## CHEMISTRY 12

STOICHIOMETRY review and RATES OF REACTIONS Calculations
A quick recap of what you learned in Chemistry 11:
Balanced equations represent the $\qquad$ in which substances combine.
The ratio comes from the $\qquad$ of the balanced equation.
The combining ratio of substances in any chemical reaction is called the
This is STOICHIOMETRY.

Consider:
Copper (II) sulphate reacts with Aluminum.
You should recognize that the copper (II) sulphate will be an . Do you know what colour it will be? $\qquad$
And the Aluminum will be a $\qquad$ .

Write the balanced equation.

A more realistic scenario is NOT to think in individual atoms and molecules:

And consider that moles represents a large number of atoms / molecules:

In Chemistry 12, we study the RATE of reaction. This means that our Stoichiometry calculations include the time it takes for all of the reactant to be used up, or for all of the product to be made. It depends on what you are actually OBSERVING, to measure the rate of reaction.

A student carries out the chemical reaction 3 separate times.
The table below shows the data they collected each time, in order to determine the reaction rate:

|  | $3 \mathrm{CuSO}_{4}$ | +2 Al | $\rightarrow \mathrm{Al}_{2}\left(\mathrm{SO}_{4}\right)_{3}$ | +3 Cu |
| :--- | :--- | :--- | :--- | :--- |
| a) |  | 5.00 moles <br> completely reacts <br> in 45 seconds |  |  |
| b) |  |  | 1.75 moles forms <br> in 30 seconds |  |
| c) |  |  |  | Yield is 155 g. <br> Reaction is complete <br> in 21 seconds |

In Chemistry 12, at this point, you should be thinking about what the experimenter would actually observe (see) to be able to monitor that reactant being used up, or that product being formed. Will they see a colour change? Gas forming? Volume difference? Mass change? What number will they be writing down (for example every 5 seconds or 10 seconds), to keep track of how fast the reaction is occurring? Refer to your notes for this.

## SAMPLE QUESTION 2

6.00 L of oxygen gas at RTP reacts with nitrogen gas to produce $\mathrm{NO}_{2}(\mathrm{~g})$.

Consider that the 6.00 L of oxygen gas at RTP completely reacts (is consumed) after 46.3 seconds. State the rate of reaction for every chemical involved in this reaction.

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1) Find the reaction rate of all chemical species if you start with 1.20 moles of hydrochloric acid and react it with tin (IV) oxide, to form water and tin (IV) chloride. The reaction occurs in 25 seconds.
2) 425 L of ammonia gas combusts at RTP. The reaction What is the reaction rate in moles per minute of each substance involved in the reaction? The reaction occurs in 1.35 minutes.
3) Lead (II) Oxide + Sulphur $\rightarrow$ Lead (IV) Sulphide + Oxygen

510 g of sulphur is consumed in 96 seconds. What is the rate of reaction in $\mathrm{g} / \mathrm{s}$ for each reactant and product?
4) 80.0 g of methane gas is produced in the Combination (Synthesis) reaction between Carbon and hydrogen. It took 320 seconds for the products to form. What is the rate of reaction in $\mathrm{g} / \mathrm{s}$ for each species in this reaction?

