Physics MidTerm 2 Cheat Sheet

by Jaco (brandenz1229) via cheatography.com/138824/cs/29649/

Chapter 6: Work and Kinetic Energy

m = mass	g = 9.8 m/s
F = Weight (N)	F = m · g
s = distance	K_E = Kinetic Energy
W = Workdone	
Power = P (Watts)	x = cos y = sin
1 km = 1000m	1kg = 1000g
$\Delta K = K_f - K_i$	Friction = always negative
g = -9.8 (decreasing)	g = 9.8 (normal)
a = g (gravitational acceleration)	Θ = Angle between F and s
‖ = Component of F parallel to dl	v = 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 · s (Joules)
$P_{av} = \Delta W / \Delta t$	P = lim Δt > 0 (ΔW / Δt) = dW / dt
$V_f = V_i^2 + 2 \cdot a \cdot s$	P = (W/t)
Constant Speed : (a = 0)	F = force P = F · v
Friction (opposite) = cos(180°)	
$W_x = F (\cos\Theta) \cdot s$ ‖ $W_y = F (\sin\Theta) \cdot s$	
$a = (V_f^2 - V_i^2) / (2 \cdot s)$	
$F_s = (1/2) \cdot m \cdot V_f^2 - (1/2) \cdot m \cdot V_i^2$	
$W_{grav} = m \cdot g \cdot h$	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 = Kinetic Energy	R = Radius
$s = y_f - y_i$	$U_{grav} = m \cdot g \cdot y$
$\Delta s = \Delta x\hat{i} + \Delta y\hat{j}$	cm = circular motion

Chapter 7: Potential Energy, Energy Conservation (cont)

	k = constant of spring
$P_E = (1/2) \cdot k \cdot x^2$	
W_{grav} = w-vector · Δs-vector	Diameter = 2 · Radius
W_f = 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.... $E = K + U_{grav}$	$W_{total} = K_f - K_i$ $W_{total} = W_{grav} + W_{el} + W_{other}$
$W_{other} + U_i - U_f = K_f - K_i$ arrange to.... $K_i + U_i + W_{other} = K_f + U_f$	Work done on a spring $W = (1/2) K_E \cdot X_f^2 - (1/2) K_E \cdot X_i^2$ 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: $W_f = -W_{fric}$ $W_f = -(-f_k \cdot s)$ $W_f = \mu_k \cdot m \cdot g \cdot s$	Law of Conservation of Energy $\Delta K + \Delta U + \Delta U_{int} = 0$
$F = F_x + F_y + F_z$ $F_x(x) = -m \cdot g$ $F_y(y) = -m \cdot g$ $F_z(z) = -m \cdot g$	$F_x = (1/2) \cdot K \cdot x^2$

Chapter 8: Momentum, Impulse, Collisions

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

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