

## Physics 11 equation sheet

### KINEMATICS

$$v_{ave} = \frac{\Delta d}{\Delta t} \quad a = \frac{\Delta v}{\Delta t} \quad d = 1/2 (v_f + v_o)t \quad at = v_f - v_o \quad v_f^2 = v_o^2 + 2a\Delta d \quad d = v_o t + 1/2 at^2$$

### FORCES

$$F_c = kx \quad F_f = \mu F_n \quad F_g = mg \quad F_g = \frac{Gm_1m_2}{r^2} \quad \frac{F_{net}}{m} = a$$

### MOMENTUM

$$p = mv \quad \Delta p = m\Delta v = F\Delta t$$

### ENERGY WORK AND POWER

$$E_p = mg\Delta h \quad E_k = 1/2 mv^2 \quad E_h = mc\Delta T \quad E = mc^2 \quad E_e = 1/2 kx^2 \quad \text{Eff} = \frac{\text{useful out} \times 100\%}{\text{total input}}$$

$$W = Fd \quad P = \frac{W}{t}$$

### WAVES

$$T = \frac{1}{f} \quad f = \frac{1}{T} \quad v = \lambda f \quad v = \frac{\lambda}{T}$$

### LIGHT

$$n_i \sin \theta_i = n_r \sin \theta_r \quad n = \frac{c}{v} \quad \frac{1}{f} = \frac{1}{d_i} + \frac{1}{d_o} \quad M = -\frac{d_i}{d_o} = \frac{h_i}{h_o}$$

### RELATIVITY

$$t = \frac{t_o}{\sqrt{1 - v^2/c^2}} \quad L = L_o \sqrt{1 - v^2/c^2} \quad m = \frac{m_o}{\sqrt{1 - v^2/c^2}}$$

### NUCLEAR

$$E = mc^2 \quad \% \text{ remaining} = 100 (1/2)^n$$

### CONSTANTS

$$g = 9.8 \text{ m/s}^2 \quad G = 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2 \quad c_{\text{H}_2\text{O}} = 4200 \text{ J/kg} \cdot \text{K}$$

$$1 \text{ kWh} = 3.6 \times 10^6 \text{ J} \quad c = 3.00 \times 10^8 \text{ m/s} \quad 1 \text{ eV} = 1.60 \times 10^{-19} \text{ J}$$

$$m_e = 5.98 \times 10^{-24} \text{ kg} \quad r_e = 6.38 \times 10^{-6} \text{ m} \quad 1 \text{ amu} = 1.66 \times 10^{-27} \text{ kg}$$

$$1 \text{ amu} = 934 \text{ MeV}$$

Indices of Refraction:

Medium	n		Medium	n
Vacuum	1.0000	Have	Crown glass	1.52
Air	1.0003	a	Quartz	1.54
Water	1.33	nice	Flint glass	1.61
ethanol	1.36	day	Diamond	2.42