Chapter 34 Even Answers

2. 2.25×10^{8} m / s

4. 38.0 pT

6. $E = (300 \text{ V / m})\cos(62.8x - 1.88 \times 10^{10} t)$, $B = (1.00\ \mu\text{T})\cos(62.8x - 1.88 \times 10^{10} t)$

10. 2.9×10^{8} m / s $\pm 5\%$

12. 49.5 mV in amplitude

14. (a) 13.3 nJ / m^3 (b) 13.3 nJ / m^3 (c) 7.96 W / m^2

16. 5.16×10^{-10} T, ~10^5 times weaker than the Earth's field.

18. (a) $\mathbf{E} \cdot \mathbf{B} = 0$ (b) $(11.5\ \mathbf{i} - 28.6\ \mathbf{j})$ W / m^2

20. (a) 50.0% (b) 269 kW / m^2 toward the oven chamber

(c) 14.2 kV / m

22. 5.16 m

24. (a) 540 V / m (b) 2.58 μJ / m^3

(c) 773 W / m^2 (d) 77.3% of the flux in Example 34.5

26. (a) 1.60×10^{-10} kg · m / s (b) 1.60×10^{-10} N

28. 6.67×10^{-10} N

30. (a) 577 W / m^2 (b) 2.06×10^{16} W

(c) 6.87×10^{7} N if Mars behaves as a perfect absorber.

(d) The gravitational force is ~10^{13} times stronger than the light force, in the opposite direction.

32. 3.48 A / m^2

34. (a) 93.3% (b) 50.0% (c) 0

36. (a) 134 m (b) 46.9 m

38. $\dfrac{2\pi mc}{qB}$

40. (a) ~10^8 Hz, radio wave (b) ~10^{13} Hz, infrared

42. (a) 0.690 wavelengths (b) 58.9 wavelengths.

44. 60.0 km

46. 1.00×10^3 km (621 mi), not very practical.

48. (a) 4.17 m to 4.55 m (b) 3.41 m to 3.66 m (c) 1.61 m to 1.67 m

50. $\sim 10^6$ J

52. (a) See solution (b) 3.78×10^{-7} m (or 378 nm)

54. (a) $\dfrac{(\Delta V)i}{2\pi r \ell}$ radially outward (b) $(\Delta V)i$ (c) The Poynting vector is now directed radially inward.

56. (a) 3.14×10^7 W (b) $0.625\ \mathrm{W/m^2}$ (c) 0.513%

58. (a) $23.9\ \mathrm{W/m^2}$ (b) It is 4.19 times the standard.

60. (a) 388 K (b) 363 K

62. (a) 6.16×10^{-6} Pa (b) 1.64×10^{10} times smaller than atmospheric pressure

64. (a) $\dfrac{4\rho gc}{3}\left(\dfrac{3m}{4\pi\rho}\right)^{1/3}$ (b) $\dfrac{4\pi r^2 \rho gc}{3}\left(\dfrac{3m}{4\pi\rho}\right)^{1/3}$

66. (a) 1.50 cm (b) 25.0 μJ (c) $7.37\ \mathrm{mJ/m^3}$

(d) 40.8 kV/m, 136 μT (e) 83.3 μN

68. 6.37×10^{-7} Pa

70. The projected area is πr^2 and the radiating area is $4\pi r^2$.
Orbital radius, $R = 4.77 \times 10^9\ \mathrm{m} = 4.77\ \mathrm{Gm}$

72. (a) 3.33 m, 11.1 ns, 6.67 pT

(b) $\mathbf{E} = (2.00\ \mathrm{mV/m}) \cos 2\pi\left(\dfrac{x}{3.33\ \mathrm{m}} - \dfrac{t}{11.1\ \mathrm{ns}}\right)\mathbf{j}$, $\mathbf{B} = (6.67\ \mathrm{pT}) \cos 2\pi\left(\dfrac{x}{3.33\ \mathrm{m}} - \dfrac{t}{11.1\ \mathrm{ns}}\right)\mathbf{k}$

(c) $5.31 \times 10^{-9}\ \mathrm{W/m^2}$ (d) $1.77 \times 10^{-17}\ \mathrm{J/m^3}$ (e) 3.54×10^{-17} Pa