

13-1

- Energy: ability to do work or cause change; Work: transfer of energy
- Unit of energy and work is the same: Joule or Newton.meter
- Kinetic Energy: energy of motion, depends on mass and velocity
 $KE = (m \times v^2) \div 2$
The change in velocity has a greater effect on the kinetic energy;
double the velocity, quadruple the energy; double the mass, double the energy
- Potential Energy: stored energy held to be used later
 - elastic potential energy is associated with objects that can be stretched or compressed, ex. rubber band, arrow
 - gravitational potential energy is associated with height
GPE (N.m or Joules) = weight (N) x height (m)
Weight (Force) = mass x acceleration (Newton's 2nd Law)
GPE = mass x acceleration x height
- Forms of energy
 - mechanical: associated with motion or position of an object
ex. moving car
kinetic and potential
 - thermal: associated with arrangement of particles; total energy of the moving particles
ex. ice cream melting in warmer temperatures
kinetic and potential
 - chemical: energy stored in the chemical bonds in compounds
ex. match, fuel, candle, food
potential
 - electric: energy carried by moving charges
ex. radio, TV, battery
kinetic
 - electromagnetic: travels in waves
ex. radiowaves (microwaves, radar), infrared waves, visible light, UV rays, X rays, gamma rays
kinetic
 - nuclear: energy stored in the nucleus until released in nuclear reactions (fission – splitting of nucleus and fusion – joining of nuclei)
ex. Uranium splitting in nuclear power plants
potential

13-2

- Energy can be converted from kinetic to potential or vice versa. Energy can also be converted from one form to another.
- The Law of Conservation of Energy
- Friction changes mechanical energy into thermal energy. This explains why some work in a machine is used to overcome friction and reduce its efficiency.
- Einstein's relativity law changes the Law of Conservation of Energy by showing that some energy is created by destroying matter (in nuclear reactions).

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In the sun nuclear energy is converted into electromagnetic energy, which is used by plants to make chemical energy. Chemical potential energy is converted to thermal energy in combustion. Thermal energy is converted to mechanical energy when it is used to boil the water into steam. The mechanical energy of the steam is used to generate electricity by a generator. The electrical energy is converted to electromagnetic (light), thermal (toaster), or other forms.

13-4

- $\text{Power} = \text{Work} \div \text{Time}$ or $\text{Power} = (\text{Force} \times \text{Distance}) \div \text{Time}$
- Unit: Newton.meter/sec or Joule/sec or Watt
- Since work is transfer of energy, then power is the rate at which energy is transferred.
- 100 W bulb is brighter than 40 W bulb since it gives more energy/second.
- Horsepower = 746 Watts is another unit for power used for car engines. It is not SI.