Welcome to STEM Workshops:

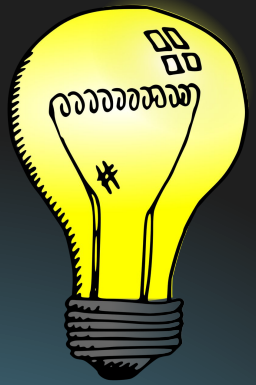
Energy

Brought to you by the University of Maryland Balloon Payload Program

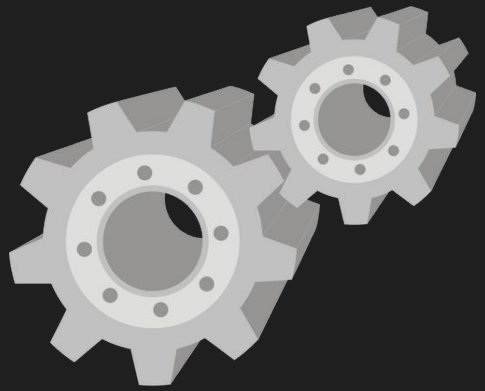
What is Energy?

- The ability to do work
- The ability to cause change

Types of Energy



- Thermal (heat)
- Chemical
- Electrical
- Mechanical
- Nuclear
- Gravitational
- More!



What does energy do?

We use energy in it's different forms every day!

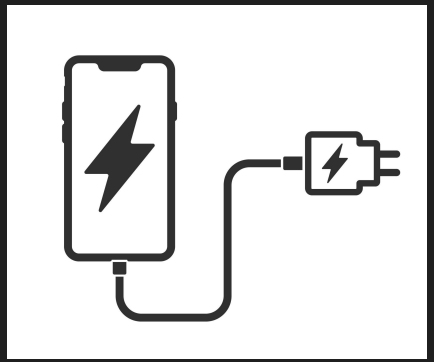
Can anyone name a few?

cooking

walking

driving

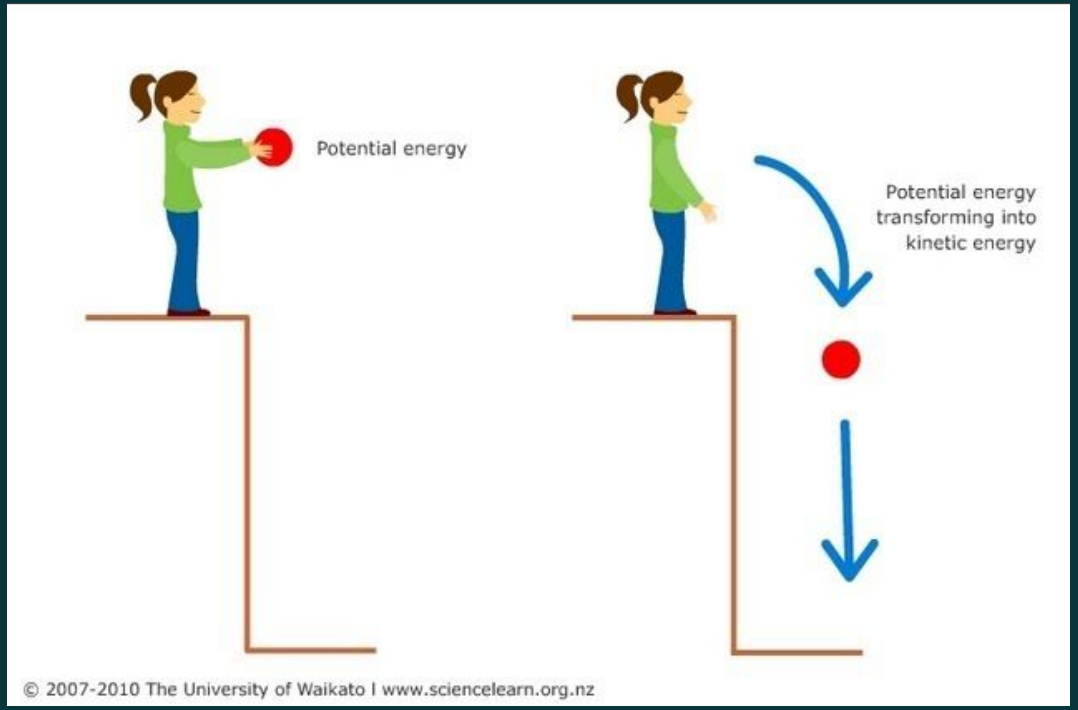
Charging your phone!

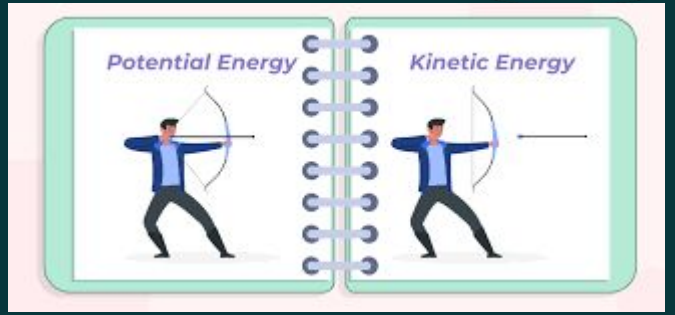


How do we observe changes in energy?

Kinetic vs potential energy

Kinetic - Energy of **motion**
Potential - **Stored** energy due to position or state





We use two basic formulas to compute KE and PE

$$KE = \frac{1}{2} mv^2$$

m = mass
v = velocity

$$PE = mgh$$

m = mass
g = gravitational constant ($9.81\ m/s^2$)
h = height

Lets practice!

If I hold a ball with a mass of 2 kg, 5 meters above the ground, how much potential and kinetic energy does it have?

$KE = ½ mv^2$
m = 2kg
v = 0 m/s

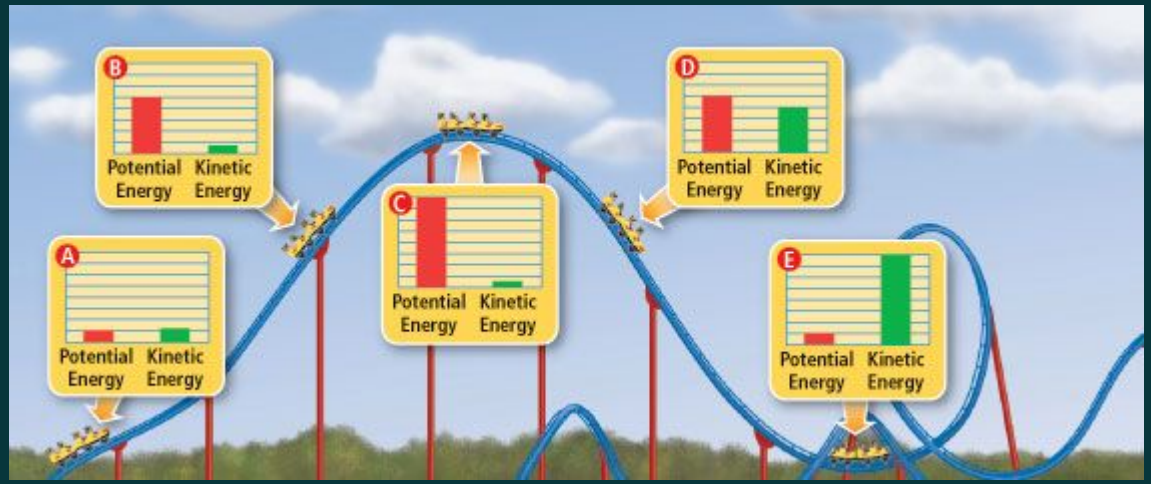
$PE = mgh$
m = 2kg
$g = 9.81\ m/s^2$
h = 5m

KE = ½ x 2 x 0 = 0 Newtons

PE = 2 x 9.81 x 5 = 98.1 Joules

Law of Conservation of Energy

Energy cannot be **created** or **destroyed**, only <u>transferred</u> or <u>transformed</u>



Energy from the food you ate before getting on the roller coaster turns to screaming - noise energy when you're on the roller coaster!
! THINK OF SOMETHING BETTER

Total Energy = KE + PE = remains constant

Law of Conservation of Energy

Some more examples...

- Ice in hand

- Portable charger

- Boiling water

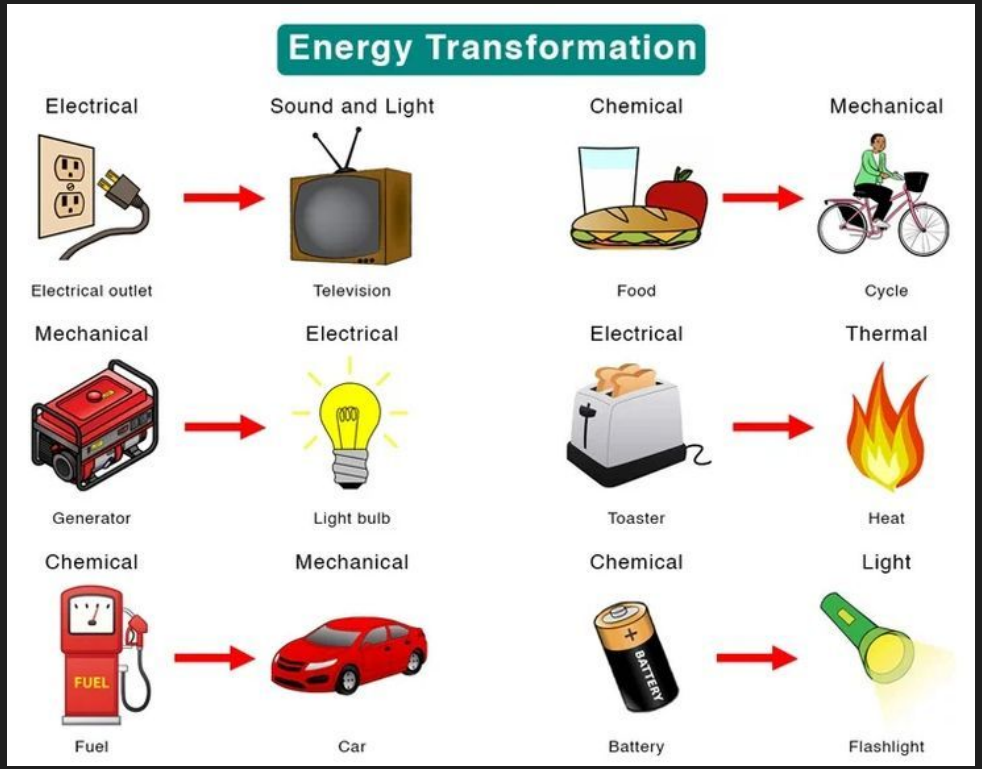
Energy Transfer

Energy can move from one place to another through different interactions

- **Conduction (touch)**
  - Electrical wires, stove top, hugging
- **Convection (through a medium)**
  - Boiling an egg, sea breeze
- **Radiation (through waves)**
  - Microwave, the Sun warming Earth

Energy Transformation

You can also change from one type of energy to another while still following the law of conservation



How can we observe energy?

- **Thermal (heat)** → **temperature, color**
- **Chemical** → **color, bubbling, volume**
- **Electrical** → **temperature, touch**
- **Mechanical** → **movement**

Workshop Time!!

Kinetic Stick Chains

Let us walk you through it and give you an example.... and then it’s your turn!

Access this lesson and extra materials online!

Visit our Wiki Page:

https://ter.ps/STEMworkshop

Thank you!