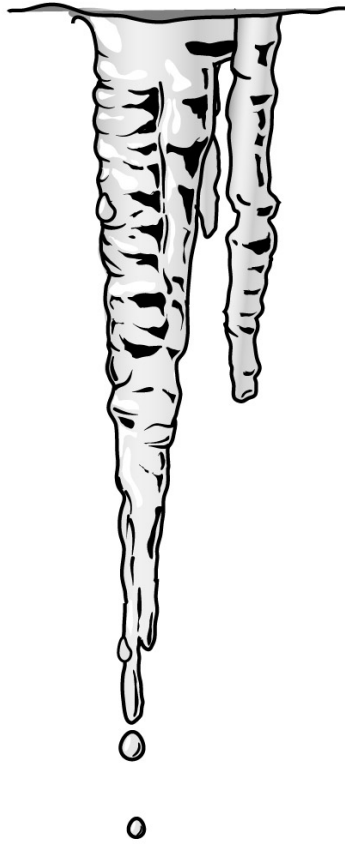


The Changing Phases of Matter

Teacher's Guide



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Table of Contents

A Message from our Company	2
Viewing Clearances	2
Use and Copyright	2
National Standards Correlations	4
Student Learning Objectives	5
Assessment	6
Introducing the Program	7
Program Viewing Suggestions	7
Video Script	8
Answer Key to Student Assessments	12
Answer Key to Student Activities	13
Pre-Test	14
Post-Test	16
Video Review	18
Vocabulary	19
Writing Activity	20
Phase Changes Around You	21
Changing Phases of Water	23

National Standards Correlations

Benchmarks for Science Literacy

(Project 2061 – AAAS) Grades 3–5

The Physical Setting – The Earth (4B)

By the end of the 5th grade, students should know that:

- When liquid water disappears, it turns into a gas (vapor) in the air and can reappear as a liquid when cooled, or as a solid if cooled below the freezing point of water. Clouds and fog are made of tiny droplets of water.

The Physical Setting – The Structure of Matter (4D)

By the end of the 5th grade, students should know that:

- Heating and cooling cause changes in the properties of materials. Many kinds of changes occur faster under hotter conditions.

National Science Education Standards

(Content Standards: K–4, National Academy of Sciences)

Physical Science – Content Standard B

As a result of their activities in grades K-4, all students should develop an understanding of:

- Materials can exist in different states-- solid, liquid, and gas. Some common materials, such as water, can be changed from one state to another by heating or cooling.
- Objects are made of one or more materials, such as paper, wood, and metal. Objects can be described by the properties of the materials from which they are made, and those properties can be used to separate or sort a group of objects or materials.

Student Learning Objectives

Upon viewing the video and completing the enclosed student activities, students will be able to do the following:

- Explain that phases of matter, also called states of matter, are the physical forms matter can take.
- State the four phases of matter: solid, liquid, gas, and plasma.
- Understand that matter is made up of tiny particles that are constantly in motion.
- Explain that the various states of matter are determined by the motion and speed of particles. And understand that the movement of particles is related to the amount of energy a given type of matter contains.
- Explain that the particles in solids are packed closely and are more or less locked into place.
- Understand that solids have a definite shape and a definite volume.
- Explain that the particles in liquids are more loosely arranged. Liquids have a definite volume, but do not have a definite shape.
- Understand that the particles in gases are very loosely arranged. Gases do not have a regular volume and do not have a definite shape.
- Define a phase change as the change of matter from one phase to another. A phase change involves energy being added or taken away.
- Describe melting as a phase change from a solid to a liquid.
- State that the melting point of water is 0 degrees Celsius (32 degrees Fahrenheit).
- Explain that freezing involves the change of a liquid to a solid.
- State that the freezing point of water is 0 degrees Celsius (32 degrees Fahrenheit).
- Define vaporization as a phase change of a liquid to a gas.
- Differentiate between the processes of evaporation and boiling.
- Understand that condensation occurs when particles in a gas lose energy, slow down, and change phase into a liquid.
- Explain that sublimation occurs when the surface particles of solids gain enough energy to become a gas.
- Provide some common examples of phase changes that regularly occur.

Assessment

Preliminary Test (p. 14–15):

The Preliminary Test is an assessment tool designed to gain an understanding of students' preexisting knowledge. It can also be used as a benchmark upon which to assess student progress based on the objectives stated on the previous pages.

Post-Test (p. 16–17):

The Post-Test can be utilized as an assessment tool following student completion of the program and student activities. The results of the Post-Test can be compared against the results of the Preliminary Test to assess student progress.

Video Review (p. 18):

The Video Review can be used as an assessment tool or as a student activity. There are two sections. The first part contains questions displayed during the program. The second part consists of a five-question video quiz to be answered at the end of the video.

Introducing the Program

Before showing the video to your students hold the following things in front of the class: a piece of ice, glass of water, and a jar containing just air. Explain to students that these are three different examples of matter. Ask them what form of matter is exemplified in each case. Explain to students that all of these examples include water. How can water exist in three different forms? Write the following phrase on the board: “Phases of Matter”. Tell students that matter can exist in different phases. Ask students to describe and name each different phase of matter.

Next, ask students what will happen to the ice if left on the desk for a few hours. Students will describe that the ice will eventually completely melt. Now ask them what would happen if the glass of water was placed in the freezer for several hours. Students will explain that the liquid water will freeze into ice. Write the term “Phase Change” on the board. Explain that these are examples of phase changes. Ask students why they think these phase changes occur. Tell students to pay close attention to the video to learn more about phases of matter, and more about phase changes.

Program Viewing Suggestions

The student master “Video Review” (p.18) is provided for distribution to students. You may choose to have your students complete this master while viewing the program or do so upon its conclusion.

The program is approximately 14 minutes in length and includes a five-question video quiz. Answers are not provided to the Video Quiz in the video, but are included in this guide on page 12. You may choose to grade student quizzes as an assessment tool or to review the answers in class.

The video is content-rich with numerous vocabulary words. For this reason you may want to periodically stop the video to review and discuss new terminology and concepts.

Video Script

1. Have you ever wondered how clouds form?
2. Maybe you have noticed icicles dripping on a sunny winter day?
3. Or, perhaps you have seen the outside of a cold soda can get moist on a warm, humid afternoon.
4. These phenomena are the result of changing phases of matter.
5. What is a phase of matter, and...
6. ... how does matter change from one phase to another?
7. Why do phase changes occur, and why are they important to us?
8. During the next few minutes we are going to answer these questions and others,...
9. ...as we explore changing phases of matter.
- 10. Graphic Transition – Phases of Matter**
11. This person is cutting water with a chainsaw.
- 12. You Decide!** What form is the water?
13. That's right, the water is in the form of ice – it's a solid.
14. One of the amazing properties of water and other substances is that they can exist in three different forms – as a solid...
15. ... a liquid...
16. ...and a gas.
17. Even though water can exist in these very different forms, it is still water.
18. Phases of matter, also called states of matter, are the physical forms that matter can take.
19. There are actually four phases of matter: solid, liquid, gas, and plasma.
20. While plasma is not commonly found on Earth, it is commonly found in stars such as our sun. We'll talk more about plasma in a few minutes.
- 21. Graphic Transition – Moving Particles and Matter**
22. Even though you can't see them, billions of tiny particles make up this pencil.
23. All matter, even matter you can't see, is made up of particles.
24. Tiny particles, in their smallest form, consist of atoms and molecules that are far too small to be seen with the naked eye.
25. Particles that make up matter are constantly vibrating and bumping into each other.
26. The various states of matter are determined by the motion, and speed of particles.
27. Understanding how particles move helps explain how matter behaves and changes phase.
- 28. Graphic Transition – Understanding Phases of Matter**
- 29. You Compare!** Describe how this piece of solid ice is different from liquid water.
30. The ice is rigid, and solid, whereas the liquid water flows easily and takes the shape of the container that holds it.
31. Why is liquid water so different from ice? The answer lies in the behavior of water particles found in liquid water and ice.
32. The particles in solids are packed closely together. The particles move, but not as much as in liquids.

Video Script

33. Particles in solids vibrate, but they are more or less locked into place.
34. Therefore, solids such as ice, have a definite shape and a definite volume.
35. This is why it takes a great deal of effort to reshape a solid.
36. Liquids, on the other hand, such as orange juice have a definite volume, but do not have a definite shape.
37. For example, this beaker contains juice. Notice how the liquid takes on the shape of the container.
38. When poured into this container it takes on a different shape, but it still has the same volume.
39. The reason liquids behave the way they do is because the particles in liquids, while still packed closely together, move more freely past each other.
40. Unlike solids and liquids, gases have no definite shape and no definite volume.
41. If you put a gas in a container and place a lid on it, the gas particles spread out, or squeeze together to fill the container.
42. In other words, the volume and shape of a gas changes according to its container.
43. Particles in gases fly at high speeds in all directions, and are not arranged in any set pattern.
44. This makes it easy for gas particles to move around, spreading apart or moving close together.
45. The fourth state of matter, plasma, has different properties than solids, liquids, and gases.
46. Plasma, such as that found in stars, has no definite shape or volume, and its particles have broken apart.
47. Natural plasmas are found in lightning, stars, and fire.
48. Artificial plasmas are found in fluorescent lights, and are created by passing electric charges through gases.
- 49. Graphic Transition – Solid to Liquid Phase Change**
- 50. You Predict!** What will happen to this ice cube if left on a warm windowsill?
51. Over time it changes from a solid to a liquid. This is an example of a phase change.
52. A phase change is the change of matter from one phase to another.
53. Phase changes occur when energy is added or taken away from a substance.
54. For example, when enough energy is added to a solid it will eventually melt.
55. Melting involves the phase change of a solid to a liquid.
56. The melting point of a substance is the temperature at which a substance changes from a solid to a liquid.
57. The melting point of water, for example, is 0 degrees Celsius or 32 degrees Fahrenheit.
58. The melting point of salt is much higher at 801 degrees Celsius.
59. The opposite of melting is freezing. Freezing is the process where a liquid changes to a solid.

Video Script

60. In this process heat is removed from a substance, particles move slower, to the point where they become locked into place as a solid.
61. The freezing and melting points of water is 0 degrees Celsius, or 32 degrees Fahrenheit.
- 62. Graphic Transition – Liquid to Gas Phase Change**
63. Have you ever left a glass of water on the shelf for several days, and noticed that the water eventually disappeared? Why did this occur?
64. This is the result of a phase change called vaporization.
65. Vaporization involves a phase change of a liquid to a gas.
66. In the process of vaporization particles absorb enough energy to escape the liquid phase.
67. When vaporization occurs at the surface of a liquid the process is referred to as evaporation.
68. Evaporation is occurring all around us in places such as mud puddles, lakes, and even off the surface of our skin.
69. In this process, liquid water changes into water vapor. Water vapor, even though we can't see it, is present in the air around us.
70. Vaporization not only occurs on the surface of liquids, but within liquids as well.
71. If enough heat energy is supplied, particles in a liquid can change to a gas.
- 72. You Observe!** Describe what you see in this container of water.
73. You can actually see vaporization occur as gas bubbles form and travel to the surface. This process is called boiling. Perhaps you have boiled water to cook food.
74. The boiling point of water in normal conditions at sea level is 100 degrees Celsius, or 212 degrees Fahrenheit.
75. The opposite of vaporization is condensation.
76. Condensation occurs when the particles in a gas lose energy, slow down, and change phase into a liquid.
77. Condensation can also occur on the side of a cold soda can as water vapor particles of gas turn into droplets of liquid water on the outer surface of the can.
78. Condensation is also the process by which clouds form. As warm, moisture-rich air containing water vapor rises, at some point the atmosphere air cools enough to condense. When it condenses billions of tiny liquid water droplets form a cloud.
- 79. Graphic Transition – Solid to Gas Phase Change**
80. If you live in a place where winters are cold and snowy, you may have noticed that snow mysteriously disappears even when temperatures are well below freezing.
81. This is due to a process called sublimation. Sublimation occurs when the surface particles of solids gain enough energy to become a gas. In this process particles do not pass through the liquid state.
82. Another example of sublimation occurs in dry ice. Dry ice is actually solid carbon dioxide.
83. At room temperature dry ice goes through a phase change from a solid to a gas without going through the liquid phase.

Video Script

84. Graphic Transition – Summing Up

85. During the past few minutes we have explored the changing phases of matter.
86. We began by briefly discussing the four phases of matter: solids, liquids, gases, and plasma.
87. The arrangement and movement of particles in the various phases of matter were discussed.
88. We then investigated the characteristics of different phase changes including melting, freezing, vaporization, condensation, and sublimation.
89. So, the next time you watch ice melt,...
90. ..., touch a moist soda can on a warm afternoon,...
91. ... or boil a pot of water, think about some of the things we discussed during the past few minutes.
92. You just might think about the changing phases of matter a little differently.

93. Graphic Transition – Video Assessment

Fill in the correct word to complete the sentence. Good luck and let's get started.

1. There are _____ phases of matter.
2. Liquids have a definite volume and no definite _____.
3. Phase changes occur when _____ is gained or lost from a substance.
4. _____ occurs when a liquid changes to a solid.
5. _____ involves a phase change of a liquid to a gas.



Answer Key to Student Assessments

Pre-Test (p. 14-15)

1. a - phases
2. c - four
3. b - particles
4. d - a definite shape
5. a - in stars and lightning
6. c - phase change
7. d - solid to a liquid
8. b - 0 degrees Celsius
9. a - gas
10. b - condensation
11. true
12. false
13. true
14. true
15. false
16. Phases of matter are the physical forms matter can take.
17. The four phases of matter are: solid, liquid, gas, and plasma.
18. A phase change is the change of matter from one phase (state) to another.
19. Melting involves the phase change of a solid to a liquid.
20. Water boils at 100 degrees Celsius.

Post-Test (p. 16-17)

1. d - a definite shape
2. d - solid to a liquid
3. b - condensation
4. c - phase change
5. a - phases
6. b - 0 degrees Celsius
7. c - four
8. a - gas
9. a - in stars and lightning
10. b - particles
11. false
12. true
13. true
14. true
15. false
16. A phase change is the change of matter from one phase (state) to another.
17. Phases of matter are the physical forms matter can take.
18. Water boils at 100 degrees Celsius.
19. The four phases of matter are: solid, liquid, gas, and plasma.
20. Melting involves the phase change of a solid to a liquid.

Video Review (p. 18)

1. The water is in the form of ice which is a solid.
2. The ice is rigid and solid. The liquid water flows easily and takes the shape of the container that holds it.
3. Over time the ice cube will change from a solid to a liquid.
4. You can see vaporization occur as gas bubbles form and travel to the surface in a process called boiling.

1. There are **four** phases of matter.
2. Liquids have a definite volume and no definite **shape**.
3. Phase changes occur when **energy** is gained or lost from a substance.
4. **Freezing** occurs when a liquid changes to a solid
5. **Vaporization** involves a phase change of a liquid to a gas.

Answer Key to Student Activities

Vocabulary (p. 19)

1. phases of matter
2. liquid
3. gas
4. phase change
5. melting
6. freezing
7. vaporization
8. evaporation
9. condensation
10. sublimation

Writing Activity (p. 20)

All matter is made up of tiny **particles**. These particles are in constant **motion**. The movement of particles helps explain how matter behaves. There are four main **phases** of matter. In the **solid** phase particles are packed tightly together and are more or less locked into place. The particles in **liquids** are more loosely arranged, which accounts for the reason why they do not have a definite shape but have a definite volume. The particles in **gases** freely move. This explains why gases have no definite **shape** or volume. **Plasma**, the fourth phase of matter has particles that have broken apart. Plasma is found in lightning, **stars**, and fluorescent lights. It is possible for matter to change form in a process called a **phase**

In Your Own Words (p. 20)

1. A solid has a definite shape and a definite volume. A liquid has no definite shape but does have a definite volume. The particles in solids have less energy, and cannot move as freely as they do in liquids.
2. Clouds form when moisture rich air cools and water vapor changes to tiny droplets of liquid water. This involves the phase change of condensation.
3. Vaporization is the process by which a liquid changes to a gas. In this process particles gain enough energy to “escape” the liquid phase.

Phase Changes Around You (p. 21–22)

- 1.a. This is an icicle. b. There are two phases of water shown - solid and liquid. The icicle is the solid and the water drops and puddle are the liquid. c. The phase change occurring is solid to liquid (melting). d. The thermometer should read above 0° Celsius.
- 2.a This is a stream. b. The phase of water shown is liquid. c. Water exists as a liquid between 0° Celsius to 100° Celsius, but the water temperature of the stream should not exceed 35° Celsius. d. Thermometer should read above 0° to around 35° Celsius.
- 3.a. This is an ice cube. b. The phase of water shown is a solid. c. Water freezes at or below 0° Celsius d. The thermometer should read just below 0° Celsius.
- 4.a. This is liquid water boiling in a teapot. b. The phase change occurring is liquid to gas.

Changing Phases of Water (p. 23–25)

1. The three phases of water are liquid, solid, and gas.
2. The water exists as a solid in the temperature range of -3° Celsius to -1° Celsius.
3. The readings were level at 0° Celsius.
4. The temperature stayed at 0° Celsius for many minutes because water was changing from a solid to a liquid. The energy was being used for this phase change.
5. The water was boiling at 100° Celsius and changing from liquid to a gas.
6. One phase change that occurred was water changing from a solid to a liquid (melting). The second phase change was liquid water changing to a gas (vaporization).
7. The places where phase changes were occurring had a flat or horizontal line (slope).

Pre-Test

Name _____

Circle the best answer for each of the following questions.

- The physical forms matter can take are referred to as:
a. phases **b. molecules** **c. water** **d. atoms**
- There are how many states of matter?
a. two **b. six** **c. four** **d. five**
- All matter is made up of many tiny:
a. water droplets **b. particles** **c. cells** **d. metal pieces**
- Solids have a definite volume and:
a. a changing shape **b. plasma shell** **c. gray color** **d. a definite shape**
- Where can plasma, the fourth state of matter be commonly found?
a. in stars and lightning **b. in the oceans** **c. the air** **d. in freezers**
- The change of matter from one phase to another is called a(n):
a. transition **b. melting event** **c. phase change** **d. converting**
- Melting involves the following type of phase change:
a. liquid to solid **b. solid to gas** **c. gas to liquid** **d. solid to a liquid**
- At what temperature does water freeze?
a. 100 degrees Fahrenheit **b. 0 degrees Celsius** **c. 212 degrees Fahrenheit** **d. 100 degrees Celsius**
- Vaporization involves a phase change of a liquid to a:
a. gas **b. solid** **c. plasma** **d. liquid**
- The process of a gas changing into a liquid is referred to as:
a. vaporization **b. condensation** **c. freezing** **d. sublimation**

Pre-Test

Name _____

Write true or false next to each statement.

- 11. _____ Water can exist in three different phases.
- 12. _____ Particles that make up matter are never in motion.
- 13. _____ Particles in gases are not arranged in any set pattern.
- 14. _____ Different types of matter have different freezing and melting points.
- 15. _____ Vaporization is the process responsible for cloud formation.

Write a short answer for each of the following.

16. What are phases of matter?

17. List three of the four phases of matter.

18. What is a phase change?

19. What is melting?

20. At what temperature does water boil (in degrees Celsius)?

Post-Test

Name _____

Circle the best answer for each of the following questions.

- Solids have a definite volume and:
a. a changing shape **b. plasma shell** **c. gray color** **d. a definite shape**
- Melting involves the following type of phase change:
a. liquid to solid **b. solid to gas** **c. gas to liquid** **d. solid to a liquid**
- The process of a gas changing into a liquid is referred to as:
a. vaporization **b. condensation** **c. freezing** **d. sublimation**
- The change of matter from one phase to another is called a(n):
a. transition **b. melting event** **c. phase change** **d. converting**
- The physical forms matter can take are referred to as:
a. phases **b. molecules** **c. water** **d. atoms**
- At what temperature does water freeze?
a. 100 degrees Fahrenheit **b. 0 degrees Celsius** **c. 212 degrees Fahrenheit** **d. 100 degrees Celsius**
- There are how many states of matter?
a. two **b. six** **c. four** **d. five**
- Vaporization involves a phase change of a liquid to a:
a. gas **b. solid** **c. plasma** **d. liquid**
- Where can plasma, the fourth state of matter be commonly found?
a. in stars and lightning **b. in the oceans** **c. the air** **d. in freezers**
- All matter is made up of many tiny:
a. water droplets **b. particles** **c. cells** **d. metal pieces**

Post-Test

Name _____

Write true or false next to each statement.

- 11. _____ Vaporization is the process responsible for cloud formation.
- 12. _____ Different types of matter have different freezing and melting points.
- 13. _____ Water can exist in three different phases.
- 14. _____ Particles in gases are not arranged in any set pattern.
- 15. _____ Particles that make up matter are never in motion.

Write a short answer for each of the following.

- 16. What is a phase change?

- 17. What are phases of matter?

- 18. At what temperature does water boil (in degrees Celsius)?

- 19. List three of the four phases of matter.

- 20. What is melting?

Video Review

Name _____

While you watch the video, answer these questions:

You Decide!

1. What form is the water?

You Compare!

2. Describe how this piece of solid ice is different from liquid water.

You Predict!

3. What will happen to this ice cube if left on a warm windowsill?

You Observe!

4. Describe what you see in this container of water.

After you watch the video, test your knowledge with these questions.

1. There are _____ phases of matter.
2. Liquids have a definite volume and no definite _____.
3. Phase changes occur when _____ is gained or lost from a substance.
4. _____ occurs when a liquid changes to a solid.
5. _____ involves a phase change of a liquid to a gas.

Vocabulary

Name _____

Use these words to fill in the blanks next to the sentences below.

Words	melting	sublimation	freezing	liquid	condensation
	evaporation	phases of matter	phase change	vaporization	gas

- _____ The physical forms matter can take.
- _____ A phase of matter with a definite volume but no definite shape.
- _____ A phase of matter with no definite volume and no definite shape.
- _____ The change of matter from one phase to another.
- _____ The phase change of a solid to a liquid.
- _____ The phase change of a liquid to a solid.
- _____ Involves a phase change of a liquid to a gas.
- _____ Vaporization that occurs at the surface of a liquid.
- _____ Occurs when particles lose energy and change from a gas to a liquid.
- _____ A phase change that involves a solid changing directly to a gas.

Writing Activity

Name _____

Words	shape	liquids	stars	phases	particles
	motion	phase change	gases	plasma	solid

Use the correct word from above to complete the sentences in the following paragraph.

All matter is made up of tiny _____. These particles are in constant _____. The movement of particles helps explain how matter behaves. There are four main _____ of matter. In the _____ phase particles are packed tightly together and are more or less locked into place. The particles in _____ are more loosely arranged, which accounts for the reason why they do not have a definite shape but have a definite volume. The particles in _____ freely move. This explains why gases have no definite _____ or volume. _____, the fourth phase of matter has particles that have broken apart. Plasma is found in lightning, _____, and in fluorescent lights. It is possible for matter to change form in a process called a _____.

In Your Own Words

1. What is the difference between a solid and a liquid?

2. How do clouds form and what phase change is involved?

3. What is vaporization?

Phase Changes Around You

Name _____

Background: Take a minute to think about some of the different ways you have used water today. Perhaps you had a drink of water, took a shower, or brushed your teeth with water. Maybe you had to travel to school in the rain or snow. Water is everywhere around us, and it doesn't necessarily exist in the form of a liquid.



You may not realize it, but water can exist in three different forms referred to as states or phases. The three phases of water are: solid, liquid, and gas. As a solid, water exists in the form of ice. You are familiar with the liquid form of water because we drink it. Water can also exist as a gas in the form of water vapor. The amount of energy held by water determines the phase in which it exists. Below 0° Celsius water exists as a solid. Between 0° and 100° Celsius water exists as a liquid. And, above 100° Celsius water exists as a gas.

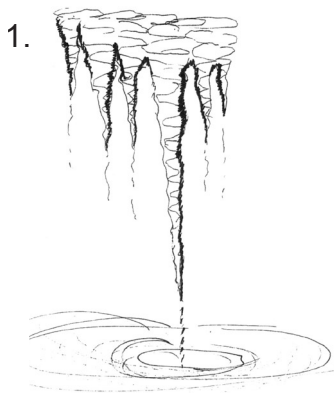
Water does not necessarily stay in one of these three phases. Have you ever put an ice cube tray full of liquid water in the freezer? Or have you ever boiled liquid water in a teapot on the stove? Or, perhaps you have noticed ice cubes melt in a glass. If you have witnessed any of these things, you have observed a phase change of water. A phase change involves matter changing from one form to another. Freezing, melting, and vaporization are all examples of phase changes.

Generally speaking, phase changes of water occur at specific temperatures:

- water freezes at 0° Celsius
- water melts at 0° Celsius
- water boils at 100° Celsius and turns to a gas

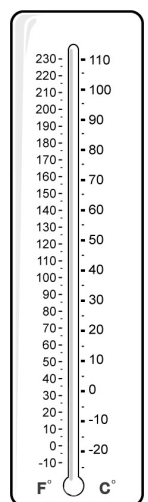
Directions:

In this activity you will be provided with several images that illustrate a specific phase or phase change of water. Study each image carefully, and then answer the questions that pertain to the image. Also fill in the temperature or temperature range at which the phase of water exists or the temperature at which the phase change is occurring. Use red pencil to fill in the thermometer.



- What is this?
- What phase(s) of water is shown?
- What phase change is occurring?

d.



Phase Changes Around You

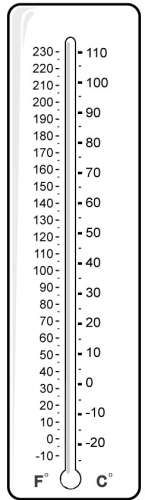
Name _____

2.



- a. What is this?
- b. What phase of water is shown?
- c. What range of temperature does liquid water exist in?

d.

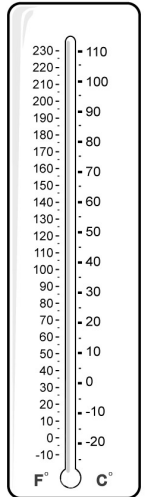


3.



- a. What is this?
- b. What phase of water is shown?
- c. What temperature does water freeze?

d.

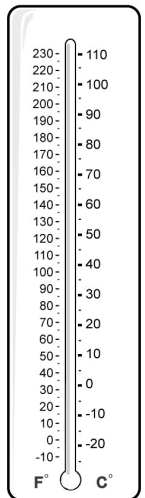


4.



- a. What is this?
- b. What phase change is occurring?
- c. At what temperature does water boil?

d.



Changing Phases of Water

Name _____

Background: Water is one of the most important substances on the planet. All living things need water to survive. Everyday we drink water, and consume other things that are made with water, or need water to survive. We also wash with water, use it to clean our clothes, and even swim in it. Needless to say, water is extremely important.



One of the amazing properties of water is that it exists in all three phases on Earth. Temperature is the main factor determining whether water exists as a solid, liquid, or gas. Liquid water freezes at 0° Celsius (32° Fahrenheit). Below that temperature fresh water exists as a solid in the form of ice. In turn ice melts at 0° Celsius (32° Fahrenheit). Water exists as a liquid between 0° Celsius and 100° Celsius. At 100° Celsius (212° Fahrenheit) liquid water boils, changing from a liquid to a gas.

In this activity you will study the temperature changes and the phase changes that water goes through - from ice to liquid water to a gas. You will graph the temperature changes and answer questions about the data you graph!

Directions:

1. This activity models the phase changes that occur when heat is applied to a container of solid ice over many minutes. After several minutes the ice melts into liquid water. And, after several more minutes the liquid water begins to boil, and some of the water vaporizes into water vapor (a gas).
2. On the following page is a data table that illustrates the temperature changes water goes through as it gains energy. Every minute a temperature reading is taken in degrees Celsius. Take a couple of minutes to study the data in the chart titled "Phase Change Data Table".
3. On the next page is a blank graph titled "Phase Changes of Water". Your task is to create a line graph using the data in the "Phase Change Data Table". With a pencil carefully plot the data. If you have questions, ask your teacher.
4. Answer the questions at the bottom of the page.

Changing Phases of Water

Name _____

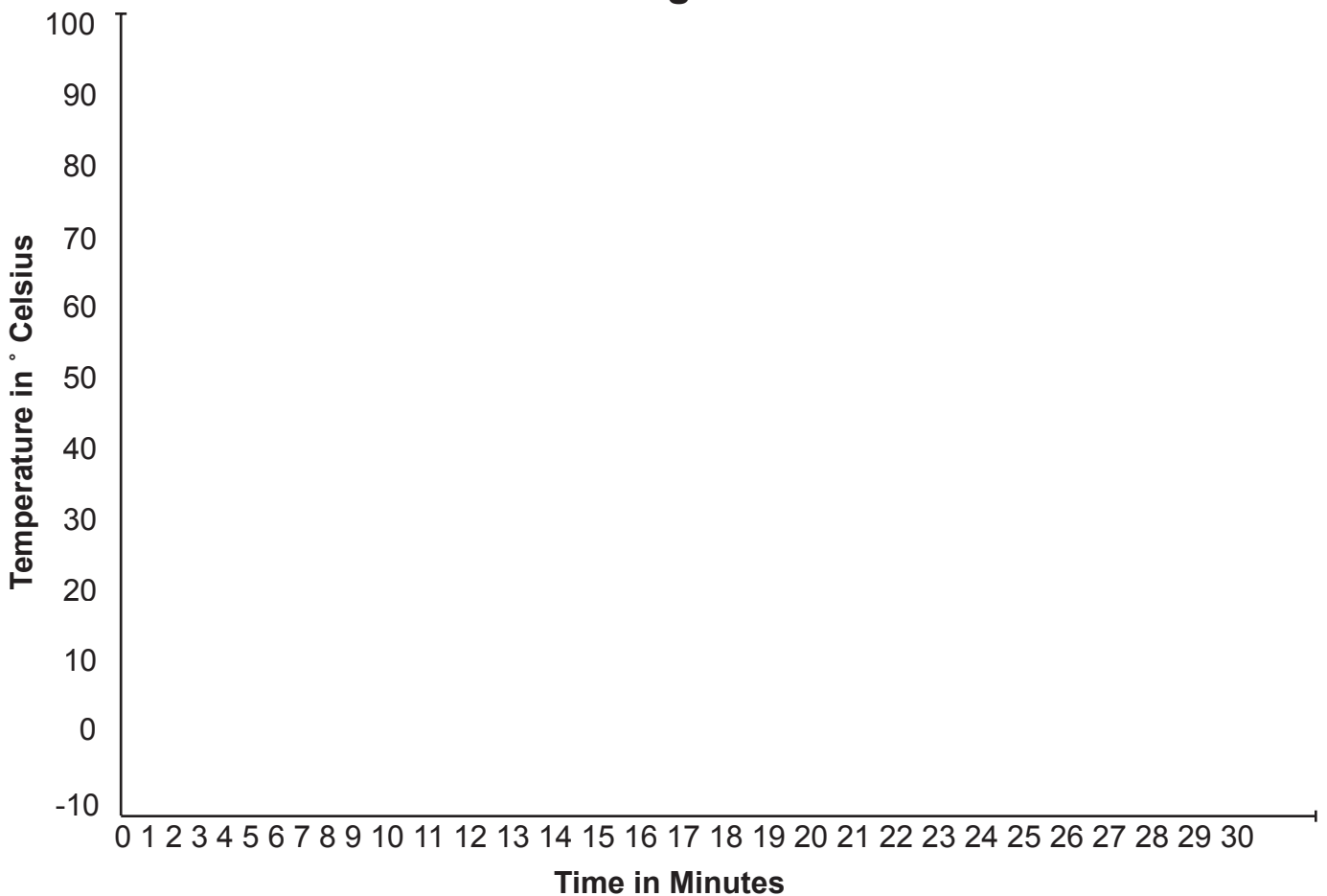
Phase Change Data Table

Minutes	Temperature in ° Celsius
1	-3
2	-2
3	-1
4	0
5	0
6	0
7	0
8	0
9	3
10	8
11	15
12	20
13	25
14	30
15	35
16	40
17	45
18	50
19	55
20	60
21	65
22	70
23	75
24	80
25	85
26	90
27	95
28	100
29	100
30	100

Changing Phases of Water

Name _____

Phase Changes of Water



Questions:

1. List the three phases of water.
2. At what temperature did the water exist as a solid?
3. At what temperature were the readings level early in your experiment?
4. Why do you think the temperature stayed at 0° Celsius for many minutes?
5. What process was occurring at 100° Celsius?
6. Describe the two phase changes that occurred in the activity.
7. By looking at the graph how would you describe the area where phase changes were occurring?