

Name \_\_\_\_\_

**Welcome to the Spire School Chemistry summer packet!** This assignment is designed to help you keep sharp many of the science and math skills that you already have, to help you think about the types of topics that we will be covering during the year, and to become excited about your upcoming year of chemistry!

**Part 1: Thinking about Chemistry:**

Many topics that we will cover in chemistry may be slightly familiar to you already. Some such topics include density, acids and bases, the periodic table, etc. We will ideally take what you already know and then learn even more about these particular topics, while at the same time challenging ourselves with a more in depth approach. For example, you may already know that acids are sour, but you may not have learned yet how to calculate the pH of an acidic solution.

**Assignment # 1**

**Directions:**

In the following blank space on this page, list at least **10** things about chemistry that you already know. If at first you can't think of any, just think a little bit harder! The things that you know don't have to be very elaborate or in depth. Also, our every day experiences can be great places to find chemistry in action...

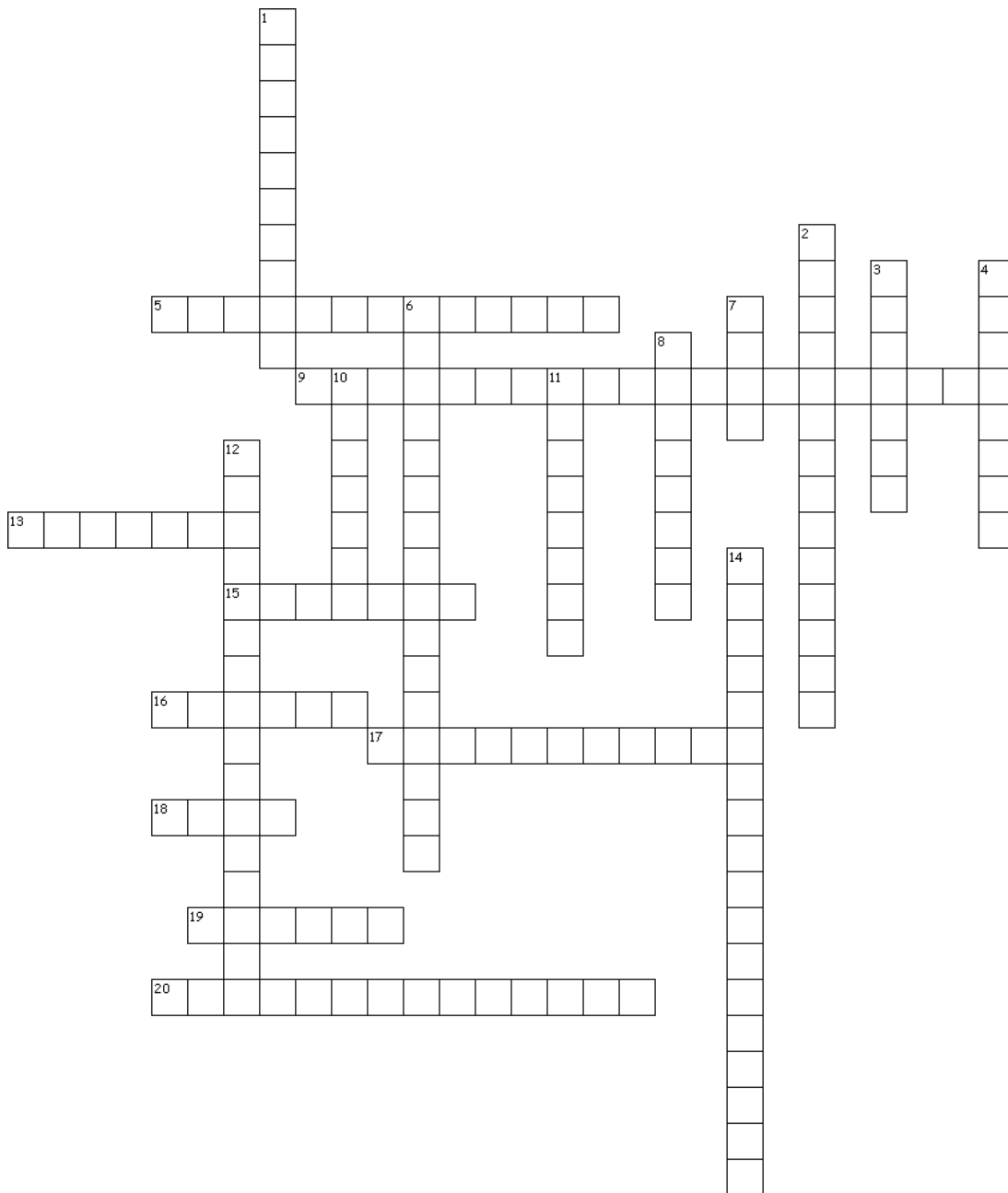
- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Name \_\_\_\_\_

## Assignment # 2

In the following assignment, you will practice matching up some basic chemistry vocabulary words with their definitions in the form of a crossword puzzle

# State of Matter – Chemistry



Name \_\_\_\_\_

# State of Matter – Chemistry

## Word Bank:

**Isotope, Molecule, Compound, Element, Periodic Table, Neutron, Proton, Electron, Atom, Homogeneous Mixture, Heterogeneous Mixture, Physical Property, Physical Change, Chemical Property, Chemical Change, Kelvin, Density, Temperature, Scientific Method, Mass**

### Across

5. Organized list of known elements, Arranged by increasing atomic number
9. Different material unevenly mixed and easily identifiable
13. Mass per unit volume of a material
15. Atoms of the same element that have different number of Neutrons
16. The SI unit of Temperature
17. Average Kinetic Energy of all particles in an object
18. The smallest particle of an element that still retains the properties of that element
19. Positively charged particle inside the nucleus of the atom
20. Change in shape, size or state

### Down

1. 6 step method to investigate a problem
2. Change of one substance into a new substance
3. Neutral particle inside the nucleus of the atom
4. A neutral particle that forms as a result of sharing electrons
6. Characteristic of a substance that indicates whether it can undergo a chemical change
7. Amount of matter in an object
8. Substance formed from two or more elements in which the exact proportions are always the same
10. Substance with atoms that are all alike
11. Particles surrounding center of an atom with a negative charge
12. Characteristic of a substance that can be observed without changing identity
14. Solid, liquid or gas that contains two or more substances blended evenly

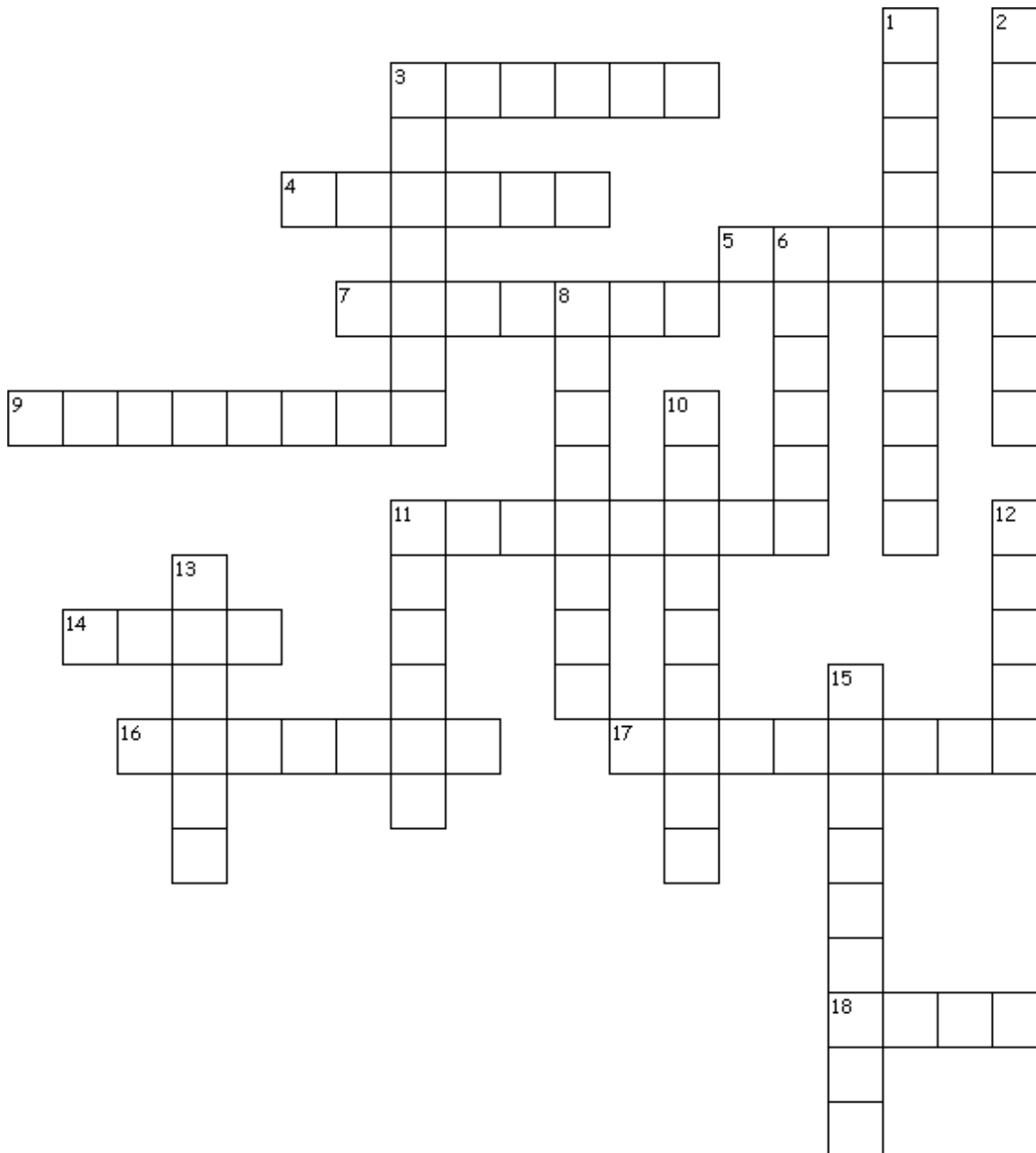
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### Assignment # 3

Oh, the Periodic Table of the Elements! In this next assignment, we will see how much you know about some of the elements and the periodic table.

## Elements in the Periodic Table

Use a periodic table to complete the following crossword



Name \_\_\_\_\_

Across

3. two forms: diamond, graphite
4. Element Number 16
5. The symbol Cu
7. The symbol Si
9. Soda Cans Made from this
11. The lightest known gas
14. Gas used in colored lights
16. Metal used in some Batteries
17. 78% of the air we breathe
18. The symbol Fe

Down

1. Element Number 15
2. In toothpaste protects teeth
3. The metal found in milk
6. 21% of the air we breathe
8. Kills bacteria in swimming pools
10. Element Number 12
11. Gas in Goodyear Blimps, Balloons
12. Element Number 18
13. The symbol Na
15. The Symbol K

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## Part 2: The Mathematics of Chemistry

Raise your hand if you like math! Although chemistry is a science, we use some basic math concepts throughout the entire year of chemistry. Using math in chemistry is sometimes like using the English language in History class. It may not be the main focus, but it sure is a useful tool!

### Assignment # 1:

This first assignment will test your ability to do basic calculations, and also to carry units into your answer. For instance, when we are calculating density, we divide the mass (in grams) by the volume (in milliliters). Our answer, therefore, has units of g/mL. Do your best. You can use a calculator if you wish...

**Complete the following calculations. Include units on your answers.**

1.  $\frac{(54 \text{ g})}{(4 \text{ L})}$

10.  $\frac{(75 \text{ kg}) (5.0 \text{ m})}{(2.5 \text{ s}) (6.0 \text{ s})}$

2.  $(34 \text{ cm}) (21 \text{ cm}) (8 \text{ cm})$

11.  $56 \text{ N} \times 2.5 \text{ m}$

3.  $\frac{(12 \text{ kg}) (30 \text{ m})}{(10 \text{ s})}$

12.  $\frac{12700 \text{ J}}{(116 \text{ g}) (4.8^\circ\text{C})}$

4.  $\frac{(4.08 \text{ g})}{(0.061 \text{ g})}$

13.  $\frac{26000 \text{ J}}{125 \text{ g}}$

5.  $\frac{(7.5 \text{ N}) (0.25 \text{ m})}{(0.68 \text{ s})}$

14.  $\frac{1.35 \text{ mol}}{3.55 \text{ L}}$

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## Assignment # 2:

In this second assignment, we are asking you to solve for a variable,  $x$ . Many times in chemistry we use an equation to find an unknown quantity while using quantities that we do know. The key is to remember to isolate  $x$  by doing the same mathematical operation to both sides. It is ok to have letters in your answer...

*Solve each of the following expressions for  $x$ . ( $x = ?$ )*

18.  $2x - 15 = 8$

22.  $4x = 3 + 8$

23.  $8x + 5y - z = 0$

24.  $H = WQx$

25.  $Y = \frac{T + 6}{x}$

26.  $x + 8 = 23FG$

27.  $\frac{18KRx}{F^2} = E$

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### Part 3: Some challenging problems...

In this last unit we are asking you to try a few more difficult problems. They include working with scientific notation, balancing chemical equations, and calculating density. Try your best! They may be difficult now, but by the end of your year in chemistry, they should be old hat...

**Express in standard form.**

1.  $5.2 \times 10^3$

2.  $9.65 \times 10^{-4}$

3.  $8.5 \times 10^{-2}$

**Express in scientific notation.**

4. 780000

5. 0.00000422

6. 10000000

**Use the exponent function on your calculator to compute the following.**

1.  $(4.1 \times 10^{23}) (8.0 \times 10^3)$

2.  $(3.6 \times 10^4) (13)$

3.  $(4.0 \times 10^{-3}) (145)$

4.  $(7.9 \times 10^5) (3.1 \times 10^{-8})$

9.  $(4.7 \times 10^{-4}) (1.1 \times 10^{-3})$

5.  $(3.2 \times 10^4) / (6.8 \times 10^3)$

6.  $(4.6 \times 10^3) / (9.8)$

7.  $(298) / (2.7 \times 10^{-2})$

8.  $(5.6 \times 10^{-9}) / (3.3 \times 10^6)$

11.  $(6.3 \times 10^{-6}) / (4.4 \times 10^{-3})$

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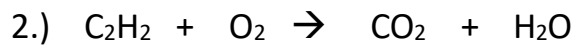
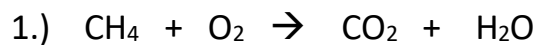
10.  $(-3.2 \times 10^{-7}) (8.0 \times 10^{-9})$

12.  $(-8.5 \times 10^{-4}) / (3.7 \times 10^{-16})$

Balance the following chemical equations (so that there are equal numbers of each element on the reactant and products side):



Atom	Products	Reactants
Na	2	2
Cl	2	2



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Density Calculations:

1. Calculate the density of an object with a mass of 25.0 g and a volume of 4.55 cm<sup>3</sup>.

2.) Water has a density of 1.0 g/mL. What volume of water has a mass of 250 g ?

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## Part 4: Lab Safety

Read the following story about a science activity. Under the passage, rewrite the paragraph identifying and correcting the unsafe laboratory behaviors.

### A Story of First Period Science Lab

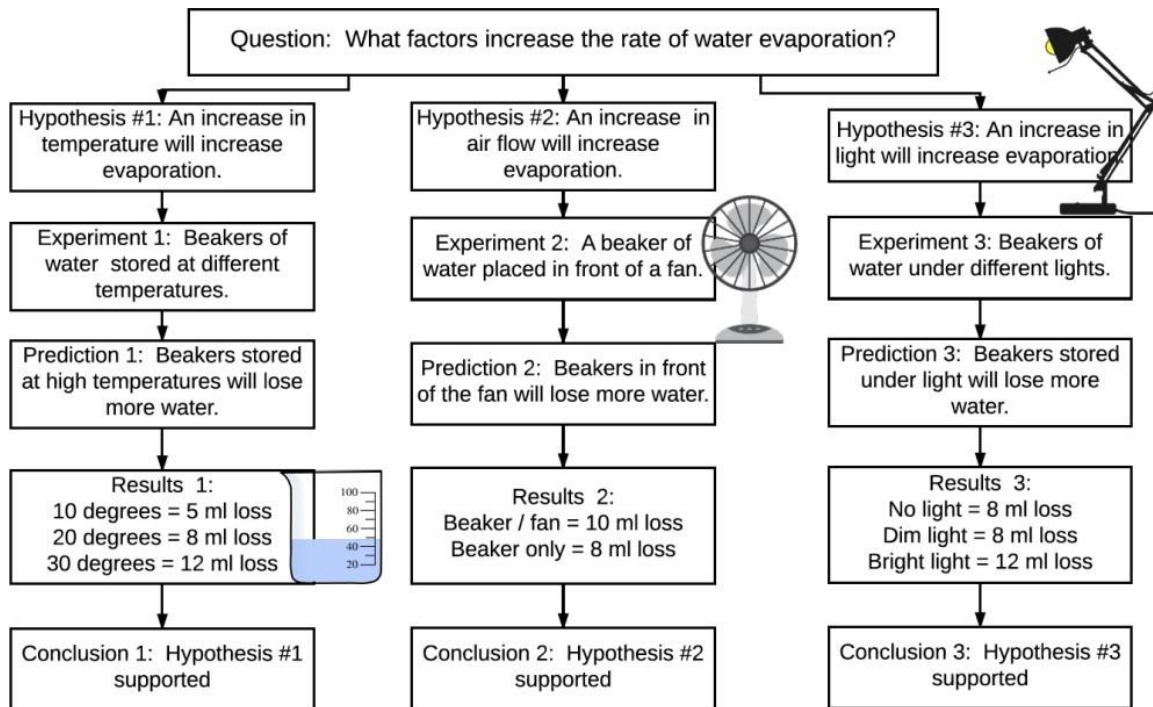
Sarah, Sean, and Tommy loved science class and could not wait to begin their lab. Before Mr. Smith arrived, Tommy lit a Bunsen burner and reached across the flame to give Sarah a beaker to start the experiment. Once Mr. Smith came, the students took a lab quiz, but Michael failed because he did not read the protocol the night before. During the lab, Terry observed a sample substance. He noticed that the substance had a sweet smell, so he decided to take a big whiff of it. John was bored during the lab, so he decided to dare his partner Jodi to put the lens of the cow eye they were dissecting into her mouth. Sam heated a chemical in a test tube over a Bunsen burner. The tube fogged over and he could not see that material in the tube, so he looked over into the tube with his goggles up on his head. He pointed the tube away from his body while he was heating it, but it was pointed directly at another group of students. While trying to open a sample container, Rachel cut her hand. It was not bleeding badly, so she wiped it with a tissue that she had in her pocket and put the tissue back in her pocket without telling Mr. Smith. When Jeff and Gina finished their lab exercise, they noticed that they had a lot of excess chemicals. They dumped the chemicals down the sink and ran the water for 2 minutes to wash them away. At the end of the lab, Ryan and Michelle were cleaning up and noticed a small crack in one of their test tubes. They were afraid that they would get blamed for it, so they secretly put it away with the others. Austin and Karen were working slowly and had just completed the testing of the last sample when the bell rang to dismiss them. Austin and Karen left for their next class because they were afraid they would be late for ELA.

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Name \_\_\_\_\_

## Part 5: Scientific Method

Experimental rigor is important for maintaining the integrity of science. Look at the following question, hypotheses and theoretical experiments, then answer the questions below.



1. What are the independent and dependent variables in each of the experiments?
  - a. Experiment 1:
  - b. Experiment 2:
  - c. Experiment 3:
2. What information should be added to the diagram to give the reader a better understanding of how these experiments were conducted?
3. What items should have been CONTROLLED in the experiments?
4. How much confidence would you have in the conclusion of experiment 3 if you found out that the temperature was not controlled? Explain your reasoning.

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5. Create your own flow chart to answer a causal question.

**Thank you for completing the Chemistry summer packet. Please bring the completed packet to Chemistry class during the first week of school for extra credit! We look forward to seeing you then!**

Sincerely,

Mrs. Piro, Dr. Commodari, & Mr. Fantarella