Year 11 Physics
Equation Sheet
Semester 2

Physical Constants

$g = 9.8\ \text{ms}^{-2}$	g = magnitude of acceleration due to gravity
$G = 6.67 \times 10^{-11}\ \text{Nm}^2\text{kg}^{-1}$	G = universal constant of gravitation
$h = 6.63 \times 10^{-34}\ \text{Js}$	h = Planck's constant
$c = 3.00 \times 10^{8}\ \text{ms}^{-1}$	c = speed of light
$e = 1.60 \times 10^{-19}\ \text{C}$	e = charge of an electron

Common Formulae

$\vec{F} = m\vec{a}$

$\vec{F}_1 = -\vec{F}_2$

$\Delta\vec{v} = \vec{v}_f - \vec{v}_i$

$\vec{F}$ = force
m = mass
$\vec{a}$ = acceleration
$\vec{v}$ = velocity
$\Delta\vec{v}$ = change in velocity

Projectile Motion

$v_H = v\cos\theta$

$v_V = v\sin\theta$

$v = \sqrt{{v_H}^2 + {v_V}^2}$

$\theta = \tan^{-1}\left(\frac{v_V}{v_H}\right)$

$\vec{v} = \vec{v}_0 + \vec{a}t$

$\vec{s} = \vec{v}_0 t + \frac{1}{2}\vec{a}t^2$

$v^2 = {v_0}^2 + 2as$

θ = angle to the horizontal
v_H = horizontal component of velocity
v_V = vertical component of velocity
v_0 = initial velocity
v = velocity at time t
a = acceleration
s = displacement after time t

Circular Motion

$a = \frac{v^2}{r}$

$v = \frac{2\pi r}{T}$

$\theta = \tan^{-1}\left(\frac{v^2}{rg}\right)$

θ = angle to the horizontal
v = orbital speed
r = radius of circle
a = magnitude of centripetal acceleration
T = period of motion

Gravitation and Satellites

$F = G\frac{m_1 m_2}{r^2}$ $\quad v = \sqrt{\frac{GM}{r}}$ $\quad T = \sqrt{\frac{4\pi^2 r^3}{GM}}$ $\quad a = \frac{GM}{r^2}$

M = mass of object being orbited
v = orbital speed
r = distance between m_1 and m_2
T = period of motion

Energy and Momentum

$K = \frac{1}{2}mv^2$ $\quad W = Fs\cos\theta$

θ = angle between directions of force F and displacement s
W = work done

$\vec{p} = m\vec{v}$ $\quad \Delta\vec{p} = \vec{p}_f - \vec{p}_i$

p = momentum
Δp = change in momentum

$\vec{F} = \frac{\Delta\vec{p}}{\Delta t}$

Heat and Temperature

$\frac{Q}{t} = hA(T_O - T_S)$

$\frac{Q}{t}$ = rate of heat transfer
h = heat transfer coefficient
A = surface area of heat transfer
T_O = temperature of object
T_S = temperature of surroundings

$Q = mc\Delta T$

$Q = mL$

Q = heat transferred to or from the object
m = mass of object
ΔT = temperature change
c = specific heat capacity
L = latent heat capacity

$\eta = \frac{\text{energy output}}{\text{energy input}} \times 100$ $\quad \eta$ = efficiency

The Nucleus and Radioactivity

$N = N_0\left(\frac{1}{2}\right)^n$

N = number of nuclides remaining in sample
N_0 = initial number of nuclides in sample
n = number of half-lives

$E_b = \Delta m c^2$

E_b = energy change
Δm = mass change
c = speed of light

$A = Z + N$

A = mass number
Z = atomic number
N = number of neutrons

TABLE OF PREFIXES

Prefix	Symbol	Value
giga	G	10^9
mega	M	10^6
kilo	k	10^3
centi	c	10^{-2}
milli	m	10^{-3}
micro	μ	10^{-6}
nano	n	10^{-9}