AP Physics C – Table of Friends – Mechanics

Name:	symbol:	Units (SI):	Equation(s)
Relative Error	E_r	Percentage (%)	$E_r = \frac{O-A}{A}\times 100$
Displacement	Δx	Length (m)	$\Delta\vec{x} = x_f - x_i$
Speed	speed	Length / Time (m/s)	$speed = \frac{\text{distance}}{time}$
Velocity	v	Length / Time (m/s)	$\vec{v}_{avg} = \frac{\Delta x}{\Delta t}$ & $\vec{v}_{ins} = \frac{dr}{dt}$
Acceleration	a	Length / Time^2 (m/s^2)	$\vec{a}_{avg} = \frac{\Delta v}{\Delta t}$ & $\vec{a}_{ins} = \frac{dv}{dt}$
Force	F	Newtons, N (kg·m/s^2)	$\sum \vec{F} = m\vec{a}$
Arc Length	s	M	$s = r\theta$
Tangential Velocity	v_t	Length / Time (m/s)	$v_t = r\omega$
Tangential Acceleration	a_t	m/s^2	$\sum \vec{F}_t = m\vec{a}_t$ & $a_t = r\alpha$ (always tangent)
Centripetal Acceleration	a_c	m/s^2	$a_c = r\omega^2 = \frac{v_t^2}{r}$ (always in)
Centripetal Force	$\sum \vec{F}_{in}$	Netwons, N	$\sum \vec{F}_{in} = m\vec{a}_c$
Work	W	Joules, J (N·m)	$W = \int \vec{F}\cdot d\vec{r} = \vec{F}\Delta r\cos\theta$
Energy	U	Joules, J (N·m)	$KE = \frac{1}{2}mv^2;\ U_g = mgh;\ U_e = \frac{1}{2}kx^2$
Power	P	Watts, W (J/s)	$P_{avg} = \frac{\Delta W}{\Delta t}$ & $P_{ins} = \frac{dW}{dt} = F\cdot v$
Impulse	J	Kg·m/s (N·s)	$J = \int F\cdot dt = \Delta\vec{p}$
Momentum	p	Kg·m/s (N·s)	$\vec{p} = m\vec{v}$
Angular Displacement	Δθ	radians (degrees, rev)	$\Delta\theta = \theta_f - \theta_i$
Angular Velocity	ω	rad/sec (rev/min)	$\omega = \frac{d\theta}{dt}$
Angular Acceleration	α	rad/sec^2	$\alpha = \frac{d\omega}{dt}$
Torque	τ	N·m	$\tau = \vec{r}\times\vec{F} = \vec{r}\vec{F}\sin\theta$
Volumetric Mass Density	ρ	Kg/m^3	$\rho = \frac{m}{\forall}$
Surface Mass Density	σ	Kg/m^2	$\sigma = \frac{m}{A}$
Linear Mass Density	λ	Kg/m	$\lambda = \frac{m}{L}$
Center of Mass	r_{cm}	M	$r_{cm} = \frac{m_1r_1 + m_2r_2 + \ldots}{m_1 + m_2 + \ldots}$ & $r_{cm} = \frac{1}{m}\int r\,dm$
Moment of Inertia	I	Kg·m^2	$I = \int r^2\,dm$ & $I = \sum mr^2$
Angular Momentum	L	Kg·m^2/s	$L = \vec{r}\times\vec{p} = I\omega$