Carolina Quick Tips®

Balancing Chemical Equations

Use models to help balance chemical equations and understand the law of conservation of mass. Minimize students' misconceptions about balancing equations by helping them to visualize the number of atoms participating in each side of a chemical reaction. This activity supports 3-dimensional learning and builds toward the following:

- NGSS Science and Engineering Practice: Developing and Using Models
- NGSS Core Idea: Physical Science 1: Matter and Its Interactions

Materials Required

Carolina ChemKits®: Balancing Chemical Equations (840656)

Dry-Erase Markers

Activity Procedure

1. Choose approximately 10 cubes each of 5 different colors and place them on your Balancing Equations Mat. Group the cubes by color. These cubes will represent different atoms; 1 color = 1 atom.
2. With a dry-erase marker, write the 5 cube colors in the "Color" column of the Tally Table on your mat.
3. Write the reactants and products of the equation from the equation list on the top of the Balancing Equations Mat.
4. Assign a different color to each atom in the equation. In the "Symbol" column of the Tally Table, write the symbol for the atom beside the assigned color from your groups of cubes.
5. Assemble the molecules according to the formulas based on the colors you assigned. Note: The shape and arrangement of the molecules do not matter for this activity.
6. Place the completed molecule into its box on the Balancing Equations Mat.

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7. Count the number of each atom of each color on both sides of the arrow. In the Tally Table, record the number of atoms of each color on the left side and the right side of the equations.
8. If the number of atoms (cubes) of each color on each side of the equation is the same, then the equation is balanced. Skip to step 10.
9. If the number of atoms of each element is not the same on both sides, make additional molecules and add them to the appropriate box. Adjust your tally numbers to reflect the new number of atoms. Continue this process until the number of atoms on each side is the same.
10. Once the equation is balanced, write the total number of molecules in each box on the line above the box labeled "Coefficient."

Summary

The ability to balance equations properly is a fundamental skill in chemistry. Balanced equations:

- Determine the amount of a product that can be produced in a chemical reaction
- Ensure that the proper amounts of reactants are added to allow reactions to occur
- Help identify limiting reactants

Additional Information

Carolina ChemKits®: Balancing Chemical Equations (840656) overview

Grades 9–12. Introduce and reinforce balancing chemical equations with this model-based kit. Students use colorful manipulatives and a unique Balancing Equations Mat to understand the Law of Conservation of Mass and to visualize the number of atoms participating in each side of a chemical reaction. This activity also helps students understand the difference between coefficients and subscripts in chemical equations. Kit contains enough materials for 10 groups, pairs, or students working individually. Dry-erase marker and erasers are needed but not supplied.

If your students are ready to balance more challenging chemical equations, add the Carolina ChemKits®: Balancing Chemical Equations Expansion Pack (840675). It contains additional cubes for 10 teams (extra Balancing Equations Mats not included).

View more information, content links, and products related to this activity at www.carolina.com/takeaways.

Balance the following equations using the mat and cubes:

_____ HCl	+	_____ NaOH	→	_____ NaCl	+	_____ H_2O
_____ $Ca(OH)_2$	+	_____ HCl	→	_____ $CaCl_2$	+	_____ H_2O
_____ Na_2CO_3	+	_____ $CaCl_2$	→	_____ $CaCO_3$	+	_____ NaCl
_____ CH_4	+	_____ O_2	→	_____ CO_2	+	_____ H_2O
_____ Mg	+	_____ HCl	→	_____ $MgCl_2$	+	_____ H_2
_____ Mg	+	_____ Mn_2O_3	→	_____ MgO	+	_____ Mn