Week 32 – Modern Physics

Read Page 349 (de Broglie Wavelength)

TQ1. Einstein proposed that photons, which have no mass, could have what?

TQ2. Arthur Compton observed in an experiment that photons obeyed what two laws of matter?

TQ3. What is the equation for the de Broglie wavelength?

CQ4. What phenomenon best supports the theory that matter has a wave nature?

CQ5. What particle best exhibits the wave-duality of nature?

Read Page 350 (Models of the Atom)

TQ6. In Rutherford's experiment, he shot _____ particles at a thin sheet of _____ foil.

TQ7. When Rutherford observed most of the particles went straight through undeflected but a significant number were deflected drastically, he concluded:

- Atoms have a _____ at the center
- Most of the atom is made up of _____ _____

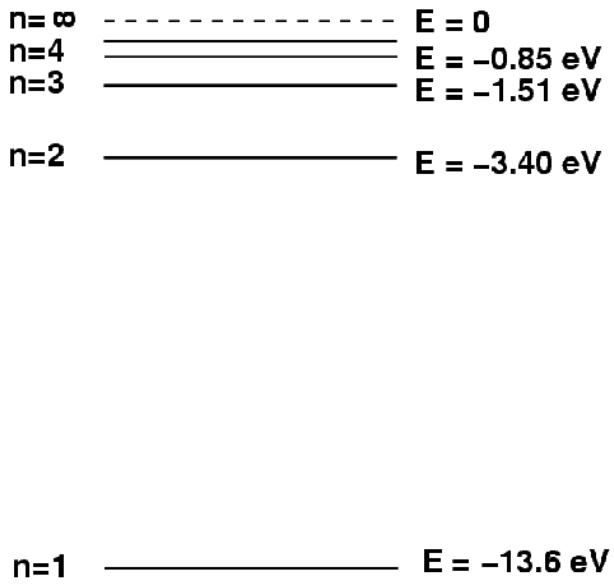
TQ8. What was one weakness of Rutherford's model of the atom?

TQ9. Bohr's model of the atom had three assumptions:

- Electrons can only exist at specific discrete _____ _____
- Each atom has a specific _____ at each energy level.
- To change energy levels, an electron must _____ or _____ energy.

TQ10. What is the equation to determine the energy of a photon using Bohr's model of the atom?

QQ11. Calculate the energy of the emitted photon when an electron moves from an energy level -3.40 eV to -13.60 eV.



QQ12. Using the energy levels for the hydrogen atom shown above, how much energy is needed to excite an electron from the n = 2 energy level to the n = 3 energy level?

QQ13. If an electron is at the n = 3 energy level in a hydrogen atom (see graphic shown above), determine the three different energies that are possible to go to the n = 1 ground state energy level.

CQ14. If an electron goes from the n = 2 energy level to the n = 1 ground state energy level, is energy (photons) absorbed or released to make this transition?

QQ15. An electron goes from a higher energy level to a lower energy level and releases 3.105 eV of energy.

(A) Calculate the frequency of the photon of light that is released.
(B) Calculate the wavelength of the photon of light that is released.
(C) Determine using the electromagnetic spectrum if this photon of light is ultraviolet, visible, infrared, or a radio wave?

Read Page 354-355 (Atomic Spectra)

CQ16. Given the bright-line spectra shown above, which elements are found in the unknown sample?