**Introduction**

All living things need energy, which is defined as the ability to do work. You can often see energy at work in living things — a bird flies through the air, a firefly glows in the dark, a dog wags its tail. These are obvious ways that living things use energy, but living things constantly use energy in less obvious ways as well.

**Why Living Things Need Energy**

Inside every cell of all living things, energy is needed to carry out life processes. Energy is required to break down and build up molecules and to transport molecules across plasma membranes. All life’s work needs energy. A lot of energy is also simply lost to the environment as heat. The story of life is a story of energy flow — its capture, its change of form, its use for work, and its loss as heat. Energy, unlike matter, cannot be recycled, so organisms require a constant input of energy. Life runs on chemical energy. W here do living organisms get this chemical energy?

**How Organisms Get Energy: Autotrophs and Heterotrophs**

The chemical energy that organisms need comes from food. Food consists of organic molecules that store energy in their chemical bonds. In terms of obtaining food for energy, there are two types of organisms: autotrophs and heterotrophs.

**Autotrophs**

Autotrophs are organisms that make their own food. Most autotrophs use the energy in sunlight to make food in a process called photosynthesis. Only three types of organisms — plants, algae, and some bacteria — can make food through photosynthesis. Autotrophs are also called producers. They produce food not only for themselves but for all other living things as well (which are known as consumers). This is why autotrophs form the basis of food chains.

**Heterotrophs**

Heterotrophs are living things that cannot make their own food. Instead, they get their food by consuming other organisms, which is why they are also called consumers. They may consume autotrophs or other heterotrophs. Heterotrophs include all animals and fungi and many single-celled organisms. What do you think would happen to consumers if all producers were to vanish from Earth?

*Questions -* Write true if the statement is true or false if the statement is false.

1. All life needs energy.

2. C6H12O6 + 6O2 → 6CO2 + 6H2O is the chemical reaction of photosynthesis.

3. Glucose is a carbohydrate that stores chemical energy in a concentrated and stable form.

4. Many scientists consider photosynthesis to be the most important life process on Earth.

5. Only autotrophs can perform photosynthesis.

6. Only four types of organisms — plants, algae, fungi and some bacteria — can make food

through photosynthesis.

7. ATP is the “energy currency” of the cell, so it makes sense that a molecule of ATP contains

much more chemical energy than a molecule of glucose.

8. Whereas photosynthesis occurs in only some organisms, cellular respiration occurs in the cells

of all living things.

9. Like matter, energy is also recycled by living organisms.

10. Heterotrophs cannot make their own food.

11. Because you are able to cook your own food in the microwave oven, you are a producer.

12. As mushrooms are fungi, they are heterotrophs.

13. A food chain shows how energy and matter flow from consumers to producers.

14. Photosynthetic animals are autotrophs.

15. Autotrophs are producers.

*Questions – Answer the questions below using the cellular respiration process we’ve covered so far.*

1. What is energy? Give an example of how energy is used in a living organism.

2. Distinguish between autotrophs and heterotrophs.

3. Determine if the following are autotrophs or heterotrophs: (a) a giant redwood tree, (b) a spider, (c) a

rose bush, (d) a mushroom, (e) a blue whale. Explain why you categorized them as auto or heterotroph.

4. How is energy used in a cell?

5. Why are autotrophs considered the basis of food chains? Explain using what you know about cellular respiration.