

Engineering Your Perfect Ice Cream - Resource Handout

Research

I. Listen to the first six minutes of this Science Friday radio segment, [Total Meltdown: The Rate of Ice Cream Collapse](#)

1. Outline the basic steps to making ice cream.
2. What are the ingredients in ice cream and what are their purposes?
3. How do scientists change how ice cream melts?
4. What are the parts of ice cream's chemical structure?
5.
 - a) What are some things that affect melting rate?
 - b) What is something free we can add to ice cream to change how fast it melts?
 - c) How do scientists change how ice cream melts?
6. What is overrun? What does having a big overrun cause?
7. Do ice creams with more air cost more or less?

8. Why is it important to use the same size of scoops when conducting your experiment?

II. Watch this video, [How Science Affects your Ice Cream](#)

1. What did you learn about the process of making ice cream from this video?
2. What determines the consistency of the ice cream?
3. How does having big ice crystals affect your ice cream?
4. Ice cream is a mixture of what two things?
5. What do the water and fats want to do naturally?
6. How do you make sure the water and fat mix?
7. What is another way of preventing your ice cream from melting faster?

III. Read the “Air is Important” and “Sugar and Fat” sections of this American Chemistry Society article, [Ice, Cream ...and Chemistry](#)

- What did you learn about the process of making ice cream from these readings? What affects the rate of melt?

Questions for “Air is Important”

1. What ice cream ingredient do most people not see or know about?
2. What percentage of the volume of ice cream does air make up?
3. What is the amount of air added to an ice cream called? How does it affect the ice cream?
4. Ice cream is an emulsion. Explain what an emulsion is.
5. What two liquids are mixed together to make ice cream?

Questions for “Sugars and Fats”

1. What is the purpose of sugar in ice cream?
2. What is the purpose of fat in ice cream?
3. What is the problem with using fat as an ingredient?
4. Why don't fat and water like to mix?
5. How can you prevent the fat and water mixture from separating?
6. What is an emulsifier and how does it work?
7. What is the emulsifier in basic ice cream?

Baseline Recipe

Fill out the following sections with the recipe to make a simple batch of ice cream with the information from [these slides](#).

Materials and Quantity

-
-
-
-
-
-
-
-
-

Procedure

(Use as many of the numbered spaces as you like.)

1.

2.

3.

4.

5.

6.

7.

Collecting Baseline Data

(If you are doing this project on your own, fill in the chart for Baseline Ice Cream Group 1 only. Use additional lines to repeat the experiment several times.)

| Group | Time |
|----------------------------|-------------|
| Baseline Ice Cream Group 1 | |
| Baseline Ice Cream Group 2 | |
| Baseline Ice Cream Group 3 | |
| Baseline Ice Cream Group 4 | |
| Baseline Ice Cream Group 5 | |
| Baseline Ice Cream Group 6 | |
| Class Average Time to Melt | |

Reflection Questions

1. In your opinion, did the ice cream melt slowly or quickly?
2. What are some changes you can implement—aka, variables—to make the ice cream melt faster or slower?
3. Did you notice differences between this recipe and what you learned about ice cream in your research?

II. Design the Ice Cream Experiment

1. Identify the independent variables.
2. Identify the dependent variables.
3. Identify the control variables.
4. Identify the what independent variable you plan to change.
 1. Amount of Air -
 2. Stabilizer -

Design Your Own Ice Cream

Prototype

| Recipe | Schematic (Draw a picture of your experiment) |
|--------|--|
| | |

Reasoning for recipe:

Data Collection for Experimental Trials

| Ice Cream Mix | Time For 5 mL to Melt |
|---------------|-----------------------|
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Results:

Difference from baseline ice cream:

Reflection: