



Open the TI-Nspire document *Ice\_Cream\_Cool\_Science.tns*.

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. A simulation will take you through the process of making ice cream from the “cow to the cone”.



**Move to pages 1.2–1.3.**

1. You are introduced to Beth Marie’s Old Fashioned Ice Cream, an ice cream shop in Denton, TX. You are also informed that ice cream is a combination of all three states of matter.

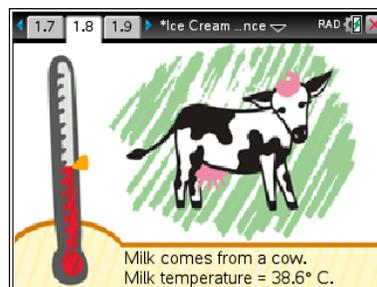
**Move to pages 1.4–1.7. Make notes as you read the information.**

2. Pages 1.4 to 1.7 describes how matter can change between states based on temperature and pressure.

**Move to pages 1.8. Make notes as you view each image.**

3. Images on this page will illustrate the process of making ice cream, from the “cow to the cone.” With each image, the text explains what is happening and how the matter that makes up ice cream is changing states based on temperature changes.

Press **▶** or **enter** to view the next image.



**Move to page 1.9.**

4. Make notes about the vocabulary related to **State Changes**.

**Move to pages 1.10–1.11 and answer the questions here and/or in the .tns file.**

- Q1. Which of the following states are in ice cream (just served from the freezer)?
  - A. Gas
  - B. Liquid
  - C. Solid
  - D. Plasma

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

- A. True
- B. False

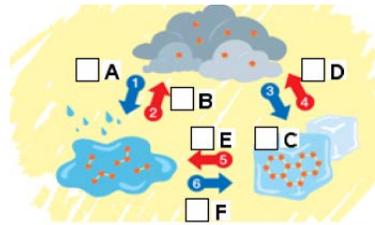
Move to pages 2.1 – 2.2.

5. These pages introduce 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 crumbs and fruit. The more solid pieces that are added, the more it affects how the ice cream freezes. There is a delicate balance required.

Move to pages 2.3–2.6 and answer the questions either here or in the .tns file.

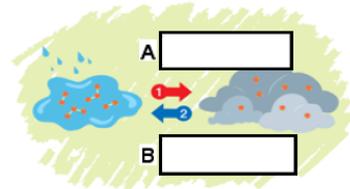
Q3. Select all the labels where heat is removed.

- A
- B
- C
- D
- E
- F



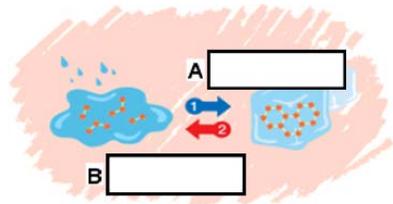
Q4. Label the phase changes on 1(A) and 2(B).

- A.
- B.



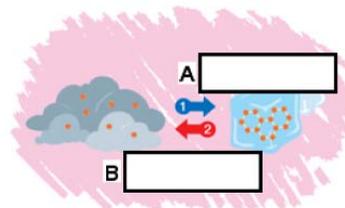
Q5. Label the phase changes on 1(A) and 2(B).

- A.
- B.



Q6. Label the phase changes on 1(A) and 2(B).

- A.
- B.



Q7. The image shows sublimation.

- A. True
- B. False



**Move to pages 3.1 – 3.2.**

6. These pages discuss what happens at the molecular level during state changes. You will be able to run a simulation using three different materials (water, ethyl alcohol, and iron). You should see that as temperature increases, the material 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.

7. **Move to page 3.3**

On this page you will find a simulation of the effect of increasing heat on 3 different substances: water (experiment 1), ethyl alcohol (experiment 2) and iron (experiment 3). Use the **duration** slider to run through each experiment. Set the **substance** number using the other slider.

**Move to pages 3.4–3.6 and answer the questions either here or in the .tns file.**

Q8. The melting point for the substance in experiment 2 occurs when the temperature is \_\_\_\_\_.

- A.  $-114^{\circ}\text{C}$
- B.  $0^{\circ}\text{C}$
- C.  $100^{\circ}\text{C}$
- D.  $78^{\circ}\text{C}$
- E.  $1535^{\circ}\text{C}$

Q9. The boiling point for this substance occurs when the temperature is \_\_\_\_\_.

- A.  $-114^{\circ}\text{C}$
- B.  $0^{\circ}\text{C}$
- C.  $100^{\circ}\text{C}$
- D.  $78^{\circ}\text{C}$
- E.  $1535^{\circ}\text{C}$

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

- A. Always
- B. Sometimes
- C. Never



# Ice Cream, Cool Science

Name \_\_\_\_\_

STUDENT ACTIVITY   

Class \_\_\_\_\_

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**Move to pages 4.1—4.5.**

8. These pages describe a hands-on activity where you are challenged to make your own ice cream. It also introduces the idea of freezing-point depression.