DON BOSCO HIGH SCHOOL PANJIM

LESSON 7 HEAT

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1. What is heat?

Answer:
Heat is a form of energy that flows from a **hotter object** to a **colder object** until both objects reach the same temperature. Heat makes objects warmer and can cause changes such as expansion, melting, or evaporation.

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2. What is temperature?

Answer:
Temperature is the measure of how hot or cold an object is. It tells us the degree of hotness or coldness of a substance.

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3. What is the difference between heat and temperature?

Answer:

Heat	Temperature
A form of energy.	A measure of hotness or coldness.
Flows from a hotter object to a colder object.	Does not flow from one object to another.
Measured in joules (J).	Measured in degrees Celsius (°C).

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4. In which direction does heat always flow?

Answer:
Heat always flows from a **hotter object** to a **colder object** until both objects reach the same temperature. This process is called **heat transfer**.

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5. What are the three modes of heat transfer?

Answer:
The three modes of heat transfer are:

1. **Conduction**
2. **Convection**
3. **Radiation**

Each mode transfers heat in a different way.

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6. What is conduction?

Answer:
Conduction is the transfer of heat from one particle to another **without the movement of the material as a whole**. It mainly occurs in solids.

Example: A metal spoon becomes hot when one end is placed in hot tea.

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7. Explain how heat is transferred by conduction.

Answer:
When one end of a solid is heated, the particles at that end gain energy and vibrate faster. They pass this energy to neighbouring particles. In this way, heat travels from the hot end to the cold end without the particles moving from their places.

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8. What is convection?

Answer:
Convection is the transfer of heat through the movement of liquids or gases. Heated particles move from one place to another, carrying heat with them.

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9. Explain convection with an example.

Answer:
When water is heated in a pan, the water at the bottom becomes hot, expands, and becomes lighter. It rises upward, while cooler, denser water moves downward to replace it. This continuous movement forms **convection currents**, which transfer heat throughout the water.

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10. What are convection currents?

Answer:
Convection currents are the circular movements of liquids or gases caused by heating. Warm, lighter particles rise, and cool, heavier particles sink, creating a continuous flow of heat.

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11. What is radiation?

Answer:
Radiation is the transfer of heat **without the need for any material medium**. Heat travels in the form of electromagnetic waves.

Example: Heat from the Sun reaches the Earth by radiation.

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12. Why can heat from the Sun reach the Earth?

Answer:
Space between the Sun and the Earth is almost a vacuum, where conduction and convection cannot occur. Heat reaches the Earth by **radiation**, which does not require a material medium.

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13. Which mode of heat transfer does not require a medium?

Answer:
Radiation does not require a material medium. It can transfer heat through empty space.

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14. What are conductors of heat?

Answer:
Conductors are materials that allow heat to pass through them easily.

Examples:

- Copper
- Aluminium
- Iron
- Silver

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15. What are insulators (poor conductors) of heat?

Answer:
Insulators are materials that do not allow heat to pass through them easily.

Examples:

- Wood
- Plastic
- Rubber
- Cork
- Wool
- Air

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16. Why are cooking utensils made of metals?

Answer:
Metals are good conductors of heat. They transfer heat quickly from the flame to the food, making cooking faster and more efficient.

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17. Why are the handles of cooking utensils made of wood or plastic?

Answer:
Wood and plastic are poor conductors of heat. They do not become hot easily, making it safe to hold the utensils while cooking.

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18. Why do we wear woollen clothes in winter?

Answer:
Wool contains tiny pockets of trapped air. Both wool and air are poor conductors of heat, so they reduce the loss of body heat and keep us warm.

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19. Why do we wear light-coloured clothes in summer?

Answer:
Light-coloured clothes reflect most of the Sun's rays and absorb less heat. Therefore, they help keep us cool during hot weather.

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20. Why do we wear dark-coloured clothes in winter?

Answer:
Dark colours absorb more heat from the Sun than light colours. This helps keep our bodies warmer during winter.

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21. Why are desert nights cold even after very hot days?

Answer:
Sand heats up quickly during the day but also loses heat quickly after sunset. As a result, the temperature drops rapidly, making desert nights cold.

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22. How does a sea breeze occur?

Answer:
During the day, land heats up faster than water. The air above the land becomes hot and rises. Cooler air from over the sea moves toward the land to replace it. This movement of cool air is called a **sea breeze**.

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23. How does a land breeze occur?

Answer:
At night, land cools faster than water. The air above the sea remains warmer and rises. Cooler air from the land moves toward the sea. This movement is called a **land breeze**.

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24. Why do birds spread their wings on hot days?

Answer:
Birds spread their wings to increase the exposed surface area. This helps them lose excess body heat to the surrounding air and stay cool.

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25. Why do refrigerators have freezers at the top?

Answer:
The cold air produced in the freezer is denser and sinks downward. As it moves down, warmer air rises to the top to be cooled. This convection current cools the entire refrigerator efficiently.

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26. Why is a thermos flask able to keep liquids hot or cold for a long time?

Answer:
A thermos flask reduces heat transfer by:

- Preventing conduction with insulated walls.
- Preventing convection using a vacuum between the walls.
- Reducing radiation with shiny silver-coated surfaces.

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27. Why is air considered a poor conductor of heat?

Answer:
Air does not transfer heat easily because its particles are far apart. This is why trapped air acts as an insulator in woollen clothes, double-glazed windows, and thermos flasks.

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28. Differentiate between conduction, convection, and radiation.

Conduction	Convection	Radiation
Heat transfer through solids.	Heat transfer through liquids and gases.	Heat transfer through electromagnetic waves.
No movement of particles as a whole.	Particles move from one place to another.	No material medium is needed.
Example: Hot metal spoon.	Example: Boiling water.	Example: Heat from the Sun.

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29. Differentiate between conductors and insulators.

Conductors	Insulators
Allow heat to pass easily.	Do not allow heat to pass easily.
Mostly metals.	Mostly non-metals.
Examples: Copper, Aluminium	Examples: Wood, Plastic, Wool

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30. State three uses of good conductors of heat.

Answer:
Good conductors are used:

- To make cooking utensils.
- To make radiators in vehicles.
- To make the base of electric irons.

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31. State three uses of poor conductors of heat.

Answer:
Poor conductors are used:

- To make utensil handles.
- In woollen clothes.

- In thermos flasks and building insulation.

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32. Complete the table.

Material	Good/Poor Conductor
Copper	Good conductor
Aluminium	Good conductor
Iron	Good conductor
Plastic	Poor conductor
Wood	Poor conductor
Wool	Poor conductor
Rubber	Poor conductor
Air	Poor conductor

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33. Why should metal handles not be used on cooking vessels?

Answer:
Metal handles conduct heat quickly and become very hot during cooking. This can cause burns. Therefore, handles are usually made of wood or plastic.

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34. Why is it difficult to walk barefoot on sand during a hot afternoon?

Answer:
Sand absorbs heat from the Sun and becomes very hot. When we walk barefoot, heat is transferred from the hot sand to our feet by **conduction**, making it uncomfortable.

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35. Explain with examples how heat transfer is useful in our daily life.

Answer:
Heat transfer helps us in many ways:

- Cooking food (**conduction**).
- Boiling water (**convection**).
- Feeling the warmth of the Sun (**radiation**).
- Cooling of land and sea through breezes (**convection**).
- Keeping food hot or cold in thermos flasks by reducing heat transfer.

Higher-Order Thinking Questions

1. Why is the handle of a pressure cooker made of bakelite or plastic instead of metal?

Answer:
Bakelite and plastic are poor conductors of heat. They prevent heat from reaching our hands, making the cooker safe to handle.

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2. A metal spoon and a wooden spoon are kept in a cup of hot tea. After five minutes, which spoon will feel hotter? Why?

Answer:
The **metal spoon** will feel hotter because metal is a good conductor of heat, while wood is a poor conductor.

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3. Why are the roofs of many houses painted white in hot regions?

Answer:
White surfaces reflect most of the Sun's rays and absorb less heat. This keeps the houses cooler during hot weather.

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4. Explain why hot air balloons rise into the sky.

Answer:
The air inside the balloon is heated. Hot air expands, becomes less dense, and rises above the cooler surrounding air. This upward movement lifts the balloon.

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5. On a sunny day, a person wearing a black shirt feels hotter than someone wearing a white shirt. Explain.

Answer:
Black absorbs more heat by **radiation**, while white reflects most of the Sun's rays. Therefore, the person wearing black feels hotter.

Quick Revision Table

Term	Meaning
Heat	A form of energy that flows from a hotter object to a colder object.
Temperature	Measure of the hotness or coldness of an object.
Conduction	Transfer of heat through solids without movement of the material.
Convection	Transfer of heat by the movement of liquids or gases.
Radiation	Transfer of heat without a material medium.
Conductor	Material that allows heat to pass through easily.
Insulator	Material that resists the flow of heat.
Sea Breeze	Cool air moving from sea to land during the day.
Land Breeze	Cool air moving from land to sea during the night.
Convection Current	Circular movement of fluids caused by heating.