What is the wavelength of the line in the Balmer series of hydrogen that is comprised of transitions from the \( n = 4 \) to the \( n = 2 \) level? \((R = 1.097 \times 10^7 \text{ m}^{-1} \text{ and } 1 \text{ nm} = 10^{-9} \text{ m})\)

a. 380 nm  
b. 486 nm  
c. 523 nm  
d. 630 nm

The Lyman series of hydrogen is made up of those transitions made from higher levels to \( n = 1 \). If the first line in this series has a wavelength of 122 nm, what is the wavelength of the second line?

a. 49 nm  
b. 103 nm  
c. 364 nm  
d. 486 nm
The Paschen series of hydrogen corresponds to electron transitions from higher levels to \( n = 3 \). What is the shortest wavelength in that series? \((R = 1.097 \times 10^7 \text{ m}^{-1} \text{ and } 1 \text{ nm} = 10^{-9} \text{ m})\)

a. 365 nm  
b. 820 nm  
c. 1094 nm  
d. 313 nm

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The ionization energy of the hydrogen atom is 13.6 eV. What is the energy of the \( n = 5 \) state?

a. 2.72 eV  
b. −2.72 eV  
c. 0.544 eV  
d. −0.544 eV
5) In the hydrogen atom the potential energy is negative, but the absolute value of the potential energy:

a. is equal to the kinetic energy of the electron.
b. is twice the kinetic energy of the electron.
c. is half the kinetic energy of the electron.
d. is equal to \( n^2 \) times the kinetic energy of the electron.

6) A muon behaves like an electron except that it has 207 times the mass of the electron. If a muon were bound to a proton, how would the energy levels in the Bohr model compare to those for a bound electron?

a. They would be the same.
b. They would be \((207)^2\) times as much as those for the electron.
c. They would be 207 times as much as those for the electron.
d. They would be \((1/207)\) times as much as those for the electron.
A hydrogen atom in the ground state absorbs a 12.75-eV photon. To what level is the electron promoted? (The ionization energy of hydrogen is 13.6-eV).

a. $n = 2$
b. $n = 3$
c. $n = 4$
d. $n = 5$

What is the energy needed to change an He$^+$ ion into an He$^{2+}$ ion? (The ionization energy of hydrogen is 13.6 eV).

a. 13.6 eV
b. 54.4 eV
c. 92.9 eV
d. 112.4 eV
9) If the principal quantum number for hydrogen is 5, which one of the following is not a permitted orbital magnetic quantum number for that atom?

a. 6  
b. -2  
c. 0  
d. 3  

10) How many electrons are in bromine’s (atomic number 35) next to outer shell ($n = 3$)?

a. 2  
b. 4  
c. 8  
d. 18
Characteristic x-rays are the result of:

a. outer electron transitions.
b. inner electron transitions.
c. nuclear electron states.
d. buckytopes.

The stimulated emission of photons from the excited atoms in a gas laser is prompted by which of the following?

a. high voltage
b. high flux of electrons
c. nearby presence of photons of same wavelength as those emitted
d. high temperature