

Formula Sheet for Exam 1
PHYS 1120 Section 01

Unit conversions

1 in = 2.54 cm	1 ft = 12 in	1 m = 39.37 in = 3.28 ft
1 mi = 1,609 m	1 h = 3,600 s	1 year = 365 days
1 atm = 101,325 Pa = 760 torr = 14.70 lb/in ²		1 bar = 10 ⁵ Pa
1 lb = 4.448 N	1 cal = 4.186 J	

Physical constants

Gravitational constant $G = 6.674 \times 10^{-11} \text{ N} \cdot \text{m}^2 / \text{kg}^2$
Earth's surface gravity $g = 9.8 \text{ m/s}^2$
Coulomb constant $k = 8.988 \times 10^9 \text{ N} \cdot \text{m}^2 / \text{C}^2$
Permittivity of free space $\epsilon_0 = 8.854 \times 10^{-12} \text{ C}^2 / (\text{N} \cdot \text{m}^2)$
Elementary charge $e = 1.602 \times 10^{-19} \text{ C}$
Mass of an electron $m_e = 9.109 \times 10^{-31} \text{ kg}$
Mass of a proton $m_p = 1.673 \times 10^{-27} \text{ kg}$
Density of water 1000 kg/m³
Density of mercury 13600 kg/m³

Formulas

Density $\rho = m/V$
Pressure $p = F/A$
Hydraulics $F_1/A_1 = F_2/A_2$
Pressure with depth $p = \rho gh$
Buoyancy $F = \rho gV$
Flow $\Delta V/\Delta t = vA$
 $v_1 A_1 = v_2 A_2$
 $p_1 + \frac{1}{2} \rho v_1^2 + \rho g y_1 = p_2 + \frac{1}{2} \rho v_2^2 + \rho g y_2$
Viscosity $\eta = \frac{Fd}{Av}$
Reynolds number $\rho v d / \eta$
Surface tension $\gamma = F/L$
Capillary action $h = \frac{2\gamma \cos \theta}{\rho g r}$
Coulomb's law $F = k q_1 q_2 / r^2$
Electric field $F = qE$
Electric potential $V = U/q; E = \lim_{\Delta x \rightarrow 0} \Delta V / \Delta x$
Electric flux $\Phi_E = EA = q_{in} / \epsilon_0$