all six years.
- ☐ D. The colony had more nests in Year 6 than in Year 1.

7. True or false: 'If a population has no predators and no disease, it will keep growing for as long as the area exists.' Circle your answer and explain, using the term **carrying capacity**. 3 pts
- ☐ True ☐ False Explain your thinking:

8. Suppose two kinds of desert rodents live in the same valley and both eat seeds. One kind eats mostly large seeds and the other mostly small seeds. (a) Explain why these two species compete less than two species that eat exactly the same seeds. (b) Predict what happens to both populations in a drought year when the plants make very few seeds of any size, and explain why. 3 pts

9. Draw five nested shapes, one inside the next, to show the levels of organization from an organism to the biosphere. Label each level. For the first four levels, add one example from a city park. 3 pts



10. A region at middle latitudes, far from the ocean, has hot summers, cold winters and about 400 mm of rain a year, falling mostly in spring and early summer. Which biome is it most likely to hold? 2 pts
- ☐ A. Tropical rainforest
- ☐ B. Temperate grassland, such as a prairie or steppe
- ☐ C. Boreal forest
- ☐ D. Coral reef

11. In a clear lake, rooted water plants grow from the shore out to a depth of several meters and then stop, even though the mud in the deeper water holds plenty of nutrients. Name the resource that most likely limits how deep they grow, explain why it runs short with depth, and predict what would happen to the plants' depth limit if the lake became muddy. 2 pts

Part B: Synthesis (item 12)

12. Write one paragraph (6-8 sentences) explaining how the availability of a resource affects (1) individual organisms and (2) populations. Use the poison dart frogs from the start of the chapter for (1), and for (2) use one population from this chapter (the St. Matthew reindeer, the duckweed tubs, the Daphnia jars, the Sage Flats pronghorn, the Hollis Pond bluegill, or the seabirds on this quiz). Use the terms **resource**, **limiting resource**, **competition** and **carrying capacity**, and cite at least one number as evidence. If you kept your first frog explanation from Worksheet 1, say one thing you now explain differently. 3 pts

A support card (only if your teacher allows it)

Resource or condition? Ask: if one organism uses it, is there less for the next? Yes means resource; no means condition. Carrying capacity from a resource: $\text{usable resource} \div \text{amount one individual needs}$, rounded down. Percent change: $(\text{new} - \text{old}) \div \text{old} \times 100$; a negative answer is a decrease. Levels of organization, smallest to largest: organism, population, community, ecosystem, biosphere. A cause-and-effect claim needs the pattern, a mechanism, and a check that nothing else explains it.

Write the thirteenth item

Write one new multiple-choice item for this quiz that tests the difference between a limiting resource and a carrying capacity, using an organism not mentioned in the chapter. Give four options, mark the correct answer, and for each wrong option write one sentence explaining what mistaken idea would make a student choose it. Then explain how your item could be changed into a short-answer item that shows even more of a student's thinking.