Energy

Physical Science

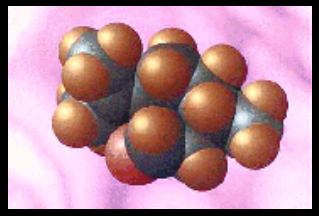
Nature of Energy

Energy is all around you.

- You hear energy as sound, you see energy as light, you can feel energy in wind.
- Living organisms need energy for growth and movement.

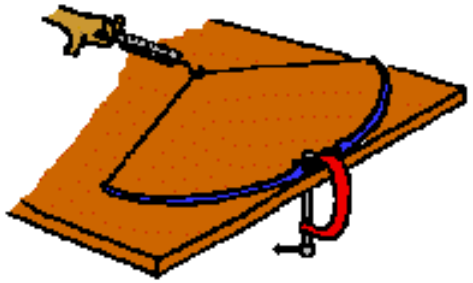
- You use energy when you hit a tennis ball, compress a spring, or lift a grocery bag.
- Energy is the ability to do work.

Forms of Energy



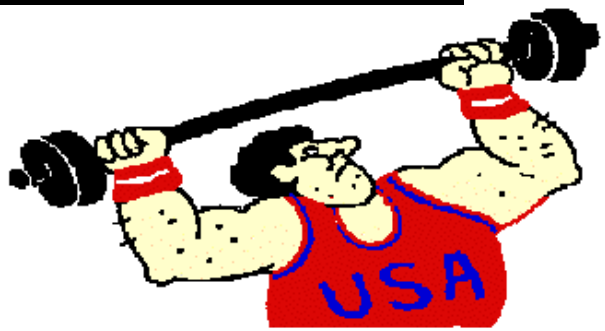
- Energy appears in many forms. There are 7 main forms of energy.
- Mechanical
- Heat – Thermal Energy
- Chemical
- Electrical
- Nuclear
- Sound
- Light

Mechanical Energy



A drawn bow possesses mechanical energy in the form of elastic potential energy.

The kinetic energy of high speed winds contributes to its ability to do work.



A weightlifter applies a force to cause a barbell to be displaced. The barbell then possesses mechanical energy – all in the form of potential energy.

Energy of motion.

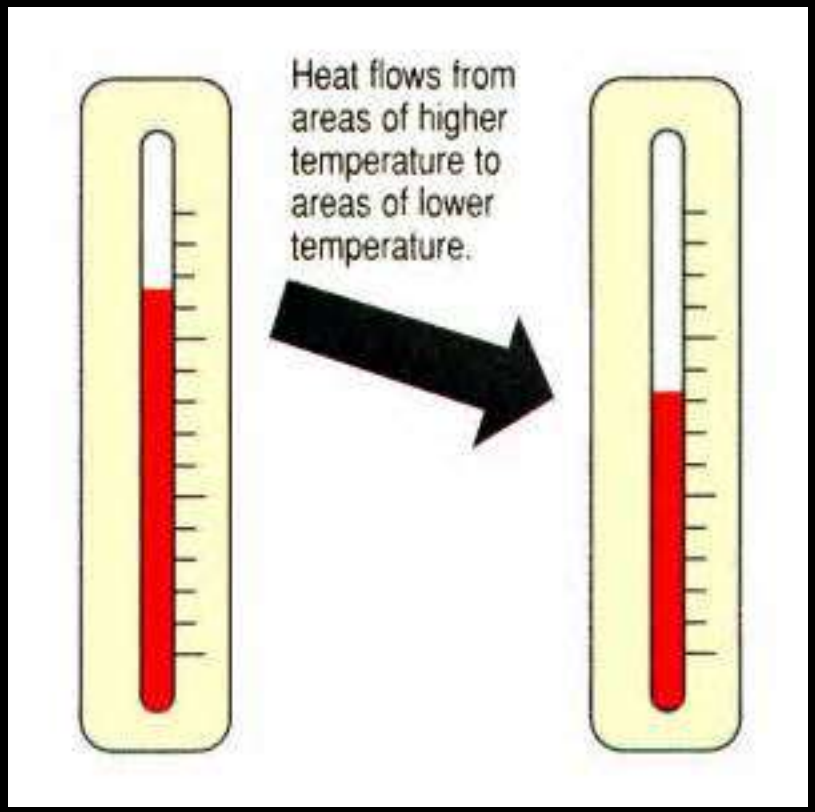
Energy of moving particles of matter

Examples:

- Water in a waterfall
- Wind
- Moving vehicles
- Sound
- Blood traveling through your body

Heat Energy

AKA…Thermal Energy



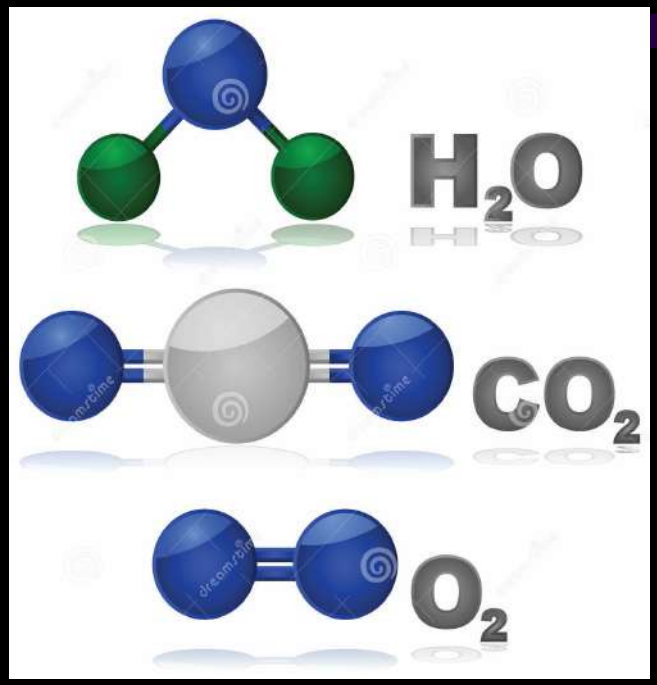
- The internal motion of atoms.
- The faster the molecules move, the more heat energy is produced.

Examples:

Friction

Changes in state of matter

Chemical Energy



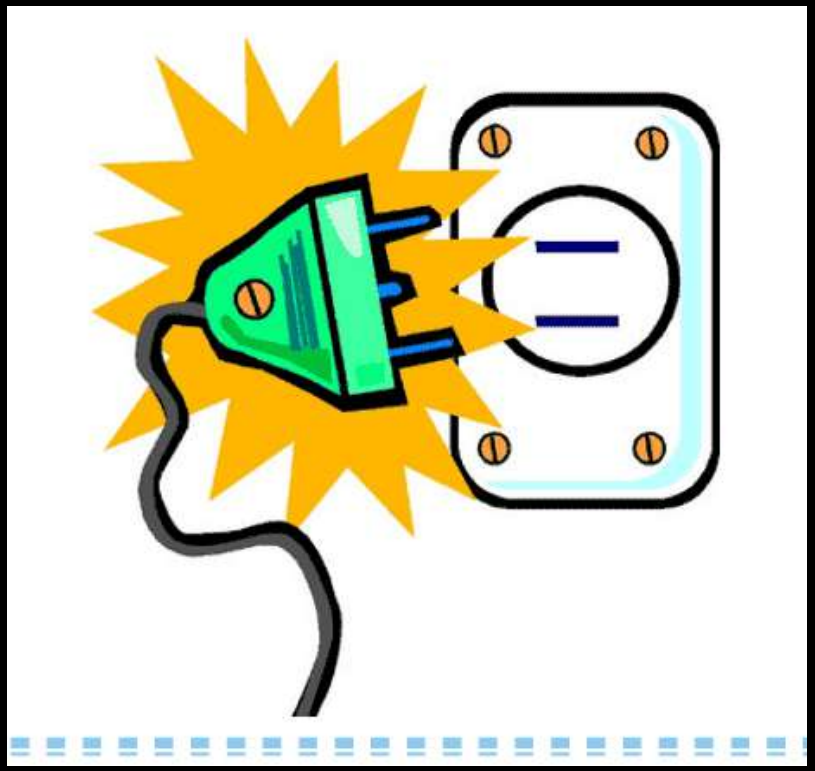
- Energy that exists in the bonds that hold atoms together.
- When bonds are broken, chemical energy is released.

Examples:

- Digesting food…bonds are broken to release energy for your body to store and use.
- Sports… your body uses energy stored in your muscles obtained from food.
- Green plant
- Fire–a chemical change.

Sodium metal reacts with water.

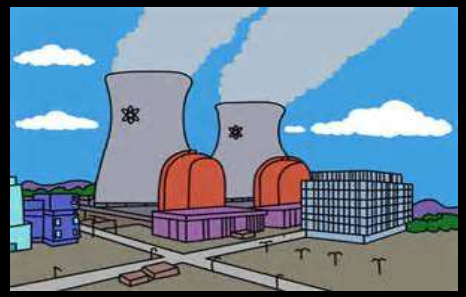
Electrical Energy



Energy that results from the flow of moving charges

Examples:

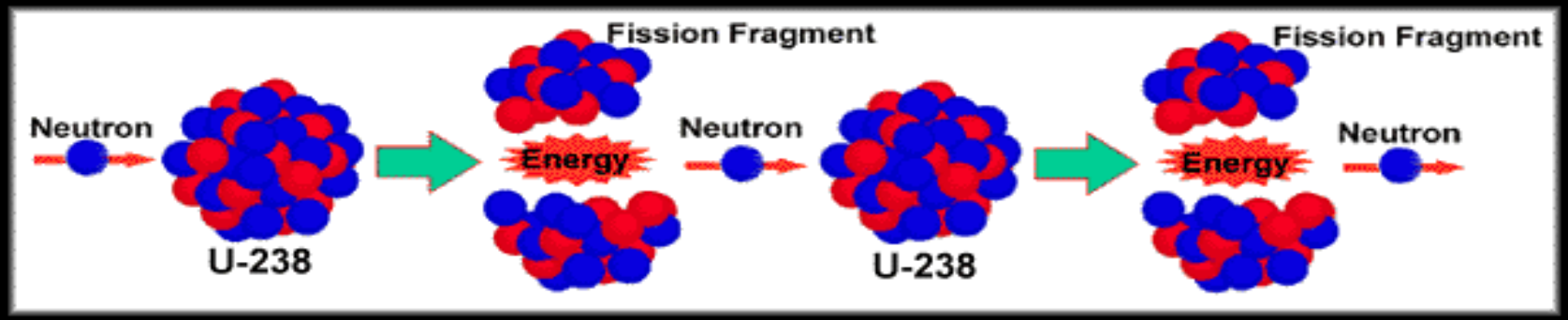
- Electricity
- Lightening



Nuclear Energy

Energy stored in the nucleus of an atom as a result of strong nuclear forces.

- When the nucleus of an atom splits, nuclear energy is released.
- Nuclear energy is the most concentrated form of energy.



Light Energy

- Energy when light is absorbed, transmitted, or reflected.
- If the light is absorbed, it will cause the object to warm up a little.
- Examples: X-rays, radio waves, sunlight

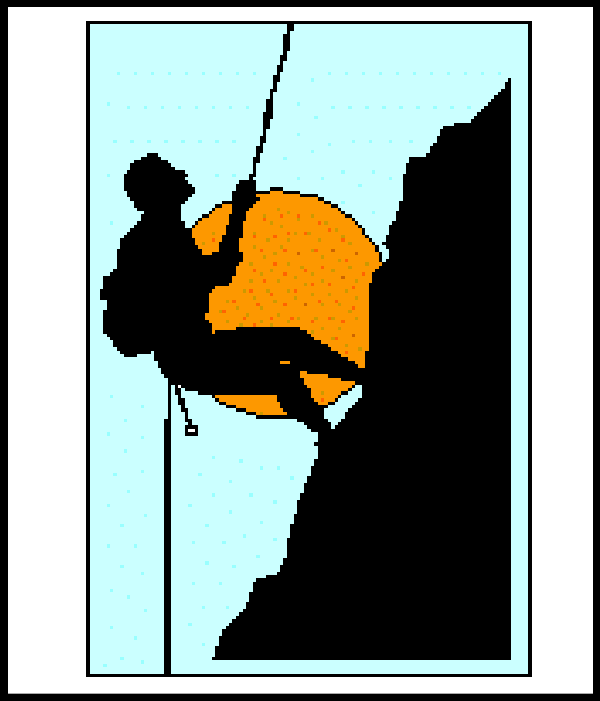
Sound Energy

- Energy given off by a vibrating object.
- Travels through matter in the form of waves
- Ex. Large blast from explosion, space shuttle taking off

Questions

- What is energy?
- Can energy be transferred from one object to another?
- What are the different forms of energy?

States of Energy



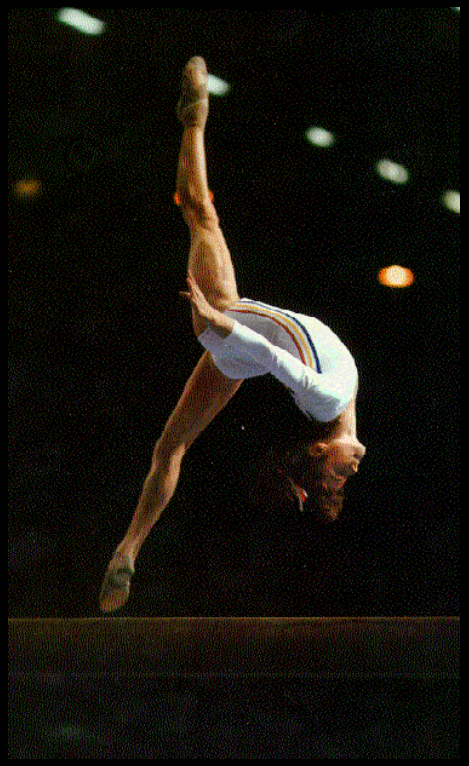
There are two states of energy:

Potential and Kinetic

Potential Energy

- Stored energy – energy of position.
- Gravitational Potential energy – dependent on height and weight.
- GPE = Weight x Height
- Units – Newton*meter = Joules

Kinetic Energy



- The energy of motion.
- The faster the object moves – the more kinetic energy.
- Kinetic energy depends on both mass and velocity.
- KE = $\frac{1}{2}$(mass x velocity^2)
- Kg m^2/s^2 =Newton*meter= Joules

Energy Conversions

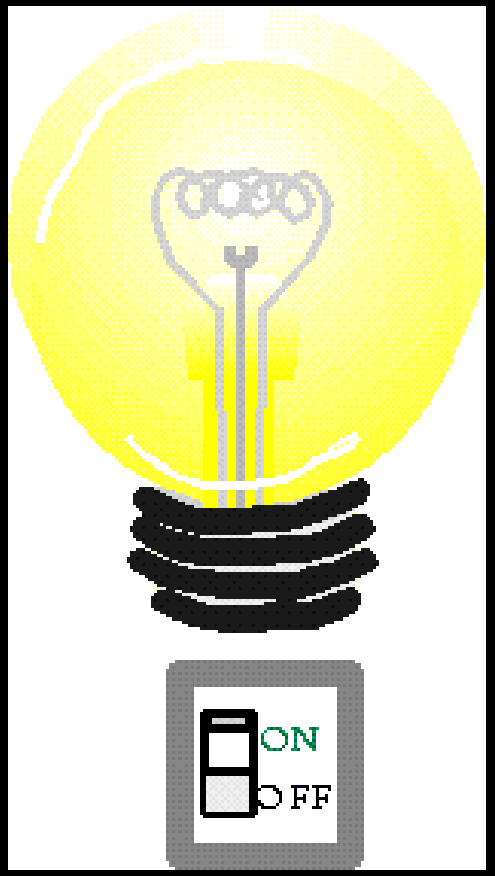
- The most common energy conversion involves the changing of potential energy into kinetic energy or vice-versa.

Examples:

Ball thrown in the air

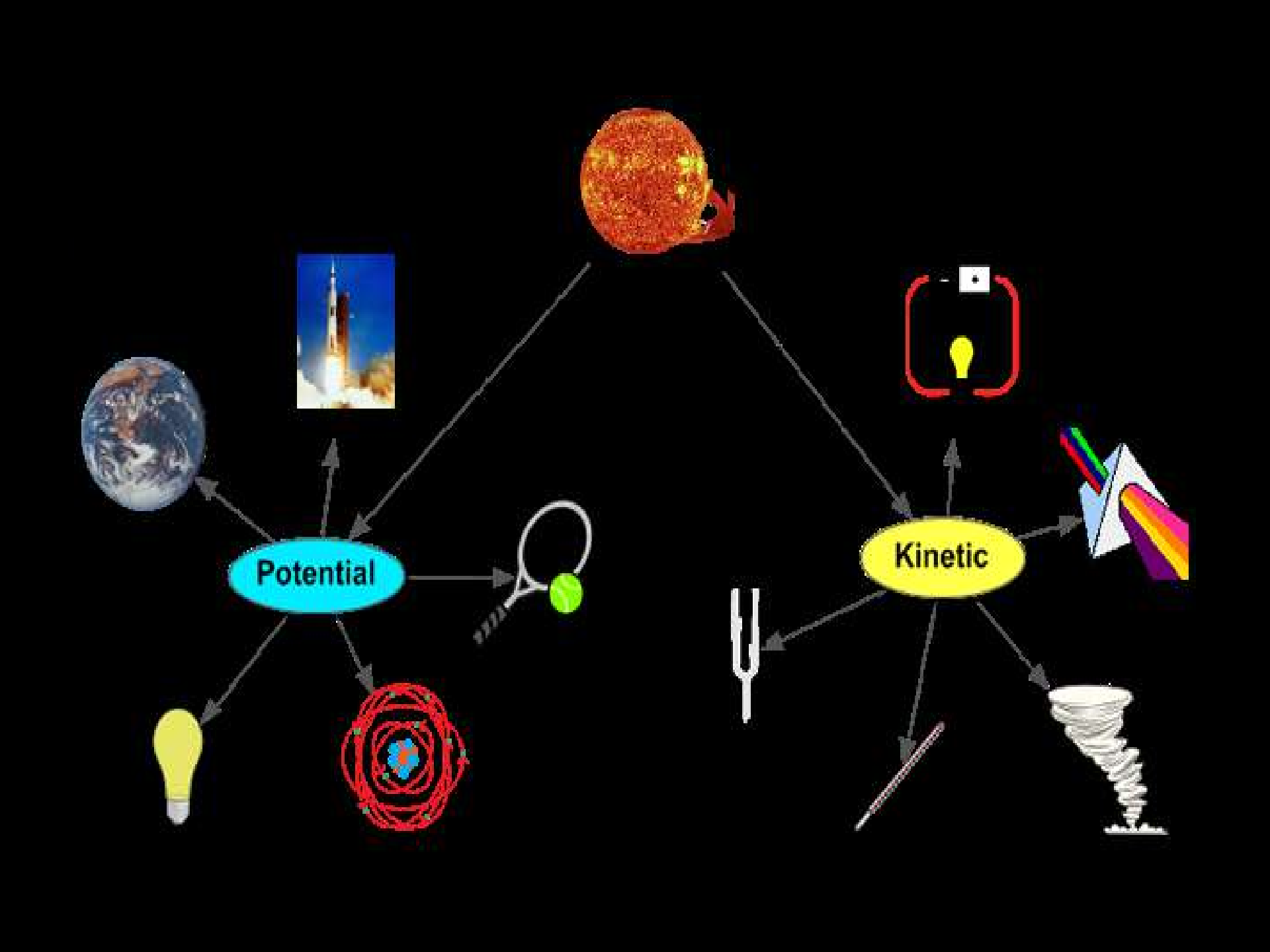
Roller coaster

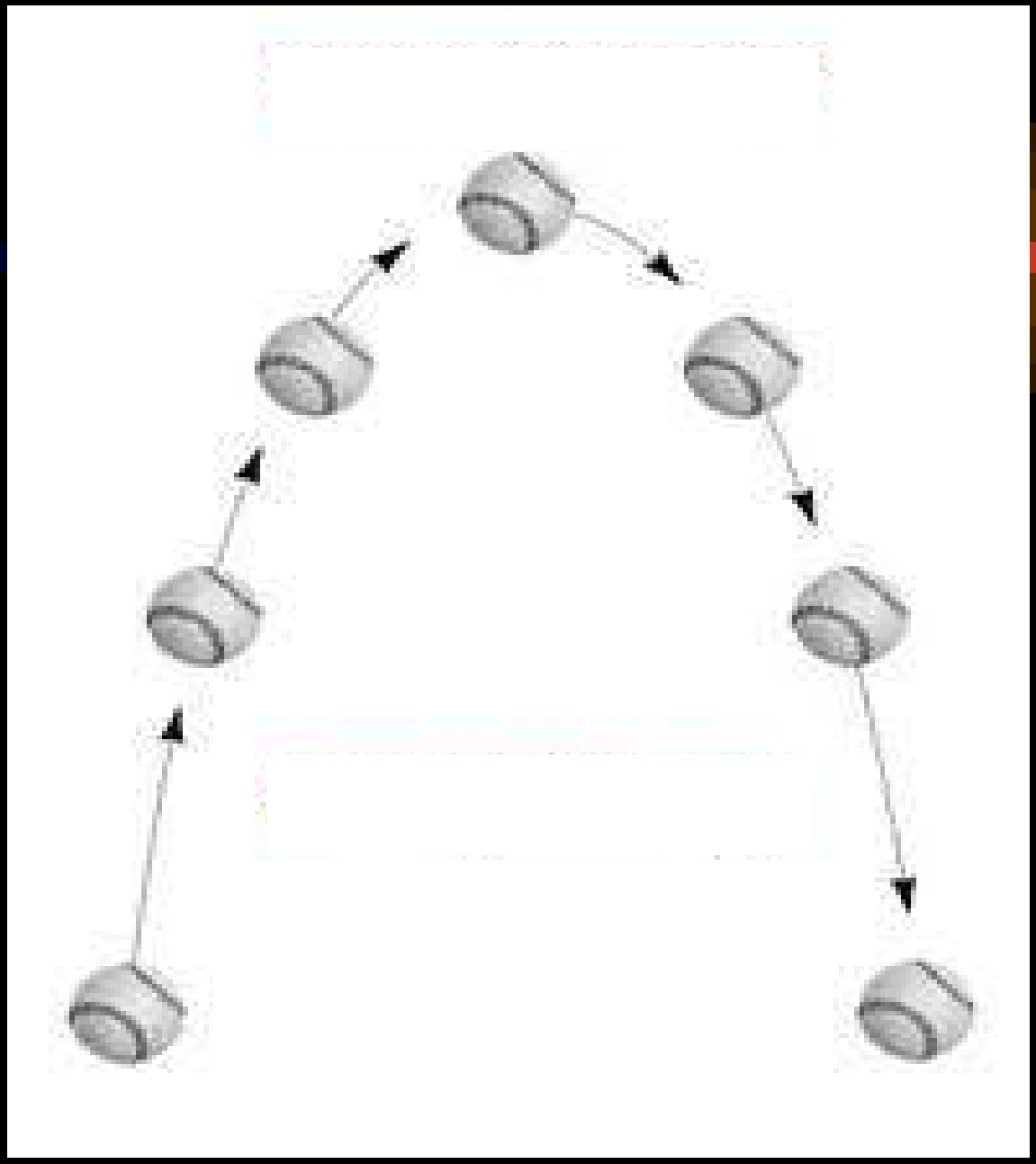
More Conversions

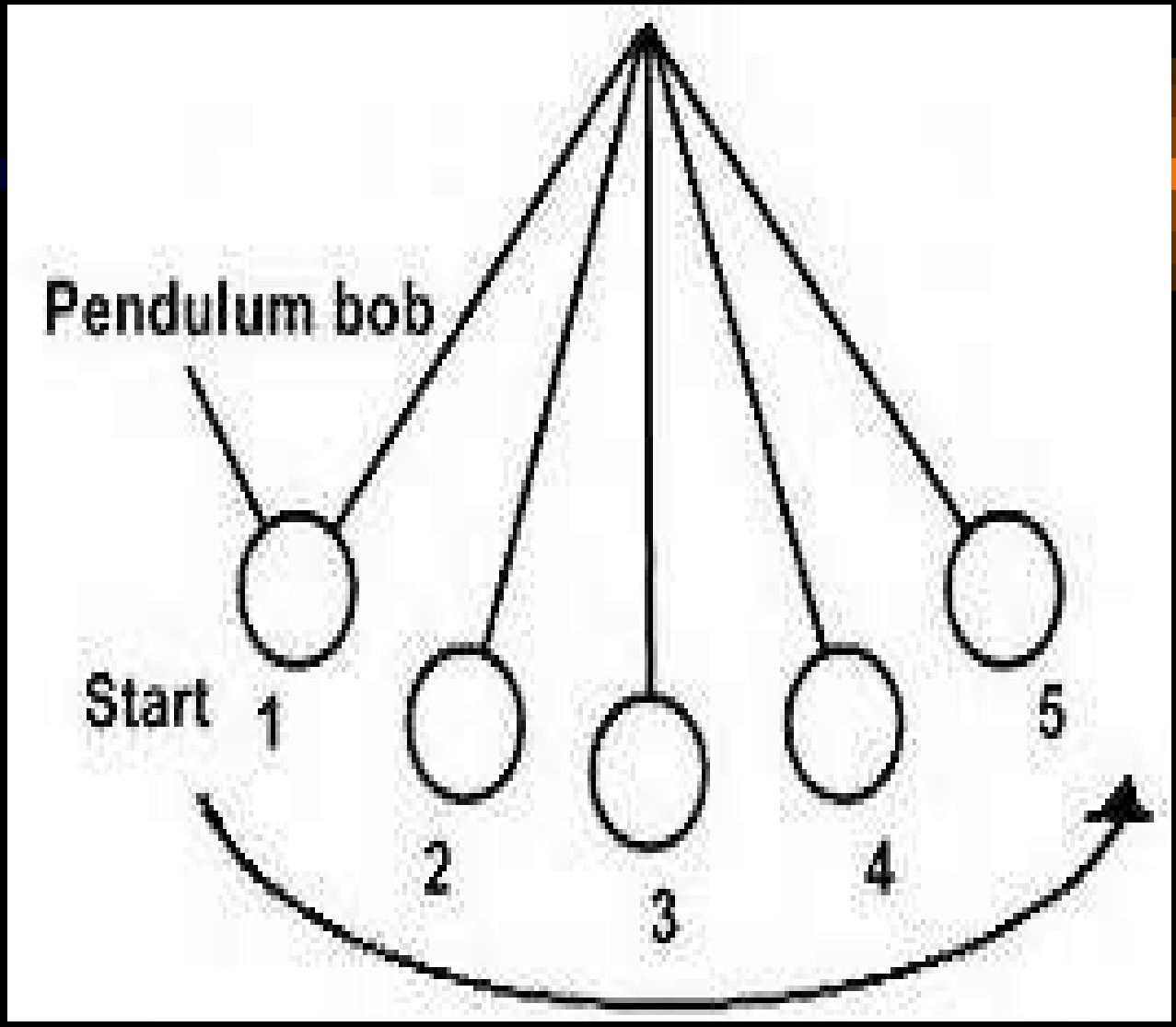


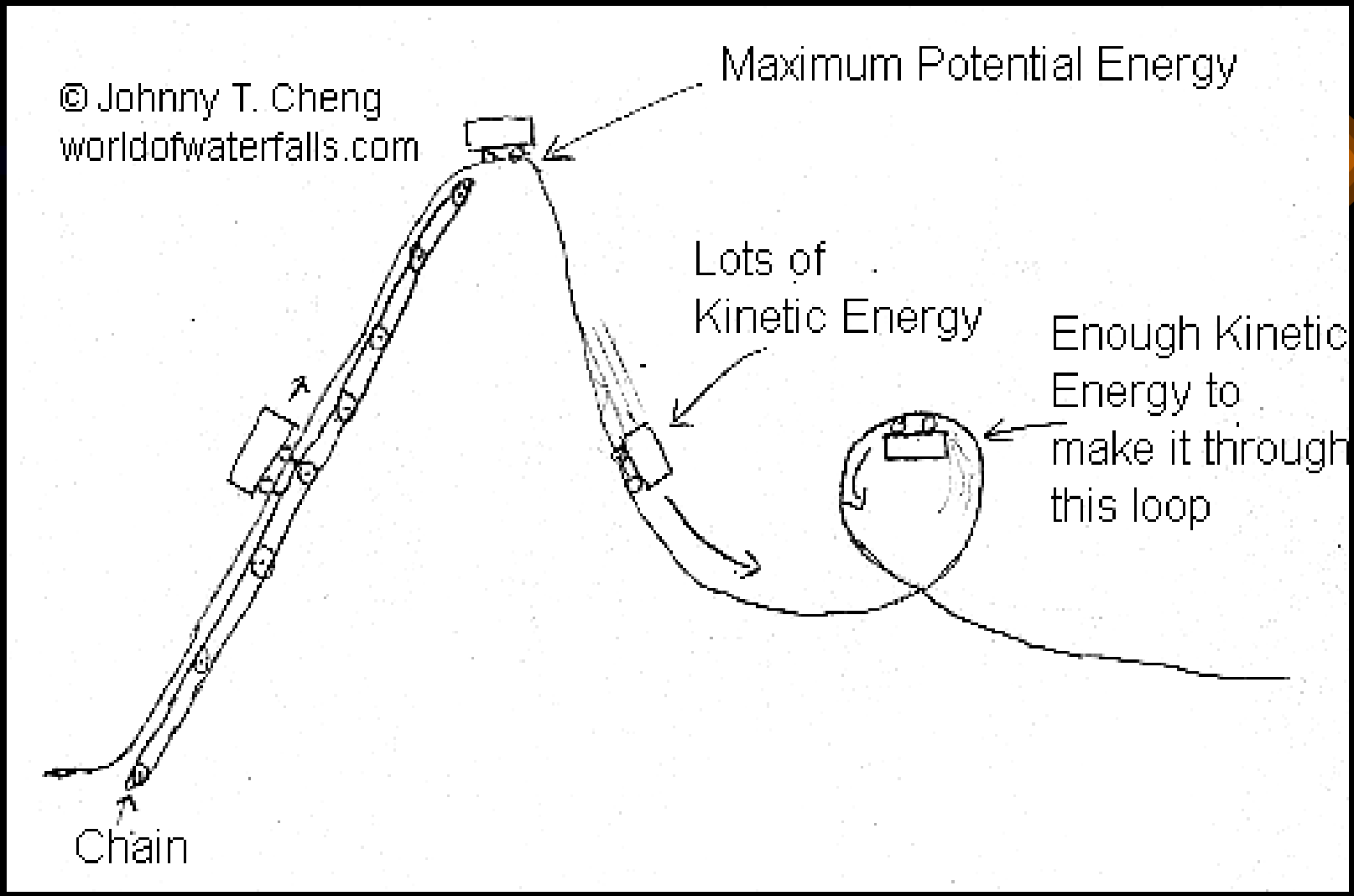
- All forms of energy can be converted to other forms.
- Law of Conservation of Energy: Energy cannot be created or destroyed.
- Einstein – If matter is destroyed, energy is created, if energy is destroyed, matter is created. The total amount of mass and energy is conserved.

Electromagnetic energy comes in…produces light then, converted to heat..


Potential
Kinetic




Pendulum bob
Start
1
2
3
4
5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worldofwaterfalls.com
Maximum Potential Energy
Lots of
Kinetic Energy
Enough Kinetic
Energy to
make it through
this loop
Chain

Copy and Answer.
Which will have the greatest gravitational potential energy?

1. a) 50 pound rock at the top of a hill.
   b) 25 pound rock at the top of a hill.

2. a) a car at the top or a hill.
   b) a car at the bottom of a hill.

Concept Review

Energy

Types of
1. Heat
2. Chemical
3. Nuclear
4. Mechanical
5. Electromagnetic

Ability to
? Work

Potential ?

Is energy
Stored

Formula
Weight x Height

Kinetic

Energy of
? Motion

Formula
$1/2mv^2$

Writing Assignment

Page 407 # 4

- Identify the various energy conversions involved in the following events:
- An object is raised and then allowed to fall. As it hits the ground it stops, produces a sound and becomes warmer.
- Due tomorrow at the beginning of class.

Resources

Roller coaster Animation:

http://www.glenbrook.k12.il.us/gbssci/phys/mmedia/energy/ce.html

Mouse Trap animation

http://communities.msn.com/VickisClipArtandAnimationStorage/mimichar.msnw?action=ShowPhoto&PhotoID=4571

Chevy animation

http://communities.msn.com/VickisClipArtandAnimationStorage/angelfirepics.msnw?action=ShowPhoto&PhotoID=4601

Pics

http://www.glenbrook.k12.il.us/gbssci/phys/Class/energy/u5l1e.html

http://www.glenbrook.k12.il.us/gbssci/phys/Class/energy/u5l1b.html

http://www.glenbrook.k12.il.us/gbssci/phys/Class/energy/u5l1d.html

http://library.thinkquest.org/20331/types/

http://library.thinkquest.org/20331/history/timeline1600.html

http://library.thinkquest.org/20331/history/timeline1900.html

http://library.thinkquest.org/2745/data/loops.htm

http://www.sunybroome.edu/~eet_dept/POWERPIX.html

http://www.st-agnes.org/~lstinson/webpages/kinpot.htm

http://www.rz.uni-frankfurt.de/~schauder/

http://radar.metr.ou.edu/OK1/meteorology/HeatTransfer.html

http://hrast.pef.uni-lj.si/docs/en/web-based_education/infodist/tutorial/simulate/off.htm

http://heritage.stsci.edu/2000/15/index.html

http://csep10.phys.utk.edu/guidry/violence/remnants-save.html

Text

Exploring Physical Science, Prentice Hall, chapter 16.