

## 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
  - $E=mc^2$