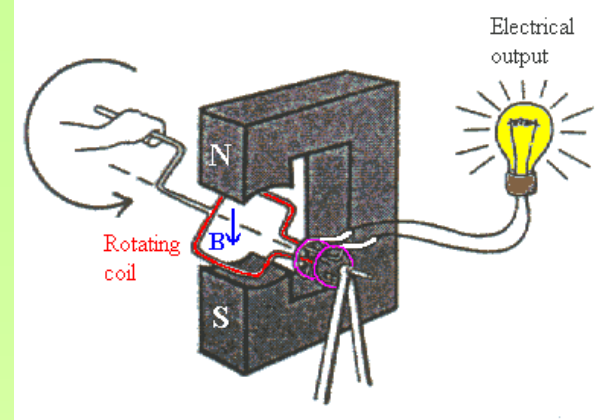


Ch 3 Energy



3.1 Energy exists in different forms



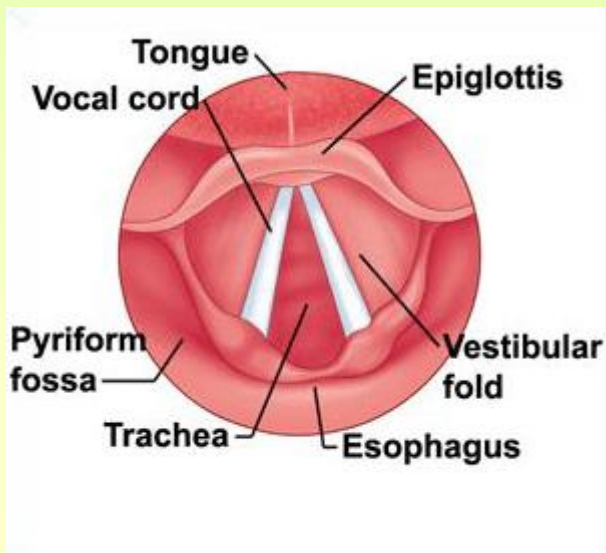
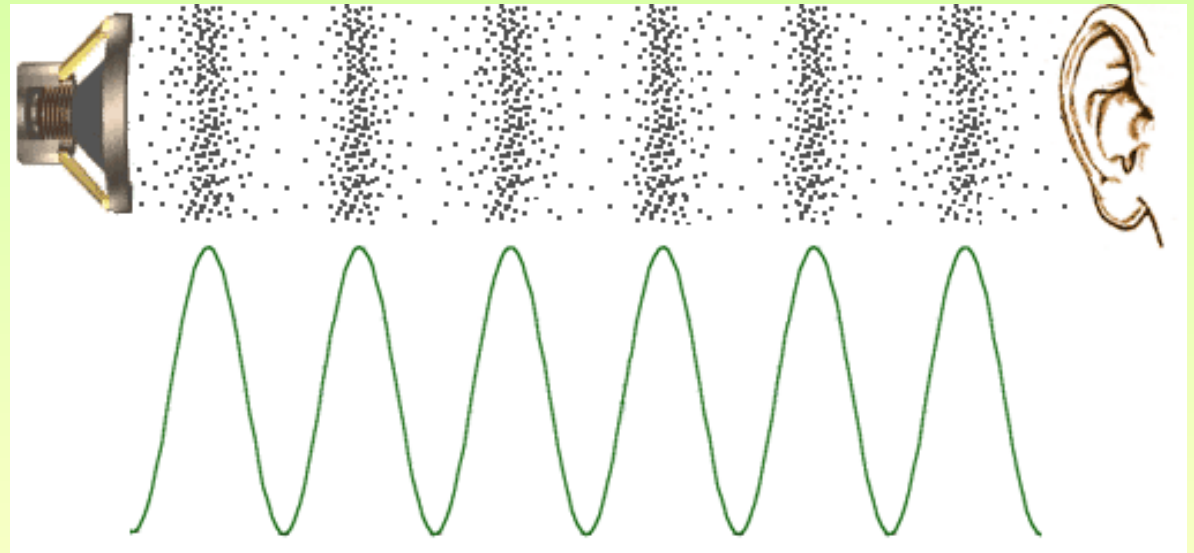
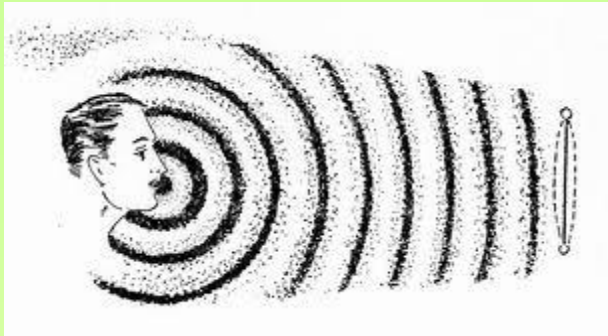
Energy—ability to cause a change; different forms of energy cause different changes

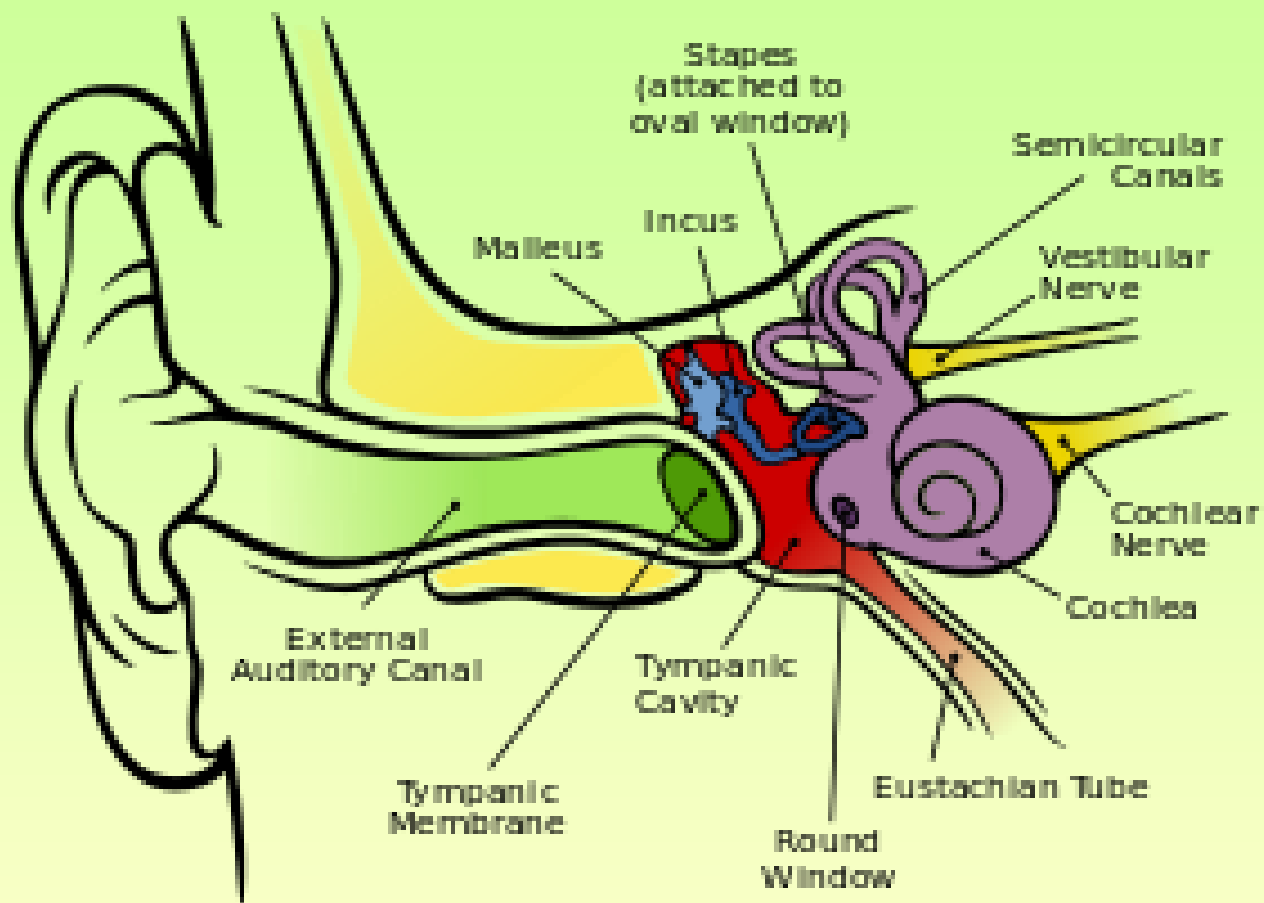
1. Mechanical energy—involves the position & motion of objects

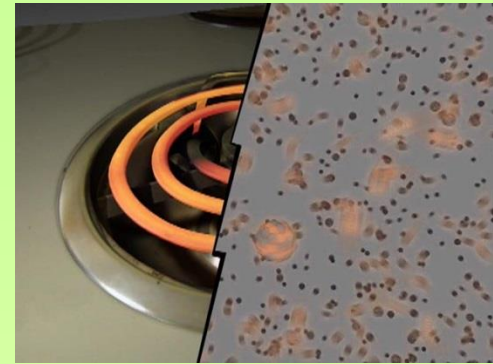
(may be potential or kinetic)

2. Sound energy—associated with the transfer of vibrations through a solid, liquid, or gas

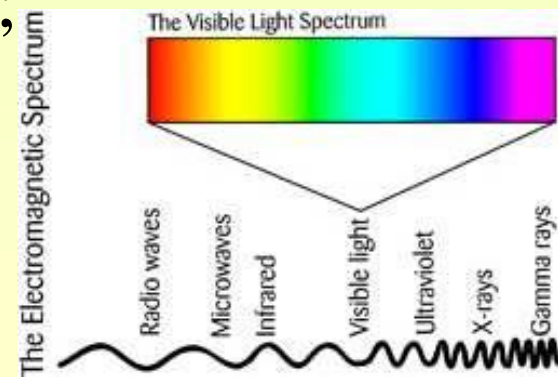


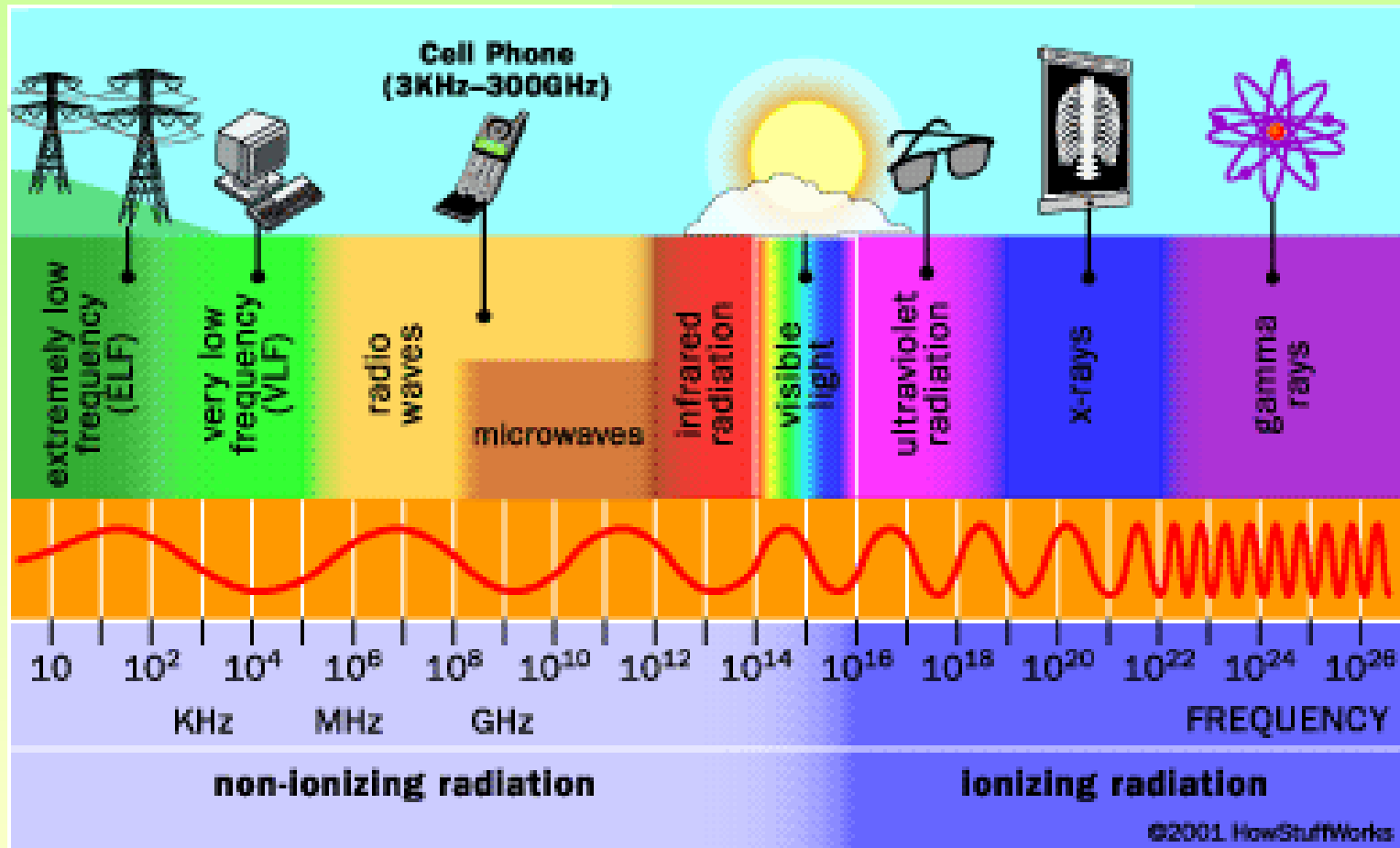




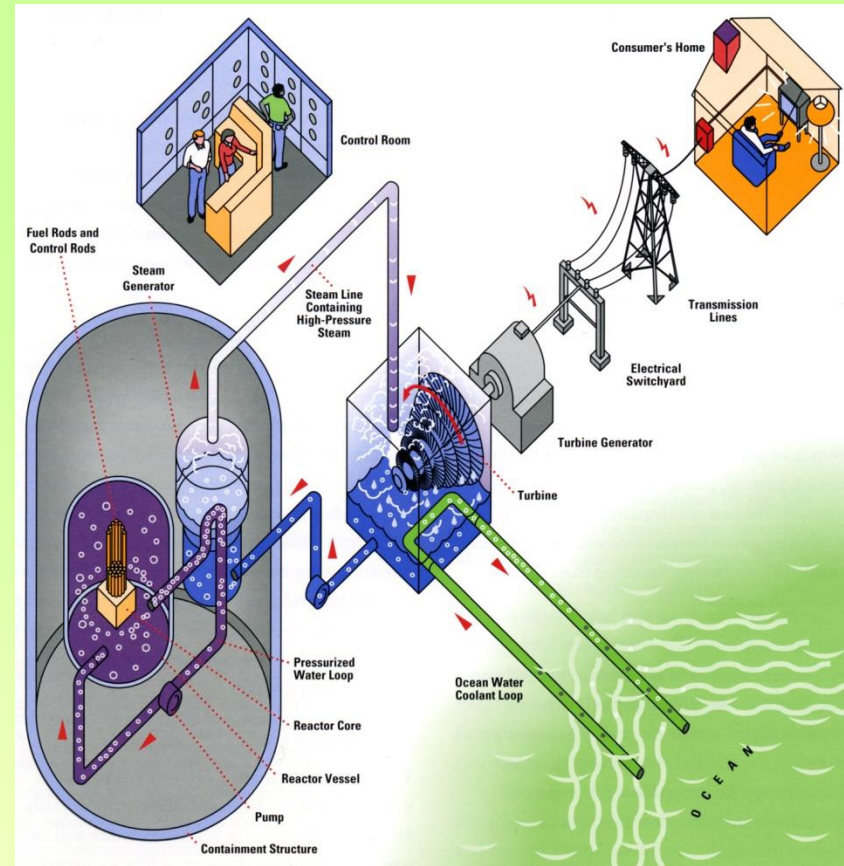
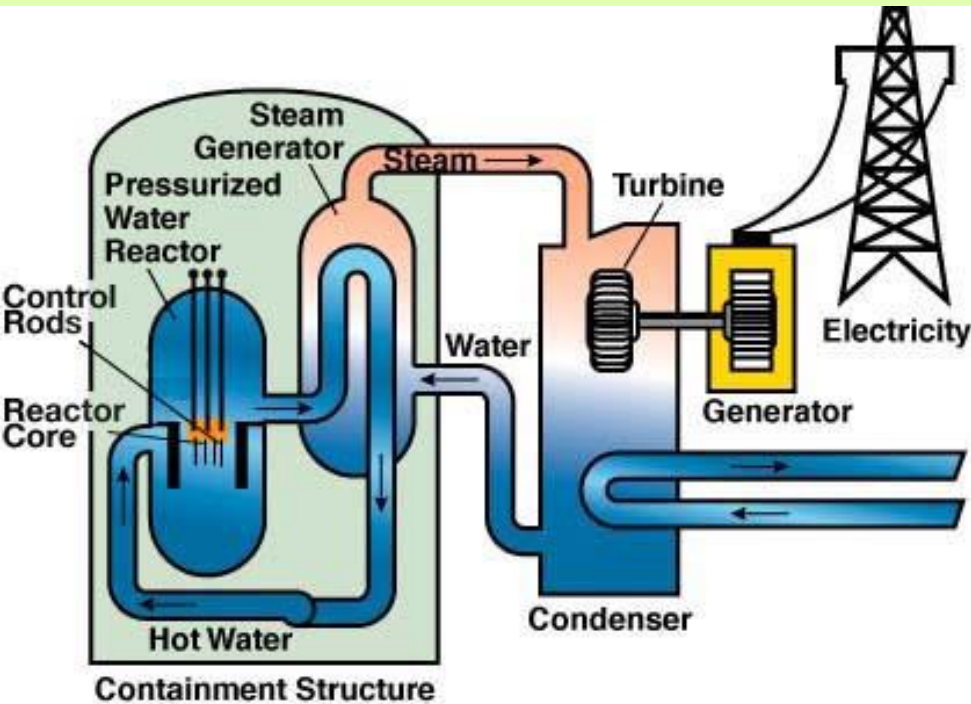


3. Chemical energy—stored in the chemical composition of matter (atoms & bonds)
4. Thermal energy—(heat energy) total amount of energy within an object due to the motion of atoms
5. Electromagnetic energy—energy that travels in electromagnetic waves (visible light, ultraviolet radiation, x-rays, microwaves); can travel through a vacuum (empty space)



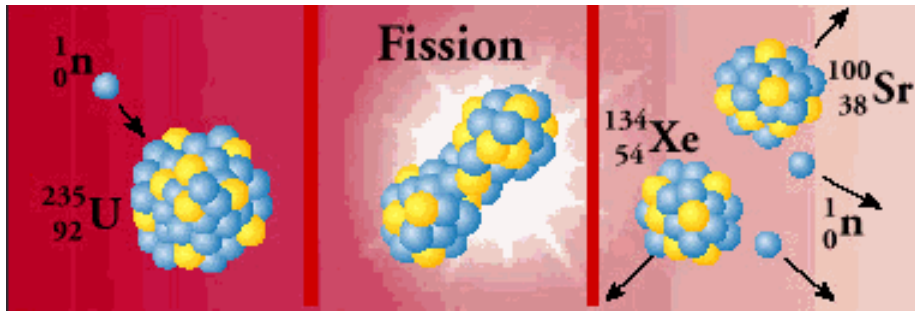


6. Nuclear energy—holds atomic nuclei together



<http://healthypro.org/effects-of-nuclear-radiation/>

http://en.wikipedia.org/wiki/Agent_Orange



Fission of ^{235}U after absorption of a thermal neutron.

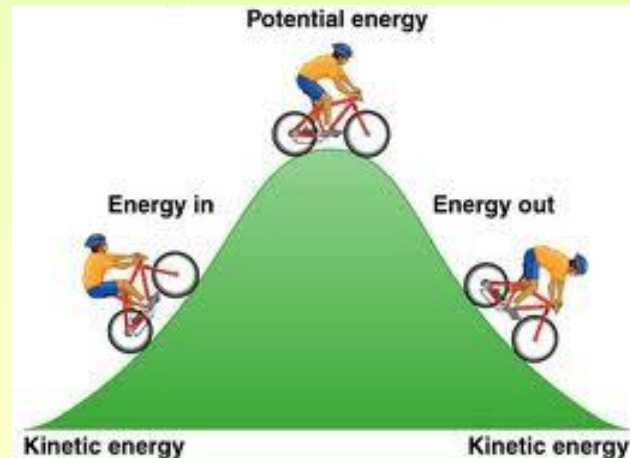
nuclear fission--The splitting of an atom's nucleus releases an incredible amount of heat

Kinetic energy & potential energy are the 2 general types of energy

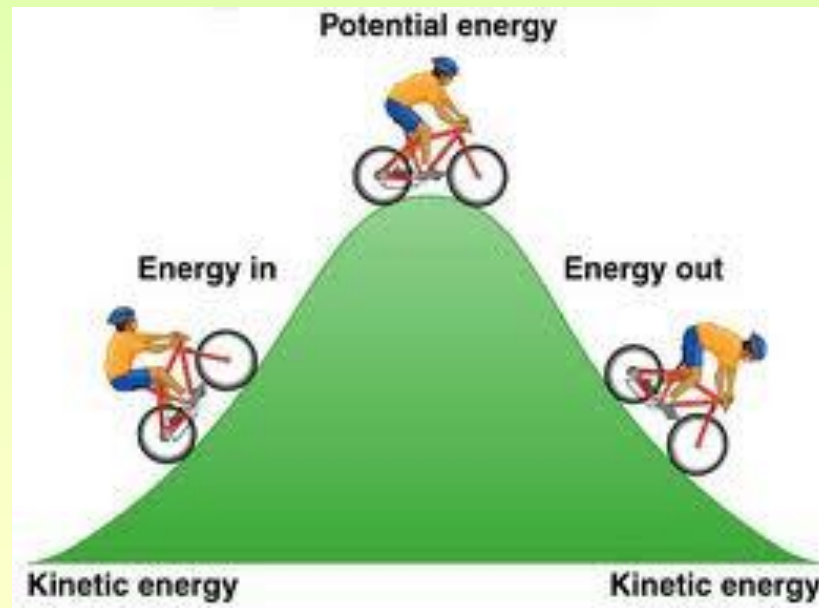
Kinetic energy (KE)—energy in motion

*KE is directly proportional to mass & speed

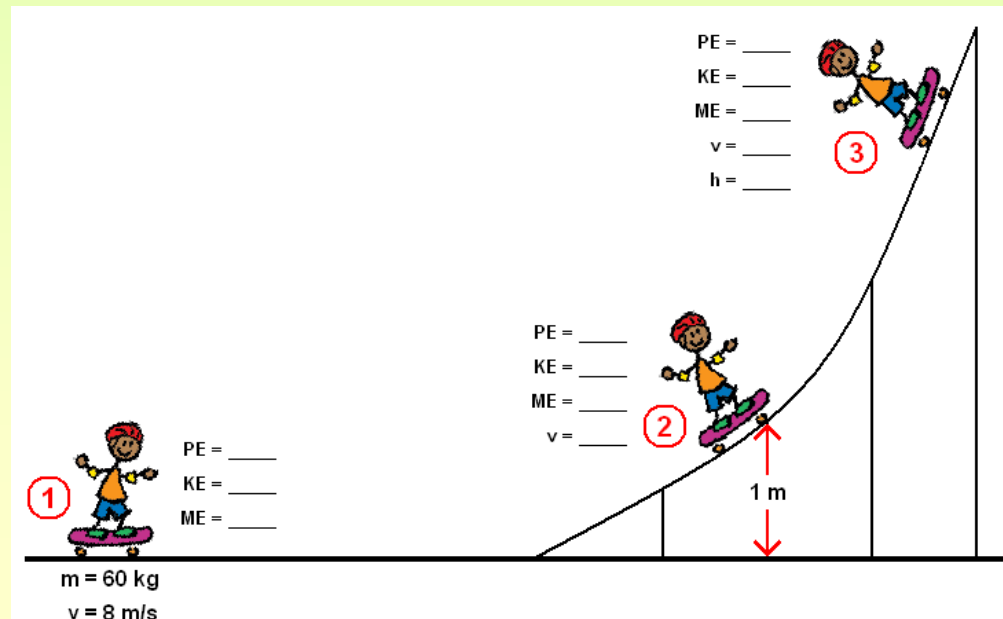
*More mass or speed = more KE



$$KE = \frac{1}{2} \times \text{Mass} \times \text{Speed}$$



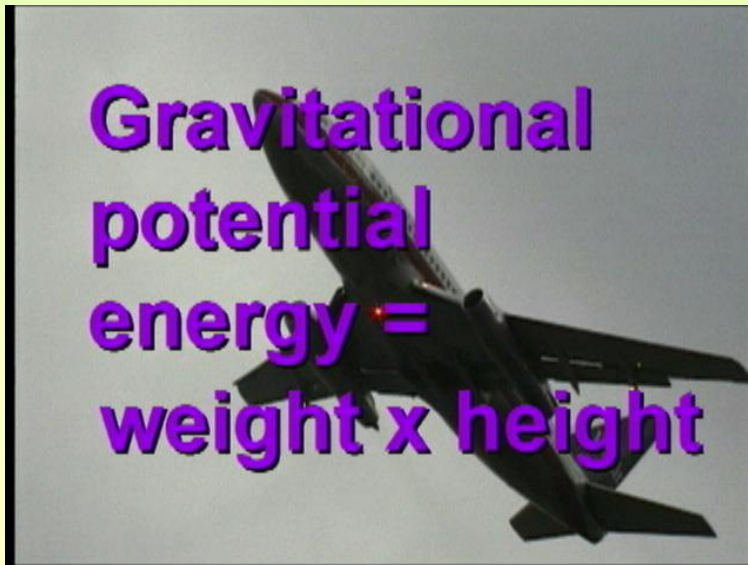
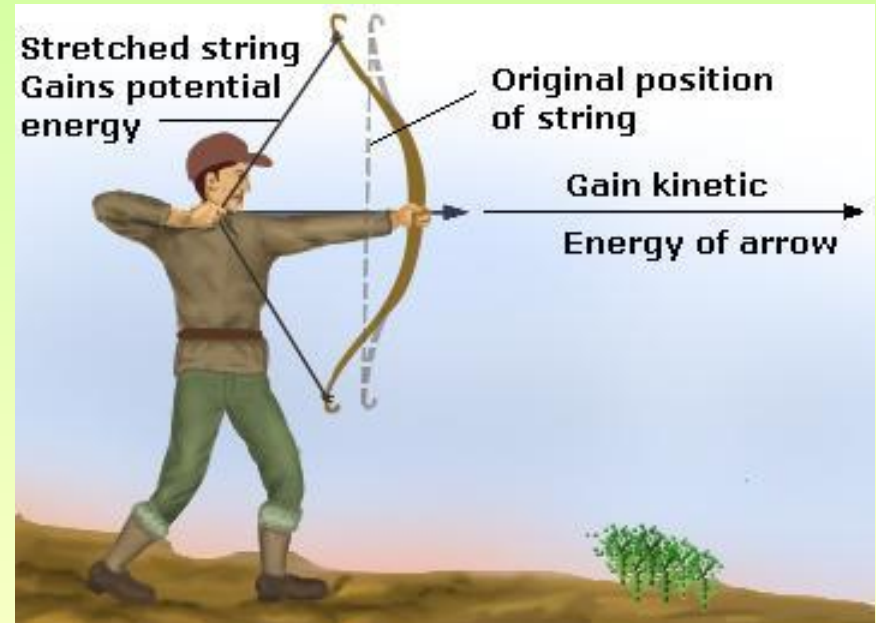
Potential energy (PE)—energy stored in an object due to its position, shape, or chemical composition



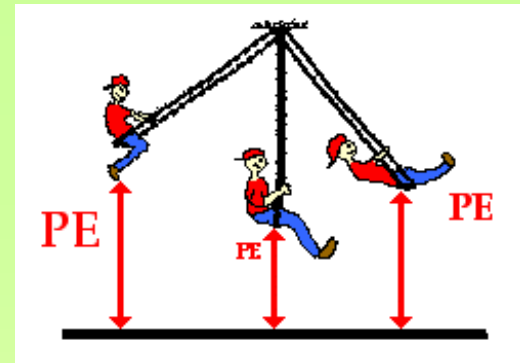


3 Types of Potential Energy

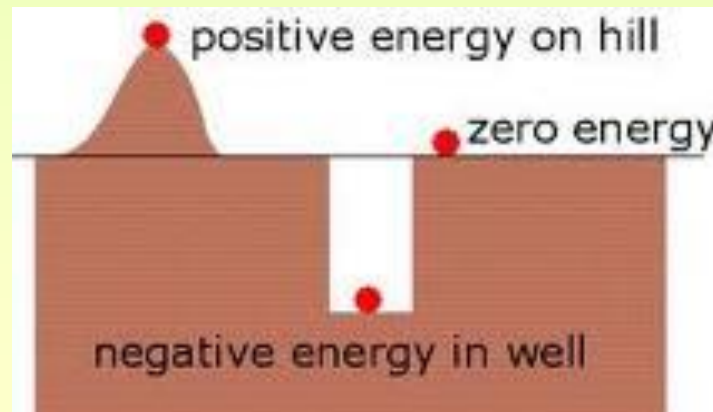
1. Gravitational PE
2. Elastic PE
3. Chemical PE



Gravitational PE

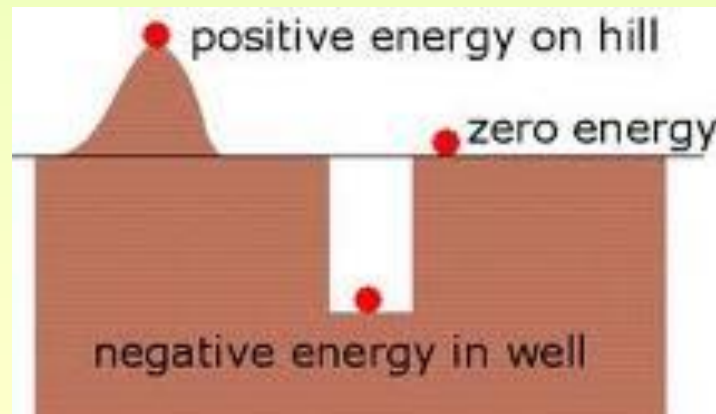


- Due to an object's position above Earth's surface
- Related to an object's mass & height above ground



$GPE = \text{Mass} \times \text{Height} \times \text{gravitational constant}$

*On Earth, gravitational constant is 9.8 m/s



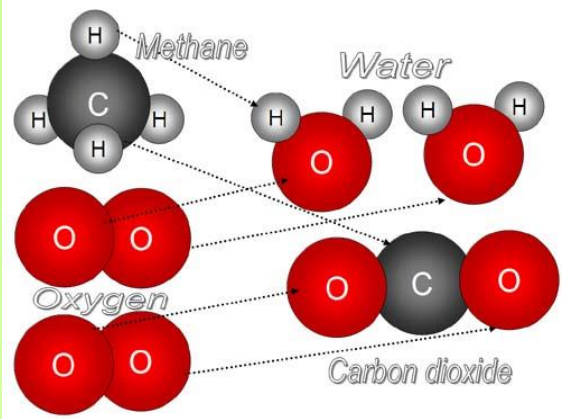


Elastic PE



- Due to an object's position & shape in being compressed or flexed
- Tension in springs, rubber bands, etc.
- Some compressed objects; not all compressed objects contain elastic PE (aluminum foil crumpled into a ball)

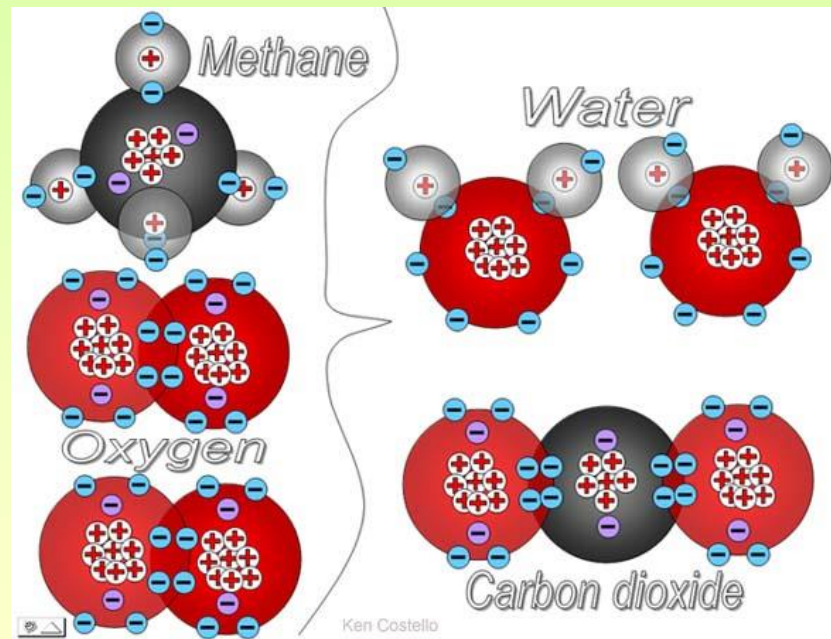




Chemical PE



- Due to a substance's chemical position (atoms & bonds)
- The larger the chemical structure, the greater the Chemical PE
- Fossil fuels, food, etc.



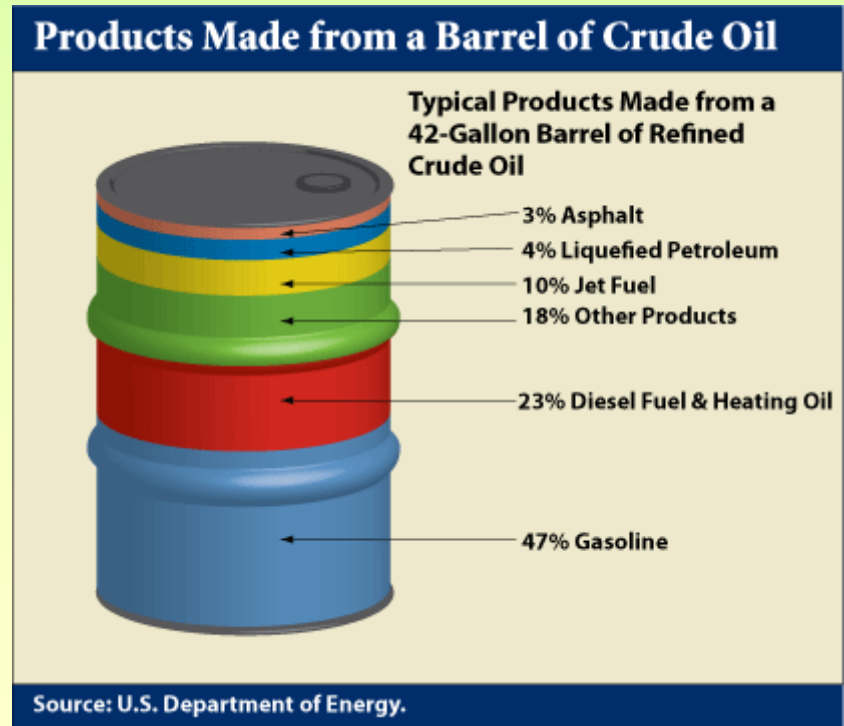
3.2 Energy can change forms but is NEVER lost

- Energy changes forms
 - Must change forms in order to be useful
 - Many transformations occur between KE & PE
 - Example 1
 - A ski jumper at the top of a slope has GPE
 - Converts into mechanical KE as he moves down the slope
 - Converts back to PE as he stops at the bottom



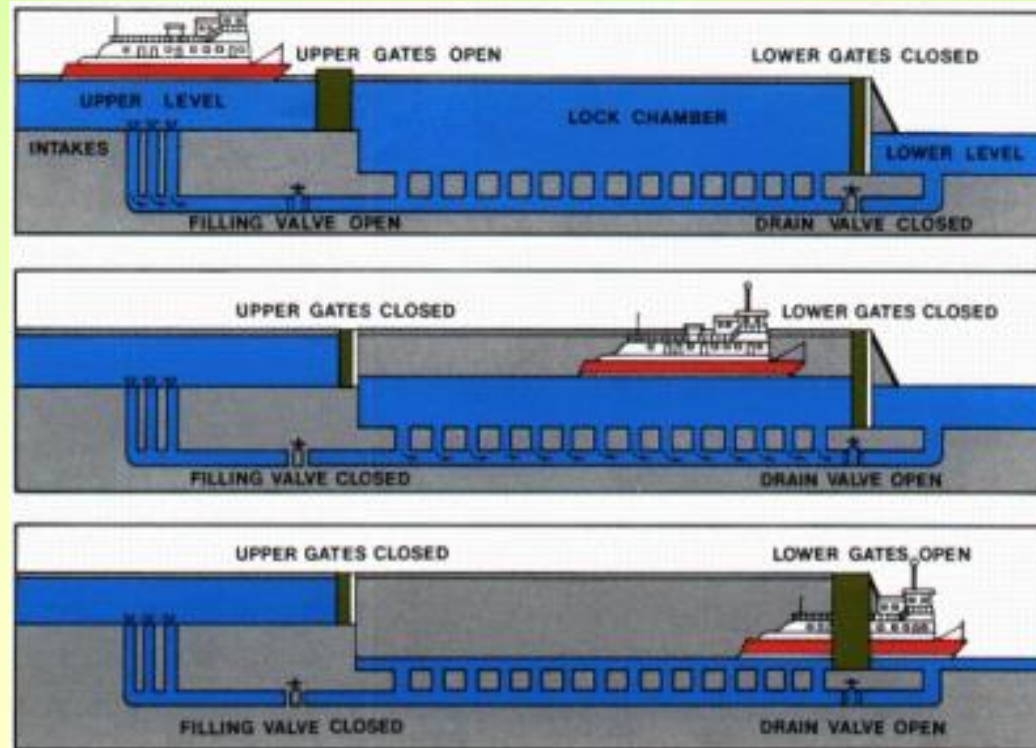
– Example 2

- Gasoline is chemical PE
- When burned in the engine, it converts into mechanical KE & thermal KE



Video—barge passing through a dam

- <http://www.youtube.com/watch?v=BTJ1hBzI-D0>



Energy is always *conserved*



Law of conservation of energy

- Energy is neither created nor destroyed, but converts from 1 form to another



- When it appears to be *lost*, it simply has changed into another form or has been transferred to another object

Example



- As a soccer ball moves down a field, its mechanical KE decreases (but energy is transferred into sound & heat)
- Total amount of energy never changes during transformations



Energy conversions may produce unwanted forms of energy



- When energy changes forms, the *total amt* of energy does not change, but some of it may convert to *unusable* or *unwanted* forms
- Energy efficiency—measure of usable energy *after* a conversion
- The more energy-efficient the conversion, the more energy is changed into the desired form



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search ID: msh0060

3.3 Technology improves the ways people use energy



- Because most energy conversions are not efficient, efficiency is a goal of technology
- LEDs convert almost all the electricity they use into light
- Hybrid cars (using both gasoline & electrical energy from batteries) are more efficient than conventional gasoline-powered cars



Honda

COUNTERTHINK

AMERICAN AUTO COMPANIES ANNOUNCE
NEXT GENERATION HYBRID CAR



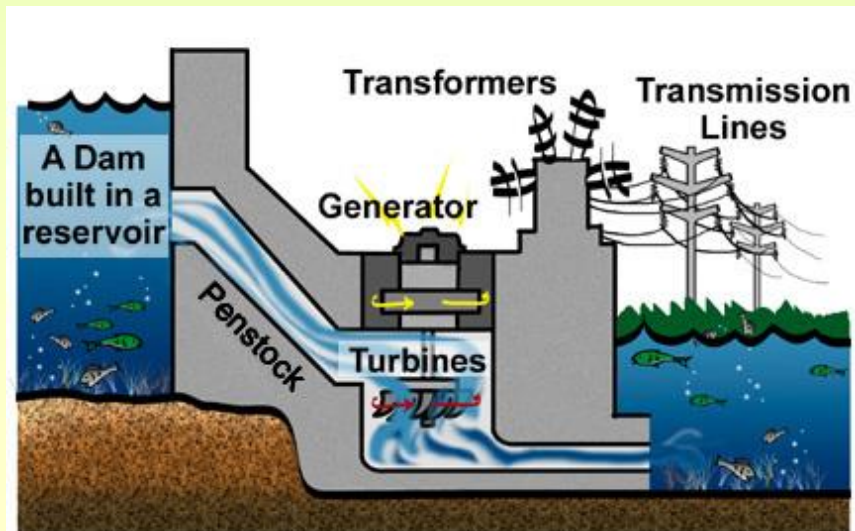
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OUTSTANDING
DOWNHILL PERFORMANCE!

CONCEPT-MIKE ADAMS ART-DAN BERGER WWW.NEWSTARGET.COM

Technology improves the use of energy resources

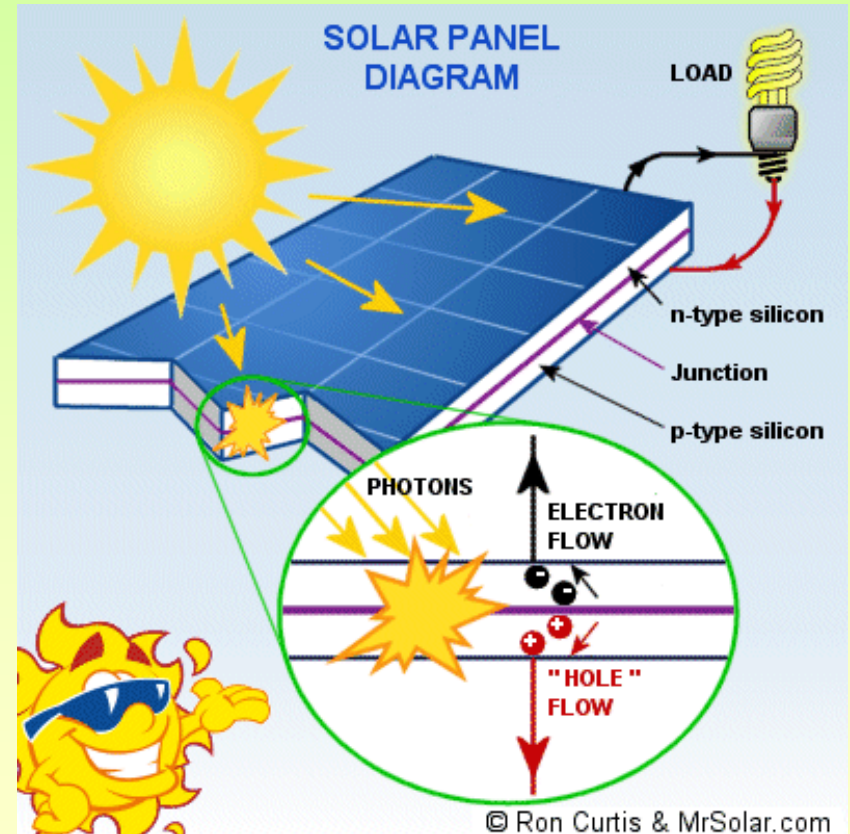
- Fossil fuels (most commonly used energy source) are considered non-renewable
- Technology looks to renewable resources as alternatives to fossil fuels
 - Solar cells
 - Wind mills
 - Hydroelectric
 - Geothermal





Solar Cells

- Convert sunlight to electrical energy
 - Unlimited amounts
 - Quiet
 - Clean, non-polluting
 - But is inefficient & expensive to set up



Windmills

- Used to convert KE of wind into electrical energy
 - Inexhaustible
 - Non-polluting
 - But there are limitations to its usefulness
 - Takes a LOT of windmills to produce enough electrical energy to make an economy viable
 - Limited to regions of the country where wind is relatively constant (coastlines, etc.)

