Chemistry

"Math Review"

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1. Scientific Notation – Text, p.R56-R58

- Also called Exponential Notation
- Scientists sometimes use very large or very small numbers
  - ➢602 000 000 000 000 000 000 000
  - –Called Avogadro's Number
  - ➢0.000 000 000 114 nm
  - –The radius of a bromine atom

1. Scientific Notation

- Very inconvenient, even difficult
- Thus, very large or small numbers should be written in *Scientific Notation*
  - –In standard form, the number is the *product* of two numbers:
    - •A coefficient
    - •A power of 10

1. Scientific Notation

- 2300 is: 2.3×10^3
- A coefficient is a number greater than or equal to one, and less than ten
  - –The coefficient here is 2.3
- The power of ten is how many times the coefficient is multiplied by ten

1. Scientific Notation

- The product of 2.3 x 10 x 10 x 10 equals 2300 (2.3×10^3)
- Note:
  - –Moving the decimal to the *left* will *increase* the power of 10
  - –Moving the decimal to the *right* will *decrease* the power of 10

1. Scientific Notation

- The value of the exponent changes to indicate the number of places the decimal has moved left or right.
- $12\ 000\ 000 = 1.2 \times 10^7$
- $85\ 130 = 8.513 \times 10^4$
- $0.000\ 05 = 5 \times 10^{-5}$
- $0.0342 = 3.42 \times 10^{-2}$

1. Scientific Notation

- Multiplication and Division
  - –Use of a calculator is permitted
  - –use it correctly: pages R62-R65
  - –No calculator? Multiply the coefficients, and add the exponents

$(3 \times 10^4) \times (2 \times 10^2) = 6 \times 10^6$

$(2.1 \times 10^3) \times (4.0 \times 10^{-7}) = 8.4 \times 10^{-4}$

1. Scientific Notation

- Multiplication and Division
  - In division, divide the coefficients, and subtract the exponent in the denominator from the numerator

$$\frac{3.0 \times 10^5}{6.0 \times 10^2} = 5 \times 10^2$$

1. Scientific Notation

- Addition and Subtraction
- Before numbers can be added or subtracted, the exponents must be the same
  - Calculators will take care of this
  - Doing it manually, you will have to make the exponents the same- it does not matter which one you change.

1. Scientific Notation

- Addition and Subtraction

$(6.6 \times 10^{-8}) + (4.0 \times 10^{-9}) = 7 \times 10^{-8}$

$(3.42 \times 10^{-5}) - (2.5 \times 10^{-6}) = 3.17 \times 10^{-5}$

(Note that these answers have been expressed in standard form)

2. Algebraic Equations, R-69-R71

- SOLVING an equation means rearranging
- Many relationships in chemistry can be expressed by simple algebraic equations.
- The unknown quantity is on one side, and all the known quantities are on the other side.

2. Algebraic Equations

- An equation is solved using the laws of equality
  - Laws of equality: if equals are added to, subtracted from, multiplied to, or divided by equals, the results are equal.
  - This means: as long as you do the **same thing to both sides** of the equation, it is okay.

2. Algebraic Equations

•Solve for ^oC: $K = {}^oC + 273$

Subtract 273 from both sides: $^oC = K - 273$

•Solve for T_2: $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$$T_2 = \frac{V_2 \times T_1}{V_1}$$

3. Percents, R72-R73

- Percent means "parts of 100" or "parts per 100 parts"
- The formula:

$$\text{Percent} = \frac{\text{Part}}{\text{Whole}} \times 100$$

3. Percents

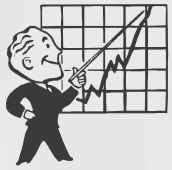
- If you get 24 questions correct on a 30 question exam, what is your percent?

  24/30 x 100 = 80%
- A percent can also be used as a RATIO
  - A friend tells you she got a grade of 95% on a 40 question exam. How many questions did she answer correctly?

  40 x 95/100 = 38 correct

4. Graphing, R74-R77

- The relationship between two variables is often determined by graphing
- A graph is a "picture" of the data



4. Graphing Rules – **10 items**

1. Plot the independent variable
   - ✓ The **independent variable** is plotted on the x-axis (abscissa) – the horizontal axis
   - ✓ Generally controlled by the experimenter
2. The **dependent variable** on the y-axis (ordinate) – the vertical axis

4. Graphing Rules

3. **Label** the axis.
   - ✓ Quantities (temperature, length, etc.) and also the proper units (cm, ^oC, etc.)
4. **Choose a range** that includes all the results of the data
5. **Calibrate** the axis (all marks equal)
6. **Enclose the dot** in a circle (point protector)

4. Graphing Rules

7. Give the graph a **title** (telling what it is about)
8. Make the graph **large** – use the full piece of paper
9. **Indent** your graph from the left and bottom edges of the page
10. Use a **smooth line** to connect points

5. Logarithms, R78-R79

- A logarithm is the exponent to which a fixed number (base) must be raised in order to produce a given number.
- Consists of two parts:
  - –The characteristic (whole number part)
  - –The mantissa (decimal part)

5. Logarithms

- Log tables are located in many textbooks, but not ours
- Calculators should be used
- Find the log of 176 = 2.2455
- Find the log of 0.0065 = -2.1871

6. Antilogarithms, R78-R79

- The reverse process of converting a logarithm into a number is referred to as obtaining the antilogarithm (the number itself)
- Find the antilog of 4.618 = 41495 (or 4.15×10^4)

End of Math Review