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6.4: Grading Decomposers Unit Posttest

This posttest is the same as the Decomposers Unit Pretest (Activity 1.1). The file "1.1_Assessing_Decomposers_Unit_Pretest" explains how the unit pretest can be used for formative assessment, providing insight into students' reasoning using the Learning Progression Framework. This file explains how the posttest can be used for grading, holding students accountable for the ideas that they have studied in the Decomposers Unit.

*Correct responses are in **bold blue italics** below. Red italics suggest ways to grade student responses by giving them points for correct or partially correct answers.*

These are difficult questions, so even the most sophisticated reasoners will miss a few of them. You should decide how to translate the number of points that students earn into grades for report cards. Here are some ideas about levels of points that represent excellent, good, and adequate performance.

Total possible: 29 points	***For higher demand high school courses***	***For middle school or lower demand high school courses***
Excellent	*23 points (~80%)*	*20 points (~70%)*
Good	*20 points (~70%)*	*17 points (~60%)*
Acceptable	*17 points (~60%)*	*15 points (~50%)*

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.*

1 point for correct answer

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 (CO_2 and water vapor) as a result of cellular respiration. Most students will probably not answer d, or give the Level 4 explanation.

1 point for identifying that the bread and mold will decrease in mass because of mass lost to air through cellular respiration.

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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.

1 point for identifying either cellular respiration or chemical energy as the source of heat.

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."

1 point for correctly answering each line. 3 points total. Note that based on the information given, either agreeing, disagreeing or indicating not sure with Latisha and agreeing or indicating not sure with Sanjay is reasonable (see explanation below).

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.**

1 point for recognizing each of the three things that can happen to the decomposers' food source (remain undigested, used for cellular respiration, used for biosynthesis)
1 point for providing a correct explanation for agreement or disagreement with each of the 3 claims
6 points total

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?

1 point for identifying that there was an overall decrease in mass in the system

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

1 point for correct answer

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.

1 point for choosing Sanjay's claim due to mass differences.

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.

1 point for identifying additional evidence that could 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*.

1 point for correctly answering each line. 5 points total.

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

1 point for correct answer.

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.
1 point for identifying high energy bonds in organic molecules as the source of energy.

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 (C6H12O6) 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.

1 point for correctly answering each line. 5 points total.

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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.

1 point for correctly tracing the atoms from the starch.