

Water · supported focus

Supported focus · HL

Supported scope

- Supported HL focus. First assessment 2025; current subject brief acquired; full Biology guide not acquired. Remaining guide, assessment and practical requirements retain their recorded holds.
- State model conditions and distinguish fictional data from measurements.

Water · 1.1

Reasoning

A water droplet holds together on a leaf. Its behaviour comes from interactions between molecules, not a skin made of solid water. Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

Water · 2.1

Reasoning

Water molecules are polar. Attraction between the partially positive hydrogen of one molecule and a partially negative oxygen of another gives hydrogen bonding. Cohesion is attraction between water molecules; adhesion is attraction to another surface. cohesion: Attraction between molecules of the same substance; adhesion: Attraction between different substances.

Water · 3.1

Reasoning

The same intermolecular interactions help explain surface tension and the energy needed to change temperature. Heating changes molecular motion and interactions; it does not normally break the covalent O–H bonds. Compare equal drops on clean surfaces under fixed temperature. Measure contact angle or spreading consistently. A detergent changes the system, so record concentration rather than treating all liquids as equivalent.

Water · 4.1

Reasoning

State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution. Known: 0.100 kg of water warms by 5.0 K; specific heat capacity is 4,180 J/(kg K). $Q = mc\Delta T = 0.100 \times 4,180 \times 5.0 = 2,090$ J. This calculation excludes energy absorbed by the container and lost to the surroundings.

Water · 4.2

Reasoning

Use $c = 4,180 \text{ J}/(\text{kg K})$. Calculate Q for 0.200 kg water heated through 5.0 K . Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

Water · 5.1

Reasoning

Hydrogen bonds between molecules differ from covalent bonds within a water molecule. Polarity alone does not make every substance dissolve well in water. Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Water · 5.2

Reasoning

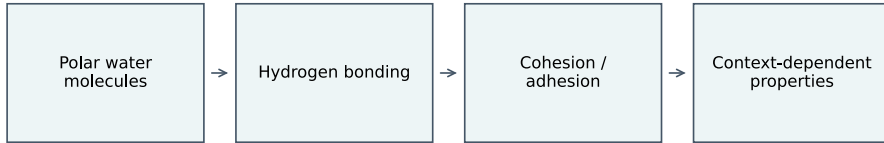
Boiling water normally breaks its O–H covalent bonds. This claim is false: Hydrogen bonds between molecules differ from covalent bonds within a water molecule. Polarity alone does not make every substance dissolve well in water.

Water · 5.3

Reasoning

Water: a molecular cause for a biological property: The same intermolecular interactions help explain surface tension and the energy needed to change temperature. Heating changes molecular motion and interactions; it does not normally break the covalent O–H bonds.

Water · diagram



- Original teaching diagram: Water: a molecular cause for a biological property
- Use the labels and the stated model together.

Water · original transfer

Your turn

A fictional 0.200 kg water sample gains 4,180 J but the observed rise is 4.0 K. Compare with the no-loss prediction and identify what the discrepancy can and cannot show.

Water · transfer reasoning

Method and interpretation

Ideal rise $Q/(mc)=5.0$ K. The observed rise is lower; container heating or loss can explain it. It does not prove which contribution dominates without measurements.

Check yourself

- Explain cohesion using the stated model.
- Explain adhesion using the stated model.
- Change one value in the original transfer; explain which assumption still matters.