

## Worldviews, Chemistry of life, and biogeochemical cycles

NOTE: This is a guide only. DO NOT let it substitute for reading or studying your notes. READ the chapters in the book – you will do MUCH better on the test if you do.

- Know the first and second laws of thermodynamics, and the law of conservation of matter: neither energy nor matter can be created or destroyed – they can change form though, and usually do so from a more ‘useful’ to a less ‘useful’ form.
- Know the example of mercury and methyl mercury as a harmful toxin becoming an even more toxic one through a biologically facilitated (bacteria!) chemical reaction.
- Know the concept of matter quality
- Know the phases of matter
- Photosynthesis and respiration as examples of the law of conservation of matter (see posted notes and powerpoint)
- Know what organic molecules are, and be able to give an example of some (eg. the large biological molecules such as lipids, carbohydrates, proteins and nucleic acids)
- What is a molecule compared to a mixture? What is an atom? Hint: molecules are made of atoms, and mixtures are made of molecules
- Know what matter is and what an element is
- Know the atomic structure of an element (protons, neutrons and electrons). Know that protons and neutrons stay near the ‘nucleus’ while electrons spin around outside the nucleus in orbitals and electron shells – this determines (in part) their stability
- Know that it is the stability (or instability) of electrons that leads to many chemical reactions and bond formation. Electrons seek stability. They like to be paired (outer shells like to have 8)
- Bonding (types) and bond strengths – know them: ionic (gives up an electron), covalent (share electrons) and polar bonds (eg. Water)
- Know what makes chemical reactions go forward. What is activation energy? What is a catalyst?
- Know the pH scale (14 is basic and 1 is very acidic)
- Know what osmosis and diffusion are and their differences
- Water – why is it so ‘special’?
- What are some properties of water?

- What are some examples for how worldviews affect how people utilize and manage the environment (we talked about Costa Rica, Haiti and Ulithi a bit, and also how religion affects worldview)
- Were all (or even most) people historically good to their environment? No!

Chemical cycling:

- In what three major places do elements accumulate (from a chemical cycling perspective)? Reservoirs (hard to get places), exchange pools (easy to get places), and the bodies of living organisms.
- Know the carbon cycle and where the major accumulation areas are (eg. lots in the air, some in animal and plant material etc.
- Know that Nitrogen is a cycle that is facilitated primarily by bacteria and decomposers
- Know that Phosphorous is a SLOW cycle, and happens via the weathering of rocks. Primarily a soil cycle