Sweetly Balanced Equations

Using Simulations with Candy to Help Understand the Balancing of Chemical Equations

Introduction

Pieces of candy will be used to represent atoms in chemical equations. Different colors will represent different atoms. Conservation of atoms in a chemical equation will be shown by having the same number and kinds of atoms on each side of the equation. One lab partner will use his/her candy to simulate the reactant (left) side of the equation, and the other partner will use his/her candy to simulate the product (right) side.

Materials (per person):

- candy (see kinds and amounts in table on next page)
- small square of paper with **=** printed on it (1 per group)
- small square of paper with **+** printed on it (2 per group)
- clean paper napkin
- clean piece of copier paper

IMPORTANT NOTES:

• The candy used in this activity is edible, and it is important that cleanliness and common-sense sanitary precautions be observed when handling it.

• Wash your hands, since you will be handling candy you may eventually want to eat.

• Follow class instructions for obtaining candy in supply containers.

• Place candy on the napkin or the copier paper to keep it clean.

• ONCE YOU HAVE HANDLED CANDY, DO NOT RETURN IT TO A SUPPLY CONTAINER OR GIVE IT TO SOMEONE ELSE TO EAT; EITHER EAT IT YOURSELF OR THROW IT AWAY.

California Science Standards Addressed

- Grade 8; Physical Science; Reactions; 5b; Students know the idea of atoms explains the conservation of matter: **In chemical reactions the number of atoms stays the same no matter how they are arranged**, so their total mass stays the same.
- Grades 9-12; Chemistry; Conservation of Matter and Stoichiometry; 3a**; Students know how to describe chemical reactions by writing balanced equations.**

References/Acknowledgement

- P. W. Atkins, **Molecules**, W.H. Freeman, 1987; a unique chemistry classic, showing relation of molecular structures to everyday substances and phenomena; great molecular drawings
- Nicole Hays, West Bloomfield High School, MI; **Candy Chemistry**; a shorter version of this activity, with no drawings; will print as a pdf; use a Google search to locate it on the web (the URL is LONG!)

- Tom Frost, my longtime close friend and colleague at Foothill High School, Pleasanton, CA; use of molecular drawings in equations; use of candy and other food as teaching tools in chemistry; many facets of teaching chemistry and helping students to learn

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Procedure

1. Obtain a Fun Size bag of m&m's, plus the specified number of pieces of other candy shown in the table below. If your bag of m&m's does not have enough green, blue or yellow m&m's, get them from the reserve stockpile. The numbers shown below are the minimum for you to be able to do the equation balancing. You may eat the brown, red and orange m&m's whenever you wish, but save all the green, blue and yellow ones until the activity is finished. Once the activity is over, you may eat any of your remaining candy.

ELEMENT	COLOR	CANDY	QUANTITY
H	white	miniature marshmallows	6
Cl	green	m&m's	4
O	red	Red Vine pieces (red)	7
N	blue	m&m's	3
C	black	Red Vine pieces (black)	3
Na	yellow	m&m's	2
Fe	silver	Hershey's Kisses	2

2. For equations (1) - (5) below, complete the following steps:
   a. Try to balance the equation.
   b. One of the two lab partners should use his/her pieces of candy to simulate the left side of the balanced equation on a piece of copier paper, and the other person should simulate the right side on a separate piece of paper. Use the small pieces of paper with **+** or **=** as appropriate. Make sure that there are the same number of pieces of each kind and color on each side of the equation.
   c. When you and your lab partner have completed an equation, have your instructor check the balanced equation and the candy arrangement to verify that everything is correct. Your instructor will then initial in the space provided so that you will get credit.

(1) ___ Na + ___ Cl_2 = ___ $NaCl$ initials _____

(2) ___ Na + ___ H_2O = ___ $NaOH$ + ___ H_2 initials _____

(3) ___ CO + ___ NO = ___ CO_2 + ___ N_2 initials _____

(4) ___ Fe_2O_3 + ___ CO = ___ Fe + ___ CO_2 initials _____

(5) ___ C + ___ Fe_2O_3 = ___ CO + ___ Fe initials _____

4. The drawings for equations (6) - (10) below represent **unbalanced** chemical equations. For these equations, first use the drawings and the key provided to write the **unbalanced** equation, and then follow the same procedure for balancing, simulating with candy, and having your results initialed that you used for equations (1) - (5) above.

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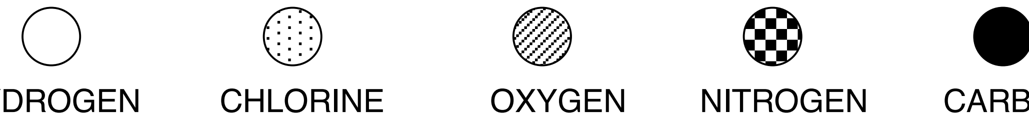
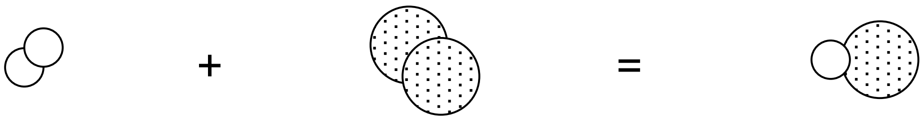
KEY:

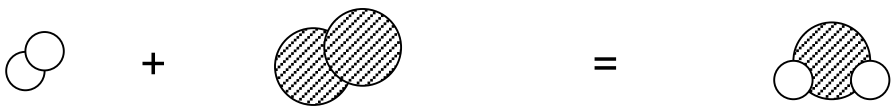


(6)



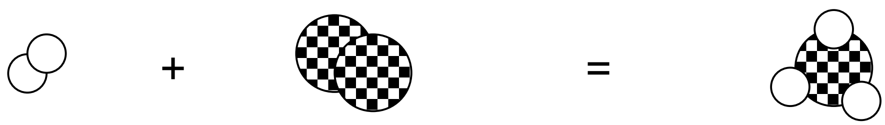
______________________________ initials______

(7)



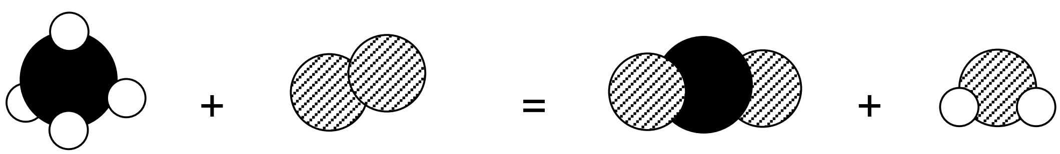
______________________________ initials______

(8)



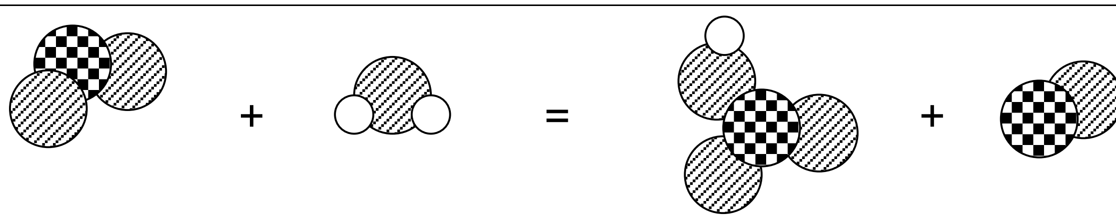
______________________________ initials______

(9)



______________________________ initials______

(10)



______________________________ initials______

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Cut out signs below so that each sign is on its own small square of paper. Each group requires one **=** sign and two **+** signs.

=	+	+
=	+	+
=	+	+
=	+	+

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