Signs of Life

Use evidence to sort living and nonliving samples.

BIO.1A.1 "Develop criteria to differentiate between living and non-living things."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline three criteria for life, then circle one observation for each sample that helps you apply a criterion rather than judge by appearance.

Four Samples at the Shore

1. At a shoreline research station, four unlabeled samples raise a question: what counts as living? Movement, size increase, and energy use can be misleading because nonliving systems may show them too. Biologists look for a combination of evidence. Living things consist of one or more cells, use energy through cellular processes, and regulate internal conditions. Living populations also produce offspring that inherit information and can change across generations. An individual does not need to display every activity at the moment it is observed. A strong decision rule should rely on cellular structure and several functions, rather than one dramatic change.

2. Sample A sits in a shallow dish of salty water. Over several days, it becomes larger as particles from the water attach to its smooth, repeating surfaces. Under a microscope, it has no cell boundaries or internal compartments. Sample B looks like a dry, motionless speck. A thin slice reveals many cells, and its cells contain inherited instructions. After water reaches it, enzymes break down stored food, and a root begins to extend. Before water was added, a brief classroom observation might have shown no visible change at all.

3. Sample C flickers in a controlled chamber. It consumes fuel and oxygen, releases heat, and spreads when more fuel is available. Careful inspection finds no cells, and it stops when its fuel runs out. Sample D moves through a drop of pond water. A microscope shows a cell membrane surrounding its contents. It takes in dissolved nutrients, adjusts the amount of water inside its cell, and sometimes divides into two cells. Both samples can spread into nearby space, but the processes behind that spread differ. Which observations would make a useful test, even when appearance alone gives the wrong impression?

2 ANSWER WITH EVIDENCE

Use the passage

1. Classify samples A and B as living or nonliving. Support each choice with one observation from the passage.

2. Why would a rule that requires visible growth during a brief observation misclassify sample B? Give a better criterion from the passage.

3. Samples C and D both spread into nearby space. Which is living, and what evidence distinguishes it from the other?

4. Write a two-step decision rule that sorts all four samples correctly. Use cell structure and at least one life process from the passage.

3 YOUR TURN

Your own words

Invent an unfamiliar object or organism that could fool someone who uses only one sign of life. In four or five sentences, describe at least two observations and use at least two criteria to defend whether it is living, including why the misleading sign is not enough.

Signs of Life

PART 1 · READ AND MARK

Underline three criteria for life, then circle one observation for each sample that helps you apply a criterion rather than judge by appearance. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Classify samples A and B as living or nonliving. Support each choice with one observation from the passage.	**A is nonliving because it has no cells. B is living because it has cells that break down stored food.**
2	Why would a rule that requires visible growth during a brief observation misclassify sample B? Give a better criterion from the passage.	**B might show no visible change before water is added. Checking for cells and cellular processes is a better test.**
3	Samples C and D both spread into nearby space. Which is living, and what evidence distinguishes it from the other?	**D is living. It has a cell and regulates the water inside it, while C has no cells.**
4	Write a two-step decision rule that sorts all four samples correctly. Use cell structure and at least one life process from the passage.	**First, check for cells; samples without cells are nonliving. Then check whether samples with cells carry out cellular processes, such as breaking down food or regulating internal water. A and C are nonliving; B and D are living.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

A small rover turns toward sunlight and uses a solar panel to power its wheels. Its movement might make someone think it is alive, but movement alone is not enough evidence. A close look shows circuits and metal parts rather than cells, and the rover does not regulate conditions inside cells. I would classify it as nonliving because it lacks cellular structure and cellular life processes.

Accept equivalent criteria supported by passage evidence. A brief lack of visible growth does not rule out life, and spreading alone does not establish it.