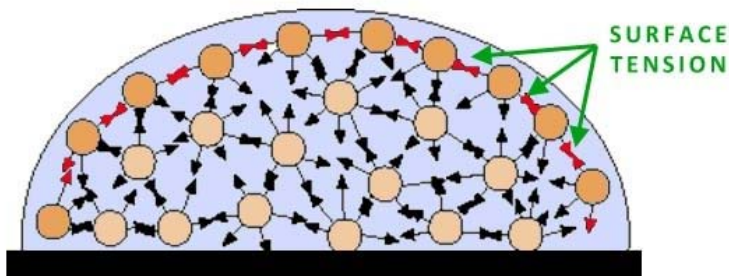


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Water's Invisible Skin: Understanding Surface Tension



Have you ever marveled at the way small insects can seemingly walk on water? Or have you noticed how water droplets form perfect spheres on a waxed car surface? These phenomena are all

thanks to a remarkable property of water known as surface tension. In this passage, we'll explore what surface tension is, how it results from water's cohesive forces, and why it has such fascinating effects on the world around us.

The Concept of Surface Tension

Surface tension is the force that acts on the surface of a liquid and tends to minimize the area of that surface. In simpler terms, it's like an invisible skin that forms on the surface of a liquid, pulling it together and resisting external forces. Surface tension is why you can fill a glass of water slightly above its rim without it overflowing.

Water's Cohesive Forces

Surface tension in water is a direct result of the cohesive forces between water molecules. Cohesion is the tendency of molecules of the same substance to stick together. Water, with its unique molecular structure, exhibits particularly strong cohesive forces.

The Role of Hydrogen Bonds

Water molecules are composed of two hydrogen atoms and one oxygen atom, connected by covalent bonds. However, water's polar nature makes it even more fascinating. The oxygen atom attracts electrons more strongly than the hydrogen atoms, giving it a partial negative charge (δ^-) and the hydrogen atoms a partial positive charge (δ^+).

This polarity allows water molecules to form hydrogen bonds with one another. In a hydrogen bond, the partially negative oxygen end of one water molecule is attracted to the partially positive hydrogen end of another. These hydrogen bonds are relatively strong compared to other intermolecular forces, and they play a crucial role in water's behavior.

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How Surface Tension Forms

Surface tension arises from the unequal forces acting on water molecules at the surface compared to those in the bulk (interior) of the liquid. In the bulk of the liquid, water molecules are attracted equally in all directions by their neighbors, resulting in a net force of zero. At the surface, however, water molecules are pulled inwards by the cohesive forces with the molecules below and to the sides, creating a net force inward.

This inward force causes the surface of the water to behave as if it were covered by an invisible "skin." This skin resists any external forces that try to break it or penetrate it, giving rise to surface tension.

Effects of Surface Tension

Surface tension has several fascinating effects on water and the world around us:

- **Capillary Action:** Surface tension enables liquids to move against gravity in narrow tubes or spaces. This phenomenon, called capillary action, is responsible for water being drawn up in a straw or absorbed by the roots of plants.
- **Water Striders:** Small insects like water striders use the surface tension of water to "walk" on the surface without sinking. Their legs create tiny depressions in the water's surface, but the cohesive forces quickly restore the surface tension behind them, allowing them to stay afloat.
- **Spherical Water Droplets:** Surface tension causes water droplets to form near-perfect spherical shapes. This is why raindrops, dew on leaves, and water droplets on your car's windshield are spherical.
- **Floating Objects:** Surface tension can support small objects placed on the water's surface. For example, a paperclip carefully placed on the surface can appear to "float" due to surface tension.

Surface tension is a fascinating property of water that results from the cohesive forces between water molecules. It creates an invisible skin on the surface of liquids, affecting everything from the way small insects navigate on water to the shape of raindrops. Understanding surface tension helps us appreciate the complexity of the natural world and the unique properties of this essential substance.

