

Nutrient Cycling: Molecules and Bonding Review

Ecology

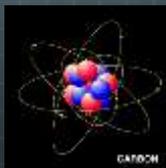
Question of the Day

- Human beings weigh, on average, three pounds less when we wake up in the morning than when we went to sleep, without using the bathroom. What causes this?
- Where does the extra mass go?



The answer: carbon atoms!

- The answer is that we lose carbon atoms every time we exhale. We aren't replacing them because we aren't consuming anything like we do during the day.
- So, what is an atom?



What is an atom?

- A tiny unit of matter – **one of the most basic units of matter** that exists.
- Small beyond what we can imagine. If you wanted to see an atom in a drop of water, you'd need to enlarge the drop of water to be 15 miles across.



What is an atom?

- Atoms are also very durable. Every atom that exists in your body has been a part of several stars and millions of organisms – plants, animals, bacteria, and so on – on its way to becoming a part of you.
- It has been estimated that at least one billion of the atoms in your body once belonged to Genghis Khan.



Scale of the Universe

- <http://htwins.net/scale2>



Matter

- Atoms are the basic building blocks of all matter
- Matter is anything that occupies space and has mass



Elements

- 94 different kinds of atoms occur naturally
- 21 have been created in the lab
- Elements have very different properties
 - Highly reactive vs. inert
 - Solid, liquid or gas at room temp
 - Metals vs. non metals



Molecules and Compounds

- Molecule: Two or more atoms bonded together in a specific way
 - Example: Nitrogen, N_2
- Compound: Two or more different kinds of atoms bonded together
 - Example: H_2O
- Breaking bonds releases potential energy

The Four Spheres of Earth

- On the planet Earth, atoms move through four "spheres"
- Biosphere, hydrosphere, lithosphere, and atmosphere



The Biosphere

- In the biosphere, there are six elements that are essential for life

Carbon, hydrogen, oxygen, nitrogen, phosphorus, and sulfur



The Atmosphere

- Contains a mixture of molecules of:
 - Oxygen (O_2)
 - Nitrogen (N_2)
 - Carbon dioxide (CO_2)
 - Water vapor and other trace molecules
- Normally stable, but some do react (ozone)



The Hydrosphere

- Major source of carbon and oxygen for all organisms
- Major source of hydrogen (in the form of water)
- Changes in temperature cause phase changes



Lithosphere

- Contains all of the natural elements in non-living form
- Mineral: hard, crystalline, inorganic material of a given chemical composition



Elements move in cycles

- It is possible to trace the path of a carbon atom through all four spheres
- This is true of many elements

