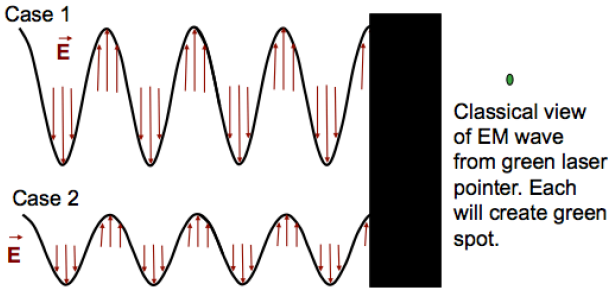
Sample questions:
MidTerm #1: Phys 2130 Sp15

WARNING: WARNING: WARNING: WARNING:
THESE QUESTIONS GIVE YOU A SAMPLE OF THE KINDS OF QUETSIONS ASKED ....
THEY DO **NOT** REPRESENT THE SPAN OF TOPICS. SEE NOTES ONLINE AND IN REIVEW LECTURE ABOUT TOPICS COVERED.

PART 1: Sample Multiple choice questions:

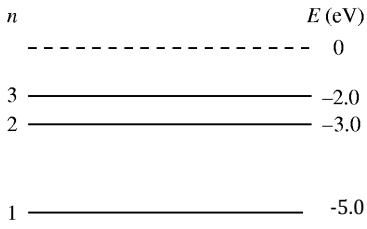
1. Consider Two different lasers, each green light (532 nm) hitting a barrel.



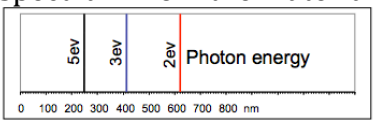
If max E field in case 1 is 2 times max E field in case 2,
then power in case 1 is _____ of case 2
number of photons in case 1 is _____ of case 2.

A. 2x, 2x B. same, unknown C. 4x, 4x D. 2x, unknown
E. some other combination.

2. The first three energy levels of the fictitious element X are shown in the figure.
What is the ionization energy of element X?
a) 10 eV b) 5 eV c) 3 eV d) 2 eV e) 0 eV

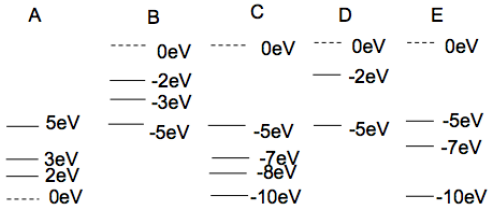


3) Consider the emission spectrum from the material Bailonium

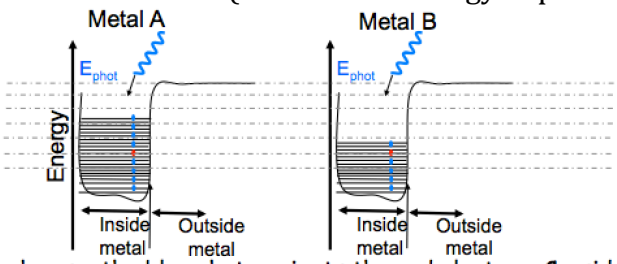


What energy levels for electrons are consistent with this spectrum for "*Bailonium*"?

Electron Energy levels:



4. In considering the photoelectric effect. The same blue light hits two different metals. It deposits its energy to the electron in red (at the same energy depth in the metal).



In each case, the blue photon ejects the red electron. Consider the following statements:

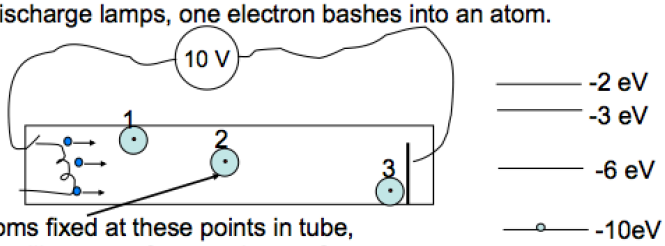
I. The work functions are the same in both cases.

II. The KE of the ejected electrons are the same in both cases.

A. I=True, II=True
B. I=True, II=False
C. I=False, II=True
D. I=False, II=False

5. Consider a discharge lamp as shown, with atoms at various positions in the tube.

In discharge lamps, one electron bashes into an atom.



If atoms fixed at these points in tube, what will you see from each atom?

A. All atoms will emit the same colors.
B. Atom 1 will emit more colors than 2 which will emit more colors than 3
C. Atom 3 will emit more colors than 2 which will emit more colors than 1
D. Atom 3 will emit more colors than 2. Atom 1 will emit no colors.
E. Impossible to tell.

6. A cell phone tower transmits a signal over a broad area by generating 100 Watts of power in a E/M wave with a wavelength of 0.30 m. At what frequency are the electrons in the transmitter oscillating?

(pick the closest answer)

a. 3 Hz b. 60 Hz c. 3×10^8 Hz d. 1×10^9 Hz e. 1×10^{11} Hz

7. What does the e-field (e.g. shown at right) curve tell you?

a. The spatial extent of the E-field. E-field is covering a larger extent in space with peaks/troughs
b. The E-field's direction and strength along the center line of the curve
c. The oscillating path that the light travels
d. more than one of these
e. none of these.

8) A ruby laser emits a 1 MW, 20ns long pulse of light with a wavelength of 690 nm. How many atoms undergo stimulated emission to generate this pulse?

a) 0.5 b) 345 c) $3.5\ 10^{18}$ d) $6.9\ 10^{16}$ e) $6.9\ 10^{18}$

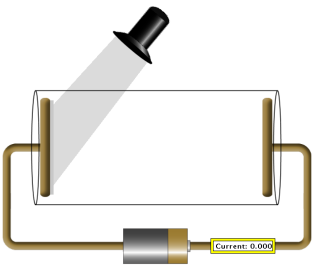
9) Which of the following does the Bohr model succeed in predicting:

1. It predicts the colors of light emitted from a Hydrogen atom.
2. It predicts the relative intensities of spectral lines of Hydrogen.
3. It predicts the size of the hydrogen atom.

a) 1, 2, 3 b) 1 only c) 1 and 2 only d) 1 and 3 only e) 2 and 3 only

Part II: Sample Portion of A Long Answer question

You are performing the photoelectric experiment with a target metal where you first start measuring a current when the wavelength of the light source = 300nm (the battery is set to zero volts). Consider our two different models for light: electromagnetic waves and photons – for each of the questions below you will be drawing two graphs: one for what would be predicted by the electromagnetic wave model of light, and another for what would be predicted by the photon model of light.



a. For each of the two models of light (EM waves and photons) draw a curve showing the current in the ammeter versus the frequency (f) of the light shining on the metal plate (where the intensity is kept constant). For both graphs briefly explain how the curve you've drawn is consistent with the model used to produce it.

b. For each of the two models of light (EM waves and photons) draw a curve showing the current in the ammeter as a function of time, from the moment the light is turned on (t=0) until long after. For both graphs briefly explain how the curve you've drawn is consistent with the model used to produce it.