Appendix A

Answers to Numerical Chapter and Unit Review Questions

Chapter 1

5. (a) 4.0×10^2 mL; 10.0 mL; 1.0×10^2 mL
(b) 1.7×10^2 mL

6. (a) 1.0×10^4 g **(b)** 2.23×10^{-1} m
(c) 52 cm^3 **(d)** 1.0×10^3 cm^3

7. (a) 1 **(b)** 4 **(c)** 1 **(d)** 2
(e) 5 **(f)** 4 **(g)** 5

8. (b) 5.7×10^3 km **(c)** 5.700×10^3 km

9. (a) 8.73 mL **(b)** 1.1×10^5 m^2
(c) 2.2×10^2 kg/L **(d)** 0.7
(e) 1.225×10^4 L **(f)** 1.8×10^1 g/mL

10. (a) 6.21×10^4 **(b)** 3×10^1
(c) 6×10^2 **(d)** 1.72×10^1

11. 1.9×10^4 cm^3

12. (a) 2.4×10^1 °C
(b) the tenths digit, to the right of the decimal

Chapter 2

6. (a) 7 **(b)** 7 **(c)** 10 **(d)** 3–
(e) $^{79}_{34}Se^{2-}$ **(f)** 2– **(g)** Cr **(h)** 24
(i) 28 **(j)** 21 **(k)** 3+ **(l)** 19
(m) 9 **(n)** 9 **(o)** 9 **(p)** 0

7. 32 neutrons; 27 electrons

8. (a) 2.40×10^6 **(b)** 2.13×10^6

Chapter 3

2. (a) 1.79 **(b)** 1.35 **(c)** 1.28 **(d)** 0.40

14. (a) 1.55; 1.49; 2.43
(b) 2.41; 1.59; 1.39
(c) 1.62; 1.33; 1.26; 1.23; 1.30

16. (a) Ag, 1; Cl, 1 **(b)** Mn, 2; P, 3
(c) P, 5; Cl, 1 **(d)** C, 4; H, 1
(e) Ti, 4; O, 2 **(f)** Hg, 2; F, 1
(g) Ca, 2; O, 2 **(h)** Fe, 2; S, 2

Unit 1

42. (a) 21.5 **(b)** 58 cm^3
(c) 19.3 kg/dm^3 **(d)** 17.5 g
(e) 298°C

44. 7, 7, 10, $^{32}S^{2-}$, 16, ^{4}He, 2, 4, 2, ^{38}Ca, 18

Chapter 5

9. 40

10. 69.8 u

11. 72.71 u

12. K-39, 95.0%; K-40, 5.0%

13. (a) 2.84×10^{-3} mol **(b)** 5.17×10^{-1} mol
(c) 8.16×10^{-5} mol **(d)** 4.38 mol
(e) 0.126 mol

14. (a) 7.09×10^{-3} mol **(b)** 1.23 mol
(c) 8.93×10^{-2} mol **(d)** 4.83×10^{-1} mol
(e) 2.69 mol **(f)** 9.27×10^{-4} mol

15. NH_3: 17.0, 8.77×10^{23}, 1.46, 5.84; H_2O: 18.0, 1.58, 8.77×10^{-2}, 2.63×10^{-1}; Mn_2O_3: 158, 1.05×10^1, 4.00×10^{22}, 6.64×10^{-2}; K_2CrO_4: 246, 2.37×10^{21}, 3.92×10^{-3}, 2.75×10^{-2}; $C_8H_8O_3$: 152, 2.00×10^3, 1.31×10^1, 2.49×10^2; $Al(OH)_3$: 78.0, 6.66×10^4, 5.14×10^{26}, 5.98×10^3

16. (a) 355 **(b)** 74.1
(c) 142 **(d)** 252
(e) 310 **(f)** 183

17. (a) 6.66×10^3 **(b)** 3.35×10^2
(c) 3.75×10^3 **(d)** 1.45
(e) 5.74×10^1 **(f)** 2.05×10^{-2}

18. 2.11×10^{24}

19. 1.3×10^{24}

20. (a) 131 **(b)** 131
(c) 2.18×10^{-22} **(d)** 7.89×10^{25}
(e) 6.02×10^{23}

21. 3.01×10^{24}

22. 6.57×10^{24}

23. 4.53×10^{23}

24. 192 g

25. Br-79, 55.0%; Br-81, 45.0%

26. (a) 1.00 **(b)** 84.9

27. (a) 14 **(b)** 16
(c) 4.2×10^{-3}

32. (a) 2.65×10^{-4} **(b)** 1.19×10^{-1}

33. 101 mg

Chapter 6

5. 2.64 g

6. (a) 9.9% C; 58.6% Cl; 31.4% F
(b) 80.1% Pb; 16.5% O; 0.3% H; 3.1% C

7. (a) 6.86 g **(b)** 1.74 g

8. (a) 63.5% **(b)** 127 kg

9. 26.9 g

10. 168 g

11. $C_4H_8O_4$

12. $C_{12}H_4O_2Cl_4$

13. (b) C_3H_8

14. $C_{21}H_{30}O_2$

15. $Na_2Cr_2O_7$

16. $HgSO_4$

17. (a) $Ca_3P_2O_8$ **(b)** $Ca_3(PO_4)_2$

18. (a) $C_{18}H_{26}O_3N$ **(b)** $C_{18}H_{26}O_3N$

19. V

20. C_3H_6O

21. 7

22. (a) 37.5% C; 4.2% H; 58.3% O
(b) $C_6H_8O_7$ **(c)** $C_6H_8O_7$

23. CO_2, 1.37 g; H_2O, 1.13 g

28. (a) 0.87 g **(b)** 0.56 g

29. (b) 60.3% **(c)** 1.0×10^2 kg

30. (b) $C_9H_8O_4$

Chapter 7

6. 9.60 g

7. 8.0×10^{22}

8. 292 g

9. (b) 8.94 g **(c)** 0.407 g S

10. 36.1 g

11. 2.04 g

12. 22.6 g

13. 1.65 g

14. 2.58 g

15. (a) 7.32 g **(b)** 34.2%
(c) 7.23 g

16. 53.7%

17. (a) 15.1 g **(b)** 0.414 g
(c) 14.2 g **(d)** 94.3%

19. (a) 3.24 g **(b)** 270 g

23. 5.9×10^5 L air or 7.1×10^5 g air

24. (d) 7×10^{-2}

Unit 2

29. (a) 6.02×10^{23} molecules; 1.21×10^{24} atoms
(b) 3.0×10^{24} ions **(c)** 2.3×10^{24} atoms

33. (a) 0.167 mol **(b)** 1.00×10^{23} mol
(c) 3.01×10^{23} atoms

34. 1.94×10^{23}

35. 1.20×10^{22}

37. 68.1% C; 13.7% H; 18.1% O

38. 2.84 g

42. (a) 0.015 mm **(b)** 2.7 nm

Chapter 8

11. 6.25 g

12. (a) 25 g **(b)** 225 g
(c) 2.50 mol/L

13. 96 mL

14. 1.2 ppm

15. 5.67 mol/L

16. 0.427 mol/L

17. (a) 9.89 g **(b)** 83 g

18. (a) 1.7 mol/L **(b)** 1.44 mol/L

19. (a) 0.381 mol/L **(b)** 0.25 mol/L

20. 25.0 g

23. (b) approximately 90 g **(c)** approximately 145 g
(d) approximately 76°C

24. approximately 380 g

25. 40°C

29. 0.25 ppm; 250 ppb

Chapter 9

13. 1.5×10^{-2} mol/L

14. (a) 2.69×10^{-3} mol/L **(b)** 1.88×10^{-2} mol/L
(c) 0.999 mol/L

15. 0.104 mol/L

16. $K^+ = 6.67 \times 10^{-2}$ mol/L; $Ca^{2+} = 6.67 \times 10^{-2}$ mol/L; $NO_3^- = 0.200$ mol/L

17. iron(III) chloride

18. (a) $Ca^{2+} = 4.5 \times 10^{-2}$ mol/L; $Mg^{2+} = 2.4 \times 10^{-2}$ mol/L
(b) $Ca^{2+} = 1.8 \times 10^3$ ppm; $Mg^{2+} = 5.8 \times 10^2$ ppm

19. 1.4×10^{-2} mol

20. 12.2 g

22. (b) 0.01057 mol **(c)** 120.4 g/mol

24. (b) 0.09600%

Chapter 10

10. (b) half

13. (a) 1.0×10^3 g **(b)** 55 mol

14. 0.800 mol/L

15. 0.020 mol/L

16. 1.0×10^{-5} mol

18. (a) 2.399 mol/L **(b)** no (because 9.317%)

Unit 3

22. 3.6×10^{-3} g

23. 1.25×10^{-5} g

Chapter 11

16. 0.50 L

17. 37.5 atm

18. 1.31×10^3 torr

19. 21 L

20. 2.8 L

21. −233

22. (a) 16.2 L **(b)** 138 cm^3
(c) 109 mL

23. 2.2 L

24. 50.2 kPa

25. 3.7×10^2 °C

26. 62.5 kPa

27. 273°C

28. 262 kPa

29. 68 days

30. –68°C

31. 24 atm

32. 2.3×10^3 L

33. 21 mL

34. 752 mm

35. (a) 1.5×10^2 **(b)** 1.017×10^3
(c) 750

36. 1.666×10^1, 1.066×10^1

37. (a) 87.5 **(b)** –148

Chapter 12

12. (a) 22.4 L **(b)** 2.80×10^2 L
(c) 5.60×10^2 L

13. 6.72×10^{24}

14. 50.4 L

15. 3.28×10^{-1}

16. 9.68×10^2 kPa

17. 1.80×10^3 g

18. (a) 1.69 g/L **(b)** 1.66 g/L

19. (a) 2.40 g **(b)** 1.75 g

20. (a) 20 g/mol

21. (a) 7.46 mol **(b)** 628 kPa
(c) 210 kPa

22. 12°C

23. C_2H_6O; $C_4H_{12}O_2$

24. C_8H_{18}

25. CH_3Cl

26. (b) 10 L **(c)** 14.3 g

27. 4.35 g

28. 3.00 L

29. 7.33 L

30. 1.28×10^3 L

31. 1.70 L

32. (b) 0.206 g; 0.736 g

35. (a) 8.314 kPa•L/mol•K
(b) 0.08206 atm•L/mol•K
(c) 62.36 torr•L/mol•K

36. (a) 68 L **(b)** 3.4 L; 3.4 L
(c) 2.5 mL

Unit 4

16. 0°C

17. 0.5000 mol

18. 2.0 L

19. 202.6 mL

20. 56.8 atm

21. 368 kPa

22. 374 dm^3

23. 49.3°C

24. 1.5

25. 4.6; 6.2×10^2; 1.03×10^3; –15.8; 15.1; 88

26. 54.7 mL

27. 7.5×10^2 kPa, 4.8×10^2 kPa, 1.10×10^3 kPa, 2.4×10^2 kPa

28. 2.5×10^2 L

29. 78 kPa

30. 22.4°C

31. 16 kg

32. 7.5 L, 5.0 L

33. 0.34 L

34. 29.5 g

35. 0.69 L

36. $C_4H_{10}O$

37. $C_{10}O_2H_{20}$

38. (a) 9.7×10^{21} molecules
(b) 2.6×10^{21} molecules
(c) 1.2×10^{20} molecules
(d) 3.7×10^{18} molecules

39. 1.94×10^{11} mol

Chapter 14

8. (b) 121 kJ

13. 322 kJ

14. Sample 2

15. 4.93 Cal/g

16. 158 kJ

17. 188 kJ

18. (a) 5.0 kJ/g, 1.2 Cal/g **(b)** 3.6 Cal/g

20. 2.51 kJ

21. 9.68 kJ/°C

22. 39.3°C

24. 1.1×10^3 L

25. (a) 56.2 mL **(b)** 34.9 L

Unit 5

15. (c) –0.75 kJ/g, 0.42 kJ/g

28. (a) 26 min **(b)** 2.6 km

29. (a) 2.90×10^4 kJ **(b)** 2.52×10^3 L