Physics Common Assessment Formula Sheet

Kinematic Equations

Constant Velocity → $\Delta X = V*\Delta t$

ΔX = change in position (displacement)
V = Velocity
Δt = change in time

Constant Acceleration

$V_f = V_i + a\Delta t \rightarrow a = \Delta V / \Delta t$

$\Delta X = V_i\, t + \frac{1}{2}(a\Delta t^2)$

$V_f^2 = V_i^2 + 2a\Delta X$

$\Delta X = \frac{1}{2}(V_f + V_i)\,\Delta t$

V_f = Velocity final
V_i = Velocity initial
ΔX = change in position (displacement)
a = acceleration
Δt = change in time

Newton's Laws of Motion

1st Law → An object in motion stays in motion in a straight line at constant speed unless acted upon by an outside unbalanced force (Net Force).

2nd Law → Fnet = m*a

3rd Law → If a force is applied on an object the object will apply a force back of equal amount in the opposite direction. (Equal, but opposite) ($F_{\text{Hand on block}} = F_{\text{Block on hand}}$)

Newton's Law Equations

$F_{net} = m \bullet a$ weight (F_g) = m*g (g = 10 m/s^2 or 9.8 m/s^2) Friction = μ * Normal Force

Parallel Force of Earth = $mg_{||} = mg*\sin(\theta)$ Perpendicular Force of Earth = $mg_{\perp} = mg*\cos(\theta)$

Force in a spring = $F = -k*\Delta x$ k = spring constant Δx = distance pulled back from equilibrium

Momentum and Collisions

Momentum = p = m*v Impulse = Momentum Change (Δp) = F*t = m*Δv

Conservation of Momentum → $p_i = p_f$

Inelastic Collision = Momentum is conserved, Kinetic Energy is not Conserved
Inelastic Collision = Objects stick together in the collision

Equation for Inelastic Collision = $m_1V_{1i} + m_2V_{2i} = (m_1 + m_2)V_f$ (Stick together after the collision)

$(m_1 + m_2)V_i = m_1V_{1f} + m_2V_{2f}$ (Stuck together BEFORE the collision)

Elastic Collision = Momentum and Kinetic Energy are conserved → $m_1V_{1i} + m_2V_{2i} = m_1V_{1f} + m_2V_{2f}$
Elastic Collision = Objects bounce off of each other in the collision

Work, Energy and Power

W = Work P = Power h = height
Ug or PE = Potential Energy due to Gravitational = Energy due to Position
K or KE = Kinetic Energy = Energy due to Motion

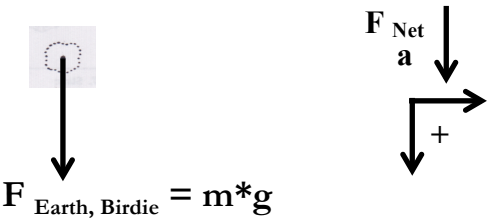
$W = F*d*\cos(\theta)$ $P = W / t$ $P = F*v*\cos(\theta)$

$PE_{grav} = m*g*h$ $KE = 0.5*m*v^2 = 1/2*m*v^2$

Energy in = Energy out $KE_i + PE_i + W_{ext} = KE_f + PE_f$

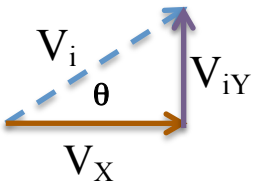
Unit 6 2-Dimensional Motion Particle Model

$F_{Net\,Y} = m*a_Y$
~~m~~$*g =$ ~~m~~$* a_Y$ cancel out the mass
$g = a_Y = 10.\ m/s^2$



$F_{Net\,X} = m*a_X$
$0\ N = m*a$
$a = 0\ m/s^2$

X – Direction	Y – Direction
Unit 2 Constant Velocity NO ACCELERATION! $V_{ix} = V_{fx} = V_x$ ΔX = Range $\Delta X = V_x * \Delta t$	Unit 3 Constant ACCELERATION $a = g = 10.\ m/s^2$ $V_{fY} = V_{iY} + g * \Delta t$ $\Delta Y = V_{iY} * \Delta t + ½ * g * \Delta t^2$ $V_{fY}^2 = V_{iY}^2 + 2 * g * \Delta Y$ $\Delta Y = ½ * (V_{fY} + V_{iY}) * \Delta t$



$V_{iY} = V_i \sin\theta$ $\sin\theta = V_{iY} / V_i$
$V_X = V_i \cos\theta$ $\cos\theta = V_X / V_i$

Units

Quantitiy	Unit	Symbol	Quantitiy	Unit	Symbol
Distance (x, d, s)	Meter	m	Energy (KE, PE, E)	Joules	J
Displacement (ΔX, ΔY)	Meter	m	Energy (KE, PE, E)	Newton*meter	N*m
Time (t)	Seconds	s	Work (W)	Joules	J
Velocity (V)	Meters/Second	m/s	Power (P)	Watts	W
Acceleration (a)	Meters/Second^2	m/s^2	Power (P)	Joules/Second	J/s
Acceleration (a)	Newtons/Kilogram	N/kg			
Force (F)	Newtons	N	Period (T)	Seconds	s
Mass (m)	Kilogram	kg			