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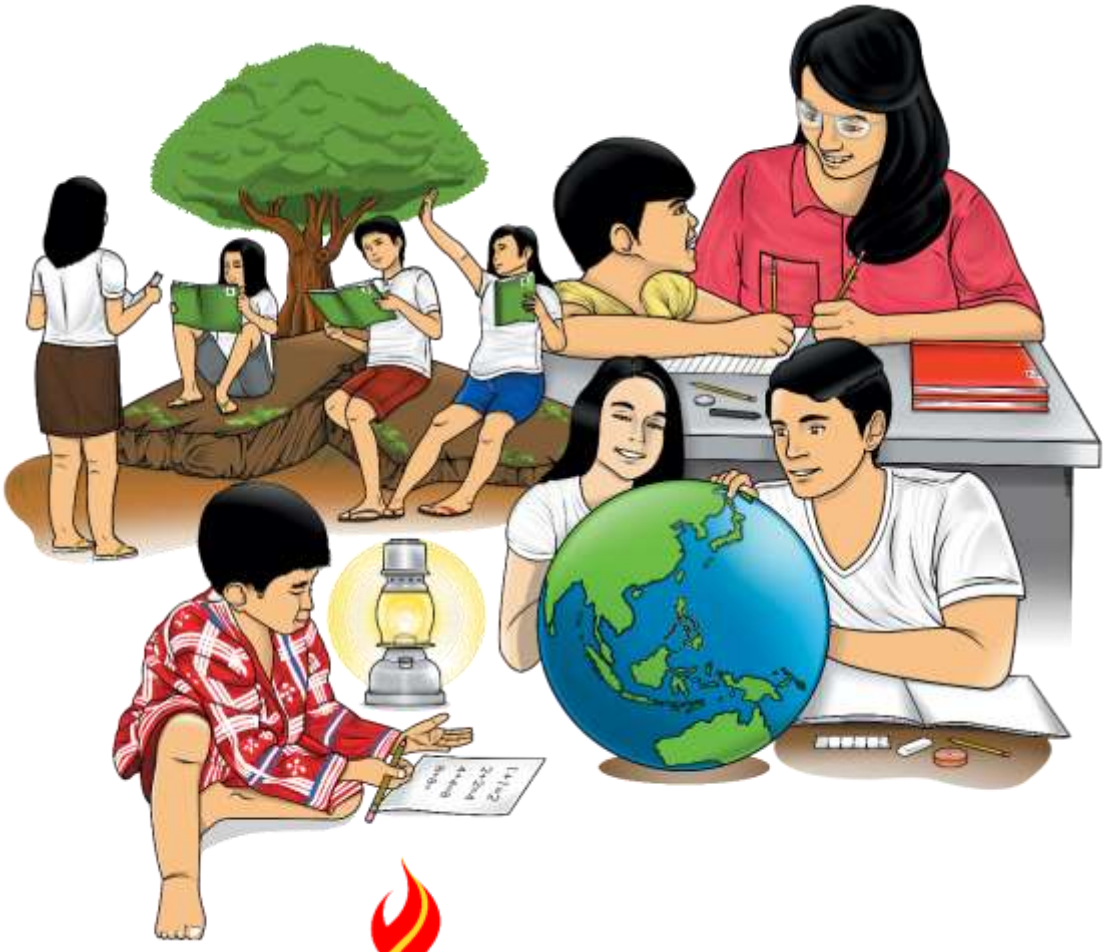
DEPARTMENT OF EDUCATION

# Science

## Quarter 3 – Module 2:
## The Phase Change



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**Development Team of the Module**

**Writers:** Lynnette C. Dua and Eva A. Bentoles

**Editor:** Ana Rubi L. Sereno

**Reviewers:** Bernabe L. Linog, Edna Esplana Trinidad, Jane C. Basul, Romeo A. Villarin, Kevin Hope Z. Salvaña, Alfonz Lexie John C. Basul, Myra Joy B. Montero, Pamela Lou C. Suazo

**Illustrator:** Rosa Mia L. Pontillo

**Layout Artist:** Christopher David G. Oliva

**Layout Evaluators:** Celeste Faith R. Almanon, Jay S. Ayap

**Management Team:** Francis Cesar B. Bringas, CESO V
Isidro M. Biol, Jr.
Maripaz F. Magno
Josephine Chonie M. Obseñares
Gregoria T. Su
Marvilyn C. Francia
Jay S. Ayap

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**Department of Education – Caraga**

Office Address: Teacher Development Center
J.P. Rosales Avenue, Butuan City, Philippines 8600
Telefax: (085) 342 – 8207 / (085) 342 - 5969
E-mail Address: caraga@deped.gov.ph

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# Introductory Message

This Self-Learning Module (SLM) is prepared so that you, our dear learners, can continue your studies and learn while at home. Activities, questions, directions, exercises, and discussions are carefully stated for you to understand each lesson.

Each SLM is composed of different parts. Each part shall guide you step-by-step as you discover and understand the lesson prepared for you.

Pre-tests are provided to measure your prior knowledge on lessons in each SLM. This will tell you if you need to proceed on completing this module or if you need to ask your facilitator or your teacher's assistance for better understanding of the lesson. At the end of each module, you need to answer the post-test to self-check your learning. Answer keys are provided for each activity and test. We trust that you will be honest in using these.

In addition to the material in the main text, Notes to the Teacher are also provided to our facilitators and parents for strategies and reminders on how they can best help you on your home-based learning.

Please use this module with care. Do not put unnecessary marks on any part of this SLM. Use a separate sheet of paper in answering the exercises and tests. And read the instructions carefully before performing each task.

If you have any questions in using this SLM or any difficulty in answering the tasks in this module, do not hesitate to consult your teacher or facilitator.

Thank you.

# *What I Need to Know*

This module was designed and written with you in mind. It is here to help you master the phase change of matter. The scope of this module permits it to be used in many different learning situations. The language used recognizes the diverse vocabulary level of students. The lessons are arranged to follow the standard sequence of the course. But the order in which you read them can be changed to correspond with the textbook you are now using.

This module contains:

- **Lesson 1** - The Phase Change

After going through this module, you are expected to:

1. Identify phase changes;
2. Describe how matter undergoes phase change; and
3. Explain physical changes in terms of the arrangement and motion of atoms and molecules. *(MELC Week 3-4 S8MT-IIIc-d-9)*

# *What I Know*

**Directions:** Choose the letter of the correct answer. Write your answers on a separate sheet of paper.

1. Which transformation process involves the change of state from gas to solid?
   A. deposition
   B. freezing
   C. melting
   D. sublimation

2. Which transformation process occurs in drying of wet clothes?
   A. evaporation
   B. freezing
   C. melting
   D. sublimation

3. Which transformation process changes the state of a matter from that of a liquid to a solid?
   A. condensation
   B. evaporation
   C. freezing
   D. melting

4. What process involves the change of state from solid to gas without passing the liquid state?
   A. evaporation
   B. freezing
   C. melting
   D. sublimation

5. What phase change is observed in the formation of clouds in the atmosphere?
   A. condensation
   B. deposition
   C. evaporation
   D. sublimation

6. What happens to the arrangement of particles of matter in solid, liquid and gas as the temperature is increased?
   A. Particles are becoming closer together
   B. Particles move farther apart from each other
   C. There is no change in the arrangement, it stays the same.
   D. It becomes disordered and then changes back to become ordered

7. In what conditions of temperature and kinetic energy will favor the condensation process?
   A. There is an increase, both for temperature and kinetic energy
   B. There is a decrease, both for temperature and kinetic energy
   C. There is no change, both for temperature and kinetic energy
   D. There is an increase in temperature and a decrease in kinetic energy

8. Which of the given situations demonstrate a phase change?
   A. cutting of nails
   B. drying of fishes
   C. growing of plants
   D. chopping of woods

9. What transformation takes place when dry ice (solid carbon dioxide) changes from solid to gas?
   A. condensation
   B. evaporation
   C. melting
   D. sublimation

10. Which processes increases the movement of particles?
   A. melting → freezing
   B. melting → evaporation
   C. condensation → freezing
   D. evaporation → deposition

11. Which of the following examples turns solid into another state of matter?
   A. cutting of hair
   B. dropping a plastic can
   C. tearing of paper into pieces
   D. ice cubes in a glass of juice

12. What phase change occurs when water droplets form outside the glass of cold water?
   A. condensation
   B. evaporation
   C. melting
   D. sublimation

13. Which of the following phase changes needs an increase of both temperature and kinetic energy?
    A. gas to solid
    B. gas to liquid
    C. solid to liquid
    D. liquid to solid

14. What happens to the arrangement of particles in ice cream once its temperature increases?
    A. The particles are freezing.
    B. The particles are coming closer.
    C. The particles are getting farther.
    D. The particles are getting heavier.

15. Which of the following is TRUE when a substance changes its state from liquid to solid?
    A. The particles of a substance getting smaller.
    B. The particles of a substance become heavier.
    C. The particles of a substance are moving closer.
    D. The particles of a substance changes from soft to hard.

# Lesson 1 The Phase Change

Matter has three states. The state of matter can be in the form of solid, liquid or a gas. When matter changes its states, it is said to be undergoing a Phase Change. This lesson on the Phase Change of Matter explains the changes taking place when matter changes its state.

## *What's In*

Module 1 Lesson 1 talks about that matter is made of tiny particles. These particles are arranged depending on its state. These tiny particles are moving all the time and its movement differs in every state. Can the state of matter change into another state? What happens when ice cream melts? What phase change is observed when solid bathroom deodorizer changes from solid to gas?

## *What's New*

### Phase Change

Matter occurs in three states such as solid, liquid and gas. When ice melts, it changes its state from solid to liquid. This change of state is known as melting. On the other hand, animal oil solidifies when cooled. This change of state from liquid to solid is called solidification. Both melting and solidification are referred as Phase change. We can see that there is a phase change when the current state of matter changes into another state, and still retaining its original composition. When phase change occurs, only the state of the substance is change but its chemical composition is retained. What are some examples of phase changes?

## Activity 1. What changes take place?

**Objective:** Identify the phase change in matter.

**Procedure:**

A. Answer the questions that follow. Write your answers on a separate sheet of paper.

Lighted candle (Figure 1).

Illustrated by: Lynnette C. Dua

*Figure 1. Lighted Candle*

1. What is your observation about the candle before it is lighted? How about during the time the candle was lit? How about after putting out the flame of the candle?
2. What state of matter is the lighted candle when it melts?
3. What process takes place when solid state changes to a liquid state?
4. How about when a liquid state changes back to solid? What is the process called?

Letting wet clothes to dry (Figure 2).

5. What is your observation on the wet clothes before exposure to the heat of the sun? How about during the time of sun exposure? Finally, after it was exposed to the sun?
6. What process takes place when a liquid state changes to a gas state?
7. How about when the gas state changes back to a liquid? What is the process called?

Photo credits: Lynnette C. Dua

*Figure 2. Hang wet clothes*

Photo credits: Lynnette C. Dua

*Figure 3. Toilet deodorizer*

Toilet deodorizer (Figure 3) is placed in the comfort room.

8. What is your observation about the size of the toilet deodorizer based from the given conditions?
   A. Packed toilet deodorizer.
   B. Unpacked deodorizer after 5 days.
   C. Unpacked deodorizer after 15 days.
9. What causes the change in its size?
10. What process takes place when solid state changes to gas state?

## Activity 2. Phase Changes Using the Particle Model of Matter

**Objective:** Explain phase changes using the particle model of matter.

**Directions:**

A. Study the illustrations below. Write your answers on a separate sheet of paper.

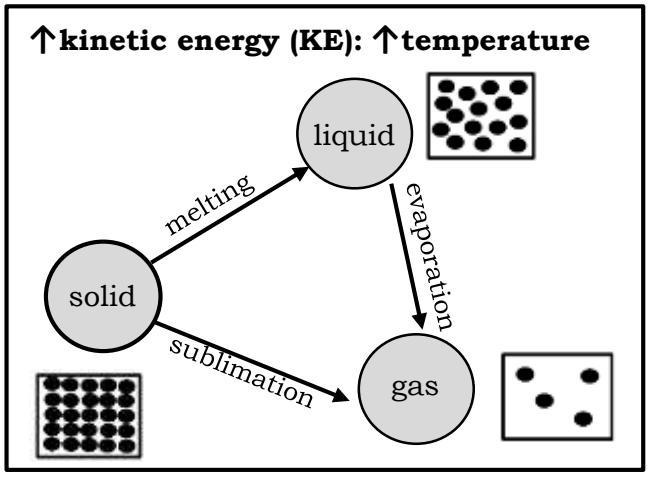



*Figure 4. Phase Changes (Increasing ↑ Temperature and Increasing ↑ KE)*

A.1 Refer to Figure 4.

1. What happens to the arrangement of particles of matter in solid, liquid and gas as the temperature increases? _____
2. What happens to the kinetic energy of particles of matter in solid, liquid and gas as temperature increases? _____

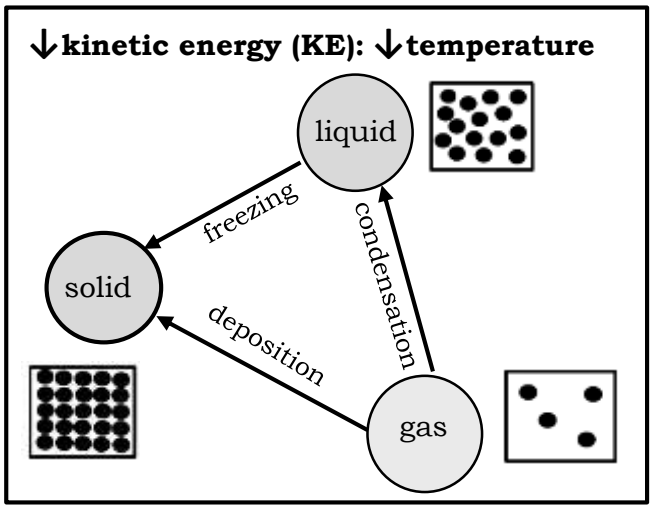



*Figure 5. Phase Changes (Decreasing ↓Temperature and Decreasing ↓ KE)*

A.2 Refer to Figure 5.

3. What happens to the arrangement of particles of matter in solid, liquid and gas as the temperature decreases? _____
4. What happens to the kinetic energy of the particles of matter in solid, liquid, and gas as temperature decreases? _____

B. Describe the motion and arrangement of particles in each state as temperature changes. Fill in the table with the correct answer. Write your answers on a separate sheet of paper. Number 1 is done for you as an example.

| Phase Change | Temperature **(increasing or decreasing)** | Motion (Kinetic Energy) **(fast or slow)** | Arrangement of particles **(very close, close or far)** |
|---|---|---|---|
| 1. Melting (Solid – Liquid) | increasing | fast | close |
| 2. Evaporation (Liquid-Gas) | | | |
| 3. Sublimation (Solid-Gas) | | | |
| 4. Deposition (Gas-Solid) | | | |
| 5. Condensation (Gas-Liquid) | | | |
| 6. Freezing (Liquid-Solid) | | | |

## *What is It*

Matter undergoes phase changes. The phase change is a change from one state to another without changing the chemical composition of a substance. There are six phase changes that matter can undergo.

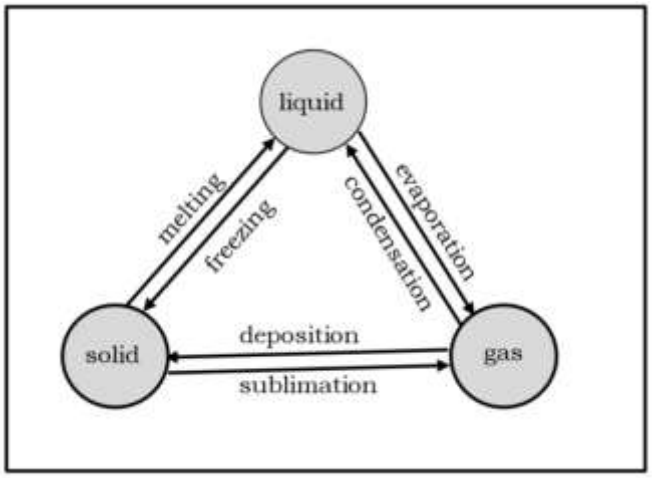
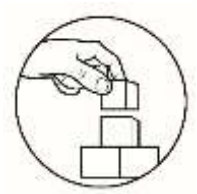



*Figure 6. Phase changes*

Melting is the change of matter from solid state to a liquid state. When liquid state changes back to a solid state, this phase change is called freezing/ solidification. Evaporation is changing matter from the liquid state to gas state, while condensation is the change from the gaseous state to liquid state. When solid state directly changes to gas without passing the liquid state, it is called sublimation. In addition, deposition is the change from a gaseous state directly to solid state.

Increasing the temperature will result in the increase of kinetic energy (motion) of particles and this will affect the current arrangement of the particles in solid, liquid and gas. As the temperature and the kinetic energy are both increase, the tiny particles move, resulting to a farther distance between the particles.

Decreasing the temperature will result in the decrease of kinetic energy (motion) of particles, leading to a closer distance between the particles. The lower the temperature and the kinetic energy, the closer the particles are together.



## *What's More*

### Activity 3. Fill me in!

**Directions:** Identify the phase change involved by filling in the blanks. Write your answers on a separate sheet of paper.

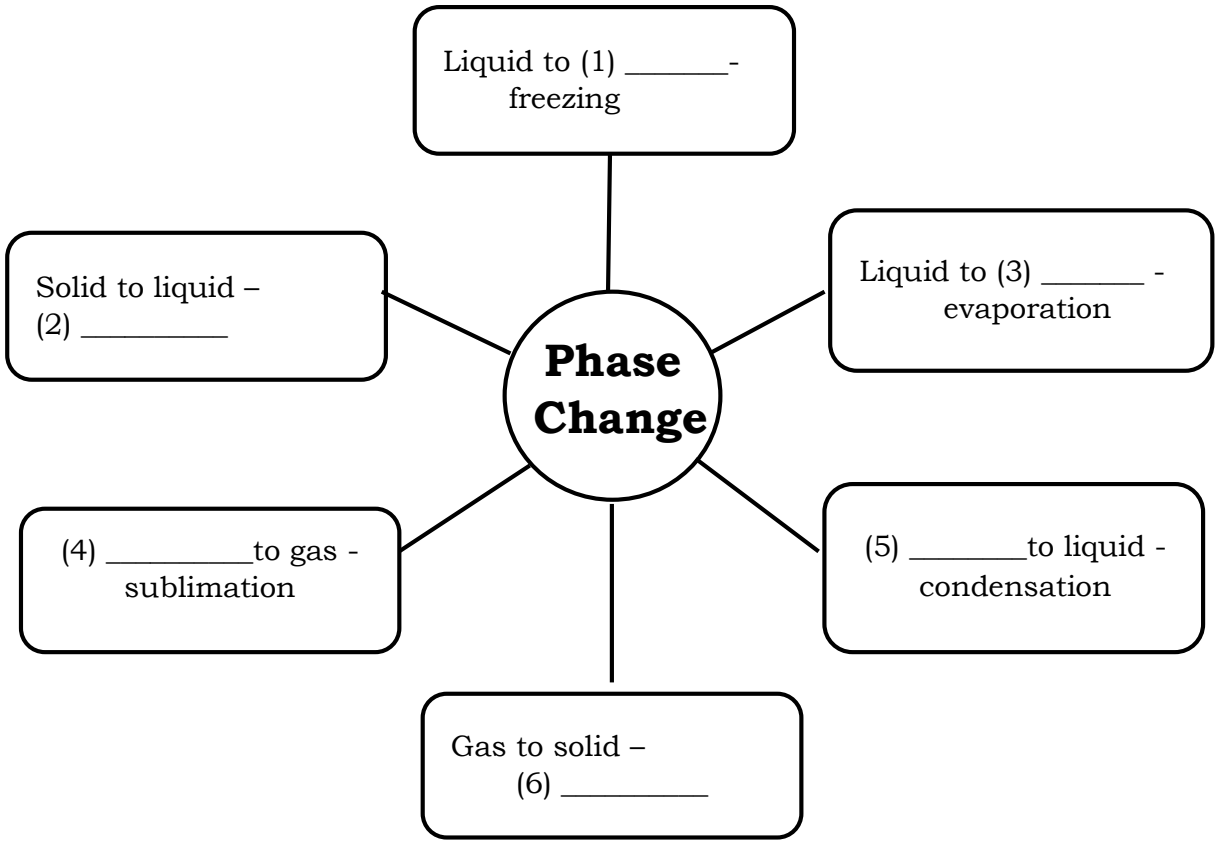
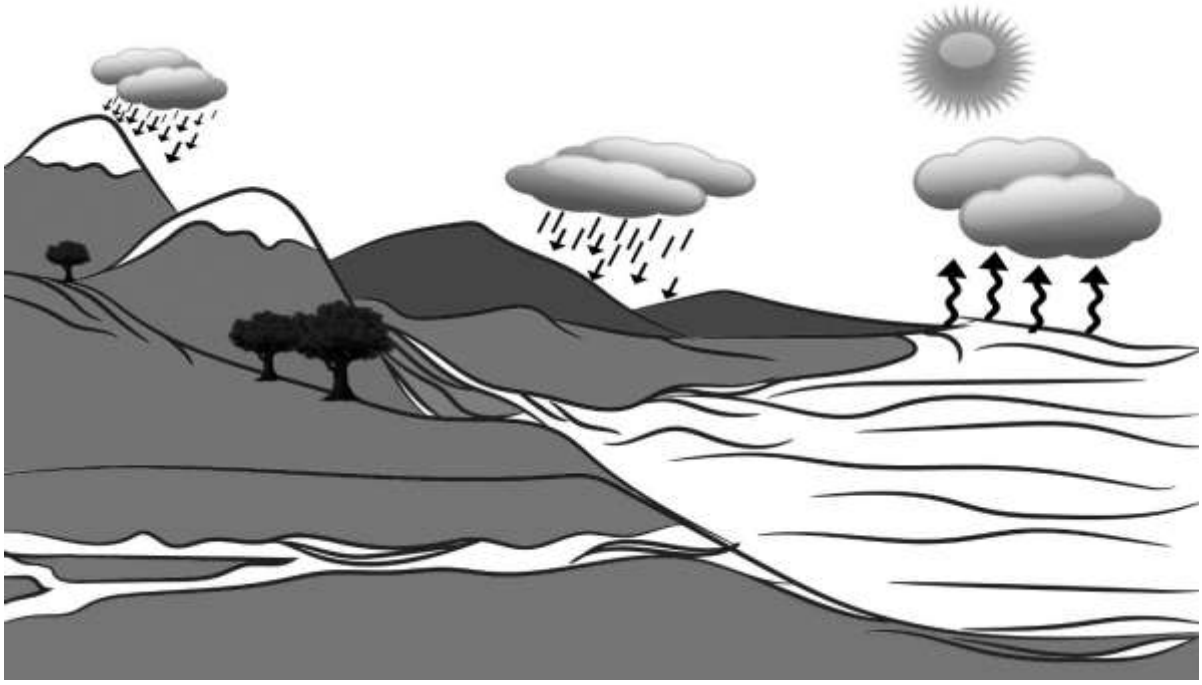



Figure 7. The Phase Changes

## Activity 4. Phase changes in our environment!

**Directions:** Identify the phase changes shown in the picture. Make a presentation on how water behaves in its states within the water cycle. Write your answers on a separate sheet of paper.



Illustrated by: Rosa Mia L. Pontillo

*Figure 8. The Water Cycle*

Answer:

_____

_____

_____

_____

_____

**Scoring Rubrics**

3 – Discussions do not have misconceptions; with complete scientific evidence.

2 – Discussions do not completely show scientific evidence.

1 – Discussions do not show complete scientific evidence; with misconceptions.

0 – There is no discussion shown.

## *What I Have Learned*

**Directions:** Fill in the blanks with the correct answers. Write your answers on a separate sheet of paper.

Phase change is the change of state of substance undergoing from one form to another. The chemical composition of the substance is retained even when it undergoes phase change.

Matter undergoes phase change due to the change in temperature. The higher the (1) _____ and the kinetic energy, the faster the tiny particles move resulting to the farther distance of the particles from each other. The lower the temperature and the (2) _____, the particles move slowly leading to a closer distance of the particles.

As liquid water evaporates, its temperature (3) _____ and its kinetic energy increases. As the water vapor in the form of clouds condenses, its (4) _____ decreases and its kinetic energy (5) _____.

When ice melts, its temperature increases and its kinetic energy (6) _____. As liquid water solidifies, both its temperature and kinetic energy (7) _____.

## *What I Can Do*

**Directions:** Read the text below and answer the question that follows. Write your answers on a separate sheet of paper.

Availability of potable drinking water is a problem today. Hence, we are not sure if the water we are drinking is potable or not. What phase change can we apply to have a safe drinking water? Write your own idea on how to make water potable/drinkable.

**Scoring Rubrics**

3 – Discussions do not have misconceptions; with complete scientific evidence.
2 – Discussions do not completely show scientific evidence.
1 – Discussions do not show complete scientific evidence; with misconception.
0 – There is no discussion shown.

# *Assessment*

**Directions:** Choose the letter of the correct answer. Write your answers on a separate sheet of paper.

1. Which transformation process changes a solid state of matter to a gaseous state?
   A. evaporation
   B. freezing
   C. melting
   D. sublimation

2. Which of the following processes changes a gaseous state of matter to a solid state?
   A. deposition
   B. evaporation
   C. melting
   D. sublimation

3. Which transformation process changes a solid state of matter to a liquid state?
   A. condensation
   B. evaporation
   C. freezing
   D. melting

4. What phase transformation occurs when clouds precipitate in the form of rain?
   A. condensation
   B. evaporation
   C. melting
   D. freezing

5. What will happen to the kinetic energy of the particles of matter if the temperature will increase?
   A. decrease
   B. increase
   C. remains the same
   D. neither increase nor decrease

6. What happens to the arrangement of particles of solid, liquid and gas as the temperature of particles decreases?
   A. Particles are becoming closer together
   B. Particles move farther apart from each other
   C. There is no change in the arrangement, it stays the same.
   D. It becomes disordered and then changes back to become ordered

7. What conditions favor evaporation?
   A. Increase of temperature and increase of kinetic energy.
   B. Decrease of temperature and decrease of kinetic energy.
   C. Increase of temperature and decrease of kinetic energy.
   D. Decrease of temperature and increase of kinetic energy.

8. Which situations undergoes phase change?
   A. cleaning of room
   B. opening of tin can
   C. melting of ice drop
   D. chewing of bubble gum

9. What phase change takes place as ice candy solidifies?
   A. condensation
   B. evaporation
   C. freezing
   D. sublimation

10. Which of the following processes leads to the decrease in the movement of particles?
   A. melting → evaporation
   B. freezing → sublimation
   C. condensation → freezing
   D. deposition → sublimation

11. Which of the following activities turns liquid into another state of matter?
   A. boiling of water
   B. stirring of lemon juice
   C. pouring water in a glass
   D. discarding used water in a sink

12. What phase change occurs in drying wet clothes?
   A. condensation
   B. evaporation
   C. melting
   D. sublimation

13. Which of the following phase changes needs a decrease in temperature and kinetic energy?
    A. solid to gas
    B. liquid to gas
    C. solid to liquid
    D. liquid to solid

14. What happens to the arrangement of particles in mothballs once it is placed inside the cabinet for a month?
    A. The particles are freezing.
    B. The particles are coming closer.
    C. The particles are getting heavier.
    D. The particles are getting farther apart.

15. What happens to temperature and kinetic energy of a substance when it undergoes change of state from liquid to solid?
    A. Both increases
    B. Both decreases
    C. Both remains the same
    D. One either increase or decrease

# *Additional Activities*

**Directions**: Read the selection below, then answer the questions that follow. Write your answers on a separate sheet of paper.

Peter is a good basketball player. He loves to play every day. As he plays basketball, he perspires a lot. After few minutes, his perspiration disappears. What phase change takes place? What happens to his sweat?

_____
_____
_____
_____

**Scoring Rubrics**

3– Discussions do not have misconceptions; with complete scientific evidence.

2 – Discussions do not completely show scientific evidence.

1 – Discussions do not show complete scientific evidence with misconception.

0 – There is no discussion shown.

# *Answer Key*

**What's New**

Act. 2:
A.1
1. As the temperature of the particles increases, the attractive forces decrease.
2. Increases
A. 2
3. As temperature of the particles decreases, its attractive forces increase.
4. Decreases

**What's New**

Act. 1:
1. Candle is solid, its part started melting, its the melted part turns back to solid.
2. Melting
3. Melting
4. Freezing/solidificat ion
5. The clothes were heavy & watery, they gradually dried up
6. Evaporation
7. Condensation
8. The size decreases
9. Because of temperature change, the deodorizer sublime.
10. Sublimation

**What I know**

1. A
2. A
3. C
4. D
5. A
6. B
7. B
8. B
9. D
10. B
11. D
12. A
13. C
14. C
15. C

**What's New**

Act. 2:B

| **B.** | | | |
|---|---|---|---|
| Melting | Increasing | Fast | Close |
| Evaporation | Increasing | Fast | Far |
| Sublimation | Increasing | Fast | Far |
| Deposition | Decreasing | Slow | Very close |
| Condensation | Decreasing | Slow | Close |
| Freezing | Decreasing | Slow | Very close |

## Additional Activities

Possible answers
When Peter's sweat disappears, evaporation occurs. Sweat changes to vapor.
The decrease in size of the ice indicates that melting occurs, and the appearance of water droplets along the side of the glass shows that the water vapor from the surrounding transformed into water droplets. This process is called condensation.

Arrangement of particles of ice.

Arrangement of particles of liquid.

## Assessment

1. D
2. A
3. D
4. A
5. B
6. A
7. A
8. C
9. C
10. C
11. A
12. B
13. D
14. D
15. B

## What I Can Do

Possible answer:

Phase changes involve in making water potable are the processes, evaporation and condensation.

Procedure:
Prepare a simple distillation set-up.
1. Heat the water until it evaporates.
2. Collect the evaporated water that was condensed from the vapor in a container.

## What I Have Learned

1. Temperature
2. Kinetic energy
3. Increases
4. Temperature
5. Decreases
6. Increases
7. Decreases

## What's More

Act. 4
Possible answer:

As water evaporates, it changes to water vapor. This process is called evaporation. When water vapor condenses it forms into clouds, this is called condensation.
Condensation is a process of changing gaseous state to liquid state.

## What's More

Act. 3
1. Solid
2. Melting
3. Gas
4. Solid
5. Gas
6. Deposition

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**For inquiries or feedback, please write or call:**

Department of Education - Bureau of Learning Resources (DepEd-BLR)

Ground Floor, Bonifacio Bldg., DepEd Complex
Meralco Avenue, Pasig City, Philippines 1600

Telefax: (632) 8634-1072; 8634-1054; 8631-4985

Email Address: blr.lrqad@deped.gov.ph * blr.lrpd@deped.gov.ph