Ice Cream, Cool Science

Student Activity

Name _____

Class _____

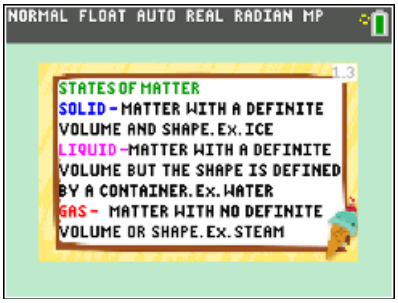
In this activity, you will explore the states of matter with an ice cream theme. You will learn about how molecules can exist as a solid, liquid, or a gas based on the temperature and/or pressure. Ice cream is actually a combination of all three states of matter. You'll need to explore the activity to understand how this is possible.

Move to page 1.2.

1. This page introduces you to Beth Marie's Old Fashioned Ice Cream, an ice cream shop in Denton, TX.

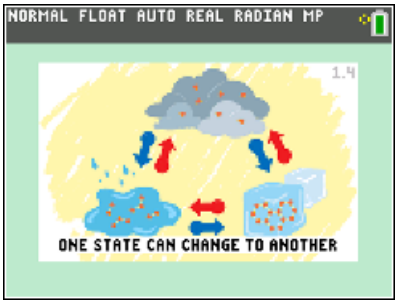
Move to page 1.3.

2. Page 1.3 explains how matter can change between states based on temperature and pressure.



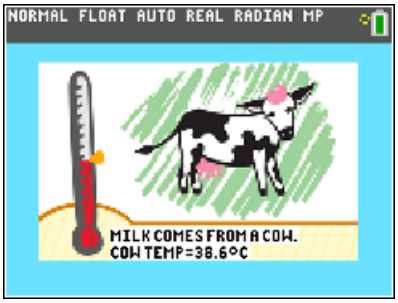
Move to pages 1.4 – 1.6.

3. These pages demonstrate and explain how each state of matter can change into another state of matter with the addition or removal of energy (heat) and/or pressure.



Move to page 1.7.

4. This page is the introduction to an animation walking through the process of making ice cream from cow to cone. Use RIGHT and LEFT arrows to navigate. It also addresses the states of matter that different parts of the ice cream go through during the various temperature changes.



Answer the questions

Q1. Which of the following states are in ice cream (just served from the freezer)?

A. Gas

B. Liquid

C. Solid

Q2. Ice cream contains air (gaseous nitrogen and oxygen), ice (solid water), and syrup (liquid sugar and flavoring).

A. True

B. False

5. Meet Haddy Morales. Haddy is the lead ice cream maker at Beth Marie's. Haddy must know how much cream to add to the machines as well as how much flavorings and add-ins like candy bar crumbles and fruit. The more solid pieces that are added, the more it effects how the ice cream freezes. There is a delicate balance required.

Answer the questions

Q3. Circle the numbers where heat is removed.

1. 4.

2. 5.

3. 6.

Q4. Label the phase changes on 1 and 2.

1.

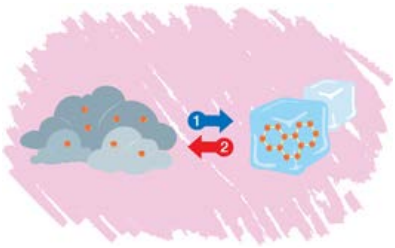
2.

Q5. Label the phase changes on 1 and 2.

1.

2.

Q6. Label the phase changes on 1 and 2.



1.

2.

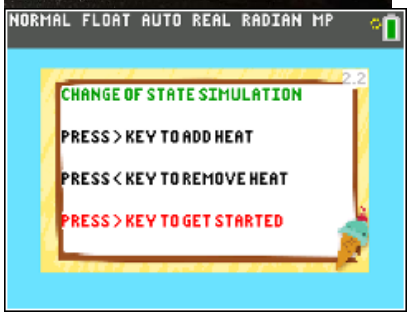
Q7. The image shows sublimation

A. True

B. False

Move to page 2.2.

6. This page discusses what happens at the molecular level during state changes. You will be able to run a simulation of water going through various state changes due to temperature changes. You will see that as temperature is added, the water changes states at the molecular level moving from solid to liquid to gas. Conversely, when heat is removed from the system the molecules become less excited and condense into a solid.



Name _____

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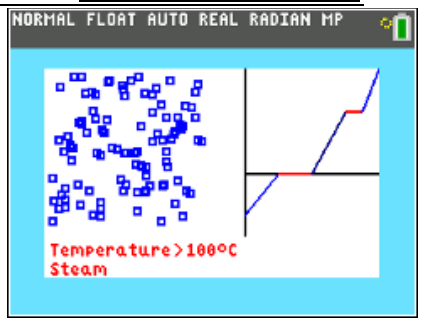

Answer the questions

Q8. The melting point for water occurs when the temperature is above _____.

A. 0**°C**

B. 50**°C**

C. 100**°C**

Q9. The boiling point for water occurs when the temperature is _____.

A. 0**°C**

B. 50**°C**

C. 100**°C**

Q10. As temperature increases, the amount of movement of the particles increases.

A. Always

B. Sometimes

C. Never

Optional Hands-On Activity

Become an ice cream pro like Haddy! Reading about ice cream has probably excited your sweet tooth. So, why not make your own? Follow the instructions to see what Haddy does at Beth Marie's every day!

Material:

* Small ziptop bag
* Quart or gallon size ziplock bag (with about 3 to 4 cups of ice; add 1/2 cup salt)
* One tablespoon of sugar
* One half cup of heavy whipping cream
* Quarter teaspoon of vanilla extract

Directions:

Add the ingredients to the smaller bag and seal it. Put the smaller bag into the bigger ice & salt bag. Seal the bigger ice bag. Massage and shake the ice bag for about 5 to 8 minutes.

What's with the salt?

The salt lowers the freezing point of water to below 0°C. This process is called Freezing-Point Depression. Because more thermal energy would need to be removed in order for the salt + water mixture to freeze, the mixture can pull more energy from the smaller bag (where the ice cream is) more quickly causing it to turn into ice cream faster! Salt is also used on icy roads during the winter. It's safer to drive on wet roads than it is frozen roads.

Congratulations!

Like Haddy, you have what it takes to work in the food industry. A strong understanding of how temperature and pressure affect the states of matter and preparation of food is very important! What other culinary creations would require this knowledge? Think about cooking an omelet or making a cake. What processes are taking place? How do temperature and/or pressure play a role?