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CONCEPTS • CLARITY • CONFIDENCE

GRADE 7 • SCIENCE • CHAPTER 7

Heat Transfer in Nature

A QUANCEPT EduNext reference companion to the NCERT chapter

UNDERSTAND → VISUALISE → **EXPLORE** → CONNECT → **SOLVE** → APPLY →
RECALL → MASTER

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How to read this book

	Why?	one strong question answered in depth
	Step by step	every step, with the reason for it
	Misconception diagnostic	wrong idea → correct idea → why it happens
	Reference insight	a deeper, syllabus-safe idea
	Activity	NCERT activity: steps and what you find
	Worked example	Level A direct · B multi-step · C higher-order
	Concept check	a question that forces thinking; answers at the end
	Source note	where this book corrects or completes the NCERT text

Built on NCERT *Curiosity*, Textbook of Science for Grade 7, Chapter 7 (reprint 2026–27), following its section order. Explanations, diagrams and additional examples are original. Content beyond the NCERT text is marked *enrichment*. Page numbers refer to the numbered pages that follow.

7 Heat Transfer in Nature

how heat moves, and why it matters

NCERT Chapter 7 opening

Pema and Palden live in Gangtok. On a cold winter evening they sit by a fireplace. Palden has just visited Kerala, where winter was warm and humid. Why are some places so cold and others so warm? Their grandfather, a retired science teacher, explains that Kerala is closer to the equator and has a long coastline. Meanwhile their grandmother cooks thukpa in a large metal pan, and Pema wonders: why are cooking pots made of metal?

Every question in that story is about **heat moving from one place to another**: from the fire to the children, from the flame through the pan into the soup, from the Sun to Kerala, and from the sea to the land. This chapter explains how that movement happens.

Heat always flows from a hotter object to a colder one

The one rule behind the whole chapter

it stops when both reach the same temperature

Concept check. When you hold a cold glass of water, does “cold” flow into your hand, or does heat flow out of it? Use the rule in the box above.

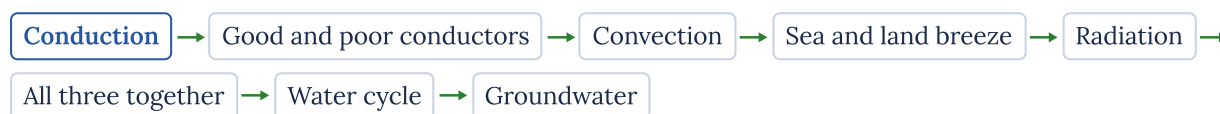
Three ways heat can travel

Conduction particle to particle solids needs a medium	Convection particles move liquids, gases needs a medium	Radiation no particles needed even through space no medium
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The three processes of heat transfer. Each is studied in its own section.

Process	How heat moves	Everyday example	Section
Conduction	passed from particle to particle; the particles stay in place	the handle of a metal spoon in hot tea gets hot	7.1
Convection	hot particles themselves move, carrying heat with them	smoke rising from an incense stick	7.2
Radiation	travels without needing any particles at all	warmth of the Sun on your face	7.3

The same ideas then explain two big processes in nature: the **sea and land breezes** that keep coastal places mild, and the **water cycle** that is driven by the Sun’s heat and refills our rivers and groundwater.



You bring: the Sun as Earth’s main source of heat and light, and the three states of water (Grade 6 Curiosity); metals as good conductors of heat (*The World of Metals and Non-metals*); using a laboratory thermometer.

7.1 Conduction of Heat

passing heat from particle to particle

NCERT §7.1, Activity 7.1, Fig. 7.1-7.2

Activity 7.1 Let us experiment

Caution: do this under the supervision of a teacher or an adult.

1. Take a metal strip (aluminium or iron) about 15 cm long.
2. Stick four pins to it with wax, about 2 cm apart, and label them I, II, III, IV (I is farthest from the stand).
3. Clamp the strip to a stand (or rest it between two bricks).
4. Heat the free end with a candle or spirit lamp. Predict, then record, the order in which the pins fall.

What you find. Pin I, nearest the flame, falls first, then II, III and IV, one after another. They do not all fall together.

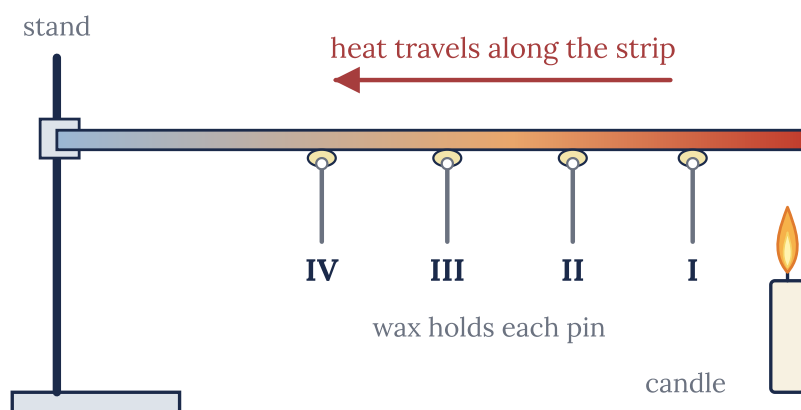


Fig. 7.1 (redrawn). Heat creeps along the strip from the heated end towards the stand, melting the wax under each pin in turn.

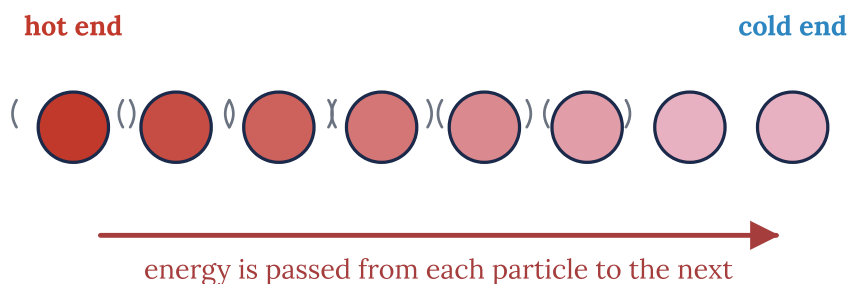
WHAT THE PINS TELL US

- 1 The end of the strip in the flame gets hot first.
- 2 That heat travels along the metal, towards the colder end.
heat flows from hot to cold
- 3 When enough heat reaches a pin, its wax melts and the pin drops.
the nearest pin drops first
- 4 The pins fall in order because heat takes time to travel along the strip.
order: I → II → III → IV

Conduction: heat passes from the hotter part of an object to its colder part, particle by particle

Definition

the particles pass heat on but do not leave their places



each particle vibrates about its own place; none travels along the strip

The particle picture of conduction. Hot particles vibrate more strongly and nudge their neighbours; the energy is handed along, like buckets passed along a line of people.

Why? Why did the pins not all fall at the same time?

Heat does not jump instantly to every part of the strip. Each particle has to warm up and pass the energy to the next one. So the part near the flame warms first, and a place farther along warms only later. The distance from the flame decides when each pin falls.

Good and poor conductors of heat

Materials that let heat pass through them easily are **good conductors**. Metals are good conductors, which is why cooking utensils are made of metal. Materials that do not let heat pass easily are **poor conductors**, also called **insulators**. In solids, heat travels mainly by conduction.

Good conductors	Poor conductors (insulators)
copper, aluminium, iron, steel, silver	wood, plastic, glass, rubber
a metal pan, a steel spoon	clay (<i>kulhad</i>), porcelain cup, cloth
—	air, wool, cotton wool, cork

If Activity 7.1 were repeated with a wooden or glass strip, the pins would not fall: those materials are poor conductors. That is also why tea stays hot longer in a clay or porcelain cup, and why a pan's handle is made of plastic or wood.

Misconception diagnostic

Student may think	A metal railing feels colder than a wooden bench on a winter morning, so the metal must be at a lower temperature.
Correct interpretation	Both are at the same temperature as the air. Metal is a good conductor, so it carries heat away from your hand much faster; your hand loses heat quickly and feels cold.
Why the confusion happens	Our skin senses how fast we lose heat, not the actual temperature of the object.

Air: the insulator all around us

Air is a **poor conductor** of heat. Woollen clothes keep us warm because wool traps air in its pores, and that trapped air slows the flow of heat from our warm body to the cold surroundings. Wool does not make heat; it holds on to the heat our body produces.

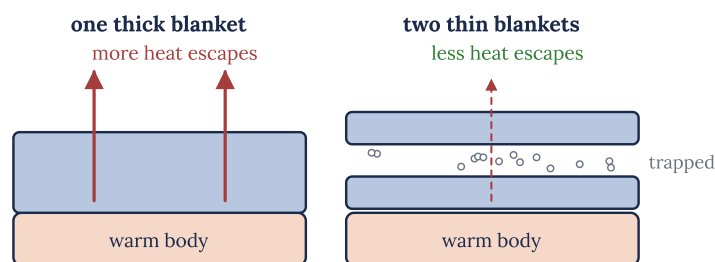
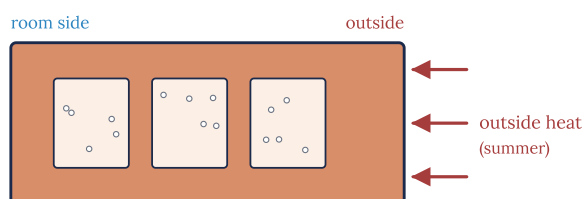


Fig. 7.2 idea. A layer of air trapped between two thin blankets acts as an insulator, so two thin blankets keep us warmer than one thick one.

Houses that use conduction



Hollow bricks: air in the gaps slows heat flow through the wall.

Hollow bricks in outer walls trap air, a poor conductor. The house stays cooler in summer and warmer in winter.

Fascinating fact. In the Mori block of Uttarkashi, Uttarakhand, winters are extremely cold. Houses are built with walls of two wooden layers filled with cow dung and mud. Wood and mud are poor conductors, so heat does not escape easily and the houses stay warm.

Worked example

Level B • applying the idea

A saucepan has a metal body and a plastic handle. Explain each choice in terms of conduction.

Body Metal is a good conductor, so heat from the flame passes quickly through the base into the food.

Handle Plastic is a poor conductor, so heat from the hot pan does not reach your hand.

Answer **body: good conductor; handle: poor conductor (insulator)**

Question types choose the correct option (order of pins falling; materials of a pan); true/false with reason (conduction in solids); explain everyday choices (woollens, blankets, hollow bricks, clay cups).

Concept check. Is air a good or a poor conductor of heat? Give two examples from this section where that fact is used.

7.2 Convection

heat carried by moving particles

NCERT §7.2, Activities 7.2–7.3, Fig. 7.3–7.5

Pema points at the smoke rising from the burning firewood. “Why is the smoke going up?”

Activity 7.2 Let us investigate

1. Hang two identical paper cups upside down from the two ends of a wooden stick, using threads of equal length.
2. Balance the stick so that it is horizontal.
3. Place a burning candle below one cup (well below it, so the cup cannot catch fire), and watch.

What you find. The cup above the candle **rises**, and the stick tilts.

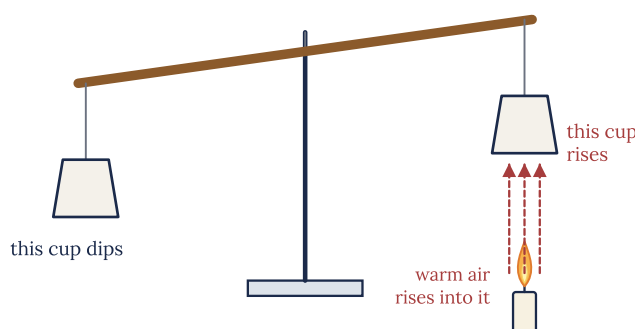


Fig. 7.3 (redrawn). Warm air from the candle collects inside the right-hand cup and lifts it.

WHY THE CUP RISES

- 1 The candle heats the air around its flame.
- 2 Warm air expands: the same air takes up more space.
it is now lighter for its size than the cooler air around it
- 3 Lighter air rises, like a cork rising in water, and collects in the cup.
the cup is pushed up

You can see air expand on heating by leaving a partly blown-up balloon in the Sun: as the air inside warms, the balloon swells (Fig. 7.4). Smoke from an incense stick (*agarbatti*) is a mixture of hot gases and tiny solid particles; because it is warmer than the surrounding air, it rises.

Misconception diagnostic

Student may think	Warm air rises because heating makes it lose weight.
Correct interpretation	The amount of air does not change. The same air spreads out into more space, so a cupful of warm air is lighter than a cupful of cool air. The cooler, heavier air around it pushes in below and lifts it.
Why the confusion happens	Everyday words like “light” and “heavy” mix up total weight with weight for a given size.

Heat transfer in liquids

Activity 7.3 Let us find out

Caution: do this under the supervision of a teacher or an adult.

1. Half-fill a 500 mL beaker with water.
2. Using a straw, place one grain of potassium permanganate at the centre of the base.
3. Heat the beaker gently with a candle placed right below the centre, and watch the coloured streak.

What you find. A purple streak rises up the middle, spreads out at the top and comes down along the sides. The pattern keeps going round.

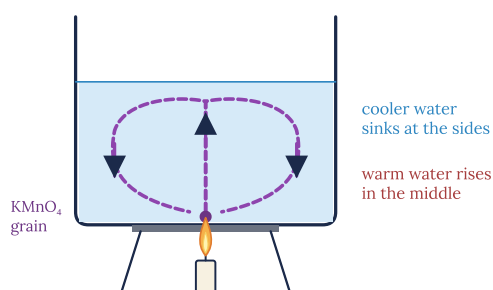


Fig. 7.5 (redrawn). The coloured streak shows the path of the moving water.

THE LOOP IN THE BEAKER

- 1 Water at the bottom, just above the flame, is heated first.
- 2 It expands, becomes lighter and rises up the middle.
- 3 Cooler, heavier water from the sides sinks to take its place.
- 4 This water is heated in turn and rises. The loop continues until all the water is hot.

a convection current

Convection: heat is carried by the actual movement of particles from one place to another

Definition

this is how liquids and gases are heated

	Conduction	Convection
Do particles move from place to place?	no, they vibrate in place	yes, they carry the heat with them
Main way heat travels in	solids	liquids and gases
Needs a medium (particles)?	yes	yes

Why? Why must a room heater be placed near the floor, and an air conditioner high on a wall?

Warm air rises and cool air sinks. A heater near the floor warms the air there; that air rises and cooler air comes down to be heated, so the whole room circulates and warms. An air conditioner cools air near the ceiling; the cool air sinks and pushes warm air up to be cooled. Both use convection to mix the whole room.

Worked example

Level A • smoke detector (NCERT Q1 iii)

Where should a smoke detector be fitted in a room: near the floor, in the middle of a wall, on the ceiling, or anywhere?

Idea Smoke from a fire is hot, so it rises by convection.

Answer **(c) on the ceiling**, where the rising smoke reaches it first

Question types explain an activity (cups, beaker); choose placement (smoke detector, heater); true/false (convection needs movement of particles).

Concept check. Water is heated in a pan from below, but a pot of milk on a stove is sometimes stirred. Why is stirring not needed for water to heat all through?

7.2.1 Land and Sea Breeze

convection on the scale of a coastline

NCERT §7.2.1, Activity 7.4, Fig. 7.6–7.7

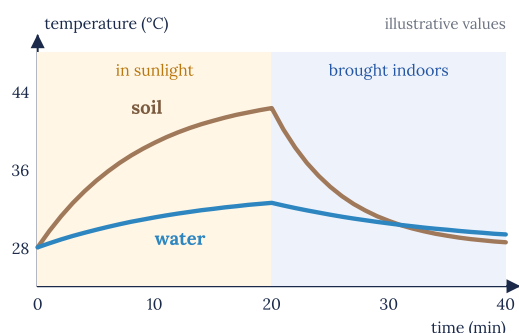
Palden remembers the beach in Kerala: “During the day the sand was hotter than the sea water, but at night the sand was cooler.” Pema replies, “So different things heat up and cool down differently.”

Activity 7.4 Let us investigate

Caution: do this on a clear, sunny day, under the supervision of a teacher or an adult.

1. Half-fill one bowl with soil and an identical bowl with water.
2. Fix a laboratory thermometer in each, with the bulb covered but not touching the bottom or sides.
3. Place both in sunlight. Record the temperatures every 5 minutes for 20 minutes.
4. Then bring both indoors and record how they cool for another 20 minutes.

What you find. The soil warms up more than the water in the same time, and it also cools down faster.



Soil and water in the Sun, then indoors. Values are illustrative: your readings will differ, but the pattern will not.

Reading the graph

Time runs along the bottom; temperature up the side. In the Sun (left, shaded yellow) the **soil line climbs steeply** and the water line only gently: soil heats faster. Indoors (right) the soil line **falls steeply** while the water line falls slowly: soil also cools faster. Water is slow to change temperature in both directions.

Sea breeze and land breeze

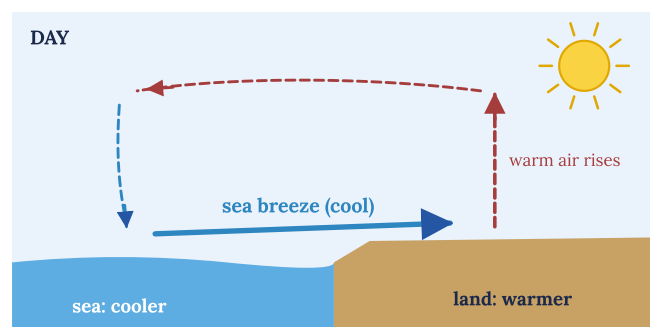


Fig. 7.7(a) (redrawn). By day the land is warmer.

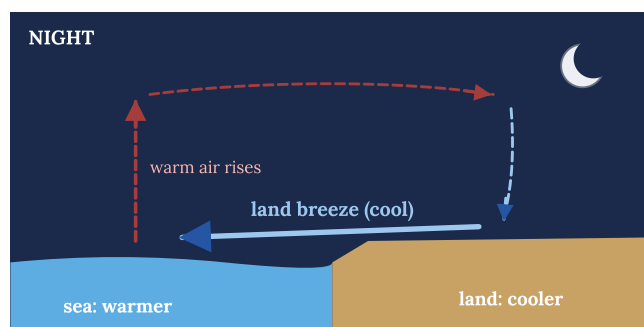


Fig. 7.7(b) (redrawn). At night the sea is warmer.

HOW THE WIND REVERSES EVERY DAY

- 1 **Day.** The Sun heats the land faster than the sea.
air above the land becomes warm

- 2 The warm air over the land rises (convection).
- 3 Cooler air from over the sea moves in to take its place.
sea breeze: cool wind from sea to land
- 4 **Night.** Without sunlight, the land cools faster than the sea.
air above the sea is now warmer
- 5 That warm air over the sea rises, and cooler air from the land flows out to replace it.
land breeze: cool wind from land to sea

The sea breeze gives people in hot coastal places relief in the daytime, which is why windows in coastal houses often face the sea. Because the direction of the wind reverses between day and night, people living near the sea feel it change.

Reference insight: the sea as a giant temperature buffer

This is why Kerala's winter felt mild to Palden. A large body of water heats slowly by day and gives up its heat slowly at night, so the air near it never gets very hot or very cold. Places far inland, away from any sea, have much hotter days and colder nights.

Misconception diagnostic

Student may think	A sea breeze blows from the land to the sea.
Correct interpretation	A breeze is named after where it comes from . The sea breeze blows from the sea to the land (by day); the land breeze blows from the land to the sea (by night).
Why the confusion happens	Students name the wind after where it goes.

Question types true/false (land breeze direction); explain with a diagram (sea and land breeze); reason why coastal climates are mild (NCERT Q8).

Concept check. Draw arrows for the wind near a beach at 2 p.m. and at 2 a.m. In which one does warm air rise over the land?

7.3 Radiation

heat that needs no medium

NCERT §7.3, Fig. 7.8, Deeper Dive, Fascinating Facts

Sitting around the fire, Pema and Palden feel warm on their faces, although no hot air is blowing at them and they are not touching the fire. How does the heat reach them?

Heat can travel straight from a hot object to us without heating the things in between. This is **radiation**. The heat of the Sun reaches the Earth this way, across space where there is no air at all.

Radiation: heat travels from one place to another without needing any medium

Definition

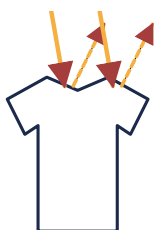
it works even through empty space



Sunlight crosses empty space to reach the Earth. Conduction and convection are impossible there, because there are no particles.

All objects radiate heat. A hot utensil taken off the flame slowly cools down, partly because it radiates heat to its surroundings. At the same time, it also receives some heat back from them.

Colour and radiation NCERT Deeper Dive



light colour: reflects most heat
better in summer



dark colour: absorbs more heat
better in winter

Light colours reflect most of the heat that falls on them; dark colours absorb more.

Light-coloured clothes reflect most of the Sun's heat, so they are more comfortable in summer. Dark clothes absorb more heat, so they suit winter. (Enrichment: for the same reason, water tanks and roofs are sometimes painted white in hot places, and solar cookers are painted black inside.)

All three together

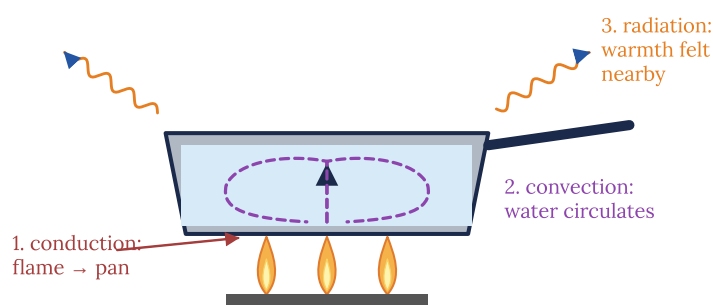
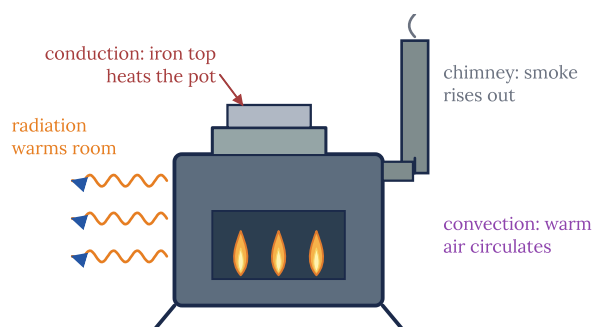


Fig. 7.8 idea. Heating water in a pan uses all three processes at once.

What gets heated	Process	How
the metal base of the pan	conduction	heat passes through the metal from the hot underside to the inside
the water in the pan	convection	warm water rises, cooler water sinks, in a loop
your hands held near the pan	radiation	warmth reaches you without touching or hot air

A finer point. NCERT says heat goes from the flame to the utensil by conduction. More precisely, the flame's hot gases touch the pan, and the heat then passes through the metal base by conduction.



A bukhari: one device, all three processes.

Fascinating fact. In the upper Himalayas, a traditional heater called the **bukhari** keeps rooms warm in winter. It is an iron stove burning wood or charcoal, with a long pipe as a chimney to carry the smoke out. Its flat iron top heats cooking pots by **conduction**; the air around it circulates by **convection**; and the hot stove warms people nearby by **radiation**.

	Conduction	Convection	Radiation
Medium needed?	yes	yes	no
Particles move?	no	yes	no particles needed
Mainly in	solids	liquids, gases	anywhere, even empty space
Example	hot spoon handle	sea breeze	Sun's heat

Worked example

Level C • a thermos flask (enrichment)

A vacuum flask keeps tea hot for hours. It has two glass walls with a vacuum (no air) between them, and the walls are silvered like a mirror. How does it stop each kind of heat loss?

Conduction	The vacuum has no particles, so heat cannot be passed across the gap.
Convection	No air in the gap means no moving particles to carry heat. A tight stopper also stops warm air escaping from the top.
Radiation	The shiny silvered walls reflect radiated heat back towards the tea.
Answer	it blocks all three processes , so the tea stays hot

Question types name the process in an everyday situation; explain clothes colour; why radiation needs no medium; all three in one device (bukhari, pan).

Concept check. On the Moon there is no air. Can heat from the Sun still reach the Moon? Which process carries it?

7.4 Water Cycle

the Sun's heat keeps water moving

NCERT §7.4, Fig. 7.9

Wet clothes on a line dry faster on a sunny day, because the Sun's heat makes the water evaporate faster. The same heat from the Sun drives the evaporation of water from oceans, rivers and lakes, and powers one of the most important cycles on the Earth.

State of water	Where we find it
Liquid	oceans, rivers, lakes
Solid	snow, ice sheets, glaciers in mountains and polar regions
Gas	water vapour in the atmosphere

In summer, some snow and ice melt under the Sun's radiation and flow down as rivers, finally into the oceans. In winter, fresh snow replaces the ice that melted.

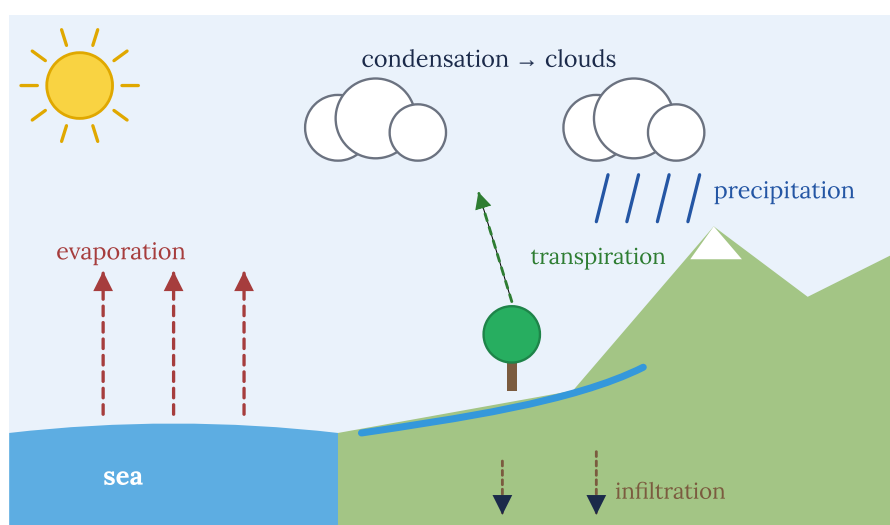


Fig. 7.9 (redrawn). The water cycle, powered by heat from the Sun.

THE WATER CYCLE, STEP BY STEP

- 1 Evaporation.** The Sun heats water in oceans, rivers and lakes; it turns into water vapour.
liquid → gas
- 2 Transpiration.** Plants and trees also release water vapour from their leaves.
- 3 Condensation.** Water vapour rises, cools high up and condenses into tiny droplets that form clouds.
gas → liquid
- 4 Precipitation.** Clouds bring water back down as rain, snow or hail.
- 5 Return.** Rainwater flows into ponds, lakes, rivers and oceans, or seeps into the ground.
and the cycle continues

Water cycle: the continuous movement of water, up as vapour and down as precipitation, through soil, rocks and plants and back to water bodies

Definition

Why? What does the water cycle actually do for us?

It **redistributes** water: water that evaporates from the sea falls as rain far inland, on fields and mountains. It **replenishes** rivers, lakes and groundwater that we use up. And it **conserves** water: the total amount of water on the Earth stays the same; it only changes place and state.

Science in history

Know a scientist: Varahamihira. An astronomer and mathematician of the sixth century CE in Ujjaini (modern Ujjain, Madhya Pradesh), he described methods for predicting seasonal rainfall in his work *Brihatsamhita*, using cloud formation, wind patterns, the positions of stars and the Moon, and other natural signs.

Misconception diagnostic

Student may think	Clouds are made of water vapour.
Correct interpretation	Water vapour is an invisible gas. Clouds are made of tiny droplets of liquid water (or ice) formed when the vapour cools and condenses .
Why the confusion happens	Clouds look like steam, and “vapour” and “steam” are used loosely in everyday speech.

Question types label a water-cycle diagram; name each process; justify “the water cycle redistributes and replenishes water” (NCERT Q10).

Concept check. Which process in the water cycle needs heat from the Sun, and which one happens when the air cools?

7.4.1 Seepage of Water beneath the Earth

infiltration, groundwater and aquifers

NCERT §7.4.1, Activity 7.5, Fig. 7.10–7.13

People draw water from wells and handpumps. This is water that has seeped into the ground. How does it get there?

Activity 7.5 Let us investigate

1. Cut three 1 L plastic bottles in half and make a small hole in each cap. Keep the top halves upside down like funnels.
2. Fill one with clay, one with sand and one with gravel; place a beaker under each.
3. Pour 200 mL of water into each, predict how much will flow through, and collect for 10 minutes.

What you find. Water seeps **fastest through gravel**, slower through sand, and **slowest through clay**.

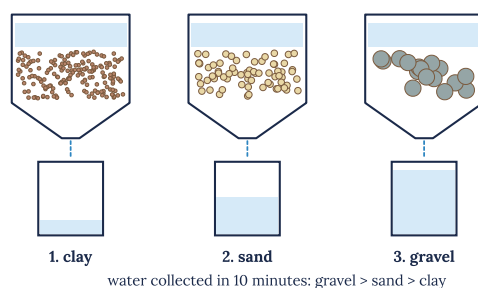


Fig. 7.10 (redrawn). The same amount of water poured in; very different amounts come out.

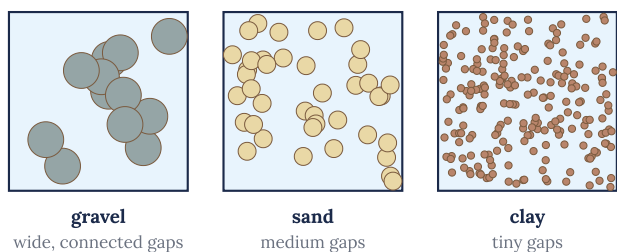


Fig. 7.11 idea. Bigger grains leave wider, connected spaces.

The spaces between gravel particles are wide and connected, so water passes through easily. Clay particles are tiny and packed closely, leaving very small gaps. Water can seep in readily only where the spaces are **wide, open and interconnected**.

Infiltration: surface water seeping down through soil and rocks

Definition

Groundwater and aquifers

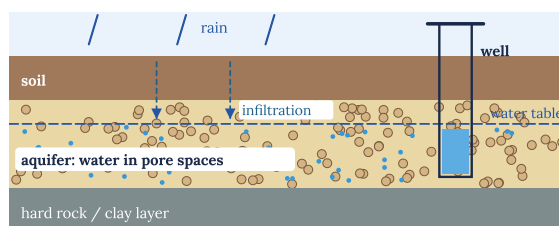


Fig. 7.12 (redrawn). Rainwater infiltrates and is stored in an aquifer, from which a well draws it.

Key terms

Groundwater water that seeps down and is stored in the pore spaces of sediments and the openings in rocks below the surface

Aquifer an underground layer of sediments or rocks that stores water in its pore spaces

Well, bore well dug or drilled down into an aquifer to take out groundwater; it may lie a few metres to hundreds of metres deep

Groundwater is not unlimited

Problem	Why it happens	What helps
Too much water is pumped out	growing population needs more water	use water carefully
Less water soaks in	fewer plants and more concrete in cities stop infiltration	rainwater harvesting and recharge pits refill the aquifers

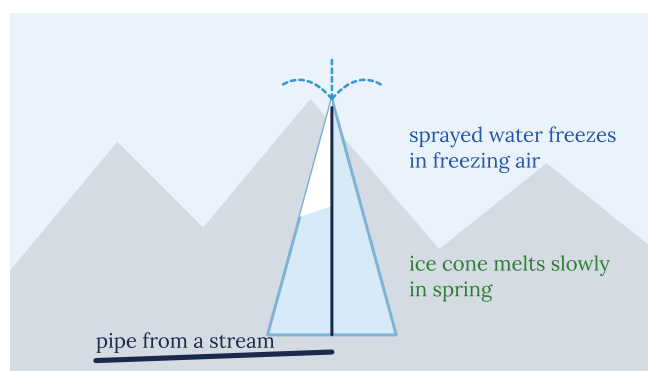


Fig. 7.13 idea. An ice stupa in Ladakh.

Science and society: the ice stupa. In Ladakh, streams often dry up in spring, because the Sun is not yet strong enough to melt the mountain snow. So in winter, water from mountain streams is piped down and sprayed into the freezing air. It freezes as it falls, building up layer by layer into a tall cone of ice called an **ice stupa**. The cone melts slowly in spring, giving water for farming through the dry season.

Why? Why does a cone of ice last longer than the same ice spread out flat?

A cone exposes much less surface to the Sun and the warm air for the amount of ice it holds. Heat can only enter through the surface, so the ice melts slowly, releasing water gradually just when farmers need it. (Enrichment.)

Question types compare seepage through clay, sand and gravel (true/false, NCERT Q3 iii); explain infiltration and groundwater (NCERT Q9); suggest ways to recharge groundwater.

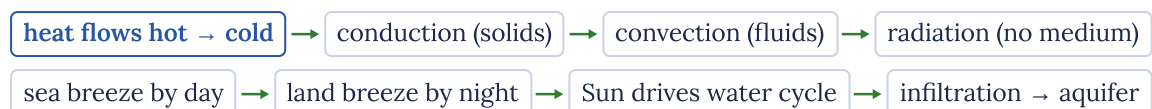
Concept check. A school replaces its mud playground with concrete. What happens to the rainwater that used to soak in, and what could the school build to help?

★ Chapter Synthesis

the whole chapter as one connected structure

NCERT In a Nutshell

The chapter on one page



Idea	In one line	Remember the example
Conduction	heat passed particle to particle; particles stay in place	<i>pins fall one by one</i>
Good / poor conductors	metals / wood, plastic, glass, clay, air, wool	<i>metal pan, clay cup</i>
Trapped air	a poor conductor that keeps heat in or out	<i>woollens, two blankets, hollow bricks</i>
Convection	heat carried by moving particles in liquids and gases	<i>rising smoke, purple streak</i>
Sea / land breeze	land heats and cools faster than water	<i>cool wind from sea by day, from land by night</i>
Radiation	no medium needed; all objects radiate	<i>Sun's heat; light vs dark clothes</i>
Water cycle	evaporation, transpiration, condensation, precipitation	<i>redistributes and replenishes water</i>
Groundwater	infiltration fills aquifers; easiest through gravel	<i>wells; recharge pits; ice stupa</i>

Reference insight: the logic of the chapter

Conduction, convection and radiation are not three unrelated facts. Conduction needs particles that touch; convection needs particles that can flow; radiation needs no particles at all. Ask two questions about any situation, **are there particles?** and **can they move?**, and you can name the process.

★ Misconception Bank

twelve traps and how to escape them

NCERT Let Us Enhance Our Learning

Wrong idea	Correct idea	\$
Cold flows into things.	Heat flows out of warmer things; “cold” is just less heat.	7
Metal is colder than wood in the same room.	Same temperature; metal carries heat from your hand faster.	7.1
Woollen clothes produce heat.	They trap air, which slows the loss of body heat.	7.1
One thick blanket is warmest.	Two thin ones trap an extra layer of insulating air.	7.1
In conduction, hot particles travel along the object.	They vibrate in place and pass energy on.	7.1
Warm air rises because it loses weight.	The same air spreads out, so it is lighter for its size.	7.2
Solids are heated mainly by convection.	Solids by conduction; liquids and gases by convection.	7.2
A sea breeze blows from land to sea.	Sea breeze: sea → land (day). Land breeze: land → sea (night).	7.2.1
Water heats up faster than soil.	Soil heats and cools faster than water.	7.2.1
Heat always needs a medium to travel.	Radiation needs none; the Sun’s heat crosses space.	7.3
Clouds are water vapour.	Clouds are droplets of condensed water.	7.4
Clay lets water through quickly.	Clay allows the least seepage; gravel the most.	7.4.1

★ Solutions to NCERT Exercises

model answers with reasons

NCERT Let Us Enhance Our Learning

Model answers to **Let Us Enhance Our Learning**. Read the reasoning, not just the answer: the reasoning is what earns marks.

NCERT exercise map

Question	Topic	Where in this book
1 (i)	materials of a saucepan	§7.1 worked example
1 (ii)	order of pins falling	§7.1 Activity 7.1
1 (iii)	placing a smoke detector	§7.2 worked example
2	leaky tumbler inside another	§7.1 (trapped air)
3	true/false: conduction, convection, seepage, land breeze	§7.1, 7.2, 7.2.1, 7.4.1
4	where melting ice gets its heat	§7 opening rule, §7.3
5	smoke from a downward incense stick	§7.2
6	two test tubes heated differently	§7.2
7	hollow bricks	§7.1
8	large water bodies and mild climate	§7.2.1
9	seepage and groundwater	§7.4.1
10	water cycle redistributes and replenishes	§7.4

Q1 (i) (c) A (the body) is a good conductor, so heat reaches the food quickly; B (the handle) is a poor conductor, so it stays cool to hold.

Q1 (ii) (b) Pins I and II fall earlier than III and IV: they are nearest the flame, and heat reaches them first by conduction.

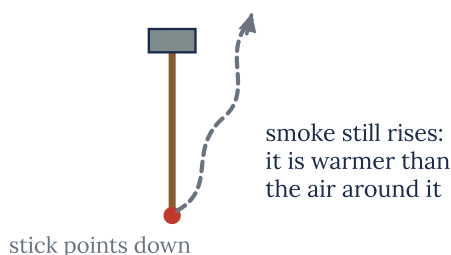
Q1 (iii) (c) On the ceiling. Smoke is hot and rises by convection, so it reaches the ceiling first.

Q2 Yes. A layer of air is trapped between the two tumblers. Air is a poor conductor, so heat from the warm surroundings reaches the lassi more slowly, and it stays cold longer.

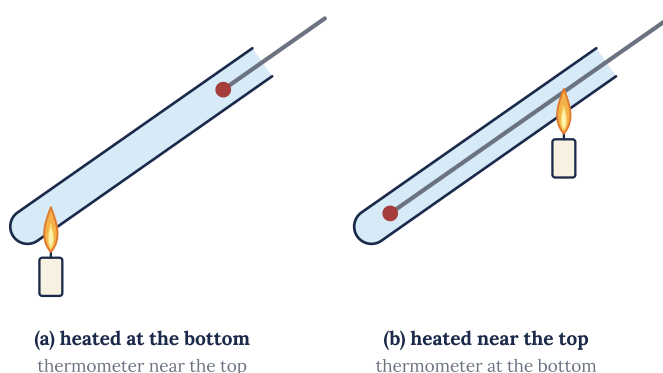
Q3 (i) **F**: in solids heat is transferred mainly by conduction. (ii) **T**: in convection the particles themselves move. (iii) **F**: clay has the tiniest gaps and allows the *least* seepage; sand allows more. (iv) **T**: cool air moving from land to sea at night is the land breeze.

Q4 From their surroundings, which are warmer: from the dish they touch (conduction), from the air around them (conduction and convection) and by radiation from warmer objects nearby. Heat always flows from the warmer surroundings into the colder ice.

Q5 Upwards. The smoke is warmer and lighter than the surrounding air, so it rises by convection whichever way the stick points.



Q6 Fig. 7.16(a). There the water is heated at the bottom; the warm water rises (convection) and the thermometer near the top gets hot water. In (b) the water is heated near the top: warm water stays at the top and does not sink, and water is a poor conductor, so the water near the bottom, where the thermometer bulb is, stays cooler.



Q7 Hollow bricks trap air inside them. Air is a poor conductor of heat, so less of the outside heat passes through the walls into the house, which stays cooler.

Q8 Water heats up and cools down more slowly than land. By day, the water stays cooler, and the sea breeze brings cool air to the land. At night, the water stays warmer and gives up its heat slowly, so the nearby air does not become very cold. So places near large water bodies avoid extreme temperatures.

Q9 Rainwater on the surface seeps down through the gaps between soil and rock particles (infiltration). It passes easily where the spaces are wide, open and connected (as in gravel or sand) and slowly through clay. It collects in the pore spaces of underground sediments and openings in rocks as groundwater; these water-holding layers are aquifers, reached by wells and bore wells.

Q10 The Sun's heat evaporates water from seas, rivers and lakes (and plants release vapour by transpiration). The vapour rises, condenses into clouds, and falls as rain or snow, often far away, over land and mountains: this **redistributes** water. Rain refills rivers, lakes and, by infiltration, groundwater: this **replenishes** water. The total amount of water stays the same; it only moves and changes state.

Exploratory projects: what you should see

- **Paper on a metal rod.** The paper does not burn easily. The metal conducts heat away from the paper so quickly that the paper does not get hot enough to catch fire.
- **Paper spiral over a candle.** The spiral turns. Hot air rising from the candle (convection) pushes against the slanted paper and makes it spin.

- **Visit to a water-harvesting site.** Note how rainwater is collected from roofs or ground, filtered through layers of gravel and sand, and led into a pit or well so it can infiltrate and recharge the aquifer.

★ Answers to Concept Checks

QUANCEPT EduNext

check your reasoning, not just your answers

§7 Heat flows out of your hand into the colder glass. Nothing called “cold” flows; your hand simply loses heat.

§7.1 A poor conductor. Examples: woollen clothes (air in the pores), two thin blankets (air between them), hollow bricks (air in the hollows).

§7.2 Water heated from below sets up convection currents that mix all of it. (Thick milk circulates less freely and can burn at the bottom, so it is stirred.)

§7.2.1 At 2 p.m. the land is warmer: warm air rises over the land and the cool breeze blows from sea to land. At 2 a.m. the arrows reverse: warm air rises over the sea and the breeze blows from land to sea.

§7.3 Yes. Radiation needs no medium, so the Sun’s heat crosses empty space to reach the Moon just as it reaches the Earth.

§7.4 Evaporation needs the Sun’s heat; condensation happens when the rising vapour cools.

§7.4.1 The water runs off the concrete into drains instead of soaking in, so less groundwater is recharged. The school could build a recharge pit or a rainwater-harvesting system to lead the water back into the ground.

Source notes for this chapter. (1) §7.3 says heat reaches the utensil from the flame “by conduction”; strictly, the flame’s hot gases heat the underside of the pan, and heat then passes through the metal base by conduction (see the note in §7.3). (2) §7.2 says warm air “becomes lighter”; it means lighter for the same volume (less dense): its total weight does not change. (3) Activity 7.2 does not say how far the candle must be from the paper cup; keep it well below so the cup cannot catch fire. (4) The soil–water graph in §7.2.1 uses illustrative numbers to show the pattern NCERT describes; it is not NCERT data.

Material marked **enrichment** (thermos flask, white roofs and black solar cookers, why an ice cone melts slowly, heater and air-conditioner placement) is consistent with the NCERT text.