

6.2: Grading Bracket Fungi Worksheet

*This worksheet has “grading” in the title because at this point, students can be held accountable for correct answers. Level 4 (correct) responses to the questions are in **blue bold italics** below.*

Red italics suggest ways to grade student responses by giving them points for correct or partially correct answers. There are 19 points total on this worksheet.

A. Draw and label arrows that represent the molecules that carbon atoms are in as they move into, through and out of the bracket fungus as it grows.

Label each arrow to show the kind of molecules that the carbon atoms are in: large organic molecules (LOM), small organic molecules (SOM), or carbon dioxide (CO₂).



Arrows should show:

- *SOM moving from wood into hyphae*
- *SOM moving through hyphae (and into bracket)*
- *(Optional: LOM in wood and in hyphae)*
- *CO₂ leaving hyphae*

1 point for each correct answer (3 points total)

1. What happens to the wood of the tree as the bracket fungus lives and grows?

Bracket Fungi break down the large organic molecules of the wood of the tree into small organic molecules. They use the cellulose from the tree in two ways: for biomass (for growth) and cellular respiration (for energy).

1 point for explaining digestion (large organic molecules broken into small organic molecules)

2. How do a bracket fungus's cells get oxygen from the air as it grows? What do they do with the oxygen?

Bracket Fungi get oxygen from the air and the small organic molecules from the tree. Bracket Fungal cells use the oxygen as one of the reactants as they perform cellular respiration. (Some of those oxygen atoms end up in water molecules that stay in the

Bracket Fungi, so a tiny percentage of oxygen atoms in the Bracket Fungi do come from air.)

1 point each for getting oxygen from air and using oxygen for cellular respiration (2 points total)

B. Investigating how bracket fungi grow and function

A class is investigating the process of bracket fungi in decomposition. A teacher describes a scenario where there is a branch with bracket fungus sitting in a pot of dirt. The teacher asks, "What do you think the mass of the branch with bracket fungus and the pot of dirt will be after two months?"

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

<i>Agree</i>	Disagree	Not sure	Jackson claims: "I think the whole pot of (both dirt and apple tree sapling with bracket fungi) will lose mass because the Bracket Fungi takes in molecules from the branch and converts them into CO ₂ released into the air."
Agree	<i>Disagree</i>	Not sure	Kim claims: "I think the whole pot will get heavier because the bracket fungi get bigger as it grows on the branch and nothing leaves the pot."
Agree	<i>Disagree</i>	Not sure	Josephina claims: "I think the whole pot will have the same mass because the molecules in the branch will be converted into dirt that stays in the pot."

1 point for correctly answering each line. (3 points total.)

4. Provide an explanation. Why did you agree or disagree with each student's claim?

What are you not sure about?

Level 4 explanations will consider the two things that can happen to the branch as a food source for the Bracket Fungi (small organic molecules from digested food used either for cellular respiration and energy or biosynthesis and growth) and use this knowledge to evaluate the students' claims:

- Jackson's claim correctly recognizes CO₂ as a product of cellular respiration, so mass should be leaving the pot.*
- Kim's claim is incorrect because it violates the principle of conservation of matter: The pot cannot gain mass unless new materials enter the pot.*
- Josephina's claim correctly recognizes that matter is conserved but does not consider the possibility that gases are leaving the system.*

1 point for providing a correct explanation for agreement or disagreement with each of the 3 claims (3 points total)

The class does an experiment. They weighed out 300 grams of dirt into 5 pots. They then weighed 5 branches just beginning to grow bracket fungi 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 months. At the end of that time, they reweighed the branches and the dirt. Below are their results.

Sample	Change in mass of branch with bracket fungi (g)	Change in mass of dirt (g)
1	-18.0	+1.2
2	-8.2	+1.1
3	-12.9	-1.1

4	-23.4	+1.3
5	-3.1	-1.1
Average	-13.2	+1.1

5. What patterns do you see in the data?

Level 4 responses will focus on mass differences: On average, the apple tree saplings lost more mass than the dirt gained, so some of the matter in the apple tree saplings must have gone somewhere else.

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

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

Jackson's claim

Kim's claim

Josephina's claim

1 point for correct answer

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

Level 4 responses will recognize that the data support only Jackson's claim.

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

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

Responses at all levels may include generic suggestions about gathering more or more precise data: measure more pots, measure the masses more accurately, measure the masses every day, etc. While these are legitimate ways of collecting additional data, they need to be accompanied by suggestions that identify specific problems with this investigation.

Level 4 responses may focus on the biggest single problem with this investigation: The failure of the procedure to account for water. What part of the "missing mass" might be water that evaporated? Other possibilities:

- They may also mention other variables not accounted for, such as oxygen from the atmosphere or measuring CO₂ as a product.*
- They may suggest other conditions, such as measuring what happens to apple tree saplings decaying without soil*

1 point for identifying additional evidence that could be collected.

C. A question about how bracket fungi grow and function

A dead branch from an oak tree was left alone for 4 weeks. Bracket fungi started to grow on it. Assuming the branch did not dry out, which of the following is a reasonable prediction of the mass of the dead branch and bracket fungus after the 4-week period?

9. The total mass (of the branch and fungus combined) is going to:

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

1 point for correct choice

10. Explain your reasoning. Why does the mass of the oak tree and bracket fungus change in the way you selected above?

Level 4 responses recognize the connection between this question and the Matter Change Question: there are multiple processes occurring as the fungus grows on the

oak tree, and that only some of the mass of the oak tree will be incorporated into the bracket fungus' 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.

1 point for identifying that the oak tree and bracket fungi will decrease in mass because of mass lost to air through cellular respiration.

D. Something interesting about bracket fungi

11. What is something interesting that you learned about bracket fungi from your reading and discussion?

1 point for correct fact from the reading or discussion.