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Melting, Freezing, Boiling, and Condensation: A Dance of Phase Changes

Have you ever watched a pot of water on the stove and wondered why it goes from a solid ice cube to a liquid, and then to steam? These changes in states of matter are known as phase changes, and they involve the processes of melting, freezing, boiling, and condensation. Let's explore how each of these phase changes differs from one another.

Melting: From Solid to Liquid

Melting is the process by which a solid turns into a liquid when heat is added. Imagine holding an ice cube in your hand. As it absorbs heat from your warm palm, the ice begins to change. The temperature at which this change occurs is called the melting point, which is specific to each substance. For example, the melting point of ice is 0 degrees Celsius (32 degrees Fahrenheit).

During melting, the particles in the solid gain energy from the heat and start vibrating faster. This added energy disrupts the forces holding the particles in a fixed, orderly arrangement. As a result, the particles move more freely, and the solid transforms into a liquid while maintaining the same temperature.

Freezing: From Liquid to Solid

Freezing is the reverse process of melting, where a liquid turns into a solid when heat is removed. Picture a puddle of water on a cold winter night. As the temperature drops, the liquid water loses energy and slows down the movement of its particles. Eventually, the particles come close enough together to form a fixed, orderly structure, creating solid ice.

The temperature at which this change occurs is called the freezing point, and it is identical to the melting point for a given substance. For water, this point is also 0 degrees Celsius (32 degrees Fahrenheit). When a liquid reaches its freezing point,

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it solidifies and maintains its shape as long as the temperature remains below the freezing point.

Boiling: From Liquid to Gas

Boiling is the process by which a liquid turns into a gas when heat is added. Imagine heating a pot of water on the stove. As it absorbs heat, the water molecules gain energy and start moving faster and faster. At a specific temperature known as the boiling point, the molecules have enough energy to overcome the forces holding them together as a liquid. The water then turns into water vapor, which is the gaseous state of water.

The boiling point varies depending on the substance and the pressure of the surroundings. For example, at sea level, water boils at 100 degrees Celsius (212 degrees Fahrenheit). Boiling is an essential process in cooking, as it helps food items like pasta and vegetables become tender.

Condensation: From Gas to Liquid

Condensation is the reverse process of boiling, where a gas turns into a liquid when it loses heat. Think about a hot shower in a cold bathroom. The steam from the hot water (gas) touches the cold mirror and loses heat. As a result, the steam particles lose energy and slow down, coming closer together to form tiny water droplets (liquid) on the mirror's surface.

Condensation plays a crucial role in the formation of clouds in the sky. As warm, moist air rises into the colder atmosphere, it cools down, leading to condensation of water vapor into water droplets, which gather to form clouds.

