Norfolk Public Schools
Science Learning in Place Plan: Science 8 Lessons

Week 7: April 27 – May 1, 2020 (Atomic Structure and the Periodic Table of Elements)

Monday	Tuesday	Wednesday	Thursday	Friday
Read and Text Annotation: • Read "Atomic Structure" • Using *Critical Reading* Strategies to make note of the key points in the passage.	Concept Analysis: • Review the passage "Atomic Structure" • Use the Key Vocabulary to the Atomic Structure. • Answer questions 1 thru 11 on the Atomic Structure	Read and Text Annotation: • Read "Periodic Table" **page 1** • Using *Critical Reading* Strategies to make note of the key points in the passage.	Concept Analysis: • Review the Passage "Periodic Table" • On **page 2,** differentiate between **metals, metalloids and nonmetals** using colors of you own choice. • On **page 2,** Label the elements as metals, metalloids and nonmetals.	Concept Analysis: • Review the Passage "Periodic Table" **Pages 1** • On **page 3,** answer questions 1-8.

Week 8: May 4 – 8, 2020 (The Particle Theory of Matter and Phases of Matter)

Monday	Tuesday	Wednesday	Thursday	Friday
Reading & Text Annotation: • Read "Force, Motion, Energy & Matter" **The Particle Theory of Matter** • Use *Critical Reading Strategies* to make note of the key points in the passage.	Concept Analysis: • Review the passage Read "Force, Motion, Energy & Matter" **The Particle Theory of Matter** • Answer the questions on the handout **"The Particle Theory of Matter Analysis Questions"**	Reading & Text Annotation: • Read "Force, Motion, Energy & Matter" **The Phases of Matter** • Use *Critical Reading Strategies* to make note of the key points in the passage.	Concept Analysis: • Review the passage Read "Force, Motion, Energy & Matter" **The Phases of Matter** • Answer the questions on the handout **"The Phases of Matter Analysis Questions"**	Concept Analysis: • Complete the worksheet entitled, **"Particle Theory"**

Week 9: May 11 – 15, 2020 (Temperature & Heat and Energy)

Monday	Tuesday	Wednesday	Thursday	Friday
Reading & Text Annotation: • Read "Force, Motion, Energy & Matter" **Temperature and. Heat** • Use *Critical Reading Strategies* to make note of the key points in the passage.	Concept Analysis: • Review the passage Read "Force, Motion, Energy & Matter" **Temperature and Heat.** Fill in the Comparison Chart of **"Temperature and Heat"** Handout	Reading & Text Annotation: • Read "Force, Motion, Energy & Matter" **Energy Transformation** • Use *Critical Reading Strategies* to make note of the key points in the passage.	Concept Analysis: • Review the passage Read "Force, Motion, Energy & Matter" **Energy Transformation** • Answer the question 1 **"Energy Transformation"** the handout	Concept Analysis: • Review the passage Read "Force, Motion, Energy & Matter" **Energy Transformation** • Answer the question 1 **"Energy Transformation"** the handout

CRITICAL READING
strategies

Marking the Text

- # → Number the paragraphs
- → Circle key terms
- → Underline essential info
  (...based on the reading purpose)
- → Box new vocab words
  (...and define them in the margins)

Additional Ways to Mark the Text

- → [Bracket] information
  (when underlining has been used for another purpose)
- → Write labels in the margins
  (double underline labels to stand out from other marks)

SOL PS 3 Part II

Atomic Structure

Note Page For Students

Atomic Structure

Everything around us is made up of atoms. Atoms are one of the smallest units of matter. An atom is too small to see directly through a microscope. The smallest speck that can be seen under an ordinary microscope contains more than ten billion atoms. An atom is more that a million times smaller than the thickness of a human hair.

There are three pieces to an atom. They are protons, neutrons, and electrons. These are called subatomic particles.

The center of the atom is called the nucleus. Neutrons and protons are located in the atomic nucleus. Electrons are very small particles located outside the nucleus. They orbit the nucleus at fantasist speeds, like the Earth orbits the sun.

Each type of subatomic particle has a different electrical charge. A proton always has an electrical charge of +1. An electron always has an electrical charge of –1. A neutron has no electrical charge associated with it, a charge of 0.

Atoms form the building blocks of the simplest substances, the chemical elements. Familiar elements include hydrogen, helium, sodium, chlorine, iron, lead, carbon, nitrogen and oxygen.

The smallest unit into which an element may be divided while keeping all of the characteristics of that element is an atom. Each chemical element consists of only one type of atom. For example, pure 24K gold is composed of only one type of atom, gold atoms.

The atoms of any element are alike but are different from atoms of other elements. The thing that makes them different is the number of protons. Hydrogen, for example, has atoms with only one proton. All atoms with one proton are hydrogen. Helium has two protons. All atoms with two protons are helium. Oxygen has eight protons. Atoms with the same number of protons in the atomic nucleus are the same element.

The atomic number is the number of protons an atom has. The atomic number is unique for each element. The atomic mass (also referred to as the atomic weight) is the sum total of the number of protons and neutrons in an atom.

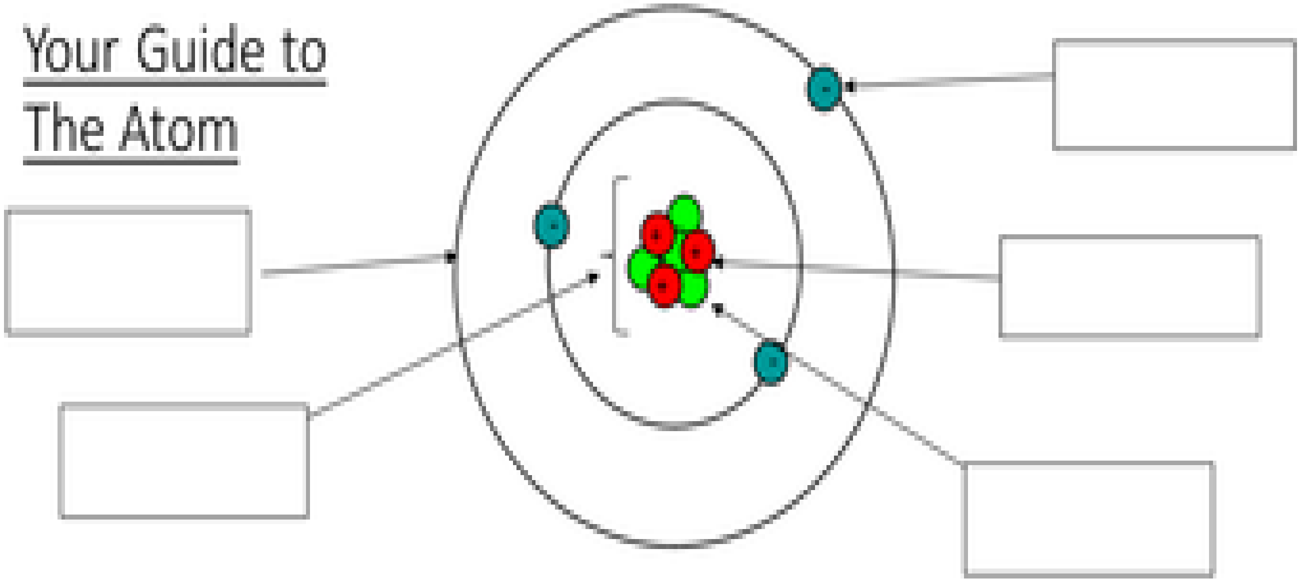
Hydrogen is different from all other atoms in that the hydrogen atom normally does not contain a neutron. The hydrogen atom is composed of one proton and one electron but no neutron.

The Periodic Table of the Elements provides a great deal of information about various elements. It tells us how many electrons and protons each element has. It also tells us the atomic number and atomic mass.

Elements are arranged in the periodic table from left to right and top to bottom in order of increasing mass. Each element is identified by an abbreviation (H=Hydrogen, Na=Sodium, K=Potassium, and so on). The table starts with hydrogen (with an atomic number of one) and goes on to unnilennium (with an atomic number of 109).

All substances on Earth are made of different combinations of the 109 elements. Approximately 25 elements occur in living things. The six major elements in living things are carbon, hydrogen, nitrogen, oxygen, phosphorous, and sulfur.

Concept Analysis: Label the Atomic Structure base using the following words, nucleus, energy shell, protons, electrons, neutrons.



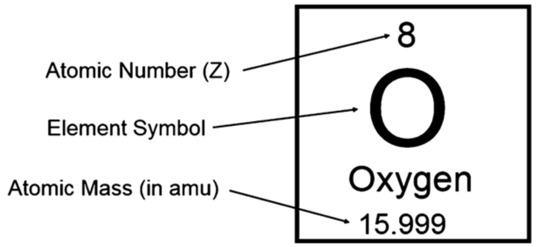
Direction: Answer the following questions using the reading.

1. What is the smallest unit of matter?
2. Name three subatomic particles of an atom.
3. Explain how the subatomic particle are arranged in the inside an outside of the nucleus.
4. What is the thing that makes atoms of one element different from atoms of another element?
5. What does the atomic number mean?
6. How many protons does oxygen have?
7. What does atomic mass mean?
8. How is hydrogen different from all other atoms?
9. Name three major elements in living things.
10. How are neutrons different for protons and electrons?
11. What are the six major elements in the living things?

SOL PS 4 Part II

Periodic Table

Note Page For Students



The Periodic Table of Elements.

In 1871, the first periodic table was developed by **Dmitrii Mendeleev**. Mendeleev is known as the father of the current day periodic table. He arranged the known elements at the time in order of increasing atomic mass. There was a predictive power in his table - based on the periodic law, Mendeleev believed that more elements would be discovered someday. He left spaces in his table where the elements would be placed once they had been discovered. Unlike Mendeleev's table, the currently accepted periodic table is arranged in order of increasing atomic number.

The Periodic Law

The Periodic Law states that when elements are arranged in order of increasing atomic number, there is a periodic repetition of their physical and chemical properties.

Periods and Groups

Elements in the periodic table are arranged in periods (rows) and groups (columns). Atomic number increases as you move across a period.

Metals

Metals are located on the left side of the periodic staircase on the periodic table. They are malleable, ductile, good conductors of heat and electricity, solid at room temperature (except for Mercury), and they have a high luster (they are shiny). Metals make up most of the elements in the periodic table.

Nonmetals

Non-metals are located on the right side of the periodic staircase on the periodic table (except for Hydrogen). They are brittle, not ductile, poor conductors of heat and electricity, and they have a low luster. Most are gases at room temperature, but some are solids and Bromine is a liquid.

Metalloids

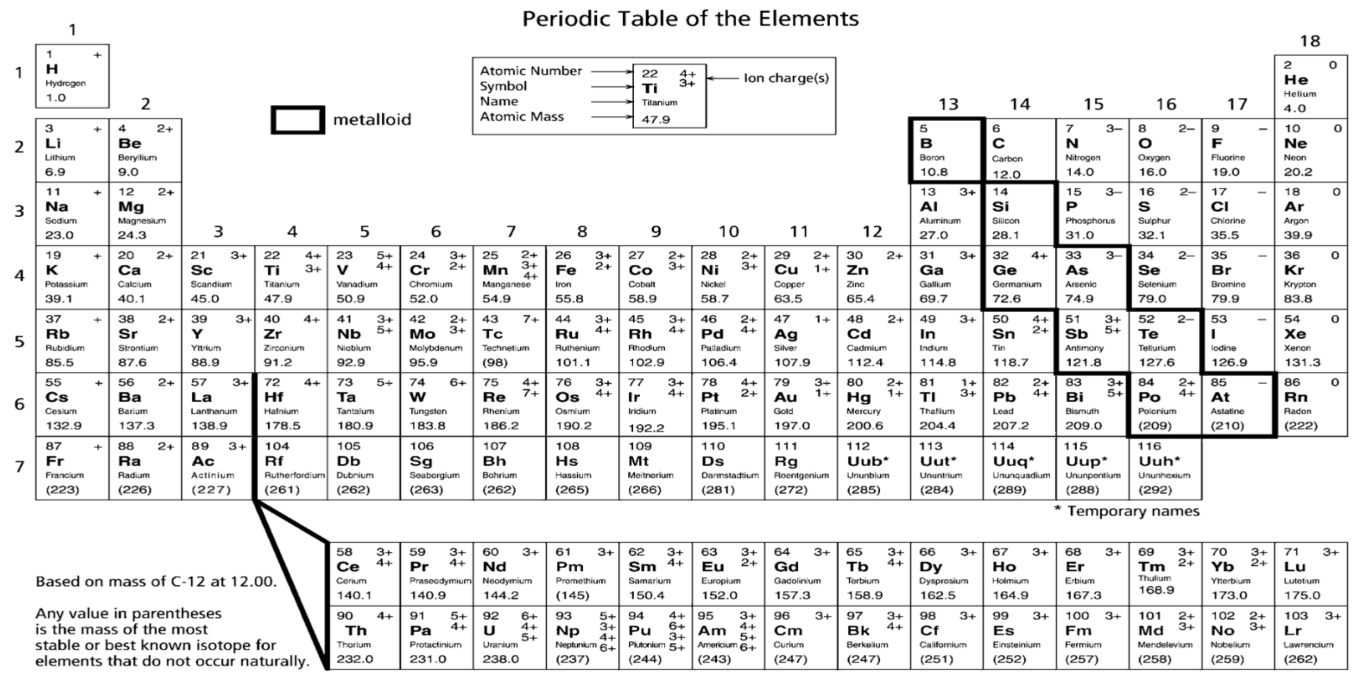
Metalloids have properties of both metals and nonmetals. A metalloid may behave as a metal under some conditions, but the same metalloid may behave as a nonmetal under other conditions.

Representative Elements

The representative elements are found in groups 1 through 2 and groups 13 through 18 on the periodic table. They display a wide variety of properties that represent the table as a whole. They represent each category of metals, nonmetals, and metalloids; as well as representing each state of matter solids, liquids and gasses. Representative Elements on many periodic tables have a second group number to represent the number of valence electrons found in the elements of that group. For example, elements in group 2 (2A) have 2 valence electrons, while elements in group 15 (5A) have 5 valence electrons, group 17 (7A) have 7 valence electrons and so on.

Concept Analysis

Differentiate between metals(left), metalloids(bolded) and nonmetal(right) by coloring each sections with colors of your choice.



Label the following elements as a metal, non-metal, or metalloid

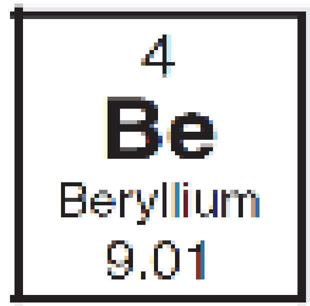
C_________________ Pd_____________ Xe_____________ Mg___________________

H_________________ Si______________ Bi______________ Es__________________

O_________________ Na_____________ Ne______________ B_________________

Concept Analysis: Information on the Periodic Table

1. How is each element represented on the periodic table?

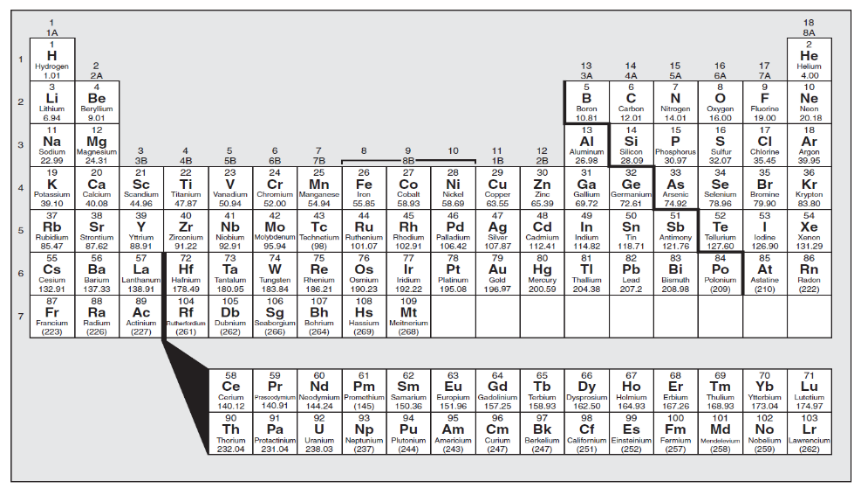


2. Using the diagram on the note page, label the parts of the element :

3. State what columns on the periodic table called and identify how many of them there are.

4. State what rows on the periodic table called and identify how many of them there are?

5. In the diagram able, identify and highlight the zigzag line. State another name for the zigzag. Label it on the diagram above.



6. Describe where the metalloids found and how many of them there are.

7. Describe where metals are found on the periodic table.

8. Describe where nonmetals are located on the periodic table.

The Particle Theory of Matter

Look around your classroom. In most classrooms we will find desks, tables, books, paper, pencils, book bags, students, and teachers. Although they all look very different, all of these things have something in common. They are all made of **matter**! What is matter? What is matter made of? How can we classify and describe it? What are its properties? Let's answer these questions by investigating the basic nature of matter!

Since ancient times, men have been studying and questioning the world of matter around them. Over two thousand years ago, a Greek philosopher by the name of Democritus put forth a theory about matter. A **theory** is a statement developed to explain observations of our natural world. His theory proposed that all substances were composed, or made, of very small **particles** that are too small to be seen by the human eye. He called these particles *atomos*.

Since Democritus' time, scientists have continued to study matter. Today we define matter as anything that has **mass** and **volume**. Mass is the amount of matter in a substance. Volume is the amount of space the substance occupies. The tiny particles that create the mass of a substance and cause it to take up space are now called **atoms**. Scientists use the kinetic or **particle theory of matter** to help explain the properties and characteristics of different substances on Earth. This **theory** can be summarized in the following statements:

1. All matter is made up of extremely small particles.
2. All particles of one substance are the same. Different substances contain different particles.
3. These particles are always moving. They rotate, vibrate, or travel in straight lines. When energy, like heat, is added to these particles, they move faster.
4. There are spaces between the particles. When energy is added, particles tend to move farther apart.
5. The particles in a substance attract one another. The slower particles move, the stronger their attraction to each other. The stronger the attraction, the closer together the particles become.

Matter Concept Analysis

<u>Directions</u>: Answer and justify each question. Justify your answer by indicating the paragraph that supports your answer.

The Particle Theory of Matter Analysis Questions	**Justifications**
1. What do most things around us have in common?	1.
2. What is a theory?	2.
3. What do scientists use to help explain the properties and characteristics of matter on Earth?	3.
4. Describe the movement of the particles.	4.
The Phases of Matter Analysis Questions	**Justifications**
1. What are the four phases of matter? How are they different?	1.
2. Describe the effect of movement of particles in a solid on their attraction.	2.
3. Describe the effect of movement on particles in a liquid on their attraction.	3.
4. What is one unique way gases are different from solids and liquids?	4.

The Phases of Matter

Matter can be a **solid**, **liquid**, **gas**, or **plasma**. Each of these phases has different properties. Let's use our knowledge of the particle theory of matter to describe and understand the properties of the **phases of matter**.

As we have learned, all matter is composed of tiny particles or **atoms** that are attracted to each other and are in constant motion. In a **solid,** these particles move so slowly they cannot overcome their strong attraction. This attraction causes them to be packed tightly together. They are so close together, they can only vibrate in place. As a result, **solids have a definite shape and volume**.

The particles in a **liquid** move quickly enough to overcome some of their attraction to each other. Unlike the vibrating particles of a solid, the particles of a liquid are able to slide past each other. As a result, **liquids do not have a definite shape and will flow and take the shape of the container** in which they are placed.

A **gas** consists of particles that are widely spread out and are moving around very rapidly. Gas is the only phase of matter that is highly compressible. Although a **gas does not have a definite shape and will flow and expand** (like the air we breathe), **gas particles can be compressed** (like a helium tank) **and will take the shape of its container** (like a balloon).

Another phase of matter is **plasma**. Plasma makes up 99% of the universe including the stars. Plasma is not common on Earth although it does appear in fluorescent and neon lights. **Plasma does not have definite shape or volume.** It is similar to gases and liquids in that it flows; however, plasma has some unique qualities. Its' ability to break electrons away from atoms is one way plasma is different from liquids, solids, and gases.

Changes from one phase to another are caused by adding or taking away energy, such as heat for example. When thermal (heat) energy is added to a substance, the particles in that substance begin to move faster, lose their attraction to each other, and space themselves farther and farther apart. When the energy is removed, the particles slow down, become more attracted to each other, and move closer and closer together.

Particle Theory

1. Solids are hard and cannot be squashed (compressed). They are heavy. They cannot flow so stay as one shape.

I think that the particles in a solid are arranged like this:

The particles in a solid are actually arranged like this:

2. Liquids can flow. Their shape can change. Liquids cannot be compressed.

I think that the particles in a liquid are arranged like this:

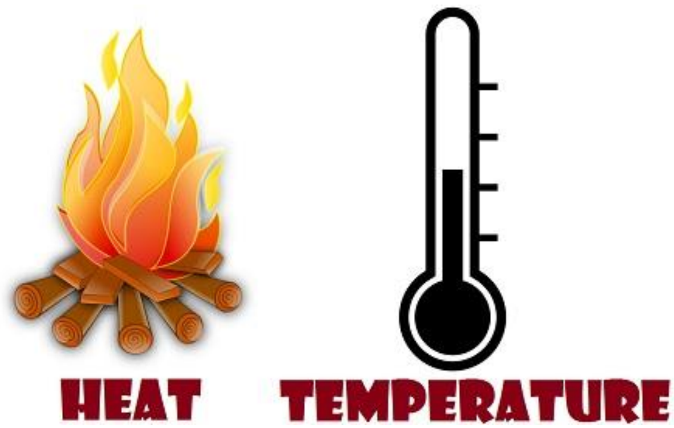
The particles in a liquid are actually arranged like this:

3. Gases take up a lot of space. They are light and can move about. They can be compressed

I think that the particles in a gas are arranged like this:

The particles in a gas are actually arranged like this:

Heat and Temperature



The concept of heat and temperature are studied together in science, which is somewhat related but not alike. The terms are very common, due to their wide usage in our day to day life. There exist a fine line which demarcates heat from temperature, in the sense that **heat** is thought of, as a form of energy, but the **temperature** is a measure of energy.

The fundamental difference between heat and temperature is slight but significant, heat is the overall energy of the molecular motion, whereas temperature is the average energy of the molecular motion. So, let's take a look at the article given below, in which we have simplified the two for you.

Definition of Heat

The heat of an object is the aggregate energy of all molecular movement inside the object. A form of energy that is transmitted from one object or source to another due to the differences in their temperature. It moves from a hotter object to the cooler one. Its measurement can be done in energy units, i.e. calorie or joules. The transfer of heat can take place in three ways, which are –

- **Conduction**: Heat transfer between molecules which are in direct contact with each other, without the movement of particles.
- **Convection**: The transfer of heat that takes place due to the movement of particles from one place to another is convection.
- **Radiation**: When the heat is transferred through a medium or vacuum, wherein space in between, is not heated up.

Definition of Temperature

Temperature is defined as the average kinetic energy of all molecules together, i.e. average energy of all the particles in an object. As an average measurement, the temperature of a substance does not rely on its size (number of particles) and type. It identifies how hot or cold an object is, in degrees. It also measures, the speed of atoms and molecules of the substance.

It can be measured in various scales, which are – Kelvin, Celsius and Fahrenheit. The thermometer is used to gauge the temperature of the object.

Key Differences Between Heat and Temperature

The differences between heat and temperature can be drawn clearly on the following grounds:

1. Heat is nothing but the amount of energy in a body. As against this, temperature is something that measures the intensity of heat.
2. Heat measures both kinetic and potential energy contained by molecules in an object. On the other hand, temperature measures average kinetic energy of molecules in substance.
3. The main feature of heat is that it travels from hotter region to cooler region. Unlike temperature, which rises when heated and falls when cooled.
4. Heat possesses the ability to work, but the temperature is used exclusively to gauge the extent of heat.
5. The standard unit of measurement of heat is Joules, while that of temperature is Kelvin, but it can also be measured in Celsius and Fahrenheit.
6. Calorimeter is a device, which is used to measure the heat. On the other hand, temperature can be measured by thermometer.
7. Heat is represented by ‘Q’ whereas ‘T’ is used to represent temperature.

Conclusion

Both heat and temperature are the concepts of thermodynamics; that works together to let the energy flow from hotter body to the cooler body. While heat depends on the number of particles in an object, temperature does not depend on a number of particles in an object because it is an average measurement.

Concept Analysis: Comparison Chart

Basis for Comparison	Heat	Temperature
Meaning		
Measures		
Property		
Working ability		
Unit of measurement		
Device		
Labelled as		

SOL PS.6 PART 2

Force, Motion, Energy, & Matter

Energy Transformations

We can find energy everywhere. Energy can be found in the wind and in the ground. We can find it in our bodies and in our movement. It can also be found in falling rain.

We get most of the energy on Earth from the Sun. The Sun is our nearest star. We get energy from the Sun in the form of heat and light. Some of this energy can be seen by us in the form of light. Some of this energy is difficult for us to see directly. This energy reaches Earth, and plants use it to make food. It also warms the land and oceans and helps to start the water cycle.

Uses of Energy Force, Motion, and Energy

Energy cannot be created or destroyed. We say that it transforms from one type to another. This means that energy is always changing. This is called the law of conservation of energy. Conservation means that it does not disappear but just changes. Therefore, energy can do many things because it is always changing.

Sometimes we think that energy disappears. Think about sound energy for a moment. When you stand close to a bell and it rings, the bell sounds very loud. If you move away from the bell, the sound gets quieter. If you move even farther away, you will not hear the bell at all. What do you think has happened to the sound energy? Has it disappeared or has it changed? If you think about it, it changed from sound to heat energy. Sound energy did not disappear or get lost.

Humans have been able to harness energy changes. This makes it possible to do many things. Take electric light, for example. Electric energy first flows into the filament of a light bulb. There, it changes from electric energy to light energy. How does this happen? When electrical energy flows into the light bulb, the filament turns very hot. This makes the filament glow and turn into heat and light energy. The light brightens the room. When this happens, the energy also heats the air and objects around it. Light energy has now changed into heat energy.

During photosynthesis, plants use the Sun's energy to make food. The energy from the Sun becomes chemical energy inside plants, such as vegetables. Then, when you eat the vegetables, the chemical energy changes to kinetic energy that you use to help you move. So, energy is also transformed inside plants and inside your own body.

Energy is all around you. It will never disappear, only change forms.

Concept Analysis: Energy Transformation

1**. (Thursday)** Identify at least 3 examples of the following forms of energy in the diagram:

Heat____

Light ____

Chemical ____

Electrical ____

Sound ____

2. (Friday) Select three energy transformations to describe. Include a description of the event and the energy transformations that occur. For example: the fire in the fireplace; chemical energy in the wood is converted to thermal energy and radiant energy [you cannot use this example]

Example 1: ____

Example 2: ____

Example 3: ____

3. Explain the Law of Conservation of Energy using the diagram above. ________________________________

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