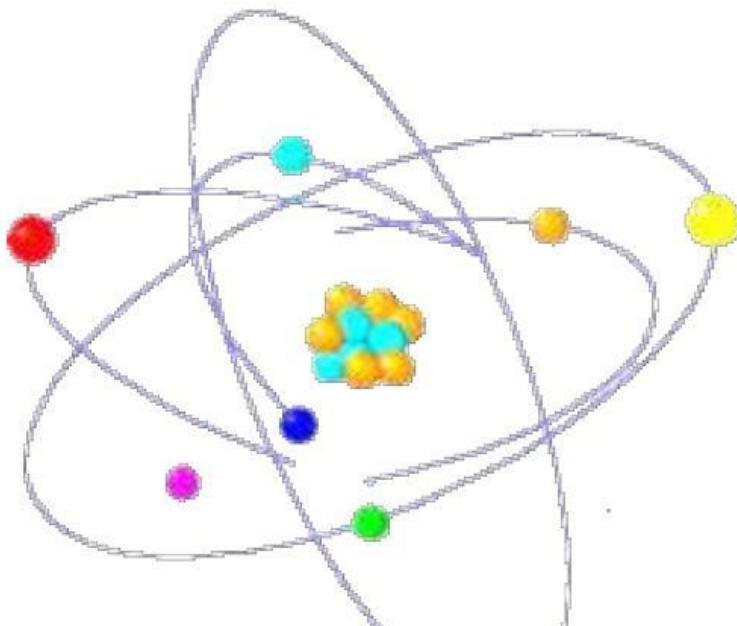


Students' Worksheet

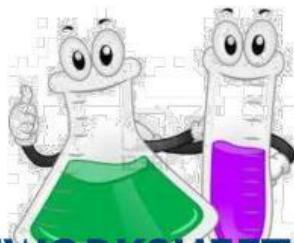
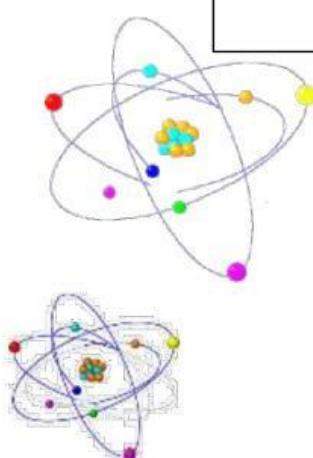
Balancing Chemical Reaction



Name : _____

Class : _____

No. : _____





Topic: Balancing Chemical Reaction

Basic Competencies:

3.10 Applying the basic laws of chemistry, concepts of relative molecular mass, chemical equations, mole concepts, and substance levels to complete chemical calculations

4.10 Analyze experimental data using the basic laws of quantitative chemistry

Indicator: 3.10.1 Determines the coefficient of a reaction in a reaction equation

3.10.2 Equalizing chemical reaction equations

4.10.1 Analyze a chemical reaction based on the concept of equivalent reaction equations

Goals: Students can determine the equalization of chemical reaction equations correctly.

Introduction

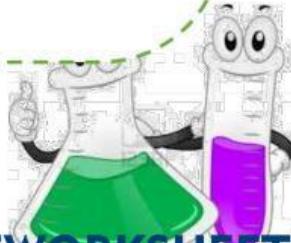
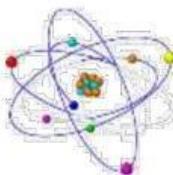
Previously we have studied the material of compound nomenclature. *Do you remember, what is meant by the nomenclature of compounds?* Each chemical formula has a name with rules that have been determined and regulated by IUPAC. Try to recall the compound nomenclature material by filling in the following questions:

NaCl =

Fe₂O₃ =

CO₂ =

Now, we will enter the next material, which is the reaction equation.



LIVEWORKSHEETS



Phenomenon

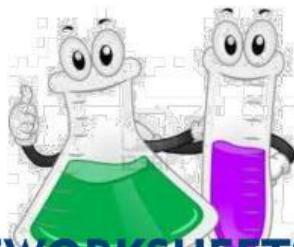
Have you ever done a chemical practicum? What information do you get from the picture on the side? If it is associated with a chemical reaction, then what are the conditions or signs that there has been a chemical reaction?



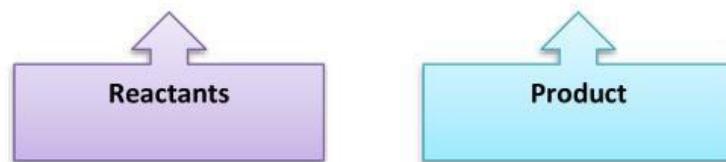
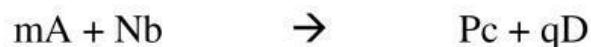
Material

A chemical reaction equation is a statement written with a molecular formula that provides information on the identity and quantity of substances involved in a chemical or physical change. All reacting substances, called reactants, are placed to the left of the arrow, whose arrow direction to the right points to the product, that is, all substances resulting from the reaction.

The reaction equation, known as the reaction coefficient, is the number to the left of the molecular formula for multiplying all the atoms in the molecular formula. The ratio of the coefficients of the reaction can be interpreted as a comparison of moles of substances in the reaction. On each reactant and product, it is written the form of the substance (s (solid), l (liquid), g (gas), or aq (solution with water solvent)) in parentheses to the right of the molecular formula respectively.



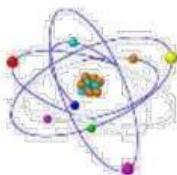
Writing a reaction by stating the symbol of an element or the chemical formula of the compound involved in the reaction is called a reaction equation. The general formula of the reaction equation is as follows.



To understand chemical equations better, pay attention to the following phenomena!



Corrosion (Kennet and Chamberlain, 1991) is a decrease in the quality of metals due to electro-chemical reactions with their environment. Corrosion or solids are chemical phenomena in metal materials that are basically the reaction of metals into ions on the surface of metals that are in direct contact with the aqueous and oxygen environment. The most common example, namely iron metal damage, is the reaction between iron metal and oxygen gas forming iron (III) oxide.





In writing the reaction equation, the chemical formula of reagents (reactants) is needed and a chemical formula of the reaction result (product). Now write down the chemical formula of the reactants and products contained in the phenomenon!

Reactant:

Product:

Based on the phenomenon, write the equation of the reaction!

.....
.....
.....

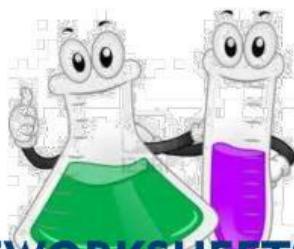
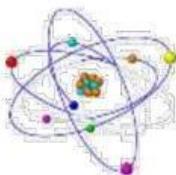
BALANCING CHEMICAL EQUATIONS

A chemical reaction can be predicted and expressed through the equation of a chemical reaction. To write down the equations of chemical reactions, you must know who acts as reactants and products and their phases, and the direction of the reaction takes place.

$$\boxed{\text{Number of atoms in each element of the left segment}} = \boxed{\text{Number of atoms in each right-segment element}}$$

How to equalize a reaction?

Check out the next activities in this worksheet!



LIVEWORKSHEETS

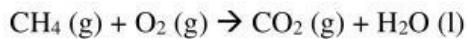
Reaction Equalization

Most simple reaction equations can be equalized easily. To equalize quite difficult reactions, we can use the "alphabetical method".

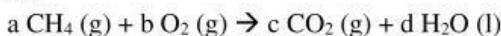
Pay attention to the procedure of reaction equalization below. Follow the teachings described by your teacher by looking at the step by step written in this worksheet!

- **Step By Step**

Balance the following reaction equation!



- 1) Write each coefficient in a letter



Number of Atoms	C	a	=	c
	H	4a	=	2d
	O	2b	=	2c + d

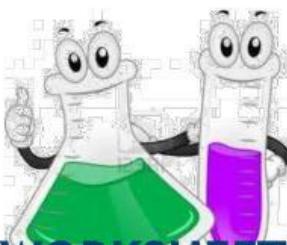
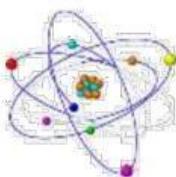
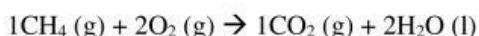
- 2) Suppose one of the coefficients of letters with numbers. For example, a=1

$$\begin{aligned} c &= a \\ c &= 1 \end{aligned}$$

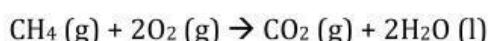
$$\begin{aligned} 4a &= 2d \\ 4(1) &= 2d \\ 4/2 &= d \\ d &= 2 \end{aligned}$$

$$\begin{aligned} 2b &= 2c + d \\ 2b &= 2(1) + 2 \\ 2b &= 2 + 2 \\ b &= 2 \end{aligned}$$

Reaction :



3) When the coefficient is 1, then it is possible not to be written, then the reaction becomes

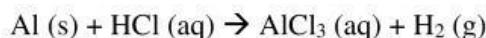


4) Compare the number of loads on both segments, whether it is equivalent?

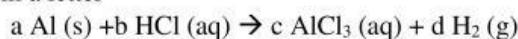
Left side	C	1	Right side	C	1
	H	4		H	4
O	4		O	4	

Equivalent reaction

Write down and match the reaction equation between aluminum metal and hydrochloric acid resulting in a solution of aluminum chloride and hydrogen gas



1. Write each coefficient in a letter



Jumlah Atom	Al	a	=	c
	H	b	=	2d
	Cl	b	=	3c

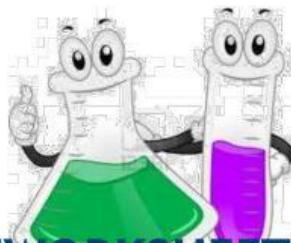
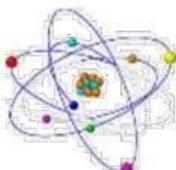
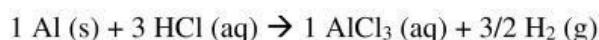
2. Suppose one of the coefficients of letters with numbers. For example, a=1

$$\begin{aligned} c &= a \\ c &= 1 \end{aligned}$$

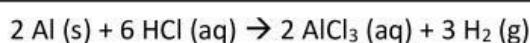
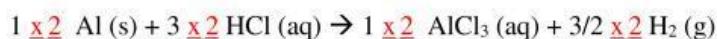
$$\begin{aligned} b &= 3c \\ b &= 3(1) \\ b &= 3 \end{aligned}$$

$$\begin{aligned} b &= 2d \\ 3 &= 2d \\ 3/2 &= d \end{aligned}$$

Reaction:



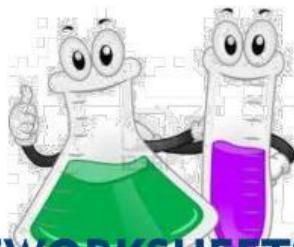
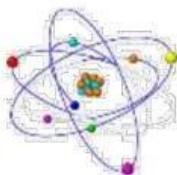
3. If the coefficient is fractional, then we must round it by multiplying by 2, the reaction will be:



4. Compare the number of loads on both segments, is it equivalent?

Left side	Al	2		Al	2
H	6	H		6	
Cl	6	Cl		6	

Equivalent reaction



PRACTICE

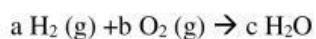


Do the practice below by following the teacher's guidance!

Write down and match the reaction between hydrogen gas and oxygen gas to form water!

..... + \rightarrow

1. Write each coefficient in a letter



Jumlah Atom	H	2a	=	2c
	O	2b	=	c

2. Suppose one of the coefficients of letters with numbers. For example, a=1

$$2c = 2a$$

$$2c = \dots$$

$$c = \dots$$

$$2b = c$$

$$2b = \dots$$

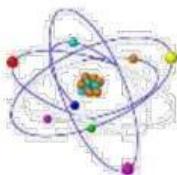
$$b = \dots$$

Reaction:

..... + \rightarrow

3. If the coefficient is fractional, then we must round it by multiplying by 2, the reaction will be

..... + \rightarrow





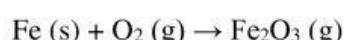
4. Compare the number of loads on both segments, is it equivalent?



Left side	H		Right side	H	
	O			O	

.....

Balanced this reaction!



1. Write each coefficient in a letter



Jumlah Atom	Fe	=
	O	=

2. Suppose one of the coefficients of letters with numbers. For example, c=1

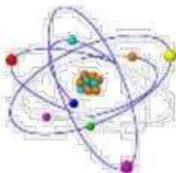
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Reaction:



3. If the coefficient is fractional, then we must round it by multiplying by 2, the reaction will be

$\dots + \dots \rightarrow \dots$





4. Compare the number of loads on both segments, is it equivalent?



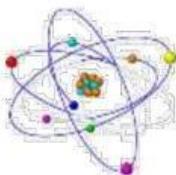
Left side	Fe		Right side	Fe	
	O			O	

.....

EXERCISES

Balanced the following reaction equations:

1. $\text{Al} + \text{HCl} \rightarrow \text{AlCl}_3 + \text{H}_2$
2. $\text{Na}_2\text{O} + \text{H}_2\text{O} \rightarrow \text{NaOH}$
3. $\text{KClO}_3 \rightarrow \text{KCl} + \text{O}_2$
4. $\text{P}_4 + \text{O}_2 \rightarrow \text{P}_2\text{O}_5$
5. $\text{NH}_3 + \text{O}_2 \rightarrow \text{NO} + \text{H}_2\text{O}$
6. $\text{C}_2\text{H}_4 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
7. $\text{Pb}(\text{NO}_3)_2 \rightarrow \text{PbO} + \text{NO}_2 + \text{O}_2$
8. $\text{NaHCO}_3 + \text{HCl} \rightarrow \text{NaCl} + \text{CO}_2 + \text{H}_2\text{O}$
9. Nitrogen gas reacts with hydrogen gas to form ammonia.
10. Butane burns perfectly to form carbon dioxide gas and water



LIVEWORKSHEETS