Chapter 38 Even Answers

2. 547 nm

4. 91.2 cm

6. (a) 1.09 m (b) 1.70 mm

8. 560 nm

10. (a) 11 predicted; $0°, \pm 10.3°, \pm 21.0°, \pm 32.5°, \pm 45.8°, \pm 63.6°$

(b) 9 actually occur; $0°, \pm 10.3°, \pm 21.0°, \pm 32.5°, \pm 63.6°$

(c) 1.00 at 0°, 0.811 at 10.3°, 0.405 at 21.0°, 0.0901 at 32.5°, and 0.0324 at 63.6°

12. $2.61\ \mu\text{m}$

14. 0.512 m

16. 6.10 cm

18. $1.22\lambda vt/d$

20. 241 m

22. (a) 2.40×10^{-6} rad (b) 213 km

24. 514 nm

26. $1.81\ \mu\text{m}$

28. The first-order spectrum is between 23.6° and 34.1°. The second-order spectrum begins at 53.1°. There is no third-order spectrum. No overlap.

30. $\theta_{2\,\text{red}} > \theta_{3\,\text{violet}}$ for all grating spacings, so they overlap.

34. $m = 2$

36. 0.455 nm

38. 3 other orders

40. 5.51 m, 2.76 m, 1.84 m

42. (a) 6.89 units (b) 5.63 units

44. 1.11

50. See solution

52. 30.5 m

54. (a) $7.26\ \mu\text{rad}\ (1.50\ \text{seconds of arc})$ (b) 0.189 ly

(c) $50.8\ \mu\text{rad}\ (10.5\ \text{seconds of arc})$ (d) 1.52 mm

56. 545 nm

58. 11.5°

62. 1/8

66. (a) See solution (b) $\phi = 1.39$ rad

68. (a) $\beta/2 = 4.4934$ rad or $a\sin\theta = 1.4303\lambda$

(b) $\beta/2 = 7.7253$ rad or $a\sin\theta = 2.4590\lambda$