

Physics 112
Quiz #25
December 6, 1999

Name: _____

IF YOU WANT A QUESTION GRADED OUT OF THREE POINTS (-1 [MINUS ONE] FOR WRONG ANSWER!!) WRITE "3" IN SPACE PROVIDED ON EACH QUESTION.

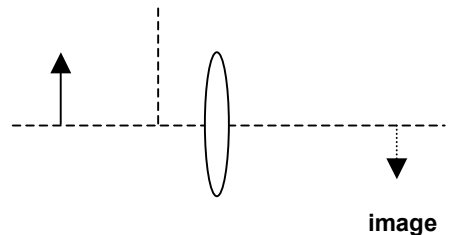
$c = 3 \times 10^8 \text{ m/s}$

$h = 4.14 \times 10^{-15} \text{ eV}\cdot\text{s}$

1. If an electron in a hydrogen atom drops down from the $n = 2$ energy level ($E = -3.40 \text{ eV}$) to the $n = 1$ energy level ($E = -13.6 \text{ eV}$), what is the frequency of the emitted photon?
 - A. $1.41 \times 10^{-14} \text{ Hz}$
 - B. $5.63 \times 10^{-14} \text{ Hz}$
 - C. $4.22 \times 10^{-14} \text{ Hz}$
 - D. $8.21 \times 10^{14} \text{ Hz}$
 - E. $3.28 \times 10^{15} \text{ Hz}$
 - F. $2.46 \times 10^{15} \text{ Hz}$
2. When a hydrogen atom absorbs light from a red laser, the electron jumps from the $n = 2$ energy level to the $n = 3$ energy level. ($\Delta E_{23} = 0.66 \text{ eV}$). Suppose instead that in a hydrogen atom the electron drops **down** from the $n = 6$ level to the $n = 1$ level ($\Delta E_{16} = 13.22 \text{ eV}$); what might the atom do in that case?
 - A. emit a radio wave
 - B. absorb a radio wave
 - C. emit an infrared wave
 - D. absorb an infrared wave
 - E. emit an ultraviolet wave
 - F. absorb an ultraviolet wave.

Grade out of 3? Write "3" here: _____

3. A convex lens forms an image of an illuminated arrow as shown. (Illuminated arrow is on the left.) What will happen to the image if the **top half** of the lens is blocked with an opaque board placed on the dashed line?
 - A. The arrowhead part of the image will disappear from the image.
 - B. The arrow tail part of the image will disappear from the image.
 - C. The entire image will disappear.
 - D. The image will get darker, but will undergo no other significant change.
 - E. The image will be **completely** unaffected in any way.



Grade out of 3? Write "3" here: _____

4. Suppose that you are sent in to an apparently empty room, and told to measure the magnitude of the uniform "external" magnetic field at a point two meters from the center of the room (produced by source currents outside the room). You are supplied with a 2-m length of straight wire that has a resistance of 5 ohms; a 15-volt battery; and a spring scale to measure the force on the wire. You connect the wire to the battery and measure the force. The force on the wire seems to depend on how you orient the wire, but after trying all orientations the largest value you observe is 4 N. What is the magnitude of the external magnetic field at that point? *No partial credit; answer must be within 10% of correct answer. -1 point for incorrect or missing units.*

Answer: _____