

Name: _____
Hour: _____ Date: _____

Chemistry: *Soap Article*

1. What is the oldest chemical reaction known?
2. How was soap probably first discovered? Explain.
3. How was lye tested to see if it was the correct concentration for soapmaking?
4. Give a simple, "homegrown" recipe for the preparation of soap.
5. What is soft soap? Why is it called soft soap?
6. How is soft soap turned into hard soap?
7. Why is homemade soap usually excessively harsh to skin and fabric?
8. Give 5 examples of ingredients that are utilized in the modern manufacturing of soap.
9. What is saponification?
10. Draw a simple molecule of a fatty acid and a simple molecule of a soap.

Fatty Acid

Soap

11. The manufacturing of soap has become as much an art as it is a science. List 5 variables that can be changed in the manufacturing process AND the effect each variable has on the soap.
 - a.
 - b.
 - c.
 - d.
 - e.

12. What is a strigil?
13. Explain why soap and water (and NOT just water) must be used to wash your body.
14. Why are water and alcohol soluble? Why are water and oil NOT soluble?
15. Why can soap combine with both oil and water?
16. Define what a micelle is and draw a simple picture of one.
17. How often did Queen Elizabeth I of England bathe?
18. Why was bathing discouraged for so long by the religious establishment?
19. What ancient peoples bathed in the nude?
20. Why did bathing become a common practice?
21. According to Roman legend, where did the term for soap come from?
22. What soapmaker and candlemaker teamed up to form what is now one of the largest soap companies in the world?
23. Where did Palmolive get its name?
24. How does the composition of soap (that is, what is in it) differ from that of detergent?
25. What is the principle advantage of a detergent over a soap?

Chemistry: *Preparation of Soap*

Soap is made of molecules that have one polar end and one nonpolar end. This fact gives soap its ability to attach to the oily substances on your skin and carry away the bacteria and dirt with the rinse water. Soap has been made for thousands of years, and can be made in the laboratory quite easily.

Procedure:

1. Measure out 25 mL of cold water in a graduated cylinder and pour it into a beaker containing 10 g of sodium hydroxide (NaOH). Stir the mixture until the NaOH dissolves. The resulting solution is called lye, and it is **very corrosive**, so **avoid contact** with it. Wash your hands thoroughly and immediately if you get it on your skin. After the NaOH has dissolved, add 1 gram of borax to the solution; this will improve the sudsing action of the finished product. Stir the mixture until you feel no heat from the beaker. You may want to hold the beaker under cold running water or immerse the beaker in a cold water bath to speed up the cooling process.
2. Have your teacher pour 60 mL of melted lard into a plastic cup. The lard should NOT be a clear yellow color; it should be slightly cloudy.
3. Next, *trickle* the lye down the glass stirring rod and into the lard. Trickle a small amount of the lye down the rod **very slowly** and then stop to stir. Then, trickle a little more lye in, etc. **Do not pour the lye into the lard too quickly.** Pouring the lye too quickly will cause the lard to separate from the lye, and your final product will be a **failure**. Stir the mixture until it thickens. **You want to avoid** getting a mixture with 2 distinct layers - the lye on the bottom and the lard on the top. If you see 2 distinct layers forming, stir vigorously until the liquids are well-mixed.
4. After all of the lye has been added, add 2 ml of ammonia and continue to stir.
5. If you wish to add dyes or perfumes to your soap, do so now. 2 or 3 drops is sufficient. Do not add very much or you will ruin your soap. You may add “rope” at this point also, if you wish. Use tape to label the cup containing your soap.
6. We will store the soap until it has solidified. This process takes several weeks.
7. Clean up all of your equipment and return it to its proper place.

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Partners: _____

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Chemistry: *Molecular Models Activity*

A molecule can be represented on paper in several ways. The chemical formula shows the number and kind of each atom in a molecule.

Example: NH_3

The Lewis structure shows the arrangement of the atoms of a molecule in 2-dimensions. In a Lewis structure, the atoms, bonds, and unshared electron pairs are shown.

Example: H N H
 H

A structural formula is simply the Lewis structure without the unshared electron pairs. The main purpose of the structural formula is to show which atoms are bonded to which.

Example: H N H
 H

In this activity, you will be constructing 3-dimensional models of several molecules. You will find the chemical formula, the Lewis structure, the structural formula, and then you will construct a model of each molecule. You will show the model to the teacher and have the appropriate box initialed.

Use the model kits according to the following key:

carbon = black tetrahedron
chlorine = green tetrahedron
nitrogen = red tetrahedron
oxygen = blue tetrahedron
sulfur = yellow tetrahedron
hydrogen = white with one bond

You may work in groups of up to 3. It is sufficient to have one member of your group have the "Official Initial" paper. The teacher will initial only this paper, as long as the names of all of the group members are on this paper.

Compound Name	Chemical Formula	Lewis structure	Structural Formula	Teacher's Initials
carbon tetrachloride	CCl_4			
methane				
water				
ethane	C_2H_6			
ethyne	C_2H_2			
hydrogen sulfide				
carbon dioxide				

Compound Name	Chemical Formula	Lewis structure	Structural Formula	Teacher's Initials
ammonia				
hydrogen chloride				
trichloro-methane	CHCl_3			
urea	$\text{CO}(\text{NH}_2)_2$			
propane	C_3H_8			
butane	C_4H_{10}			
isobutane				

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Chemistry: Vocabulary - Unit 5, Chemical Bonds

Search the pages of Chapters 5 and 6 in your text and write the definitions for each of the following terms.

octet rule

cation

anion

ionic compound

salt

crystal lattice

monatomic ion

binary compound

polyatomic ions

covalent bond

molecular compound

nonpolar covalent bond

polar covalent bond

hydrogen bond

single bond

Lewis structure

double bond

triple bond

molecular formula

polymer

structural formula

organic compound

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Chemistry: *Chapter 5 Study Questions*

1. Why do atoms form chemical bonds?
2. Explain how the octet rule predicts the stability or reactivity of atoms.
3. When atoms bond, what happens to their: ...stability? ...energy?
4. What is bond energy?
5. Describe how an atom becomes: ...positively charged. ...negatively charged.
6. What group of elements have a stable octet in their natural state?
7. Define *ion*, *anion*, and *cation*. Describe how anions and cations are formed.
8. All salts are held together by what type of bonds?
9. List some physical and chemical properties that all salts share.
10. Describe the energy changes an atom experiences if electrons are:
 ...added to the atom.
 ...taken away from the atom
11. List some differences between metals and salts.
12. Explain how metallic bonding gives metals their unique properties.
13. Explain why the ionization energy needed to remove *the next* electron from an atom increases with each electron that is removed.
14. What are hydrates and what are they used for?

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Chemistry: *Chapter 6 Study Questions*

1. Describe how covalent and ionic bonds differ with regard to melting point, boiling point, and bond strength.
2. How is bond length related to stability and energy?
3. Describe the relationship between:
 - a) the difference of the electronegativity values of a compound's atoms, and
 - b) the degree of ionic or covalent bonding in the compound.
4. Explain the difference between polar covalent and nonpolar covalent bonds.
5. What are hydrogen bonds?
6. Why would scientists need to determine a compound's empirical formula?
7. How does an empirical formula differ from a molecular formula?
8. Distinguish between a monomer and a polymer, and give 4 examples of polymers.
9. Why are structural formulas useful?
10. What is the most important factor in determining the chemical properties of a molecule?
11. What does VSEPR stand for, and what is the purpose of the theory?
12. State 3 weaknesses of the VSEPR theory.
13. How does a network solid differ from a crystal lattice?
14. Give 2 examples of network solids.
15. What are: ...organic compounds? ...hydrocarbons? ...functional groups?
16. List 6 types of molecular models.

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Chemistry: *Ions in Chemical Compounds*Complete the following table, being sure that the total charge on the resulting compound is *zero*.

<u>Ions</u>	Chloride Cl¹⁻	Hydroxide OH¹⁻	Nitrate NO₃¹⁻	Sulfate SO₄²⁻	Sulfide S²⁻	Carbonate CO₃²⁻	Phosphate PO₄³⁻
Hydrogen H¹⁺							
Sodium Na¹⁺							
Ammonium NH₄¹⁺							
Potassium K¹⁺							
Calcium Ca²⁺							
Magnesium Mg²⁺							
Aluminum Al³⁺							
Ferrous Fe²⁺							
Iron (II) Fe²⁺							
Ferric Fe³⁺							
Iron (III) Fe³⁺							
Plumbous Pb²⁺							
Stannic Sn⁴⁺							
Copper (I) Cu¹⁺							
Cupric Cu²⁺							