Energy

Work

- Work is force x distance
- Work is zero if the object is not moved at all. That does not necessarily mean that there is no force on the object.
- Work is broken into 2 categories.
  - Work done against a force
  - Work done to accelerate an object.
- The unit for work is the Nm or Joule

Power

- Power is a measure of the rate at which work happens.
- P=W/t where P is power, and W is work
- The unit for power is J/s or Watt (W)

Mechanical Energy

- There are two types of mechanical energy.
  - Potential – energy due to position
  - Kinetic – energy due to motion
- Potential energy is stored energy that has potential to be used.
- There are numerous types of potential energy.
  - Chemical, nuclear, electrical
  - We will focus on gravitational PE

Gravitational PE

- The higher an object is from the Earth's surface, the more work it took to get there.
- The amount of potential energy (PE or U) is exactly equal to the work done to get it there.
- PE = mgh the force is mg and the distance is the height.
- It is unimportant what path was taken to get to that height.

Kinetic Energy

- KE is the energy of motion
- KE = $1/2mv^2$
  - m is the mass
  - V is the velocity.
- It is also equal to the work done to bring the object from rest to that speed.
- So…. $Fd=1/2mv^2$
- Since both KE and PE are equal to the work done, then work is always equal to the change in energy

Conservation of energy

- Energy is not lost or gained, it is changed from one form to another.
- This is true for mechanical energy as well
- The potential energy that an object has can be converted to kinetic energy or back.
- So $\Delta PE = \Delta KE$

Energy of a spring

- A compressed or stretched spring has PE
- The amount of energy is related to the distance that it is deformed.
- PE is equal to $1/2kx^2$
- $F = kx$
- K is the spring constant which needs to be experimentally calculated for each spring.
- X is the amount of compression/expansion