DEFINITIONS AND PRINCIPLES OF PHYSICS

Newton's laws of motion

I. An object remains at rest or continues in motion in a straight line unless acted on by an external force.
II. The rate of change of momentum of an object is proportional to the applied force.
III. To the action of every force, an equal and opposite opposing force is generated.

Force – that which causes or changes motion (SI unit: Newton, N = kg m/s^2)

Mass – A measure of the amount of matter in a body (SI unit: kilogram, kg)

Velocity – The rate of change of position of an object (speed of motion) in a given direction (SI unit: meter per second, m/s)

Force of gravity – The force that causes objects to fall toward a body and controls the motions of the planets; it is proportional to the product of the masses of the two objects involved and inversely proportional to their distance apart

Momentum – The mass of an object in motion multiplied by its velocity (SI unit: kilogram meter per second, kg m/s)

Acceleration – The rate of change of the velocity of an object in motion. Thus, Newton's second law of motion means that force equals mass multiplied by acceleration

Work – Work is done when the point of application of a force moves; the work done equals the force multiplied by the distance moved by the force's point of

application (SI unit: joule, J); the concept of work is fairly intuitive, as is the concept of power

Power – The rate of doing work or the work done per unit time; power equals the work done divided by the time taken to do it (SI unit: watt, W).

Kinetic energy – The energy an object has by virtue of its motion (SI unit: joule, J)

Potential energy – The energy an object has by virtue of its position or state (SI unit: joule, J)

Law of Conservation of Energy – In a closed system for which no energy leaves or enters, the amount of energy in the system is constant

Law of Conservation of Momentum – When two or more objects act upon one another their total momentum does not change unless external force is applied; this is derived from Newton's Third Law of Motion

Pressure – Force per unit area of application (SI unit: Pascal, Pa = N/m2)

Density – The mass per unit volume of a substance (SI unit: kilogram per cubic meter, kg/m^3)

Absolute pressure measurement – A pressure measurement made with reference to vacuum

Relative or gauge pressure – A pressure measurement made with reference to atmospheric pressure

Latent heat – The latent heat (e.g. vaporization) is the energy required to convert 1 kg of a substance from one phase to another without change in temperature at a given pressure (SI unit: joules per kilogram, J/kg)

Fick's Law – The rate of diffusion is proportional to the gradient of concentration

Graham's Law – The rate of diffusion through a permeable material is inversely proportional to the square root of the molecular weight of the diffusing molecule

Henry's Law – Given an inert gas in contact with a liquid, the mass of gas that dissolves in the liquid is directly proportional to the partial pressure of the gas above the liquid