VER**I**TAS Chemistry   Name: _____ Date: _____

Chapter 4 – Problem Solving in Chemistry

Chapter 4: 1 – 5, 7, 9 – 17, 19, 22 – 24, 26 – 29, 33, 34, 38, 40, 51, 52, 56, 70 (30 total)

Practice Problems

1. The density of silicon is 2.33 g/ cm^3. What is the volume of a piece of silicon that has a mass of 62.9 g?

2. Helium has a boiling point of 4 K. This is the lowest boiling point of any liquid. Express this temperature in degrees Celsius.

Section Review 4.1

3. List three useful problem-solving skills.

    a.

    b.

    c.

4. State in your own words the three suggested step for solving word problems.

    a.

    b.

    c.

5. Identify the statements that correctly complete the sentence: Good problem solvers

    a. read a problem only once.

    b. check their work.

    c. break complex problems down into one or more simpler problems.

    d. look for relationships among pieces of information.

7. Calculate normal body temperature (37℃) on the Kelvin scale.

Practice Problems

9. An experiment requires that each student use an 8.5-cm length of magnesium ribbon. How many students can perform the experiment if there is a 570-cm length of magnesium ribbon available?

10. A 1.00-degree increase on the Celsius scale is equivalent to a 1.80-degree increase on the Fahrenheit scale. If a temperature increases by 48.0℃, what is the corresponding temperature increase on the Fahrenheit scale?

Practice Problems

11. Using tables from Chapter 3, convert the following.

      a. 0.044 km to meters

      b. 4.6 mg to grams

      c. 8.9 m to decimeters

      d. 0.107 g to centigrams

12. Convert the following.

      a. 15 cm^3 to liters

      b. 7.38 g to kilograms

      c. 0.67 s to milliseconds

      d. 94.5 g to micrograms

Practice Problems

13. Use dimensional analysis and the given densities to make the following conversions.

a. 14.8 g of boron to cubic centimeters of boron. The density of boron is 2.34 g/ cm^3.

b. 2.8 L of argon to grams of argon. The density of argon is 1.78 g/ L

c. 4.62 g of mercury to cubic centimeters of mercury. The density of mercury is 13.5 g/ cm^3.

Practice Problems

14. Rework the preceding problems by applying the equation:

Density = mass/ volume

Section Review 4.2

15. What conversion factor would you use to convert between these pairs of units?

a. minutes to hours

b. grams of water to cubic centimeters of water

c. grams to milligrams

d. cubic decimeters to milliliters

16. Make the following conversions. Express your answers in scientific notation.

a. 36 cm to meters

b. 14.8 g to micrograms

c. 1.44 kL to liters

16. (continued)

     d. 68.9 m to decimeters

     e. 3.72 x 10^{-3} kg to grams

     f. 66.3 L to cubic centimeters

     g. 0.0371 m to kilometers

17. A 2.00-kg sample of bituminous coal is composed of 1.30 kg of carbon, 0.20 kg of ash, 0.15 kg of water, and 0.35 kg of volatile (gas-forming) material. Using this information, determine how many kilograms of carbon are in 125 kg of this coal.

19. An atom of gold has a mass of 3.271 x 10^{-22} g. How many atoms of gold are in 5.00 g of gold?

Practice Problems

22. How many minutes are there in exactly one week?

23. How many seconds are there in exactly a 40 hour work week?

Practice Problems

24. Gold has a density of 19.3 g/ cm^3. What is the density in kilograms per cubic meter?

Section Review 4.3

26. How can you solve a complicated problem more easily?

27. How are complex units dealt with in calculations?

28. Convert the following. Express your answers in scientific notation.

   a. 7.5×10^4 nm to kilometers

   b. 3.9×10^5 mg to decigrams

   c. 0.764 km to centimeters

   d. 2.21×10^{-4} dL to microliters

29. Light travels at a speed of 3.00×10^{10} cm/ s. What is the speed of light in kilometers per hour?

Chapter 4 Review

33. A volume of 5.00 mL of mercury is added to a beaker that has a mass of 87.3 g. What is the mass of the beaker with the added mercury? 4.1

34. What is the name given to a ratio of two equivalent measurements? 4.2

38. One of the first mixtures of metal used by dentists for tooth fillings consisted of 26.0 g of silver, 10.8 g of tin, 2.4 g of copper, and 0.8 g of zinc. How much silver is in a 25.0 g sample of this amalgam? 4.2

40. The density of dry air measured at 25 ℃ is 1.19 x 10^{-3} g/ cm^3. What is the volume of 50.0 g of air? 4.2

51. Alkanes are a class of molecules that have the general formula C_nH_{2n+2}, where n in an integer. The table below gives the boiling points for the first five alkanes with an odd number of carbon atoms. Using the table, construct a graph with number of carbon atoms on the x-axis.

Boiling Point (℃)	Number of carbon atoms
-162.0	1
-42.0	3
36.0	5
98.0	7
151.0	9
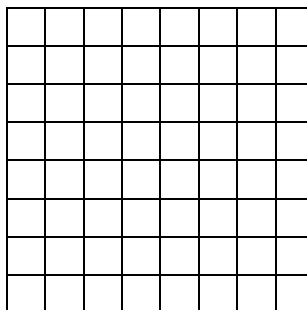
a. what are the approximate boiling points for the C_2, C_4, C_6, and C_8 alkanes?

b. Which of these nine alkanes are gases at room temperature (20 ℃)?

c. How many of these nine alkanes are liquids at 350K?

d. What is the approximate increase in boiling point per additional carbon atom in this series of alkanes?

52. Earth is approximately 1.5×10^8 km from the sun. How many minutes does it take light to travel from the sun to Earth? The speed of light is 3.00×10^8 m/s.

56. Choose the term that best completes the second relationship.

  a. journey: route   problem: _____

     (1) unknown   (3) known

     (2) plan   (4) calculate

  b. meter: 100 cm   gram: _____

     (1) 0.001 kL   (3) 1000 mg

     (2) 100 cm   (4) 100 kg

70. The density of dry air at 20℃ is 1.20 g/ L. What is the mass of air, in kilograms, of a room that measures 25.0 m by 15.0 m by 4.0 m?