

# Unit II INTRODUCTION TO CHEMISTRY

Name Key

1. For each of the following problems use dimensional analysis (factor - label) to write equations. Show all units but do not calculate a final answer.

a) How many "loonies" have the same value as 650 dimes?

$$\text{loonies} = 650 \text{ dimes} \times \frac{1 \text{ loonie}}{10 \text{ dimes}}$$

b) Copper has a mass of 63.5 grams for every mole of atoms. What would the mass of 5.62 moles be?

$$\text{mass (g)} = 5.62 \text{ moles} \times \frac{63.5 \text{ g}}{1 \text{ mole}}$$

c) How many minutes are there in 24 weeks?

$$\text{minutes} = 24 \text{ weeks} \times \frac{7 \text{ days}}{1 \text{ week}} \times \frac{24 \text{ hours}}{1 \text{ day}} \times \frac{60 \text{ min}}{1 \text{ hour}}$$

d) How long must an electrical current of 9.6 C per second flow in order to deliver 42.7 C?

$$\text{time (s)} = 42.7 \text{ C} \times \frac{1 \text{ s}}{9.6 \text{ C}}$$

e) The energy in food is often described in units called calories where one calorie is equivalent to 4.184 kJ. Bread has about 11 kJ of energy per gram. How calories of food energy would there be in 25 g of bread?

$$\text{energy (calories)} = 25 \text{ g} \times \frac{11 \text{ kJ}}{1 \text{ g}} \times \frac{1 \text{ calorie}}{4.184 \text{ kJ}}$$

f) How many centimetres are there in 7.62 Megametres?

$$\text{cm} = 7.62 \text{ Mm} \times \frac{10^6 \text{ m}}{1 \text{ Mm}} \times \frac{100 \text{ cm}}{1 \text{ m}}$$

2. a) In SI (metric), for the quantity of mass, the **written** unit is kilogram (or gram)

b) In the SI (metric), for the quantity of temperature, the **written** unit is Kelvin

3. The metric prefix "kilo" stands for  $10^3$ . Say what each of the following stands for:

a) micro  $10^{-6}$       b) milli  $10^{-3}$

Give one example of a derived quantity and give also the derived unit for this quantity.

quantity: density      unit: g/mL  
speed      m/s.

5. Scientists often use what they call "significant digits" as they record data or do calculations. For example, when the value for a mass is recorded as 2.043 g, information about the uncertainty of this value is implied. Explain.

The 3 (the last significant digit) is uncertain.

6. In what way is writing the uncertainty separately an advantage over using significant digits?

It shows the range of the uncertainty.

7. Round off the following measurements and write them without showing the uncertainty separately:

a)  $0.234 \pm 0.02$  g

0.23 g

b)  $762 \pm 10$  mL

760 mL

c)  $9.99 \pm 0.3$  kg

10.0 kg

d)  $23070 \pm 200$  L

23100 L

8. Circle the significant digits only:

a) 0.09870L

b) 34060 kg

c) 2.100  $\times 10^4$  m

d) 204.000 mL

e) 0.4050 cm

f) 6500 g

9. Express in scientific notation. Do not change the number of significant digits.

a) 450.0  $4.500 \times 10^2$

b) 0.00240  $2.40 \times 10^{-3}$

10. a) Describe the rule that should be applied when doing either an addition or a subtraction while using significant digits.

- columns etc.

- b) Describe the rule that should be applied when doing either a multiplication or a division while using significant digits.

- least number etc.

11. The following calculations were done with a **calculator**. Round off the answers according to the rules of significant digits.

- a)  $0.345 + 1.23 + 9.10 \Rightarrow 10.675 \Rightarrow \underline{10.68}$  ( $10.675 \Rightarrow \frac{1}{2}$ )
- b)  $9.877 \div 2.33 \Rightarrow 4.2390558 \Rightarrow \underline{4.24}$  ( $4.23 \Rightarrow \frac{1}{2}$ )
- c)  $56700 - 680 \Rightarrow 56020 \Rightarrow \underline{5.60 \times 10^4}$
- d)  $1.400 \times 2.000 \Rightarrow 2.8 \Rightarrow \underline{2.800}$
- e)  $47583 + 224.8 \Rightarrow 47807.8 \Rightarrow \underline{47808}$  ( $47807.8 \Rightarrow \frac{1}{2}$ )
- f)  $0.0208 \div 2.3 \Rightarrow 0.0090435 \Rightarrow \underline{0.0090}$

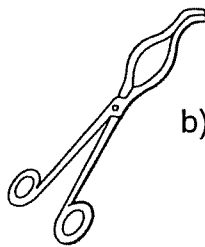
12. An high school experiment to determine the molar mass of magnesium metal gave a value of 25.8 g. If the accepted value for this mass is 24.3 g, what is the percentage error in this experiment?

$$\% \text{ error} = \frac{25.8 \text{ g} - 24.3 \text{ g}}{24.3 \text{ g}} \times 100\% = 6.2\%$$

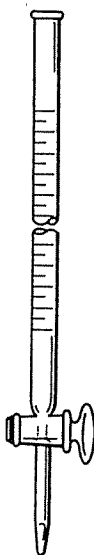
13. Identify the apparatus. Spelling counts.



a) evaporating dish



b) tongs



c) buret



d) test-tube brush

28+ Ex

26+ V.G

27+ C

