List what you know: Energy

1. Take pretest and energy misconceptions quiz
2. Turn to the next available page in your journal
3. Write the date:
4. Write the word **ENERGY** in large letters across the page, down the page or diagonally. Make it look nice, this is your Energy unit title page.
5. Draw pictures or write words that relate to types of energy, what you use it for, and what you think it is in smaller letters around the title page
6. Color the page for Homework tonight

Write what you know: Energy

- In one minute, list everything you know about energy, what you use it for and what you think it is. Give examples of kinds of energy and your definition of energy. Be prepared to share your answers.

Tell what you know: Energy

- In one minute, tell to the person next to you everything you know about energy, what you use it for and what you think it is. Give examples of kinds of energy and your definition of energy. Be prepared to share your answers.

Last group talking wins

OPENER

- Compare mindmaps and answers to problems on HW
- Define ENERGY - be prepared to share with class

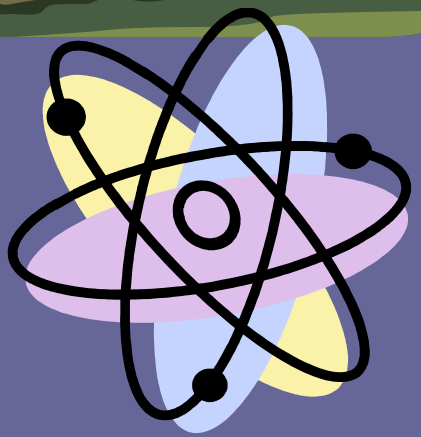
Objectives

1. Practice work problems
2. Define for energy, work
3. Discuss and take notes on Kinetic and Potential Energy

Define ENERGY in your journal

- Energy is an abstract concept like love or freedom and is difficult to define…

- Energy: Scientists define energy as the ability to exert a force, do work or cause change. (The ability to make things happen!)



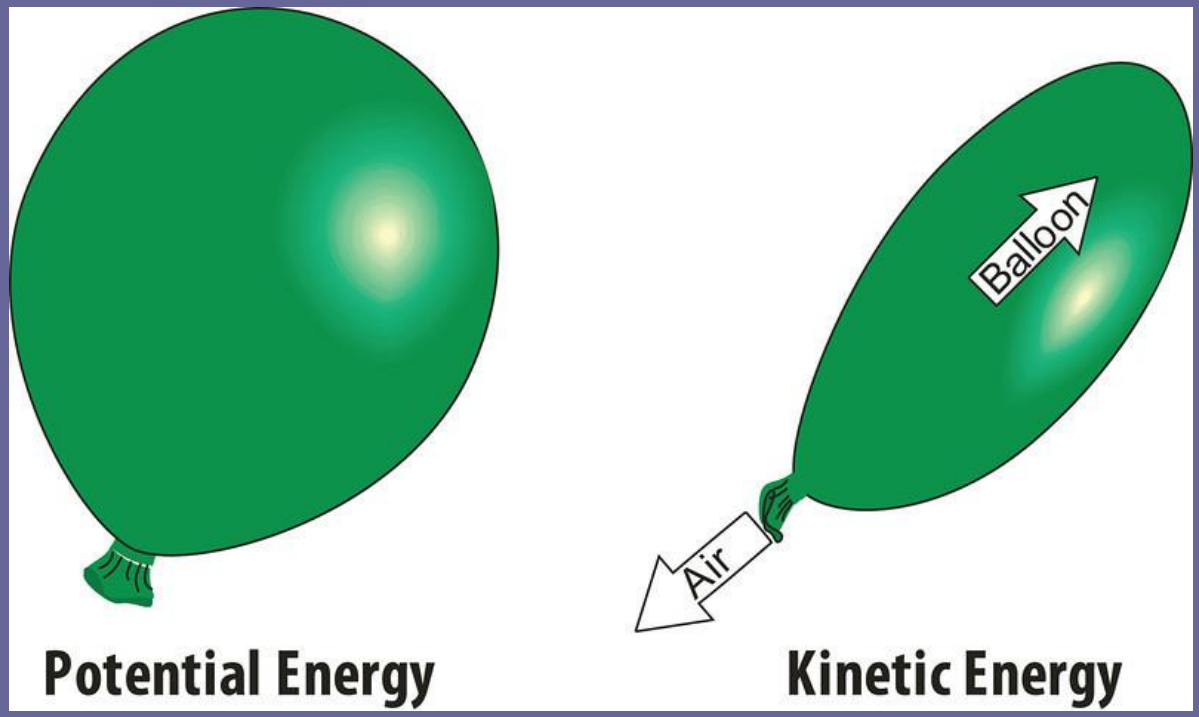
WORK – energy in action

- Work= force x distance
- W = fd
- When you exert a force and move an object over a distance, you have done work
- Work is measured in Nm or joules
- 1N x m = 1 Kgm/s2 x m = 1 kg m2/s2   = 1 Joule

Check Work HW

- **And** energy reading mind map

Kinetic and Potential Energy



- The two main categories of energy are kinetic and potential energy – KNOW THESE
- Kinetic Energy: energy of motion
- Potential Energy: stored energy

The first main category of types of energy: Kinetic Energy

- This is energy of motion.
- Kinetic energy is the motion of :
  - Waves
  - Electrons (negatively charged particles in atoms)
  - Atoms (the smallest component of an element having the chemical properties of the element)
  - Molecules (The smallest unit of a substance that has all of the physical and chemical properties of the substance)

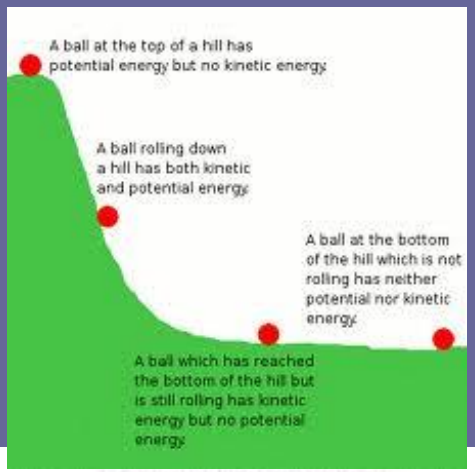
- Eureka – Kinetic Energy
- https://www.youtube.com/watch?v=39qa-

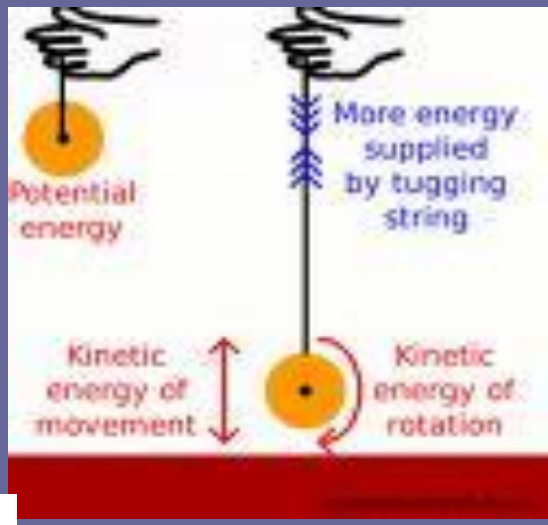
Potential Energy

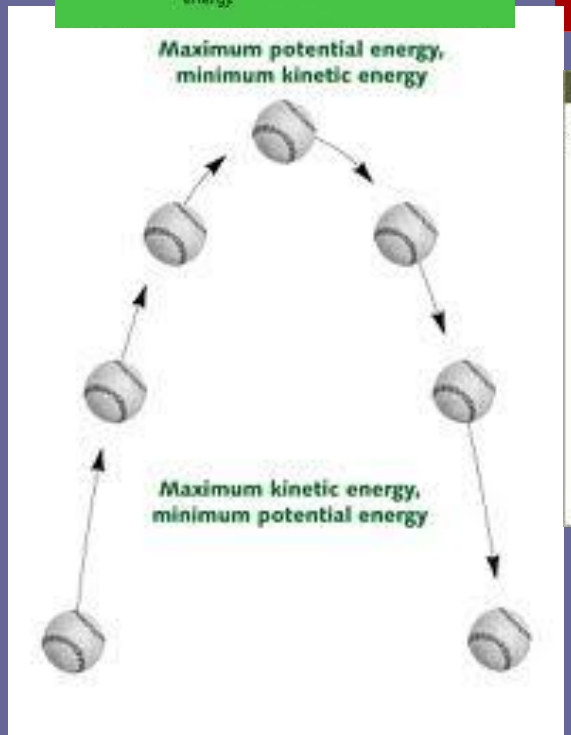
- This is stored energy that is capable of producing motion.

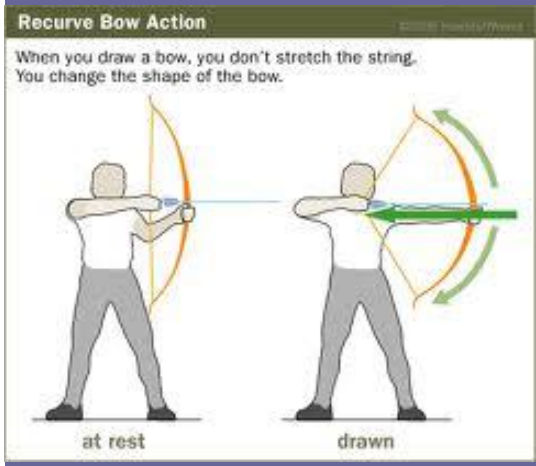
- Examples:

1. Meter stick + ball
2. Newton's Cradle





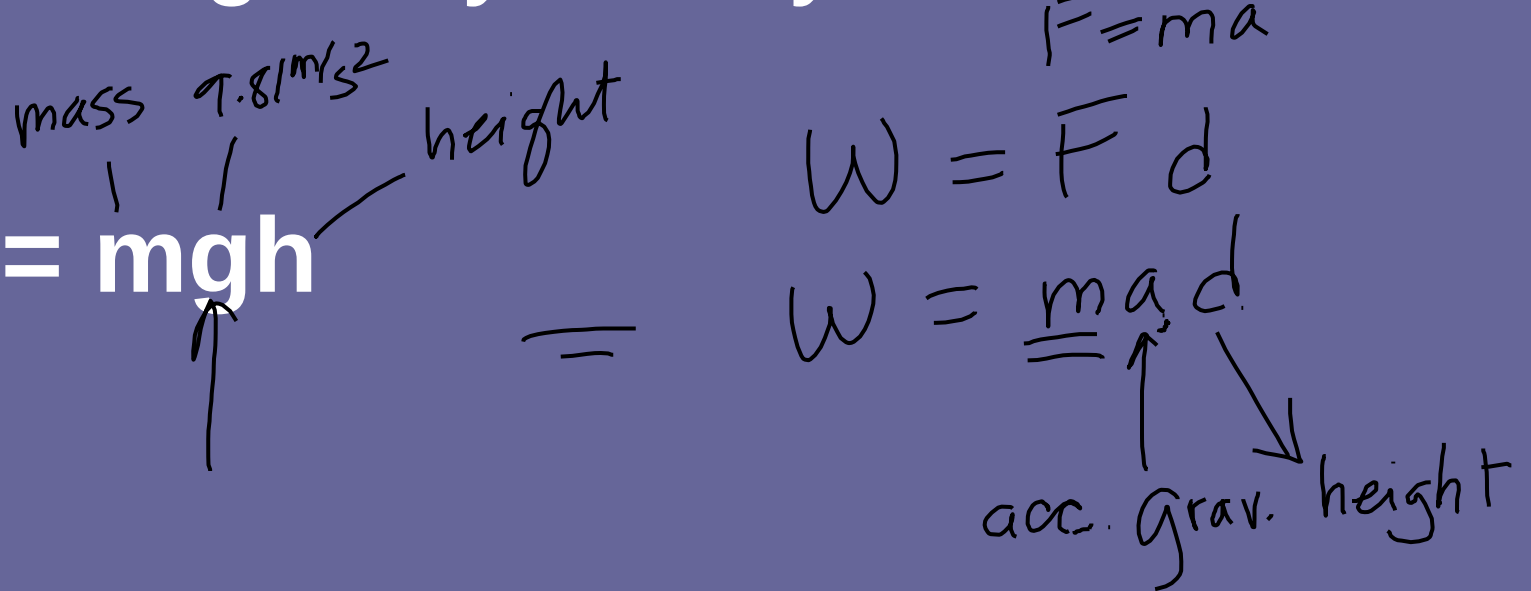




Eureka Potential and Kinetic Energy https://www.youtube.com/watch?v=EM7FjGzUCR4&list=PL07249EFA9038FDC1&index=7

Calculating PE

- You can calculate potential energy by calculating the work you did raising the object up against gravity – or you can use
- **PE = mgh**



Practice Problem

- Calculate the PE of the race car before it is released from the top of the track.

- PE = mgh
- PE =
- PE =

Happy Sad Ball Part I

- Do Prelab for HW

OPENER

- Calculate the work done on a superball if you lift it to a height of exactly 1 m.

- $W = Fd$

Review work, energy, KE, PE

- Work, KE and PE

- https://www.youtube.com/watch?v=EM7FjGzUCR4&list=PL07249EFA9038FDC1&index=7

LAW of CONSERVATION OF ENERGY

- Energy cannot be created or destroyed, it only changes form.
- Within a closed system, the total amount of energy is constant.

- Closed system: nothing gets in or out
  - Ex. sealed chamber
    - Universe
- Is the Earth a closed system?
- Newton's Cradle?

Dr. Lewin at MIT and the Law of Conservation of Energy

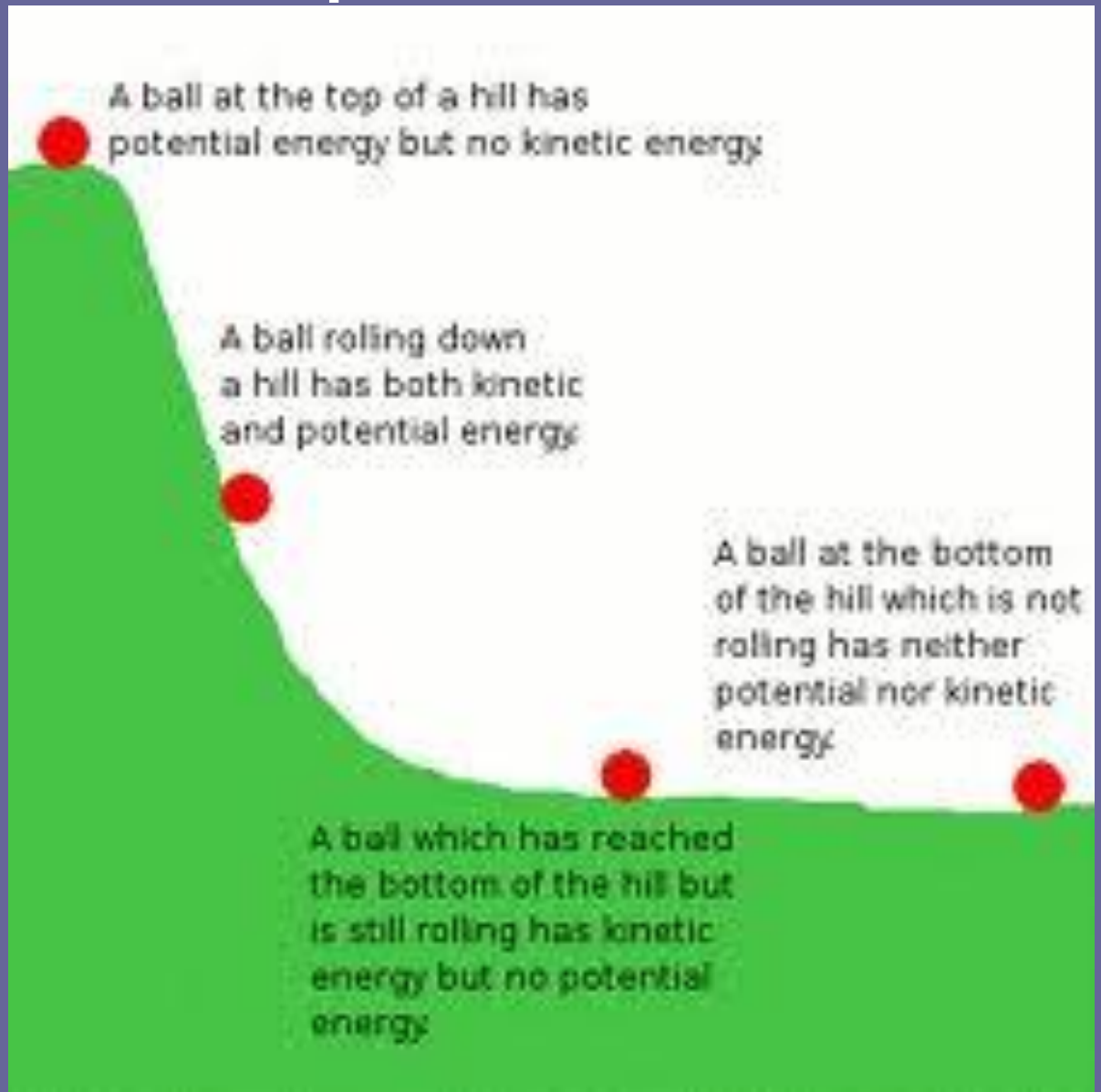
- Teaching with style and the Law of Conservation of Energy
- http://www.youtube.com/watch?v=mhIOylZMg6Q

- Wrecking Ball
- Match box car on track
- Newton's Cradle

Example

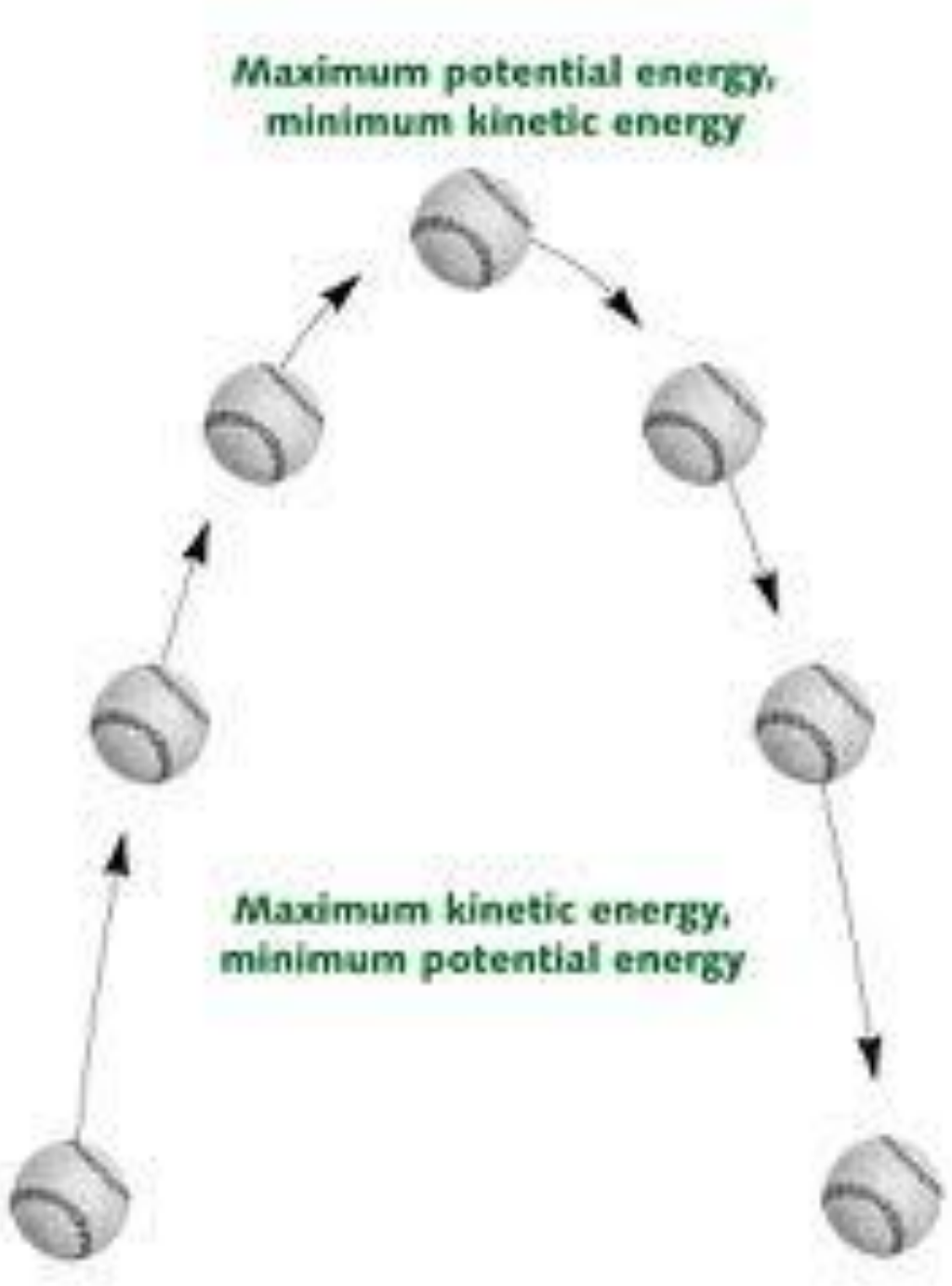
- Boulder on hill

Has gravitational potential energy because of its position above the flat area below



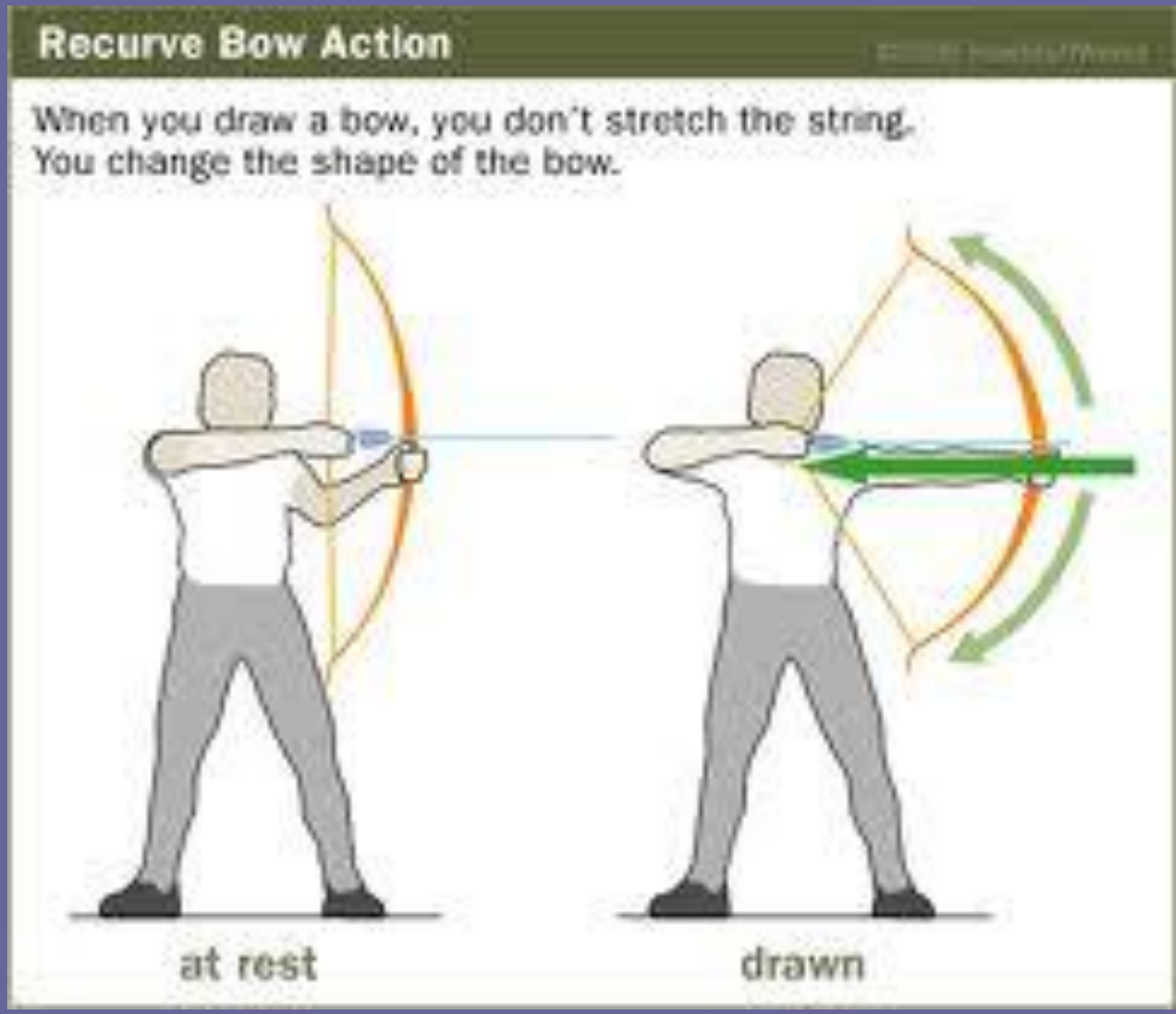
- Example 4
- Ball in air

Has gravitational potential energy at top of path because of its position



- Example 5:
- Bent bow
- (ready to
- fire)

Has stored mechanical potential energy because of the changed shape of the bow

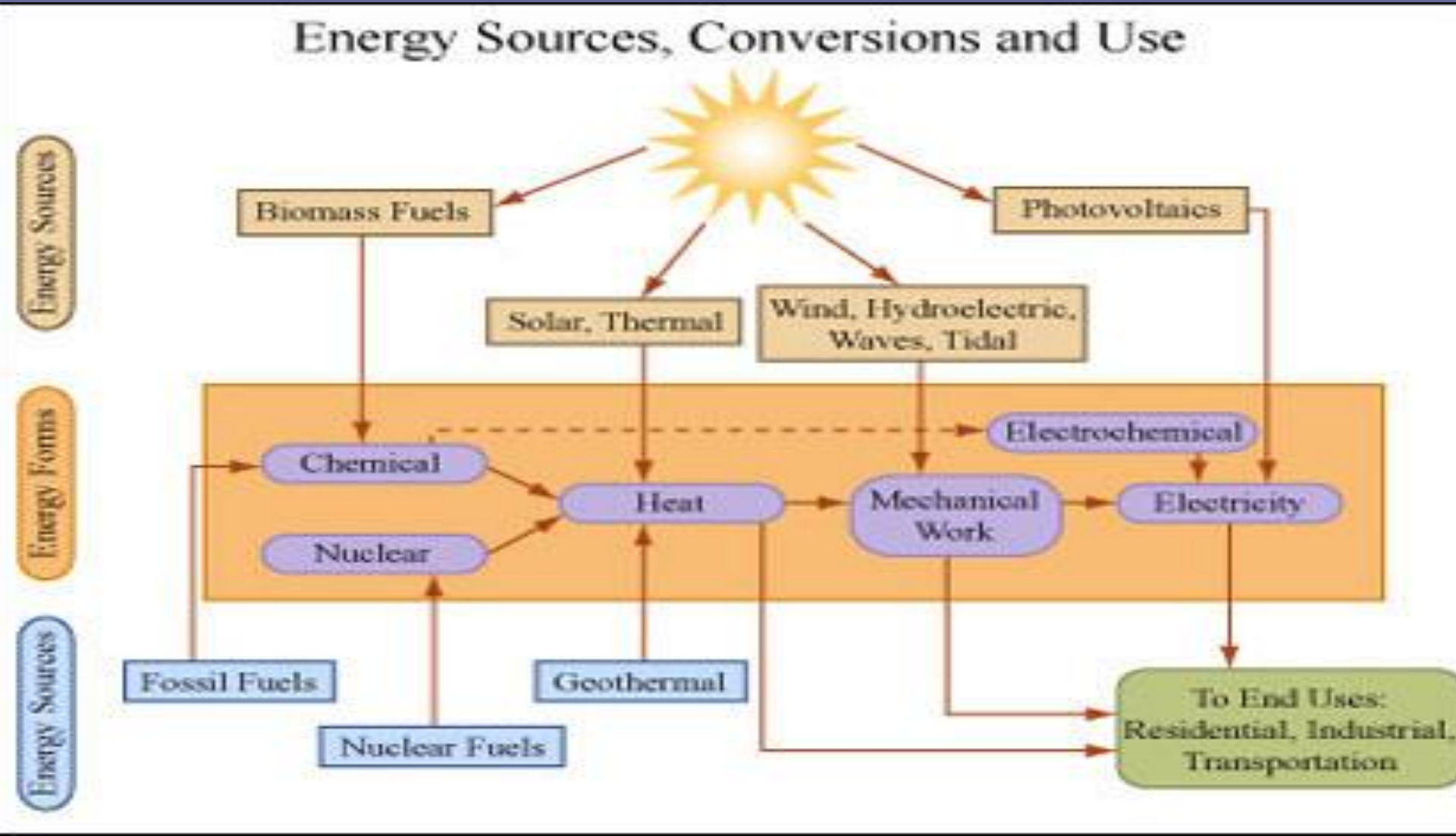


CALCULATING KINETIC ENERGY

- $KE = \frac{1}{2} mv^2$
- KE = ½ x mass x velocity^2

Complete SLED WARS GIZMO

Sources and Forms of Energy



What is the source of most of the energy on Earth?

- Most of the energy on earth comes from the sun
- https://www.twigcarolina.com/film/energy-transformation-3619/

- Read the rubric for the foldable
- How many pounds (lbs) in 15 kg?
- show all calculations.

Energy Graphic Organizer

Measure and Cut and/or Draw Lines

Draw same lines inside

	3 cm
	5cm
	5 cm
	5 cm
	5 cm
	5 cm

Label Your Rectangles

Open flap and write definitions and notes inside

Kinetic	Potential
Radiant	Chemical
Thermal	Nuclear
Motion	Gravitational Potential
Sound	Stored Mechanical
Electrical	Name

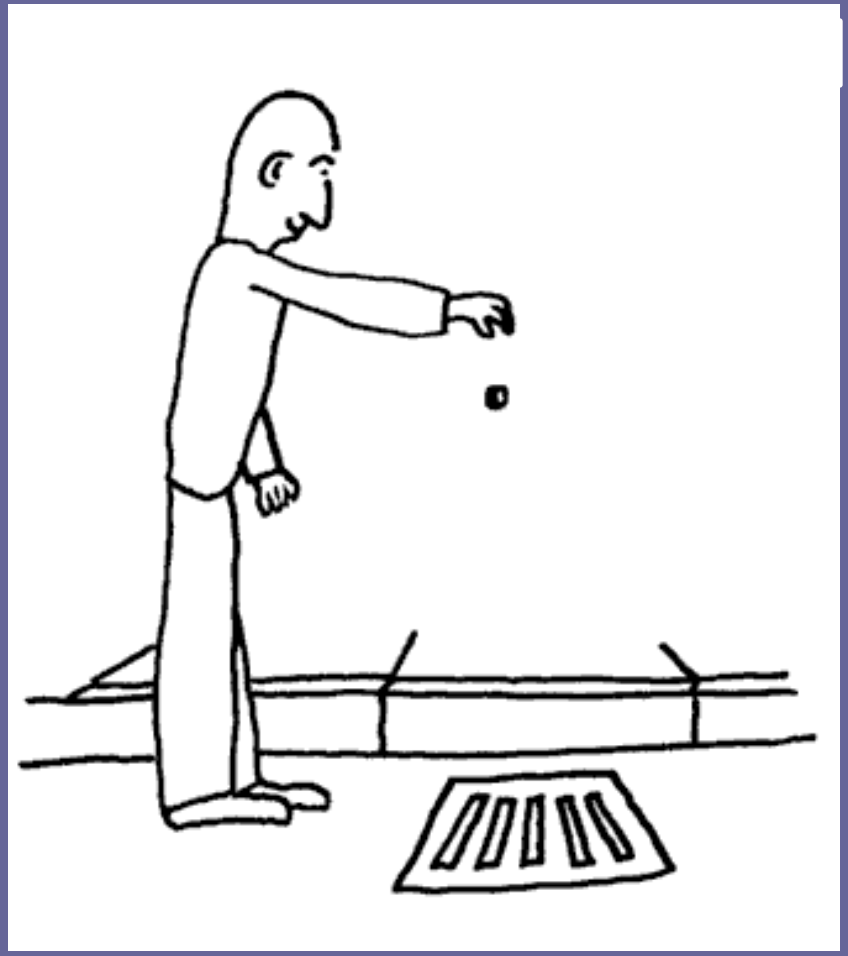
Examples
1. 2. 3.

On the inside of the open flap you must list at least three examples of each form of energy

Label the inside of your foldable

Examples	Definitions	Definitions	Examples
	Radiant	Chemical	
	Thermal	Nuclear	
	Motion	Gravitational Potential	
	Sound	Stored Mechanical	
	Electrical		

Notes on types of Potential Energy



https://www.twigcarolina.com/film/potential-energy-3620/

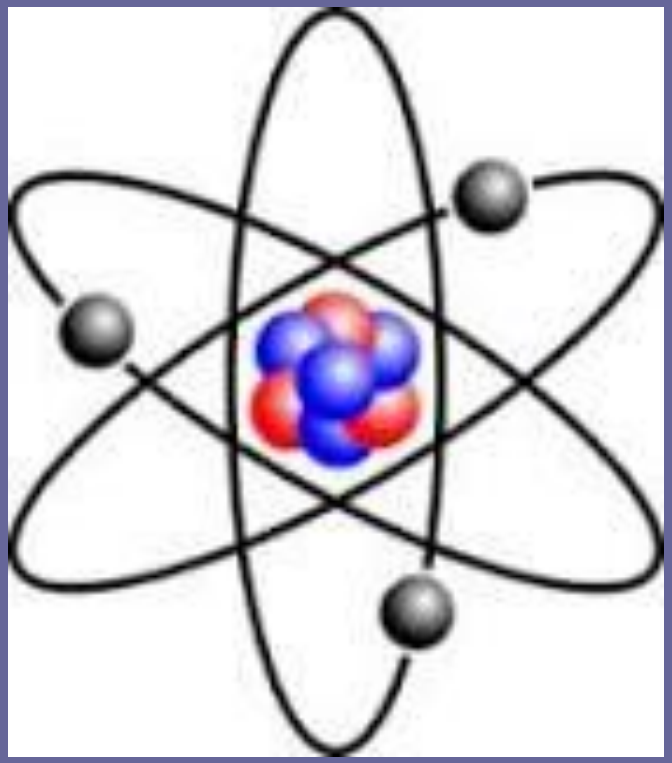
Chemical Energy

- Energy stored in the BONDS of atoms and molecules.
  - Examples-
    - Sugar - PHOTOSYNTHESIS https://www.twigcarolina.com/film/glossary/photosynthesis-4409/
    - petroleum (crude oil used to make gasoline)
    - natural gas, which is a mixture natural gasses found in the earth (methane, propane, butane)
    - fireworks

What is an atom?

- The smallest particle of matter for any element

- ONLY ELECTRONS are involved in chemical bonds (NOT NUCLEUS)



https://www.twigcarolina.com/film/what-is-an-atom-3462/
smallest movie ever made
https://www.youtube.com/watch?v=oSCX78-8-q0

OPENER

- Draw, label and explain a model of an atom.
- What part of the atom is involved in chemical bonds formed and broken during chemical reactions?

FOLDABLE EXPECTATIONS

FRONT

1.Name of each energy form

2.Colored drawing of an example of an energy transformation involving that energy form

FOLDABLE EXPECTATIONS

- **DEFINITION and NOTES column**

1. Write a thorough definition from your class notes for each form of energy.
2. Add any important details from your notes.

- **EXAMPLE column**

1. List 3 examples of each form of energy
2. Write an energy transformation example for each energy form from your labs **IN A COMPLETE SENTENCE**

Example: In a bouncy ball, gravitational potential energy is converted to kinetic energy and then to…when the ball bounces.

Why are the following examples Chemical Energy?

- Alka Seltzer and water
- Burning a match
- A battery
- Burning gasoline to move your car

- https://www.twigcarolina.com/film/glossary/chemical-energy-4649/
- CHEMICAL REACTIONS and energy conversions

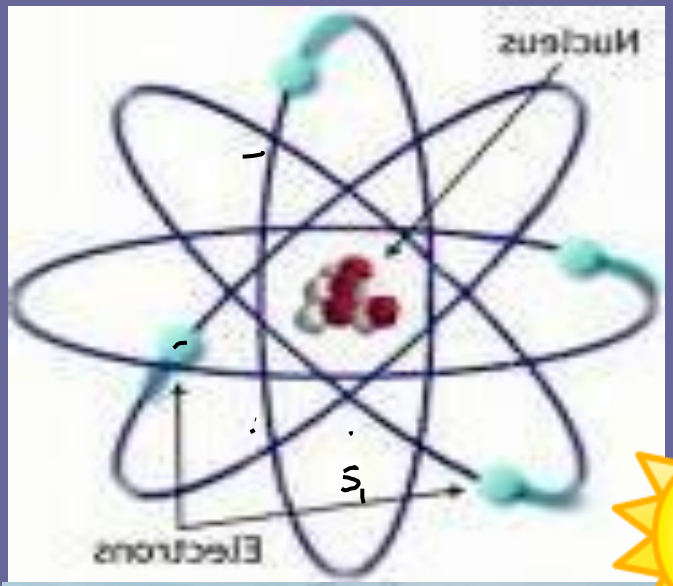
Chemical Energy converts to and from thermal energy during chemical reactions

- Endothermic: A chemical reaction that requires heat energy (feels cold)
- https://www.twigcarolina.com/film/glossary/endothermic-4389/

- Exothermic: A chemical reaction that releases heat energy (feels hot)
    - CHEMICAL REACTIONS and energy conversions
    - https://www.twigcarolina.com/film/glossary/exothermic-4391/

Nuclear Energy

- Energy that is stored in the nucleus of an atom
- Bonds that hold the nucleus together can release enormous amounts of energy.
- Types: Fission (nuclear power) and fusion (sun)



How does Nuclear Power Work?
https://www.youtube.com/watch?v=d7LO8lL4Ai4

Tzar bomb
https://www.youtube.com/watch?v=aMYYEsKvHvk

https://www.twigcaroli
na.com/film/nuclear-

2 Types of Nuclear Reactions

- **FUSION** — join together
- Examples:
  - H atoms are fused together to form He
  - Sun
  - Hydrogen Bomb
- https://www.twigcarolina.com/film/nuclear-fusion-the-hot-and-cold-science-3636/

- **FISSION** — split
- Examples:
  - Splitting the nucleus of U into smaller particles
  - Nuclear Power Plant — controlled fission
  - Atom Bomb — uncontrolled
- https://www.twigcarolina.com/film/nuclear-fission-3663/

OPENER

- 1. Silently begin reading hand out - consider which presentations interest you most

Compare the following

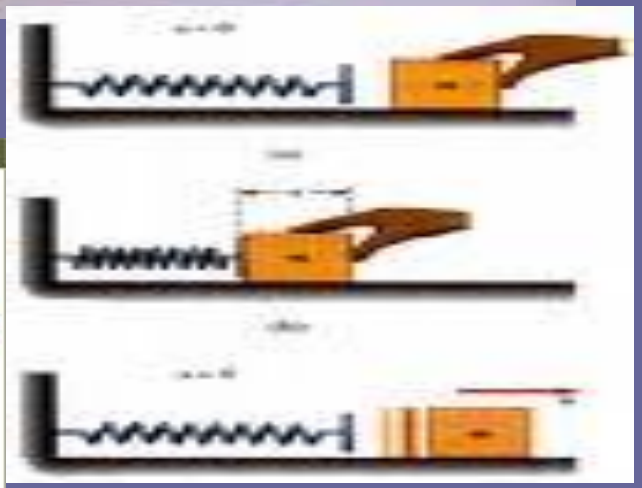
- **Chemical Energy**
- Energy stored in the bonds **between** atoms
- Involves electrons only

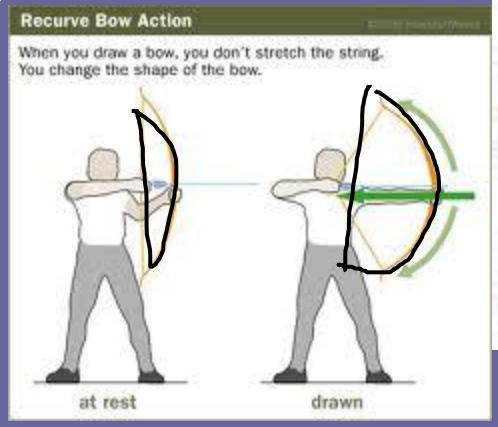
- **Nuclear Energy**
- Energy stored in the bonds between particles **within the nucleus** of the atom
- Changes the type of atom

Both are forms of Potential Energy!

Stored Mechanical Energy

- Energy that is stored in objects by application of a force.
- Example- & stretching, twisting, bending
  - Compressed springs
  - Stretched rubber bands
  - mousetrap

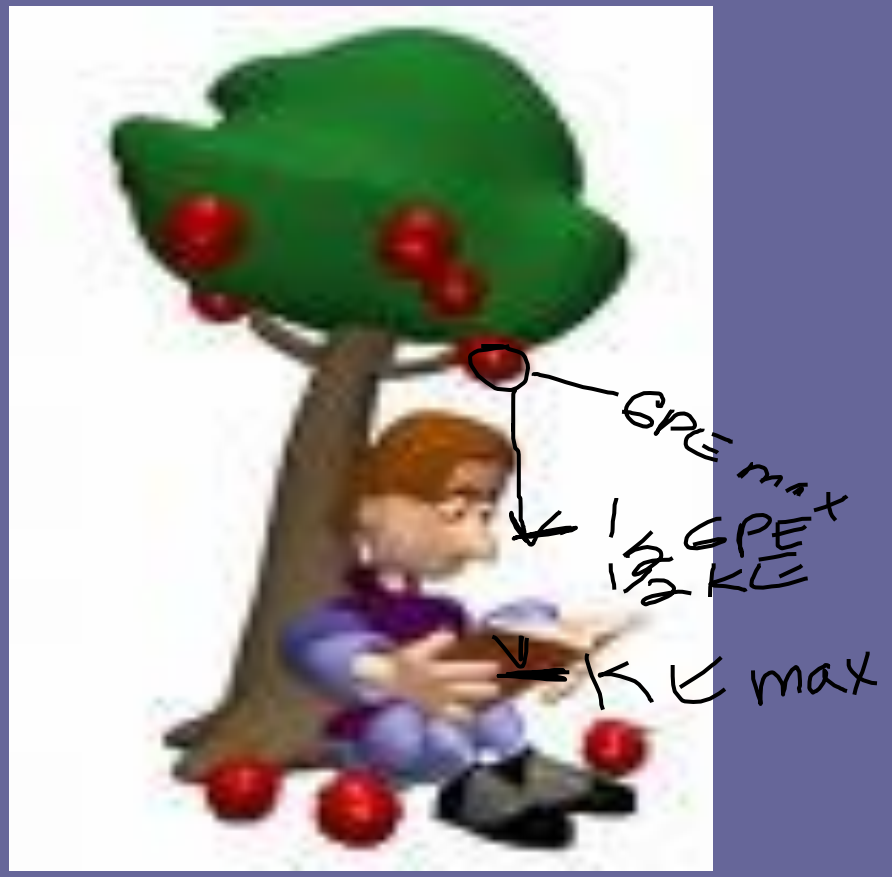




Video 1: 1 minutes

Gravitational Potential Energy

- Energy of place or position.
- Requires gravitational force
- GPE = mgh
  - When I hold a ball in the air-if I let it drop gravity will act on it
- When the ball is let go it becomes an example of motion (Kinetic) energy



- eg. Marble maze
- Newton's cradle

OPENER

- Do energy conversions bingo sheet in pairs

Gizmo – Energy Conversions

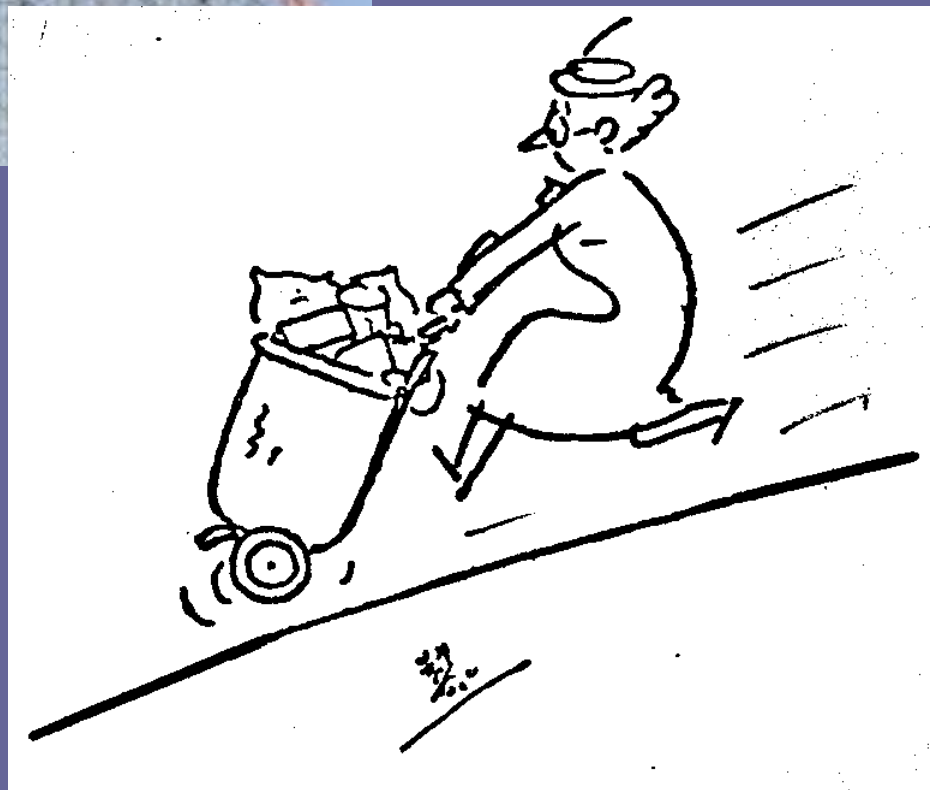
Why is the sun needed to produce…

- Wind power?
- Electrical power from ethanol?
- Hydroelectric power from dams?

How is a solar cell similar to a plant like corn?

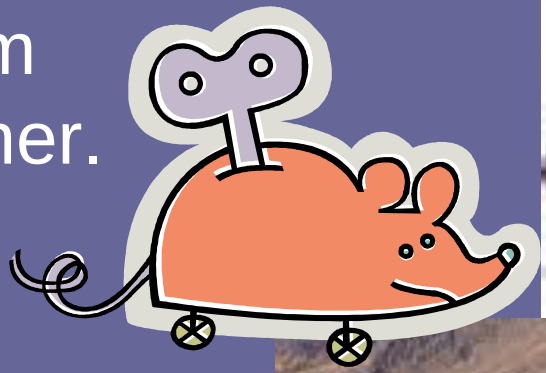
The second main category of types of energy: Kinetic Energy

- Remember: This is energy of motion.
- Kinetic energy is the motion of :
  - ANY OBJECT (visible or not)
  - Waves
  - Electrons, Atoms, Molecules



Motion

- Movement of objects or substances from one place to another.
  - Wind
  - Ball dropping
  - **Any** moving object: list 3 of your own

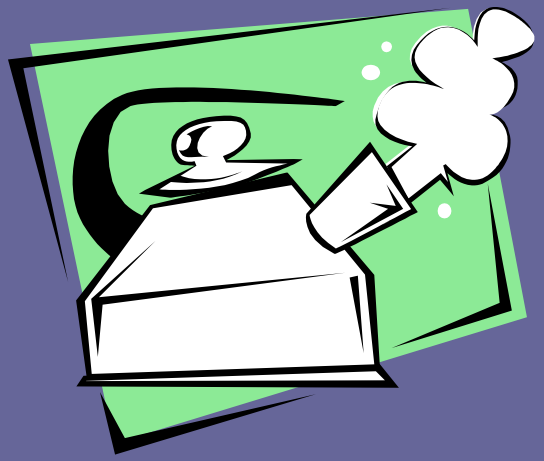


Think pair share

- What is heat?

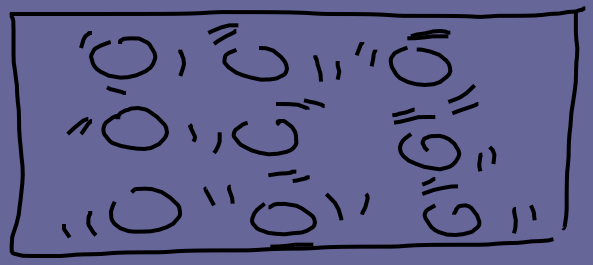
Thermal Energy

- Also known as HEAT energy
- Internal energy in substances.
- Vibration and movement of atoms and molecules within substances
  - Eureka Heat as Energy
  - https://www.youtube.com/watch?v=o3gN9wl_w64

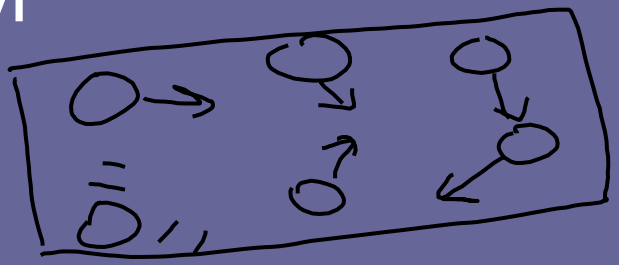


In journal: How do atoms and molecules move in substances that are…

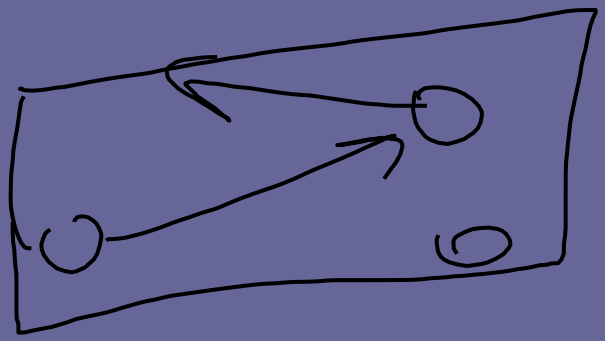
- COLD



- WARM

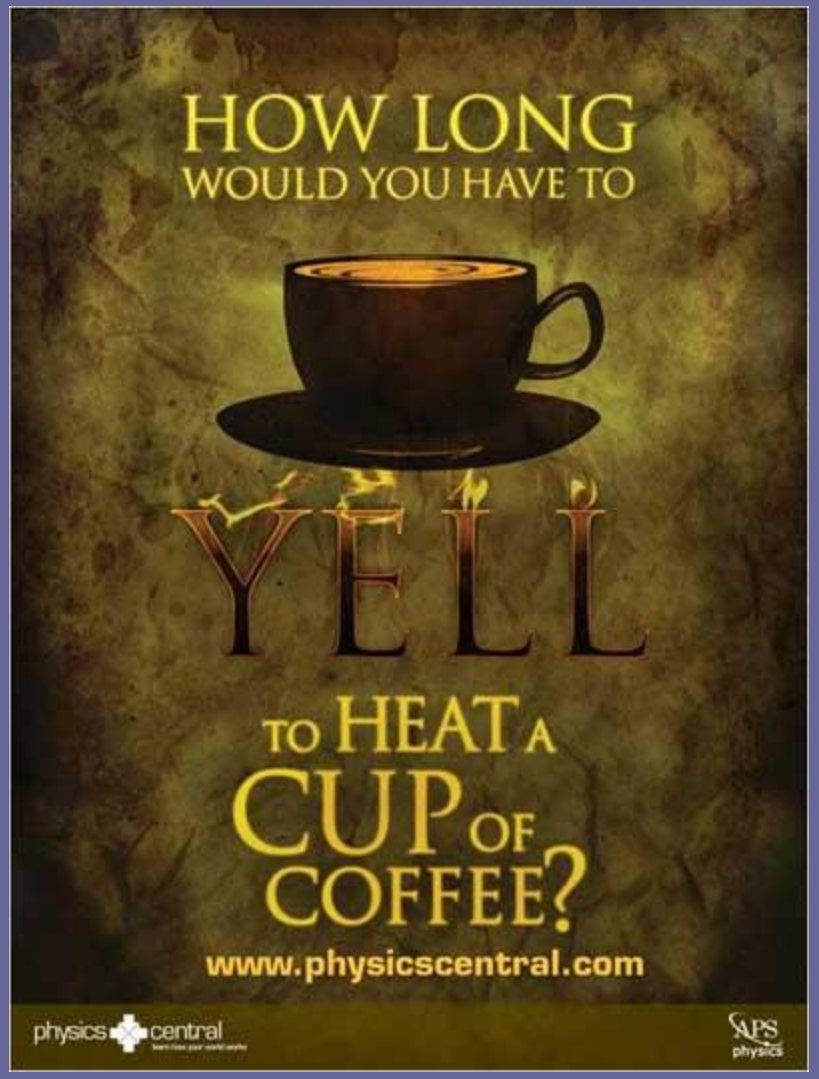


- HOT



OPENER

- How long would you have to yell to heat up a cup of coffee?
- http://www.physicscentral.com/explore/poster-coffee.cfm



- **1 year, 7 months, 26 days, 20 hours, 26 minutes and 40 seconds**

Direction of heat flow

- Heat always flows from …
- Hot coffee will always eventually…
- Cold coffee will never…

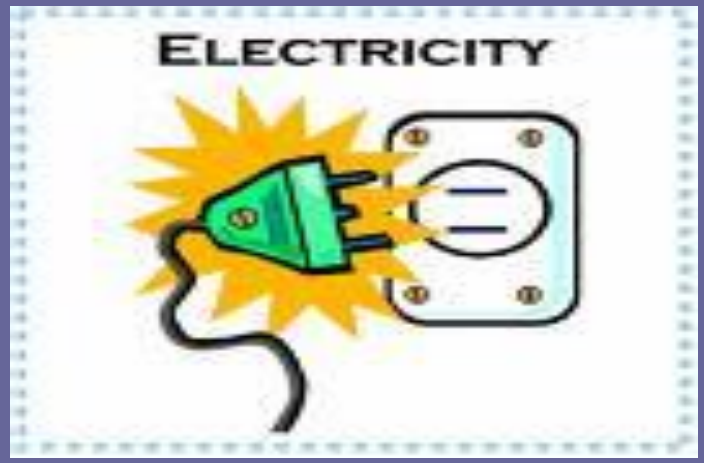
Electrical Energy

- Energy released by the movement of electrons.
  - Lightning
  - electricity

How magnetic field is produced
http://www.youtube.com/watch?v=AgZHqfIBkUI&feature=fvwp&NR=1

How do generators and motors work?
http://www.youtube.com/watch?v=d_aTC0iKO68

How is electricity made?
http://www.youtube.com/watch?v=20Vb6hlLQSg



How do you build a battery? AD
http://www.youtube.com/watch?v=EJeAuQ7pkpc

How is our electricity generated?

- Are magnetism and electricity related?
- How does a turbine/generator do to make electricity?
- Where does our electricity come from?

https://www.youtube.com/watch?v=gfJG4M4wi1o

https://www.twigcarolina.com/film/how-do-generators-work-3650/

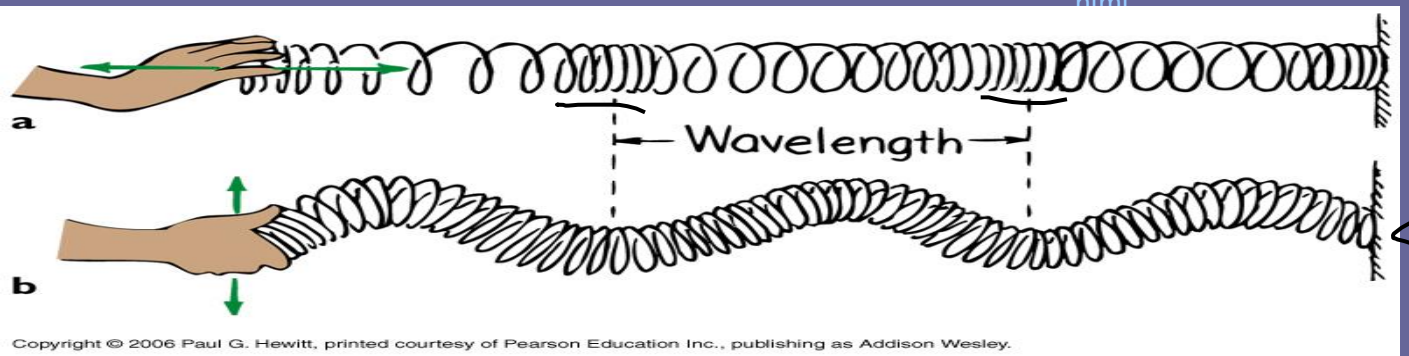
http://www.youtube.com/watch?v=20Vb6hlLQSg

- Complete Gizmo on electromagnetic induction

Some forms of kinetic energy travel in waves

- Ocean waves
- Seismic Waves
- Sound
- Light

- There are 2 kinds of waves: transverse (up and down) and longitudinal (compression)
- Clip showing wave motion
- http://www.acs.psu.edu/drussell/demos/waves/wavemotion.html

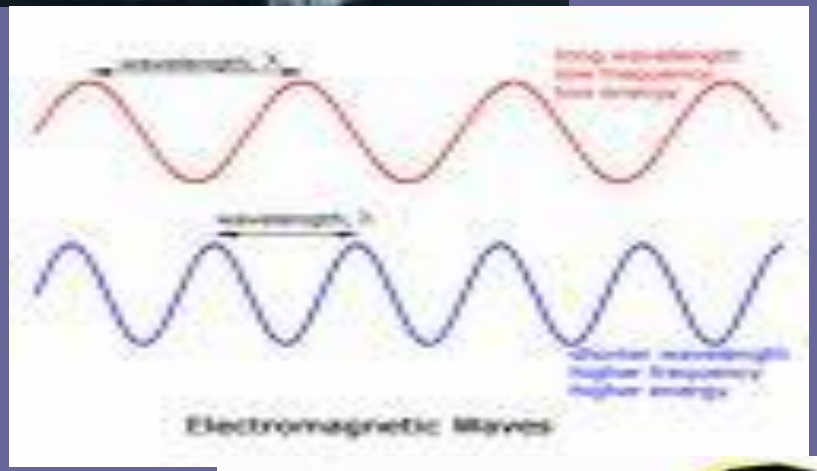


compression

transverse

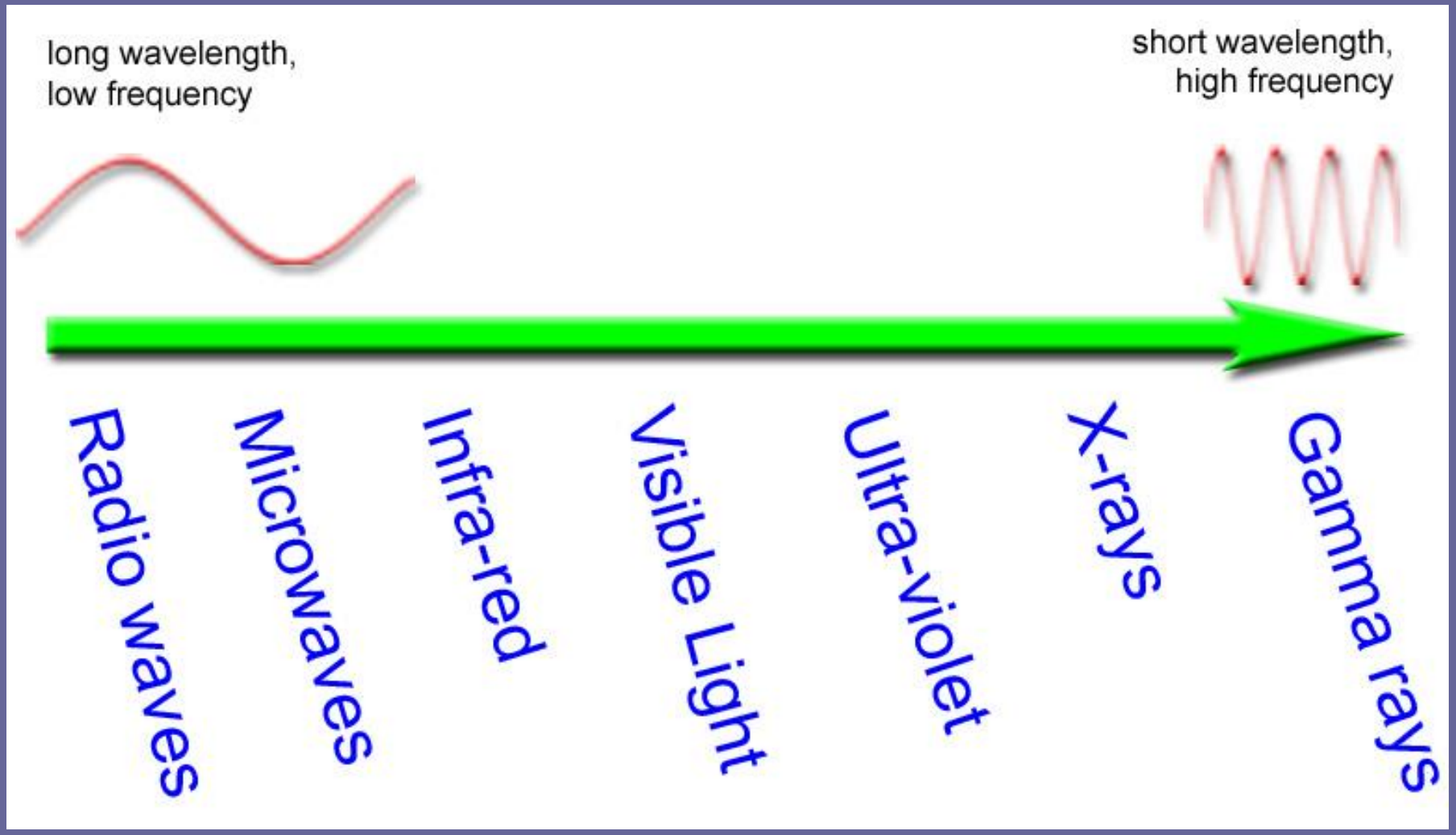
Radiant Energy

- Electromagnetic energy that travels in transverse waves.
- This energy includes:
  - X-rays
  - Gamma rays
  - Radio waves
  - SOLAR ENERGY



What is light?
https://www.twigcarolina.com/film/what-is-light-3546/
Eureka Radiation Waves
https://www.youtube.com/watch?v=2JZciWtK6vc

The Electromagnetic Spectrum



Can you Hear Sound on the Moon?

Sound

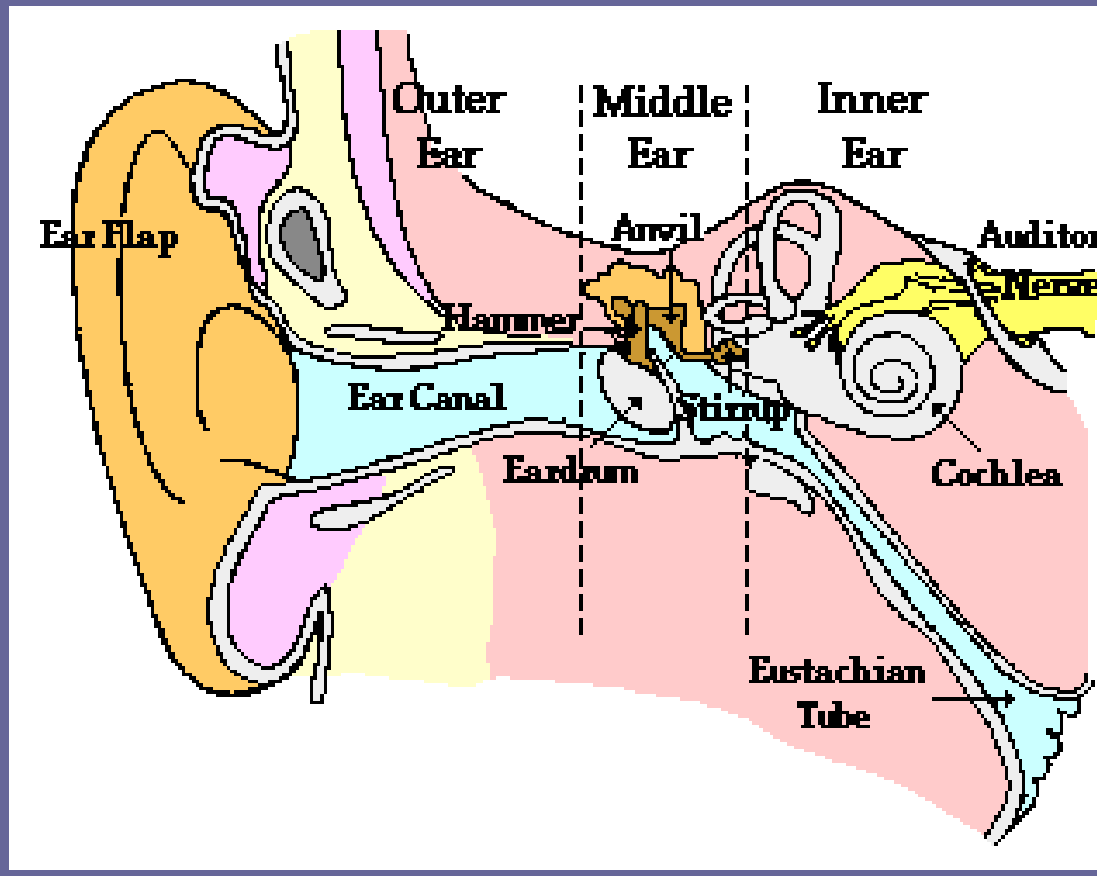
Movement of energy <u>through objects</u> in longitudinal (compression) waves.

https://www.twigcarolina.com/film/what-is-sound-3537/

Eg:

Slinky and compression waves

The human ear



Tuning fork

Drum

- The eardrum moves as a result of compression waves sent through the air to the ear and it transfers the sound to the inner ear and eventually to the auditory nerve

Energy Transformations

- Braking a Car
- https://www.twigcarolina.com/film/red-hot-emergency-stop-3628/

Objectives

1. Set up a foldable to organize notes on energy
2. Review definitions for energy, work
3. Discuss and take notes on types of energy

- Take handout and complete as much as you can using your foldable and notes.
- Foldable with COLORED pictures, definitions/notes and examples due tomorrow!
- Today we will…
  - Finish notes on types of energy
  - Complete forms of energy worksheet
  - Hand back papers/grade reports
  - Remember: FOLDABLE due tomorrow!