




Warm Up  **ENERGY**

Create a New Unit:     

In your Notebook, use 1 whole page and write:

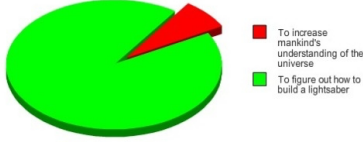
Physics Unit: ENERGY

Draw pictures of anything you can think of related to "Energy".



Energy and Energy Transfer


Why I Am Majoring in Physics




GraphJam.com

Energy



- > The ability to do work or cause change.
- > Work is the transfer of energy.
- > Energy is measured in Joules (J), the same unit as work.
- > If the transfer of energy is work...then power is the rate at which energy is transferred or the amount of energy transferred in a unit of time.



$$Power = \frac{Energy \text{ Transferred}}{Time}$$


2 Major Types of Energy

- Kinetic energy
 - "the energy of motion"
 - Comes from the Greek work "kinetos" which means "moving."
 - 2 factors that affect kinetic energy
 - > Mass
 - > Velocity
 - Kinetic energy increases if either mass or velocity increases.

Video ->

$$Kinetic _ energy = \frac{1}{2} \bullet Mass \bullet Velocity^2$$

2 Major Types of Energy




- Potential energy
 - > "energy of position"
 - > Gravitational potential energy
 - > Potential energy related to an object's height.
 - > Equal to the amount of work done to lift an object.

$$Work = Force \bullet Dist.$$

Affected by 2 factors

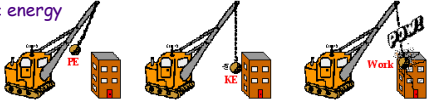
- Height of the object
- Weight of the object (Pull of gravity on object)

Work formula can be modified; substituting Weight of the object for Force, & height for distance object is moved.


$$Gravitational _ Potential _ Energy = Weight \bullet Height$$




- Mechanical energy
 - The form of energy associated with the position and motion of an object.
 - An object with mechanical energy can do work on another object.
 - The more mechanical energy an object has the more work it can do.
 - Combination of the potential energy and kinetic energy of the object.

Mechanical energy = Potential energy + Kinetic energy



The massive ball of a demolition machine possesses mechanical energy - the ability to do work. When held at a height it possesses mechanical energy in the form of potential energy. As it falls, it exhibits mechanical energy in the form of kinetic energy. As it strikes the structure to be demolished, it applies a force to displace the structure - i.e., it does work upon the structure.



Energy Key Terms- RT side

Energy: The ability to do work or cause change. Unit: Joules (J).

Work: The transfer of energy. Work is done when a force moves an object. Unit: Joules (J).

Power: The rate at which work is being done or energy is transferred. Unit: Watt (W) = 1 Joule per second (J/s)

Potential Energy: The energy of position that is affected by the height of the object and its weight (pull of gravity).

Kinetic Energy: The energy of motion that is affected by mass and velocity.

Mechanical Energy: A form of energy associated with the position and motion of an object. (Potential + Kinetic)

Left Side Output

Use the **Key Terms & Underlined words** from your notes to fill in your vocabulary chart. This should be on the LEFT side of your ISN.

Term	Definition	Your Words	Drawing

Bouncy Ball Energy Lab

How much energy does different types of bouncy balls have? Which one is the bounciest? Let's find out!

In your group, you will choose 3 types of bouncy balls to see which one has the most Gravitational potential energy.

1. First, you must know the mass of all 3 balls.
2. Then, you will calculate the GPE (Gravitational Potential Energy) of each ball at each height.
3. Finally- see how high the balls bounce!

You will be able to use a slow motion camera if you wish.

Roller Coaster Web Quest



Warm Up

1.) What is the difference between kinetic and potential energy?
 -kinetic energy is energy of motion; potential energy is stored energy

Click picture to review kinetic and potential energy



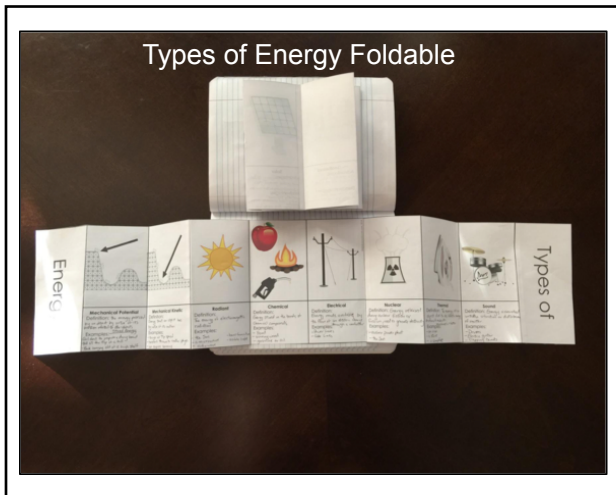
2.) What unit is energy measured in?
 -Joules (J)

3.) What is power?
 -the rate at which energy is transferred

Brain Pop: Forms of Energy



Watch the movie once, then watch it a second time while filling out the activity. After you finish, take the quiz.



- Other forms of energy
- Thermal energy
 - The energy a substance or system has related to its temperature
 - Ex.) fire, warmth from friction
- Electrical energy
 - The energy of electric charges (protons, electrons, neutrons)
 - Ex.) lightning, batteries, power-lines
- Chemical energy
 - Potential energy stored in the chemical bonds.
 - Ex.) Food, matches, cells

- Nuclear energy
 - Energy stored in the nucleus of an atom.
 - 1st Type: Nuclear fission
 - Reaction inside the nucleus of an atom in which the nucleus splits into smaller nuclei.
 - « Ex.) Nuclear power plants
 - 2nd Type: Nuclear fusion
 - Reaction inside the nucleus of an atom in which smaller nuclei fuse (join) together.
 - « Ex.) Surface of the sun.
- Radiant energy (Electromagnetic)
 - The energy of light and other forms of radiation.
 - Ex.) Light, Ultraviolet radiation, infrared radiation, microwaves, etc.
- Sound Energy
 - The energy of vibrating matter.
 - Ex.) Instruments, clapping hands.

- A. Mechanical energy (motion) → ↻
- B. Thermal energy (heat) 🔥
- C. Electrical energy ⚡
- D. Fluid power 🌀
- E. Chemical energy ⚗️
- F. Solar/light energy ☀️
- G. Nuclear energy ☢️
- H. Sound energy 🔊

Warm Up

1.) What type(s) of energy powers your cell phone?

- Chemical (Battery),
Electrical (Charger),
Nuclear (Sharon Harris Plant)

2.) What is "green energy"?

-Energy resources that are renewable, meaning they're naturally replenished, not used up like fossil fuels.

GREEN ENERGY POSTER PROJECT


- Work with your shoulder partner
- Use a sheet of copy paper
- Read the Rubric for what is required
- Use your electronic device to look up information
- Choose a Green Energy:

SOLAR	WIND	GEOTHERMAL	WOODY BIOMASS	LANDFILL GAS
ANAEROBIC DIGESTION	RECYCLED ENERGY	COAL MINE METHANE*	PYROLYSIS*	HYDROPOWER**

Warm Up

- 1.) Which type of energy is found in the nucleus of an atom? **-nuclear energy**
- 2.) What is energy transformation? **-a change from one form of energy to another**
- 3.) From heating up and chewing food, to digesting food, to playing a sport with energy gained from that food, what is the path of energy transformation? **-thermal energy --> mechanical energy --> chemical energy --> mechanical energy**

Energy transformation

- **A change from one form of energy to another.** 
 - > Ex.) potential → kinetic → potential Click picture for website -->
- Energy in a system may be transformed so that it resides in a different state.
- Energy in many states may be used to do many varieties of physical work.
- Energy may be used in natural processes or machines, or else to provide some service to society (such as heat, light, or motion).
 - > A machine that transforms energy from one form to another is called a transducer.

2 main transformation types

> Single energy transformations

- Energy is transformed from one energy type directly into a second energy type.

- Ex.) cell phone: electrical → electromagnetic
- Ex.) muscles/food: chemical → mechanical



> Multiple energy transformation

- Energy is transformed through a series of different energy types before ending in the desired energy type.

- Ex.) match: mechanical → thermal → chemical → electromagnetic
- Ex.) car engine: electrical → thermal → chemical → thermal → mechanical

One of the most common energy transformations is the transformation between potential & kinetic energy.

- Kinetic energy: energy of motion

- Potential energy: energy due to position or shape (no motion)

> Examples

- Waterfall

- Water at the top of the waterfall has gravitational potential energy, once the water begins to fall this energy is changed to kinetic energy.



- Juggling

- In the hand an object has gravitational potential energy, once the object is thrown is changed to kinetic energy. Once it lands it changes back to gravitational potential energy.



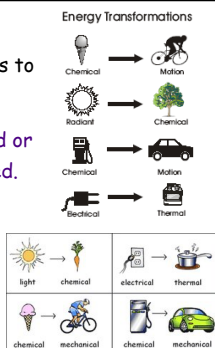
Law of Conservation of Energy

- Remember conserve in Science means to begin & end with the same amount.
- Therefore, energy cannot be created or destroyed, it can only be transformed.

> Ex: Energy & Friction

- Friction transforms mechanical energy into thermal energy.

- Whenever a moving object experiences friction, some of its kinetic energy is transformed into thermal energy.



Energy & Matter

- Matter is defined as anything that has mass and takes up space.
- Einstein discovered that there is an exception to the law of conservation of energy.

- > Energy can be created through the absolute destruction of matter however to destroy matter requires a substantial amount of energy & a substantial amount of energy is released (i.e., the atomic bomb).

> Revised Law of Conservation of Energy

- Matter and energy together cannot be created or destroyed just transformed.



ANSWER ON LEFT SIDE OF ISN

QUESTIONS:

1. What is an energy transformation?
2. What is an example of a service provided by energy?
3. What is the difference between single energy and multiple energy transformations?
4. Give an example of a multiple energy transformation.
5. Give an example of a potential energy transforming into kinetic energy.
6. State the Law of Conservation of Energy and give an example.
7. Why was this law eventually revised?

Glue RT Side

Energy Transformation Notes:

- Read through the notes
- Copy Main Ideas on the Left Side

Quiz Today!

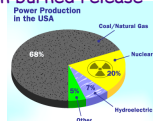
- Take the first few minutes of class to study/look over material.
- Any last questions?
- You need a pencil
- When finished, put tests in the folder. Then, read "Energy Sources" reading passage and answer questions. Keep until Monday.

Warm Up

- 1.) What is the most common type of energy transfer?
 - kinetic --> potential
- 2.) If a given scenario states that some energy was "lost" due to friction, was it truly lost?
 - No, it was transformed into another form (thermal)
- 3.) List the energy exchanges for the following scenario: *In Western states, many homes generate electricity from windmills. In a particular home, a young boy is using the electricity to run a toy electric train.*
 - mechanical --> electrical --> mechanical

Renewable and Nonrenewable Resources

- **Fossil Fuel**
 - A non-renewable resource that forms over millions of years from the remains of ancient plants and animals; when burned release chemical energy.
 - > Ex.) Coal → Plant material
 - > Ex.) Oil, Petroleum, Natural Gas → Animal material
- **Fossil fuels contain energy that originally came from the sun.**
 - > The sun is source of energy for most of Earth's processes.
 - > Nuclear fusion is the process by which nuclear energy is transformed into electromagnetic energy. This energy then travels to Earth where it is absorbed & stored inside of plants & animals.
- **Combustion**
 - > The process of burning a fuel to produce thermal energy.



Warm Up

- 1.) Where do fossil fuels come from?
 - plant and animal remains from millions of years ago
- 2.) What are renewable and nonrenewable resources?
 - renewable resources can be used over and over; nonrenewable sources get used up completely
- 3.) Why is there such a big push in society to use energy sources like solar, wind, and hydropower?
 - because we are running out of our natural nonrenewable resources