

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)



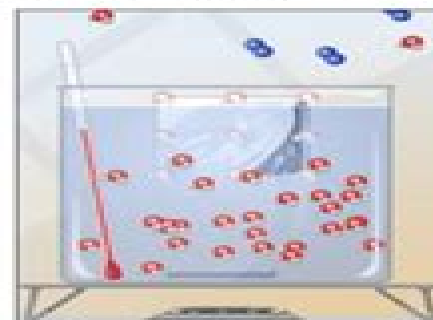
Vocabulary

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)



Teacher Guide Phase Changes Gizmo

Guillaume Favre

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.

Teacher Guide Phase Changes Gizmo:

The book delves into Teacher Guide Phase Changes Gizmo. Teacher Guide Phase Changes Gizmo is a crucial topic that must be grasped by everyone, ranging from students and scholars to the general public. This book will furnish comprehensive and in-depth insights into Teacher Guide Phase Changes Gizmo, encompassing both the fundamentals and more intricate discussions.

1. The book is structured into several chapters, namely:
 - Chapter 1: Introduction to Teacher Guide Phase Changes Gizmo
 - Chapter 2: Essential Elements of Teacher Guide Phase Changes Gizmo
 - Chapter 3: Teacher Guide Phase Changes Gizmo in Everyday Life
 - Chapter 4: Teacher Guide Phase Changes Gizmo in Specific Contexts
 - Chapter 5: Conclusion
2. In chapter 1, this book will provide an overview of Teacher Guide Phase Changes Gizmo. This chapter will explore what Teacher Guide Phase Changes Gizmo is, why Teacher Guide Phase Changes Gizmo is vital, and how to effectively learn about Teacher Guide Phase Changes Gizmo.
3. In chapter 2, this book will delve into the foundational concepts of Teacher Guide Phase Changes Gizmo. This chapter will elucidate the essential principles that need to be understood to grasp Teacher Guide Phase Changes Gizmo in its entirety.
4. In chapter 3, this book will examine the practical applications of Teacher Guide Phase Changes Gizmo in daily life. The third chapter will showcase real-world examples of how Teacher Guide Phase Changes Gizmo can be effectively utilized in everyday scenarios.
5. In chapter 4, this book will scrutinize the relevance of Teacher Guide Phase Changes Gizmo in specific contexts. The fourth chapter will explore how Teacher Guide Phase Changes Gizmo is applied in specialized fields, such as education, business, and technology.
6. In chapter 5, the author will draw a conclusion about Teacher Guide Phase Changes Gizmo. The final chapter will summarize the key points that have been discussed throughout the book.

This book is crafted in an easy-to-understand language and is complemented by engaging illustrations. This book is highly recommended for anyone seeking to gain a comprehensive understanding of Teacher Guide Phase Changes Gizmo.

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