Plant cells versus solar cells

Louis Pasteur once said ??? There are no such things as applied sciences, only applications of science.??? Today, we??™re going to put that theory to the test with a comparison of natural and man-made sunlight to energy sources. We will be comparing and contrasting the photosynthesis in plant cells versus semiconductor-based solar cells. First we will discuss how plant cells turn sunlight into energy using photosynthesis. After that we will discuss how semiconductor-based solar cells transfer sunlight into usable energy.

We will also go over a few similarities and differences between the two. Lastly, we??™ll explain how the laws of thermodynamics affect both systems. Plants are natures little energy engines. They are made of millions of cells each with their own job and purpose. One purpose above all others is energy production. Without the plants ability to produce energy, it could not survive and in turn, neither could we. Plants use the process of photosynthesis to transform sunlight to energy.

Photosynthesis happens during two different times known as reactions. These reactions are called the light reaction and the dark reaction. As can be assumed by the names, these reactions happen during specific times throughout the day and night. As sunlight radiates from the sun and down to earth, plants are here to absorb it. They absorb the sunlight by letting it into their cells. The part of the cell which stores this light is known as chlorophyll.

As the chlorophyll absorbs this energy it attracts water from inside the plant and breaks this water apart into oxygen, protons, and electrons. The oxygen is released into the world as clean air and the protons and electrons are used

to make adenosine triphosphate (ATP) and nicotinamide adenine dinucleotide diphosphate (NADPH2). (“ Photosynthesis”) These two compounds are then used during the dark reaction to create carbohydrates.

This mixed with some carbon dioxide from the environment is what the plant uses for energy. As people and animals eat the plant, they absorb the chemical energy of the plant and use it as their own. (“ Photosynthesis”)While plants have a natural way to make energy, humans have created their own ways of creating a usable energy source, semiconductor-based solar cells. These solar cells use a semiconductor to capture and transform heat and light energy into a usable current.

This process is very inefficient as it loses a lot of the energy absorbed as well as not having the ability to absorb all the different spectrums of light. (Toothman, & Aldous) A semiconductor-based solar cell work by capturing sunlight in an array of semiconductors made of silicon. As light is absorbed into the silicon, it causes the electrons within the shell of the silicon to break loose. These ??? freed??? electrons then form pairs and flow through the various holes and imperfections within the solar arrays causing a current which is then mixed with the solar cells built in voltage. (Toothman, & Aldous) This mixture of current and voltage causes a wattage which can then be used to power external devices. Although these two types of cells are systemically different, they do share some similarities. One of these similarities, and the most obvious of the three to be described, is the ability to make energy out of light. Another similarity is that both processes rely heavily on electrons to help create the energy.

A third similarity between plant cells and solar cells is that they both loose energy in the creation process. Some key differences between plant cells and solar cells is that plant cells are alive while solar cells are not. Another difference is that plant cells do part of their process at night while solar cells do the entire process during the day due to a lack of usable light at night. Lastly, a third difference between the two cells is the way the electrons are used.

Solar cells force electron pairs thru an array causing current, while plant cells use the electrons to make ATP as described above. (“ Photosynthesis”)Both processes are governed by the laws of thermodynamics. The first law states that energy or matter can neither be created nor destroyed. This means that both processes cannot create energy out of light, but instead transform light energy into different forms of energy. Plant cells make light energy into chemical energy used by the plant until death or until it is eaten. Solar cells transform light energy into electrical energy which is then used by humans as power for electronic devices. The second law is considered the law of Entropy. I interpret this law as stating that no process of transforming energy is 100% efficient.

This means that energy will always be lost during the process. The third law builds upon the second law by stating that absolute zero is not obtainable. This means that due to the second law, a perfectly efficient system is impossible.

All of these laws govern the processes of transforming light energy into different forms of energy regardless of the system used to do so. So today

we??™ve compared and contrasted the photosynthesis in plant cells versus semiconductor-based solar cells. We also discussed how plant cells turn sunlight into energy using photosynthesis. After that we discussed how semiconductor-based solar cells transfer sunlight into usable energy. We then went over a few similarities and differences between plant cells and solar cells. Lastly, we explained how the laws of thermodynamics affect both systems.