Chapter 24 Even Answers

2. $355\ \text{kN}\cdot\text{m}^2/\text{C}$

4. zero

6. (a) aA (b) bA (c) 0

8. $1.87\ \text{kN}\cdot\text{m}^2/\text{C}$

10. (a) -55.6 nC (b) negative, with a spherically symmetric distribution

12. $-\dfrac{Q}{\epsilon_0}$ for S_1; 0 for S_2; $-\dfrac{2Q}{\epsilon_0}$ for S_3; 0 for S_4

14. $E_0\pi r^2$

16. (a) $1.36\ \text{MN}\cdot\text{m}^2/\text{C}$ (b) $678\ \text{kN}\cdot\text{m}^2/\text{C}$ (c) No

18. 0 if $R \le d$; $\dfrac{2\lambda}{\epsilon_0}\sqrt{R^2 - d^2}$ if $R > d$

20. $\dfrac{Q - 6|q|}{6\epsilon_0}$

22. $28.2\ \text{N}\cdot\text{m}^2/\text{C}$

24. (a) 761 nC (b) Net charge is positive (c) Net charge negative, with same magnitude.

26. 2.33×10^{21} N / C away from the nucleus.

28. (a) 913 nC (b) 0

30. 4.86×10^{9} N / C

32. 3.50 kN

34. (a) 713 nC (b) 5.70 μC

36. (a) 16.2 MN / C (b) 8.09 MN / C (c) 1.62 MN / C radially inward

38. $1.15\ \text{nC}/\text{m}^2$

40. $E = \dfrac{Q}{2\epsilon_0 A}$ vertically upward in each case (assuming $Q > 0$)

42. $E = 0$ inside sphere and inside shell;

$E = k_e Q / r^2$ radially inward between sphere and shell.

$E = 2k_e Q / r^2$ radially outward outside the shell;

$-Q$ resides on outer surface of the sphere.

$+Q$ on the inner surface of the shell;

$+2Q$ on the outer surface of the shell.

44. (a) $248\ \text{nC} / \text{m}^2$ (b) $496\ \text{nC} / \text{m}^2$

46. (a) 2.56 MN / C, radially inward (b) 0

48. (a) $-\dfrac{q}{4\pi a^2}$ (b) $\dfrac{Q+q}{4\pi b^2}$

52. $c h w^2 / 2$

54. The strong field created by the large charge polarizes the second sphere.

56. (a) -4.00 nC (b) 9.56 nC (c) 4.00 nC, 5.56 nC

58. (a) 0 (b) σ / ϵ_0 to the right (c) 0

62. $0.269\ \text{N} \cdot \text{m}^2 / \text{C}$; 2.38 pC

66. (a) $\dfrac{\rho_0 r}{2\epsilon_0}\left(a - \dfrac{2r}{3b}\right)$ radially outward (b) $\dfrac{\rho_0 R^2}{2\epsilon_0 r}\left(a - \dfrac{2R}{3b}\right)$ radially outward

68. (a) $\dfrac{Cd^3}{24\epsilon_0}\mathbf{i}$ for $x > \dfrac{d}{2}$; $-\dfrac{Cd^3}{24\epsilon_0}\mathbf{i}$ for $x < -\dfrac{d}{2}$;

(b) $\dfrac{Cx^3}{3\epsilon_0}\mathbf{i}$ for $x > 0$; $-\dfrac{Cx^3}{3\epsilon_0}\mathbf{i}$ for $x < 0$;