Matter and Energy

1. What was the initial working hypothesis for how plants gained mass?
2. Describe the results of Van Helmont’s experiment in regards to the soil and the tree itself.
3. Define **matter -**
4. Define **energy -**

**Matter**

1. All matter in the universe is made of atoms. What is an **atom**?
2. Each **element** represents a different \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of atom.
3. Initially, many scientists believed air was a single basic element. What was Joseph Priestley’s hypothesis?
   1. Describe his two experiments with “injured” air. What were the results?
   2. What element had Priestly discovered?
4. All atoms are made of a combination of these three particles. Define the charge and location of each:
   1. **Proton –**
   2. **Electron –**
   3. **Neutron –**
5. When atoms form chemical bonds with each other, they make \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
6. Give the chemical formula and percent composition of each of these molecules found in air:

|  |  |  |
| --- | --- | --- |
| **Molecule** | **Chemical Formula** | **Percent Composition** |
| Nitrogen |  |  |
| Oxygen |  |  |
| Water |  |  |
| Carbon |  |  |

1. Describe the design and results of Jan Ingenhousz’s experiment with plants.

**Energy**

1. Potential energy is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Potential energy can exist as the result of

\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. Kinetic energy is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. Energy travels in the form of \_\_\_\_\_\_\_\_\_\_\_\_\_\_.
3. List the seven different wavelengths of energy:
4. Solar radiation that reaches the Earth are primarily made of three wavelengths. Describe each:
   1. Ultraviolet:
   2. Visible:
   3. Infrared:
5. What wavelengths of visible light can plants use as a source of energy?
6. Nicholas de Saussure grew some plants in sealed containers of carbon dioxide and measured the mass afterwards. What was his conclusion?
7. What is the name of this process? Give its chemical equation.
8. Organisms that cannot use sunlight must perform **cell respiration**. Give its chemical equation.
9. Photosynthesis and cell respiration form the basis of the flow of \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the

cycling of \_\_\_\_\_\_\_\_\_\_\_\_ that make up living ecosystems.

1. State the two **Laws of Thermodynamics**:
2. What do the arrows in a food chain represent?
3. Define each of the trophic levels of a food chain:
   1. **Producers –**
   2. **Consumers –**
   3. **Decomposers –**
4. How do food webs in more tropical or temperate ecosystems compare to those in harsher ones?
5. In a food chain, how much energy actually moves from one level to the next?

**Cycles of Matter**

1. The Earth is a closed system to matter. What does that mean?
2. What do the **biogeochemical cycles** of matter do?
3. Describe the water cycle. How does water move?
   1. What does it mean to say that every drink of water you take is “dinosaur pee”?
4. List the primary elements that plants are made of.
   1. List some of the processes that are used to cycle these elements back through soil and plants.