

QUANTIZATION OF ENERGY

Review Questions

1. Why is the term *ultraviolet catastrophe* used to describe the discrepancy between the predictions of classical physics and the experimental data for blackbody radiation?
2. What is meant by the term *quantum*?
3. What did Planck assume in order to explain the experimental data for blackbody radiation? How did Planck's assumption contradict classical physics?
4. What is the relationship between a joule and an electron volt?
5. How do observations of the photoelectric effect conflict with the predictions of classical physics?
6. What does Compton scattering demonstrate?

Conceptual Questions

7. Which has more energy, a photon of ultraviolet radiation or a photon of yellow light?
8. If the photoelectric effect is observed for one metal using light of a certain wavelength, can you conclude that the effect will also be observed for another metal under the same conditions?
9. What effect, if any, would you expect the temperature of a material to have on the ease with which electrons can be ejected from the metal in the photoelectric effect?
10. A photon is deflected by a collision with a moving electron. Can the photon's wavelength ever become shorter as a result of the collision? Explain your answer.

Practice Problems

For problems 11–12, see Sample Problem A.

11. A quantum of electromagnetic radiation has an energy of 2.0 keV. What is its frequency?
12. Calculate the energy in electron volts of a photon having a wavelength in the following ranges:
 - a. the microwave range, 5.00 cm
 - b. the visible light range, 5.00×10^{-7} m
 - c. the X-ray range, 5.00×10^{-8} m

For problems 13–14, see Sample Problem B.

13. Light of frequency 1.5×10^{15} Hz illuminates a piece of tin, and the tin emits photoelectrons of maximum kinetic energy 1.2 eV. What is the threshold frequency of the metal?
14. The threshold frequency of silver is 1.14×10^{15} Hz. What is the work function of silver?

MODELS OF THE ATOM

Review Questions

15. What did Rutherford's foil experiment reveal?
16. If Rutherford's planetary model were correct, atoms would be extremely unstable. Explain why.
17. How can the absorption spectrum of a gas be used to identify the gas?
18. What restriction does the Bohr model place on the movement of an electron in an atom?
19. How is Bohr's model of the hydrogen atom similar to Rutherford's planetary model? How are the two models different?
20. How does Bohr's model account for atomic spectra?