Sample of a Student’s Work/Notebook
2nd Edition
Activities 15-17
Activity 14: Physical and Chemical Properties of Material

Analysis Questions 1-4

1. My group's were the same as those of the other students. Some were different. For example, we said formation the same and natural was different for us.

2. The shape of an object should not be considered a property of the material because it could be the same material just a different shape. It will not affect any of the properties just by being a different shape.

3. A case in which color does not help identify a material is when there are trees in the distance. But someone thinks they are bushes. You can not tell by color because they are both light green so when you get closer you see it is taller than a bush would be. Another case is when there is a food that looks similar to another food but it is not. For example, you go to a friend's house to eat dinner and it is a surprise. You think it is chicken but when you taste it, it is fish.

4. Procedure: Steps 4 and 9

Title: Activity 15: Families of Elements

Date: January 29, 2014

Challenge: How can elements be grouped based on their physical and chemical properties?

Hypothesis: I think we will be grouping elements.

Background: Definitions:
1. Atom - Unit of a chemical element
3. Element - A substance that cannot be broken down into simpler substances by heating it or causing it to react with other chemicals.
4. Family of Elements - Group of elements with similar chemical properties.
5. Metal - Solid material shiny hard
6. Periodic Table of the Elements - Table of chemical elements organized based on its chemical properties.
<table>
<thead>
<tr>
<th>Metal and Hydrogen atoms</th>
<th>Metal and Hydrogen atom</th>
<th>Nonmetal and Hydrogen atom</th>
<th>Nonmetal and Hydrogen atom</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnesium (Mg)</td>
<td>Lithium (Li)</td>
<td>Argon (Ar)</td>
<td>Chlorine (Cl)</td>
</tr>
<tr>
<td>Calcium (Ca)</td>
<td>Sodium (Na)</td>
<td>Neon (Ne)</td>
<td>Bromine (Br)</td>
</tr>
<tr>
<td>Beryllium (Be)</td>
<td>Potassium (K)</td>
<td>Helium (He)</td>
<td>Fluorine (F)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Noble Gases</th>
<th>Halogens</th>
<th>Alkali Metals</th>
<th>Alkaline Earth Metals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helium (He)</td>
<td>Hydrogen (H)</td>
<td>Potassium (K)</td>
<td>Beryllium (Be)</td>
</tr>
<tr>
<td>Neon (Ne)</td>
<td>Fluorine (F)</td>
<td>Sodium (Na)</td>
<td>Magnesium (Mg)</td>
</tr>
<tr>
<td>Argon (Ar)</td>
<td>Chlorine (Cl)</td>
<td>Lithium (Li)</td>
<td>Calcium (Ca)</td>
</tr>
<tr>
<td>Krypton (Kr)</td>
<td>Bromine (Br)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Conclusion:** In Activity 15: Families of Elements, we learned about some elements on the periodic table. We learned their symbol, name, whether it is a metal or nonmetal, whether it is a liquid, solid, or gas, color, atomic mass, reactivity, and number of bonds to hydrogen. Atom is a unit of a chemical element. Atomic mass is mass of an atom of a chemical element. Element is a substance that cannot be broken down into simpler substances. Family of elements is a group of elements with similar chemical properties. Metal is a solid material. Periodic table of Elements is a table of chemical elements organized by its chemical properties. Elements can be grouped by their similar physical and chemical properties. I found out that making groups by matching properties is harder than I thought. My hypothesis was correct, we did group chemical elements.
Activity 15: Families of Elements
Analysis Questions 1-5

1a The physical properties on the Element Cards are states of matter, color, atomic mass, and whether it is a metal or not.
1b The chemical properties on the Element Cards are the Reactivity and number of bonds to hydrogen.
2 Our first classification system was the same except the order by atomic mass and the headings.
3 Grouping elements can help scientists understand their properties because then they can see the similarities and differences between them.

4a Noble Gases
4b Halogens
4c Alkali Metals
4d Alkaline Earth Metals
4e Halogens

5 Sr
Strontium
metal
solid
silvery white
Atomic Mass: 88
Reactivity: very high
Number of bonds to hydrogen: 2
The physical properties on the Element Cards are states of matter, color, atomic mass, and whether it is a metal or not. The chemical properties on the Element Cards are Reactivity and number of bonds to hydrogen.

Our first classification system was the same except the order by atomic mass and the headings.

Grouping elements can help scientists understand their properties because they can see the similarities and differences between them.

Noble Gases
Halogens
Alkaline Metals
Alkaline Earth Metals
Halogens

Sr
Strontium metal
Solid silvery white
Atomic Mass: 88
Reactivity: very high
Number of bonds to hydrogen:

Title: Activity 16: Elements and the Periodic Table
Date: January 31, 2014
Challenge: What are elements, and how do they relate to compounds?
Hypothesis: I think we will read and learn more about the periodic table.

Background: The kinds of properties I can use to distinguish groups of elements are its physical and chemical properties.

Define: 1. Chemical Formula - Short hand way to identify the kind and number of atoms that make up a compound.
2. Compound - When elements react, they can form substances called compounds.
3. Molecule - Group of atoms bonded together

Data: Stopping to Think Questions 1-5

1. The very Greek philosophers were right about elements: that everything on Earth is made of a basic set of elements. But they were wrong about fire, earth, air, and water combine to make everything in the world.
2. Mendeléev built on other scientists work by using the data they had collected. Other scientists built on Mendeléev's work by building onto the elements and put them on the chart.
3. Lithium(Li), Calcium(Ca), Titanium(Ti) are metals. Carbon(C), Sulfur(S), and Bromine(Br) are non-metals. Bromine is Halogen.
4. Magnesium's chemical symbol is Mg; it belongs to the Alkaline earth Metals family, and magnesium is a solid. I would expect it to be highly reactive.

5. One way that compounds are different from the elements that form them is water, it is a liquid formed from two gases—hydrogen and oxygen. Another is table sugar; it is an edible white solid formed from a black solid (carbon) and the gases hydrogen and oxygen.

6. The elements in baking soda are sodium, hydrogen, carbon, and oxygen. There is one sodium atom, one hydrogen atom, one carbon atom, and three oxygen atoms that represent baking soda.

Conclusion: In Activity 16: Elements and the Periodic Table, we learned more about the Periodic Table. This activity was a reading. Chemical formula is a shorthand way to identify the kind and number of atoms that make up a compound. When elements react, they can form substances called compounds. Molecule is a group of atoms bonded together. Elements are a part of something and they relate to compounds because two or more elements chemically joined is called a compound. I found out that there are 118 elements on the Periodic Table today. My hypothesis was correct. We did learn more about the periodic table.
Activity 16: Elements and the Periodic Table

Analysis Questions: 1-4

<table>
<thead>
<tr>
<th>Substance</th>
<th>Chemical formula</th>
<th>Atoms that make up the molecule</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>H₂O</td>
<td>2 hydrogen atoms, 1 oxygen atom</td>
</tr>
<tr>
<td>Hydrogen peroxide</td>
<td>H₂O₂</td>
<td>2 hydrogen atoms, 2 oxygen atoms</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>CO₂</td>
<td>1 carbon atom, 2 oxygen atoms</td>
</tr>
<tr>
<td>Sucrose (table sugar)</td>
<td>C₁₂H₂₂O₁₁</td>
<td>12 carbon atoms, 22 hydrogen atoms, 11 oxygen atoms</td>
</tr>
<tr>
<td>Alanine (an amino acid)</td>
<td>C₃H₇O₂N</td>
<td>3 carbon atoms, 7 hydrogen atoms, 2 oxygen atoms</td>
</tr>
<tr>
<td>Oleic acid (a fat)</td>
<td>C₁₇H₃₃O₂</td>
<td>12 carbon atoms, 24 hydrogen atoms, 2 oxygen atoms</td>
</tr>
</tbody>
</table>

3. a. Table salt is a compound because it is sodium + chlorine = sodium chloride.
   b. Physical Properties of table salt are tiny, rough, and white.
   c. Table salt is a compound, tiny, solid, and sodium and chlorine are elements that react to form table salt.

4. I think seawater is a mixture. I think this because it contains more than one compound. It contains water and salt.

4. The relationship between an atom and a molecule is that a molecule is a joining of two or more atoms.
Activity 16: Elements and the Periodic Table

Analysis Questions: 1-4

1. Substance: Water
   Chemical formula: H₂O
   Atoms that make up the molecule: 2 hydrogen atoms, 1 oxygen atom

2. Substance: Hydrogen peroxide
   Chemical formula: H₂O₂
   Atoms that make up the molecule: 2 hydrogen atoms, 2 oxygen atoms

3. Substance: Carbon dioxide
   Chemical formula: CO₂
   Atoms that make up the molecule: 1 carbon atom, 2 oxygen atoms

4. Substance: Sucrose (table sugar)
   Chemical formula: C₁₂H₂₂O₁₁
   Atoms that make up the molecule: 12 carbon atoms, 22 hydrogen atoms, 11 oxygen atoms

5. Substance: Alanine (amino acid)
   Chemical formula: C₈H₁₇O₂N
   Atoms that make up the molecule: 8 carbon atoms, 17 hydrogen atoms, 2 oxygen atoms, 1 nitrogen atom

6. Substance: Oleic acid (a fat)
   Chemical formula: C₆₃H₁₀₃O₃
   Atoms that make up the molecule: 63 carbon atoms, 103 hydrogen atoms, 3 oxygen atoms

A. Table salt is a compound because it is sodium + chlorine = sodium chloride.

B. Physical Properties of table salt are: tiny, white, and solid.

C. Table salt is a compound, tiny, solid, and sodium and chlorine are elements that react to form table salt.

D. I think seawater is a mixture. I think this because it contains more than one compound. It contains water and salt.

E. The relationship between an atom and a molecule is that a molecule is a joining of two or more atoms.
Title: Activity 17: Modeling Molecules

Date: February 4, 2014

Challenge: How do atoms combine to form molecules?

Hypothesis: I think we will make different molecules.

Background: The smallest building block of matter is an atom.

1. Chemical bond — "Energy connections" that can hold atoms together to form molecules.

Data: Diagrams from procedure steps 2, 3, 5, 6, 7, 11, 12, 15

- H₂O: Water molecule
- Hydrogen and carbon
- H₂: Hydrogen gas
- O₂: Oxygen gas
- N₂: Nitrogen gas
- NH₃: Ammonia
- H₂O₂: Hydrogen peroxide
- O₃:臭氧
**Activity 17: Modeling Molecules**

**Date:** February 4, 2014

**Challenge:** How do atoms combine to form molecules?

**Hypothesis:** I think we will make different molecules.

**Background:** The smallest building block of matter is an atom.

1. Chemical bond--Energy connections that can hold atoms together to form molecules.

**Diagram:** Diagrams from procedure steps 7, 3, 5, 6, 7, 11, 12, 15

- **H₂O:** Hydrogen and oxygen
- **H₂:** Hydrogen
- **NH₃:** Nitrogen and hydrogen
- **CO₂:** Carbon dioxide

**Conclusion:** In Activity 17: Modeling Molecules, we learned more about molecules. Chemical bonds are energy connections that can hold atoms together to form molecules. Atoms combine to form molecules by the bonding sites. I found out that Gyshgyl is the medication for athletes' foot or ringworm. My hypothesis was correct. This was very similar to Activity 36.

**Good Vocabulary:**
Activity 17: Modeling Molecules

Date: February 4, 2014

Challenge: How do atoms combine to form molecules?

Hypothesis: I think we will make different molecules.

Background: The smallest building block of matter is an atom.

Chemical bond: Energy connections that can hold atoms together to form molecules.

Diagrams from procedure, steps 2, 3, 5, 7, 11, 15:

1. We were working with four elements. They were hydrogen, carbon, oxygen, and nitrogen.

2. He role of the "sticks" on each atom model are bonding sites.

3. Yes, it is possible for an atom to make more than one bond. This is possible because oxygen, for example, has two bonding sites.

4. Bonds with Hydrogen

<table>
<thead>
<tr>
<th>Element</th>
<th>Atomic number</th>
<th>Number of bonds with hydrogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Si (Silicon)</td>
<td>14</td>
<td>4 bonds with hydrogen</td>
</tr>
<tr>
<td>S (Sulfur)</td>
<td>34</td>
<td>2 bonds with hydrogen</td>
</tr>
<tr>
<td>Ca</td>
<td>20</td>
<td>1 bond with hydrogen</td>
</tr>
<tr>
<td>C</td>
<td>6</td>
<td>3 bonds with hydrogen</td>
</tr>
</tbody>
</table>

5. If you have two oxygen atoms and one hydrogen atom, you cannot form a molecule, because one of the bonding sites is open.

6. atom → molecule

7. A chemical formula provides more information, because you know how many atoms of each element needed to form the molecule. A model may not have color.
Sample of running glossary in the back of the notebook

- **Life Cycle** - What is needed to make the container, how it will be made, and what will happen to it when not in use. These are the stages.
- **Activity 13**
- **Life Cycle Diagram** - Illustrating each stage in the cycle.
- **Raw Materials** - Materials that come from the Earth. **Activity 13**
- **Manufacturing** - A product or material is created. **Activity 13**
- **Useful Life** - The product is used for its intended purpose. **Activity 13**
- **End of Life** - When the product is no longer useful. **Activity 13**
- **Chemical Property** - Describes how a material reacts with another substance, such as an acid or oxygen. **Activity 19**
- **Physical Property** - Is one that you can identify without seeing if the material reacts with another substance. **Activity 14**
- **Density** - How compact something is. Density = mass / volume. **Activity 14**
- **Atom** - Unit of a chemical element. **Activity 15**
- **Atomic Mass** - Mass of an atom of a chemical element. **Activity 15**
- **Element** - A substance that cannot be broken down into similar substances by heating it or causing it to react with other chemicals. **Activity 15**
- **Families** - Elements with similar chemical properties. **Activity 15**
- **Periodic Table of Elements** - Table of chemical elements, organized based on its chemical properties. **Activity 15**
- **Chemical Formula** - Short-hand way to identify the kind and number of atoms that make up a compound. **Activity 16**
- **Compound** - When elements react, they can form substances called compounds. **Activity 16**
- **Molecule** - Is a group of atoms bonded together. **Activity 16**
- **Chemical Bond** - Are "energy connections" that can hold atoms together to form molecules. **Activity 17**