

Class:7	Subject: Science	Topic: Heat
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SUMMARY SHEET		
Pedagogical Approach: Student – led		
Learner Previous Knowledge	Warmth and coldness of objects, weather;; concept of hot and cold	
Target Knowledge for this Topic	Heat and Temperature	
	Understand the link between heat and temperature; Investigate about the different instruments that can measure temperature and similarities and differences between them; Summarize the effects of heat with respect to temperature change;	
	Kinetic theory of matter	
	Study how expansion takes place in solids, liquids and gases; Find out about the different ways in which heat can be transferred; Figure out how thermos flask work	
Learning Goals		
More Complex Learning Goal -Students will be able to infer how substances are affected by heat in relation with kinetic theory of matter and explain how transfer of heat is done in given situations.		
Target Learning Goal - Students will be able to explain kinetic theory of matter, describe modes of transfer of heat and explain applications of heat transfer.		
Simpler Learning Goal - Students will be able to list modes of heat transfer, postulates of kinetic theory of matter and applications of heat transfer.		
Period No.	Lesson Objectives	Teaching Learning Materials Required
1	Demonstrate concept of heat and how heat can be measured	- Board and markers - Worksheet 1 - Clinical thermometer, antiseptic solution, lab thermometer, beaker of water, Bunsen burner
2	Identify good and bad conductors of heat and categorise them suitably.	- Board and markers - Worksheet 2 - Pencil, plastic ruler and steel spoon of same size, beaker, boiling water, wax, all pins, kulhad and steel cup/glass

Class:7	Subject: Science	Topic: Heat
----------------	-------------------------	--------------------

3	Demonstrate transfer of heat in solids and explain conduction	- Board and markers - Worksheet 3 - Iron scale, pins, wax, candle/burner
4	Demonstrate transfer of heat in liquids and explain convection.	- Board and markers - Worksheet 4 - Round bottom flask, potassium permanganate crystal, water, candle, match stick
5	Demonstrate transfer of heat by radiation and describe it	- Board and markers - Worksheet 5
6	Explain how land and sea breeze occur and describe applications of transfer of heat transfer.	- Board and markers - Worksheet 6

Class:7	Subject: Science	Topic: Heat
----------------	-------------------------	--------------------

Period 1

Lesson Objectives

At the end of this lesson students will be able to:

- Demonstrate concept of heat and how heat can be measured

Teaching Learning Materials required

- Board and markers
- Worksheet 1
- Clinical thermometer, antiseptic solution, lab thermometer, beaker of water, Bunsen burner

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 or 5

Lesson Beginning <u>Time:</u> 5 min <u>Purpose:</u> • Activate the prior knowledge	<u>Introduction of Topic</u> • Introduce the topic by asking how do you feel in summers as opposed to winters? What is it that makes you feel 'hot' or 'cold'? • How do you know if the beverage that you want to drink is hot or cold? • What happens when a person has fever? How does his/her body feel? • Ask the students what is a thermometer and when is it used. Ask the students if it is possible to find out how much exactly is the fever if you do not have thermometer? • Collect response and arrive at the conclusion that thermometer is needed to find the degree of hotness. This degree of hotness is called temperature. Inform the students that today they will learn about heat and how it can be measured.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> • Develop	• Distribute worksheet 1 to all the students. • Let the students do the activity as per instructions. Let them arrive at the conclusion together. • Discuss the information in groups. They can exchange information and

conceptual understanding	ideas. Discuss the correct answers with the whole class.
Lesson End <u>Time:</u> 10min <u>Purpose:</u> - Finish up - Homework Distribution	<u>Finish Up</u> - Clear doubts of the students. <u>Homework Assignment</u> - Distribute Annexure 1B for homework.

Worksheet 1

Skill: Spirit of Inquiry

Activity

Material: Clinical thermometer, antiseptic solution

* *Thermometers used exclusively for measuring body temperatures are called **clinical thermometers**.*

Instruction

1. Take the thermometer and observe its readings/markings.
2. Now shake the thermometer. Dip it into antiseptic solution and wipe it clean.
3. Put it under your tongue for one minute and measure the temperature.
4. Let each group member repeat this and fill in the table.

* Temperature is measured in ⁰Celsius.

Name	Temperature

Questions

1. What maximum and minimum readings of temperature readings are shown on this thermometer?

2. Is the temperature same or different for all group members?

* **Information:**

Class:7	Subject: Science	Topic: Heat
----------------	-------------------------	--------------------

- The normal body temperature of human body is 37 °C.
 - It may not exactly be the same and may slightly vary but the average temperature of humans remains the same.
 - The human temperature does not usually rise above 42 °C.
- Can you guess now why this thermometer has got such limited marking?
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Activity

Material- Lab thermometer, beaker of water, Bunsen burner

** Thermometers used in laboratories for experiments or any other purposes are called **laboratory thermometers**.*

Instructions

1. Observe the maximum and minimum readings of temperature readings shown on this thermometer.
2. Dip the thermometer in water and see what the temperature is.
3. Now put the thermometer in your school bag and measure the temperature.
4. Measure your body temperature. Record all the temperatures in the given table.
5. Now take a beaker of water and put it on burner and let it get hot.
6. Put a thermometer in it and measure the temperature.
7. Observe how the mercury rises slowly.
8. Once the water starts boiling observe the temperature. Observe again after a couple of minutes.

Object	Temperature

Questions

1. What happened to the temperature when water was boiling?
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2. Did the temperature rise continuously when the water was boiling?
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3. At what temperature did the water boil and at what temperature the thermometer showed constant reading?
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****** The temperature at which the water boils is called its boiling point.**

So, boiling point of water is _____

Class:7	Subject: Science	Topic: Heat
----------------	-------------------------	--------------------

Period 2

Lesson Objectives

At the end of this lesson students will be able to:

- Identify good and bad conductors of heat and categorise them suitably.

Teaching Learning Materials required

- Board and markers
- Worksheet 2
- Pencil, plastic ruler and steel spoon of same size, beaker, boiling water, wax, all pins, kulhad, steel cup/glass

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4-5

Lesson Beginning <u>Time:</u> 5 min. <u>Purpose:</u> Introduce the topic	<u>Introducing the topic</u> - Ask the how particles are arranged in solids, liquids and gases. - Keep the kulhad and steel cup/glass in front of them on the table. - Pour hot water in each of them. - Ask them to feel the cups. - Which cup felt very hot? - Which cup were they able to hold easily? - Ask the students, “Are the particles in the steel glass and in the kulhad arranged similarly?” - If the answer to above is yes, why does one object becomes hot while the other doesn't? - Collate all answers and ensure that all the students are on the same page. - Inform the students that they will now find out why some substances become hot while some do not on heating.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> Develop conceptual understanding	<u>Activities & Worksheet</u> - Distribute Worksheet 2. - Let the groups do the activities mentioned in it. - Let them record their observation and conclusions. - Let there be a whole class discussion now. - Arrive at a common consensus.

Lesson End <u>Time:</u> 5 min <u>Purpose:</u> • Finish Up • Homework Distribution	<u>Finish Up</u> • Wrap the class by clearing doubts. <u>Homework Distribution</u> • Ask students to make a list of conductors and insulators that they find at home.
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Worksheet 2

Skill: Observation and Investigation

Activities

1. **Material:** Pencil, plastic ruler and steel spoon of same size, beaker, boiling water

Instructions

1. Take a copper strip, a plastic rod and a wooden stick, all of the same size and put them in a beaker.
2. Pour boiling water to half way mark in the beaker.
3. After a few minutes feel the three objects.
4. Record your observation.

Questions

1. Did all the strips heat up?

2. Which strip became very hot?

3. What do you conclude from this?

2. **Material:** Pencil, plastic ruler and steel spoon of same size, beaker, boiling water, wax, all pins, hot water

Instructions

1. Take a copper strip, a plastic rod and a wooden stick, all of the same size.
2. Attach 3 pins with same distance between them at one end of the objects with the help of some melted wax.
3. Now take boiling water in a beaker.
4. Dip the three objects in the water.

Observe what happens.

Class:7	Subject: Science	Topic: Heat
----------------	-------------------------	--------------------

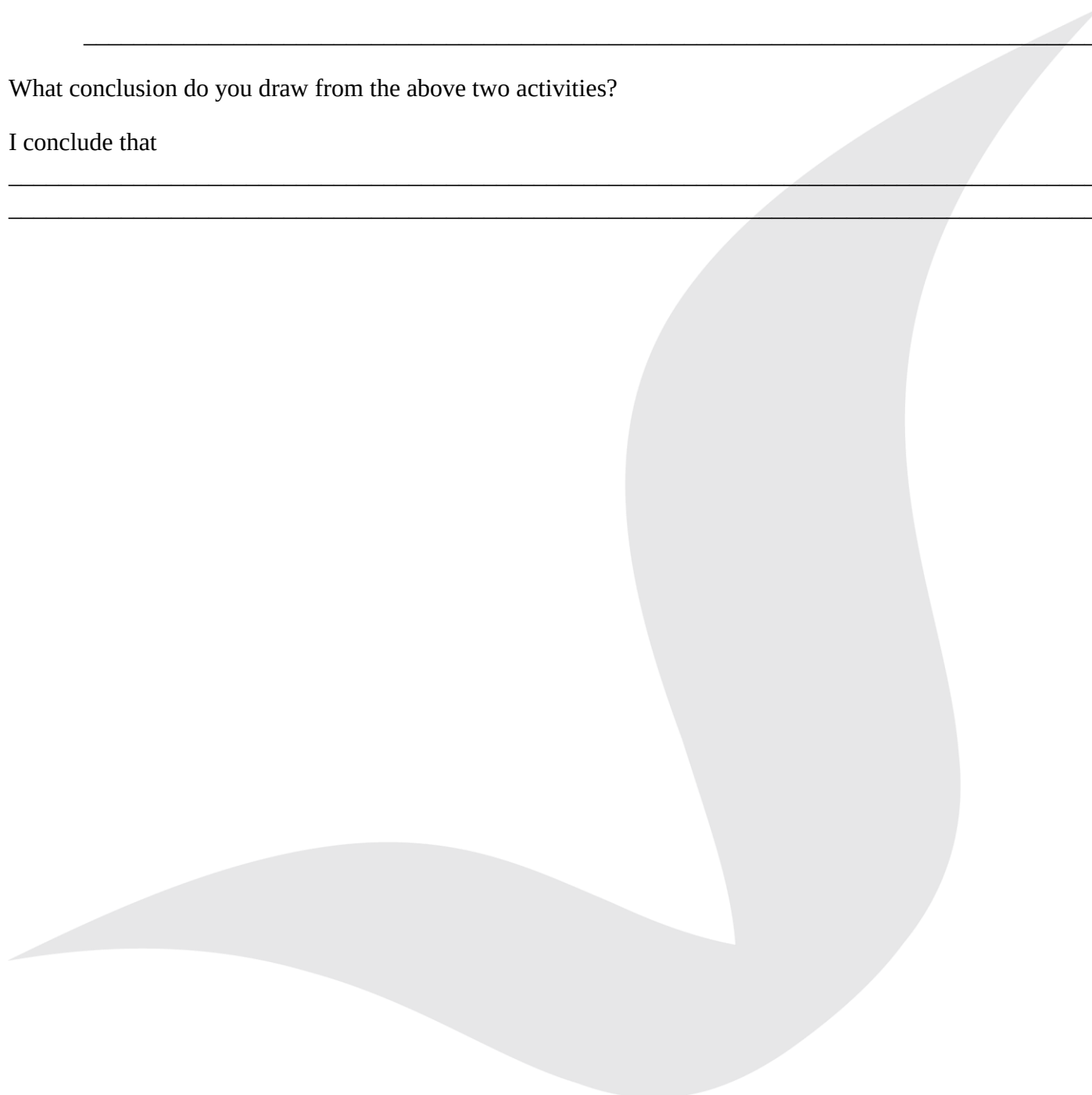
1. Did the pins from all objects fall down at the same time?

2. Name the object from which the pin fell down at the earliest.

3. What do you conclude from this?

What conclusion do you draw from the above two activities?

I conclude that



Class:7	Subject: Science	Topic: Heat
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Period 3

Lesson Objectives

At the end of this lesson students will be able to:

- Demonstrate transfer of heat in solids and explain conduction.

Teaching Learning Materials required

- Board and markers
- Worksheet 3
- Iron scale, pins, wax, candle/burner

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4-5

Lesson Beginning <u>Time:</u> 5 min. <u>Purpose:</u> Introduce the topic	<u>Recapping Good and Bad conductors</u> • Ask the students to recap examples of good and bad conductors which they must have listed as per the homework given to them. • Ask the students following questions: ○ What are good conductors? ○ What are bad conductors? ○ Why are you able to feel the heat through metallic containers? ○ What can be the uses of good and bad conductors? • Collate all answers and ensure that all the students are on the same page. • Ask the students- Why does a pan cool down when removed from fire? Where does the heat go? Does the heat flow from hot object to cold object or vice versa? Inform the students that they will now do an activity to find out how heat flows in conductors.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> Develop conceptual understanding	<u>Activity& Video</u> • Distribute worksheet 3 to all students. • Let the groups do the activity mentioned in it. • Let them record their observation and conclusions. • Let there be a whole class discussion now. • Arrive at a common consensus.
Lesson End	<u>Finish Up</u>

Class:7	Subject: Science	Topic: Heat
----------------	-------------------------	--------------------

<u>Time:</u> 5 min <u>Purpose:</u> - Finish Up - Homework - Distribution	- Wrap the class by clearing doubts. <u>Homework Assignment</u> - Define Conduction in your own words and explain it. Write the explanation and definition in your science notebook.
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Worksheet 3

Skill: Drawing Inferences

Activity

Material: Iron scale, pins, wax, candle/burner

Instructions

1. Keep the iron strip flat on the table.
2. Stick 5 pins equidistant at one end of the strip.
3. Now upturn the strip and heat its other end.
4. Observe what happens.

Questions

1. Which was the first pin to fall?

2. Why do you think all the pins not fall at the same time?

3. Did the pins fall in any specific order?

Now predict what will happen if we stick equal number of pins on both sides from the centre and heat the centre of the strip.

Prediction: If we had heated the centre of the iron strip and the pins were stuck on both sides then

Wash the iron strip with cold water and wipe it dry. Then repeat the activity by sticking pins on both sides of the centre. Keep the centre spot vacant. Heat the centre of the strip.

How did the pins fall? _____

Was your prediction correct? Why?

Class:7	Subject: Science	Topic: Heat
----------------	-------------------------	--------------------

Period 4

Lesson Objectives

At the end of this lesson students will be able to:

- Demonstrate transfer of heat in liquids and explain convection.

Teaching Learning Materials required

- Board and markers
- Worksheet 4
- Round bottom flask, potassium permanganate crystal, water, candle, match stick

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4-5

Lesson Beginning <u>Time:</u> 5 min. <u>Purpose:</u> Introduce the topic	<u>Whole Class Discussion</u> • Ask the students to recap what is conduction and how heat is transferred in solids. Now pose following questions: • Do you think heat is transferred identically in liquids too? • Will the entire liquid get hot in the same manner as solid does? Give reasons for your answer. • Collate all answers and ensure that all the students are on the same page. • Inform the students that they will now do an activity to find out how heat flows in liquids.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> Develop conceptual understanding	<u>Activities</u> • Distribute worksheet 4 to all students. • Let the groups do the activities mentioned in it. • Let them record their observation and conclusions. • Let there be a whole class discussion now. • Arrive at a common consensus.
Lesson End <u>Time:</u> 5 min <u>Purpose:</u>	<u>Finish Up</u> • Wrap the class by clearing doubts.

Class:7	Subject: Science	Topic: Heat
----------------	-------------------------	--------------------

• Finish Up	
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Worksheet 4

Skill: Drawing Inferences

Activity

Material: Round bottom flask, potassium permanganate crystal, water, candle/burner, stand, straw

Instructions

1. Keep the round bottom flask on the stand and place a candle/burner under it.
2. Fill the flask with water.
3. Place a crystal of potassium permanganate at the bottom of the flask gently with the help of a straw.
4. Now heat the water.
5. Observe how the crystal mixes with the water.
6. Observe what happens.

Questions

1. What did you observe? How did the water near the flame react?

2. What happened to the cold water which was away from the flame?

3. How does the whole water get heated?

Information:

Based on your observation, you can say that hot water moves _____ and cold water moves _____ continuously till heat is spread in the liquid evenly. The same phenomenon is also seen in air. This mode of heat transfers where particles actually move from one place to another to transfer heat is called **Convection**.

Activity

Material: Candle, match stick

Instructions

1. Light a candle.
2. Keep one hand on the flame (Be careful! Keep a safe distance) and another at the side of the flame.
3. Observe what you feel.

Question

1. Where do you feel heat the most?

Class:7	Subject: Science	Topic: Heat
----------------	-------------------------	--------------------

2. What do you feel when you put your hand at the side of the flame?

3. What can you deduce from this?



Class:7	Subject: Science	Topic: Heat
----------------	-------------------------	--------------------

Lesson Plan 5

Lesson Objectives

At the end of this lesson students will be able to:

- Demonstrate transfer of heat by radiation and describe it.

Teaching Learning Materials required

- Board and markers
- Worksheet 5

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4-5

Lesson Beginning <u>Time:</u> 5 min. <u>Purpose:</u> Introduce the topic	<u>Recap</u> • Ask the students to recap what is conduction and convection and how heat is transferred in solids and liquids. Now pose following questions: ○ Will heat travel if there are no particles? ○ Are the particles [molecules] required for transfer of heat? What do you think? • Collate the answers and ensure that all the students are on the same page. • Inform the students that they will now analyze how heat can be transferred without or with particles.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> Develop conceptual understanding	<u>Case Study</u> • Distribute worksheet 5 to all students. • Let the groups do the activity mentioned in it. • Let them record their observation and conclusions. • Let them attempt the questions based on it. • Let there be a whole class discussion now. • Arrive at a common consensus.
Lesson End <u>Time:</u> 5 min <u>Purpose:</u> • Finish Up	<u>Finish Up</u> • Wrap the class by clearing doubts.

Class:7	Subject: Science	Topic: Heat
----------------	-------------------------	--------------------

Worksheet 5

Skill: Drawing Inferences

Case Studies:

1. You feel warm when you are out in the sun. Considering that the layer of air over Earth is thin and that there is only empty space between Earth and Sun, how do you think the heat reach us?

* *Hint: Heat is energy.*

Heat of the Sun reaches Earth directly without the help of _____ between it.

Information: The mode of transfer of heat in which heat is transmitted without any medium or particles in between is called **Radiation**.

Information

1. Heat can travel in vacuum.
2. Heat radiation travels through air.
3. Heat radiation travels very fast.
4. Heat radiation is absorbed better by black surfaces than by shiny ones.

Based on the information above, answer the following questions.

1. It is advisable to wear white or light coloured clothes in summer instead of black or dark coloured. Why?

2. Scientists ensure that the artificial satellites sent in space have highly polished surface. What can be the reason?

Class:7	Subject: Science	Topic: Heat
----------------	-------------------------	--------------------

Period 6

Lesson Objectives

At the end of this lesson students will be able to:

- Explain how land and sea breeze occur and describe applications of transfer of heat transfer.

Teaching Learning Materials required

- Board and markers
- Worksheet 6

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4-5

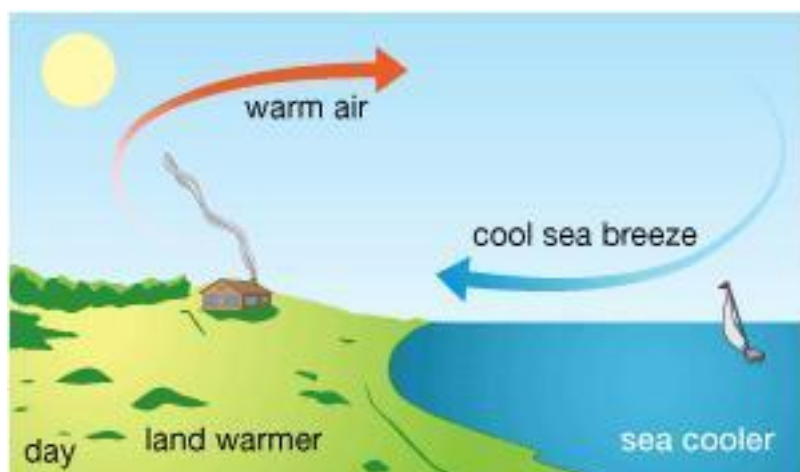
Lesson Beginning <u>Time:</u> 5 min. <u>Purpose:</u> Introduce the topic	<u>Recap</u> • Ask the students to recap all the modes of transfer of heat. Now pose following questions: ○ Are these modes of transfer of heat useful to us in any manner? ○ Can we use our knowledge of conduction, convection and radiation for our convenience? ○ Are these modes of heat transfer useful to us too? • Collate the answers and ensure that all the students are on the same page. • Inform the students that they will now find out about applications of modes of transfer of heat.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> Develop conceptual understanding	<u>Analysis & Worksheet</u> • Distribute worksheet 6 to all students. • Let the groups attempt the questions given in it after thorough group discussion. • Let them record their observation and conclusions. • Let them attempt the questions based on it. • Let there be a whole class discussion now. • Arrive at a common consensus.

Lesson End <u>Time:</u> 5 min <u>Purpose:</u> Finish Up	<u>Finish Up</u> Wrap the class by clearing doubts.
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Worksheet 6

Skill: Comprehension

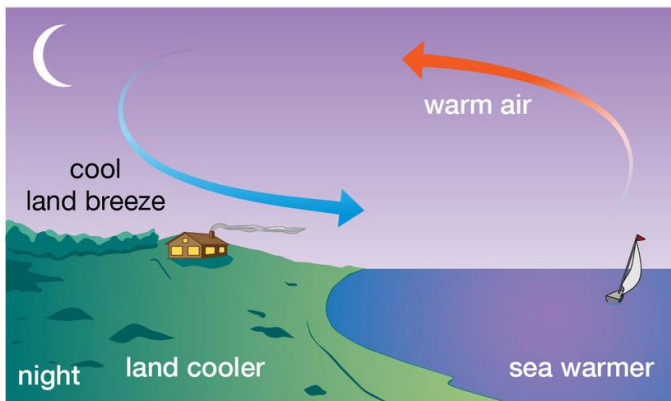
1. Observe the picture and answer the questions.



1. It is day time. The sun is shining. Land and sea both are getting heated up.

- Which one will get hot first; land or sea? _____
- What is the mode of heat transfer for land getting heated up? _____
- What is the mode of heat transfer for water in the sea getting heated up? _____
- What will happen to the air above land? _____
- Which air will be colder; air above sea or land? _____
- The warm air above land will rush towards the sea and where will the air above sea rush to? _____
- So which kind of air is now rushing to the land; cooler or hotter? _____

The air above sea rushing towards land is cooler and it is called **Sea Breeze**.



2.

In the night, there is no sun light and heat energy.

- Which one will cool faster; land or sea water? _____
- What will happen to the air above land? _____
- Which air will be cooler; air above sea or land? _____
- The cooler air above land will rush towards the sea and where will the air above sea move to?

- So which kind of air is now rushing to the sea; cooler or hotter?

The air above land rushing towards sea is called **Land Breeze**.

What is the mode of transfer of heat which causes land and sea breezes?

Analyze the following statements and give your opinion.

- If two identical containers, one white and one black in colour, are filled with water and kept in sunlight, which one will show higher temperature? Why?

- Woollen clothes keep us warm in winter. Why?

** Hint: Wool is poor conductor of heat and its fibres trap air.*

- Why are you advised to use an umbrella when you go out in sun?

