

STUDENT WORKSHEET (SW)

Limiting Reagent

Chemistry – Grade 10 | Time Allowed: 25 Minutes

Student Information

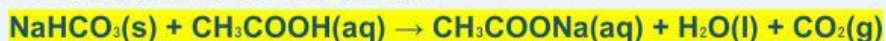
Name : _____ Class : _____

Student ID: _____ Date : _____

STIMULUS: THE MAGIC BALLOON PHENOMENON

Observe the demonstration your teacher performed! Baking soda (NaHCO_3) was placed into a bottle containing acetic acid solution (CH_3COOH), and the bottle was capped with a balloon. The CO_2 gas produced caused the balloon to inflate. However, the balloon stopped inflating once one of the reactants was completely consumed.

The chemical equation for this reaction:



The reactant that is consumed first is called the **LIMITING REAGENT**, because it determines the maximum amount of product that can be formed.

QUESTION 1 – WORD SEARCH

Find 8 chemistry terms related to limiting reagent in the letter grid below. Circle each word you find and write its meaning in the table provided!

R	E	A	C	T	A	N	T	X	M	O	L
A	K	S	T	O	I	C	H	I	O	M	E
T	H	A	B	I	S	B	A	L	O	N	A
I	L	A	T	U	R	A	S	I	O	N	K
O	I	A	K	C	O	E	F	F	I	C	N
P	M	L	H	A	S	I	L	Q	P	T	S
E	I	I	P	R	O	D	U	C	T	A	G
X	T	S	E	Q	U	A	T	I	O	N	A
C	I	I	R	E	A	C	T	A	N	T	S
E	N	S	T	O	I	C	H	I	O	M	R
S	G	A	S	X	M	O	L	E	K	U	L
S	E	X	C	E	S	S	L	Q	W	X	Z

Words to find: REACTANT | STOICHIOMETRY | PRODUCT | MOL | COEFFICIENT | EXCESS | EQUATION | GAS

QUESTION 2 – MULTIPLE CHOICE (Single Answer)

Choose the BEST answer. Place a checkmark (✓) next to ALL statements that are CORRECT..

- In a chemical reaction, the limiting reagent is defined as ...
 - The reactant present in the greatest quantity in the mixture
 - The reactant that is completely consumed first and determines the amount of product formed
 - The reactant that does not participate in the reaction until it is complete
 - The reactant that forms a precipitate during the reaction
- Consider the reaction: $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{g})$. If 4 mol H_2 and 1 mol O_2 are available, the limiting reagent is ...
 - H_2 , because it has the smaller coefficient
 - O_2 , because fewer moles of O_2 are available
 - H_2O , because it is the product of the reaction
 - H_2 , because more moles of H_2 are present
- Reaction: $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$. If 2 mol N_2 reacts with 4 mol H_2 , how many moles of NH_3 are produced?
 - 4 mol
 - 2.67 mol
 - $8/3$ mol
 - 3 mol
- The CORRECT approach to identifying the limiting reagent from a balanced equation is ...
 - Directly compare the masses of each reactant
 - Divide the available moles of each reactant by its coefficient, then select the smallest value
 - Choose the reactant with the largest molar mass
 - Compare the volumes of the reactant solutions
- During the baking soda + acetic acid demonstration, the balloon stopped inflating because ...
 - CO_2 gas could no longer enter the balloon
 - One of the reactants was fully consumed, stopping the reaction
 - The reaction temperature became too high, causing the balloon to soften
 - The pressure inside the bottle became too low

QUESTION 3 – MULTIPLE RESPONSE (Checkboxes)

Place a checkmark (✓) next to ALL statements that are CORRECT. (More than one answer may be correct.)

- Which of the following statements about limiting reagent are CORRECT?
 - The limiting reagent determines the maximum amount of product that can be formed
 - The limiting reagent is always the reactant with the smallest mass
 - After the reaction is complete, the limiting reagent has been entirely consumed
 - The reactant remaining after the reaction is called the excess reagent
 - The limiting reagent is determined solely by dividing the moles by the molar mass
- For the reaction: $2\text{Al} + 3\text{Cl}_2 \rightarrow 2\text{AlCl}_3$, given 4 mol Al and 6 mol Cl_2 , which statements are correct?
 - The mol/coefficient ratio for Al = $4/2 = 2$
 - The mol/coefficient ratio for $\text{Cl}_2 = 6/3 = 2$
 - Al is the limiting reagent because its ratio is smaller
 - Cl_2 is the limiting reagent because there is more of it
 - The amount of AlCl_3 produced is 4 mol
- Which of the following is NOT a step in determining the limiting reagent?
 - Converting moles of each reactant to grams
 - Writing and balancing the chemical equation
 - Calculating the number of moles of each reactant
 - Comparing the mol/coefficient ratio for each reactant
 - Measuring the density of the reactant solutions

QUESTION 4 – DRAG AND DROP (Match & Order)

Activity A: Match the terms in the left column with the correct definitions in the right column by drawing lines in the boxes provided!

Term	Definition
Limiting Reagent	A substance formed as a result of a chemical reaction
Excess Reagent	The reactant that is completely consumed first in a reaction
Product	The ratio of the moles of a reactant to its stoichiometric coefficient
Stoichiometry	The reactant that remains after the reaction is complete
Mol/Coefficient Ratio	The quantitative study of relationships between reactants and products in a chemical reaction

Activity B: Arrange the steps for identifying the limiting reagent in the correct order from FIRST (1) to LAST (5) by writing the number in the box.

[]	Calculate the number of moles of each reactant using the formula: $\text{moles} = \text{mass} / \text{molar mass}$
[]	Write and balance the chemical equation
[]	The reactant with the smallest ratio value is the limiting reagent
[]	Identify all reactants involved in the reaction
[]	Divide the available moles of each reactant by its stoichiometric coefficient