**Energy and Work**

**http://www.eschooltoday.com/energy/kinds-of-energy/all-about-energy.html**

Please use the information contained in the www.eschooltoday.com website on Energy to develop answers to the following.

Click on the “Mechanical Energy” tab. As you read about mechanical energy, you will notice the word “Work” written in bold red letters. What is the meaning of the term “work” as it is used in science?

Now that you know what work is, explain what scientists mean when they describe energy as “the ability to do work”.

Now click on the “Kinetic Energy” tab. Read the first paragraph, and then describe what Kinetic Energy is.

How can an object that has kinetic energy “do work”?

What properties of an object are needed to determine its kinetic energy?

Further down the page you find the terms “potential energy” and “gravitational energy”. In your own words, explain what potential energy is.

What must be present in order for an object to have “Gravitational” potential energy?

Let's figure out how much work you do every time that you walk up the stairs from the first floor to the second floor! First step-- determine your weight, in Newtons (Instead of pounds, Newtons is the unit used by scientists to describe weight).

Your Weight in Pounds = \_\_\_\_\_\_\_\_\_\_\_\_

Your weight in Newtons is (weight in pounds) x 4.45 = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Newtons

Next, determine the HEIGHT of the stairs that you climb to get to the second floor from the first floor. Work with your partners to figure this out. What units do you need to express the height in (hint: not inches or feet)?

Height of stairs \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (meters)

If you climb the stairs at a constant speed, the size of the force that you must exert on the stairs as you move upwards is actually just your weight (the gravitational force that the Earth exerts on you).

Use your weight (in Newtons) and the height of the stairs (in meters) to find the total work that you do every time that you climb up the stairs to the second floor. Work is found by multiplying Force times the distance that the force is applied.

**Work = Force x “distance that force is applied”**

Work that you do walking up the stairs is found by multiplying the force that your legs exert (your weight) times the height that you climbed.

Work = (your weight) x (height of stairs)

Work done = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Joules

(Joules are units of energy used by scientists)

**Thermal Energy**

Click on the “Thermal” tab on the eschooltoday energy website. What word do we commonly use in daily conversations that means “thermal energy”?

The objects that we interact with in our lives are all made up of atoms and molecules. Do the atoms and molecules in the substances around us tend to be motionless, or are they in motion? Describe in the space below.

A thermometer is used to measure “temperature”. What is actually being measured when the temperature of an object is being taken?

Describe what happens on the scale of atoms and molecules when ice is added to a glass of water. How does the ice actually make the water colder?

Are temperature and heat the same thing, or are they different? \_\_\_\_\_\_\_\_ Clearly explain your answer.

Why does it take longer to make a large pot of water come to a boil than a small pot of water?

**How is Heat (Thermal Energy) transferred between objects?**

Click on the “**Conduction**” link at the bottom of the “Thermal Energy” webpage. Read through the description of conduction, and run the short interactive video. When you are done, please answer the following question:

When you accidently brush your hand against a hot pan on a stove, you can burn your hand. Describe, on the scale of atoms and molecules, how energy is transferred from the pan to your hand. A picture will be helpful.

Next, click on the “**Convection**” link and read about convection. Convection is actually a topic that we have already studied this year, except that we didn’t use the term convection to describe what was happening.

Describe the process of heat transfer by convection. Clearly describe how density plays a role in convection.

What are two different examples of naturally occurring heat convection that we have explored this year?

Now, click on the “**Radiation**” link and read about heat transfer by radiation. It talks about “infrared radiation” that is emitted by cooling objects. This is a very cool, and very important topic in science. Let’s learn more about light energy and electromagnetic waves!

**Vibrations and Waves**

We are beginning a new topic of study this week, and as part of that study we’ll be examining waves.  Waves are pretty cool--they allow the universe to transfer energy from one location to another, without having to move matter along in the process. Waves are also fun to look at, and to play with.  Today, you will be teaching yourselves some of the important background information that we will need in order to fully grasp the behavior of waves.

The resources that you will need for this activity are all located online. Go to the wave website

<http://www.pbslearningmedia.org/asset/lsps07_int_waves/>

and read through the three pages “What is a Wave”. Answer the following questions:

How do scientists define what a wave is?

What is a wave “medium”?

How does the density of a medium affect the waves that travel through it?

What is a “periodic wave”?

Now, let’s learn more about the characteristics of waves. Go to

<http://zonalandeducation.com/mstm/physics/waves/waves.html>

and work through the demonstrations in the sections entitled *Introduction*, *Parts of a Wave*, *Transverse and Longitudinal Waves, and Doppler Effect*.

In the space below, draw a picture of a wave and identify/label the following parts of the wave:

Crest

Trough

Amplitude

Wavelength

What is a wave’s “frequency”?

In the space below, show the difference between a transverse wave and a longitudinal wave.

A wave is said to carry energy, but not matter. Make a sketch below that shows how a water wave moves a boat up and down, while transporting energy in a different direction. Be sure to show that the wave ends up in a different place from where it started.