Student name: _____ Date: _____

Fruit Caviar

You expect to hear and see the word "molecular" in science class but do you expect chefs and "foodies" to use that word? Some of the most celebrated chefs in the world use the term "molecular gastronomy" to describe some special presentations of foods. Most diners don't realize all food and drink is "molecular." What is a glass of water … H_2O… if not molecules of water?

Think about it….

1. Suppose you are a famous chef and you strive to provide your diners with a fruit experience that is most ***awesome***. You have heard of "fruit caviar" and you found some recipes online and on youtube.com. One recipe is:
    1) Mix 9 ounces of fruit juice with 1 gram sodium alginate. Blend, and strain to remove lumps.
    2) Mix 3 grams of food safe calcium chloride with 18 ounces water in a bowl.
    3) Gently place drops of the fruit and alginate mixture into the calcium chloride solution.
    4) After a minute, gently remove the caviar using a strainer and spoon and put the caviar into a bowl of plain water.
    5) Remove the caviar from the plain water using a strainer and spoon.
    6) Dry briefly on a clean towel and add the caviar to your food creation.

    What questions do you have about the process of making fruit caviar?

    Recall, fruit juice combined with alginate (a food chemical isolated from seaweed) is dropped into a bath of a salt, (specifically, calcium chloride) and water.

    _____

2. What testable questions might help you answer your questions about the formation of fruit caviar? What procedure(s) could you use to test what happens when fruit caviar forms? What materials do you want to use in your tests? To help you organize your thoughts, record your discussions with your classmates by writing comments in the following columns.

What is the testable question for fruit caviar formation?	What materials are needed? What is our procedure? What data will be collected?	Is there a control for "caviar" formation? How will the data be organized?

3. Use the following pages to organize and summarize your science work.

Student name: _____ Date: _____

Science Research Summary

The investigating scientists are:

_____ _____

_____ _____

Our Question(s) — What we want to find out?

Our Test(s) — How we plan to find out?

We plan the following test:

Our Materials

Our Observations and Data (Results)

We plan to collect the following data:

We organize this data in the following data table to allow us to make a claim:

Student name: _____ Date: _____

Our Claim

From our test (experiment) and data (results) we claim:

Our Evidence

Our claim is supported by the following evidence:

Our Reasoning

Our claim and evidence are linked or supported by the following science reasoning:

Our Readings and Discussions — How do our results fit with what others know or have found out?

Our claim, evidence or reasoning fits because we heard:

Our claim, evidence or reasoning fits because we read:

Our Reflection

After working on this question or test we now know and wonder about:

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The Science Behind Your Investigation

You have just observed the reaction of calcium ions and other divalent or multivalent ions (ions with a charge of 2+ or more) with the natural polysaccharide from seedweed called alginate. A divalent ion like calcium 2+ ion sets up a crosslinked gell structure with the polysaccharide to form the gelled shell of the fruit caviar. You may have tested that monovalent salts like sodium chloride, NaCl, or potassium chloride, KCl, did not form the gelled fruit caviar. You may or may not have tested other divalent ions like copper chloride, $CuCl_2$, copper sulfate, $CuSO_4$, and cobalt chloride, $CoCl_2$. They also form the gelled alginate structures. Although alginate is not present in your body, divalent ions such as calcium ions form crosslinked structures with minerals such as hydroxyapatite in your teeth and bones.

This activity illustrates the importance of calcium in the diet and also indicates that other divalent metal ions that are toxicants, such as lead ions from paint, can become incorporated in the bones and teeth of exposed individuals. While communities should protect young children and their citizens from exposure to lead ions, if individuals eat a diet that is rich in calcium and iron ions to provide more than enough calcium for strong bones and teeth and iron for hemoglobin, it is possible the effects of the exposure to lead ions may not be as severe as for individuals with a calcium and/or iron deficient diet.