

1 • Matter and Measurement

STUDY QUESTIONS and PROBLEMS

- Identify the following changes as physical or chemical changes:
 - Baking soda reacts with vinegar to produce carbon dioxide.
 - The copper sheath on the Statue of Liberty turns green.
 - Addition of salt melts ice on the highway.
 - Steam condenses on the windowpane.
 - Epoxy resin cures and hardens.
 - Sugar dissolves in a cup of coffee.
 - Natural gas burns in a furnace.
- Calculate the density of lead if a 10 kg block has a volume of 885 cm^3 .
 - What is the volume of a 100 g bar of aluminum if its density is $2.70 \text{ g}\cdot\text{cm}^{-3}$?
 - Calculate the mass of 100 cm^3 of uranium (density $19.07 \text{ g}\cdot\text{cm}^{-3}$).
- Convert:
 - 25°C to K
- Which of the following physical properties are extensive?
 - heat of fusion
 - melting point
 - color
 - viscosity
 - conductivity
 - density
- Write the names of the following elements:
 - N
 - Ca
 - K
 - P
 - V
- Write the symbols for the following elements:
 - silicon
 - chlorine
 - iron
 - sodium
 - silver
 - sulfur
- Convert:
 - 1342 mL into L
 - $3.26 \times 10^{-6} \text{ km}$ into mm
 - 8,768 mg into g
 - 400 cm^3 into m^3
 - 3600 sq. in. into sq. ft.
- Write the following numbers in scientific notation with the correct number of significant figures:
 - 1,327
 - 0.00562
 - 2.76
 - 0.166
 - 0.09911

11. Measurements of the boiling point of a liquid were taken by two laboratory technicians (A and B). The actual boiling point was 92.3. Which technician achieved the most accurate result and which technician was the most precise?

A: 92.0 92.1 92.4 92.2

B: 91.9 92.5 92.6 92.0

12. Match the prefix with the correct multiplier:

milli	mega	kilo	micro	centi	pico
10^{-6}	10^3	10^{-2}	10^6	10^{-12}	10^{-3}

13. Evaluate the following expressions. Express the answers in scientific notation with the correct number of significant figures and the correct units.

a. $0.0045 \text{ in} + 1.0098 \text{ in} + 0.987 \text{ in} + 23.08 \text{ in}$

b. $(3.45 \text{ cm}^3 \times 2.70 \text{ g}\cdot\text{cm}^{-3}) + (7.433 \text{ cm}^3 \times 1.677 \text{ g}\cdot\text{cm}^{-3})$

c. $2.703 \text{ g}/(1.376 \text{ cm} \times 2.45 \text{ cm} \times 3.78 \text{ cm})$

14. A 12.3 g block of an unknown metal is immersed in water in a graduated cylinder. The level of water in the cylinder rose. The level of water in the cylinder rose exactly the same distance when 17.4 grams of aluminum (density $2.70 \text{ g}\cdot\text{cm}^{-3}$) was added to the same cylinder. What is the unknown metal's density?

15. Use the outline described in Section 1.8 to plan your approach to solving the following problem. Describe the strategy you use.

The level of water in a graduated cylinder is at the 100 mL mark. When a platinum crucible floats on the surface of the water, the level reads 157.9 mL. When the crucible is totally immersed in the same cylinder, the level reads 102.70 mL. What is the density of platinum? The density of water is 0.997 g/mL at 25°C .

16. If one pound is 453.59 grams, how many grams are there in one ounce? How many ounces are there in one kilogram?

17. A sample of gold alloy contains 5.6% silver by mass. How many grams of silver are there in 1 kilogram of the alloy?