4.4 Grading the Explanations Tool: How does a potato plant make the food it needs to grow and function?

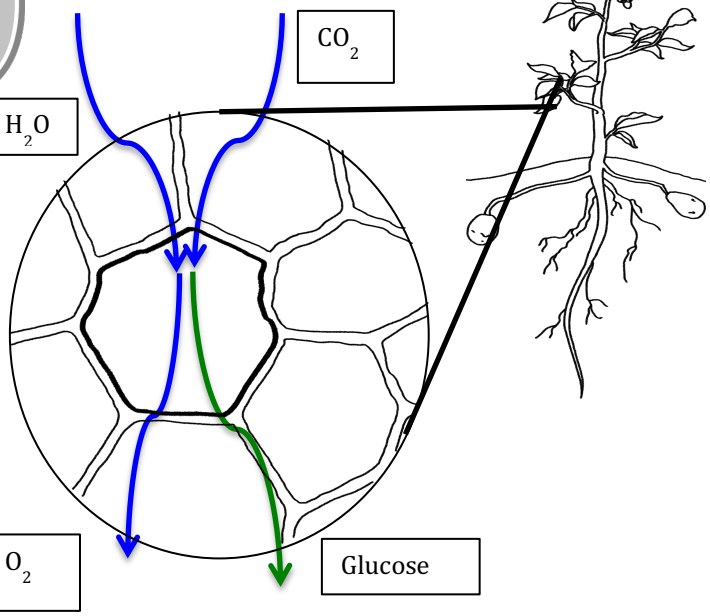
*This worksheet has "grading" in the title because at this point, students can be held accountable for correct answers. Level 4 (correct) responses to the questions are in **blue bold italics** below.*

Red italics suggest ways to grade student responses by giving them points for correct or partially correct answers. There are 16 points total on this worksheet.

Carbon TIME Discourse Routine around the Explanations Tool:

1. *Introduction: Students review their Evidence-Based Arguments Tools. Establish the purpose for completing the tool as developing a complete explanation for the unit phenomenon.*
2. *Private thinking and writing: Students complete the Explanations Tool individually.*
3. *Partner or small group work: Students share and compare ideas in pairs/small groups, with the goal of improving their explanations.*
4. *Sharing ideas in whole-class discussion: Class discussions serve to elicit, clarify, and compare explanations from individual students and/or student groups*
5. *Consensus-seeking discussion accompanied by public writing: Class discussions focus on coming to consensus around a correct, coherent explanation that answers the Three Questions while addressing the 4 steps. We recommend that students revise their explanations in a different colored pen/pencil.*

The Matter Movement Question



Draw and label arrows that show molecules moving into, through and out of a **cell** in a potato plant

- Show molecules with carbon atoms moving into and out of the cell in the plant's leaf that makes the food
- Show other relevant molecules

Grading arrows

- *1 point for arrow labeled "carbon dioxide" or "CO_2" going into leaf cell*
- *1 point for arrow labeled "water" or "H_2O" going into leaf cell*
- *1 point for arrow labeled "glucose," "sugar," or "$C_6H_{12}O_6$" going out of the leaf cell*
- *1 point for arrow labeled "oxygen" or "O_2" going out of the leaf cell*

4 points total

The Matter Change Question

Name the chemical change that allows cells to make food: ***Photosynthesis*** *1 point*

Write the chemical equation for this change: ***6 CO_2 + 6 H_2O → $C_6H_{12}O_6$ + 6 O_2*** *1 point*

Carbon TIME

Name: _____ Class: _____ Date: _____

What molecules are carbon atoms in before the chemical change?
Carbon Dioxide
1 point for correct answer

What other molecules are needed?
Water
1 point for correct answer

Chemical Change

What molecules are carbon atoms in after the chemical change?
Glucose
1 point for correct answer

What other molecules are produced?
Oxygen
1 point for correct answer

The Energy Change Question

What forms of energy go into this chemical change?
Light energy.
1 point for correct answer

Energy Transformation

What forms of energy come out of this chemical change?
Chemical energy
1 point for correct answer

Explain in words: How does a potato plant get food to a cell in its roots? (Answer on back).
Use this Explanation Tool to help guide your written explanation, be sure to answer the Three Questions.

Remember: **Atoms last forever** (so you can arrange atoms into new molecules, but can't add or subtract atoms).
Energy lasts forever (so you can change forms of energy, but energy units can't appear or go away).

Level 4 responses should include answers to each of the four numbered steps on the Three Questions poster and handout:

1. ***Matter movement: Carbon dioxide and water enter into the potato's leaf cells.***
2. ***Matter change: Carbon dioxide and water are changed into glucose and oxygen during photosynthesis in the leaf cells.***
3. ***Energy change: Light energy is transformed into chemical energy when glucose is produced during photosynthesis in the leaf cells.***
4. ***Matter movement: Glucose and oxygen leave the cell. The glucose is transported to other cells in the plant, including root cells.***

1 point for each correct part of the answer
4 points total