Formulae and Relationships to Learn (not on data sheet) v1.0

Imaging and signalling
curvature = 1/radius
lens power = 1 / focal length
information in image = number of pixels x bits per pixel
resolution of image = width of an object / number of pixels across the object
resolution of signal = p.d. range of signal / number of bits per sample
minimum sampling rate > 2 x highest frequency in signal
bit rate of signal = samples per second x bits per sample
duration of signal = number of bits in message / bit rate

Electricity
$V = IR$
$R = 1/G$
$G = I/V$
$P = E/t$
$V_1/V_2 = R_1/R_2$ in potential divider
RC = time constant
$T_{½} = \ln 2\ RC$

Materials
density = mass / volume

Gases
$P \propto 1/V$
$V \propto T$
$P \propto T$
distance = $\sqrt{N}$ x step length
$½\ mv^2 = 3/2\ kT$ (= 3/2 RT per mole)
$R = k\ N_A$ ($8.31 = 1.38 \times 10^{-23} \times 6.02 \times 10^{23}$)

Motion and Forces
$s = ½\ (v+u)\ t$
$m_1v_1 = m_2v_2$ conservation of momentum
$F = ma$
$E_k = ½\ mv^2$
$\Delta E_{grav} = mg\Delta h$ for constant g near surface
$\Delta\theta = v\Delta t/r$
$\omega = 2\pi f$
$a = \omega^2 r$
$v = \omega r$

Waves
$\lambda_{fundamental} = 4L$ for pipe with closed end
$\lambda_{fundamental} = 2L$ for pipe with open ends
$\lambda_{fundamental} = 2L$ for string
n = c in vacuum / c in material
$n\lambda = dx/L$
maximum $n = d/\lambda$ (sin90 = 1)

Atomic and nuclear physics
$A = A_0 e^{-\lambda t}$
$A = -\lambda N$
Fraction remaining = $1 / 2^{\text{half-lives}}$
$\ln N / \ln N_0 = -\lambda t$
$p \approx E_{total} / c$
$E = hc/\lambda$
$\lambda = h/mv$
$E_k(max) = hf - \phi$
$E = qV$

Field and potential
$W = Vq$
$V = qEd$
$E = kq/r^2$
$g = -GM/r^2$
$v_{esc} = \sqrt{(2GM/r)}$

Electromagnetism
$\Phi N = BAN$
$V_p/V_s = N_p/N_s$ for transformer
$\varepsilon = vLB$

Universe
$v = H_0 d$
age = $1/H_0$
red shift $z = \Delta\lambda/\lambda = v/c$
$z+1 = r_{now} / r_{then}$
$t = \gamma\tau$

root mean square = $\sqrt{(\text{mean of (values}^2))}$
angle ≈ short side / long side