Formula Sheet (1st midterm)

$f = \frac{1}{T}$; $v = \lambda f$; $v = \sqrt{\frac{F}{m/L}}$ (String); $v = \sqrt{\frac{\gamma kT}{m}}$ (Ideal gas);

$\Delta s = n\lambda$ $n = 0,1,2,3\ldots$ (Constructive interference)

$\Delta s = \left(n + \frac{1}{2}\right)\lambda$ $n = 0,1,2,3\ldots$ (Destructive interference)

$v = \sqrt{\frac{B_{ad}}{\rho}}$ (Liquid); $v = \sqrt{\frac{Y}{\rho}}$ (Solid); $y = A\sin\left(2\pi ft \mp \frac{2\pi x}{\lambda}\right)$ (Wave function);

$I = \frac{P}{A}$ (Sound intensity); $\sin\theta = \frac{\lambda}{D}$ [rectangular Slit] & $\sin\theta = 1.22\frac{\lambda}{D}$ [circular] (Diffraction);

$f_o = f_s\left(\frac{1}{1 \pm \frac{v_s}{v}}\right)$ (Moving source), $\begin{cases} - \text{ toward} \\ + \text{ away} \end{cases}$; $f_o = f_s\left(1 \pm \frac{v_o}{v}\right)$ (Moving observer), $\begin{cases} + \text{ toward} \\ - \text{ away} \end{cases}$;

$f_{beat} = |f_1 - f_2|$ (Beat frequency); $f_n = n\left(\frac{v}{2L}\right)$ $n = 1,2,3,\ldots$ (String fixed at both ends);

$f_n = n\left(\frac{v}{2L}\right)$ $n = 1,2,3,\ldots$ (Tube open at both ends);

$f_n = n\left(\frac{v}{4L}\right)$ $n = 1,3,5,\ldots$ (Tube open at only one end);

$N = \frac{q}{e}$ (Number of charge); $F = \frac{kq_1q_2}{r^2}$ where [$k = 8.99\times10^9 \text{N}\cdot\text{m}^2/\text{C}^2$] (Coulomb's law);

$F = q_0E$; $E = \frac{kq}{r^2}$ where [$k = 8.99\times10^9 \text{N}\cdot\text{m}^2/\text{C}^2$] (Point charge);

$E = \frac{q}{\varepsilon_0 A} = \frac{\sigma}{\varepsilon_0}$ where [$\varepsilon_0 = 8.85\times10^{-12}\text{C}^2/(\text{N}\cdot\text{m}^2)$] (Parallel plate capacitor);

Appendix

$F = kx$ (Spring motion); $E = Pt$ (Energy–Power relation);
$F = ma$ (Newton's equation of motion)
Surface area of sphere = $4\pi r^2$; Area of circle = πr^2

M (mega)	$\times 10^6$
k (kilo)	$\times 10^3$
m (milli)	$\times 10^{-3}$
μ (micro)	$\times 10^{-6}$