Science Unit: **Exploring Chemistry**

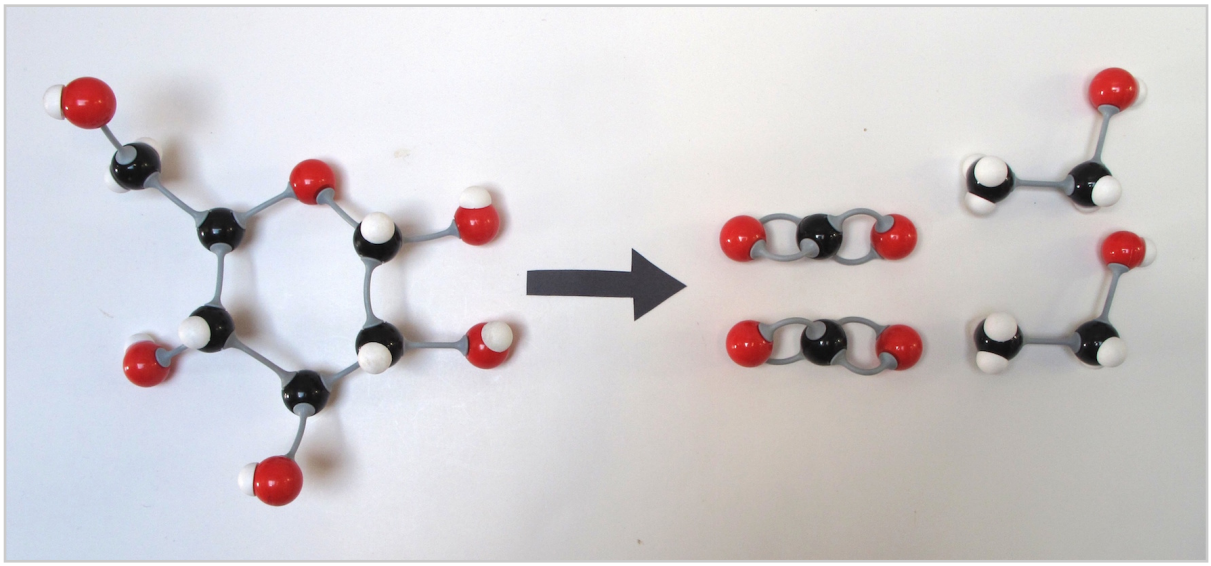
Lesson 6: ***The Science of Bread***

School Year:	2015/2016
Developed for:	Sir Wilfred Laurier Elementary School, Vancouver School District
Developed by:	Ingrid Sulston (scientist); Sonia Ko and Sonja Watson (teachers)
Grade level:	Appropriate for grades 5 - 7 with age appropriate modifications
Duration of lesson:	1 hour and 20 minutes
Notes:	If the oven is not in the classroom where this lesson takes place, a second adult is needed to leave the class and check on the baking process.

Science Activity
Bake bread with students.

Background Information for the Teachers

1. Prior to the activity, assemble several glucose molecules from molecule model pieces.
2. Glucose is $C_6H_{12}O_6$, and requires these components to build:
    - 6 black carbon atoms, 12 white hydrogen atoms, 6 red oxygen atoms and 24 bonds.
    - See refs. 4 and 5, and left molecule in the photo below, for assembly.
3. Once the basic framework of black carbons and red oxygens are linked, just fill all the rest of the holes with white hydrogens.



4. Give one sugar molecule to each small group of students.
5. Tell them that this is the sugar (glucose) that yeast eats to make the bread rise — the yeast breaks apart each sugar molecule into two different kinds of molecules:
    a. One kind of molecule is an ethanol molecule - show students the ethanol structure (CH_3CH_2OH, right side of the photo).
    b. Challenge students to find out what this other molecule is…

       Explain again that they should break apart their sugar molecule, make two ethanol molecules, then use all the rest of the atoms and bonds to make two identical molecules with another structure.

6. They should arrive at two CO_2 molecules, like the small molecules in the photo containing one red and two black atoms (students may need to be encouraged to fill all the holes, so making double bonds). Once the name is spelled out C-O-2, they may recognize this molecule as carbon dioxide, which is a gas.
7. CO_2 gas is made by the yeast as it eats the sugar. The gas bubbles get stuck in the dough and push it up, making it rise. This makes bread light and airy.

References

1. Zubrowski, Bernie. 1981. Messing around with Baking Chemistry. Little, Brown and Company. Detailed lesson ideas using baking powder and yeast, including recipes.
2. McGee, Harold. 1984, 2004. On Food and Cooking. Scribner. An excellent, detailed resource for the science behind most foods and cooking you can think of.
3. <http://s.hswstatic.com/gif/food-glucose.gif> How Stuff Works image of glucose. Accessed May 18, 2016.
4. <https://www.khanacademy.org/computer-programming/3d-glucose-molecule/1131049891> Kahn Academy Computer Programming pages. [Glucose molecule that can be turned to see all sides. Note that the carbon atoms are blue instead of black.] Accessed May 18, 2016.

Extension of Lesson Plan

Other cooking ideas:

- Make butter from whipping cream
- Make scones with baking soda and an acid e.g. buttermilk/lemon juice.
- Make ice cream by shaking cream and cooling it with salted iced water.