PHYS-201 Equation Sheet for Exam 2
(4 March 2010, Disque 103, 8:00-8:50 AM)

Diffraction and Interference on a Double Slit or Multiple Slits

$$\delta = d \sin\theta_{bright} = m\lambda \qquad (m = 0, \pm 1, \pm 2, ...)$$

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

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

Diffraction and Interference on Thin Films

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

Diffraction & Resolution of Single Slit or Circular Apertures

$$\sin\theta_{dark} = m\frac{\lambda}{a} \qquad (m = \pm 1, \pm 2, \pm 3, ...)$$

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

Blackbody Radiation

$$\mathcal{P} = \sigma A e T^4 \qquad \sigma = 5.7 \times 10^{-8}\mathrm{Wm^{-2}K^{-4}}$$

$$\lambda_{max} T = 2.898 \times 10^{-3}\mathrm{m \cdot K} \qquad E_n = nhf$$

Photoelectric Effect

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

$$h = 6.626 \times 10^{-34}\mathrm{J \cdot s} \qquad hc = 1240\mathrm{eV \cdot nm}$$

$$\hbar = 1.055 \times 10^{-34}\mathrm{J \cdot s} \qquad c = 2.998 \times 10^{8}\mathrm{ms^{-1}}$$

Discrete Spectra of Atomic Gases: Rydberg Formula

$$\frac{1}{\lambda} = R_H\left(\frac{1}{2^2} - \frac{1}{n^2}\right) \quad (n = 3, 4, 5, ...) \qquad R_H = 1.097 \times 10^7 \mathrm{m}^{-1}$$

$$E_i - E_f = hf$$

Bohr Model of the Hydrogen Atom

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

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

$$k_e = \frac{1}{4\pi\epsilon_0} = 8.988 \times 10^9 \mathrm{N} \cdot \mathrm{m}^2 (\mathrm{As})^{-2} \qquad e = 1.602 \times 10^{-19} \mathrm{As}$$

$$a_0 = \frac{\hbar^2}{m_e k_e e^2} = 5.292 \times 10^{-11} \mathrm{m} \qquad m_e = 9.109 \times 10^{-31} kg = 0.511\, \mathrm{MeV} \cdot c^{-2}$$

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