

Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

# Chemistry Formula Triangles Lab Sheet

## Background:

Chemistry is a highly abstract subject, which requires a great deal of higher-order thinking and problem-solving skills to fully master it. Many students struggle with this level of abstract thought and so using scaffolds to allow them to see success is essential. One such method is the use of formula triangles. These provide students who struggle with algebra to be successful when it comes to manipulating chemical formulae.

## Theory

The measure of the amount of a substance in a unit is called a 'mole'. It is a convenient way of counting atoms and allows chemists to make predictions about the masses of different substances that are involved in reactions. Regardless of the element in question, one mole of atoms contains  $6 \times 10^{23}$  atoms. This is known as the Avogadro number. The mole can be used to help you to work out other information about a substance, such as its concentration or its mass.

The mole concept:

- <https://www.youtube.com/watch?v=b2raanVWU6c>

Calculating moles per liter

- <https://www.youtube.com/watch?v=KLjWa9cE2uk>

Converting between grams and moles

- <https://www.youtube.com/watch?v=b2raanVWU6c>

## Prior Knowledge Required

This lesson requires knowledge of:

- Extracting information from the periodic table
- Calculating molar mass ( $M_r$ )
- Writing chemical formula
- Basic mole concepts

## Curriculum Links

- **HS-PS1-7.** Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction.

## Learning Objectives

During this lesson students will learn how to:

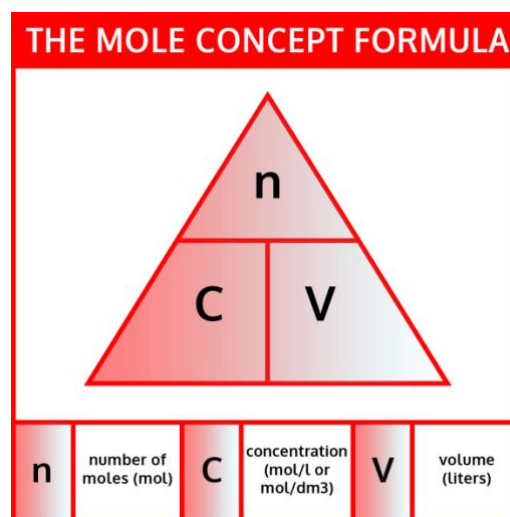
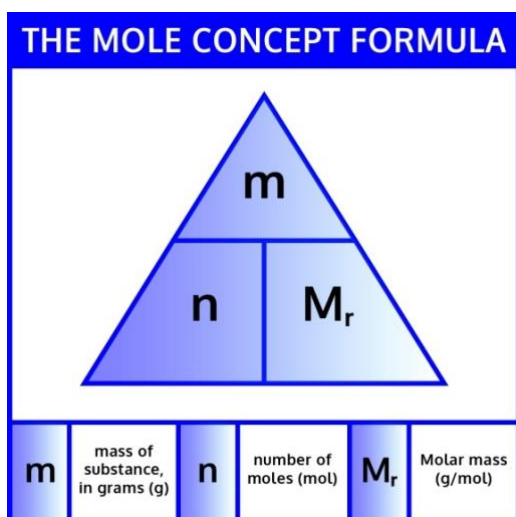
- Use the formula number of moles = mass/molar mass
- Use the formula concentration = number of moles/volume
- Manipulate the above formulas to solve Chemistry problems

# Chemistry Formula Triangles Lab Sheet

## Formula Triangles:

Formula triangles are handy those of us who really struggle with algebra and manipulating terms. All you need to do is remember how to draw the triangle, what letters go where, what they mean, and how to use the triangle. NO ALGEBRA SKILLS NEEDED

- The horizontal line means that you must divide.
- The vertical line means that you must multiply.



The three equations derived from this triangle are:

$$m = n \times M_r$$

$$n = m / M_r$$

$$M_r = m / n$$

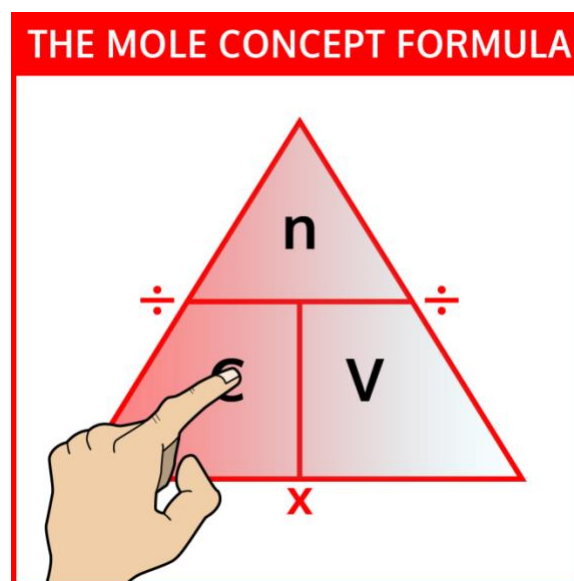
$$C = n / V$$

$$n = C \times V$$

$$V = n / C$$

### How to use a formula triangle:

1. Write down the term you wish to calculate (e.g.  $n =$ ).
2. Cover the term you wish to calculate with your forefinger.
3. The remain two terms are those you must use in your equation on the other side of the = sign, working from the top down and/or left to right, and include all multiplication/division signs linking the two remaining terms



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### Practice Problems:

1. Calculate the following:
  - a. The molarity of a solution where 1.9 moles of iron (II) chloride are dissolved to make 1750 mL of solution.
  - b. The molarity of a solution where 1.1 moles of silver nitrate are dissolved to make 0.250L of solution.
  - c. The number of moles of  $\text{Na}_2\text{CO}_3$  in 0.750L of solution if the concentration is a 0.640mol/L?
  - d. The molarity if 3.2 moles of  $\text{CaCl}_2$  are dissolved to make 1000 ml of solution?
  - e. The volume of 1.7 moles of sucrose made into a 3.4mol/l solution.
  - f. The number of moles of 54.9 grams in  $\text{K}_2\text{SO}_4$ .
  - g. The mass of 11 mol of hydrogen chloride.
  - h. The number of moles of 99.4 grams of  $\text{NaCl}$ .
2. Expert Level (hint you must use both equations)
  - i. The molarity when 54.8 grams of lithium sulfate are dissolved to make 250 mL of solution.
  - j. The molarity when 99.1 grams of  $(\text{NH}_4)_2\text{SO}_4$  are dissolved to make 0.5 L of solution.