Physical Science

Mechanics:

Newton's laws of motion.

1. Inertia
2. $F_{net} = m \bullet a$
3. action = -reaction

Kinematic Equations

$s = \frac{1}{2}a \bullet t^2 + a \bullet t + s_0$

$v = a \bullet t + v_0$

a = acceleration

speed is scalar, magnitude only vs. velocity is a vector, both magnitude and direction

Work and Energy

Kinetic: $KE = \frac{1}{2} m \bullet v^2$

Potential : $PE = m \bullet g \bullet y$

Work = $F \bullet s = E_2 - E_1$

Power = work/time

Gravity

$s = \frac{1}{2}g \bullet t^2 + g \bullet t + s_0$

$v = g \bullet t + v_0$

$a = g \cong -9.8\ m/s^2 \cong -32\ ft/s^2$

$g = G \bullet m_1 \bullet m_2 / d^2$

$G = 6.67 \times 10^{-11}\ N \bullet m/kg^2$

Chemical bonds

Covalent: electron sharing, strong bonds each atom is attracted for shared electrons.

Ionic: electron gaining/losing, change in charge attracts atoms

Metal: electrons loosely bonded to metal nuclei. Sea of electrons permits heat, electricity and shaping of metal.

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Electricity and Magnetism

V, voltage (volt, V) = PE/charge or I•R
I, current (ampere, A) = charge/time or voltage/resistance
R, resistance (ohm, Ω) = voltage/current
P, power (watt, W) = I•V
q, charge (coulomb, C) = 1C ≅ charge on 6.25×10^{18} e^-
Coulombs Law: $F = k \bullet q_1 \bullet q_2 / d^2$
Faraday's Law: voltage induced ≅ number of loops•B field/time
F = q•v•B
V, velocity (meter/second)
B, magnetic field strength (tesla, T)

Atom, Nuclear, and Chemistry

Mass number, the number of nucleons $p^+ + n^0$.
Atomic number, the number of protons p^+.
Number of neutrons = mass # - atomic #.
Isotope is an atom with differing # of neutrons n^0, has radioactive properties.
Energy is released when mass is converted into E according to $E = mc^2$.

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