Useful Formulae in Advanced Level Physics

A1.	$a = \frac{\upsilon^2}{r} = \omega^2 r$	centripetal acceleration	
A2.	$a = -\omega^2 x$	simple harmonic motion	
A3.	$L = I\omega$	angular momentum of a rigid body	
A4.	$T = \frac{dL}{dt}$	torque on a rotating body	
A5.	$E = \frac{1}{2} I\omega^2$	energy stored in a rotating body	
B1.	$\upsilon = \sqrt{\frac{T}{m}}$	velocity of transverse wave motion in a stretched string	
B2.	$\upsilon = \sqrt{\frac{E}{\rho}}$	velocity of longitudinal wave motion in a solid	
B3.	$n = \tan\theta_p$	refractive index and polarising angle	
B4.	$d = \frac{\lambda D}{a}$	fringe width in double-slit interference	
B5.	$d\sin\theta = n\lambda$	diffraction grating equation	
B6.	$f' = f(\frac{\upsilon - u_0}{\upsilon - u_s})$	Doppler frequency	
B7.	$10\log_{10}(\frac{I_2}{I_1})$	definition of the decibel	
C1.	$F = \frac{Gm_1m_2}{r^2}$	Newton's law of gravitation	
C2.	$V = -\frac{GM}{r}$	gravitational potential	
C3.	$r^3 / T^2 =$ constant	Kepler's third law	
C4.	$E = \frac{Q}{4\pi\varepsilon_0 r^2}$	electric field due to a point charge	
C5.	$V = \frac{Q}{4\pi\varepsilon_0 r}$	electric potential due to a point charge	
C6.	$E = \frac{V}{d}$	electric field between parallel plates (numerically)	
C7.	$C = \frac{Q}{V} = \frac{\varepsilon_0 A}{d}$	capacitance of a parallel-plate capacitor	
C8.	$Q = Q_0 e^{-t/RC}$	decay of charge with time when a capacitor discharges	
C9.	$Q = Q_0(1 - e^{-t/RC})$	rise of charge with time when charging a capacitor	
C10.	$E = \frac{1}{2} CV^2$	energy stored in a capacitor	
C11.	$I = nA\upsilon Q$	general current flow equation	
C12.	$R = \frac{\rho l}{A}$	resistance and resistivity	
C13.	$F = BQ\upsilon\sin\theta$	force on a moving charge in a magnetic field	
C14.	$F = BIl\sin\theta$	force on a moving conductor in a magnetic field	
C15.	$V = \frac{BI}{nQt}$	Hall voltage	
C16.	$B = \frac{\mu_0 I}{2\pi r}$	magnetic field due to a long straight wire	
C17.	$B = \frac{\mu_0 NI}{l}$	magnetic field inside long solenoid	
C18.	$F = \frac{\mu_0 I_1 I_2}{2\pi r}$	force per unit length between long parallel straight current carrying conductors	
C19.	$T = BANI\sin\phi$	torque on a rectangular current carrying coil in a uniform magnetic field	
C20.	$E = BAN\omega\sin\omega t$	simple generator e.m.f.	
C21.	$\frac{V_s}{V_p} \approx \frac{N_s}{N_p}$	ratio of secondary voltage to primary voltage in a transformer	
C22.	$E = -LdI/dt$	e.m.f. induced in an inductor	
C23.	$E = \frac{1}{2} LI^2$	energy stored in an inductor	
C24.	$X_L = \omega L$	reactance of an inductor	
C25.	$X_C = \frac{1}{\omega C}$	reactance of a capacitor	
C26.	$P = IV\cos\theta$	power in an a.c. circuit	
C27.	$\Delta V_{out} / \Delta V_{in} = -\beta\frac{R_L}{R_B}$	voltage gain of transistor amplifier in the common emitter configuration	
C28.	$V_0 = A_0(V_+ - V_-)$	output voltage of op amp (open-loop)	
C29.	$A = -\frac{R_f}{R_i}$	gain of inverting amplifier	
C30.	$A = 1 + \frac{R_f}{R_i}$	gain of non-inverting amplifier	
D1.	$pV = nRT = NkT$	equation of state for an ideal gas	
D2.	$pV = \frac{1}{3} Nm\overline{c^2}$	kinetic theory equation	
D3.	$E_k = \frac{3RT}{2N_A} = \frac{3}{2}kT$	molecular kinetic energy	
D4.	$E = \frac{F}{A} \Big/ \frac{x}{L}$	macroscopic definition of Young modulus	
D5.	$E = \frac{1}{2} Fx$	energy stored in stretching	
D6.	$F = -\frac{dU}{dr}$	relationship between force and potential energy	
D7.	$E = k/r$	microscopic interpretation of Young modulus	
D8.	$P + \frac{1}{2}\rho\upsilon^2 + \rho gh$ = constant	Bernoulli's equation	
D9.	$\Delta Q = \Delta U + \Delta W$	first law of thermodynamics	
D10.	$E_n = -\frac{13.6}{n^2}$ eV	energy level equation for hydrogen atom	
D11.	$N = N_0 e^{-kt}$	law of radioactive decay	
D12.	$t_{\frac{1}{2}} = \frac{\ln 2}{k}$	half-life and decay constant	
D13.	$\frac{1}{2} m\upsilon_m^2 = h\nu - \Phi$	Einstein's photoelectric equation	
D14.	$E = mc^2$	mass-energy relationship	