

1. What is the fundamental law of nature that determines whether a particular set of molecules, atoms etc will be converted to another set?
2. Will it always be true that the conversion favored by this fundamental law will take place? Explain.
3. In what way can an increase in temperature help overcome the impediment you described in question 2? Explain fully.
4. A new drug proposed for the treatment of advanced liver cancer has just shown excellent results in monkeys with the disease. You are the commissioner of the Food and Drug Administration and have the responsibility for deciding whether and when it should be made available for human cancer patients for whom all known treatments are ineffective. Name and discuss four factors, two favoring release, two favoring delay of release, that should influence your thinking.
5. The hydrogen atom can form a covalent bond. Explain.
6. The hydrogen atom can become H^+ . What would you call this? How does it happen? Explain.
7. Three types of chemical bonds have been discussed. Name them and for each briefly describe how the electrons are behaving and how that behavior determines the nature of the bond.
8. Explain how the freezing of a lake in cold weather can moderate the temperature of the land and air.
9. Scientists have no difficulty (except for the need for safety precautions) using radioactive isotopes in chemical reactions that have been designed for the corresponding non-radioactive isotope. How can this be so when one atom is radioactive and the other is not. Explain.
10. On the basis of comparison to similar molecules, most of which are gases at room temperature, it is unusual that water is a liquid at room temperature. Explain, based on the molecular structure of water, why it is a liquid, rather than a gas at room temperature.
11. ATP, a molecule involved in the use of energy by organisms, is regarded as "high energy", (in that it can be chemically converted to a product of very much lower energy) and yet it is very stable.
 - a. Propose an explanation.
 - b. What could you do to a solution of ATP to make it less stable, and more readily converted to the lower energy product.