

Sample of a Student's Work/Notebook

The Chemistry of Materials, *Issues and Physical Science*,
2nd Edition

Activities 15-17

LaB-aids®



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: Define:

1. Atom - Unit of a chemical element
2. Atomic Mass - Mass of an atom 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.

Data: Procedure Steps 4 and 9

82

Metal and 2

Hydrogen atoms

• Magnesium (Mg)

• Calcium (Ca)

• Beryllium (Be)

Metal and 1

Hydrogen atom

• Lithium (Li)

• Sodium (Na)

• Potassium (K)

Nonmetal and 0

Hydrogen atoms

• Argon (Ar)

• Neon (Ne)

• Helium (He)

• Krypton (Kr)

Nonmetal and 1

Hydrogen atom

• Chlorine (Cl)

• Bromine (Br)

• Fluorine (F)

• Hydrogen (H)

Noble Gases

• Helium (He)

• Neon (Ne)

• Argon (Ar)

• Krypton (Kr)

Halogens

• Hydrogen (H)

• Fluorine (F)

• Chlorine (Cl)

• Bromine (Br)

Alkali Metals

• Potassium (K)

• Sodium (Na)

• Lithium (Li)

Alkaline Earth Metals

• Beryllium (Be)

• Magnesium (Mg)

• Calcium (Ca)

Conclusion: In Activity 15: Families of Elements we learned,

Nick - 4

Kaley - 4

Caroline - 4

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 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.

January 30, 2014
5th period

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: 44

Reactivity: very high

Number of bonds to hydrogen: 2

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 - Shorthand 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 way 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. Mendeleev built on other scientists work by using the data they had collected. Other scientists built on Mendeleev'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:

C:4
because no
vocabulary
was good.

N:4
because
vocabulary
was good.

In Activity 1b: 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.

3, 2014

5th Block

Activity 16: Elements and the Periodic Table

Analysis Questions: 1-4

1. Substance	Chemical formula	Atoms that make up the molecule
Water	H_2O	2 hydrogen atoms, 1 oxygen atom
Hydrogen peroxide	H_2O_2	2 hydrogen atoms, 2 oxygen atoms
Carbon dioxide	CO_2	1 carbon atom, 2 oxygen atoms
Sucrose (table sugar)	$C_{12}H_{22}O_{11}$	12 carbon atoms, 22 hydrogen atoms, 11 oxygen atoms
Alanine (an amino acid)	$C_3H_7O_2N$	3 carbon atoms, 7 hydrogen atoms, 2 oxygen atoms, 1 Nitrogen atom
Oleic acid (a fat)	$C_{18}H_{34}O_2$	18 carbon atoms, 34 hydrogen atoms, 2 oxygen atoms

- Table salt is a compound because it is sodium + chlorine = sodium chloride.
 - Physical Properties of table salt are tiny, rough, and white.
 - Table salt is a compound, tiny, solid and sodium and chlorine are elements that react to form table salt.
- I think seawater is a mixture. I think this because it contains more than one compound. It contains water and salt.
 - The relationship between an atom and a molecule is that a molecule is a joining of two or more atoms.

Periodic Table of the Elements

color key
 Non-metals
 Alkali Metals
 Alkaline earth metals
 Transition metals
 Rare earth metals
 other metals
 Halogens
 Noble gases

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 H hydrogen 1.008	2 He helium 4.003	3 Li lithium 6.941	4 Be beryllium 9.012	5 B boron 10.81	6 C carbon 12.01	7 N nitrogen 14.01	8 O oxygen 16.00	9 F fluorine 19.00	10 Ne neon 20.18	11 Na sodium 22.99	12 Mg magnesium 24.31	13 Al aluminum 26.98	14 Si silicon 28.09	15 P phosphorus 30.97	16 S sulfur 32.07	17 Cl chlorine 35.45	18 Ar argon 39.95
19 K potassium 39.10	20 Ca calcium 40.08	21 Sc scandium 44.96	22 Ti titanium 47.88	23 V vanadium 50.94	24 Cr chromium 52.00	25 Mn manganese 54.94	26 Fe iron 55.85	27 Co cobalt 58.93	28 Ni nickel 58.69	29 Cu copper 63.55	30 Zn zinc 65.39	31 Ga gallium 69.72	32 Ge germanium 72.58	33 As arsenic 74.92	34 Se selenium 78.96	35 Br bromine 79.90	36 Kr krypton 83.80
37 Rb rubidium 85.47	38 Sr strontium 87.62	39 Y yttrium 88.91	40 Zr zirconium 91.22	41 Nb niobium 92.91	42 Mo molybdenum 95.94	43 Tc technetium (98)	44 Ru ruthenium 101.1	45 Rh rhodium 102.9	46 Pd palladium 106.4	47 Ag silver 107.9	48 Cd cadmium 112.4	49 In indium 114.8	50 Sn tin 118.7	51 Sb antimony 121.8	52 Te tellurium 127.6	53 I iodine 126.9	54 Xe xenon 131.3
55 Cs cesium 132.9	56 Ba barium 137.3	57 La* lanthanum 138.9	72 Hf hafnium 178.5	73 Ta tantalum 180.9	74 W tungsten 183.9	75 Re rhenium 186.2	76 Os osmium 190.2	77 Ir iridium 192.2	78 Pt platinum 195.1	79 Au gold 197.0	80 Hg mercury 200.5	81 Tl thallium 204.4	82 Pb lead 207.2	83 Bi bismuth 208.9	84 Po polonium (209)	85 At astatine (210)	86 Rn radon (222)
87 Fr francium (223)	88 Ra radium (226)	89 Ac~ actinium (227)	104 Rf rutherfordium (257)	105 Db dubnium (260)	106 Sg seaborgium (263)	107 Bh bohrium (262)	108 Hs hassium (265)	109 Mt meitnerium (266)	110 Ds darmstadtium (271)	111 Rg roentgenium (272)	112 Uub unubium (277)	114 Uuq ununquadium (296)	116 Uuh ununhexium (298)	118 Uuo ununoctium (?)			

Shading Key
 A Solid at room temperature
 A Liquid at room temperature
 A Gas at room temperature

58 Ce cerium 140.1	59 Pr praseodymium 140.9	60 Nd neodymium 144.2	61 Pm promethium (147)	62 Sm samarium (150.4)	63 Eu europium 152.0	64 Gd gadolinium 157.3	65 Tb terbium 158.9	66 Dy dysprosium 162.5	67 Ho holmium 164.9	68 Er erbium 167.3	69 Tm thulium 168.9	70 Yb ytterbium 173.0	71 Lu lutetium 175.0
90 Th thorium 232.0	91 Pa protactinium (231)	92 U uranium (238)	93 Np neptunium (237)	94 Pu plutonium (242)	95 Am americium (243)	96 Cm curium (247)	97 Bk berkelium (247)	98 Cf californium (249)	99 Es einsteinium (254)	100 Fm fermium (253)	101 Md mendelevium (256)	102 No nobelium (254)	103 Lr lawrencium (257)

* Lanthanide Series
 ~ Actinide Series

118 elements on the periodic table of elements today.

86

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 ^{are} "Energy Connections" that can hold atoms together to form molecules.

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

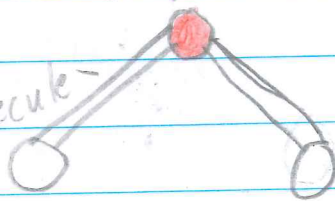
0 = hydrogen

● = carbon

● = oxygen

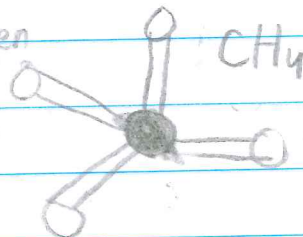
● = nitrogen

1 Water molecule



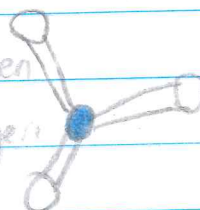
H₂O

5 Hydrogen and carbon



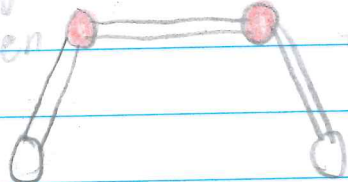
CH₄

Hydrogen and Nitrogen



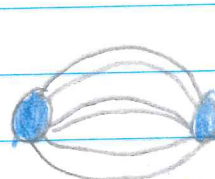
NH₃

6 Two oxygen



H₂O₂

7 Nitrogen



N₂

7 Hydrogen

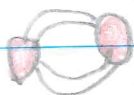


H₂

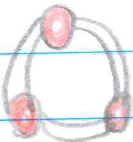
11 C₂



O₂



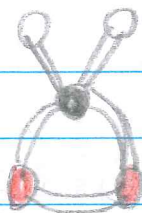
O₃



NH₄O₃



12



15



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 $\text{C}_{17}\text{H}_{14}\text{O}_{16}$ is the medication for athlete's foot or ringworm. My hypothesis was correct. This was very similar to Activity 36.

C:4 Good Vocabulary



(4)

February 5, 2019

Block 5

Activity 17: Modeling Molecules Analysis 1-7

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

Element	Atomic number	Number of bonds with hydrogen
Si (Silicon)	14	4 bonds with hydrogen
S (Sulfur)	34	2 bonds with hydrogen
I (Iodine)	53	1 bond with hydrogen
A [redacted]		3 bonds with hydrogen

5. If you have two oxygen atoms and one hydrogen atom, you can not 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 are 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. Activity 13
- 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 14
- Physical Property - Is one that you can identify without seeing if the material reacts with another substance. Activity 14
- Density - How compact something is. $\text{Density} = \frac{\text{mass}}{\text{volume}}$ 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
- Periodic Table of Elements - Table of chemical elements, organized by elements with similar chemical properties. Activity 15
shiny, hard.
- Periodic Table of Elements - Table of chemical elements, organized based on its chemical properties. Activity 15
- Chemical Formula - Shorthand 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