

Teacher Guide: Phase Changes



Learning Objectives

Students will...

- Describe and compare the molecular properties of solids, liquids, and gases.
- Observe how heating affects molecular motion.
- Create and explain a graph of temperature change during phase changes.
- Explain why temperature does not change much during a phase change.
- Determine the boiling, freezing, and melting points of water.
- Find how altitude affects the boiling, freezing, and melting points. (Extension)



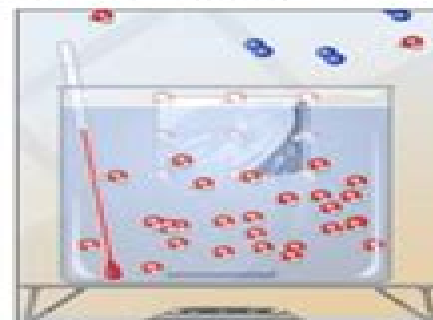
Vocabulary

altitude, boil, boiling point, freeze, freezing point, gas, liquid, melt, melting point, phase, solid



Lesson Overview

The *Phase Changes Gizmo* illustrates how molecular motion is related to phase changes. As students add heat to the system, molecules move faster and phase changes occur—ice melts and water boils. When heat is taken away, condensation and freezing occur. Students can create a graph of temperature vs. time, and the altitude can be changed as well.



The Student Exploration sheet contains two activities and an extension:

- Activity A – Students determine the temperatures at which phase changes occur.
- Activity B – Students discover that adding heat energy causes molecules to move faster. The movement of molecules explains why ice melts and water boils.
- Activity C – Students discover how altitude affects phase changes.



Suggested Lesson Sequence

1. Pre-Gizmo activity: Phase change graph

Before class, create an ice-water bath by placing a bag of ice and a small amount of water into a tub. The temperature should be close to 0 °C. Divide the class into lab groups, and ask students to put on goggles and aprons for safety.

Have each group set up an apparatus to heat the ice water as shown. Stir the water constantly, and record the temperature every two minutes. Once the water is boiling, record 4 more temperature readings before turning off the burners. Graph the results, and discuss. Why does the temperature rise very slowly (or not at all) at first? Why does the temperature stop rising once the water starts to boil?

(⌚ 45 – 60 minutes)



Study Guide Phase Changes

David D. Reid

A red circular graphic with a gradient, appearing as a semi-circle or a partial circle, located to the right of the author's name.

Study Guide Phase Changes:

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Table of Contents Study Guide Phase Changes

1. Understanding the eBook Study Guide Phase Changes
 - The Rise of Digital Reading Study Guide Phase Changes
 - Advantages of eBooks Over Traditional Books
2. Identifying Study Guide Phase Changes
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Study Guide Phase Changes
 - User-Friendly Interface
4. Exploring eBook Recommendations from Study Guide Phase Changes
 - Personalized Recommendations
 - Study Guide Phase Changes User Reviews and Ratings
 - Study Guide Phase Changes and Bestseller Lists
5. Accessing Study Guide Phase Changes Free and Paid eBooks

- Study Guide Phase Changes Public Domain eBooks
- Study Guide Phase Changes eBook Subscription Services
- Study Guide Phase Changes Budget-Friendly Options
- 6. Navigating Study Guide Phase Changes eBook Formats
 - ePub, PDF, MOBI, and More
 - Study Guide Phase Changes Compatibility with Devices
 - Study Guide Phase Changes Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Study Guide Phase Changes
 - Highlighting and Note-Taking Study Guide Phase Changes
 - Interactive Elements Study Guide Phase Changes
- 8. Staying Engaged with Study Guide Phase Changes
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Study Guide Phase Changes
- 9. Balancing eBooks and Physical Books Study Guide Phase Changes
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Study Guide Phase Changes
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
- 11. Cultivating a Reading Routine Study Guide Phase Changes
 - Setting Reading Goals Study Guide Phase Changes
 - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Study Guide Phase Changes
 - Fact-Checking eBook Content of Study Guide Phase Changes
 - Distinguishing Credible Sources
- 13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development

- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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