

Physics 11 - Equation Sheet

Motion

$$v = \frac{\Delta d}{\Delta t} \quad (1)$$

$$v_f = v_i + at \quad (2)$$

$$d = \frac{(v_f + v_i)t}{2} \quad (3)$$

$$d = v_i t + \frac{1}{2}at^2 \quad (4)$$

$$v_f^2 = v_i^2 + 2ad \quad (5)$$

Forces

$$F_{net} = ma \quad (6)$$

$$F_f = \mu F_N \quad (7)$$

$$W = F_g = mg \quad (8)$$

$$g = -9.80 \text{ m/s}^2 = -9.80 \text{ N/kg} \quad (9)$$

$$F = -kx \quad (10)$$

Waves

$$v = \lambda f \quad (11)$$

$$v = \frac{\lambda}{T} \quad (12)$$

$$f = \frac{1}{T} \quad (13)$$

$$f' = f \left(\frac{v + v_o}{v - v_s} \right) \quad (14)$$

$$v = 331 + 0.6T \quad (15)$$

$$f_{beat} = |f_2 - f_1| \quad (16)$$

Work

$$W = Fd \cos \theta \quad (17)$$

$$W_{net} = \Delta KE + \Delta PE \quad (18)$$

$$P = \frac{W}{t} = \frac{E}{t} \quad (19)$$

$$W_{friction} = E_{T_2} - E_{T_1} \quad (20)$$

$$E_{T_1} = E_{T_2} \text{ neglecting friction} \quad (21)$$

Momentum

$$\Delta p = m\Delta v \quad (22)$$

$$J = F\Delta t = m\Delta v = \Delta p \quad (23)$$

$$p_1 + p_2 = p'_1 + p'_2 \quad (24)$$

Machines

$$MA = \frac{F_R}{F_e} \quad (25)$$

$$IMA = \frac{d_e}{d_R} \quad (26)$$

$$\text{eff} = \frac{MA}{IMA} \times 100\% \quad (27)$$

$$\text{eff} = \frac{W_o}{W_i} \times 100\% \quad (28)$$

$$W_o = F_R d_R \quad (29)$$

$$W_i = F_e d_e \quad (30)$$

Energy

$$KE = \frac{1}{2}mv^2 \quad (31)$$

$$PE = mg\Delta h \quad (32)$$

$$KE_1 + PE_1 = KE_2 + PE_2 \quad (33)$$

$$EE = \frac{1}{2}kx^2 \quad (34)$$

Light

$$n = \frac{c}{v} \quad (35)$$

$$n_i \sin \theta_i = n_r \sin \theta_r \quad (36)$$

$$c = 3.00 \times 10^8 \text{ m/s} \quad (37)$$

Mirrors/Lenses

$$\frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o} \quad (38)$$

$$m = \frac{h_i}{h_o} = -\frac{d_i}{d_o} \quad (39)$$

$$d_i = \frac{fd_o}{d_o - f} \quad (40)$$

$$d_o = \frac{fd_i}{d_i - f} \quad (41)$$

$$f = \frac{d_i d_o}{d_i + d_o} \quad (42)$$

Substance	Index of Refraction (n)
vacuum	1.00000
gases at 0°C, 1.013 × 10 ⁵ Pa	
hydrogen	1.00014
oxygen	1.00027
air	1.00029
carbon dioxide	1.00045
liquids at 20 °C	
water	1.333
ethyl alcohol	1.362
glycerin	1.470
carbon disulfide	1.632
solids at 20 °C	
ice (at 0 °C)	1.31
quartz (fused)	1.46
optical fibre (cladding)	1.47
optical fibre (core)	1.50
Plexiglas™	1.51
Lucite™	1.51
glass (crown)	1.52
sodium chloride	1.54
glass (crystal)	1.54
ruby	1.54
glass (flint)	1.65
zircon	1.92
diamond	2.42