Work - Force × Distance

$W = Fd\cos\theta$

Energy - ability or capacity to do work — measured in Joules (J)

Kinetic energy - energy of motion

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

Potential energy - stored energy

$PE = mgh$

Conservation of energy - energy is neither created or destroyed

Work energy theorem - $W = \Delta E$

Power = $\frac{\text{work}}{\text{time}}$ measured in watts (W)

Momentum - mass × velocity

$p = m \cdot \vec{v}$ measured in $\frac{kg\,m}{s}$

Conservation of momentum

Momentum is conserved

$p_0 = p_f$

3 types of collisions

Inelastic - momentum conserved, kinetic energy not conserved

Perfectly Inelastic - type of Inelastic collision where objects stick together

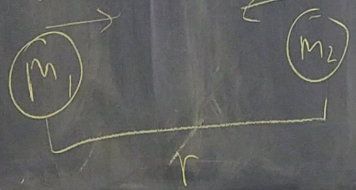
Elastic - momentum & kinetic energy is conserved.

Impulse momentum theorem

$$\Delta p = F \Delta t$$

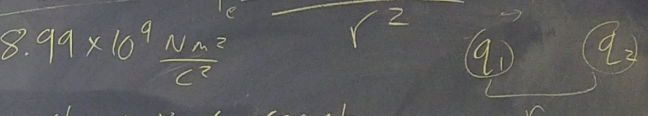
Newton's Law of universal gravitation

$$F_g = \frac{G m_1 m_2}{r^2} \qquad G = 6.673 \times 10^{-11} \frac{N m^2}{kg^2}$$



Coulomb's law - $F_e = \frac{k q_1 q_2}{r^2}$

$k = 8.99 \times 10^9 \frac{N m^2}{C^2}$



Electric charge is conserved

Fundamental electric charge $e = 1.6 \times 10^{-19}$ C

Charge is measured in Coulombs

Conductors - Charges can move freely.

Insulators - Charges cannot move easily

Relevant test questions

1. What is an atom made out of (3 subatomic particles) neutrons, protons, electrons

2. Would life be different if electric charges were flipped? It would be the same
   ex) electron is now +
   proton is now −

3. From an atomic viewpoint, why is charge usually transferred by electrons electrons are on the outside easy to move.

4. What is the electric force between 2 electrons that are 3.0×10^{-5} m apart?

$$F = \frac{k q_1 q_2}{r^2}$$

$k = 8.99 \times 10^{9} \frac{N m^2}{C^2}$

$q = -1.6 \times 10^{-19}$ C

$r = 3.0 \times 10^{-5}$ m