

SCIENCE • CLASS 9

CHAPTER 13

Earth as a System

Energy, Matter, and Life

NCERT SOLUTIONS



GREENHOUSE GASES & TEMPERATURE

Pause and Ponder — 1

Question: Use the linked greenhouse-effect simulation to study how greenhouse-gas concentration affects surface temperature.

Method

- Open the Greenhouse Effect simulation and start sunlight.
- Keep sunlight and cloud conditions unchanged.
- Compare low and high greenhouse-gas concentrations. Let the temperature settle after each change.

Expected result

- A higher concentration gives a higher final surface temperature under the same conditions.
- Greenhouse gases absorb and re-emit outgoing infrared radiation. Some radiation returns towards the surface, slowing its net cooling.
- The surface warms until outgoing energy again balances absorbed sunlight.

Conclusion: More greenhouse gases → stronger greenhouse effect → warmer surface.
This is a qualitative result; exact readings depend on the chosen settings.

MOUNTAIN BREEZES & AGRICULTURE

Pause and Ponder – 2

Question: How can a cool mountain breeze benefit agriculture, particularly crops and soil?

Solution

- At night, slopes cool. The denser air moves downhill into the valley.
- Gentle cooling can reduce heat stress in crops and create suitable temperatures for cool-season crops.
- Under suitable humidity and wind conditions, cooler air can reduce evaporation and help soil retain moisture.
- Air movement also exchanges air around plants.

Important condition

- These benefits are not automatic. Strong, dry winds can increase water loss.
- Very cold air may collect in low valleys and cause frost, damaging crops.
- The effect depends on the crop, season, humidity and strength of the breeze.

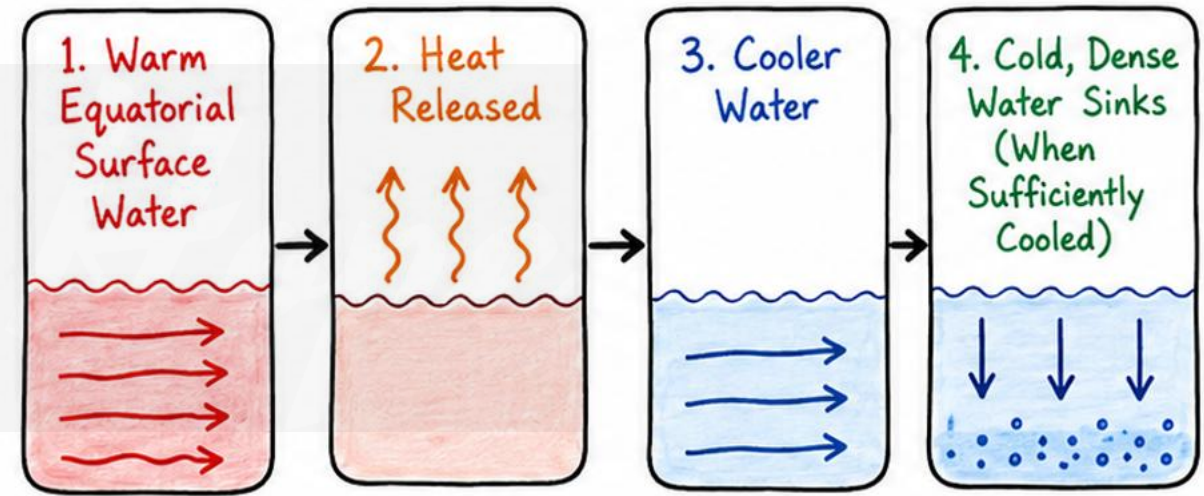
WARM OCEAN CURRENTS

Pause and Ponder — 3

Question: What happens to warm equatorial surface water as it travels towards the poles?
How does it affect nearby areas?

Solution

1. The water carries heat from the warmer equatorial region towards cooler latitudes.
2. It releases heat to the atmosphere and gradually cools.
3. This heat can make nearby coastal regions milder and influence winds and rainfall.
4. Sufficiently cooled, salty water can become dense enough to sink, helping ocean circulation. Not all poleward surface water sinks.



Warm water → heat released → cooler water

For example, the North Atlantic Drift helps keep parts of western Europe warmer than other places at similar latitudes.

Ocean currents redistribute heat and help moderate climate.

OCEAN WARMING & MARINE LIFE

Pause and Ponder – 4

Question: Global warming disturbs dissolved carbon dioxide in oceans.
What can happen to marine life?

Warming effect

- Warmer water holds less dissolved CO_2 under otherwise similar conditions. Warming can weaken the ocean's ability to absorb additional CO_2 .
- Warm water also holds less O_2 . Heat and low oxygen can stress marine organisms.
- Prolonged heat stress can cause coral bleaching and change where species live.

Rising atmospheric CO_2

- The ocean still absorbs extra CO_2 from the atmosphere. This causes ocean acidification.
- Acidification makes shell and coral-skeleton formation harder for many organisms.

Result: Habitats, food webs and fisheries can be disrupted.

Explanation: Warming reduces gas solubility; extra CO_2 uptake causes acidification.



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