Equation relating speed, frequency, and wavelength of a wave	$c = f\lambda$
Definition of ***PERIOD*** (*T*)	Time taken for one complete oscillation (measured in seconds)
Definition of ***FREQUENCY*** (*f*)	Number of complete oscillations per second

Equation relating frequency and period of an oscillation	$f = \frac{1}{T}$
Equation for finding the frequency of the first harmonic for stationary waves on a string	$f = \frac{1}{2l}\sqrt{\frac{T}{\mu}}$
Equation for the double slit experiment, relating fringe separation, slit spacing, distance from screen, and wavelength of light.	$w = \frac{\lambda D}{s}$

Equation for diffraction grating	$d\ sin\theta = n\lambda$
Formula for refractive index of a substance	$n = \frac{c}{c_s}$
Law of Refraction	$n_1 \sin\theta_1 = n_2 \sin\theta_2$

Critical Angle	$sin\ \theta_c = \frac{n_2}{n_1}$ $for\ n_1 > n_2$
Moment of a Force	*Force × perpendicular distance from the pivot, Fd*
Word definition of velocity	Rate of change of displacement

Definition of velocity in symbols	$v = \dfrac{\Delta s}{\Delta t}$
Word definition of acceleration	Rate of change of velocity
Definition of acceleration in symbols	$a = \dfrac{\Delta v}{\Delta t}$

Equations of motion for uniform acceleration (the "suvat" equations)

$$v = u + at$$

$$s = \left(\frac{u+v}{2}\right)t$$

$$v^2 = u^2 + 2as$$

$$s = ut + \frac{1}{2}at^2$$

Equation relating force, mass, and acceleration

$$F = ma$$

Definition of ***momentum*** (*p*)

$$momentum = mass \times velocity$$

$$p = mv$$

Definition of ***impulse***	$F\Delta t = \Delta(mv)$
Equation relating force, momentum, and time in words	*Force = rate of change of momentum*
Equation relating force, momentum, and time in symbols	$F = \frac{mv - mu}{t}$ *or* $F = \frac{\Delta mv}{t}$

Equation relating work done, force, and distance	$w = Fs$ or $w = Fs\cos\theta$
Equation for kinetic energy	$E_k = \frac{1}{2}mv^2$
Equation for gravitational potential energy	$\Delta E_p = mg\Delta h$

Definition of ***POWER in words***	Power is the rate of conversion of energy
Definition of ***POWER (P) in symbols***	$P = \frac{\Delta w}{\Delta t}$
Equation relating power, force, and velocity	$P = Fv$

Definition of
EFFICIENCY

$$efficiency = \frac{useful\ power\ output}{total\ power\ input}$$

$$percentage\ efficiency = \frac{useful\ power\ output}{total\ power\ input} \times 100\ \%$$

Definition of
DENSITY

$$\rho = \frac{m}{v}$$

Hooke's Law

$$F = k\Delta L$$

Young Modulus	$\frac{tensile\ stress}{tensile\ strain} = \frac{F \times L}{A \times \Delta L}$
Tensile Stress	$\frac{\mathrm{F}}{\mathrm{A}}$
Tensile Stress	$\frac{\Delta L}{\mathrm{L}}$

Equation for calculating energy stored in a stretched or compressed material obeying Hooke's Law	$E = \frac{1}{2}F\Delta L$ $E = \frac{1}{2}k\Delta L^2$
Equation for calculating energy stored ***per unit volume*** *for a stretched or compressed material obeying Hooke's Law*	½ *stress* × *strain*
Definition of WEIGHT	$W = mg$

Equation for energy of a photon	$E = hf = \frac{hc}{\lambda}$

Photoelectric effect equation	$hf = \phi + E_{k(\max)}$

de Broglie wavelength	$\lambda = \frac{h}{p} = \frac{h}{mv}$

Definition of
Work Function

ϕ = the minimum amount of energy needed to release an electron from the surface of a metal

$$\phi = hf_0$$

Definition of
Stopping Potential

Stopping potential, V_s is the potential difference needed to stop the fastest moving electron in a photocell experiment

$$E_{k(max)} = eV_s$$

Definition of
Specific Charge

$$\frac{Q}{m}$$

Equation relating current, charge, and time	$I = \frac{\Delta Q}{\Delta t}$
Equation relating p.d., work done, and charge	$V = \frac{W}{Q}$
Definition of ***the VOLT***	*1 joule per coulomb*

Equation relating p.d., current, and resistance	$V = IR$
Equation defining resistivity	$\rho = \frac{RA}{l}$
Equation for calculating total resistance of resistors in series	$R_T = R_1 + R_2 + R_3 \ldots$

Equation for calculating total resistance of resistors in parallel	$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \cdots$ *or* $R_T = \left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \cdots\right)^{-1}$
Three equations for electrical power in a circuit	$P = IV = I^2R = \frac{V^2}{R}$
Equation relating p.d. and current to the total energy transferred by a component in a time, t.	$E = ItV$

Definition of ***electromotive force (emf) in words and symbols***	amount of energy supplied per coulomb *by* a power source $\varepsilon = \frac{E}{Q}$ *units: volts*
Equation relating emf of a power supply, its internal resistance and the external resistance in a circuit	$\varepsilon = I(R + r)$
Equation relating emf of a power supply, its internal resistance, the current through the circuit, and the p.d. across the external components	$V = \varepsilon - Ir$

Equation defining angular speed	$\omega = \frac{\theta}{t}$
Equation relating angular speed to frequency of orbit	$\omega = 2\pi f$
Equation relating angular speed to period of orbit	$\omega = \frac{2\pi}{T}$

Equation relating angular speed to linear velocity and radius of orbit	$\omega = \frac{v}{r}$
Equation for centripetal force	$F = \frac{mv^2}{r} = m\omega^2 r$
Equations for centripetal acceleration	$a = \frac{v^2}{r} = \omega^2 r$

Criteria for Simple Harmonic Motion (SHM)	Acceleration is proportion to the displacement, and always directed in the opposite direction, towards the equilibrium position
Equation relating acceleration and angular frequency in SHM	$a = -\omega^2 x$
Equation for displacement in SHM	$x = A\cos(\omega t)$

Equation for speed in SHM	$v = \pm\,\omega\sqrt{A^2 - x^2}$
Equation for maximum speed in SHM	$v_{max} = \omega A$
Equation for maximum acceleration in SHM	$a_{max} = \omega^2 A$

Equation for period of SHM in a mass-spring system

$$T = 2\pi\sqrt{\frac{m}{k}}$$

Equation for period of SHM of a simple pendulum

$$T = 2\pi\sqrt{\frac{l}{g}}$$

Definition of specific heat capacity

Definition of specific latent heat of fusion

Definition of specific latent heat of vaporisation	Energy needed to change temperature of a substance
$Q = mc\Delta\theta$	Energy needed to change state of a substance
$Q = ml$	Gas Law with Boltzmann Constant

$pV = NkT$	Gas Law with molar gas constant
$pV = nRT$	Kinetic Theory Equation
$pV = \frac{1}{3}Nm(c_{\mathrm{rms}})^2$	Kinetic Energy of a Gas Molecule

$\frac{1}{2}m(c_{\mathrm{rms}})^2 = \frac{3}{2}kT = \frac{3RT}{2N_{\mathrm{A}}}$	Relationship between Pressure, Temperature, and Volume
$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$	Gravitational force between two masses
$F = \frac{Gm_1m_2}{r^2}$	Word definition of gravitational field strength

Force per unit mass	Equation defining of gravitational field strength
$g = \frac{\mathrm{F}}{\mathrm{m}}$	magnitude of gravitational field strength in a radial field
$g = \frac{\mathrm{GM}}{r^2}$	Work done in moving a mass in a gravitational field

$\Delta W = m\Delta V$	Word definition of gravitational potential
the work done per unit mass in bringing a point mass from infinity to a point in a gravitational field (unit: Jkg^{-1})	Equation for gravitational potential
$V = -\frac{GM}{r}$	Why is gravitational potential always negative?

zero gravitational potential is defined as being as being at infinity, and since work has to be done to a mass to get it to infinity, gravitational potential is always negative	Equation relating gravitational field strength and gravitational potential
$$g = -\frac{\Delta V}{\Delta r}$$	Equation for escape velocity
$$v_{esc} = \sqrt{\frac{2GM}{r}}$$	Equation relating period of satellite orbit to radius of orbit

$T^2 = \frac{4\pi^2}{GM} r^3$	Equation for gravitational potential **energy** in a radial field
$E_p = -\frac{Gm_1 m_2}{r}$	force between two point charges
$F = \frac{1}{4\pi\varepsilon_0} \frac{Q_1 Q_2}{r^2}$	Word definition of electric field strength

Force per unit charge	definition of electric field strength in symbols
$E = \dfrac{F}{Q}$	Formula for electric field strength between two parallel plates
$E = \dfrac{V}{d}$	definition of uniform field

Field strength and direction same at all points	Work done in moving a charge in an electric field
$\Delta W = Q\Delta V$	Equation for field strength for a radial field
$E = \frac{1}{4\pi\varepsilon_0}\frac{Q}{r^2}$	Equation for electric potential

$V = \frac{1}{4\pi\varepsilon_0} \frac{Q}{r}$	Equation relating electric field strength and electric potential
$E = \frac{\Delta V}{\Delta r}$	Equation for electric potential **energy** at a point in a radial field
$E_p = \frac{1}{4\pi\varepsilon_0} \frac{Q_1 Q_2}{r}$	Equation relating capacitance, charge, and voltage

$C = \frac{Q}{V}$	Equation relating capacitance to area of plates, separation of plates, and permittivity of dielectric
$C = \frac{A\varepsilon_0\varepsilon_r}{d}$	Energy stored in a capacitor
$E = \frac{1}{2}QV$ $E = \frac{1}{2}CV^2$ $E = \frac{1}{2}\frac{Q^2}{C}$	Equations describing discharging a capacitor

$Q = Q_0 e^{-\frac{t}{RC}}$ $V = V_0 e^{-\frac{t}{RC}}$ $I = I_0 e^{-\frac{t}{RC}}$	Equations describing charging up a capacitor
$Q = Q_0(1 - e^{-\frac{t}{RC}})$ $V = V_0(1 - e^{-\frac{t}{RC}})$ $I = I_0 e^{-\frac{t}{RC}}$	Word definition of the **time constant** for a resistor-capacitor (RC) circuit
Time taken for the charge or potential difference or current to fall to 1/e of its original value for a discharging capacitor	Equation for calculating time constant for a discharging capacitor

$$\tau = RC$$

Time taken for a capacitor to discharge 99% of its charge or current or potential difference

5 time constants

Equations defining relative permittivity

$$\varepsilon_r = \frac{C}{C_0} = \frac{Q}{Q_0} = \frac{\varepsilon_1}{\varepsilon_0}$$