Name

____________________________

School

____________________________
### Biomass

Biomass is **in a process called photosynthesis.** The major uses of biomass are **any organic matter (anything that was once alive) that can be used as an energy source.** Biomass gets its energy from the sun. Plants absorb sunlight **biofuels, crops, garbage and landfill gas.** Burning biomass can **electricity, transportation and heating.** Most biomass energy comes from wood. Other biomass sources include **cause air pollution.**

### Coal

Coal, a fossil fuel, was formed millions of years ago when **surface mining and underground mining.** Coal companies use two methods to mine coal: **trains and barges.** Most of the coal mined today is used **plants died and were covered with layers of soil and rock.** Coal is transported by **to generate electricity.** A disadvantage of burning coal is it **causes air pollution.**

### Geothermal

Geothermal plants generate almost no emissions **which may change the habitat and disrupt wildlife and fish.** Some of the visible features of geothermal energy are heating and producing electricity. **Niagara Falls.** Most geothermal activity occurs around the Pacific Ocean because they do not burn fuel to generate electricity. **to generate electricity in the United States.** Geothermal energy comes from heat within the earth’s core. **electricity.** People around the world use geothermal energy for Moving water turns a turbine to generate **it is replenished by snow and rainfall.**

### Hydropower

Hydropower is a renewable energy source because **which may change the habitat and disrupt wildlife and fish.** Some hydropower plants need to build a dam and reservoir **Niagara Falls.** Because they do not burn fuel to generate electricity. **to generate electricity in the United States.** Volcanoes, hot springs, and geysers. **electricity.** The first hydroelectric power plant was built in 1879 at **it is replenished by snow and rainfall.** Moving water turns a turbine to generate **it is replenished by snow and rainfall.**
### Natural Gas

- **The main ingredient in natural gas, which is colorless and odorless, is:**
  - methane.
- **Natural gas is transported by:**
  - pipelines.
- **Mercaptan, which smells like rotten eggs:**
  - generating electricity, heating and transportation.
- **Natural gas is the cleanest burning fossil fuel.**
- **Natural gas is used for:**
  - is added for safety so you can identify a gas leak.

### Petroleum

- **Petroleum is also called:**
  - crude oil or oil.
- **A refinery is a factory that processes:**
  - The major use of petroleum is transportation.
- **The use of petroleum products are other useful products made from petroleum.**
- **May cause water and air pollution.**
- **The use of petroleum into products we can use like gasoline.**

### Propane

- **Under normal conditions, propane is a gas. Under pressure:**
  - pressurized tanks.
- **In its natural state, propane is:**
  - it is portable, so it can be used in rural areas.
- **Propane is transported and stored in:**
  - heating, cooking and water heaters.
- **An advantage of propane is:**
  - colorless and odorless.
- **Homes use propane for:**
  - propane becomes a liquid.

### Solar

- **Advantage of solar energy are:**
  - it is free, clean and renewable.
- **A photovoltaic (solar) cell:**
  - light, heat and electricity.
- **People use solar energy for:**
  - in the form of radiant energy.
- **A disadvantage of solar energy is:**
  - that it is not available all hours of the day.
- **Sunlight travels to the earth:**
  - absorbs sunlight and transforms it into electrical energy.
### Energy Sources Boards

#### Nuclear
- In nuclear fission,
- Nuclear power plants produce no air pollution,
- Uranium 235
- Nuclear energy is energy in the nucleus (core) of the atom.
- Nuclear fission was first used in World War 2. Today, it is used for generating electricity.
- But their waste is highly radioactive.

#### Wind
- The major use of wind is to generate electricity.
- A wind turbine
- A wind farm is because it does not burn fuel and cause air pollution.
- Wind is produced by the uneven heating of the earth’s surface.
- Wind energy is clean and renewable because it transforms mechanical energy into electrical energy.
- A cluster of wind turbines used to generate electricity.

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**Renewable** energy sources are replenished in a short period of time.

- **Wind** is energy from moving air.
- **Geothermal** energy is heat from within the earth.
- **Hydropower** is energy that comes from the force of moving water.
- **Solar** energy is energy from the sun.
- **Biomass** is any organic matter (anything that was once alive) that can be used as an energy source such as wood, crops, and yard waste.

**Nonrenewable** energy sources are limited since it takes a very long time to replenish

- **Coal** is a solid, black fossil fuel formed from the remains of plants that lived and died millions of years ago.
- **Natural gas** is a colorless, odorless fossil fuel made mostly of methane.
- **Petroleum** is a fossil fuel that looks like a black liquid. It is also known as crude oil.
- **Propane** is a fossil fuel refined from natural gas and petroleum.
- **Uranium** is the fuel used by most nuclear power plants. During nuclear fission, atoms are split apart to form smaller atoms, which releases energy.
Snap Circuits

Build Project 1:

When the circuit is closed, the light is:

ON    OFF

Build Project 2:

Circle all the forms of energy in this circuit:

Chemical  Electrical  Mechanical
Nuclear    Radiant    Thermal

Build Project 5:

In a series circuit the electrical components are on a single path.

How does the light appear?

BRIGHTER    DIMMER

Build Project 6:

In a parallel circuit the electrical components are on more than one path.

Trace the possible paths with your finger.

How many possible paths for electricity are there?

ONE    TWO    THREE

Build Project 11:

Describe what happens with this circuit:

For each project, circle the correct answer or answers.
Sound Waves
1. What two things are necessary for a sound to be made?
   
2. Sound vibrations travel best through ________ materials.

Sound Pitch
1. The frequency of a sound wave is called its ______________.
2. As a string or air column gets shorter, its pitch becomes ____________.

Watts Up

<table>
<thead>
<tr>
<th>Appliance</th>
<th>Watt Meter Reading (watts)</th>
<th>Rank #1-lowest watts</th>
<th>Rank #8-highest watts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incandescent Bulb</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hairdryer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LED Christmas Lights</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CFL Bulb</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Radio (low volume)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incandescent Christmas Lights</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LED Bulb</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fan</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Thermal Energy
1. Thermal energy (heat) always flows from ________ to ________ until equal.
2. Name one good insulator for your home:

Energy Forms
1. Which form of energy is a girl riding her bike ____________?
2. Which form of energy is the light from the sun? _______________
Energy Explorations

Thermal Camera
1. A thermal image is a record of the amount of __________________ energy an object emits or reflects.

Light Refraction
1. The bending of light as it passes from one medium into another is called __________________.
2. A ____________ lens is the most useful type of lens and is found in many optical devices.

Balanced Forces
1. A __________________ is a push or pull in a direction.
2. When forces are ____________, there is no motion or change in speed or direction.

Light Reflection
1. Light bouncing off a surface is called __________  ____________.
2. Light travels in _____________ lines.

Forces & Motion
1. The motion of an object depends on _____________ & _____________.
2. What force pulls all things toward earth? __________________
ELECTRICITY INSULATORS AND CONDUCTORS

Electricity travels in closed loops, or circuits. It must have a complete path from the power source through the wires and back. Some materials allow electricity to travel easily. These materials are called conductors. Other materials prevent, or resist, the flow of electricity. These materials are called insulators.

Before using the Energy Baton, hypothesize whether each material will be an insulator or conductor by circling the word. Using the Energy Baton, form a closed circuit with your group. Then test each material as part of the circuit to determine if it is an insulator or conductor. Record your results on the right side of the chart.

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Your Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>insulator or conductor</td>
<td>straw</td>
</tr>
<tr>
<td>insulator or conductor</td>
<td>metal spoon</td>
</tr>
<tr>
<td>insulator or conductor</td>
<td>plastic spoon</td>
</tr>
<tr>
<td>insulator or conductor</td>
<td>fabric</td>
</tr>
<tr>
<td>insulator or conductor</td>
<td>cardboard/paper</td>
</tr>
<tr>
<td>insulator or conductor</td>
<td>aluminum foil</td>
</tr>
<tr>
<td>insulator or conductor</td>
<td>wood chopstick</td>
</tr>
<tr>
<td>insulator or conductor</td>
<td>rubber eraser</td>
</tr>
<tr>
<td>insulator or conductor</td>
<td>paper clip</td>
</tr>
</tbody>
</table>

The electric utility department is working on an electric pole in your neighborhood. The workers wear rubber sleeves, gloves and boots. Describe why.

You are swimming on a hot summer day. A thunderstorm approaches and the lifeguards make everyone get out of the water. Describe why.