How Big is a Mole?

Grades: 2-5

Materials: periodic table, How Big is a Mole? worksheet, a mole's worth of different items (beans, juice, salt, etc), *Mole and Tell*

Subject: Chemistry

NGSS: HS-PS1-7 Mathematical Representations

Skills: Mathematic equations, critical thinking, understanding and applying rules

Background: Moles measure the amount of a substance. They are used by scientists all over the world as a universal standard measurement to measure big quantities of small things, and are important in learning and understanding chemistry. One mole of a substance may have a higher mass than another due to the amount of molecules in one mole of that specific substance. In this assignment, you will teach your students how to calculate the molar mass of a chemical compound. This will help your students understand how molecule sizes vary among different substances.

Activity:

1. Read *Mole and Tell* to your class. Highlight the pages (24-29) that depict the difference between a mole of sugar and a mole of water.
2. Discuss why this occurs. This happens due to the fact that the molecules in different substances are bigger or smaller than others.
3. Then proceed to show students the mass of a mole of different items (beans, juice, salt, etc.) to demonstrate this concept further.
4. Print and pass out the How Big is a Mole? worksheet to each student. Explain to them that in order to calculate the molar mass of a substance, scientists take the atomic mass and multiply it by how many atoms there are in the substance. For single elements, this is pretty easy, but for compounds, they'll need to multiply the atomic mass by the subscript (the small number after an atomic symbol in a compound) and add all the elements' masses together.

Discussion: Why did some of these objects/substances look like they have more or less than others? What do you think a mole describes? Did you notice a relationship between the atomic mass and the mass of the mole?

Activity Answers

Ne: 20.180 g/mol

Zn: 65.380 g/mol

Mg: 24.305 g/mol

H: 1.0078 g/mol

B: 10.811 g/mol

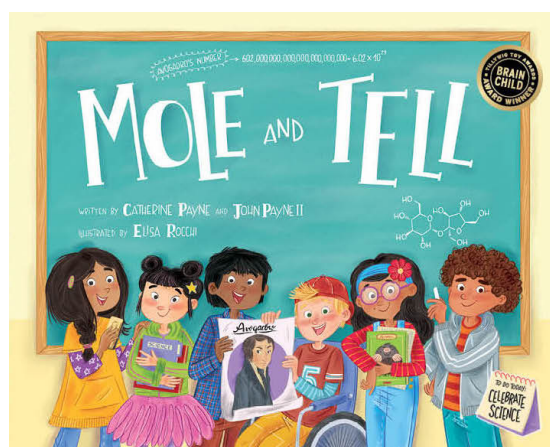Hg: 200.57 g/mol

CO_2: 44.009 g/mol

NaCl: 58.443 g/mol

H_2O: 18.01528 g/mol

$NaHCO_3$: 84.007 g/mol

$C_6H_{12}O_6$: 180.156 g/mol

H_3PO_4: 97.994 g/mol

This activity was excerpted from the Teacher's Guide to
Mole and Tell
English:
Hardback: 978-1-958629-11-6
Paperback: 978-1-958629-10-9
eBook: 978-1-958629-12-3

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How Big is a Mole? Worksheet

Calculate the molar mass (g/mol) of different elements and compounds.
Refer to the periodic table to find the atomic mass of an element.

Ne (neon):

CO_2 (carbon dioxide):

Zn (Zinc):

NaCl (table salt):

Mg (magnesium):

H_2O (water):

H (hydrogen):

$NaHCO_3$ (sodium bicarbonate):

B (boron):

$C_6H_{12}O_6$ (glucose):

Hg (mercury):

H_3PO_4 (phosphoric acid):