SUCCESS ACADEMY EDUCATION INSTITUTE

# Solids and Liquids and Gases, Oh My!

Name: _____

Teacher: _____

Class: _____

**Physical Science**
**Unit 2**
Exit Tickets

# Lesson 2, Day Two, Exit Ticket: Molecular Dances

Todd wants to know what happens to water molecules as they undergo phase changes.

1. Complete the table below to help Todd accurately compare water in each state of matter. [4]

| Name | Ice | Water | Water Vapor |
|---|---|---|---|
| **State of Matter** | Solid | Liquid | Gas |
| **Temperature** | 0 °C or lower | Above 0 °C<br>but below 100 °C | 100 °C or higher |
| **Molecular Motion**<br>Rank 1–3.<br>1 = slowest<br>3 = fastest | | | |
| **Average Kinetic Energy**<br>Rank 1–3.<br>1 = lowest<br>3 = highest | | | |
| **Volume**<br>(Definite or indefinite?) | | | |
| **Shape**<br>(Definite or indefinite?) | | | |

2. In the space below, create a visual model to represent the relative intermolecular distance of the molecules in each state of matter. Add labels and a key (if helpful) to ensure your model is easy to understand. [2]

*Exit Ticket continues on next page!*

**Lesson 2, Day Two**

Todd also wonders about the difference between *temperature* and *thermal energy*.

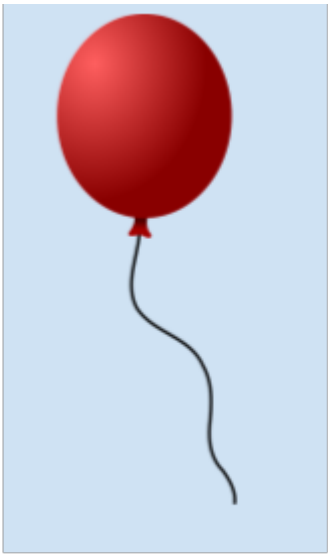
3. Which would have more *thermal energy*: five gallons of water at 59°C or one cup of water at 59°C? Circle your answer below. [1]

**Five gallons of water (contains 40 cups)**
59 °C

**Glass of water (contains 1 cup)**
59 °C

# Lesson 3 Exit Ticket: Achieving Balance

After attending his cousin's birthday party in his backyard, Michael forgot his balloon outside when he went to bed. Overnight, the temperature dropped significantly. When Michael saw the same balloon the next morning, it looked different.



1. Explain what caused this change. Assume no air escaped from the balloon. [3]

2. What does this model tell you about the relationship between temperature and volume? [1]

   A. Volume and temperature increase together

   B. As temperature increases, volume decreases

   C. As temperature decreases, volume increases

   D. Volume and temperature are not directly related

# Lesson 4 Exit Ticket:
# Total Meltdown

**Directions:** Two substances are cooled in separate beakers. After 10 minutes of cooling, both substances have a temperature of 5°C. At this temperature, one substance is a liquid and the other is a solid.

1. Which statement is true? [1]

| | |
|---|---|
| I. | Both substances must have a melting point below 5°C. |
| II. | One substance must have a freezing point below 5°C. |
| III. | Both substances must have a freezing point above 5°C. |
| IV. | One substance must have a boiling point of exactly 5°C. |

   A. I

   B. II

   C. III

   D. IV

   E. I and IV

2. Which statement best describes why freezing point and melting point are usually the same for a substance? [1]

   A. A phase change between liquid and solid occurs at this point.

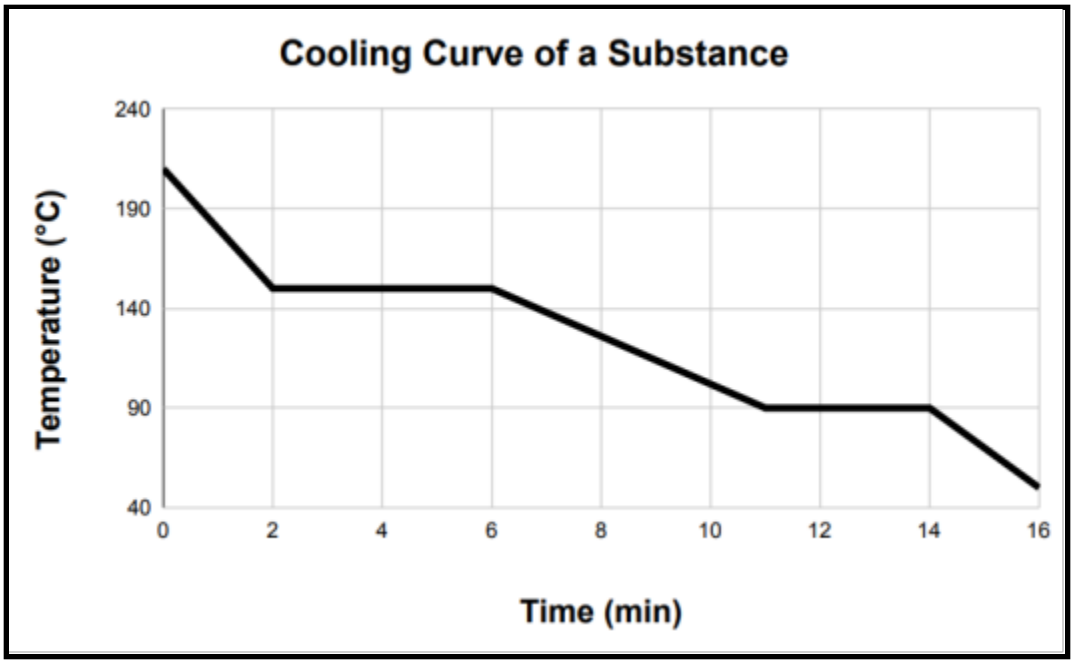
   B. A phase change between gas and solid occurs at this point.

   C. Freezing and melting cannot be told apart.

   D. All substances melt and freeze at the same temperature.

# Lesson 5 Exit Ticket:
# Graphing Phase Changes

The image below shows the cooling curve for a substance.




1. Describe what is happening to the substance between the 2- and 6-minute marks. Explain how you know with evidence from the graph. [2]

2. What is the state of the substance at 70 °C? [1]

   A. Solid

   B. Liquid

   C. Gas

   D. It is impossible to tell

*Exit Ticket continues on next page!*

**Lesson 5**

3. Which statements about what happens to energy levels during phase changes are true?

| | |
|---|---|
| I. | Average kinetic energy and potential energy decrease |
| II. | Average potential energy changes, while average kinetic energy stays the same |
| III. | Average kinetic and potential energy increase |

A. I

B. II

C. III

D. I and II

# Lesson 6 Exit Ticket:
# A Pinch of Salt

Shayne conducted an experiment to determine whether hand sanitizer or water had a lower boiling point. He collected the data in the table below.

| Time on hotplate | 0 min | 1 min | 2 min | 3 min | 4 min | 5 min | 6 min | 7 min | 8 min |
|---|---|---|---|---|---|---|---|---|---|
| **Temperature of hand sanitizer** | 19 °C | 36 °C | 55 °C | 75 °C | 75 °C | 75 °C | 92 °C | 106 °C | 120 °C |
| **Temperature of water** | 19 °C | 34 °C | 48 °C | 61 °C | 74 °C | 87 °C | 100 °C | 100 °C | 100 °C |

1. Create a double line graph to display Shayne's data. Ensure you include the following:

    - **Axes**: x- and y-axis labels, units, and a logical scale [2]
    - **Data**: all provided data graphed accurately [1]

# Lesson 7 Exit Ticket:
# An Icy Experiment

During the winter, Khari takes a walk on a beach with his family. He is surprised to see that the ocean water isn't frozen. He takes the temperature of the water, and discovers that it is -2°C! He knows that the freezing point of water is 0 °C, so he doesn't understand how it is possible that the ocean water is both -2 °C and still a liquid.

He asks his siblings what they think, and they reply with the following ideas:

- Asani: Well, maybe the ocean just can't freeze. It's so big that not all the water is the same temperature. If some of it is not as cold, it cannot freeze!

- Tabia: I know that the ocean water contains a lot of salt, the salt must make it harder for ice to form and stay together!

1. Which of the two statements above do you think is most accurate? Explain and justify your response. [3]

# Lesson 8 Exit Ticket:
# Why Do Boiling, Melting, and Freezing Points Vary?

1. Tyla begins heating 200 mL samples of substances A and B at the same time. She notices that they begin to boil at different times. If she heats them both under identical conditions, why might one substance boil before the other? Use your knowledge of *intermolecular forces* and *energy* in your response. [4]

Tyla lives in Denver, CO, while her friend Esther lives in Philadelphia, PA. They each heated 200 mL of Substance A in their respective cities, and noticed a 5 degree difference in the substance's boiling point. The table shows some facts for each city on the day they heated Substance A.

| Location | Outside Temperature (°F) | Elevation (ft. above sea level) | Weather | Time |
|---|---|---|---|---|
| Philadelphia, PA | 56 | 39 | Windy | 12:00 PM |
| Denver, CO | 50 | 5300 | Calm | 10:15 AM |

2. Which is the <u>best</u> explanation for the difference in boiling points? [1]

   A. Two identical substances never have the same boiling point.

   B. The atmospheric pressure is most likely different in each city due to their respective elevations, which could affect the boiling point of the substance.

   C. Since it was colder in Philadelphia, it would have taken Substance A longer to boil.

   D. Since it was colder in Denver, it would have taken Substance A longer to boil.

# Lesson 9 Day 2 Exit Ticket:
# Ice Cream Party, Take Two

1. Evaluate the success of your plan. If your plan was successful, provide a detailed explanation of the reasons why it worked. If your plan was unsuccessful, provide a detailed explanation of why you think it failed and at least one way you would change it if you could redo this challenge. Use the space for any necessary illustrations. [3]