Unit 1: Chemistry as a Science

Chapter 1: The Science of Chemistry

1.2: Describing Matter

(Practice on pg. 14)

1. **(a)** 0.000 765 kg **(b)** 1340 mg **(c)** 0.0342 g **(d)** 23 745 000 000 mg

2. **(a)** 1730 cm **(b)** 0.002 56 km **(c)** 56.7 m **(d)** 5130 mm

3. shortest: 0.0128 km; longest: 17931 mm

(Section Review on pg. 19)

7. $\frac{1\text{ in}}{2.54\text{ cm}}$ **8.** 22 kg

9. **(a)** 17 300 ms **(b)** 0.000 002 56 km **(c)** 5.67 g **(d)** 0.005 13 km

10. 0.0173 L **11.** About 1081 beans **12.** 11 g/cm^3

13. $\frac{1\text{ kg}}{1\text{ L}} \times \frac{1000\text{ g}}{1\text{ kg}} \times \frac{1\text{ L}}{1000\text{ cm}^3} \times \frac{1\text{ mL}}{1\text{ cm}^3} = 1\text{ g/cm}^3$

14. Mostly complete combustion of carbon is happening. The density is close to the density of carbon dioxide, so mostly carbon dioxide is produced along with a small amount of carbon monoxide.

1.3: How is Matter Classified

(Section Review on pg. 28)

6. Compounds have properties that differ from the properties of their components, but mixtures have properties that often reflect the properties of the components that make up the mixture. A compound has a definite composition, so the components must be present in exact ratios. Mixtures can have varying compositions, so the proportions of the components can vary.

7. **(a)** compound **(b)** element **(c)** compound
(d) homogeneous mixture **(e)** compound **(f)** heterogeneous mixture

8. In a homogenous mixture, the components are distributed evenly throughout, so the properties of the mixture are the same throughout. In a heterogeneous mixture, the components are not evenly distributed, so there are regions of the mixture with different properties.

9. A compound must be composed of more than one type of atom, so it cannot be monoatomic (1 atom).

14. $C + O_2$ is a heterogeneous mixture (the material are a solid and a gas). CO is a compound. CO_2 is a compound. Co is an element.

(Chapter Review on pg. 31 to 32)

13. Toasting bread is an example of a chemical change. The browning of the bread is a sin that a new substance is formed and it is not easily reversible.

14. **(a)** physical change **(b)** chemical change **(c)** chemical change **(d)** physical change

16. **(a)** L/min or L/sec **(b)** m/s, cm/s, or km/h **(c)** m^3

17. Both salt and sugar are white, crystalline solids at room temperature. Both are soluble in water. The melting point of salt is very high compared that of sugar. Their densities are different. Hence, we can use the melting point or density to distinguish between them.

21. **(a)** element, solid **(b)** element, gas **(c)** compound, liquid **(d)** mixture, gas

22. **(a)** 2400 cm **(b)** 3 L

23. **(a)** 0.357 L **(b)** 2.5×10^7 mg **(c)** 35 L
(d) 2460 cm^3 **(e)** 2.5×10^{-4} g **(f)** 2.5×10^{-7} kg

26. 10.6 g/cm^3 **27.** 151 g **28.** 2.5×10^2 mL

(Standardize Test Prep on pg. 34 & 35)

1. D **2.** H **3.** C

4. Photosynthesis is a chemical change because the products of the change are different substances than the starting materials.

5. The conclusion is not valid because volume and shape give no information about identity and two different substances can have the same melting point. Additional information could include determining other physical properties or chemical properties.

6. A physical change is the conversion of liquid water to vapour. A chemical change is the reaction between wood and oxygen that generate heat while forming carbon dioxide and ash.

7. H **8.** A **9.** G **10.** D **11.** F

12. From the table, you can calculate the density of aluminium. Aluminium is much less dense than nickel, so if the pieces are the same size, the lighter one is aluminium.

Chapter 2: Matter and Energy

2.1: Energy

(Practice on pg. 45)

7. **(a)** 373 K **(b)** 1058 K **(c)** 273 K **(d)** 236 K

8. **(a)** 0 ºC **(b)** 927 ºC **(c)** −273 ºC **(d)** −173 K

2.3: Measurements and Calculations in Chemistry

(Practice on pg. 59)

1. **(a)** 0.1273 mL **(b)** 98 cm^2 **(c)** 8.144 g

2. 0.923 g/cm^3 **3.** 4593 kJ/min

(Practice on pg. 61)

1. 0.069 J/ g · K **2.** 0.385 J/g · K **3.** 329 K **4.** 3.6 kJ

(Section Review on pg. 63)

6. **(a)** 2.79 m^2 **(b)** 29.74 g/mL **(c)** 47.10 g **(d)** 32.86 L

7. 0.30 J/g · K **8.** **(a)** 4.42 g/mL **(b)** 24.78 mm^3 **(c)** 1.4×10^5 kJ/s

9. 5.2×10^3 s

(Chapter Review on pg. 66 to 68)

17. **(a)** 2.147 **(b)** 88 **(c)** 2.12

18. **(a)** exact **(b)** not exact **(c)** exact **(d)** not exact

19. **(a)** 7×10^8 **(b)** 7.4×10^8 **(c)** 7.430×10^8

20. **(a)** four **(b)** four **(c)** six **(d)** three

21. 6.411 g **22.** 1.1 cm **23.** 2.79 m^2 **24.** 29.74 g/mL

25. 8.82×10^{-4}g **26.** **(a)** 27.0 cm^3 **(b)** 3.33 cm **27.** 0.091 J/ g • K

28. 4.9×10^3 J **29.** 13°C **30.** **(a)** 6.730×10^{-4} **(b)** 5.00000×10^4

31. **(a)** 0.007050 g **(b)** 40,000,500 mg **32.** 8.57×10^8 m^2

33. **(a)** 7.5×10^3 **(b)** 9.2002×10^7 **34.** three

35. **(a)** 0.410 J / g • K **(b)** 7.0×10^2 J **36.** 1.4×10^6 m^3 **37.** 1.43 g/cm^3

38. 9.47×10^{-4} g ; 9.47×10^{-7} kg **39.** **(a)** 4500 g **(b)** 0.00605 m **(c)** 3,115,000 km

40. **(a)** 8.0000000×10^8 m **(b)** 9.5×10^{-4} m **(c)** 6.0200×10^4 L **(d)** 1.5×10^{-3} kg

41. **(a)** 2.600000×10^{14} **(b)** 6.42×10^{-7} **(c)** 3.4×10^8 cm^2

42. **(a)** 133 m^2 **(b)** 2.1×10^2 L/min **(c)** 105 m/s

(Standardize Test Prep on pg. 70 & 71)

1. C **2.** G **3.** D **4.** F

5. Because the temperatures of the object differ under the same conditions, they must have different specific heats, so they are made of different metals.

6. The scientific method is a series of steps followed to solve problems, including collecting data, formulating a hypothesis, testing a hypothesis, and stating conclusions.

7. C **8.** I **9.** C **10.** F **11.** B

12. The right side of the graph, which shows the conditions of water in the gas phase.