**Chapter 2 – Reading Questions**

1. What are some of the largest systems in the Mono Lake story?
2. What are some examples of smaller systems within the Mono Lake story?
3. Are there any larger systems Mono Lake is a part of?
4. The Earth is a single interconnected system, but it can be subdivided in to many smaller systems. How does the nature of the problem to be studied determine the scale of the system chosen for study?
5. What is the difference between an atom, a molecule, and a compound?
6. How do different isotopes of the same element differ, and what is their significance?
7. What occurs during radioactive decay of an unstable heavy isotope?
8. How is the half-life of a radioactive element determined, and why is it important?
9. What are the distinguishing properties of covalent bonds, ionic bonds, and hydrogen bonds?
10. When scientists look for other planets that may contain life, they focus heavily on planets that contain water. How do the unique properties of water make it key for supporting biological processes?
11. Water molecules bond very strongly to other water molecules and many other molecules. Why is this?
12. How can it be determined whether a substance is an acid or a base?
13. Suppose solution A has a pH of 3, solution B has a pH of 7 and solution C has a pH or 8. How do the relative amounts of H+ ions and OH- ions compare among the 3 solutions?
14. As a tree grows, it’s mass increases. Why is this not a violation of the law of conservation of matter?
15. If matter is conserved and there is no “somewhere else” to which organisms can get rid of their wastes because of the law of conservation of matter, why is the world not filled with waste matter?
16. What defines organic matter?
17. Complete the following chart regarding the major types of macromolecules (organic matter):

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Defining Characteristics** | **Role in Cell/Organism** | **Examples** |
| Carbohydrates |  |  |  |
| Proteins |  |  |  |
| Nucleic Acids |  |  |  |
| Lipids |  |  |  |

1. How does the Sun transfer energy from millions of miles away to Earth?
2. What is the difference between power and energy?
3. Why do you think we use the term *power plants* instead of *energy plants*?
4. What is the difference between potential energy and kinetic energy?
5. Certain chemical reactions give off heat when they occur. Describe what is happening in terms of potential energy and kinetic energy in such reactions.
6. How is an object’s temperature related to the energy of its molecules?
7. The first law of thermodynamics states that energy can be neither created nor destroyed; do heat-emitting (exothermic) reactions violate this law? Explain.
8. According to the second law of thermodynamics, some energy is always lost as heat during any energy conversion. Use this concept to explain why lights, engines, computers, muscles, etc. get hot.
9. How can the efficiency of an energy transformation be calculated?
10. Use the second law of thermodynamics to explain why a barrel of oil can be used only once as a fuel. In other words: why can’t we recycle this high quality energy?
11. The force of entropy (through the second law of thermodynamics) tells us that all systems slowly degrade towards randomness. However, life on Earth has been incredibly successful at preserving itself and growing increasingly complex over time. How has life been so successful doing this?
12. Earth is considered an open system for energy and a closed system for matter. Explain what this means.
13. What characterizes a steady state in a system?
14. Explain the difference between a positive feedback loop and a negative feedback loop.
15. Are positive feedbacks necessarily good things? Are negative feedbacks necessarily bad things? Explain.
16. What can inputs, outputs and feedback loops tell us about the health of environmental systems?