**~~Don’t~~ Play With Your Food**

* **Standards**

3.2.8.A3. Explain how changes in matter are accompanied by changes in energy.

3.2.8.A4. Compare and contrast physical and chemical changes in terms of products.

* **Introduction and background:**

Molecular gastronomy is the science of food, specifically the chemical and physical changes of food and the scientific preparation of food. Molecular gastronomy relies heavily on specialized techniques and ingredients. This lab will focus on two techniques: spherification and gellification. Spherification is when a hydrocolloid (usually made from seaweed) is added to a liquid, allowing it to form a sphere when introduced into a calcium salt bath from a syringe. The seaweed immediately begins to form a soft ‘shell’ that encases the food. This shell is then broken on the palate, releasing a burst of liquid. Gellification also uses a seaweed hydrocolloid. In this case, the hydrocolloid will congeal at roughly room temperature, thereby allowing interesting gelled creations of traditionally soft foods or even juices. The type of hydrocolloid and specific calcium salt that is added is dictated by several conditions: the acidity and fat content of the food, the intended serving/preparation temperature, and how the chosen additive will affect the taste and texture of the finally prepared food.

* **Guiding questions:**

What are those chemicals on the back of the label?

How can chemicals enhance our food?

**Apple Juice Caviar**

* **Materials:**

Apple juice without added preservatives

food grade gloves

sodium alginate

calcium chloride

50 mL syringe

water and ice

two disposable food containers

magnetic stir bar

hot plate

measuring cups

500 mL beaker

balance

weigh boat

small strainer

yogurt or ginger ale

paper towels

* **Safety:** Please note that this is a food lab: this must be done in a classroom, NOT a laboratory for safety reasons. Please ensure that food-grade products are used in this lab.
* **Procedure:**
* Use a measuring cup to measure out 250 mL of apple juice. Pour into beaker.
* Use the balance and the weigh boat to measure out 2 g of sodium alginate. Add to the apple juice.
* Place a stir bar in the beaker and place the beaker on the hot plate.
* Turn on the heat and stir function until a small vortex forms. Continue heating and stirring until all the sodium alginate has dissolved.
* Remove the beaker from the hot plate and place into cold water bath.
* Next, prepare the spherification bath by using the balance and weigh boat to measure out 2.5 g of calcium chloride.
* Add 500 mL of water into one of the food containers.
* Add the calcium chloride. Stir until dissolved.
* When the apple juice is about room temperature, draw apple juice into the syringe.
* Place the small strainer into the calcium chloride bath.
* Drop the mixture into the strainer in the calcium chloride bath drop by drop.
* Do not let drops sit in calcium chloride more than about 45 seconds or else the gelled spheres will be tough.
* Gently swirl spheres around in bath.
* Remove and rinse in water bath.
* Remove from water bath.
* Wipe bottom of small strainer with a paper towel prior to adding to drink or yogurt.

**S’mores S’ghetti**

* **Materials:**

25 g marshmallows

2 g agar powder

236.5 mL water

two 500 mL beakers

hot plate

stir bar

1 chocolate bar

two syringes

balance

weigh boat

1 bowl of ice water

two 3’ lengths of silicon tubing

paper towels

food grade gloves

50 mL graduated cylinder

* **Procedure:**
* Use the graduated cylinder to measure out 236.5 mL of water. Add it to the 500 mL beaker.
* Use the balance to measure out 2 g of agar powder. Add the agar powder to the beaker of water.
* Place the beaker with the agar on the hot plate. Turn heat to medium and add the stir bar. Turn on the stir function to form a vortex without splashing.
* Heat the agar solution until boiling. Allow solution to boil until clear.
* While waiting for the agar to boil, use the balance and weigh boat to measure out 25g of marshmallows. Place marshmallows into another 500 mL beaker.
* Prepare the ice water bath; add water and ice to large container to approximately half full.
* Once agar has boiled and is clear, turn off heat and stir function.
* Pour approximately half of the solution over the marshmallows.
* Use a spoon to stir the mixture until the marshmallows have all dissolved.
* Use the syringe to draw up about 50 mL of marshmallow mixture into syringe.
* Inject into tubing until it is about 1 cm from the other end of the tube. Wipe tube clean.
* Place entire tube into ice water bath. Allow to cool about 3 - 5 minutes.
* Use a spoon to remove the stir bar from the agar solution and set on a paper towel.
* Unwrap the chocolate bar and break into pieces and add to the beaker with the remaining agar.
* Use a spoon to stir until all of the chocolate is melted.
* Use the syringe to draw up about 50 mL of chocolate mixture into syringe.
* Inject into tubing until it is about 1 cm from the other end of the tube. Wipe tube clean.
* Place entire tube into ice water bath. Allow to cool about 3 - 5 minutes.
* While tubing is cooling, clean out syringes.
* Reassemble clean syringes.
* Remove one length of tubing from ice water bath. Dry outside of tubing.
* Pull plunger all the way up on the syringe so that it is full of air.
* Place tip into tubing and slowly depress the plunger, forcing the gelled mixture to eject from the tubing into a clean bowl.
* Once the plunger has been fully depressed, remove syringe from the tubing and repeat the expulsion process until all of the gelled mixture has been expelled from the tubing.
* Repeat previous four steps with other length of tubing.
* Top with crushed graham crackers if desired.
* **Questions:**
* How does a hydrocolloid affect food?
* What is gellification?
* What is spherification?
* **References:** http://www.modernistcookingmadeeasy.com/define/molecular-gastronomy-glossary/what-is/hydrocolloids