Chapter 12 Section 1: What is Energy?

Energy is the ability to do work. In order for **work** to be done and object must move because of the force being applied to it.

Kinetic energy is the energy of **motion**. When and object moves, it has kinetic energy. $KE = mv^2/2$ where ***m*** is **mass** and ***v*** is **velocity**.

Potential energy is the energy that an object has because of its **position** or shape. **Elastic potential energy** is when the work done on the object is used to stretch that object. **Gravitational potential energy** is when the work done on the object lifts the object to an increased height. ***GPE=wh*** where ***w*** is **weight** and ***h*** is **height**.

Mechanical energy is the total energy of motion (KE) and position (PE). Another way of stating this is by the formula **ME=KE+PE.** If kinetic energy increases, then potential energy must decrease by the same amount and if kinetic energy decreases then the potential energy must increase by the same amount, so that mechanical energy remains unchanged.

Energy can exist in a number of forms. **Thermal energy** is the kinetic energy because of the **random motion** of all the particles that make up the object. **Chemical energy** is a form of potential energy because it depends on the position of atoms in a compound (chemical bonds). **Elec**trical energy is the energy of moving **elect**rons. **Sound energy** is because of an object that is vibrating and transmits those vibrations to the air which can transmit the energy to your ear. **Light energy** is produced from electrically charged particles that are vibrating. **Nuclear energy** is the energy that comes from the changes that occur in the tiny nucleus of an atom. **Nuclear fission** occurs when the nucleus of an atom is torn apart (Sequoya Nuclear Power Plant) and **nuclear fusion** occurs when the nucleus is combines with the nucleus of another atom (Sun).

1. Energy is the ability to do _____.
2. Kinetic energy is due to an object's _____.
3. Potential energy is due to an object's _____.
4. Mechanical energy is the _____ energy due to an object's _____ and _____, which can also be stated as ME=_____+_____.
5. Gravitational Potential Energy is dependent on _____ and height. **Clue**: *GPE=wh*.
6. Name six other forms of energy:
   _____
   _____
7. Chemical energy is due to the arrangement of atoms also known as _____.
8. Nuclear energy is from the changes that occur in the _____ of an atom. Tearing apart the nucleus is called _____ and combing two nuclei is called _____.
9. Electrical energy is the energy from moving _____.

Chapter 12 Section 2: Energy Conversions

Energy conversions occur because energy cannot be created or destroyed, but can be changes from one form into another. This is known as the **Law of Conservation of Energy.** A good example of this is the changes that we see in a pendulum. As the pendulum is pulled to a greater height, then energy is stored as gravitational potential energy. As the pendulum swings down, its velocity increases which also increases it kinetic energy. As the pendulum swings through and reaches maximum height again and momentarily stops, then it again reaches maximum GPE and no KE. Remember when h=0 there is no GPE and when velocity =0 there is no KE. **Elastic Potential Energy** is when the energy being used to stretch an object (rubber band) is stored in the object (stretched rubber band). When the rubber band returns to its original shape the potential energy is released as kinetic energy.

1. What does energy conversion mean?
   _____
   _____
2. _____ can be stored by stretching a rubber band. How do you release the stored energy? _____.
3. Plants get _____ energy from the Sun.
4. In plants, photosynthesis converts _____ energy into _____ energy.
5. As a pendulum is lifted upward it gains _____and as it falls downward, the gravitational potential energy is converted into _____.

Chapter 12 Section 3: Conservation of Energy

Friction is the force that opposes motion between two surfaces that are touching. Friction causes some of the potential energy to change into thermal and sound energy. Some potential energy is always converted into thermal energy.

Energy is conserved inside a **closed system**, where only certain objects transfer energy to each other. Remember the **law of conservation of energy.** Energy cannot be created or destroyed, but can be

converted from one form into another form. This is a **law**, because no exception has ever been observed.

1. The law of conservation of energy states
   _____
2. What energy conversions take place in a roller coaster?_____
   _____

Electric field, electric force, Electric Charge, attract, repel

The Law of _____ _____ states that like charges _____ and opposite charges _____. When charged, objects can exert an _____ _____. This force will be exerted in the regions around the object known as the _____ _____.

Electroscope, induction, conduction, friction, move

5. Because atoms have equal numbers of electrons and protons, they are neutral. If electrons are lost or gained, then an object becomes charged. Objects can become charged by _____, _____ or _____. _____ happens when electrons are "wiped or rubbed" from one object on to another object. _____ happens when electrons move from one object to another through "direct contact". _____ happens when charges are rearranged "without direct contact". Charges cannot be created or destroyed, but charges can _____ from one object to another. An _____ is a tool that can be used to detect charge.

Static, static discharge, insulators, conductors

Charges move easily in electrical _____, but do not move easily in electrical

_____. _____electricity is a charge that is at rest in an object, but when the charge does move off of the object this is called _____ _____.

An **electric circuit** is where electrical charges travel in a loop. Circuits begin and end in the same place. If the circuit is unconnected then it is **"open"** and if the circuit is connected then it is **"closed".** All simple circuits need **three basic parts: 1. an energy source, 2. wires and 3. a load.** An **energy source** provides the source of electrical charge. The **wires** allow for the transfer of the electric charge and the **load** allows the electrical energy to be converted into other forms of energy such as light, heat, mechanical and others.

Name and define the three parts of a circuit:

1._____:_____

2._____:_____

3._____:_____

4. Circuits consist of an _____ source, a _____ and _____.

5. A load _____ energy from one _____ of energy into another form of _____ .

Switches allow us to turn circuits on ("closed") and off ("open").

6.When you turn on the lights, is the circuit "open" or "closed"? _____

7. How are circuits open and closed? _____

8.If a switch is closed, then do charges flow through the circuit? _____

Series circuits are circuits where the pathway of electrical charge is a single loop. In your home or other building you need a parallel circuit so that you can use any appliance any time without all the other appliances are on at the same time. In **parallel circuits,** electrical charges can travel in more than one pathway, because the loops are connected side by side so that each loop is parallel to another loop. The loads are connected side by side instead of in a series. Therefore, even if your lamp is off or your bulb is burned out and the circuit is left open, other appliances will continue to work.

9.Are charges used up in a circuit or are they converted into other forms of energy? _____How do you know this? _____ _____

10.How are loads connected in a series circuit? _____

12.All parts of a series circuit are connected in a single _____ .

13.How are loads connected in a parallel circuit? _____

14.What is an example of a good use for a parallel circuit?_____

15.The loads for a parallel circuit are on _____ branches of connected loops that are side by side.