Chemistry 11

Mole I

Name:
Date:
Block:

1. **Scientific Notation**
2. **Significant Figures**

Scientific Notation

A. Scientific Notation

Scientific Notation is a way of writing numbers for values too large or small to be conveniently written in standard decimal notation.

Examples:

$$25 = 2.5 \times 10^{1}$$

$$250 = 2.5 \times 10^{2}$$

$$250{,}000{,}000 = 2.5 \times 10^{8}$$

$$0.000025 = 2.5 \times 10^{-5}$$

Write the following numbers in scientific notation:

1. 357,000
2. 41,000,000
3. 0.000572
4. 0.0000067
5. 810,000

Significant Figures

A significant figure is a **measured** or **meaningful digit.** They are important in the way we report different kinds of data.

- If a balance gives a reading of 97.53 g when a beaker is placed on it, the reading is considered to have 4 significant figures.
- If the beaker is then put on a different balance and gives a reading of 97.5295 g, there are more significant figures to the measurement (6 significant figures). This balance is more precise than the first balance.

Rules:

1. All non-zero digits <u>are</u> significant
   - 3.14 has 3 SF
   - 18.22 has 4 SF

2. Zeros that are placeholders <u>are not</u> significant
   - 0.046 has 2 SF
   - 0.581 has 3 SF
   - 8200 has 2 SF
   - 10 has 1 SF

3. Zeros placed between digits <u>are</u> significant
   - 4002 has 4 SF
   - 808 has 3 SF

4. Zeros after a decimal AND other digits <u>are</u> significant
   - 1.80 has 3 SF
   - 1.800 has 4 SF
   - 1.8000 has 5 SF

5. All digits of numbers expressed in scientific notation <u>are</u> significant
   - 2.56×10^{17} has 3 SF
   - 5.6×10^{-7} has 2 SF

> **!! IMPORTANT:** Don't apply the significant figure rules to "counting numbers" (ex. 12 eggs, 4 children, 1 basketball) or conversion factors (ex. 1km = 1000m). These numbers are assumed to be perfect and have infinite significant figures

Practice: how many significant figures does each of the following measurements have?

1. 1.25 kg
2. 1255 kg
3. 11 s
4. 150 m
5. 1.283 cm
6. 365.249 days
7. 2 000 000 years
8. 17.25 L
9. 1.05
10. 90
11. 100.00
12. 24501
13. 12.12
14. 123450
15. 0.1
16. 0.100

B. Adding or Subtracting Significant Figures

When adding or subtracting significant figures, round off the answer to the least number of decimal places contained in the calculation.

Example:

12.56 cm *(2 SF after decimal)* + 125.8 cm *(1 SF after decimal)* = 138.36 cm → 138.4 cm *(1 SF after decimal)*

Practice:

1. 15.1 + 75.32
2. 178.904 56 – 125.8055
3. 14.0 + 2.888
4. $1.805 \times 10^4 + 5.89 \times 10^2$

C. Multiplying or Dividing Significant Figures

When multiplying or dividing significant figures, round off the answer to the least number of significant figures contained in the calculation.

Example:

2.00 *(3 SF)* x 3.000 00 *(6 SF)* = 6.00 *(3 SF)*

Practice:

1. 12.5 x 0.50
2. 0.15 x 0.0016
3. 40.0 / 30.000
4. 2.5 x 7.500 / 0.150
5. $(6.40 \times 10^8) \times (5 \times 10^5)$