

## PHYSICS EQUATIONS – 2<sup>nd</sup> SEMESTER

<b>TANGENTIAL VELOCITY</b>	Tangential velocity = $\frac{2 \cdot \pi \cdot \text{radius} \cdot (\# \text{revs})}{\text{time}}$	$v_t = \frac{2\pi r(\# \text{revs})}{t}$
<b>CENTRIPETAL ACCELERATION</b>	$a_c = \frac{\text{velocity}^2}{\text{radius}}$	$a_c = \frac{v^2}{r}$
<b>CENTRIPETAL FORCE</b>	(a) centripetal force = mass · centripetal acceleration (b) centripetal force = $\frac{\text{mass} \cdot \text{velocity}^2}{\text{radius}}$	(a) $F_c = ma_c$ (b) $F_c = \frac{mv_t^2}{r}$
<b>TORQUE</b>	Torque = Perpendicular Force · Lever Arm Distance Balanced Torque = Force <sub>1</sub> · distance <sub>1</sub> = Force <sub>2</sub> · distance <sub>2</sub>	$T = F \cdot d$ $F_1 \cdot d_1 = F_2 \cdot d_2$
<b>ROTATIONAL INERTIA</b>	Hoop and Pendulum Solid Cylinder Solid Sphere Stick about End Stick about CG	$I = mr^2$ $I = 1/2 mr^2$ $I = 2/5 mr^2$ $I = 1/3 mr^2$ $I = 1/12 mr^2$
<b>ANGULAR MOMENTUM</b>	Angular Momentum = mass · tangential velocity · radius	$L = m \cdot v_t \cdot r$
<b>UNIVERSAL GRAVITATION</b>	Force of Gravity = $\frac{\text{Gravity constant} \cdot \text{mass}_1 \cdot \text{mass}_2}{\text{distance}^2}$ G = 6.67 x 10 <sup>-11</sup> N·m <sup>2</sup> /kg <sup>2</sup> r <sub>earth</sub> = 6.38 x 10 <sup>6</sup> m      m <sub>earth</sub> = 5.98 x 10 <sup>24</sup> kg	$F_g = \frac{Gm_1m_2}{d^2}$
<b>ACCELERATION OF GRAVITY</b>	Acceleration of Gravity = $\frac{\text{Gravity constant} \cdot \text{mass}}{\text{radius}^2}$	$a_g = \frac{Gm}{r^2}$
<b>TANGENTIAL VELOCITY</b>	Tangential Velocity = Square root of $\frac{\text{Gravity constant} \cdot \text{mass}}{\text{radius}}$ mass – orbit center.      radius - orbit	$v_t = \sqrt{\frac{Gm}{r}}$
<b>COULOMB'S LAW</b>	Electrical Force = $\frac{\text{constant} \cdot \text{charge}_1 \cdot \text{charge}_2}{\text{distance}^2}$ k = 9.0 x 10 <sup>9</sup> N·m <sup>2</sup> /C <sup>2</sup>	$F_e = \frac{kq_1q_2}{d^2}$
<b>POTENTIAL DIFFERENCE</b>	Potential Difference = Potential Energy ÷ charge Electron Charge = -1.6 x 10 <sup>-19</sup> C      Proton Charge = 1.6 x 10 <sup>-19</sup> C Mass = 9.11 x 10 <sup>-31</sup> kg      Mass = 1.67 x 10 <sup>-27</sup> kg	$V = PE/q$
<b>ELECTRIC CURRENT</b>	Electric Current = charge ÷ time	$I = q/t$

<b>OHM'S LAW</b>	Electric Current = Voltage ÷ Resistance	$I = V/R$
<b>ELECTRIC POWER</b>	Electric Power = Current · Voltage	$P = IV$
<b>ELECTRICAL ENERGY</b>	Electric Energy = Power · time	$E = Pt$
<b>ELECTRICAL COST</b>	Cost = Energy · rate per kilowatt-hour	$\$ = E \cdot \text{rate}$
<b>SERIES CIRCUITS</b>	Resistance <sub>total</sub> = Resistance <sub>1</sub> + Resistance <sub>2</sub> .... Voltage <sub>total</sub> = Volts <sub>1</sub> + Volts <sub>2</sub> + Volts <sub>3</sub> ....	$R_T = R_1 + R_2 + R_3 \dots$ $V_T = V_1 + V_2 + V_3 \dots$ (I constant)
<b>PARALLEL CIRCUITS</b>	1/Resistance <sub>total</sub> = 1/Resistance <sub>1</sub> + 1/Resistance <sub>2</sub> .... Current total = Current <sub>1</sub> + Current <sub>2</sub> + Current <sub>3</sub> ....	$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$ $I_T = I_1 + I_2 + I_3$ (V constant)
<b>MAGNETIC FORCE</b>	Magnetic Force = charge · velocity · magnetic field Magnetic Force = current · length · magnetic field	$F_B = q \cdot v \cdot B$ $F_B = I \cdot L \cdot B$
<b>FREQUENCY &amp; PERIOD</b>	frequency = 1 ÷ Period Period = 1 ÷ frequency	$f = 1/T$ $T = 1/f$
<b>PER. OF A PENDULUM</b>	Period = 2 · pie · square root of length ÷ gravity	$T_p = 2\pi\sqrt{L/g}$
<b>VELOCITY OF A WAVE</b>	Velocity = frequency · wavelength	$v = f\lambda$
<b>SPEED OF SOUND IN AIR</b>	$V_{\text{air}} = 331 \text{ m/s} + (0.6 \text{ m/s}) \cdot \text{Temperature in Celsius}$	$V_{\text{air}} = 331 \text{ m/s} + (0.6 \text{ m/s})T_c$
<b>ENERGY OF LIGHT</b>	Photon Energy = Planck's Constant · frequency Photon Energy = $\frac{\text{Planck's Constant} \cdot \text{speed of light}}{\text{Wavelength}}$ $h = 6.63 \times 10^{-34} \text{ J-S}$	$E = h \cdot f$ $E = \frac{h \cdot c}{\lambda}$
<b>LAW OF REFLECTION</b>	angle of incidence = angle of reflection	$\theta_i = \theta_r$
<b>LAW OF REFRACTION</b>	index of refraction <sub>1</sub> · sine angle <sub>1</sub> = index of refraction <sub>2</sub> · sine angle <sub>2</sub> $n = \frac{v_{\text{(air)}}}{v_{\text{(medium)}}}$	$n_1 \sin \theta_1 = n_2 \sin \theta_2$
<b>LENS EQUATIONS</b>	1/ focal length = 1/object distance + 1/image distance Magnification = - image distance ÷ object distance	$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$ $M = -\frac{d_i}{d_o}$