

The Life of a Plant in a Jar: Part 3 Respiration



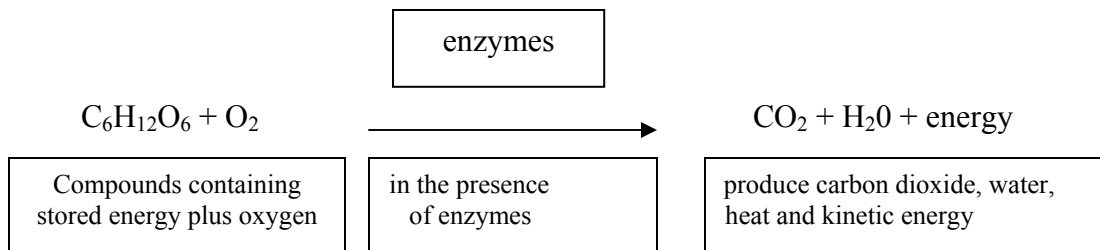
So how is our plant-in-a-jar doing? Here's a picture taken 16 days after it was placed in the jar. As you can see, it is still very much alive.

In the past two emails we've looked at this system. We found that it can exist partly because microorganisms in the potting soil carry on respiration, providing carbon dioxide the plant needs for photosynthesis.

Respiration is a life process of plants as well. We're not talking breathing here. (*See the Dec. 4, 2002 email concerning respiration and breathing.*) We're talking about the process that changes chemical energy into other forms of energy that is used by the organism to carry out life processes. Where does that energy come from, and why is it needed?

The plant combines some of the *high-energy compounds* (created during photosynthesis) with *oxygen*, creating *carbon dioxide*, *water* and *energy*. Respiration provides the energy for another life process, *synthesis*, which allows the plant to grow.

Respiration can be represented in a diagram:



Respiration and photosynthesis are cyclical life functions. A plant can't photosynthesize without the CO_2 released from its own respiration and that of the microorganisms. On the other hand, the microorganisms and the plant can't respire without the oxygen from the plant's photosynthesis. We can't have one life function without the other. We also can't have plants without other respiring organisms...



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If the plant is going to maintain an oxygen-rich atmosphere, there's got to be more CO₂ available for photosynthesis than the plant produces by its own respiration. It's like balancing a checkbook. If you're going to have a *lot* of money going out (oxygen), you need to have a *lot* of money coming in (carbon dioxide), or your account is over-drawn (and the oxygen content of the atmosphere goes down).

We'll leave you with a few questions.....

Take a look outside your window right now.

- See many green plants?
- If, as we say, photosynthesis and respiration act together to maintain constant concentrations of oxygen and CO₂ in the atmosphere, where does the oxygen come from during our harsh Northeast winters when there are relatively few plants photosynthesizing?
- What's happening to all the CO₂ we (animals) are producing as we respire?
- What about desert areas that have even fewer green plants year-round? The concentration of oxygen in the atmosphere is the same as in the tropics where there are a lot of green plants.



More about this next week...

P.S. A Word about Water...

In these last few emails, we've focused a lot on oxygen and CO₂. You may think we've ignored the role of water in the system. From email we've received and comments we've heard, we know that teachers are interested in the role of water in the closed jar.

Water is essential to all organisms. In the plant-in-a-jar system, there is plenty of water, so we have not specifically focused on it. Water doesn't leave the system; it is continually recycled. Even though water is used during photosynthesis, it is also released as a product of both photosynthesis and respiration. Indeed, the condensation that can be seen inside the jar is evidence that there is plenty of water present. That water is not currently being used for a life function, so it is, at the moment, "excess." Although it will get used during photosynthesis, it will be replenished after photosynthesis and respiration.

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