

AP physics B Atomic and Nuclear Study Guide Objectives

Atomic and Quantum Effects

- Photons
 - Relate energy in Joules or electron-volts to wavelength and frequency
 - Linear momentum of photon
 - Number of photons per second of monochromatic light
- Photoelectric effect
 - Describe photoelectric experiment – photon nature of light
 - Relate number of photons per second, kinetic energy to wavelength and intensity of light – photon nature of light
 - Determine max kinetic energy for photons emitted
 - Graph/identify stopping potential vs frequency, threshold frequency and work function, calculate value of h/e
- Compton scattering
 - Describe Compton's experiment and state results
 - Account for increase in photon wavelength and explain Compton's wavelength
- x-rays
 - nature of x-rays
 - determine shortest wavelength of x-rays by electrons accelerated through a specified voltage
- Atomic energy levels
 - Calculate the energy or wavelength of photon emitted or absorbed for transitions between energy levels of the electron
 - Explain emission spectra lines for gases
 - Calculate wavelength for single step, two step and multistep transitions of energy levels of electrons
 - Diagram energy levels and explain how several wavelengths can be produced from one atom
- Wave-particle duality
 - Calculate wavelength as a function of momentum
 - Describe the Davisson-Germer experiment and explain how it provides evidence for wave nature of light

Nuclear Physics

- Nuclear reactions
 - Interpret symbols for nuclei
 - Use conservation of mass and charge to complete nuclear reactions
 - Determine mass number and charge after a decay process
 - Nuclear force compared to electromagnetic force
 - Nuclear fission and explain chain reactions
- Mass-energy equivalence
 - Relate energy released in nuclear process to change in mass
 - $E=mc^2$