

Chapter 6: Work and Kinetic Energy

$m = \text{mass}$	$g = 9.8 \text{ m/s}$
$F = \text{Weight (N)}$	$F = m \cdot g$
$s = \text{distance}$	$K_E = \text{Kinetic Energy}$
$W = \text{Workdone}$	
$\text{Power} = P \text{ (Watts)}$	$x = \cos$ $y = \sin$
$1 \text{ km} = 1000\text{m}$	$1\text{kg} = 1000\text{g}$
$\Delta K = K_f - K_i$	Friction = always negative
$g = -9.8 \text{ (decreasing)}$	$g = 9.8 \text{ (normal)}$
$a = g \text{ (gravitational acceleration)}$	$\Theta = \text{Angle between F and s}$
$\parallel = \text{Component of F parallel to dl}$	$v = \text{velocity}$
$W = (\int_{P_2 \text{ to } P_1}) F \cdot dl$	$W = F \parallel dl$
$W = (\int_{P_2 \text{ to } P_1}) F \cdot \cos\Theta \cdot dl$	$W = F \cdot s \text{ (Joules)}$
$P_{av} = \Delta W / \Delta t$	$P = \lim_{\Delta t > 0} (\Delta W / \Delta t) = dW / dt$
$V_f = V_i^2 + 2 \cdot a \cdot s$	$P = (W/t)$
Constant Speed : ($a = 0$)	$F = \text{force}$ $P = F \cdot v$
Friction (opposite) = $\cos(180^\circ)$	
$W_x = F (\cos\Theta) \cdot s$ $W_y = F (\sin\Theta) \cdot s$	
$a = (V_f^2 - V_i^2) / (2 \cdot s)$	
$F_s = (1/2) \cdot m \cdot V_f^2 - (1/2) \cdot m \cdot V_i^2$	
$W_{grav} = m \cdot g \cdot h$	$P = (W/t)$
$K_E = (1/2) \cdot m \cdot V^2$	$P_E = m \cdot g \cdot h$

Chapter 7: Potential Energy, Energy Conservation

Potential Energy = U , P_E	$\Delta K = -\Delta U_{grav}$
$K = \text{Kinetic Energy}$	$R = \text{Radius}$
$s = y_f - y_i$	$U_{grav} = m \cdot g \cdot y$
$\Delta s = \Delta x_i + \Delta y_j$	$cm = \text{circular motion}$

Chapter 7: Potential Energy, Energy Conservation (cont)

	$k = \text{constant of spring}$
$P_E = (1/2) \cdot k \cdot x^2$	
$W_{grav} = w \cdot \text{vector} \cdot \Delta s \cdot \text{vector}$	Diameter = $2 \cdot \text{Radius}$
$W_f = \text{Work Done by Friction}$	if elastic... $K_E = P_E$
$W_{grav} = F \times s$	$W_{grav} = m \cdot g \cdot y_i - m \cdot g \cdot y_f$
$K_i + U_i = K_f + U_f$	$(1/2) \cdot m \cdot V_i^2 + m \cdot g \cdot y_i = (1/2) \cdot m \cdot V_f^2 + m \cdot g \cdot y_f$
if gravity does work...	$W_{total} = K_f - K_i$
$E = K + U_{grav}$	$W_{total} = W_{grav} + W_{other}$
$W_{other} + U_i - U_f = K_f - K_i$	Work done on a spring $W = (1/2) K_E \cdot X_f^2 - (1/2) K_E \cdot X_i^2$
arrange to... $K_i + U_i + W_{other} = K_f + U_f$	Work done by a spring $W = (1/2) K_E \cdot X_i^2 - (1/2) K_E \cdot X_f^2$
$U_{cm} = m \cdot g \cdot R$	Elastic Potential Energy $U_{el} = (1/2) \cdot K_E \cdot x^2$
	Work Done by Elastic Force $W_{el} = (1/2) \cdot K_E \cdot x_i^2 - (1/2) \cdot K_E \cdot x_f^2$
if elastic force does work, and mechanical energy is conserved	
$K_i + U_{el, i} = K_f + U_{el, f}$	

Chapter 7: Potential Energy, Energy Conservation (cont)

Work Done by Friction:	Law of Conservation of Energy
$W_f = -W_{fric}$	$\Delta K + \Delta U + \Delta U_{int} = 0$
$W_f = -(\mathbf{f} \cdot \mathbf{s})$	
$W_f = \mu k \cdot m \cdot g \cdot s$	
$F = F_x + F_y + F_z$	$F_x = (1/2) \cdot K \cdot x^2$
$F_x(x) = -m \cdot g$	
$F_y(y) = -m \cdot g$	
$F_z(z) = -m \cdot g$	

Chapter 8: Momentum, Impulse, Collisions

$p = \text{momentum}$	$J = \text{Impulse}$
$m = \text{mass}$	$v = \text{velocity}$
$P = m \cdot v \text{ (kg} \cdot \text{m/s)}$	
$F = dp / dt$	$J = \Sigma F (t_f - t_i)$ $J = \Sigma F \cdot \Delta t$
$J_y = (\int_{t_f \text{ to } t_i}) \Sigma F_y dt$	$J = (\int_{t_f \text{ to } t_i}) \Sigma F dt$
$J_y = (F_{av})_y (t_f - t_i)$	$J_x = (\int_{t_f \text{ to } t_i}) \Sigma F_x dt$
$J_y = P_{fy} - P_{iy}$	$J_x = (F_{av})_x (t_f - t_i)$
$J_y = (m \cdot V_{fy}) - (m \cdot V_{iy})$	$J_x = P_{fx} - P_{ix}$ $J_x = (m \cdot V_{fx}) - (m \cdot V_{ix})$
$\Sigma F = (P_f - P_i) / (t_f - t_i)$	$J = F_{av}(t_f - t_i)$
$J = (P_f - P_i) = \{F\} : \text{Change in Momentum}$	
$P = P_A + P_B = P_A + P_B $	
Assuming m_1 and m_2 don't change	
$m_1 \cdot v_1 + m_2 \cdot v_2 = \text{constant}$	$(P_1 + P_2)_i = (P_1 + P_2)_f$
$P_1 + P_2 = \text{constant}$	$P_i = P_f$
$V_f = (m_1 \cdot v_1 + m_2 \cdot v_2) / (m_1 + m_2)$	

