PHY2048 Exam 3 Reference Sheet

Constants

$g = 9.80\ \frac{m}{s^2}$

$J = N \cdot m$

$Hp = 745.7$ Watts

$G = 6.67x10^{-11} N \cdot \frac{m^2}{kg^2}$

$eV = 1.6 \times 10^{-19}$

Equations

$W = \vec{F}\vec{d} \cdot cos(\theta)$
$\theta = cos^{-1}(\frac{A \cdot B}{|A| \cdot |B|})$
$\rho = mv$
$m = \frac{\rho}{v}$
$m = \frac{2KE}{v^2}$
$V = k\sqrt{\frac{2KE}{m}}$
$KE = \frac{\rho^2}{2m}$
$\rho = \sqrt{2mKE}$
$k = \frac{1}{2}mv^2$

$\Delta PE = PE_{final} - PE_{initial}$
$PE = mgh \Rightarrow (mass)(g)(height)$

$KE = \frac{1}{2}mv^2 = kg\frac{m}{s^2} \cdot m \Rightarrow N \cdot m \Rightarrow J$

$E_{tot} = PE + KE = mgh + \frac{1}{2}mv^2 \Rightarrow constant$

$C_{energy} = \frac{1}{2}kx_i^2 = mgh$

$W_f = \mu_k mg \cdot d = \frac{1}{2}mv^2$

$P_{Watts} = \frac{\Delta E}{\Delta t} \Rightarrow \frac{W}{\Delta t}$

Chapter 7 PPT Problems

$PE_{s\,to\,f} = mgh_s$
$PE_{s\,to\,r} = mgh \Rightarrow mg(h_s - h_r)$
$Ex.01 \Rightarrow (xxKg)(9.8)(1.12m - 0.96m)$

Chapter 7 Quiz

Sliding Box

$\vec{F}\vec{d} \cdot cos(\theta)$

Teeth Pulling

$(part\,a) W = mg\vec{d}$
$(part\,b) \Rightarrow F_{teeth} = mg$

Chapter 7 Quiz Continued

Angle Between Two Vectors

Find the Dot Product, Given Ma

$\theta = cos^{-1}(\frac{A \cdot B}{|A| \cdot |B|})$
$\vec{A} \cdot \vec{B} = cos(\theta)(\mid A \mid \cdot \mid B \mid)$

Evaluate The Work Graph

$For\,Triangular\,Areas \rightarrow \frac{1}{2}b(in meters)h(in N)$

Work done By a Force in the x - Direction

$W = \int_{x=low}^{x=upper} \vec{F}\, w.r.t\, dx\, or\, dy$
$Ex. = \int_{x=0}^{x=4.95} 3x\hat{i}$
$= \int_0^{4.95} \frac{3}{2}(4.95)^2$

Stone in The Well

$(part\,a) = PE = mgh$, where h = 0 = at the edge
$(part\,b) = PE = mgh$, where h = negative = dropped below the reference

Chapter 8 Quiz

Block Of Mass & Spring

Goal: Solve For Height, h $\Rightarrow \frac{1}{2}kx_i^2 = mgh$

Rollercoaster Problem

$(Part\,a)$
$Solve\,for\,each\,PE_{A,B,C} = PE = mgh$

$(Part\,b)$
$Ex = KE_B = PE_A - PE_B$
$\Rightarrow KE_B = \frac{1}{2}mv_B^2, solve for V_B$

$(Part\,c)$
$W_{gravity\,A\,to\,C} = PE_A - PE_C$

Sled's & Crates

$(Part\,a)$
$Ex = (\mu_k)(m)(g)(d) = \frac{1}{2}mv^2$
$Solve\,for\,d,\,where \Rightarrow (\mu_k)(g)(d) = \frac{1}{2}v^2$

$(Part\,b)$
$Scalar Factor = \frac{New\,Velocity}{Old\,Velocity}$
$d = (part\,a)(scalar\,factor)$

$\Rightarrow KE_B = \frac{1}{2}mv_B^2, solve for V_B$

Chapter 8 Quiz Continued

Spring's & Block's With Speed

$(Part\, a\, Frictionless)$
$Solve\, for\, V_f,\, where \rightarrow kx_i^2 = mv_f^2$
$d = (part\, b\, COMEBACK)(scalar\, factor)$

Sliding Block With Falling Ball

$Plug\, and\, Chug\, and\, Solve\, for\, v_f$

$m_2gh = \frac{1}{2}(m_1 + m_2)(V_f^2) + (\mu_k m_1 g)(h)$

Joules To Watts

(1) $J = \vec{F_g} \cdot \vec{d}$

(2) $W = \frac{J}{\Delta t}$

Power Of A Car Engine

$\frac{50mi}{h} \times \frac{1069.34m}{1mi} \times \frac{1h}{60min} \times \frac{1\,min}{60\,sec} \times = \frac{m}{s}$
$\Delta KE = \frac{1}{2}mv^2$
$P_{Watts} = \frac{\Delta Ke}{t}$

Older & Newer Cars

$P_{Older} = \frac{E_{old}}{\Delta t} = \frac{\frac{1}{2}mv^2}{\Delta t}$
$\frac{P_{new}}{P_{Old}} = (v^2)$

Chapter 9 Quiz

Calculating Speed From Momentum

$\rho = \sqrt{2mKE}\, solve\, for\, m$
$v = \sqrt{(\frac{2KE}{m})},\, solve\, for\, v$

Chapter 9 Quiz Continued

Calculating Speed From Momentum

$\rho = \sqrt{2mKE}\, solve\, for\, m$
$v = \sqrt{(\frac{2KE}{m})},\, solve\, for\, v$

Particle and Magnitude

$P_x = (m)(\hat{i})$
$P_y = (m)(\hat{j})$
$\rho = \sqrt{(\rho_x)^2 + (\rho_y)^2}$
$\theta = tan^{-1}(\frac{\rho_y}{\rho_x})$

Estimated Force-time Graph (Triangle)

$J = \frac{1}{2}(t_b - t_a \cdot \vec{F_{max}})$

Average Force Over Interval (cont)

$\vec{F_{avg}} = \frac{J}{t_b - t_a} \Rightarrow \frac{F_{max}}{2}$

Impulse and Energy Change in 1D - Ball Reversed

$J_x = \Delta\rho_x = mv_f = mvi$

Complete Inelastic Collision in 2D - Stick

$\vec{v_f} = \frac{m_1 v_{1i} + m_2 v_{2i}}{m_1 + m_2}$

Inelastic Collision in Component Form

$\vec{v_f}x = \frac{m_1 v_{1ix} + m_2 v_{2ix}}{m_1 + m_2}$

$\vec{v_f}y = \frac{m_1 v_{1iy} + m_2 v_{2iy}}{m_1 + m_2}$

1D Elastic Collision of 2 Masses - Head On

$\vec{v_1}f = \frac{m_1 - m_2}{m_1 + m_2}v_{1i} + \frac{2m_2}{m_1 + m_2}v_{2i}$

$\vec{v_1}f = \frac{2m1}{m_1 + m_2}v_{1i} + \frac{m_2 - m_1}{m_1 + m_2}v_{2i}$

Quiz Chapter 09 Continued

Center of Mass Velocity - Fopr Any System

$v_c\vec{ompatibility} = \frac{m_1 v_{1i} + m_2 v_{2i}}{m_1 + m_2}$
$v_{cm,\vec{before}} v_{cm,before} = v_{cm,\vec{after}}$
$B = \frac{\mu_o I}{4\pi R^2}\Delta l_{arco}$
$B = \frac{\mu_o I}{4\pi R}(cos\theta_1 - cos\theta_2)$

Cargas en Movimiento

$r = \frac{mv}{qB}$
$a = \frac{qvB}{m} = \frac{v^2}{r}$