



ENERGY

National Science Education Standard:

Physical Science Standards, K-4, Light, heat electricity, and magnetism.

NYS Science Standard:

Physical Setting Standard 4: Energy exists in many forms, and when these forms change, energy is conserved.

Objective:

Students will be able to name the six forms of energy, examples of each form, and examples of how energy is changed into different forms.

Students will be able to set up a simple circuit on their own and be able to name the different forms of energy present in the circuit.

Materials:

Energy WS #1, #2, and #3

(For each group of 2 students):

2 film canisters or other small containers

Alka-Seltzer Tablets

Water

2 balloons

Paper towels

Check for prior learning:

What is energy?

What uses/has energy?

Procedure:

1. Ask students their definition of energy to check for prior learning. Point to things like the sun outside, the light bulbs overhead, and to the students. Explain that they all have energy, but different kinds of energy. (Light and heat, light and electrical, chemical and mechanical). Let them know that one thing may have multiple types of energy.
2. Have the students clap their hands. Is it noisy? Explain that this is sound energy. Have the students rub their hands together for 20 seconds. Do they feel their hands getting hot? Explain that friction is causing heat energy.
3. Explain the six forms of energy. See if the students can give examples.
4. Explain to students that energy is never lost. It's always "**conserved.**"



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5. Show the students that energy can change forms, and when it does it is called a **“transformation.”** These transformations occur everyday and everywhere. Explain they

were using mechanical energy to clap and rub their hands together. Their mechanical energy transformed into sound and heat energy.

6. Have them work on the Energy Balloon! activity* in pairs.
7. Regroup and discuss what sorts of energies were used. Alka seltzer contains sodium bicarbonate (baking soda) and citric acid. When water is added the two mix and a chemical reaction occurs. The reaction produces carbon dioxide gas. The balloon fills up with the gas and the chemical energy is converted into mechanical energy.
8. For review have them work on Energy Worksheets 1, 2 and 3.

Check for Learning:

- Can students name all six forms of energy and what they mean?
- Can they explain what “conserved” energy means?
- Can they explain what “transformed” energy means? Can they give an example of a transformation (including the types of energies being transformed)?

Extension: Students can list all the forms of energy and energy transformations in their classroom or homes.

*Energy Balloon! activity adapted from: The Franklin Institute Online: <http://sln.fi.edu/tfi/activity/energy/ener-4.html>



ENERGY BALLONS!

1. Obtain Alka-Seltzer tablets ($\frac{1}{4}$ and $\frac{1}{2}$ tablets) from your teacher.
2. Blow into your balloons to stretch them out.
3. Fill a film canister $\frac{3}{4}$ full with water.
4. Pour the water from the film can into a balloon. Have a team member hold it, so the water doesn't spill out. If a little spills, that's okay.
5. Repeat steps #2 - #4 to fill up the second balloon.
6. Dry the film canister with paper towels.
7. Put the $\frac{1}{4}$ sized tablet into one film can and the $\frac{1}{2}$ sized tablet into the other canister.
8. Stretch one balloon over the top of each canister. Work together. The farther the balloon is stretched over the canister, the better it will hold. Keep canisters pointed away from eyes and faces!
9. Dump the water from each balloon into the can. Hold onto where the balloon and canister are attached.
10. Take turns holding the canister while your teammates draw the results.
11. Carefully, remove the balloon from the canister. Then, clean up.



Balloon with $\frac{1}{4}$ tablet	Balloon with $\frac{1}{2}$ tablet



Energy is the ability to do work

Energy can neither be created nor destroyed, but it can be changed into different forms of energy. This is energy transformation.

The six forms of energy are: chemical, mechanical, sound, electrical, light, and heat.

Chemical Energy: Chemical energy is a form of stored energy. It is formed when light from the sun causes plants to form complex compounds. When the bonds in these compounds are broken, energy is changed into a different form like light or heat energy. Examples of chemical energy include food, gasoline, oil, wood, and coal.

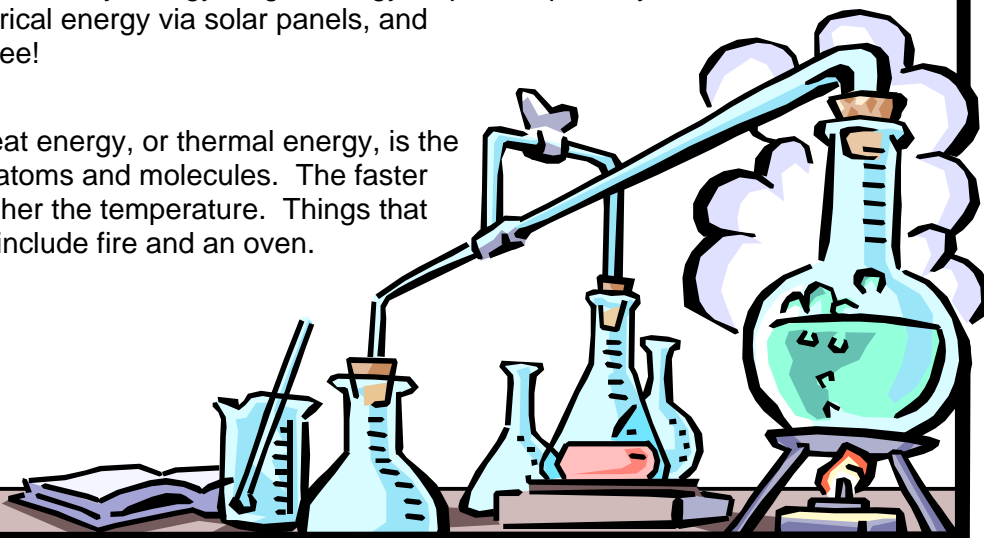
Mechanical Energy: Mechanical energy describes the energy of an object if it is moving, or if it has the *potential* to move. For example, a moving car and a car stopped on a hill both have mechanical energy. The moving car has kinetic energy (energy of motion), and the stopped car has potential energy because gravity can pull the car down the hill. Other examples of mechanical energy include a moving windmill, a person throwing a ball, and a book resting on a shelf.

Sound Energy: Sound energy happens as sounds vibrate against air molecules causing a wave effect. Our ear recognizes these different waves and hears different sounds. The telephone changes sound energy into electrical energy and then back into sound energy!

Electrical Energy: Electricity is energy from the movement of electrons from one atom to another. Power plants transform chemical, mechanical or other forms of energy to electrical energy.

Light Energy: Also called radiant energy, light is made up of electromagnetic waves, and these waves are what carry energy. Light energy helps with photosynthesis, can be changed into electrical energy via solar panels, and also allows us to see!

Heat Energy: Heat energy, or thermal energy, is the energy of moving atoms and molecules. The faster they move, the higher the temperature. Things that have heat energy include fire and an oven.





Answers to “Six Forms of Energy” Work Sheet

Chemical Energy: Food, Gasoline

Mechanical Energy: Moving bike, Moving car

Light Energy: Sun, Light bulb

Electrical Energy: Power Plant

Sound: Clapping, Doorbell

Heat Energy: Sun, Oven

***Note: Many things (like the sun) produce more than one form of energy. For example, a light bulb also produces some heat energy and an oven also produces some light energy. Also, it can be discussed which kinds of energy can produce these forms. For example, the mechanical energy of a moving car is produced using chemical energy (gasoline). Or an electrical doorbell can create sound energy.

Answers to “Transformations of Energy” Work Folder (Same as Energy Worksheet #2)

Food provides **chemical energy** and riding a bike transforms it to **mechanical energy**.

The sun provides **light energy** to help plants produce **chemical energy**.

The wind provides **mechanical energy**, which can be changed into **electrical energy**.

A battery is **chemical energy** that becomes **electrical energy** in a CD player. The CD player emits **sound energy**.

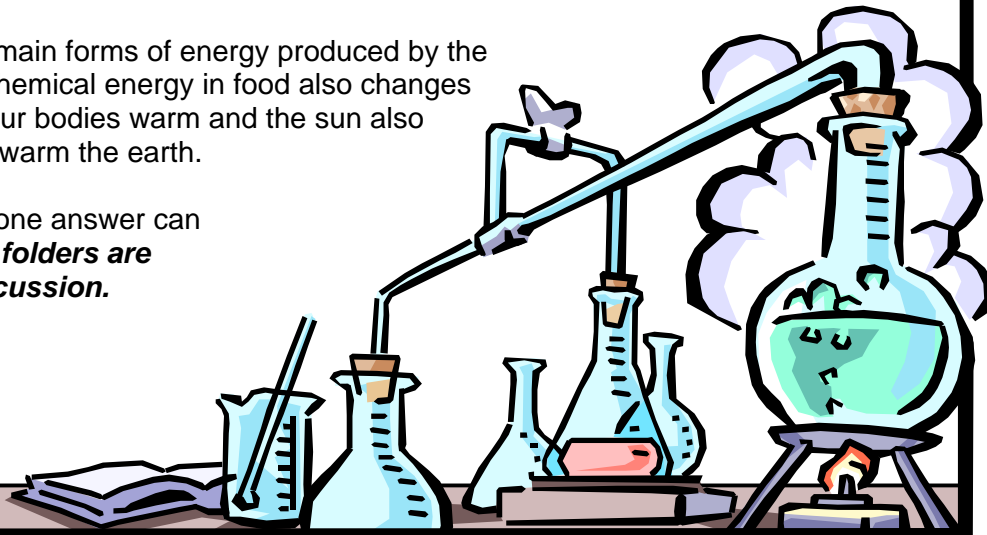
Electrical energy is transformed into **heat energy** in an oven.

Gasoline provides **chemical energy** to make a car move, which is **mechanical energy**.

Wood provides **chemical energy**, which changes to **light energy** and **heat energy** in a fire.

***Note: These are the main forms of energy produced by the objects. For example, chemical energy in food also changes to heat energy to keep our bodies warm and the sun also provides heat energy to warm the earth.

In summary, more than one answer can be correct. **These work folders are meant to promote discussion.**





ANSWER KEY

Energy Picture Worksheet #3 Answer Key

Transformations shown in picture:

1. A plane uses **chemical energy** from gasoline to fly (**mechanical energy**).
2. A person uses **chemical energy** from food to ride a bike (**mechanical energy**).
3. A car transforms **chemical energy** (gasoline), and/or **electrical energy** (battery in hybrid cars) to **mechanical energy**.
4. A man uses **mechanical energy** to ring the doorbell, producing **sound energy**.
5. The windmills turn **mechanical energy** from the wind into **electrical energy**.
6. The traffic signal turns **electrical energy** into **light energy**.
7. **Light energy** from the sun is transformed into **chemical energy** in the apple trees.
8. **Light energy** from the sun is transformed into **chemical energy** in the grass.
9. **Chemical energy** from the grass/apples is transformed into **mechanical energy** when the deer runs and jumps.
10. A lightening bolt's **electrical energy** transforms into **light energy** and **sound energy**.

***Other answers are possible

Possible energy transformations:

1. A person could transform **chemical energy** from eating an apple to **mechanical energy** (walking, running, biking etc.) or **heat energy**.
2. The gasoline (**chemical energy**) could be transformed to **mechanical energy**.
3. **Electrical energy** could be transformed to **light energy** in a light bulb.
4. **Electrical energy** could be transformed to **heat energy** in an electric oven.
5. The car (**mechanical energy**) could honk (**sound energy**) at the bicyclers.
6. **Light energy** could be transformed to **electrical energy** via solar panels.

***There are many more possible answers



New York State Standards which can be taught with this lesson:

4.1a	Energy exists in various forms: heat, electric, sound, chemical, mechanical, light.
4.1b	Energy can be transferred from one place to another.
4.1c	Some materials transfer energy better than others (heat and electricity).
4.1d	Energy and matter interact: water is evaporated by the Sun's heat; a bulb is lighted by means of electrical current; a musical instrument is played to produce sound; dark colors may absorb light, light colors may reflect light.
4.1e	Electricity travels in a closed circuit.
4.1f	Heat can be released in many ways, for example, by burning, rubbing (friction), or combining one substance with another.
4.1g	Interactions with forms of energy can be either helpful or harmful.
4.2a	Everyday events involve one form of energy being changed to another. <ul style="list-style-type: none">• animals convert food to heat and motion• the Sun's energy warms the air and water
4.2b	Humans utilize interactions between matter and energy. <ul style="list-style-type: none">• chemical to electrical, light, and heat: battery and bulb• electrical to sound (e.g., doorbell buzzer)• mechanical to sound (e.g., musical instruments, clapping)• light to electrical (e.g., solar powered calculator)