

Physics 7C Final Exam Formula Sheet

(Separate this sheet from the exam packet. Do not turn it in.)

Constants

$$v_{\text{sound in air}} = 340 \text{ m/s}$$

$$v_{\text{light in vacuum}} = c = 3 \times 10^8 \text{ m/s}$$

$$G = 6.67 \times 10^{-11} \text{ N m}^2/\text{kg}^2$$

$$M_{\text{Earth}} = 5.98 \times 10^{24} \text{ kg}$$

$$R_{\text{Earth}} = 6.37 \times 10^6 \text{ m}$$

$$k = 9 \times 10^9 \text{ Nm}^2/\text{Coul}^2$$

$$q_{\text{electron}} = -1.602 \times 10^{-19} \text{ Coul}$$

$$q_{\text{proton}} = 1.602 \times 10^{-19} \text{ Coul}$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ T m/Amp}$$

$$m_{\text{electron}} = 9.11 \times 10^{-31} \text{ kg}$$

$$m_{\text{proton}} = 1.6726 \times 10^{-27} \text{ kg}$$

$$m_{\text{neutron}} = 1.6750 \times 10^{-27} \text{ kg}$$

$$h = 6.626 \times 10^{-34} \text{ J s}$$

$$1 \text{ eV} = 1.602 \times 10^{-19} \text{ J}$$

$$n_{\text{air}} = 1.00; \quad n_{\text{water}} = 1.33$$

Visible light: 400-700nm (red longer, violet shorter)

$$k_{\text{Boltzmann}} = 1.38 \times 10^{-23} \text{ J/K}$$

Universal Gravitation

$$g_{\text{point mass}} = G \frac{M}{r^2}; \quad \mathbf{F}_{\text{g on m}} = m\mathbf{g}; \quad \Delta PE_{\text{point mass}} = GMm\Delta\left(\frac{1}{r}\right)$$

Electricity and Magnetism

$$E_{\text{point charge}} = k \frac{Q}{r^2}; \quad \mathbf{F}_{\text{E on q}} = q\mathbf{E}; \quad \mathbf{E} = -\frac{dV}{dx} \approx -\frac{\Delta V}{\Delta x}; \quad \Delta V = \frac{\Delta PE}{q};$$

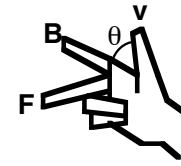
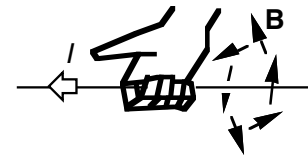
$$B_{\text{wire}} = (\mu_0) \frac{I}{2\pi r}; \quad F_{\text{B on q}} = qvB \sin \theta; \quad F_{\text{B on wire}} = qIL \sin \theta$$

$$\Delta PE_{\text{point charge}} = kQq\Delta\left(\frac{1}{r}\right); \quad PE_{\text{dipole}} = -pE \cos \theta$$

Miscellaneous

$$F_{\text{centripetal}} = \frac{mv^2}{r}; \quad L = I\omega$$

$$KE = \frac{1}{2} mv^2; \quad PE = \frac{1}{2} kx^2$$



Waves

$$y(x,t) = y_0 + A \sin\left(2\pi \frac{t}{T} \pm 2\pi \frac{x}{\lambda} + \varphi\right) = y_0 + A \sin(\Phi)$$

$$f = \frac{1}{T}; \quad \lambda = \frac{v_{\text{wave}}}{f}; \quad \Delta x \approx d \sin \theta$$

$$\varphi_{\text{reflection}} = \begin{cases} 0 \\ \pi \end{cases} \text{ depending on the type of reflection}$$

$$\Delta \Phi = \Phi_1 - \Phi_2 = 2\pi \left(\frac{t}{T_1} - \frac{t}{T_2} \right) - 2\pi \left(\frac{x_1}{\lambda_1} - \frac{x_2}{\lambda_2} \right) + (\varphi_1 - \varphi_2);$$

$$f_{\text{beats}} = |f_1 - f_2|; \quad f_{\text{carrier}} = \frac{f_1 + f_2}{2};$$

$$\text{node-antinode: } \lambda_n = \frac{4L}{2n-1}; \quad f_n = (2n-1) \frac{v_{\text{wave}}}{4L}$$

$$\text{node-node or antinode-antinode: } \lambda_n = \frac{2L}{n}; \quad f_n = n \left(\frac{v_{\text{wave}}}{2L} \right) = nf_1$$

Optics and Vision

$$\theta_{\text{incident}} = \theta_{\text{reflected}}; \quad n = \frac{c}{v}; \quad n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$\frac{1}{o} + \frac{1}{i} = \frac{1}{f}; \quad M = \frac{h_i}{h_o} = -\left(\frac{i}{o}\right); \quad \text{inverted has } M < 0; \quad \text{upright has } M > 0;$$

$$\text{nominal values } \begin{cases} \text{near pt.} = 0.25\text{m,} \\ \text{far pt.} = \infty. \end{cases}; \quad I_{\text{Intensity}} = I_0 \cos^2 \theta$$

Quantum Mechanics

$$E_{\text{photon}} = hf = \frac{hc}{\lambda}; \quad p_{\text{photon}} = \frac{hf}{c} = h/\lambda$$

$$E_{\text{matter}} = KE + PE; \quad p_{\text{photon}} = mv = h/\lambda;$$

$$\text{Oscillator: } E_n = hf(n - \frac{1}{2}); \quad f = \frac{1}{2\pi} \sqrt{k/m}$$