

I. Energy: the capacity to do work (“joules” → j)

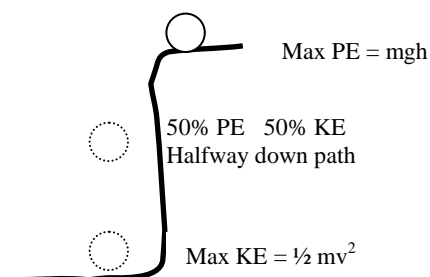
A. Potential Energy (PE) → stored energy

1. An object’s energy just prior to falling (*position*)

- Chemical energy {
2. Food, Heat
 3. Fuel
 4. Ammunition

B. Kinetic Energy (KE) → energy of motion

1. A falling object
2. **Temperature**
 - Motion of molecules



C. Specific Forms of Energy (*Each has both PE & KE*)

1. **Chemical** energy → The energy associated with chemical changes (*energy is also involved with physical changes*)
2. **Mechanical** energy → sum total of PE + KE to accomplish a task using force and involving motion (i.e. associated with machines)
 - For *elastic collisions*, mechanical energy is conserved but for *inelastic collisions*, some mechanical energy is converted into heat.
3. **Electrical** energy → flow of e-
4. **Light** energy (electromagnetic **radiation**)
 - a. gamma ... *highest energy, highest frequency, shortest wavelength*
 - b. X-ray
 - c. UV
 - d. visible (VIBGYOR) ... *400 nm to 700 nm*
 - e. infrared
 - f. microwave
 - g. radio... *lowest energy, lowest frequency, longest wavelength (> 1 m)*
5. **Sound** energy → sonar, ultrasound
6. **Magnetic** energy → magnetic field (NMR diagnostic techniques) MRI

7. **Heat** energy → form of energy that takes into account the quantity of matter
8. **Nuclear** Energy → fission (splitting atoms), fusion (combining atoms)

D. Energy Units

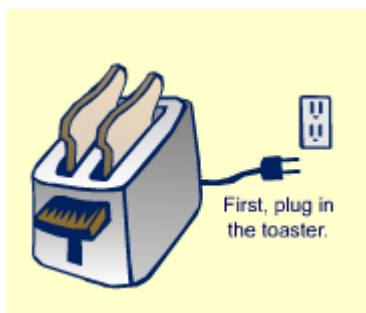
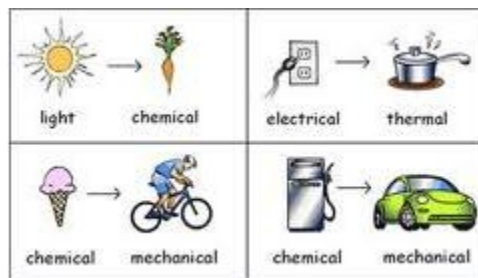
1. **Joule (j)** → *When a force of 1 Newton is applied through a distance of 1 meter, 1 joule of work is done*

$$E \text{ (joules)} = f \text{ (Newtons)} \times d \text{ (meters)}$$

2. **Calorie** → *The amount of energy required to raise 1 gram of water, one degree Celsius.*

Group Activity

Have students chose a reaction, a machine, etc. to discuss the energy transformations involved (*e.g. cell phone, toaster, eating*)



mechanical (push handle) → electrical → heat / light → chemical (toast)

- The type of energy given to a car when you speed it up is
a) potential b) kinetic c) chemical d) electromagnetic
- When a piece of paper catches on fire it is converting _____ energy to _____ energy.
a) KE to heat b) light to heat c) chemical to heat d) chemical to PE
- The energy stored in the water behind a tall dam is in the form of
a) gravitational potential c) kinetic
b) electromagnetic d) compressional energy
- When an electric motor lifts an elevator, the electrical energy
a) remains in the motor c) is doubled
b) disappears d) is converted into other forms
- When a ball is dropped on the floor, it bounces lower and lower until it stops. This is an example of energy being converted to _____ energy.
a) potential b) heat & sound c) electromagnetic d) nuclear
- Allie climbs to the top of a ladder. While doing this, she was converting _____ energy to _____ energy.
a) thermal \rightarrow sound c) kinetic \rightarrow heat
b) chemical \rightarrow gravitational d) chemical \rightarrow elastic
- A boy blows up a balloon, and then sticks a pin in it to make it pop. When it pops, it converts _____ energy into _____ energy.
a) elastic \rightarrow sound c) kinetic \rightarrow heat
b) thermal \rightarrow sound d) kinetic \rightarrow elastic
- A basketball rolls down a hallway, gradually slowing down. During this time, its kinetic energy is transformed into what type of energy?
a) elastic b) heat c) electromagnetic d) potential
- A bungee jumper (1) falls freely, (2) accelerates while falling, (3) gets suspended by the bungee cord which stretches 5 meters beyond its normal length. What energy transformations best show what took place?
a. gravitational PE \rightarrow KE \rightarrow elastic PE c. chemical \rightarrow heat \rightarrow KE
b. elastic PE \rightarrow gravitational KE \rightarrow chemical d. mechanical \rightarrow KE \rightarrow elastic PE
- What energy transformations are involved with moving a car?
a. chemical (fuel) \rightarrow thermal (engine) \rightarrow mechanical (crankshaft/wheels)
b. mechanical (turn key) \rightarrow thermal (engine) \rightarrow mechanical (crankshaft/wheels)
c. mechanical (shift/pedal) \rightarrow electrical (battery/ignition) \rightarrow chemical (fuel/combustion)
d. all of the choices

1. b
2. c
3. a
4. d
5. b ... friction slows down the ball; bouncing produces sound (also lowers KE)
6. c ... climbing involves KE, exertion produces heat
7. a ... the elasticity causes the PE to build up, the "pop" is a sound
8. b
9. a
10. d