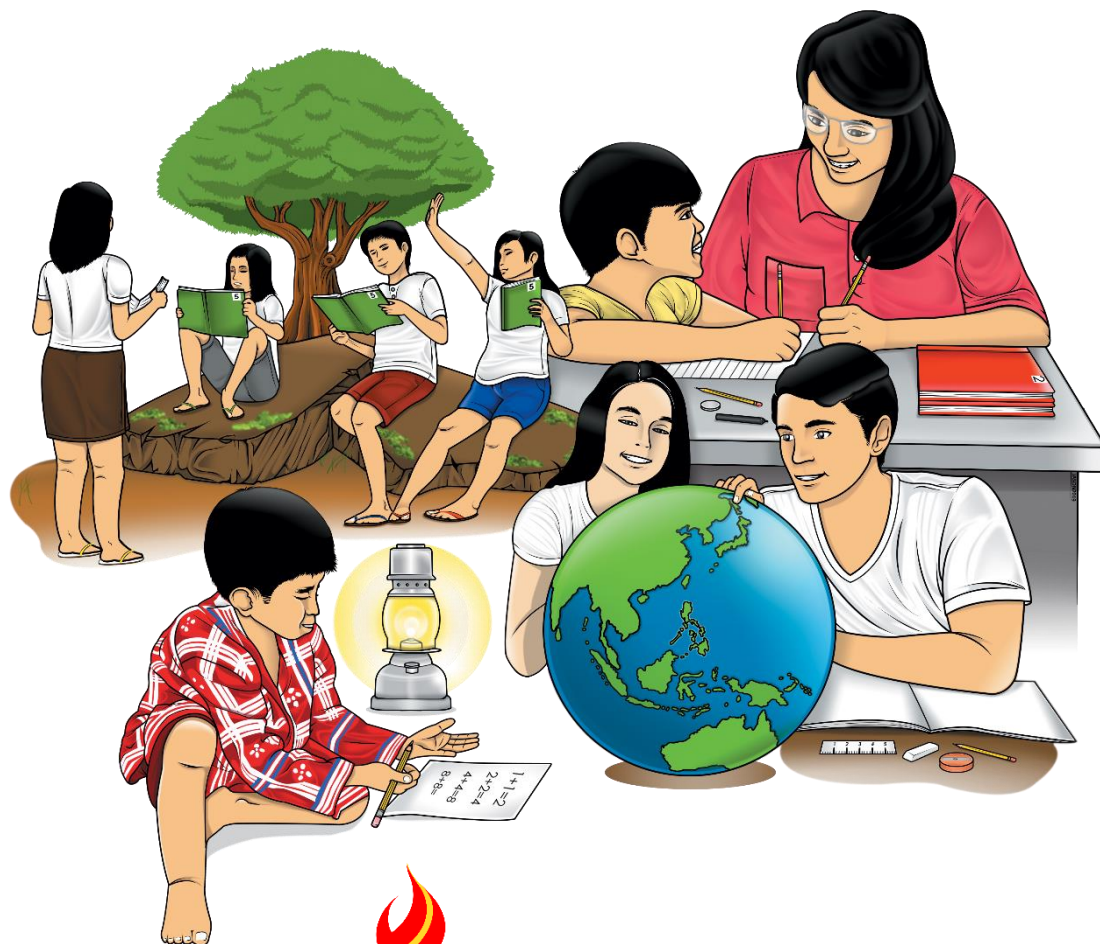


Science

Quarter 4 – Module 4: Rise Above, Sink Below, and Blow Around



Science – Grade 7
Alternative Delivery Mode
Quarter 4 – Module 4: Rise Above, Sink Below, and Blow Around
First Edition, 2020

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Science

**Quarter 4 – Module 4:
Rise Above, Sink Below, and Blow
Around**

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

What have you learned about the earth's atmosphere? It plays an important role in our lives. The earth's atmosphere is composed of different layers where significant processes occur such as the weather systems. The different weather phenomena that we experience on the planet are the result of the interaction of factors and processes such as geography, location, and the sun's radiation. This lesson will discuss the processes and behavior of the various weather systems.

Most Essential Learning Competency:

Demonstrate an understanding on the account for the occurrence of land and sea breezes, monsoons, and intertropical convergence zone (ITCZ). (S7ES-IVf-7)

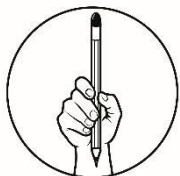
This module is divided into two lessons:

Lesson 1: Behavior of heated air and surrounding air

Lesson 2: Atmospheric Phenomena: Breezes, Monsoon, and Intertropical Convergence Zone (ITCZ).

After going through this module, you are expected to:

1. explain what happens when air is heated;
2. describe the direction of heated or warm air;
3. cite the effect of unequal temperature of air in the atmosphere;
4. identify common atmospheric phenomena such as breezes, monsoons, and intertropical convergence zone;
5. compare the types of breezes and monsoons; and
6. explains the occurrences of Intertropical convergence zone, breezes, and monsoon.



What I Know

Directions: Read and understand the questions carefully. Write your answer on a separate sheet of paper.

1. Why does warm air rise in the atmosphere?
 - A. It is denser than cold air
 - B. It is less dense than cold air
 - C. It weighs more than cold air
 - D. It has higher pressure than cold air

2. Which of the following will cause wind or movement of air in our atmosphere?
 - A. Differences in altitude
 - B. Differences in pressure
 - C. Differences in temperature and altitude
 - D. Differences in temperature and pressure

3. When does air rise in the atmosphere?
 - A. If air particles are cold
 - B. When air is warm and less dense
 - C. When air is denser than other air particles
 - D. If the air pressure around the place is higher

4. What causes the differences of air pressure in the atmosphere?
 - A. Waves of ocean's water
 - B. Rotation of earth on its axis
 - C. Rising and falling of water tides
 - D. Unequal heating of earth's atmosphere

5. What will happen if there is a difference between air pressure and temperature in the atmosphere?
 - A. Formation of wind
 - B. Creation of tides in ocean
 - C. Increase in force of gravity
 - D. Continuation of earth's rotation

6. The following materials are found in our surroundings. Which one of these is the best absorber of heat?
 - A. Oil
 - B. Juice
 - C. Rock
 - D. Water

7. Which of the following statements **CORRECTLY** describe about cool and warm air?

- I. Cool air is denser than warm air.
 - II. Cool air's density is the same with the density of warm air.
 - III. Cool air is denser than warm air and it sinks on the ground.
 - VI. Warm air is less dense than cool air and it will rise on the atmosphere.

 - A. I, II and III only
 - B. I, III, and IV only
 - C. II, III and IV only
 - D. II, III and IV only

8. When air particles in atmosphere are heated, then its temperature increases. Does increase in its temperature cause the decrease in its density?
 - A. No, because only the temperature changed and not the density.
 - B. No, because the density of air particles is not related to its temperature.
 - C. Yes, because the density of air is inversely proportional to its temperature.
 - D. Yes, because the density and temperature of air are directly related to each other

9. What will happen to the particles of air when it is heated?

- A. Expand
- B. Explode
- C. Float
- D. Sink

10. Why do air particles rise if it is heated?

- A. Because the temperature is low
- B. Because its temperature increases
- C. Because it is free to flow everywhere
- D. Because it has very small particles and light weight

11. Which of the following statements are true?

- I. All winds are caused by differences in air pressure.
- II. Air over the heated surface expands and becomes denser.
- III. Air is moving from an area of high pressure to an area of low pressure
- IV. Cool dense air has high air pressure and flows underneath the warm less dense air

- A. I, II and III only
- B. I, III and IV only
- C. I, II, and IV only
- D. II, III, and IV only

12. What happens to air particles when its temperature decreases?

- A. Stays in place
- B. Expand, then rise
- C. Spread in all directions
- D. Moves toward a low pressure area

13. Why does air sink?

- A. Because it has low density
- B. Because it has unstable density
- C. Because its temperature is low making it denser
- D. Because its temperature is high resulting it to be less dense

14. Which of the following statements are **TRUE** about surrounding air when warm air rises in the atmosphere?

- I. it is moving to a low pressure area
- II. it moves away from the place where warm air is rising
- III. it will rise and sink towards the place of rising warm air
- IV. it moves towards the place where warm air is rising in the atmosphere.

- A. I and II only
- B. I and IV only
- C. I and III only
- D. I, II, III, and IV

15. Which of the following statements correctly describes the properties of cold air?

- A. denser and less pressure
- B. denser and more pressure
- C. less dense and less pressure
- D. less dense and more pressure

Lesson

1

Behaviors of Heated Air and Surrounding Air



What's In

Activity 1: Which warms up faster; sand or water?

Materials

- 2 identical plastic containers/recycled bottle or jar (mayonnaise)
- 2 thermometers (optional)
- 2 improvised stands (made of stick)
- String
- Water in one jar/plastic container
- Sand in one jar/plastic container

Procedures:

1. Prepare your two empty plastic containers/jars and fill each container with sand and water respectively.
2. Set-up your two plastic containers containing sand and water similar to figure 1 then place the setup in a shaded area.



Figure 1: Set-up for activity 1
(Photo: Courtesy of Ma. Sheila S. Manila)

3. If thermometer is not available, you may use your sense of touch (by touching the water and sand) to monitor/check the temperature after 5 and 10 minutes.

Q1. Did the temperature of sand and water change after 10 minutes?

Q2. If thermometer was used, what is the initial reading temperature of sand and water?

4. Place your set-up in an area exposed to sunlight and wait for another 10 minutes before checking the temperature.

5. Using thermometer, determine the temperature of the two set-ups every 5 minutes. Copy and record the temperature on the table below.

Observation time(min.)	Water	Sand
0		
5		
10		

6. Without the use of thermometer, record the temperature reading qualitatively by stating as same temperature, warmer than or colder than in every 5 minutes. Copy and record the temperature on the table below.

Observation time(min.)	Water	Sand
0		
5		
10		

7. After 25 minutes, place your two set-ups in a shaded area to identify which of the two will easily decrease its temperature. Record the temperature readings of sand and water every 5 minutes (with or without the use of thermometer).

Q3. Which of the two set-ups easily increased its temperature after 10 minutes?

Q4. Which easily decreased its temperature after 25 minutes; sand or water?

Rubric Scoring

Criteria	5	3	1	Score
Knowledge	Provided detailed explanation and complete response to the question.	Provided clear explanation but incomplete response to the question.	Provided unclear explanation and incomplete response to the question	

Part II: **Directions:** Let's try to perform the activity below!

Activity 2: Rising paper bag

Materials needed:

- two paper bags
- candle
- 1-meter stick/ long straight stick
- Match
- Masking tape/ scotch tape
- Chair
- Pail with water

CAUTION: Please conduct the activity with caution. Use the candle carefully to prevent fire-related accidents. Ask assistance from your parents/guardians while doing the activity.

Procedures:

1. Prepare an area outside your house where you can easily conduct an activity. See to it the place is away from flammable materials.
2. Prepare needed materials and one pail containing water in case of unexpected fire.
3. Attach a paper bag to each end of one meter long straight stick or meter stick.
4. The open part of the paper bag must be facing downward.
5. Place and balance your one meter long straight stick on the chair similar to figure 2.

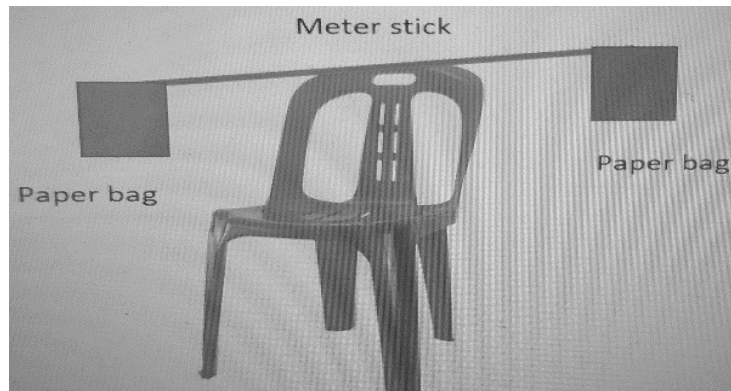


Figure 2: One-meter-long straight stick with paper bags on each side.
(Photo and illustrated by: Ma. Sheila S. Manila)

6. Light your candle and carefully place it below one of the paper bags and observe what will happen.

Q1. What happened to the paper bag after you placed the lighted candle below it?

Q2. How will you explain the occurrence observed on the paper bag?



What's New

Activity 3: Rising warm air inside the box!

Materials needed:

- 1 box (at least 30cm²)
- Candle
- Match
- Scissors
- Cardboard tube/pipe (10 cm long)
- Mosquito coil
- Clear plastic/cover cellophane (30cm²)
- Packing/scotch tape

CAUTION: Please conduct the activity with caution. Use the candle carefully to prevent fire-related accidents. Ask assistance from your parents/guardians while doing the activity.

Procedures:

1. Make two holes in your prepared box, one on top portion and another on one end side of a box. Place the cardboard tube or pipe and tape it on top hole of a box.
2. Make a window part in one side of a box. Cover whole window with a clear/cover cellophane and tape it to make the box airtight. Leave a part on window where you can easily open it.
3. Open the box's window and place a lighted candle directly below the hole on top of a box.
4. After placing your lighted candle inside, close the window of the box.
5. Light your mosquito coil until it produces a smoke and place it on the side hole of the box as displayed in figure 3.

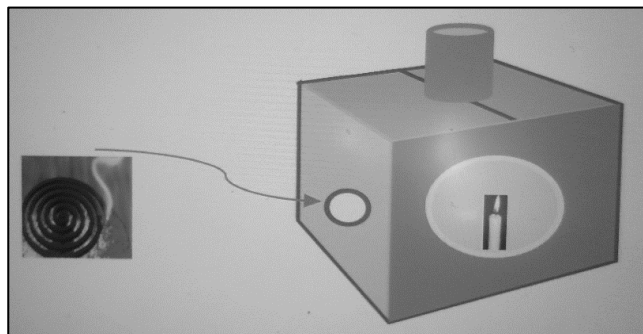


Figure 3: Set-up for activity 3
(Illustrated by: Ma. Sheila S. Manila)

6. Observe the movement of smoke outside the box.

Q1. What will happen with the temperature of air above the lighted candle inside the box?

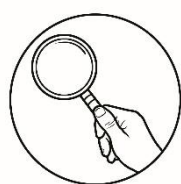
Q2. If the temperature of air inside the box is higher, what will happen to the air?

Q3. What have you observed on the smoke coming from mosquito coil beside the box?

Q4. How could you explain the movement of air inside and outside the box?

Rubric Scoring

Criteria	5	3	1	Score
Knowledge	Provided detailed explanation and complete response to the question.	Provided clear explanation but incomplete response to the question.	Provided unclear explanation and incomplete response to the question	



What is it

Which warms faster?

Specific heat capacity is defined by the amount of heat needed to raise the temperature of 1 gram of a substance by 1 degree Celsius ($^{\circ}\text{C}$). Substance with low specific heat capacity heats up faster while a substance with high specific heat capacity heats up slowly.

In activity 1, water warms and cools down slowly because it is colorless and has a high specific heat capacity. Water needs more amount of energy from the sun to increase its temperature in a longer period of time.

Sand warms and cools down faster because it has dark color and has a low specific heat capacity. Sand doesn't need much energy from the sun to warm in a short period of time.

What happens when air is heated?

In activity 2, you observed that one paper bag rose while the other paper bag dropped. The paper bag moving was caused by the rising warm air from the lighted candle below it that pushed the bag upward. The activity shows that heated or warm air rises or tends to move upward.

Why does heated air move upward?

Have you seen floating objects on water? When oil is mixed with water, a layer of oil appears on the surface of the water because oil is less dense than water. Density is how tightly packed the molecules are in an object. Oil is less dense than water because its particles are less tightly packed than water molecules. If an object sinks, it is denser than the other object.

When air is heated, its molecules gain enough energy to move around faster and spread out. When a mass of air takes up more space, it becomes less dense than the surrounding air molecules. Hence, warm air rises above the cold and denser air below it.

Is the surrounding air affected by the rising air?

In activity 3, the air above the lighted candle became warm and less dense than the rest of the air inside the box which caused it to rise. You observed that the smoke from the mosquito coil moved inside the box through the side hole. This is so because it came through the cool air inlet at the side. This movement of the smoke inside the box shows that the surrounding air is affected by the rising warm air. The rising warm air creates a low pressure inside the box which pulls in cool air from the outside to replace the rising air. Low air pressure is associated with rising air as air particles leave the surface. As the cool air descends, it creates a high pressure at the surface. Air that moves from places of high pressure to low pressure make winds.

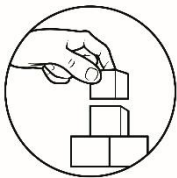
Q1. What happens to the warm air?

Q2. Why does warm air rise?

Q3. Does rising air affect the movement of air from its surrounding?

What is Convection?

Convection is heat transfer by the movement of heated fluid like air. During convection, heated particles of fluid begin to flow, transferring heat from one part of the fluid to another. Convection is caused by differences of temperature and density within a fluid like air. Density is a measure of how much mass than the same volume of fluid.



What's More

Activity 4: Warm air VS. Surrounding air

Materials needed:

- Long bond paper
- Pencil/Pentel pen
- Ruler

Part A.

Procedures:

1. Study and analyze the given diagram on figure 4.
2. Based on activity 3, draw arrows to correctly show the direction of warm air and surrounding air in figure 4.
3. Answer the following guide questions based on figure 4.

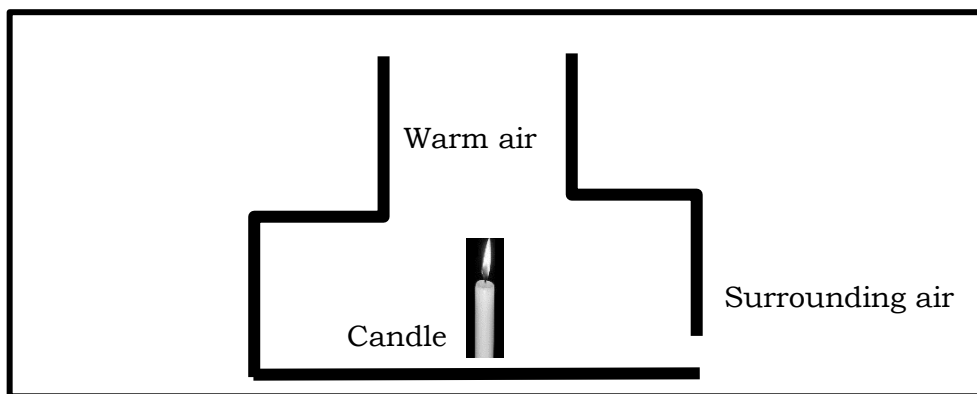


Figure 4: Direction of warm and surrounding air
(Illustrated by: Ma. Sheila S. Manila)

- Q1. Is the movement of warm air always upward?
- Q2. Why is it that the warm air rises?
- Q3. How will you describe the movement of surrounding air?
- Q4. Compare the direction of movements between surrounding air and warm air.

Rubric Scoring

Criteria	5	3	1	Score
Knowledge	Provided detailed explanation and complete response to the question.	Provided clear explanation but incomplete response to the question.	Provided unclear explanation and incomplete response to the question	



What I Have Learned

Directions: Read each item below and fill in the blank to make the sentence correct. Choose your answer inside the box. Copy and write it on a separate sheet of paper.

warm air low rises less dense denser expands high

1. The warm air _____ when it is heated.
2. The movement of surroundings air is affected by the rising _____.
3. The air _____ when it is heated.
4. The warm air is _____ than cold air.
5. The direction of air is from an area of _____ pressure to _____ pressure.



What I Can Do

Directions: Using a separate sheet of paper, make a design on how you can maximize natural ventilation in your house. Answer the following guide questions.

- Q1. Why do we need to maximize natural ventilation in our house?
Q2. What will happen if our house is having poor ventilation?

Rubric Scoring

Criteria	5	3	1	Score
Design/drawing	Presented well designed and complete parts of ventilated house.	Presented well designed but incomplete parts of ventilated house.	Presented incomplete designed of ventilated house.	
Knowledge	Provides detailed explanation	Provides explanation	Provides unclear explanation	



Assessment

Directions: Read and understand the questions carefully. Write your answer on a separate sheet of paper.

1. Why does cool air sink?
 - A. It is denser than warm air.
 - B. It is less dense than warm air.
 - C. Its weight is equal to warm air.
 - D. Its weight is less than warm air.
2. Which of the following will cause wind or movement of air in our atmosphere?
 - A. Differences in altitude
 - B. Differences in pressure
 - C. Differences in temperature and altitude
 - D. Differences in temperature and pressure
3. When do air particles sink to the ground?
 - A. If air particles are warm
 - B. If the air particles are cool and denser
 - C. When the pressure around the place is higher
 - D. When the air is less dense than other air particles

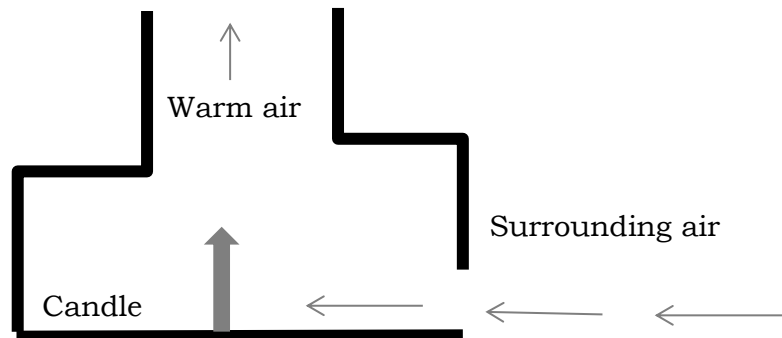
4. What causes air to rise in the atmosphere?
- Increases of air pressure
 - Increases in temperature of air
 - Decreases in temperature of air
 - Decrease of both pressure and temperature of air
5. Which of the following will occur in the atmosphere due to temperature differences of air?
- Melting of cool air
 - Sinking of warm air
 - Floating of warm and cool air
 - Sinking of cool air and rising of warm air
6. The following materials are found in our surroundings. Which one of these is the best absorber of heat?
- Oil
 - Juice
 - Rock
 - Water
7. Which of the following statements describes **CORRECTLY** about cool and warm air?
- | |
|--|
| <p>I. Cool air is denser than warm air.</p> <p>II. Cool air's density is the same with the density of warm air.</p> <p>III. Cool air is denser than warm air thus it sinks on the ground.</p> <p>VI. Warm air is less dense than cool air thus it will rise in the atmosphere.</p> |
|--|
- I, II and III only
 - I, III, and IV only
 - II, III and IV only
 - II, III and IV only
8. When air particles in the atmosphere are heated, the temperature increases. Does increase in its temperature cause increase in its density?
- No, because the higher temperature of air the lesser its density.
 - No, because the density of air is not affected by its temperature at all.
 - Yes, because the density of air will increase if its temperature increases too.
 - Yes, because the density and temperature of air are directly related to each other.
9. What happens when air is heated?
- Stays in place
 - Expands, then rise
 - Spreads in all direction
 - Moves toward a lower elevation

10. Why does air rise?
- Because the temperature is low
 - Because its temperature increases
 - Because it is free to flow everywhere
 - Because it has very small particles and light weight
11. What happens to the surrounding air when warm air rises in the atmosphere?

- it will sink and moves in a low pressure area.
- it moves away from the place where warm air is rising
- it will rise and sink towards the place of rising warm air
- it moves towards the place where warm air is rising in the atmosphere.

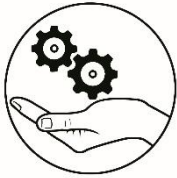
- I and II only
 - I and III only
 - I and IV only
 - I, II, III, and IV
12. Which of the following statements correctly describes the properties of cold air?
- denser and less pressure
 - denser and more pressure
 - less dense and less pressure
 - less dense and more pressure

For items 13-15 refer to the diagram given below.



13. From illustration, what is the direction of warm air?
- Moving downward
 - Moving inside the box
 - Rising towards the atmosphere
 - Moving upward and downward
14. Based on the illustration, why is the surrounding air moving towards the place where warm air is rising?
- Because air is always available in atmosphere
 - Because air always moves into a low-pressure area
 - Because the place of rising air has high pressure area
 - Because air always attracted to the place where air is rising

15. How will you describe the direction of warm air and surrounding air?
- Warm and surrounding air rises
 - Surrounding air rise but not warm air
 - Warm air moves toward the surrounding air
 - Warm air rises and is replaced by surrounding cool air



Additional Activities

Directions: Study and analyze the following human activities in the given pictures. Complete the table by identifying human activities and giving the possible effects of these activities in our atmosphere.



(Photos: Courtesy of Ma. Sheila S. Manila)

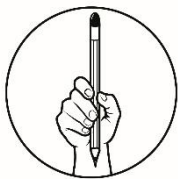
Cutting of trees for lumber

Littering of waste

Burning of garbage

Human activities	Effect in the atmosphere
A	
B	
C	

- Q1. What are the human activities that contribute negative effects to our atmosphere?
 Q2. As a student, what you can do to protect our atmosphere?



What I Know

Directions: Read and understand the questions carefully. Write your answer on a separate sheet of paper.

1. How does air move in land breeze?
- From sea to land
 - From land to sea
 - From east to west
 - From west to east

2. Why does land breeze occur during night time?
- Because water cools off faster than land, air above land is warm
 - Because land cools off slower than water, air above water is cool
 - Because water cools off slower than land, air above the water is warm
 - Because land heats up faster than water, air above the land stays warm
3. When warm air rises on land or water, what happens to the air pressure at the surface?
- Constant
 - High
 - Low
 - Unstable

4. Which of the following statements best describe between the heating and cooling rates of land mass and body of water?

- Land heats up and cools down faster than water.
- Water heats up and cools down slower than the land.
- Land and water heats up and cools down at the same time.
- Water heats up and cools down faster compared to the land.

- I and II only
 - I and III only
 - II and III only
 - II and IV only
5. During day time, which of the following statements is **TRUE** about the air above the land and sea?
- Air above the land is cool and air above the sea is warm.
 - Sea air is higher in temperature than the temperature of land air.
 - Air above land is warm and it rise, then cool sea air moves towards the land.
 - Air above land and sea are in equal temperature and then both move upwards.
6. Which of the following statements account for the occurrence of land and sea breezes?

- Differences in air pressure and temperature between land and water.
- Similarities in air pressure and temperature between land and water.
- Movement of wind from higher pressure area towards a lower pressure area
- Movement of winds from one place to another caused by the differences of air temperature and pressure in surroundings.

- I, II, III, and IV
- I, II, and IV only
- I, III, and IV only
- II, III, and IV only

7. Which of the following occurs during nighttime?
 - A. Sea breeze
 - B. Land breeze
 - C. Night breeze
 - D. Sea land breeze

8. Which of the following types of monsoon brings a heavy rain in the Philippines?
 - A. East west monsoon
 - B. Northeast monsoon
 - C. Northwest monsoon
 - D. Southwest monsoon

9. What months does *hanging habagat* occur in the Philippines?
 - A. June to October
 - B. January to February
 - C. October to December
 - D. December to January

10. Why do different types of monsoons occur?
 - A. Because of the seasons
 - B. Because wind blows from warm to cold regions
 - C. Because of seasonal shifts in wind patterns around the globe
 - D. Because of the movement of air from one place to another place

11. Which of the following statements correctly describes land breeze?
 - A. It is a local wind that blows from polar region to equator.
 - B. A global wind system categorized by the flow of air from water to land at night.
 - C. A local wind system characterized by the flow of air from land to water late at night.
 - D. It is any wind that blows from a large body of water toward or onto a landmass.

12. During nighttime, how will you describe movement of air on land and water?
 - A. Air above land will move away from sea surface
 - B. Air above land will rise and replaces by air from sea
 - C. Air above sea will rise and replaces by air from land
 - D. Air above land and sea will rise, and then both will sink

13. Which of the following describes the direction of winds in different parts of the world?
 - A. Low pressure to high pressure area
 - B. High pressure to low pressure area
 - C. Low pressure to lower pressure area
 - D. High pressure to higher pressure area

14. What type of breezes occurs during daytime?
 - A. Day breeze
 - B. Sea breeze
 - C. Land breeze
 - D. Sea land breeze

15. Your teacher explained that the wind direction during the day is usually the reverse of wind direction at night. Do you agree with your teacher?
- No, because breezes describe movement of air in one direction.
 - No, because this is only an indication of change in our weather condition.
 - Yes, because of the differences in air pressure and temperature between two different places
 - Yes, because the air temperature remains the same all throughout the day between two different places

<h1 style="margin: 0;">Lesson</h1> <h1 style="margin: 0;">2</h1>	<h2 style="margin: 0;">Atmospheric Phenomena: Breezes, Monsoon, and Intertropical Convergence Zone (ITCZ)</h2>
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What's In

Directions: Study the table below and examine the differences in the changes of temperature between sand and water. Do this in a separate sheet of paper.

Table 1: Temperature reading between sand and water under the sun for 10 minutes.

Observation time (min.)	Water (Degree Celsius) C ⁰	Sand (Degree Celsius) C ⁰
0	36	36
5	36	37
10	37	38

- Q1. Which has higher temperature after 10 minutes?
 Q2. Which of the two get easily warm under the sun?

Table 2: Temperature reading between sand and water after exposure to sunlight.

Observation time (min.)	Water (Degree Celsius) C ⁰	Sand(Degree Celsius) C ⁰
0	39	40
5	38.5	38
10	37	36
15	37.5	35
20	36	35
25	36	35

- Q1. Which has lower temperature after 25 minutes?
 Q2. What can you infer between the temperature of sand and water?
 Q3. If sand will represent the land and water will represent the body of water, what do you think is the result of this unequal temperature in our environment?

Rubric Scoring

Criteria	5	3	1	Score
Knowledge	Provided detailed explanation and complete response to the question.	Provided clear explanation but incomplete response to the question.	Provided unclear explanation and incomplete response to the question	



What's New

Activity 5: Rising and sinking air

Directions: Study and analyze the differences between two pictures below.

- Picture A shows the movement of air during day time.
- Picture B shows the movement of air during nighttime

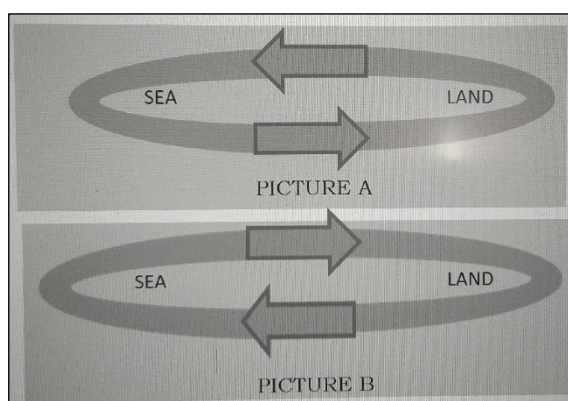


Figure 5: Movements of air during day and night time.
(Illustrated by: Ma. Sheila S. Manila)

- Q1. Based on the two pictures, what are the directions of air movement?
 Q2. Why is there a difference between the movement of air during daytime and nighttime?
 Q3. What do you call these movements of air in pictures A and B?

Rubric Scoring

Criteria	5	3	1	Score
Knowledge	Provided detailed explanation and complete response to the question.	Provided clear explanation but incomplete response to the question.	Provided unclear explanation and incomplete response to the question	



What is It

In the figure below (Figure 6), warm air above the land surface rises. This is because the sun heats up land more quickly than water. When the air above land is heated, it expands and begins to rise. The cooler air from above the surface of the sea moves toward the land to replace the rising air. This movement of air creates a local wind known as sea breeze. Sea breeze occurs at daytime and provides a cooling effect on those near the shore.

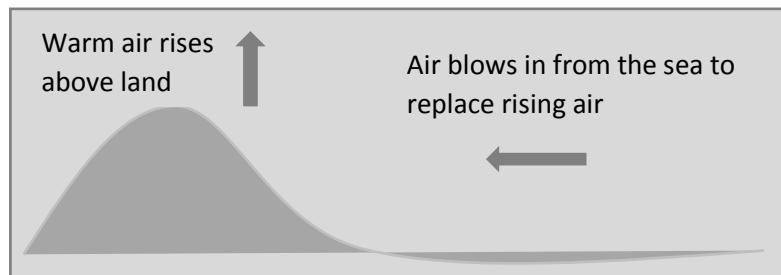


Figure 6: Sea Breeze

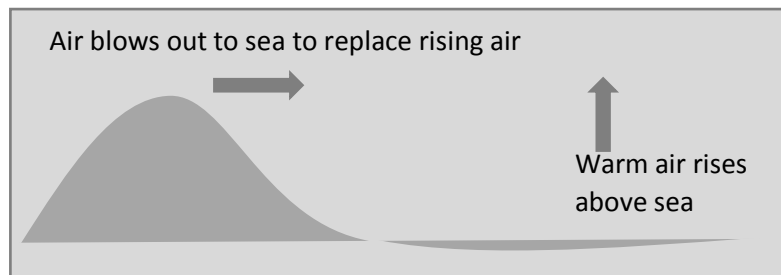


Figure 7: Land Breeze

(Illustrated by: Ma. Sheila S. Manila)

At night, the land cools faster than the sea. Thus, the warm air above the sea surface pulls in the cooler air from the land surface. This local wind is known as the land breeze. Sea and land breezes over a large region that change direction with the seasons are called **monsoons**.

What are Monsoons?

The local winds created from the differential heating of land and sea can also be felt over a much larger geographic area or region. This is a major wind system known as monsoons. Monsoons are characterized by a dramatic seasonal change in the direction of the prevailing winds over a large area. This change in the direction of the prevailing winds brings about changes in the amount of rainfall and leads to the distinct wet and dry seasons. There are two kinds of monsoons which are experienced in the country-the northeast monsoon and southwest monsoon.

The northeast monsoon locally known as *amihan* in the Philippines affects the eastern parts of the country from October to March. This is brought by the cold air mass that comes from Siberia and gathers moisture as it travels over the Pacific Ocean. *Amihan* is

characterized by widespread cloudiness with slight to moderate rainfall and prevailing cold winds.

The southwest monsoon or *habagat* affects the western part of the country from July to September. It is characterized by heavy rainfall, humid weather and bring the rainy season to the western parts of the country. *Habagat* is brought about by the cool air from the high pressure area in the Australian continent absorbing moisture by passing over the warm equatorial oceans. The air, now laden with water vapor, cools as it moves north and as it rises over land. The air can no longer hold its moisture and falls huge volume of rainfall.

Effect of Monsoons



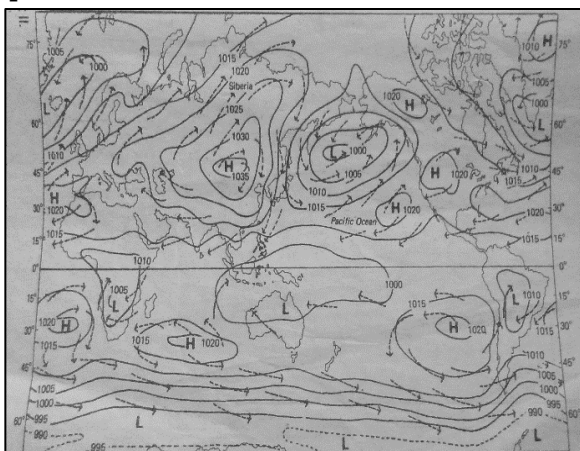
(Photo: Courtesy of Catalino E. Egaran)

- Monsoons can bring moderate to occasional heavy rains which can cause flood in our country like what happened in some parts of Pigcawayan, North Cotabato brought by typhoon Bising last April 19-20, 2021.

Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) is the agency responsible for assessing and forecasting weather, flood, and other conditions that are essentials for the safety of the people.

What is ITCZ?

The Inter-Tropical Convergence Zone (ITCZ) appears as a band of clouds consisting of showers, with occasional thunderstorms, that encircles the globe near the equator.



(<https://www.slideshare.net/lhoralight/science-q3-q4>)

Figure 10: ITCZ in January

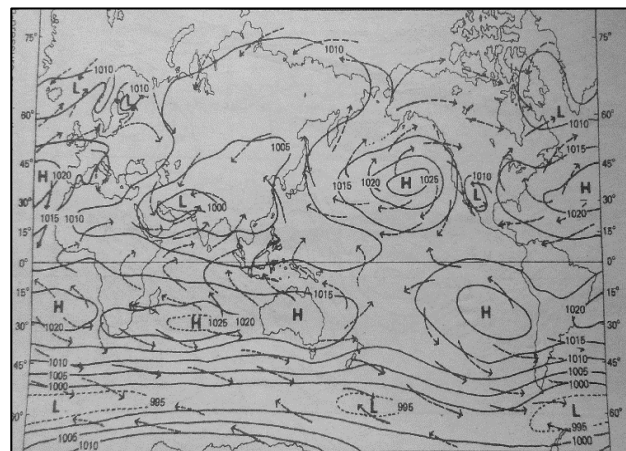
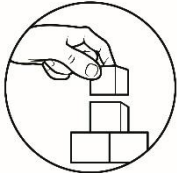


Figure 11: ITCZ in July

We always hear about the Intertropical Convergence Zone (ITCZ) in weather reports. ITCZ is the place where winds in the tropics meet or converge. Because the equator is warmer than the North and South poles, the cooler air is drawn towards the equator to replace the rising warm air. Vapor pressure condenses as air rises and cools in the ITCZ, forming clouds and rain. This is where monsoon rainfall occurs.



What's More

Study and analyze the following maps in figure 10 and 11. It show the air pressure and directions of winds in different parts of the world. The letter **L** indicates the areas with low pressure, **H** for with high pressure areas and arrowheads indicate for the direction of wind.

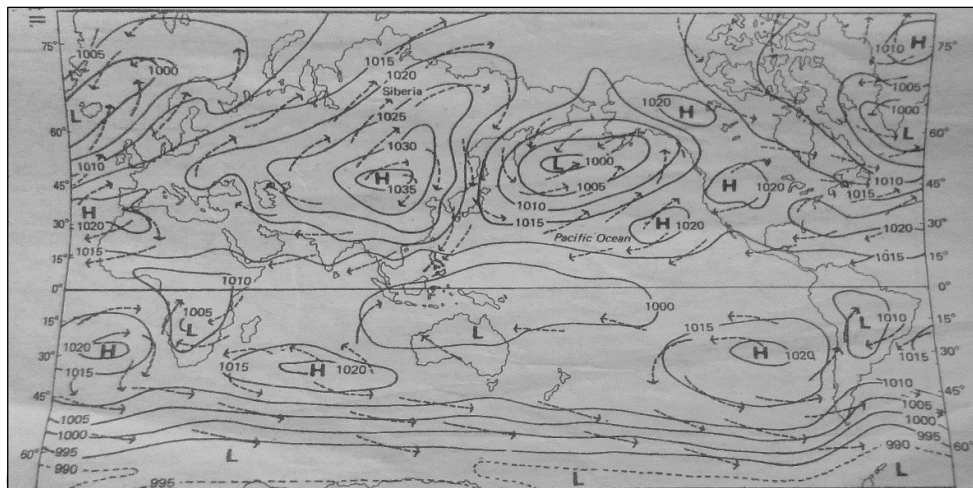
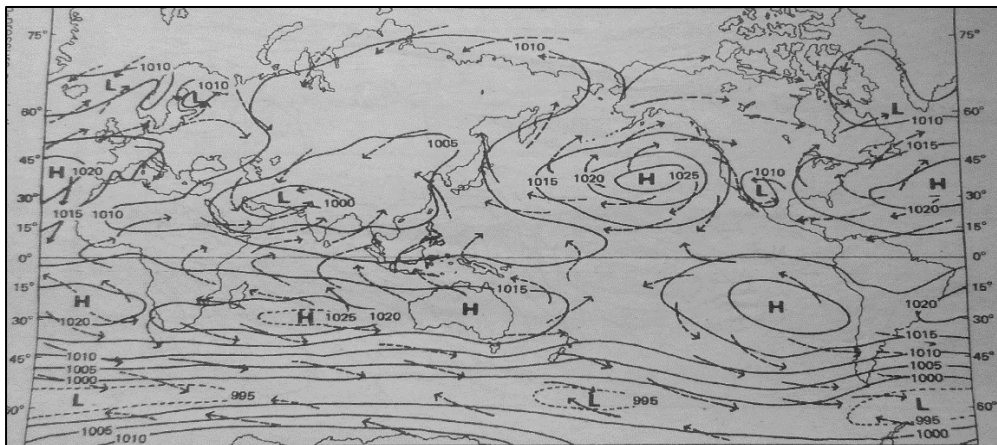


Figure 10: Pressure and winds for the month of January

- Q1. Trace the directions of the arrows. In which area do the winds move?
- Q2. Locate the Philippines in the map. From what direction do the wind blow near the country in January?
- Q3. What type of monsoon does the country experience in January?



(<https://www.slideshare.net/lhoralight/science-q3-q4>)

Figure 11: Pressure and wind during the month of July

- Q4. In what direction do air of different pressures move? Why do you think so?
 Q5. From what direction do the winds blow near the Philippines in July?
 Q6. What type of monsoon does the country experience in July?

Rubric Scoring

Criteria	5	3	1	Score
Knowledge	Provided detailed explanation and complete response to the question.	Provided clear explanation but incomplete response to the question.	Provided unclear explanation and incomplete response to the question	

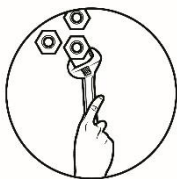


What I Have Learned

Directions: Fill in the missing word/phrase in the following statements in order to make it correct on a separate sheet of paper. Choose your answer inside the box.

low pressure	amihan	southwest	sea	unequal
high pressure	habagat	northeast	land	equal

- The wind always blows from an area with ____ to an area with _____.
- Land breeze is the movement of air from ____ towards _____ while sea breeze is from ____ towards _____.
- Northeast monsoon is also known as _____.
- _____ is characterized with slight to moderate rainfall in the Philippines during the months of December to February.
- The movement of wind in our environment is caused by _____ temperature of air between land and water.



What I Can Do

Congratulations! You have shown great performance in doing several activities that help you to understand common atmospheric phenomena.

Directions: Write a reflection essay on how the monsoons affect the Filipino farmers. Cite the monsoons' advantages and disadvantages in farming.

Rubric Scoring

Criteria	5	3	1	Score
Composition of Knowledge	Provided detailed ideas on the advantages and disadvantages of monsoons to Filipino farmers.	Provided limited ideas on the advantages and disadvantages of monsoons to Filipino farmers	Provided very short ideas on the advantages and disadvantages of monsoons to Filipino farmers	



Assessment

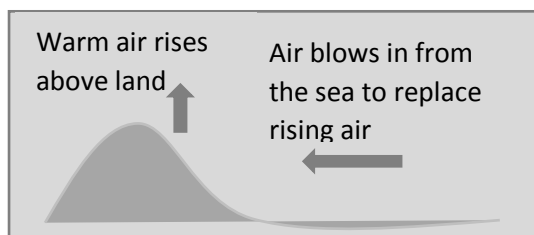
Directions: Read and understand the questions carefully. Write your answer on a separate sheet of paper.

- Which of the following statements describes the Northeast monsoon **CORRECTLY**?
 - It is known as *hanging habagat*
 - This is a season characterized by a slight to moderate rainfall and prevailing cold winds
 - It occurs during the month of June to October and characterized by frequent heavy rain
 - It is known as *hanging amihan* and characterized by frequent heavy rain and strong winds
- What kind of breeze occurs during daytime?
 - Day breeze
 - Sea breeze
 - Land breeze
 - Sea land breeze
- During daytime, what happens to air above the sea?
 - It will rise and sink
 - It will flow everywhere
 - It will move towards land surface
 - It will move away from land surface
- What is **TRUE** about intertropical convergence zone?
 - It occurs in polar regions
 - It occurs in a tropic region
 - It will happen once in a year
 - Its occurrences cannot be determined
- Which of the following statements account for the occurrence of land breeze, sea breeze, and monsoons?

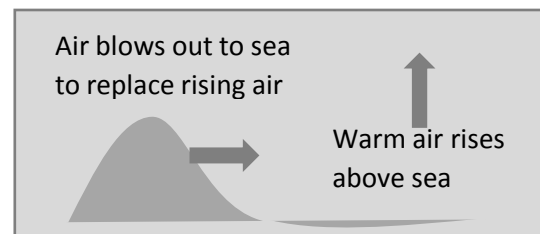
- Two different places warm up or cool down differently.
- Warm air always goes up and cold air replaces area where warm air rises.
- Winds always moves from high pressure area towards a low pressure area.
- Movement of winds from one place to another caused by the differences of temperature in surroundings.

- A. I, II, III, and IV
 - B. I, II, and IV only
 - C. I, III, and IV only
 - D. II, III, and IV only
6. Which of the following statements correctly describes land breeze?
- A. It is a local wind that blows from polar region to equator.
 - B. A global wind system categorized by the flow of air from water to land at night.
 - C. A local wind system characterized by the flow of air from land to water late at night.
 - D. It is any wind that blows from a large body of water toward or onto a landmass.
7. Your teacher explained that the wind direction during the day is usually the reverse of wind direction at night. Which of the following statements will support your teacher?
- A. There is more water in the sea than on land.
 - B. This is an indication of the change in our climate.
 - C. The water temperature's remains the same all throughout the day.
 - D. The land heats up faster during day and it cools down quickly at night than water.

For items 8 to 11, refer to the following pictures below



Picture 1



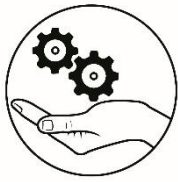
Picture 2

8. Based on pictures 1 and 2, what happens to the warm air?
- A. rising
 - B. sinking
 - C. blowing
 - D. not moving
9. The two pictures show the reverse movement of air from land to sea or from sea to land. Do you think the land and sea have the same pressure at the same time?
- A. Yes, because the air blows in one direction at a time
 - B. Yes, because there is a reverse movement of air on land and water
 - C. No, because the air always moves from an area with higher pressure to lower pressure area.
 - D. No, because the air always moves from an area with lower pressure to higher pressure area

10. Which of the following statements describe the two pictures correctly?

- I. Picture 1 occurs during daytime, while picture 2 occurs during nighttime
- II. Pictures 1 and 2 illustrate the movement of air due to temperature differences
- III. The two pictures show the rising warm air and cold air replaces the place of rising air
- IV. The air in two places experienced the same temperature as well as their

- A. I, II, III, and IV
 - B. I, II, and III only
 - C. I, III, and IV only
 - D. II, III, and IV only
11. Based on picture 2, how will you compare the density of air above the land and sea?
- A. Air above land and sea surfaces are equal in density
 - B. Air above sea is less dense than air above land surface
 - C. Air above the sea is denser than air above land surface
 - D. Air above the land is less dense than air above sea surface
12. What does I.T.C.Z stands for?
- A. Inter-tropical Convergent Zone
 - B. Inter-tropical Continental Zone
 - C. Inter-tropical Convergence Zone
 - D. Intra-tropical Convergence Zone
13. From what direction does wind blows near the Philippines for the month of July?
- A. Northeast towards South
 - B. Northwest towards North
 - C. Southwest towards North
 - D. Southwest towards South
14. What type of monsoon occurs during the month of July?
- A. Northeast monsoon
 - B. Northwest monsoon
 - C. Southeast monsoon
 - D. Southwest monsoon
15. Which of the following describes the direction of winds in different parts of the world?
- A. Low pressure to high pressure area
 - B. High pressure to low pressure area
 - C. Low pressure to lower pressure area
 - D. High pressure to higher pressure area



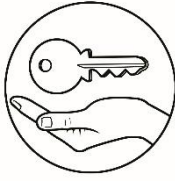
Additional Activities

Directions: Read the paragraph inside the box. Write an essay about the impact of global warming on the monsoons and tropical wet season experienced in the country.

Global warming is the gradual heating of Earth’s surface, oceans, and atmosphere caused by human activities such as cutting of trees or illegal logging, burning of plastics, rubber, and other waste materials, burning of fuels that emits gases like carbon dioxide, methane, and other greenhouse gases into the vast atmosphere. Human activities much contributed to the increase in temperature of the atmosphere. Because all the global climate system is connected, adding heat or increase of earth’s temperature causes the global climate as a whole to change. Much of the world is covered with ocean which heats up. When the ocean heats up, more water evaporates into clouds that cause the formation of intense storms like typhoons. These strong typhoons will hit our country every year that can greatly cause more damages around the country. Continuous change in temperature, can greatly affect the patterns of wind that bring the monsoons in Asia, rain and snow around the

Rubric Scoring

Criteria	5	3	1	Score
Knowledge	Provided detailed ideas on the impact of global warming on the monsoons and tropical wet season.	Provided limited ideas on the impact of global warming on the monsoons and tropical wet season.	Provided very short ideas on the impact of global warming on the monsoons and tropical wet season.	



Answer Key

LESSON 1

<p>WHAT I KNOW</p> <p>1. B 2. D 3. B 4. D 5. A 6. C 7. B 8. C 9. A 10. B 11. B 12. D 13. C 14. B 15. B</p>	<p>ASSESSMEN</p> <p>1. A 2. D 3. B 4. B 5. D 6. C 7. B 8. A 9. B 10. B 11. C 12. B 13. C 14. B 15. D</p>	<p>What's In</p> <p>Activity: 1</p> <p>Possible answers for guide questions:</p> <p>1. No, the temperatures of sand and water were the same before and after 10 minutes. 2. The initial and final temperature of water and sand was 36 °C 3. Sand easily increase its temperature every after 5 minutes. 4. Sand easily decrease its temperature every after 5 minutes.</p> <p>Activity 2:</p> <p>Possible answers for guide questions.</p> <p>1. The paper bag rises. 2. The air inside the paper bag expand and it is rising.</p>	<p>What's New</p> <p>Activity 3</p> <p>Possible answers for guide questions:</p> <p>1. The temperature of air above the lighted candle will increase. 2. If the temperature of air inside the box is higher or increases, then the air will move upward or rises. 3. It is moving towards the hole entering the box. 4. Heated air inside the box is rising in which created low pressure inside and pulls in air from high pressure area (outside the box) to replace rising air.</p>						
<p>What's More?</p> <p>Activity 4</p> <p>Possible answer for the following guide questions.</p> <p>1. Yes 2. Warm air rises because it is less dense than cold air from its surrounding. 3. The surrounding air always move towards a low-pressure area and replaces the rising warm air. 4. The surrounding air move downward (sinking) while warm air move upward (rising).</p>	<p>Additional activities</p> <table border="1" data-bbox="651 1406 1281 1727"> <tr> <td>Human activities</td> <td>Effect in the atmosphere</td> </tr> <tr> <td>A. Cutting of trees</td> <td>Releases more carbon dioxide which contribute to global warming</td> </tr> <tr> <td>B. Littering of waste</td> <td>It will release polluted gas like methane and contributes to greenhouse effect.</td> </tr> <tr> <td>C. Burning of Garbage</td> <td>It will contribute the increase of greenhouse gases to affect weather pattern of atmosphere.</td> </tr> </table> <p>Q1. Cutting of trees, littering of waste, and burning of garbage are some of human activities that cause negative effects to our atmosphere.</p> <p>Q2. As a student, promote reforestation and implement the use of 3R's (Recycle, re-use, and reduce).</p>	Human activities	Effect in the atmosphere	A. Cutting of trees	Releases more carbon dioxide which contribute to global warming	B. Littering of waste	It will release polluted gas like methane and contributes to greenhouse effect.	C. Burning of Garbage	It will contribute the increase of greenhouse gases to affect weather pattern of atmosphere.
Human activities	Effect in the atmosphere								
A. Cutting of trees	Releases more carbon dioxide which contribute to global warming								
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C. Burning of Garbage	It will contribute the increase of greenhouse gases to affect weather pattern of atmosphere.								
<p>What I Have Learned</p> <p>Possible answers:</p> <p>1. rises 2. warm air 3. expands 4. less dense 5. high, low</p>	<p>What I Can Do?</p> <p>Answers may vary and it will refer to the rubric given.</p> <p>Q1. We need to maximize good ventilation in our house because it will promote healthy lifestyle that will make our immune system strong and away from illnesses. Well ventilated house supplies enough flow of oxygen and fresh air.</p> <p>Q2. Poor ventilated house is not good for our health because it will cause the build-up of more carbon dioxide and depleted supply of oxygen that cause headache or shortness of breathing.</p>								

LESSON 2

<p>What I Know</p> <p>1.B 2.C 3.C 4.A 5.C 6.C 7.B 8.D 9.A 10.C 11.C 12.C 13.B 14.B 15.C</p>	<p>Assessment</p> <p>1.B 2.B 3C 4.B 5.A 6.C 7.D 8.A 9.C 10.B 11.B 12.C 13.C 14.D 15.B</p>	<p>What's In</p> <p>Possible answers for guide questions:</p> <p>1.Sand has higher temperature after 10 minutes. 4.B 2.Sand gets easily warm under the sun. 5.A 3.Sand has lower temperature after 25 minutes. 7.D 4. Sand will easily warm and cool down than water. 9.C 5. The unequal temperature of air in our environment will cause the movement of air from land to sea or vice versa. These movements of air are known as breezes. 15.B</p>	<p>What's New</p> <p>Activity 5 Possible answers for guide questions:</p> <p>1. In picture A, the air is moving from sea to land while in picture B, the air is moving from land to sea. 2. There is a difference in the direction of the movement of air because of the unequal temperature of air in our surroundings. 3. The movement of air in the pictures are called breezes.</p>
<p>What's More</p> <p>Possible answers for the following guide questions:</p> <p>1. The winds move from high pressure area to a low-pressure area. 2. The wind blows from Northeast during the month of January. 3. Northeast monsoon or Hanging Amihan is the type of monsoon experienced during the month of January. 4. Air always move from high to low-pressure area, because if the temperature of air is high it will rise thus creating the area low in pressure, then cold air from a high-pressure area will move towards the low-pressure area to replace the rising air. 5. The wind blow Southwest during the month of July. 6. The type of monsoon that can be experienced during the month of July is Southwest monsoon or known as Hanging Habagat.</p>		<p>What I Can Do?</p> <p>Answers may vary and refer it to the rubric given. Possible answer:</p> <p>Rain brought by monsoons had positive and negative effects to the lives of Filipino farmers. The positive effect of seasonal rains is to supply enough water that will help the farmers to speed up planting different agricultural crops to supply food in our community. However, monsoon also brought us negative effects because too much rain may cause flood and destroy lives and agricultural products of farmers.</p> <p>What I have Learned</p> <p>1. high-pressure, low-pressure 2. land towards sea; sea towards land 3. hanging amihan 4. northeast monsoon or amihan 5. unequal</p>	
<p>Additional activities</p> <p>Possible answer:</p> <p>The impact of global warming is very harmful especially to human being. Global warming can lead to change the weather condition of our atmosphere. Change in the weather patterns had serious effect in the condition of our environment or climate change. Change in the climate condition will lead to the formation of strong typhoon or more rainfall in our country.</p>			

References

Ferido, Marlene B., Gutierrez, Jacqueline Rose M., et.al. (2012,). *Science-Grade 7 Learner's Material: Part Two*. Retrieved from slideshare:
<https://www.slideshare.net/lhoralight/science-q3-q4>

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