JOBWORKS

ADULT LEARNING CENTRE

INFORMATION AND PREPARATION FOR CHEMISTRY (40S)

For the best chance of success in this course, please be prepared to attend classes, study, and do homework regularly.

Students taking this course are **required** to have a scientific calculator. Staples, Walmart, and Amazon.ca have these calculators for sale.

Only calculators can be used during quizzes, tests, and exams. Staff will not have any spare calculators to loan.

The use of cell phones/electronic devices as a calculator will not be permitted.

Teachers will focus on covering the content in the curriculum of this course. Limited time will be spent on reviewing skills and concepts that should have already been acquired by this level. To prepare for this course in advance, being familiar with the following topics would be beneficial:

- Order of Operations
- Basic Algebra

A basic review is attached. For online tutorials visit:

www.khanacademy.org/math/algebra
www.coolmath.com/algebra
www.mathplanet.com
www.Math-Drills.com
www.youtube.com

Additional resources can also be found online.

Algebra 1 for Dummies, 2nd Edition, by Mary Jane Sterling (ISBN 978-0-470-55964-2) is a book that may be used to review Basic Algebra. It can be ordered online from Amazon.ca or Chapters.

Free tutoring may be available if necessary. Visit the front desk staff to sign up after attending at least one class. Note that there is always a high demand for the limited number of spots. Students will be accommodated on a first come, first served basis if a tutor is available. Students interested in paying for a tutor can contact the Association of Independent Tutors at 204-226-3437 or at www.independenttutors.com.

Contact us at (204) 453-8351 or visit our website at www.jobworksschool.com if there are any questions or concerns.

Order of Operations

The **Order of Operations** is very important when simplifying expressions and equations. The Order of Operations is a standard that defines the order in which you should simplify different operations such as addition, subtraction, multiplication and division.

This standard is critical to simplifying and solving different algebra problems. Without it, two different people may interpret an equation or expression in different ways and come up with different answers. The Order of Operations is shown below.

1. **Parentheses and Brackets** -- Simplify the inside of parentheses and brackets before you deal with the exponent (if any) of the set of parentheses or remove the parentheses.
2. **Exponents** -- Simplify the exponent of a number or of a set of parentheses before you multiply, divide, add, or subtract it.
3. **Multiplication and Division** -- Simplify multiplication and division in the order that they appear from left to right.
4. **Addition and Subtraction** -- Simplify addition and subtraction in the order that they appear from left to right.

The most common type of math problem encountered in chemistry involves algebra and the rearrangement of a formula to find a missing value.

For example: find the value of **x** in the formula: $4x = 8$

Solution: We want to remove the 4, which is done by doing the opposite operation of what is shown. In this case, that means **dividing both sides by 4:**

$$\frac{4x}{4} = \frac{8}{4} \rightarrow \rightarrow$$ This means 1x=2 or simply **x=2**

Basic Algebra

Algebra involves the combination of both numbers and letters of the alphabet into mathematical equations, or sentences. The letter most often takes the place of some hidden number. The goal is to solve the equation and determine what this number is.

Example 1: Find what number "c" represents.
$2 + c = 5$

We read the above equation as "2 plus what equals 5".
The answer is obviously 3.

Example 2: Find what number "x" represents.
$3x = 6$

We read the above equation as "3 multiplied by what equals 6".
The answer is obviously 2.

The above examples are easy enough to solve in our head, and we do not have to solve them "algebraically". Solving algebraically involves isolating the letter on the left side of the equation and putting all numbers on the right side of the equation. This is also easy to do, but there are rules to follow.

Rule 1: "Rule of Opposites"
- the opposite of positive is negative (and vice versa)
- the opposite of multiplication is division (and vice versa)

Rule 2: What is done to one side of the equation must be done to the other.

Let's resolve the above two equations algebraically.

Example 1 solution:

$2 + c = 5$ - to isolate the "c" you must get rid of the positive 2 by subtracting 2.

$2 - 2 + c = 5 - 2$ - do it to both sides

$c = 3$ - the 2's on the left side cancel out, and we are left with the answer.

Example 2 solution:

$3x = 6$ - to isolate the "x" you must get rid of the 3 that the "x" is being multiplied by. (3x means 3 times x)

$\frac{3x}{3} = \frac{6}{3}$ - to do this, we must divide by 3 on both sides.

$\frac{\cancel{3}x}{\cancel{3}} = \frac{6}{3}$ - the 3's cancel out

$x = 2$

Example: Solve for "y"

$\frac{y}{3} = 4, \quad \frac{y}{3} \times 3 = 4 \times 3, \quad \frac{y}{\cancel{3}} \times \cancel{3} = 4 \times 3, \quad y = 12$

Simple Linear Equations (A)

Solve for each variable.

1. $8+\frac{2}{z}=10.50$

2. $3v-4=5.9$

3. $\frac{z}{5}+10=13$

4. $\frac{12}{v}=2.4$

5. $3c-6=21.6$

6. $9x=90.9$

7. $\frac{v}{5}=7.15$

8. $\frac{b}{5}=7.45$

9. $\frac{v}{2}=3.15$

10. $\frac{90}{x}+3=12$

11. $\frac{2}{v}+7=9.5$

12. $7z=63.15$

13. $\frac{6}{c}=2.35$

14. $\frac{42}{z}=7.50$

15. $\frac{24}{b}=4.8$

Answer key: 1. $z=0.8$ 2. $v=3.3$ 3. $z=15$ 4. $v=5$ 5. $c=9.2$ 6. $x=10.1$ 7. $v=35.75$ 8. $b=37.25$ 9. $v=6.3$ 10. $x=10$ 11. $v=0.8$ 12. $z=9.02$ 13. $c=2.55$ 14. $z=5.6$ 15. $b=5$

Scientific Notation

Do you know this number, 300,000,000 m/sec.? It's the Speed of light !
Do you recognize this number, 0.000 000 000 753 kg. ? This is the mass of a dust particle!

Scientists have developed a shorter method to express very large numbers. This method is called **scientific notation.** Scientific Notation is based on powers of the base number **10.**

The number 123,000,000,000 in scientific notation is written as : 1.23×10^{11}

*The first number 1.23 is called the **coefficient.*** It must be greater than or equal to 1 and less than 10.
*The second number is called the **base.*** It must always be 10 in scientific notation. The base number 10 is always written in exponent form. In the number 1.23×10^{11} the number 11 is referred to as the **exponent** or power of ten.

To write a number in scientific notation:

Put the decimal after the first digit and drop the zeroes.

1.23000000000

In the number 123,000,000,000 The coefficient will be 1.23
To find the exponent count the number of places from the decimal to the end of the number.

In 123,000,000,000 there are 11 places. Therefore we write 123,000,000,000 as: 1.23×10^{11}

Exponents are often expressed using other notations. The number 123,000,000,000 can also be written as 1.23E+11 or as 1.23 X 10^11

For small numbers we use a similar approach. Numbers less than 1 will have a **negative** exponent. A millionth of a second is: 0.000001sec. or 1.0E-6 or 1.0^-6 or 1.0×10^{-6}

To write from scientific notation to real number:

If the exponent is positive, multiply the base by tens or simply move the decimal point in the base as many places as the exponent states to the **right**, adding extra zeroes behind as needed.

Eg. $5.14 \times 10^5 = 514\,000$

If the exponent is negative, divide the base by tens or move the decimal point in the base to the **left** as many places as the exponent states, adding zeroes in front as needed.

Eg. $6.2 \times 10^{-4} = 0.00062$

EXAMPLE $2{,}300{,}000 = 2.3 \times 10^6$ ← an exponent
a number between one and ten
↖ a power of ten

EXAMPLE $.006 = 6 \times 10^{-3}$ ← a negative exponent
a number between one and ten
↖ a power of ten

Directions Rewrite the following numbers using scientific notation.

1) 2,300,000 = 2.3×10^6

2) 59,000 = _____

3) 0.0005 = _____

4) 0.0000039 = _____

5) 23.41 = _____

6) 453 = _____

7) 25,400,000 = _____

8) 0.000000000843 = _____

9) 1,900,000,000 = _____

10) 39,400,000 = _____

11) 0.00000837 = _____

12) 567.2 = _____

13) 0.0001 = _____

14) 4,000 = _____

15) 0.00495 = _____

16) 567,000,000,000,000 = _____

Directions Write the following numbers in standard form without exponents.

17) 2.3×10^3 = 2300

18) 4.29×10^5 = _____

19) 8×10^6 = _____

20) 5.7×10^5 = _____

21) 4.94×10^{-8} = _____

22) 7.03×10^{-7} = _____

23) 6.1×10^{10} = _____

24) 5.5×10^{-3} = _____

25) 6.832×10^6 = _____

26) 8.11×10^{-2} = _____

27) 3×10^{12} = _____

28) 1.35×10^{-5} = _____

Answer Key:

2) 5.9×10^4 9) 1.9×10^9 16) 5.67×10^{14} 23) 61 000 000 000

3) 5×10^{-4} 10) 3.94×10^7 24) 0.0055

4) 3.9×10^{-6} 11) 8.37×10^{-6} 25) 6 832 000

5) 2.341×10^1 12) 5.672×10^2 26) 0.0811

6) 4.53×10^2 13) 1×10^{-4} 27) 3 000 000 000 000

7) 2.54×10^7 14) 4×10^3 28) 0.0000135

8) 8.43×10^{-10} 15) 4.95×10^{-3} 29) 0.00000703