Chapter 40 Even Answers

2. (a) $\sim 10^{-7}$ m, ultraviolet (b) $\sim 10^{-10}$ m, γ - ray

4. 1.30×10^{15} s^{-1}

6. (a) 5.75×10^{3} K (b) 504 nm

8. 2.96×10^{19} photons/s

10. 5.71×10^{3} photons

12. 7.73×10^{3} K

16. (a) 1.38 eV (b) 3.34×10^{14} Hz

18. 2.22 eV for metal 1, 3.70 eV for metal 2

20. potassium

22. 8.41×10^{-12} C

24. 1.78 eV, 9.47×10^{-28} kg · m/s

26. 22.1 keV/c, 478 eV

28. 3.82 pm

30. (a) $\cos^{-1}\left(\dfrac{m_e c^2 + E_0}{2m_e c^2 + E_0}\right)$ (b) $\dfrac{E_0}{2}\left(\dfrac{2m_e c^2 + E_0}{m_e c^2 + E_0}\right), \dfrac{E_0}{2c}\left(\dfrac{2m_e c^2 + E_0}{m_e c^2 + E_0}\right)$

(c) $\dfrac{E_0^2}{2\left(m_e c^2 + E_0\right)}, \dfrac{E_0}{2c}\left(\dfrac{2m_e c^2 + E_0}{m_e c^2 + E_0}\right)$

32. 0.00486 nm

34. (a) 0.667, (b) 0.00109

36. (a) ultraviolet (b) Infrared

38. (a) 91.2 nm, 365 nm, 821 nm, 1460 nm

(b) 13.6 eV, 3.40 eV, 1.51 eV, 0.850 eV

40. (a) 2.19×10^{6} m/s (b) 13.6 eV (c) –27.2 eV

42. (a) B (b) A (c) B and C

44. (a) 13.6 eV (b) 1.51 eV

46. (a) $2.89\times10^{34}\ \text{kg}\cdot\text{m}^2/\text{s}$ (b) 2.74×10^{68} (c) 7.30×10^{-69}

48. $4.42\times10^{4}\ \text{m/s}$

50. (a) 0.0265 nm (b) 0.0177 nm (c) 0.0132 nm

52. (a) 1.52×10^{-16} s (b) 8.23×10^{9} revolutions (c) Yes, 8.23×10^{9} "electron years"

54. (a) 0.174 nm (b) 5.49×10^{-12} m

56. 0.218 nm

58. (a) 3.91×10^{4} (b) $1.07\times10^{-17}\ \text{kg}\cdot\text{m/s}$

(c) 6.22×10^{-17} m, much smaller than 10^{-14} m

60. (a) $1.10\times10^{-34}\ \text{m/s}$ (b) 1.36×10^{33} s

(c) No. The time is over 10^{15} times the age of the universe.

62. (a) 1.7 eV (b) $4.2\times10^{-15}\ \text{V}\cdot\text{s}$ (c) 730 nm

64. $\dfrac{hc}{\lambda}-\dfrac{e^2B^2R^2}{2m_e}$

66. (a) 191 MeV (b) 9.20 MeV

72. (a) $E_1=-8.16$ eV, $E_2=-2.04$ eV, $E_3=-0.902$ eV, $E_4=-0.508$ eV, $E_5=-0.325$ eV

(b) $\lambda_\alpha=1090$ nm, $\lambda_\beta=811$ nm, $\lambda_\gamma=724$ nm, $\lambda_{\text{series limit}}=609$ nm

(c) 122 nm, 108 nm, 97.3 nm, 95.0 nm, 91.2 nm

(d) The source could be moving away at $0.471c$, producing large Doppler shifts.

74. $\lambda_{\max}T=2.897755\times10^{-3}\ \text{m}\cdot\text{K}$, very close to Wien's experimental value of $2.898\times10^{-3}\ \text{m}\cdot\text{K}$

76. 3.12 fm, –18.9 MeV

80. 0.143 nm; Diffraction effects should appear.