General Physics II
2009 Fall
Prof Richard Ignace

HOMEWORK #7

- *This homework is due by the beginning of class on December 10. It covers material in chapters 27 and 28*
- *You will need a calculator and lots of scrap paper.*
- *Answers are to be recorded on a scantron that you will turn in. You may keep the questions (i.e., these sheets).*
- *You may (should) use your book. You may even work with other students. However, you should not copy the answers of other students. Since the exams are multiple choice, the homeworks are also exam prep, and so you need to be able to work these problems yourself. If you do not apply yourself to the homework and do your own work, you are not likely to perform well on the exams.*

1. A quantum of radiation has an energy of 2.0 keV. What is its frequency? ($h = 6.63 \times 10^{-34}$ J·s and 1 eV = 1.60×10^{-19} J)

   a. 3.2×10^{17} Hz
   b. 4.8×10^{17} Hz
   c. 6.3×10^{17} Hz
   d. 7.3×10^{17} Hz

2. According to Wien's displacement law, if the absolute temperature of a radiating blackbody is tripled, then the peak wavelength emitted will change by what factor?

   a. 1/3
   b. 1
   c. 3
   d. 9

3. Blue light (λ = 460 nm) is incident on a piece of potassium (ϕ = 2.20 eV). What is the maximum kinetic energy of the ejected photoelectrons? ($h = 6.63 \times 10^{-34}$ J·s, $c = 3.00 \times 10^{8}$ m/s, 1 eV = 1.60×10^{-19} J, and 1 nm = 10^{-9} m)

   a. 1.0 eV
   b. 0.50 eV
   c. 0.25 eV
   d. 4.9 eV

4. According to Einstein, increasing the brightness of a beam of light without changing its color will increase:

   a. the number of photons.
   b. the energy of each photon.
   c. the speed of the photons.
   d. the frequency of the photons.

5. The ionization energy for the hydrogen atom is 13.6 eV. What is the energy of a photon that is emitted as a hydrogen atom makes a transition between the $n = 4$ and $n = 2$ states?

   a. 0.85 eV
   b. 2.55 eV
   c. 3.40 eV
   d. 6.80 eV

6. Of the various wavelengths emitted from a hydrogen gas discharge tube, those that are associated with transitions from higher levels down to the $n = 1$ level produce which of the following?

   a. infrared
   b. visible
   c. mixture of infrared and visible
   d. ultraviolet

7. When an electron moves from the $n = 1$ to the $n = 2$ orbit:

   a. both the radius and the angular momentum double.
   b. both the radius and the angular momentum increase by a factor of 4.
   c. the radius doubles and the angular momentum increases by a factor of 4.
   d. radius increases by a factor of 4 and the angular momentum doubles.