Recycling Nutrients

Is this a model Earth?

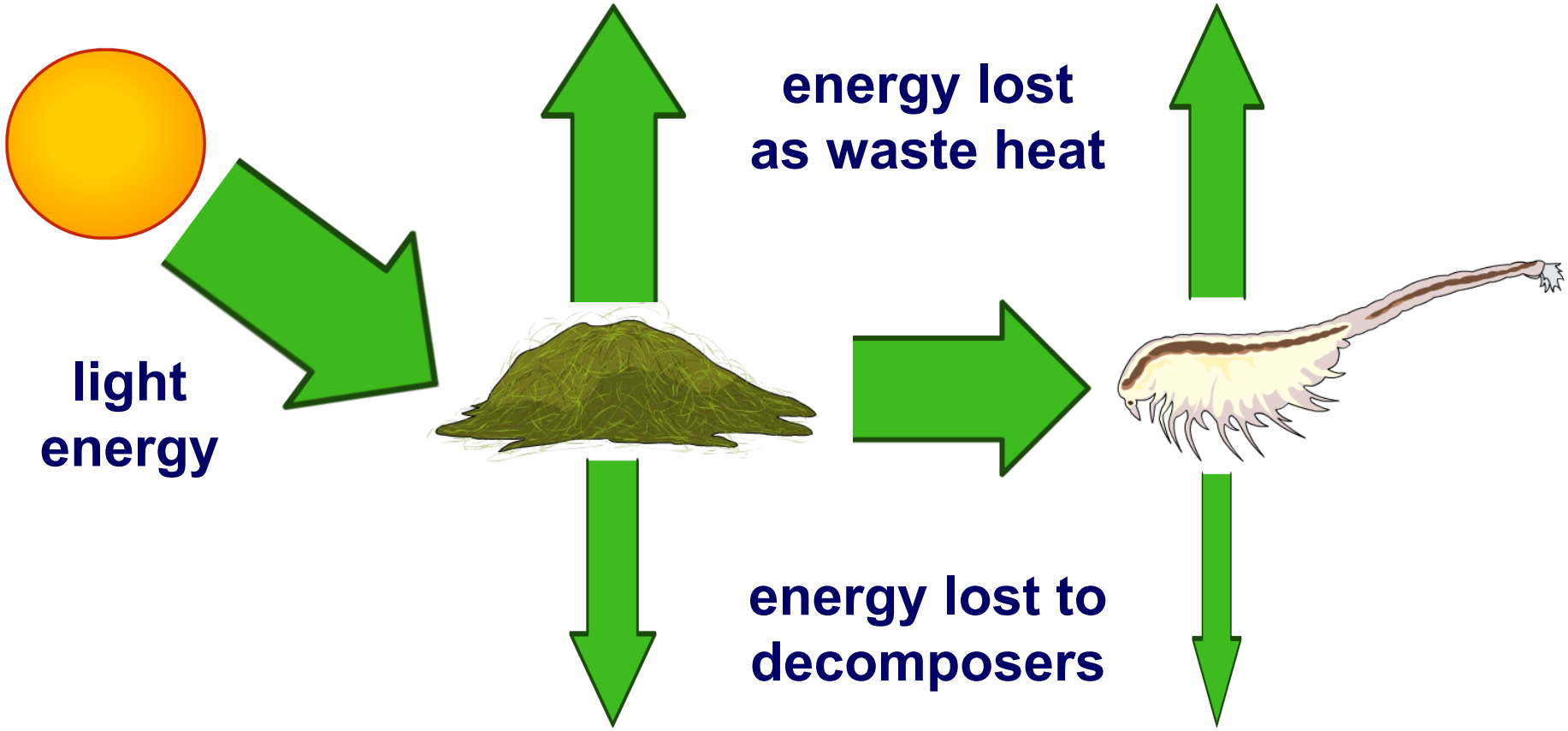
This **ecosphere** has been sealed for years but life carries on inside it.

The water contains several tiny shrimps. What keeps them alive?

The shrimps are kept alive by algae in the water. The algae provides the shrimps with food and oxygen.

How does energy flow in an ecosphere?

Shrimps obtain food and oxygen from tiny algae in the water.



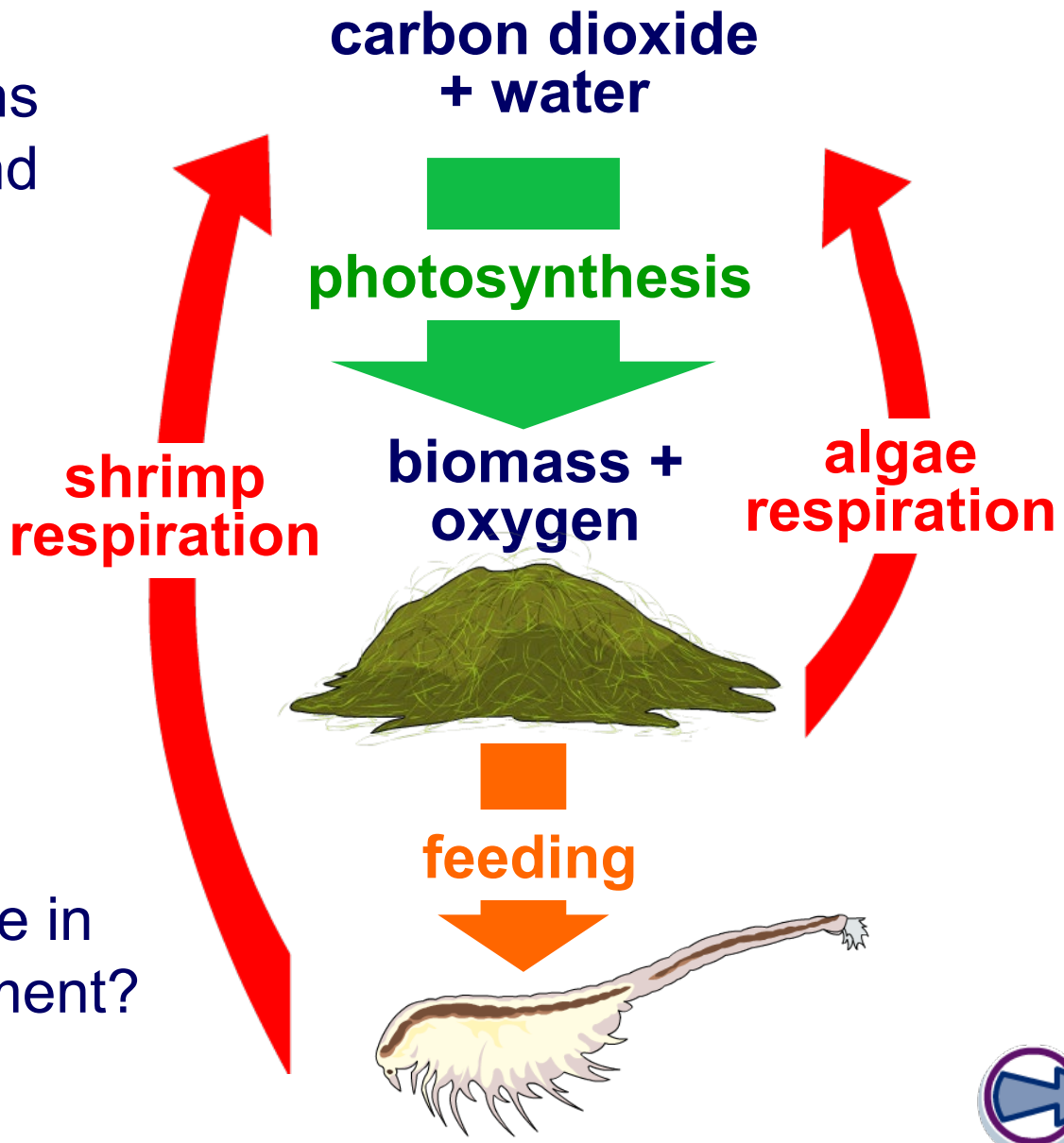
The algae use solar energy to build food molecules.
Where do their carbon dioxide and minerals come from?

How are carbon dioxide and oxygen balanced?

What is the link between the equations for photosynthesis and respiration?

One is the exact reverse of the other, so carbon dioxide and oxygen are continually recycled.

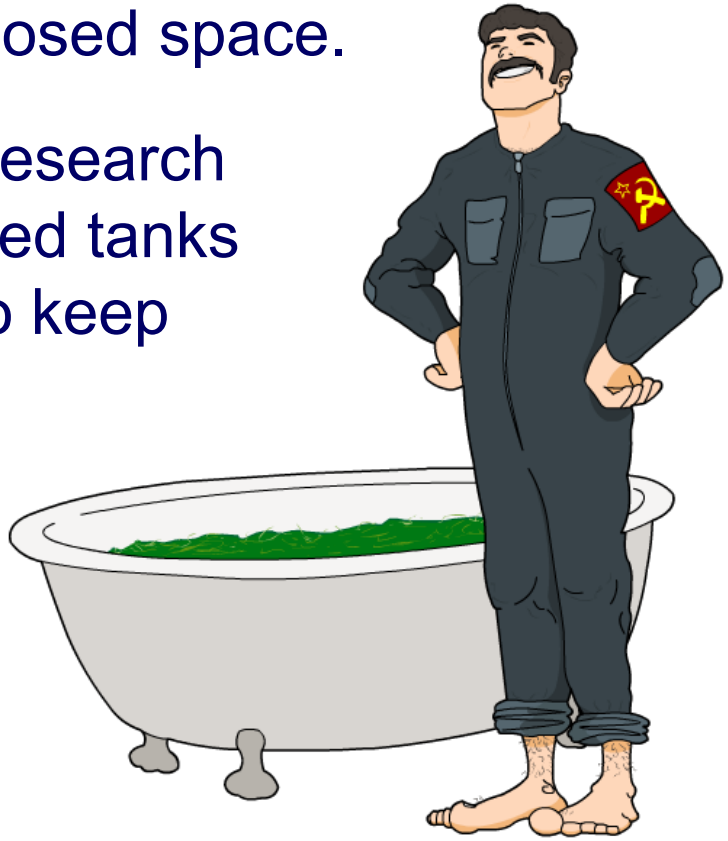
Could humans survive in an enclosed environment?



How much algae would a human need?

In the 1960s, Russian scientists investigated how much plant life would be needed to provide oxygen for humans to live in an enclosed space.

A three-man crew lived in a sealed research facility for six months. Eight bath-sized tanks of algae per person were required to keep oxygen supplies stable.



However, this was not a completely closed system:

- the scientists took food in with them instead of eating algae
- their urine and feces were dried and stored away.

Is the Earth an ecosphere?

The record for keeping an ecosphere working is eight years because the shrimps will die eventually.

This occurs because important minerals get locked up in deposits.

Like an ecosphere, the Earth is a closed system, with sunlight as the only input. Nutrients are stored in living material but return to the system as dead material or waste feces.

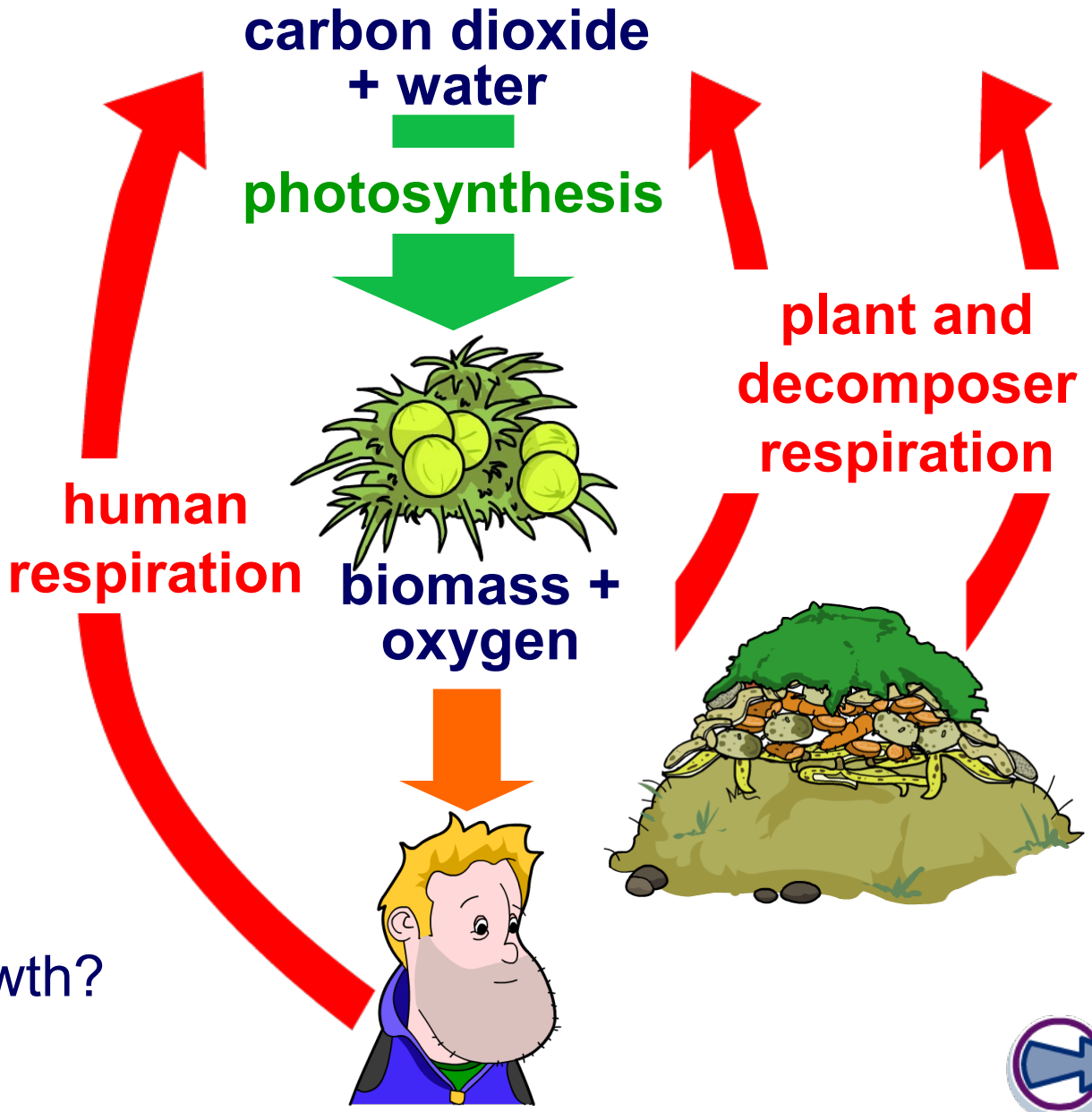
How are essential nutrients released from the dead biomass?

Do microbes use up oxygen?

Bacteria and fungi use oxygen when they break down organic material, leaving less for humans.

Plants grow well in soil containing certain types of microbes.

How do microbes improve plant growth?



Recycling and interdependence

Complete each statement about interdependence

Respiration by plants and animals produces...	Photosynthesis by plants produces...	Respiration by microorganisms produces...
?	?	?
...oxygen and glucose, and uses carbon dioxide.	...carbon dioxide and uses oxygen in some species.	...carbon dioxide and uses oxygen.