

Introduction to Chemistry and Analyzing Data

Practice Problems

You are responsible for understanding this information. This will be graded and it will be assumed that you understand the material if you do well on this assignment. Please keep a log of questions/concepts that you don't understand and have it with you on your first day of class.

Record your answers on a separate sheet of paper. Clearly mark the questions, any calculations show your work and circle your answers.

1. Identify each of the following as an example of qualitative data or quantitative data.
 - a. Taste of an apple
 - b. Mass of a brick
 - c. Speed of a car
 - d. Length of a rod
 - e. Texture of a leaf
 - f. Weight of an elephant
2. Contrast mass and weight.
3. During a chemistry lab, a student noted the following data about an unknown chemical she was studying: colorless, dissolves in water at room temperature, melts at 95°C , boils at 800°C . Classify each piece of data as either qualitative data or quantitative data.
4. Identify the dependent variable and the independent variable in the following experiments.
 - a. A student tests the ability of a given chemical to dissolve in water at three different temperatures.
 - b. A farmer compares how his crops grow with and without phosphorous fertilizers.
 - c. An environmentalist tests the acidity of water samples at five different distances from a factory.
5. Explain why hypotheses and theories are always tentative explanations.

6. How many centigrams are in a gram?
7. How many liters are in a kiloliter?
8. How many nanoseconds are in a second?
9. How many meters are in a kilometer?
10. Calculate the density of a piece of bone with a mass of 3.8g and a volume of 2.0 cm³.
11. A spoonful of sugar with a mass of 8.8g is poured into a 10mL graduated cylinder. The volume reading is 5.5mL. What is the density of the sugar?
12. A 10.0g pat of butter raises the water level in a 50mL graduated cylinder by 11.6mL. What is the density of the butter?
13. A sample of metal has a mass of 34.65g. When placed in a graduated cylinder containing water, the water level rises 3.3mL. Which of the following metals is the sample made from: silver, which has a density of 10.5g/cm³; tin, which has a density of 7.28g/cm³; or titanium, which has a density of 4.5g/cm³?
14. Rock salt has a density of 2.18g/cm³. What would the volume be of a 4.8g sample of rock salt?
15. A piece of lead displaces 1.5mL of water in a graduated cylinder. Lead has a density of 11.34g/cm³. What is the mass of the piece of lead?
16. Convert each temperature reported in degrees Celsius to kelvins.
 - a. 54°C
 - b. -54°C
 - c. 15°C
17. Convert each temperature reported in kelvins to degrees Celsius.
 - a. 32 K
 - b. 0 K
 - c. 281 K

18. Express the following quantities in scientific notation.

- a. 50,000m/s²
- b. 0.00000000062kg
- c. 0.000023s
- d. 21,300,000mL
- e. 990,900,000m/s
- f. 0.000000004L

19. Solve the following addition and subtraction problems. Write your answers in scientific notation.

- a. $5.10 \times 10^{20} + 4.11 \times 10^{21}$
- b. $6.20 \times 10^8 - 3.0 \times 10^6$
- c. $2.303 \times 10^5 - 2.30 \times 10^3$
- d. $1.20 \times 10^{-4} + 4.7 \times 10^{-5}$
- e. $6.20 \times 10^{-6} + 5.30 \times 10^{-5}$
- f. $8.200 \times 10^2 - 2.0 \times 10^{-1}$

20. Solve the following multiplication and division problems. Write your answer in scientific notation.

- a. $(12 \times 10^4 \text{m}) \times (5 \times 10^{-2} \text{m})$
- b. $(3 \times 10^7 \text{km}) \times (3 \times 10^7 \text{km})$
- c. $(2 \times 10^{-4} \text{mm}) \times (2 \times 10^{-4} \text{mm})$
- d. $(90 \times 10^{14} \text{kg}) \div (9 \times 10^{12} \text{L})$
- e. $(12 \times 10^{-4} \text{m}) \div (3 \times 10^{-4} \text{s})$
- f. $(20 \times 10^{15}) \div (5 \times 10^{11} \text{s})$

21. Mount Everest is 8847m high. How many centimeters high is the mountain?

22. Your friend is 1.56m tall. How many millimeters tall is your friend?

23. A family consumes 2.5 gallons of milk per week. How many liters of milk do they need to buy for one week? (Hint: 1L = 0.908 quart; 1 gallon = 4 quarts)

24. How many hours are there in one week? How many minutes are in one week?

25. Suppose you calculate your semester grade in chemistry as 90.1, but you receive a grade of 89.4. What is your percent error?

26. On a bathroom scale, a person always weighs 2.5 pounds less than on the scale at the doctor's office. What is the percent error of the bathroom scale if the person's actual weight is 125 pounds?

27. A length of wood has a labeled length value of 2.50 meters. You measure its length three times. Each time you get the same value: 2.35 meters.

- What is the percent error of your measurement?
- Are your measurements precise? Are they accurate?

28. Determine the number of significant figures in each measurement.

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|--------------|-------------------------------|
| a. 0.000010L | c. 2.4050×10^{-4} kg |
| b. 907.0km | d. 300,100,000g |

29. Round each number to five significant figures. Write your answers in scientific notation.

- 0.000249950
- 907.0759
- 24,501,759
- 300,100,500

30. Complete the following calculations. Round off your answers as needed.

- $52.6\text{g} + 309.1\text{g} + 77.214\text{g}$
- $927.37\text{mL} - 231.458\text{mL}$
- $245.01\text{km} \times 2.1\text{km}$
- $529.31\text{m} \div 0.9000\text{s}$