

1.1: Assessing Decomposers Unit Pretest

This pretest is designed to help students to express a wide range of ideas, even if they are incorrect. Ideally, students will come to recognize that they have many different ideas about animal growth, as well as unanswered questions.

*Level 4 responses are in **bold blue italics** below. Remember Level 4 is the eventual learning goal; we do not expect most, possibly any, students to produce these responses at this point in the unit. We also have suggestions based on our research about likely Level 2 and Level 3 responses. This worksheet has “assessing” in the title because we do NOT recommend giving your students a grade based on the scientific accuracy of their responses at this point in the unit. It is designed to be used as a tool for formative assessment.*

1. A loaf of bread was left alone for 2 weeks. Three different kinds of mold grew on it. Assuming the bread did not dry out, which of the following is a reasonable prediction of the mass of the bread and mold after the 2-week period?

a) The mass is going to:

- a. *increase*, because the mold has grown.
- b. *remain the same* because the mold converts bread into biomass.
- c. *decrease* as the growing mold converts bread into energy.
- d. *decrease as the mold converts bread into biomass and gases.***

b) Explain your reasoning. Why does the mass of the bread and mold change in the way you selected above?

Level 4 responses recognize that there are multiple processes occurring as the mold grows on bread, and that only some of the mass of the bread will be incorporated into the mold biomass. The rest will be lost to the air in the form of gaseous waste (CO₂ and water vapor) as a result of cellular respiration. Most students will probably not answer d, or give the Level 4 explanation. Level 3 responses may choose b or c. They are attempting to conserve matter but may not know that some of the matter is lost to the air due to cellular respiration. They may, however, explain that some of the matter from food was converted to energy, and this would account for mass lost from the system. Level 2 responses may choose a or b. They may believe that the mold uses the bread to grow without actually absorbing the materials the bread is made of, which would account for an increase in mass.

2. In autumn, people pile fallen leaves and put them in a compost pile. After several weeks, the pile becomes warm. Where does the heat come from?



Level 4 responses explain that heat is released during the process of cellular respiration or identify chemical energy or bond energy in leaves as the source of heat. Level 3 recognize may recognize that decomposition produces heat, but not know the mechanism behind the heat production. They may also describe the leaves as doing cellular respiration, or simply say the heat comes from energy in the leaves. Level 2 responses may suggest the heat comes from the sun warming the leaves or by some process other than cellular respiration (e.g., compaction).

3. A class is investigating the process of decomposition. A teacher describes a scenario where there is a moldy tomato sitting in a pot of dirt. The teacher asks, “What do you think the mass of the moldy tomato and the pot of dirt will be after two weeks?”

a) Three students shared their ideas about what happened. Choose whether you agree, disagree, or are not sure about each claim:

Agree	Disagree	Not sure	Sanjay claims: “I think the whole pot of (both dirt and moldy tomato) will lose mass because the mold takes in molecules from the tomato and converts them into CO ₂ released into the air.”
Agree	Disagree	Not sure	Keller claims: “I think the whole pot will get heavier because the mold gets bigger as it grows on the tomato and nothing leaves the pot.”
Agree	Disagree	Not sure	Latisha claims: “I think the whole pot will have the same mass because the molecules in the tomato will be converted into dirt that stays in the pot.”

b) Provide an explanation. Why did you agree or disagree with each student’s claim? What are you not sure about?

Level 4 responses disagree with Keller because his claim violates the principle of matter conservation; agree/not sure with Sanjay that air/gases can make the whole pot lose mass; agree/disagree/not sure with Latisha because the growing mold will change the mass of the whole system. Level 3 responses may make mistakes when reasoning through each claim, such as saying matter can be added with growth (agrees with Keller) AND/OR that respiration doesn’t account for the pot’s decreased mass (disagrees with Sanjay). Level 2 responses only reason about 1 or 2 of the claims. Level 1 responses reason about the claims in a non-matter tracing way, talking in general terms about the process of decay.

c) The class does an experiment. They weighed out 300 grams of dirt into 5 pots. They then weighed 5 tomatoes just beginning to mold and set one on top of the dirt in each pot. They put the pots in a warm, moist room and left them alone for two weeks. At the end of that time, they reweighed the tomatoes and the dirt. Below are their results.

Sample	Change in mass of moldy tomato (g)	Change in mass of dirt (g)
1	-3.0	+0.2
2	-3.2	+0.1
3	-2.9	-0.1
4	-3.4	+0.3
5	-3.1	-0.1
Average	-3.2	+0.1

What patterns do you see in the data?

Which claim do you think is best supported by the data? (Circle one choice.)

- a. *Sanjay's claim*
- b. Keller's claim
- c. Latisha's claim

Explain how the patterns in the data support the claim that you chose.

Level 4 responses recognizes there is an unaccounted for matter pool between the change in mass of dirt and mass of moldy tomato; uses this mass discrepancy to explain why Sanjay's claim is correct. Level 3 responses recognizes missing pools but agrees with Keller's claim that violates principles (matter creation) or agrees with Latisha's claim which is inconsistent with the data. Level 2 responses choose Latisha's because the mass of the dirt increases (positive numbers) while the mass of the tomato decreases (negative numbers). Level 1 responses explain that the more mold, the more mass and/or recognizes relationships among some matter pools but doesn't relate them to the claims

d. What additional evidence would you collect to help show that the claim you chose is the best claim?

Level 3 responses propose questions that target limitations in the data (recognize there is an unaccounted for matter pool, i.e., gas); they focus on matter tracing and are constrained by principles such as matter cannot be created or destroyed. Level 2 responses propose evidence that partially address limitations in the data. Level 1 responses identify aspects of the system that students are curious about independent of the data, they critique the experimental design, or do not recognize that additional evidence needs to be collected.

4. A mushroom is a part of a fungus that needs energy to live and grow. Where does the mushroom get its energy?

Select True or False for the following statements.

Some of the energy in the mushroom:

T **F** comes from the air.

T **F** comes from sunlight.

T **F** comes from water.

T F comes from soil organic matter.

T **F** is created by the mushroom.

Which ONE of the following do you think provides the MOST energy to the mushroom?

a. Energy stored in the air

b. Energy from sunlight

c. Energy stored in water

d. Energy stored in soil organic matter

e. Energy that the mushroom created

Explain your choices. How does energy get into the mushroom?

Level 4 responses recognize that mushrooms are heterotrophic organisms and get their energy from organic molecules involved in cellular respiration. Level 3 responses may suggest mushrooms conduct photosynthesis and therefore get their energy from sunlight. Level 2 responses may suggest a mushroom gets its energy from multiple sources, like air, sunlight, water, or soil minerals.

Name _____ Teacher _____ Date _____

5. A potato is left outside and gradually decays. One of the main materials in the potato is the starch, which is made of many sugar molecules ($C_6H_{12}O_6$) bonded together. What happens to the atoms in starch molecules as the potato decays? Choose True or False for each option.

True	False	Some of the atoms are changed into soil nutrients: nitrogen and phosphorus.
True	False	Some of the atoms are used up by decomposers and no longer exist.
True	False	Some of the atoms go into the air in carbon dioxide.
True	False	Some of the atoms are turned into energy by decomposers.
True	False	Some of the atoms go into the air in water.

Explain the pattern in your answers. What happens to the atoms in the starch when the potato decays?

Level 4 responses trace atoms/carbon from the starch into either decomposers or CO_2 /a gas, or they recognize that the starch is used in cellular respiration. They also answer all of the forced-choice responses correctly. Level 3 responses may suggest that atoms were converted into energy or heat, or they may state the laws of conservation of matter or energy without specifically tracing the atoms. Level 2 responses may suggest that atoms are “used up” or “disappear” when the potato decays, or that they leave the potato and enter the soil.