Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Class:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Add or Subtract**

**Objective**: Plan and conduct an experiment, then report the effect of adding or removing energy on the chemical and physical changes.

In many experiments you have seen or done, you may have observed an increase in temperature. Heat energy is often associated with chemical changes. Heat energy can also be associated with physical changes. For example, you need to add heat to water in order to get it to boil.

Recall that a chemical change occurs when two substances interact causing one or both to change properties. Variables can change the expected results of experiments. This activity will allow you to experiment with variables and see how they can affect chemical changes.

You will experiment by either adding or removing heat energy to a substance and then observing the changes. You should make careful observations to determine what physical and/or chemical changes you observe and how energy affected them.

Materials:

2- 250 mL Erlenmeyer Flasks Water

2-Effervescent Tables (i.e. Alkaseltzer) Thermometer

Ice Timer

**Procedures:** \*\*Wear Safety Goggles!\*\*\*

1. Pay attention as an effervescent tablet is placed in room temperature water as a class demonstration. The time it takes this tablet to dissolve will be timed as a class. Record the temperature and the dissolve time in the data table on the back of this page.
2. Go to your group’s station.
3. Send one person from your group to fill one of your Erlenmeyer flasks with hot water from the front of the lab room. The student should measure 100mL of the water into the flask.
4. Use your thermometer to measure the temperature of the water. Ideally, it should be between 80-85 degrees Celsius. If it is hotter than that, let it cool before the next step. Be sure to record the temperature in the data table.
5. **Get your timer ready!!!!** Place one tablet in the hot water and time how long it takes the tablet to disappear. Record your observations in the data table.
6. Fill your second Erlenmeyer flask with 100mL of water. Place your flask in one of the buckets of ice in the middle of room to cool the temperature of the water. Use your thermometer to measure the water’s temperature. The temperature needs to be 15 degrees Celsius or lower before you complete the next step. Be sure to record the temperature in the data table.
7. **Get your timer ready!!!!** Place one table in the cold water and time how long it takes the tablet to disappear. Record your observations in the data table.

**Data Table**

|  |  |  |
| --- | --- | --- |
| **Flask of Water** | **Temperature**  **(Celsius)** | **Time it took to dissolve one tablet (in seconds)** |
| Hot |  |  |
| Room Temperature  (class demo) |  |  |
| Cold |  |  |

Create a line graph showing the results of your experiment. Choose a scale for the x-axis and y-axis that best suits your data.

**Temperature vs. Time**

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**Time**

**Temperature**

**Analysis & Conclusion:**

1. Which liquid dissolved the tablet the fastest?

2. What effect did adding heat energy have on this reaction?

3. When energy is added, how does this affect the motion of the molecules? What about when energy is taken away or subtracted?

4. List at least three things other than temperature that could change the rate of the reaction.