	Variable	Units	Alternate Units	Vector or scalar	Important equations or notes(values
Acceleration	a	m/s^2		V	$F_{net}=ma$, $a=\Delta v/t$, in vertical a=g, "a does the same a F_{net}"
Centripetal acceleration	a_c	m/s^2		V	$a_c=v^2/r$ When direction not speed changes. Always toward center
displacement	d	m		V	Displacement is a vector so direction is important
distance	d	m		S	Distance is a scalar, direction is not important
Total Mechanical Energy	E_T	J	Nm, or kgm^2/s^2	S	E_T = KE + PE for frictionless systems, E_T=Work
Total Energy	E_T	J	Nm, or kgm^2/s^2	S	E_T=KE+PE + Q when friction is present. E_T = Work
Force	F	N	kg m/s^2	V	A push or pull. For momentum ?s $F=m\frac{\Delta v}{t} = F = \frac{\Delta p}{t}$ (F is rate of change in momentum)
Centripetal Force	F_c	N	kg m/s^2	V	Always toward center; a net force equal to another force agent; $F_c=mv^2/r$
Weight or force due to gravity	F_g	N	kg m/s^2	V	$F_g=mg$, $F_g=F_N$ on horizontal, $F_{g\parallel}=mg\sin\Theta$ on inclined plane.
Normal force	F_N	N	kg m/s^2	V	Force perpendicular to surface, $F_N=mg\cos\Theta$, angle=0 on horizontal
Net force	F_{net}	N	kgm/s^2	V	The unbalanced (winning) force on an object. Always in agreement with "a",
Force on a spring	F_s	N	kg m/s^2	V	$F_s=kx$ in vertical systems $F_s=F_g$
Frictional Force	F_f	N	kg m/s^2	V	$F_f=\mu F_N$ For an object moving at constant speed on horizontal $F_f=F_{Ax}$
Acceleration due to gravity	g	m/s^2	N/kg	V	On Earth all masses experience a downward vertical gravitational field with a strength of 9.81N/kg causing an acceleration 9.81m/s^2 downward when in free fall.
Gravitational Field Strength	g	N/kg	m/s^2	V	
Universal Gravitational constant	G	Nm^2/kg^2		S	6.67 x $10^{-11}Nm^2/kg^2$ On PRT
Height	h or d_y	m		V or S	For a dropped object $v_f=\sqrt{2gh}$
Impulse	J	Ns	kg m/s	V	$J=Ft=m\Delta v=\Delta p$
Spring constant	k	N/m	kg/s^2	S	Direct relationship to PE_s or work on spring
Kinetic Energy	KE	J	Nm or kgm^2/s^2	S	KE=1/2 mv ^{2} Associated with motion. Equal to Fd on a horizontal frictionless surface.
Mass	m	kg		S	Same as inertia, Objects with mass have a gravitational field.
Momentum	p	kgm/s	Ns	V	$J=Ft=m\Delta v=\Delta p$
Power	P	W	J/s	S	The rate at which work is done (or energy used or gained)
Potential Energy (gravitational)	PE	J	Nm or kgm^2/s^2	S	Equal to vertical work in frictionless (F_gd) $PE_{top}=KE_{bottom}$
Potential energy stored in a spring	PE_s	J	Nm or kgm^2/s^2	S	$PE_s=1/2kx^2$ or work on a spring $(F_s/2)x$ [average F_s x stretch)
Internal energy	Q	J	Nm or kgm^2/s^2	S	Also known as work due to friction ($W=F_fd$) and heat energy. $W=E_T$=KE + PE + Q
Radius or distance between centers	r	m		S	Inverse square to F_g (2xr means $F_g/4$)
Time interval	t	s		S	Inverse to power for a fixed amout of work
Velocity	v	m/s		V	v=d/t Velocity includes direction
Speed	v	m/s		S	v=d/t Speed is used when direction is not important
Average velocity or constant speed	v	m/s		V, S	V_{avg} equals "total d over t" or $v = \frac{v_i+v_f}{2}$
Work	W	J	Nm or kgm^2/s^2	S	$W=\Delta E_T$ in frictionless: horizontal W=KE ; vertical W=PE, spring $W=PE_s$ Friction $W=F_fd$
Coefficient of static friction	μ_s			S	$\mu = \frac{F_f}{F_N}$ Coefficients on PRT. For moving object use kinetic; for object at rest use static. Kinetic coefficient is always less than static coefficient
Coefficient of kinetic friction	μ_k			S	

	Variable	Units	Alternate Units	Vector or scalar	Important equations or notes(values
Cross sectional area	A	m^2		S	Resistance is inversely related to A and inverse square to radius ($A=\pi r^2$ $R=\frac{\rho L}{A}$ so $R=\frac{\rho L}{\pi r^2}$)
Electric Field Strength	E	N/C		V	Charge behaves in an "E field" like mass behaves in a "g field"
Electrostatic Force	F_e	N		V	$F_e=Eq$ for uniform fields (parallel plates) and $F_e=\frac{kq_1q_2}{r^2}$ between 2 point charges
Current	I	A	C/s	S	Flow of charge per second. **I =V/R**
Electrostatic constant	k	Nm^2/C^2		S	$k=8.99 \times 10^9 Nm^2/C^2$
Length of a conductor	L	m		S	Length directly related to Resistance
Electrical Power	P	W	J/s	S	**$P=W/t = VI = V^2/R=I^2R$**
Charge	q	C	Elementary charge	S	$1e = 1.6 \times 10^{-19}$ C or 1C = 6.25×10^{18}e to convert to C multiply by 1.6×10^{-19}C .to convert to e divide by 1.6×10^{-19}C
Resistance	R	Ω		S	**R=V/I** or R=ρL/A
Equivalent Resistance	R_{eq}	Ω		S	For series $R_{eq}=R_1+R_2+R_3$.... For Parallel R_{eq}=the inverse of the sum of the inverses $1/R_{eq}=\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}$ so $R_{eq}=\frac{1}{\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}}$
Distance between center (of charge)	r	m		S	Inverse square relationship between r and F_e
Potential difference	V	V	J/C CΩ/s	S	Potential difference is the energy or work per charge v=W/q **V=IR**
Electrical energy or work	W	J	CV or eV	S	$1eV = 1.6 \times 10^{-19}$J 1 eV is the amount of work required to move 1 e through 1V W=Vq W=Pt $W=VIt= V^2t/R = I^2Rt$
Resistivity	ρ	Ωm		S	A property of the material. Listed in a chart on PRT
Universal Mass Unit	u	u		S	$1u=9.31\times10^2$MeV
Frequency	f	Hz		S	Cycles per second. Inverse to period of a wave. Frequency does not change with "n"
(absolute) index of refraction	n			S	n=c/V
Period	T	s		S	Seconds per cycle
velocity of wave	v	m/s		S	v=fλ $v = (\frac{cycles}{second} x \frac{meters}{cycle} = \frac{meters}{second})$ or v=f/T $v=\frac{\frac{meters}{cycle}}{\frac{seconds}{cycle}} = \frac{meters}{second}$
Wavelength	λ	m		S	Meters per cycle. Distance between 1 repeated cycle on a wave (crest to crest etc)
Angle of incidence	Θ_i	Degrees		S	
Energy of a photon	E_{photon}	J	eV	S	E=hf
Planck's constant	h	Js		S	
Speed of light in a vacuum	c	m/s		S	Speed of all EM waves