

Chemical Equations

Pre-Lab Discussion:

In this activity, we will perform single and double replacement reactions. We will predict the products, label their states as either (s) or (aq), balance the equations and classify the reactions.

Purpose:

Observe reactions, predict the products, label the states of the products, balance the equations and classify the type of reaction.

Materials:

24 well plate	Safety glasses	Reference Tables
1) $\text{Zn}(\text{C}_2\text{H}_3\text{O}_2)_2$ (aq)		2) $\text{K}_2(\text{CO}_3)$ (aq)
3) $\text{Na}(\text{OH})$ (aq)		4) FeCl_3 (aq)
5) $\text{Pb}(\text{NO}_3)_2$ (aq)		6) $\text{Ca}(\text{SO}_4)$ (aq)
7) Cu (s)		8) $\text{Ag}(\text{NO}_3)$ (aq)
9) Zn (s)		10) $\text{Cu}(\text{NO}_3)_2$ (aq)
11) $\text{Na}_3(\text{PO}_4)$ (aq)		




Procedure:

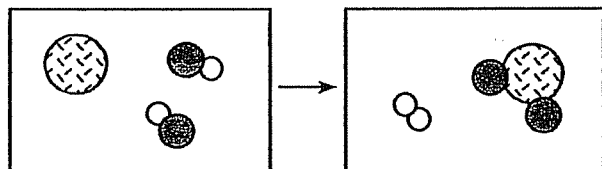
- 1) Fill the first well one third full with solution #1 and add another third of solution #2.
- 2) Fill the second well one third full with solution #3 and add another third of solution #4.
- 3) Repeat with: #5 and #6
#7 (one piece of the solid) and #8
#9 (one piece of the solid) and #10
#1 and #3
#1 and #11
- 4) Record Observations.
- 5) Predict the products, label their states, balance the equations and classify the reactions.
- 6) Clean up with soap and water.

Discussion:

- 1) Show all work for balancing the equations.

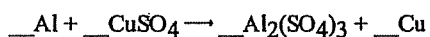
Name: _____

- 1) When the equation $\text{H}_2 + \text{N}_2 \longrightarrow \text{NH}_3$ is completely balanced using the *smallest* whole numbers, the sum of *all* the coefficients will be
- A) 7
B) 3
C) 6
D) 12
- 2) Which balanced chemical equation represents a single replacement reaction?
- A) $\text{C}_2\text{H}_4(\text{g}) + 3\text{O}_2(\text{g}) \longrightarrow 2\text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g})$
B) $\text{Cl}_2(\text{g}) + 2\text{KI}(\text{aq}) \longrightarrow 2\text{KCl}(\text{aq}) + \text{I}_2(\text{aq})$
C) $2\text{H}_2\text{O}(\text{l}) \longrightarrow 2\text{H}_2(\text{g}) + \text{O}_2(\text{g})$
D) $\text{KCl}(\text{aq}) + \text{AgNO}_3(\text{aq}) \longrightarrow \text{KNO}_3(\text{aq}) + \text{AgCl}(\text{s})$
- 3) The chemical reaction $\text{Zn}(\text{s}) + \text{CuSO}_4(\text{aq}) \longrightarrow \text{ZnSO}_4(\text{aq}) + \text{Cu}(\text{s})$ is *best* described as a
- A) double replacement reaction
B) combustion reaction
C) single replacement reaction
D) synthesis reaction
- 4) When the equation $\text{H}_2\text{S} + \text{O}_2 \longrightarrow \text{H}_2\text{O} + \text{SO}_2$ is completely balanced using *smallest* whole numbers, the sum of *all* the coefficients is
- A) 7
B) 9
C) 5
D) 11
- 5) In the particle diagram below,  represents an atom of element A,  represents an atom of element B, and  represents an atom of element C.



Which equation *best* describes the reaction shown in the diagram?

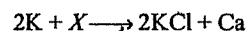
- A) $A + BC \longrightarrow AC + B$
B) $A + 2BC \longrightarrow AB_2 + C_2$
C) $2AB + C \longrightarrow A_2C + B_2$
D) $A + B_2C_2 \longrightarrow AB_2 + 2C$
- 6) Given the unbalanced equation:



When the equation is balanced using the *smallest* whole-number coefficients, what is the coefficient of Al?

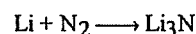
- A) 1
B) 2
C) 3
D) 4

- 7) If an equation is balanced properly, *both* sides of the equation must have the same number of
- A) coefficients
B) molecules
C) moles of molecules
D) atoms
- 8) According to the *Activity Series* chemistry reference table, which pair of substances would undergo a single replacement reaction?
- A) Li and RbCl
B) Rb and LiCl
C) Cs and LiCl
D) Cs and RbCl
- 9) When C_3H_8 burns completely in an excess of oxygen, the products formed are
- A) CO and H_2O
B) CO_2 and H_2O
C) CO_2 and H_2
D) CO and H_2
- 10) Given the balanced equation



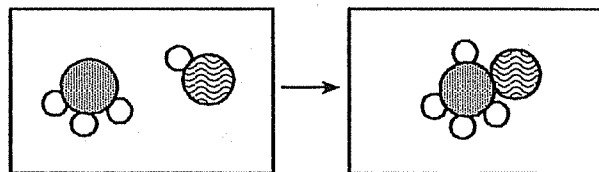
What represents the missing reactant X?

- A) 2CaCl_2
B) CaCl_2
C) 2Cl
D) Cl_2
- 11) Given the unbalanced equation:



When the equation is correctly balanced using *smallest* whole numbers, the coefficient of the lithium is

- A) 1
B) 2
C) 3
D) 6
- 12) What general type of chemical reaction is illustrated in the particle diagram below?



- A) synthesis
B) decomposition
C) double replacement
D) single replacement
- 13) Which equation illustrates conservation of mass?
- A) $\text{H}_2 + \text{O}_2 \longrightarrow \text{H}_2\text{O}$
B) $\text{H}_2 + \text{Cl}_2 \longrightarrow 2\text{HCl}$
C) $\text{H}_2 + \text{Cl}_2 \longrightarrow \text{HCl}$
D) $\text{H}_2 + \text{O}_2 \longrightarrow 2\text{H}_2\text{O}$
- 14) When the equation $\text{H}_2 + \text{Fe}_3\text{O}_4 \longrightarrow \text{Fe} + \text{H}_2\text{O}$ is completely balanced using the *smallest* whole numbers, the coefficient of H_2 would be
- A) 1
B) 2
C) 3
D) 4

Purpose _____

Observations

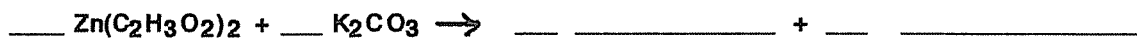
Trial	Solutions	Color of first solution	Color of second solution	Color of product
1	1 & 2			
2	3 & 4			
3	5 & 6			
4	7 & 8			
5	9 & 10			
6	1 & 3			
7	1 & 11			

Predictions and balanced equations: See table E for state. Use s for insoluble (solid), and aq for soluble (aqueous solution)

- 1) Products : formulas and physical states.

_____ , _____ , _____

Balanced equation:



- 2) Products : formulas and physical states.

_____ , _____ , _____

Balanced equation:



3) Products : formulas and physical states.

Balanced equation:



4) Products : formulas and physical states.

Balanced equation:



5) Products : formulas and physical states.

Balanced equation:



6) Products : formulas and physical states.

Balanced equation:



7) Products : formulas and physical states.



Discussion:

1) Which reactions were single replacements? # _____

2) Which reactions were double replacements? # _____

2) How is the need to balance a chemical equation related to the law of conservation of mass?

