

Physics H133: Final Exam

June 7, 2012

- Write your name at the top of this page and at least one other page.
- This exam consists of problems worth a total of 50 points. The value of each problem is given with the problem statement. Do all 10 short answer questions, worth 2 points each, and 3 of 4 “synthetic” problems, worth 10 points each. If you attempt more problems, your best solutions will count.
- *READ THE PROBLEMS CAREFULLY!*
- Write your answers to each question on the exam sheets. Use the back of a sheet if needed. Label each part of your answer with the appropriate letter (a, b, c, \dots).
- No credit will be given for answers only or for just listing formulas; you must show your work and **explain the physics**. State any assumptions you make. Partial credit will be given.
- **Don't panic!**

Refer to the review sheets and your own annotations for formulas.

Constants for your reference:

$$1 \text{ eV} = 1.6 \times 10^{-19} \text{ J} \quad \text{wavelengths of visible light} \approx 400\text{--}700 \text{ nm}$$

$$h = 6.63 \times 10^{-34} \text{ J} \cdot \text{s} \quad \hbar = h/2\pi \quad c = 3.00 \times 10^8 \text{ m/s} \quad hc = 1240 \text{ eV} \cdot \text{nm} = 1240 \text{ MeV} \cdot \text{fm}$$

$$1 \text{ u} = 1.6604 \times 10^{-27} \text{ kg} = 931.48 \text{ MeV}/c^2 \quad m_e = 9.109 \times 10^{-31} \text{ kg} = 0.0005486 \text{ u}$$

$$m_p = 1.672 \times 10^{-27} \text{ kg} = 1.007277 \text{ u} \quad m_n = 1.675 \times 10^{-27} \text{ kg} = 1.008665 \text{ u}$$

$$m_e c^2 = 0.511 \text{ MeV} \quad m_p c^2 = 938.3 \text{ MeV} \quad m_n c^2 = 939.6 \text{ MeV}$$

$$k_B = 1.38 \times 10^{-23} \text{ J/K} \quad N_A = 6.02 \times 10^{23} \text{ molecules/mole}$$

$$\gamma = 1.67 \text{ (monatomic gas)}, 1.40 \text{ (diatomic gas)} \quad \text{latent heat of melting ice} = 333 \text{ kJ/kg}$$