CHAPTER 1 Review

Reflecting on Chapter 1

Summarize this chapter in the format of your choice. Here are a few ideas to use as guidelines:

- List possible interactions among science, technology, society, and the environment (STSE).
- Give examples of physical and chemical properties.
- Make a table of common SI units.
- Think about measurement and uncertainty. When is a number exact?
- Make up a list of values. Challenge your friends to identify the number of significant digits in each.
- Review the rules for significant digits when adding, subtracting, multiplying, and dividing numbers.
- Explain the difference between accuracy and precision.
- Give examples of physical and chemical changes.
- Into what categories can matter be classified?

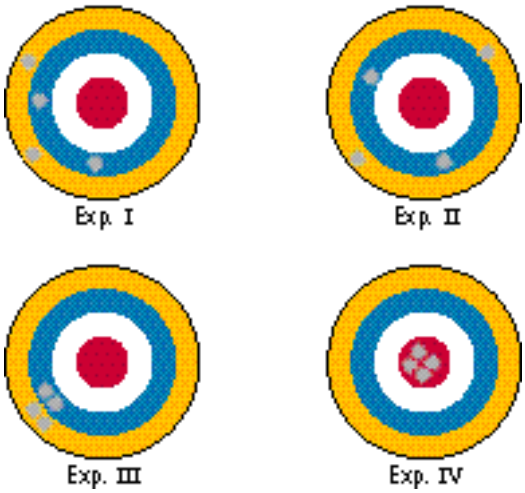
Reviewing Key Terms

For each of the following terms, write a sentence that shows your understanding of its meaning.

accuracy	chemical changes
chemical property	chemistry
compound	element
matter	mixture
physical changes	physical property
precision	properties
pure substance	significant digits
STSE	

Knowledge/Understanding

1. Identify each property as either physical or chemical.
   (a) Hydrogen gas is extremely flammable.
   (b) The boiling point of ethanol is 78.5˚C.
   (c) Chlorine gas is pale green in colour.
   (d) Sodium metal reacts violently with water.
2. How can you tell the difference between a physical change and a chemical change?
3. Name the property that each change depends on. Then classify the property as either chemical or physical.
   (a) You separate a mixture of gravel and road salt by adding water to it.
   (b) You add baking soda to vinegar, and the mixture bubbles and froths.
   (c) You use a magnet to locate iron nails that were dropped in a barn filled knee-deep with straw.
   (d) Carbon dioxide gas freezes at a temperature of −78˚C.
   (e) You recover salt from a solution of saltwater by heating the solution until all the water has evaporated.
   (f) The temperature of a compost pile rises as the activity of the bacteria inside the pile increases.
4. Use the terms “accuracy” and “precision” to describe the results on the dart boards shown below. Assume that the darts represent data and the bulls-eye represents the expected value.



5. Examine the containers on the next page.
   (a) What volume of liquid does each container contain? Be as accurate and precise as possible in your answers.
   (b) Assume that the liquid in all three containers is water. If the flask and the graduated cylinder are emptied into the beaker, what is the total volume of water in the beaker? Report your answer to the correct number of significant digits.
   (c) Which container is the best choice for measuring volume in a laboratory? Explain why.

6. Make each conversion below.
   (a) 10 kg to grams (g)
   (b) 22.3 cm to metres (m)
   (c) 52 mL to centimetres cubed
   (d) 1.0 L to centimetres cubed

7. Identify the number of significant digits in each value.
   (a) 0.002 cm
   (b) 3107 km
   (c) 5 g
   (d)
   (e) 4.0003 mL
   (f)
   (g) 91 511 L

8. (a) Explain why the value 5700 km could have two, three, or four significant digits.
   (b) Write 5700 km with two significant digits.
   (c) Write 5700 km with four significant digits.

9. Complete each calculation. Express your answer to the correct number of significant digits.
   (a) 4.02 mL + 3.76 mL + 0.95 mL
   (b)
   (c)
   (d)
   (e)
   (f)

10. Round each value to the given number of significant digits.
    (a) 62 091 to three significant digits
    (b) 27 to one significant digit
    (c) 583 to one significant digit
    (d) 17.25 to three significant digits

11. A plumber installs a pipe that has a diameter of 10 cm and a length of 2.4 m. Calculate the volume of water (in) that the pipe will hold. Express your answer to the correct number of significant digits. Note: The formula for the volume of a cylinder is , where *r* is the radius and *h* is the height or length.

12. During an investigation, a student monitors the temperature of water in a beaker. The data from the investigation are shown in the table below.
    (a) What was the average temperature of the water? Express your answer to the appropriate number of significant digits.
    (b) The thermometer that the student used has a scale marked at 1˚ intervals. Which digits in the table below are estimated?

Time (min)	Temperature (˚C)
0.0	25
1	24.3
2	24
3	23.7
4	23.6

13. Identify each change as either physical or chemical.
    (a) Over time, an iron swing set becomes covered with rust.
    (b) Juice crystals "disappear" when they are stirred into a glass of water.
    (c) Litmus paper turns pink when exposed to acid.
    (d) Butter melts when you spread it on hot toast.

Inquiry

14. Your teacher asks the class to measure the mass of a sample of aluminum. You measure the mass three times, and obtain the following data: 6.74, 6.70, and 6.71 g/. The actual value is 6.70 g/. Here are the results of three other students:

    Student A 6.50, 6.49, and 6.52 g/

    Student B 6.57, 6.82, and 6.71 g/

    Student C 6.61, 6.70, and 6.87 g/

    (a) Graph the four sets of data. (Call yourself "student D.")

(b) Which results are most precise?
(c) Which results are most accurate?
(d) Which results have the highest accuracy *and* precision?

15. (a) Design an investigation to discover some of the physical and chemical properties of hydrogen peroxide, .
(b) List the materials you need to carry out your investigation.
(c) What specific physical and/or chemical properties does your investigation test for?
(d) What variables are held constant during your investigation? What variables are changed? What variables are measured?
(e) If you have time, obtain some hydrogen peroxide from a drugstore. Perform your investigation, and record your observations.

Communication

16. Choose one of the common chemicals listed below. In your notebook, draw a concept web that shows some of the physical properties, chemical properties, and uses of this chemical.
- table salt (sodium chloride)
- water
- baking soda (sodium hydrogen carbonate)
- sugar (sucrose)

17. In your notebook, draw a flowchart or concept web that illustrates the connections between the following words:
- mixture
- pure substance
- homogeneous
- heterogeneous
- solution
- matter
- water
- cereal
- aluminum
- apple juice

18. Is salad dressing a homogenous mixture or a heterogeneous mixture? Use diagrams to explain.

Making Connections

19. Locate 3 cleaning products in your home. For each product, record the following information:
- the chemical(s) most responsible for its cleaning action
- any safety symbols or warnings on the packaging or container
- any hazards associated with the chemical(s) that the product contains
- suggestions for using the product safely

Back in class, share and analyze the chemicals that everyone found.
(a) Prepare a database that includes all the different chemicals, the products in which they are found, their hazards, and instructions for their safe use. Add to the database throughout the year. Make sure that you have an updated copy at all times.
(b) Identify the cleaning products that depend mainly on chemical changes for their cleaning action. How can you tell?

20. At the beginning of this chapter, you saw how water, a very safe chemical compound, can be misrepresented to appear dangerous. Issues about toxic and polluting chemicals are sometimes reported in newspapers or on television. List some questions you might ask to help you determine whether or not an issue was being misrepresented.

21. Describe the most important STSE connections for each situation.
(a) Car exhaust releases gases such as sulfur dioxide, , and nitrogen oxide, . These gases lead to smog in cities. As well, they are a cause of acid rain.
(b) In the past, people used dyes from plants and animals to colour fabrics. These natural dyes produced a limited range of colours, and they faded quickly. Today long-lasting artificial dyes are available in almost every possible colour. These dyes were invented by chemists. They are made in large quantities for the fabric and clothing industries.

Answers to Practice Problems and Short Answers to Section Review Questions

Practice Problems: 1.(a) 3 (b) 4 (c) 6 (d) 5 (e) 4 (f) 2 (g) 1 (h) 4 2.(a) 4 (b) 2 3.(a) 101.45 g (b) 2.5 mm (c) 1.70 L (d) 3.07 mL (e) (f) (g) 4.(a) chemical (b) chemical (c) physical (d) physical (e) physical (f) chemical (g) physical (h) physical

Section Review: 1.2: 2.(a) kg (b) g (c) mL (d) cm (e) m 3.(a) 4 (b) 3 (c) 3 4.(a) 97.88 g (b) (c) (d) 0.12 g/mL 5.(a) pipette (b) Erlenmeyer flask or large beaker (c) 250 mL beaker (d) graduated cylinder