This formula sheet shows all of the formula given on the VCAA exam. It is assumed that students know the context that each formula would be used in; the focus of this sheet is to show all of the re-arrangements that could be required / used.
Formulae marked with * are not included on the VCAA sheet, but are derived from included formulae and may still be of use in some of the questions.

Kinematics

$v = u + at$	$u = v - at$, $t = \frac{v-u}{a}$, $a = \frac{v-u}{t}$
$s = ut + \frac{1}{2}at^2$	$t = \sqrt{\frac{2s}{a}}$ (if u=0)
$v^2 = u^2 + 2as$	$v = \sqrt{u^2 + 2as}$, $u = \sqrt{2as - v^2}$, $s = \frac{v^2 - u^2}{2a}$, $a = \frac{v^2 - u^2}{2s}$
$s = \frac{1}{2}(u+v)t$	$t = \frac{2s}{(u+v)}$
$s = vt - \frac{1}{2}at^2$	$t = \sqrt{\frac{2s}{a}}$ (if v=0)

Circular motion

$a = \frac{v^2}{r}$	$v = \sqrt{ar}$, $r = \frac{v^2}{a}$
$a = \frac{4\pi^2 r}{T^2}$	$T = \sqrt{\frac{4\pi^2 r}{a}}$, $r = \frac{aT^2}{4\pi^2}$
$\tan\theta = \frac{v^2}{rg}$ *	$\theta = \tan^{-1}\left(\frac{v^2}{rg}\right)$, $v = \sqrt{\tan\theta rg}$, $r = \frac{v^2}{\tan\theta g}$

Projectile motion

$V_{vertical} = V\sin\theta$ *	
$V_{horizontal} = V\cos\theta$ *	
$t = \frac{2v\sin\theta}{g}$ *	(These equations are based on starting and finishing at the same height. They are not expected to be used, the five kinematics equations can be used with the appropriate vertical velocity.)
$H = \frac{v^2\sin^2\theta}{2g}$ *	
$R = \frac{v^2\sin 2\theta}{g}$ *	
$h(x) = \tan\theta x - \frac{g}{2v^2\cos^2\theta}x^2$ *	

Forces & energy

$\sum F = ma$	$a = \frac{\sum F}{m}$
$F = -k\Delta x$	$k = \frac{F}{x}$, $x = \frac{F}{k}$ (- just indicates opposite direction)
$E = \frac{1}{2}k(\Delta x)^2$	$\Delta x = \sqrt{\frac{2E}{k}}$, $k = \frac{2E}{(\Delta x)^2}$
$E = mg\Delta h$	$h = \frac{E}{mg}$, $g = \frac{E}{mh}$, $m = \frac{E}{gh}$
$E = \frac{1}{2}mv^2$	$v = \sqrt{\frac{2E}{m}}$, $m = \frac{2E}{v^2}$
$p = mv$	$v = \frac{p}{m}$
$\Delta p = F\Delta t$	$F = \frac{\Delta p}{\Delta t}$

Gravitational fields

$F = \frac{GM_1M_2}{r^2}$	$r = \sqrt{\frac{GM_1M_2}{F}}$
$g = \frac{GM}{r^2}$	$r = \sqrt{\frac{GM}{g}}$
$\frac{r^3}{T^2} = \frac{GM}{4\pi^2}$ *	$r = \sqrt[3]{\frac{GMT^2}{4\pi^2}}$, $T = \sqrt{\frac{4\pi^2r^3}{GM}}$, $M = \frac{4\pi^2r^3}{GT^2}$
$\frac{v^2}{r} = \frac{GM}{r^2}$ *	$v = \sqrt{\frac{GM}{r}}$, $r = \frac{GM}{v^2}$

Fields & applications of field concepts

$E = \frac{V}{d}$	$V = Ed$
$\frac{1}{2}mv^2 = qV$	$v = \sqrt{\frac{2qV}{m}}$
$E = \frac{kq}{r^2}$	$r = \sqrt{\frac{kq}{E}}$
$F = \frac{kq_1q_2}{r^2}$	$q_2 = \frac{Fr^2}{kq_1}$
$F = qE$	$E = \frac{F}{q}$ $E = \frac{kq_1}{r^2}$
$F = qvB$	$q = \frac{F}{vB}$, $v = \frac{F}{qB}$, $B = \frac{F}{qv}$
$F = ILB$	$I = \frac{F}{LB}$, $B = \frac{F}{IL}$, $L = \frac{F}{BI}$
$\frac{mv^2}{r} = qBv$	$r = \frac{mv}{qB}$, $v = \frac{qBr}{m}$, $B = \frac{mv}{qr}$

Generation and transmission of electricity

$R = r_1 + r_2 + ...$	
$\frac{1}{R} = \frac{1}{r_1} + \frac{1}{r_2} + ...$	$R = \frac{r_1 r_2}{r_1 + r_2}$, $r_2 = \frac{R r_1}{R - r_1}$
$V = IR$	$R = \frac{V}{I}$, $I = \frac{V}{R}$
$P = IV$	$P = \frac{v^2}{R}$, $P = I^2 R$ (combined with equations above)
$\frac{V_1}{V_2} = \frac{N_1}{N_2}$	$V_1 = V_2 \frac{N_1}{N_2}$, $V_2 = V_1 \frac{N_2}{N_1}$, $N_1 = N_2 \frac{V_1}{V_2}$, $N_2 = N_1 \frac{V_2}{V_1}$
$\frac{I_2}{I_1} = \frac{N_1}{N_2}$	
$V_1 = V\left(\frac{r_1}{r_1 + r_2}\right)$ *	$V_2 = V\left(\frac{r_2}{r_1 + r_2}\right)$
$V_{rms} = \frac{1}{\sqrt{2}} V_{peak}$	$V_{peak} = \sqrt{2} \times V_{rms}$ (Also applies to current)
$F = ILB$	$I = \frac{F}{LB}$, $B = \frac{F}{IL}$, $L = \frac{F}{BI}$
$\varepsilon = -N \frac{\Delta \phi}{\Delta t}$	
$\phi = BA$	

Einstein's special relativity

$\gamma = \frac{1}{\sqrt{1 - \frac{v^2}{c^2}}}$	$t = t_o \gamma$, $m = m_o \gamma$, $L = \frac{L_o}{\gamma}$
$E_{rest} = mc^2$	$c = \sqrt{\frac{E}{m}}$
$E_{total} = \gamma mc^2$	
$E_{kinetic} = (\gamma - 1)mc^2$	

The nature of light and matter

$E_{max} = hf - W$	$W = E_{max} - hf$, $f_{(threshold)} = \frac{W}{h}$ (If electrons have 0 energy)
$E = hf$	$f = \frac{E}{h}$, $h = \frac{E}{f}$
$p = \frac{h}{\lambda}$	$\lambda = \frac{h}{p}$
$E = \frac{hc}{\lambda}$ *	$\lambda = \frac{hc}{E}$
$\Delta p_x \Delta x \geq \frac{h}{4\pi}$	

Wave concepts

$v = f\lambda$	$f = \frac{v}{\lambda}$, $\lambda = \frac{v}{f}$
Path difference = $n\lambda$ (constructive interference)	Path difference = $\left(n - \frac{1}{2}\right)\lambda$ (destructive interference)
$\Delta x = \frac{\lambda L}{d}$	
$n_1 sin\theta_1 = n_2 sin\theta_2$	$\theta_2 = sin^{-1}\left(\frac{n_1}{n_2} sin\theta_1\right)$
$n_1 v_1 = n_2 v_2$	

Data

Acceleration due to gravity	$g = 9.80 m/s^2$
Rest mass of electron	$m_e = 9.11 \times 10^{-31} kg$
Electron charge	$e = 1.60 \times 10^{-19} C$
Planck's constant	$h = 6.63 \times 10^{-34} Js$, $h = 4.14 \times 10^{-15} eVs$
Speed of light in vacuum	$c = 3.00 \times 10^{8} m/s$
Gravitational constant	$G = 6.67 \times 10^{-11} Nm^2/kg^2$
Mass of earth	$m = 5.98 \times 10^{24} kg$
Radius of Earth	$R_E = 6.37 \times 10^{6} m$
Coulomb's constant	$k = 8.99 \times 10^{9} Nm^2/kg^2$

Prefixes / Units

p = pico = 10^{-12}	n = nano = 10^{-9}
μ = micro = 10^{-6}	m = milli = 10^{-3}
k = kilo = 10^{3}	M = mega = 10^{6}
G = giga = 10^{9}	t = tonne = $10^{3} kg$