PHYS-201 Equation Sheet for Exam 2
(3 March 2011, Disque 108, 8:00-8:50 AM)

Electromagnetic Waves (Ch.32)

$$\oint \vec{\mathbf{E}} \cdot d\vec{\mathbf{A}} = \frac{q}{\varepsilon_0} \qquad \oint \vec{\mathbf{B}} \cdot d\vec{\mathbf{A}} = 0$$

$$\oint \vec{\mathbf{E}} \cdot d\vec{\mathbf{s}} = -\frac{d\Phi_B}{dt} \qquad \oint \vec{\mathbf{B}} \cdot d\vec{\mathbf{s}} = \mu_0 I + \varepsilon_0\mu_0\frac{d\Phi_E}{dt}$$

$$\vec{\mathbf{F}} = q\vec{\mathbf{E}} + q\vec{\mathbf{v}} \times \vec{\mathbf{B}} \qquad \omega = \frac{1}{\sqrt{LC}}$$

$$\frac{E}{B} = c \qquad c = \frac{1}{\sqrt{\varepsilon_0\mu_0}}$$

$$c = \lambda f \qquad f' = f\sqrt{\frac{c+v}{c-v}}$$

$$\vec{\mathbf{S}} = \frac{1}{\mu_0}\vec{\mathbf{E}} \times \vec{\mathbf{B}} \qquad u = \varepsilon_0 E^2 = \frac{B^2}{\mu_0}$$

$$I = S_{avg} = cu_{avg} \qquad P = \frac{S}{c}$$

Interference on Thin Films (Ch.35)

$$2nt = (m + \frac{1}{2})\lambda \qquad 2nt = m\lambda$$

Diffraction on a Single Slit or Circular Apertures (Chs.36)

$$\sin\theta_{dark} = m\frac{\lambda}{a} \qquad (m = \pm1, \pm2, \pm3, ...)$$

$$\theta_{min} = \frac{\lambda}{a} \qquad \theta_{min} = 1.22\frac{\lambda}{D}$$

Diffraction—Interference on Double & Multiple Slits (Ch.36)

$$\delta = d\sin\theta_{bright} = m\lambda \qquad (m = 0, \pm1, \pm2, ...)$$

$$\delta = d\sin\theta_{dark} = (m + \frac{1}{2})\lambda \qquad (m = 0, \pm1, \pm2, ...)$$

$$y_{bright} = L\tan\theta_{bright} \qquad y_{dark} = L\tan\theta_{dark}$$

Blackbody Radiation (Ch.38)

$$\mathcal{P} = \sigma A e T^4 \qquad \sigma = 5.7\times10^{-8}\mathrm{Wm^{-2}K^{-4}}$$

$$\lambda_{max}T = 2.898\times10^{-3}\mathrm{m\cdot K} \qquad E_n = nhf$$

Photoelectric Effect (Ch.38)

$$K_{max} = hf - \Phi = e\Delta V_S \qquad \lambda_c = \frac{c}{f_c} = \frac{hc}{\Phi}$$

$$h = 6.626\times10^{-34}\mathrm{J\cdot s} \qquad hc = 1240\mathrm{eV\cdot nm}$$

$$\hbar = 1.055\times10^{-34}\mathrm{J\cdot s} \qquad c = 2.998\times10^{8}\mathrm{ms^{-1}}$$

Discrete Spectra of Atomic Gases: Rydberg Formula (Ch.38)

$$\frac{1}{\lambda} = R_H\left(\frac{1}{2^2}-\frac{1}{n^2}\right) \quad (n = 3,4,5,...) \qquad R_H = 1.097\times10^{7}\mathrm{m^{-1}}$$

$$E_i - E_f = hf$$

Bohr Model of the Hydrogen Atom (Ch.38)

$$E = V + K = -\frac{k_e e^2}{2r} \qquad m_e v_n r_n = n\hbar \quad (n = 1,2,3,...)$$

$$r_n = n^2\,a_0 \qquad E_n = -\frac{k_e e^2}{2a_0 n^2} \quad (n = 1,2,3,...)$$

$$k_e = \frac{1}{4\pi\epsilon_0} = 8.988\times10^{9}\mathrm{N\cdot m^2(As)^{-2}} \qquad e = 1.602\times10^{-19}\mathrm{As}$$

$$a_0 = \frac{\hbar^2}{m_e k_e e^2} = 5.292\times10^{-11}\mathrm{m} \qquad m_e = 9.109\times10^{-31}kg = 0.511\,\mathrm{MeV}\cdot c^{-2}$$

$$\frac{1}{\lambda} = R_H\left(\frac{1}{n_f^2}-\frac{1}{n_i^2}\right) \qquad (n_f = 1:\mathrm{Lyman}, 2:\mathrm{Balmer}, 3:\mathrm{Paschen})$$