

Answers to Chapter 1 Study Questions

1. a) grams (g) b) meters (m) c) liters (L) or cm^3
2. a) Clock A is the most precise because it has the most number of digits and taking into account the fact that it is five minutes fast, it is never off by more than 0.20 min. You might also say that Clock C is the most precise because its times are reproducible, but you don't know whether the actual differences are more or less than Clock A.
 b) Clock B is the most accurate, since it is consistently closest to the actual time.
 c) Clocks A & C show a systematic error: Clock A is 5 minutes slow and Clock C is 6 minutes fast.
3. a) 4 b) 5 c) 2 d) 3 e) 4
4. a) $1.24 \times 8.2 = 10.$ or 1.0×10^1 b) $6.78 - 3.3 = 3.5$
 c) $9.999 + 0.22 = 10.22$ d) $(5.67 \times 10^3) \times (2.1 \times 10^{-2}) = 1.2 \times 10^2$, or 120
5. a) 6.5×10^2 b) 5×10^{-4} c) 2.07×10^5
6. $\text{density} = \frac{\text{mass}}{\text{volume}} = \frac{0.822 \text{ g}}{0.350 \text{ cm}^3} = 2.35 \text{ g / cm}^3$; % accuracy error = $\frac{|2.70 - 2.35|}{2.70} \times 100\% = 13\%$
7. $275 \text{ grams} \times \frac{1 \text{ kg}}{1000 \text{ g}} \times \frac{2.20 \text{ lb}}{1 \text{ kg}} = 0.605 \text{ lb}$
8. $0.286 \text{ mi} \times \frac{1 \text{ km}}{0.621 \text{ mi}} \times \frac{1000 \text{ m}}{1 \text{ km}} \times \frac{100 \text{ cm}}{1 \text{ m}} = 4.61 \times 10^4 \text{ cm}$ (or convert mi \rightarrow ft \rightarrow in \rightarrow cm)
9. $10.7 \text{ kg} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{1 \text{ cm}^3}{7.87 \text{ g}} \times \frac{1 \text{ mL}}{1 \text{ cm}^3} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{1.057 \text{ qt}}{1 \text{ L}} = 1.44 \text{ qt}$
10. $\frac{0.789 \text{ g}}{1 \text{ mL}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \times \frac{2.20 \text{ lbs}}{1 \text{ kg}} \times \frac{1000 \text{ mL}}{1 \text{ L}} = 1.74 \text{ lbs/L}$
11. **pure:** table salt (if not iodized), sugar, distilled water, baking soda
solutions or homogeneous mixtures: soft drinks, vinegar, salad oil, coffee
heterogeneous mixtures: rock, tea, coffee, iced tea, milk, soup, wood
elements: oxygen, nitrogen, hydrogen, carbon, gold, silver, iron, copper, uranium
compounds: water, carbon dioxide, ammonia, baking soda, sucrose, sodium chloride

12. **chemical:** Magnesium reacts with boiling water to produce magnesium hydroxide and hydrogen gas. Magnesium reacts with oxygen to form magnesium oxide. Magnesium reacts with nitrogen at high temperature to form magnesium nitride.

physical: Magnesium is a shiny gray solid at room temperature which conducts electricity (It's a metal). Magnesium has a low density, has an ionic radius of 65 pm and a first ionization energy of 738 kJ/mol.

$$13. 100 \text{ yd} \times \frac{36 \text{ in}}{1 \text{ yd}} \times \frac{1 \text{ m}}{39.37 \text{ in}} \times \frac{1000 \text{ mm}}{1 \text{ m}} \times \frac{1 \text{ ant}}{5.0 \text{ mm}} = 1.8 \times 10^4 \text{ ants}$$