

### 3.1 Forms of Energy

**Energy** is the capacity or the ability to do work.

It is a *scalar quantity*.

The SI Unit of energy is always **Joules (J)**.

1. **Kinetic energy:** The energy in objects with motion.

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

Whereby: m is mass, v is velocity and  $E_k$  is kinetic energy.

2. **Gravitational potential energy:** Energy stored in raised objects or due to its position in a gravitational field.

$$PE_{\text{gravity}} = mgh$$

Whereby: m is mass, g is acceleration due to gravity, h is height and  $PE_{\text{gravity}}$  is Gravitational potential energy.

3. **Elastic potential energy:** Energy stored in compressed or stretched objects.

$$PE_{\text{Elastic}} = \frac{1}{2} kx^2$$

Whereby: k is spring constant, x is displacement from equilibrium and  $PE_{\text{Elastic}}$  is elastic potential energy

4. **Heat/ thermal energy:** An internal energy that flows between two substances/ objects due to temperature differences. It moves from warmer objects to a cooler object. The flow of heat continues until it reaches thermal equilibrium.
5. **Chemical energy:** This is the energy stored in chemical bonds of molecules. For example, energy is stored in batteries, fuel, and food.
6. **Electrical energy:** This is the energy associated with the flow of electric charge.
7. **Sound energy:** Energy that is produced by vibrating objects. For example, thunder.
8. **Geothermal energy:** Energy from the heat within the earth.
9. **Wind energy:** Energy derived from the motion of air.
10. **Tidal energy:** Energy from the gravitational force between the earth, moon, and sun causing tides.
11. **Solar energy:** Energy from the sun.
12. **Radiant energy:** Energy transferred by electromagnetic waves.
13. **Nuclear energy:** Energy released during nuclear reaction for example nuclear fission.