Science 10

Unit D: Energy flow in global systems

Uneven heating and phase changes

Sand and lake water cooling

- After sunset, dry land often changes temperature faster than a nearby large body of water.
- Equal energy input can produce different temperature changes because materials have different specific heat capacities.



Temperature and energy

- Temperature measures how fast particles are moving on average. It is only part of the energy change.
- The same mass and the same energy input can still produce different temperature changes in different materials.
- During a phase change, energy can go in while the thermometer stays still.

Key terms

specific heat capacity

Energy required to raise one unit mass of a substance by one degree Celsius.

phase change

A change of state without a change in chemical identity.

heat of fusion

Molar energy required for melting at the melting point.

heat of vaporization

Molar energy required for vaporization at the boiling point.

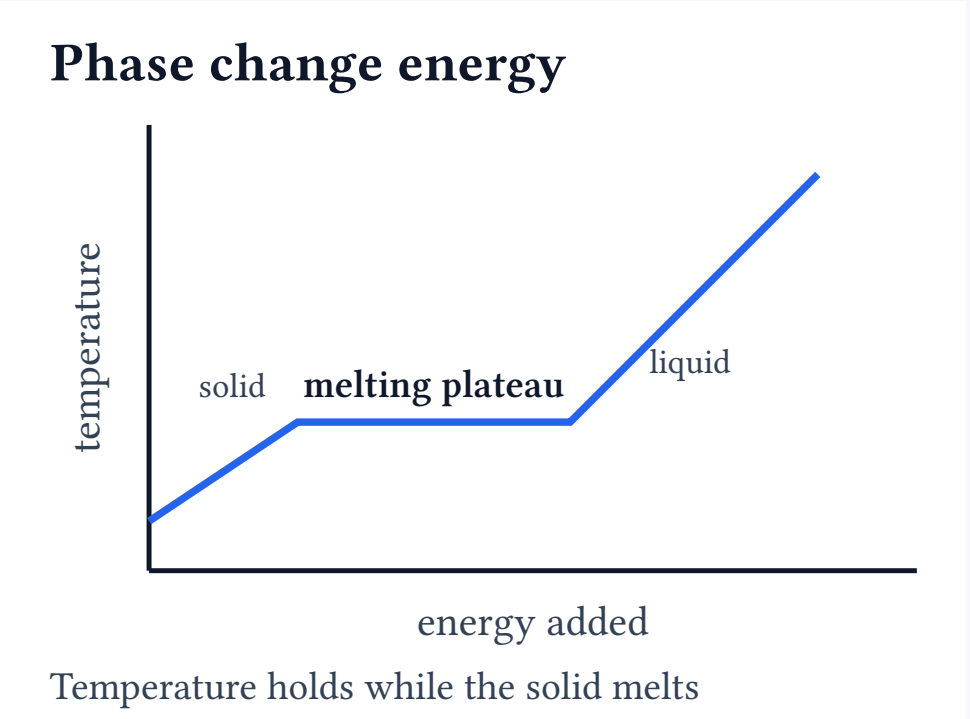
Uneven heating

- Sand and lake water warm by different amounts under the same sunshine.
- A material that warms quickly usually cools quickly too.
- Large lakes change temperature more slowly than nearby dry ground.
- Specific heat capacity is why equal masses can still diverge.



Phase change energy

- Melting ice can absorb energy while the thermometer stays at the melting point.
- Use a temperature-change calculation only while the substance stays in one state.
- Use a fusion or vaporization value when the state itself is changing.
- A full heating path may need both kinds of step, in order.



Temperature holds while the solid melts

Choosing an equation

- Decide whether a scenario uses $Q = mc\Delta t$, molar heat of fusion, or molar heat of vaporization and justify the choice.
- A complete answer names the process, the known quantities, the units, and whether temperature changed or a phase changed.

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