Coral reefs and acidification, 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.

Acidification and coral reefs:

- What are some benefits of coral reefs?
- What do we mean by multiple stressors on reefs?
- What does acidification do to corals?
- What causes acidification?
- The PH scale is logarithmic. That means a .1 change in acidity (lower now) than pre-industrial times, is a 30% change – huge for ocean organisms
- Is this the first time in Earth's history the ocean has experienced acidification?
- Have coral reefs 'gone extinct in the past'?
- What makes this event different than many historic ones, and makes us worry a bit…?

Worldviews:

- 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)
- What are some ways that Haiti and Costa Rica (or Dominican Republic) are different and some historical reasons why?
- Systems, chemistry
- What is an open system? A closed system? Give an example (even a hypothetical one) for each.
- What is a positive feedback loop?
- What is a negative feedback loop?
- What does ecosystem resilience mean?
- What does an ecosystem baseline shift (or phase shift) mean?
- 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.
- How is energy cycled through ecosystems: Sun is the source, photosynthesizers (autotrophs) harness it. Then it goes through heterotrophs (primary, secondary consumers etc).

- How much energy is lost (approx.) at each trophic level? Why are there so few top predators?
- What trophic level of consumers (give a critter example) is most 'energy efficient'? which is least? Why?
- Where is some energy lost (leaked) from the system (eg. waste, heat etc.)
- What does 'high quality' matter mean?
- 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.
- What is biomagnification?
- What does hydrophobic mean? Hydrophilic? Give an example of a type of sybstance that is hydrophilic, and one that is hydrophobic.
- 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 different molecules
- 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 that concentrations of molecules or ions can be an important factor in driving reactions (eg. ocean acidification)
- Water – why is it so 'special'? Know some of the important properties of water

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.

Review the water, carbon, nitrogen, phosphorous cycles in your books.

- Know the carbon cycle and where the major accumulation areas are (eg. lots in the air, some in animal and plant material etc.) carbon has a large atmospheric component as well as a soil component. What is an exchange pool for carbon? A reservoir?
- Know that Nitrogen is a cycle that is facilitated primarily by bacteria and decomposers, and that nitrogen is primarily a soil cycle. Atmospheric nitrogen is largely unavailable. What is an exchange pool for nitrogen? A reservoir?
- Know that Phosphorous is a SLOW cycle, and happens via the weathering of rocks. Primarily a soil cycle. What is an exchange pool for phosphorous? A reservoir?