HEAT TRANSFER IN NATURE

Class 7 Science | Curiosity | Chapter 7

Heat is energy that flows from a **hotter** object/place to a **colder** one.
The Sun is Earth's main source of heat.

THREE WAYS OF HEAT TRANSFER

CONDUCTION



- Heat passes from the hotter part to the colder part by particle-to-particle transfer; particles do not move from their positions.
- Mainly occurs in solids.
- Example: a metal spoon or strip heated at one end.
- Good conductors: iron, aluminium and steel.
- Poor conductors: wood, plastic, glass, clay, porcelain and air.
- Uses: metal cooking pan with wooden/plastic handle; woollen clothes and two thin blankets trap air; hollow bricks reduce heat transfer.

CONVECTION

- Heat is transferred by actual movement of particles in liquids and gases (fluids).
- Warm fluid becomes less dense and rises; cooler fluid sinks, forming convection currents.
- Convection occurs in liquids and gases, not solids.



RADIATION

- Heat travels by waves and does not need a medium.
- The Sun's heat reaches Earth through space; warmth from a fireplace reaches us by radiation.
- All objects radiate heat to surroundings.
- Light-coloured clothes reflect more heat (summer); dark-coloured clothes absorb more heat (winter).



LAND BREEZE AND SEA BREEZE

DAY – SEA BREEZE



- Land heats faster than sea.
- Warm air above land rises.
- Cooler air flows from sea to land.

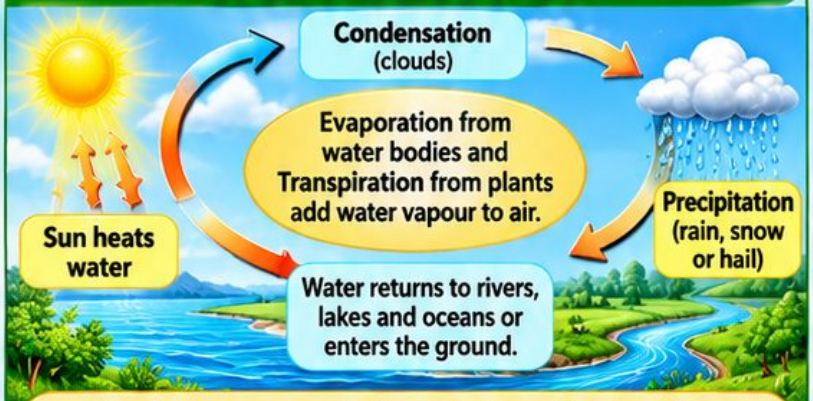
NIGHT – LAND BREEZE



- Land cools faster than sea.
- Air above relatively warmer sea rises.
- Cooler air flows from land to sea.

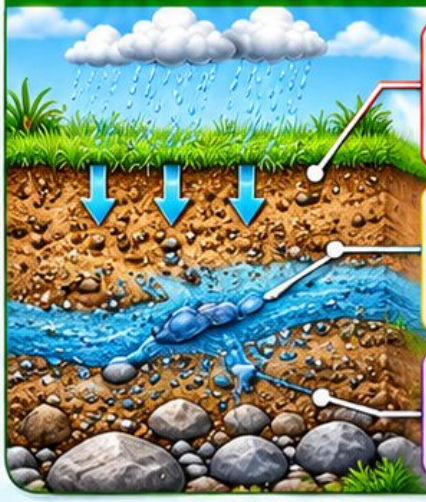
Wind direction reverses between day and night.

THE WATER CYCLE



Continuous movement of water between Earth's surface and atmosphere; driven by solar energy and redistributes water.

SEEPAGE AND GROUNDWATER



INFILTRATION: Rainwater seeps through spaces between soil grains and rocks.

GROUNDWATER: Water stored below Earth's surface in pore spaces and rock openings.

AQUIFERS: Underground layers of sediments and rocks that store groundwater.

CONDUCTION = particle-to-particle, mainly solids | **CONVECTION** = moving liquids and gases | **RADIATION** = no medium needed

Heat flows HOT → COLD.

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Conduction in Solids

What is Conduction?

Conduction is the process of transferring heat through **direct contact** in solids.



The spoon gets hot from the hot tea.

How Heat is Transferred in Solids?

In solids, heat is transferred **without the movement of the particles.**

The particles only vibrate in their fixed positions and pass the heat from one to another.



Particles vibrate, but do not move.

Examples

- A metal spoon gets hot in hot tea.
- A metal pan becomes hot on a stove.
- A metal rod gets hot at the t other end.



Good Conductors of Heat

These materials allow heat to pass through them **easily**.



Silver



Copper



Aluminium



Steel

Condutors of Heat (with poor conduction)

These materials do not allow heat to pass through them **easily**.



Wood



Plastic



Rubber



Glass

Key Takeaways

- Conduction in solids is heat transfer through direct contact.
- Particles do not move, they only vibrate.
- Metals are good conductors of heat.
- Wood, plastic, rubber and glass are poor conductors.

Metals get hot easily...
while wood and plastic keep your hands safe!



Convection

Heat transfer by the movement of particles in liquids and gases

What is Convection?

Convection is the process of transferring heat by the movement of **warm** and **cool** particles in a liquid or a gas.

How it Works?

1. Heated particles become lighter and rise.
2. Cooler particles are heavier and sink.
3. This movement carries heat from hot to cold regions.

Hot rises, Cool sinks!

Convection in Liquids – Example: Boiling Water



Hot water rises from the bottom.

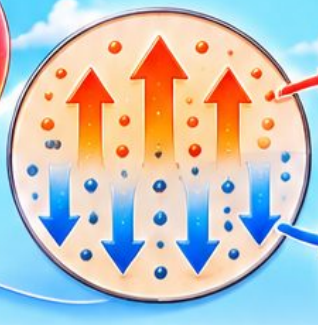
Cooler water sinks to the bottom.

Result:

Heat is distributed throughout the water by the movement of water particles.

Convection in Gases – Example: Hot Air Balloon





Hot air (less dense) rises and fills the balloon.

Cooler air (more dense) sinks down.

Result:

The balloon rises in the air because hot air moves upward.

Everyday Examples



Warm air rises from a heater.



Sea breeze (due to warm air)



Smoke rises from a chimney.



Land breeze (cool air moves in)

Key Takeaways

- Convection transfers heat by movement.
- Hot fluids rise, cool fluids sink.
- It happens in liquids and gases.

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RADIATION

– A WAY OF TRANSFER OF HEAT –

DEFINITION

Radiation is the transfer of heat directly from a hot object.
It does **NOT** require any material medium.

HOW DOES IT WORK?

The Sun's heat reaches Earth by radiation.

No material medium is needed – heat can travel through empty space.

EVERYDAY EXAMPLES

FIREPLACE



We feel heat from a fire by radiation.

HOT UTENSIL



A hot utensil cools down by radiating heat to its surroundings.

ALL OBJECTS



All objects radiate heat.

LIGHT AND DARK COLOURS

WHITE / LIGHT CLOTHES



Light-coloured clothes reflect most of the heat that falls on them. They are more comfortable in summer.

DARK CLOTHES



Dark surfaces absorb more heat. Dark clothes can feel more comfortable in winter.

REMEMBER:
RADIATION = HEAT TRANSFER WITHOUT A MEDIUM.

Sea Breeze and Land Breeze

Air moves from high pressure to low pressure!

Sea Breeze

(During the Day)

What happens?

Land gets heated faster than sea. Warm air over land rises, and cooler air from the sea moves towards land.

Result:

Cool sea breeze blows from sea to land.



Land Breeze

(During the Night)

What happens?

Land cools faster than sea. Cooler air over land becomes denser and moves towards the sea, while warmer air over sea rises.

Result:

Cool land breeze blows from land to sea.



Key Takeaways:

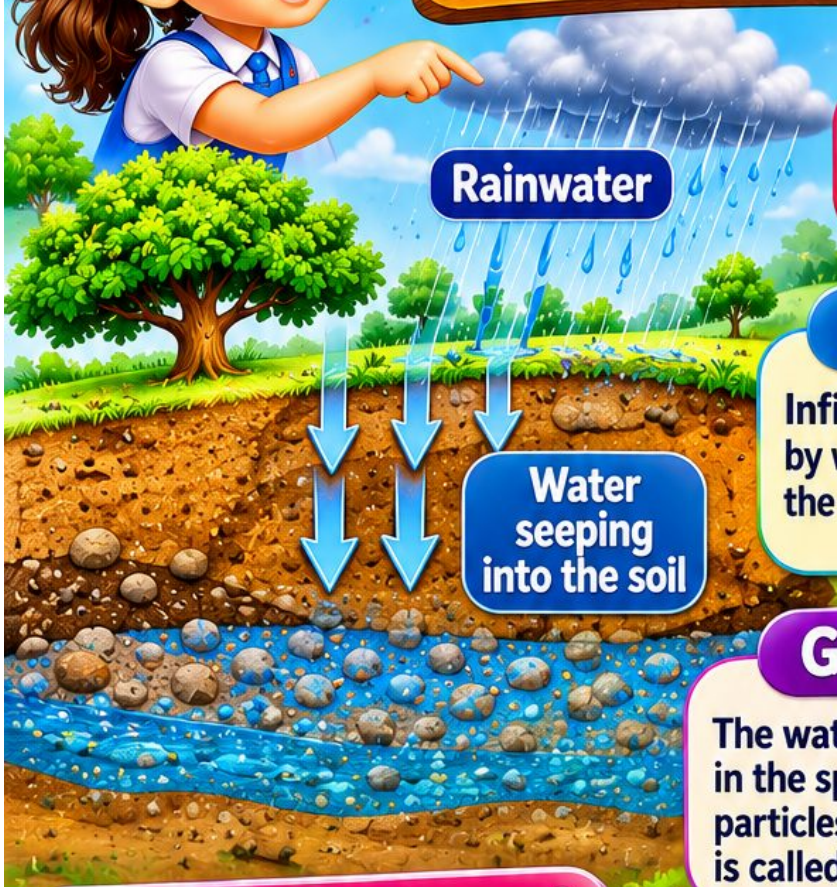
- **Sea breeze:** Blows from sea to land in the day.
- **Land breeze:** Blows from land to sea at night.
- They are caused by the difference in heating and cooling of land and water.

Nature keeps the air in motion!

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Seepage of Water Beneath the Earth





What is Seepage?

Seepage is the slow movement of water **into the ground**.

Infiltration

Infiltration is the process by which water soaks into the soil from the surface.



Groundwater

The water that gets stored in the spaces between soil particles and in cracks of rocks is called **groundwater**.



How Does It Happen?

- Rainwater percolates through soil.
- It fills the spaces between soil particles and cracks in rocks.
- This water is called **groundwater**.

Aquifers

Aquifers are layers of permeable rocks or soil that store groundwater.

Sand, gravel and porous rocks act as aquifers.



Key Points to Remember

- Seepage is the slow movement of water into the ground.
- Infiltration is water soaking into soil.
- Groundwater is water stored underground.
- **Aquifers** are layers of porous rocks that hold groundwater.

Save Groundwater!
It is precious for life!



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