

Practice Quiz 4 Part 2

These are Q's from old quizzes. I do not guarantee that the Q's on this year's quiz will be the same, or even similar.

A beam of light has an intensity of $4 \times 10^{-11} \text{ W/m}^2$ and sends light at a wavelength of 500nm. This beam has a diameter of 8.5 mm. If it is pointed at a black surface, how many photons per second hit the surface ?

- D
- a) 100
 - b) 500
 - c) 1000
 - d) 5000
 - e) 10,000

Molybdenum has a work function of 4.20 eV. What is the cut-off wavelength for the photoelectric effect?

- A
- a) 300nm
 - b) 400nm
 - c) 500nm
 - d) 600nm
 - e) 700nm

The resolving power of a microscope depends on the wavelength used. If you wanted to resolve an atom, a wavelength of approximately 1.0×10^{-11} m is required. If electrons are used, what minimal kinetic energy is required for the electrons ?

- B
- a) 1.5 keV
 - b) 15 keV
 - c) 150 keV
 - d) 1.5 MeV
 - e) 15 MeV

An electron is contained in a one dimensional box of length 0.100nm. Photons are emitted by the electron making a downward transition from $n=4$ to $n=1$. What is the wavelength of these photons ?

- A
- a) 2.2 nm
 - b) 2.8 nm
 - c) 4.1 nm
 - d) 4.7 nm
 - e) 6.6 nm

A ruby laser emits 694.3 nm light. Assume that this light is due to a transition of an electron in a 1-dimensional box from its $n=2$ to its $n=1$ state.

What is the length of the box ?

B

- a) 0.5 nm
- b) 0.75 nm
- c) 1.0 nm
- d) 1.25 nm
- e) 1.5 nm

An isolated atom of a certain element emits light of wavelength 520 nm for its Transition from its 5th excited state into its second excited state. It emits a photon of wavelength 410 nm when it transitions from its 6th excited state to its 2nd excited state. What is the wavelength of light emitted when it transitions from its 6th to its 5th excited state?

D

- a) 110 nm
- b) 300 nm
- c) 800 nm
- d) 2 microns
- e) 10 microns

A photon with energy 2.28 eV is absorbed by a hydrogen atom.
What is the minimum energy level, n , for which the hydrogen atom can be ionized by such a photon ?

- B
- a) 1
 - b) 3
 - c) 5
 - d) 7
 - e) 9

What is the magnitude of the orbital angular momentum for a hydrogen atom in a 4d state ?

- D
- a) 0.1×10^{-34} J seconds
 - b) 0.5×10^{-34} J seconds
 - c) 1.4×10^{-34} J seconds
 - d) 2.6×10^{-34} J seconds
 - e) 3.7×10^{-34} J seconds

A hydrogen atom is in its 5th excited state, with principal quantum number $n = 6$. The atom emits a photon with a wavelength of 1090 nm.

What is the maximum possible magnitude of orbital angular momentum of the atom after this transition ?

- a) 0.1×10^{-34} J seconds
- b) 0.5×10^{-34} J seconds
- c) 1.4×10^{-34} J seconds
- d) 2.6×10^{-34} J seconds
- e) 3.7×10^{-34} J seconds

D

How many protons are in the nucleus for an atom that has $n=1$ and $n=2$ shells full filled with electrons ?

- a) 2
- b) 4
- c) 6
- d) 8
- e) 10

E