Mass Matters

What happens to mass when state changes?

When matter changes from one state to another, it remains the same kind of matter. Its physical state changes, but its chemical makeup does not. But what about the amount of matter? Is there more or less matter in one state than another?

Water's Mass Doesn't Change

Active Reading

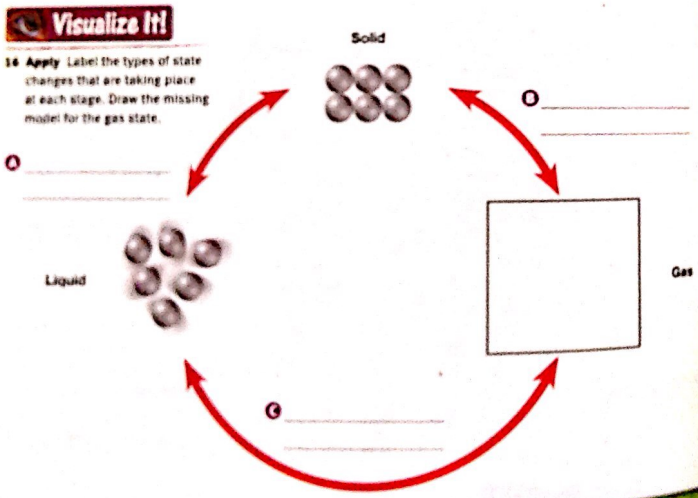
15 Compare When an ice cube melts into water, how do the mass of the ice cube and the water compare?

Suppose you place some ice in a sealed container. You heat the ice to the melting point. It becomes liquid water. Then, you heat it to the boiling point so that it forms a gas. At each stage, you measure the mass of the water. You would find no difference. The gaseous water would measure the same as the liquid water or the solid ice.

The size and number of particles do not change. Only the movement of the particles and the distance between them change in the three states of matter.

Visualize It!

16 Apply Label the types of state changes that are taking place at each stage. Draw the missing model for the gas state.

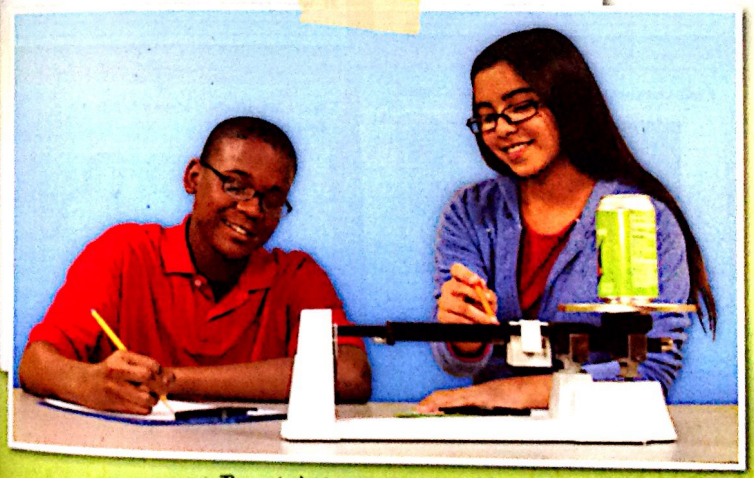


All Mass Stays the Same

Does the same thing happen with metals or gases in the air? Yes. No matter what the state of matter of a substance is at room temperature, its mass stays the same when it changes to a different state. For example, carbon dioxide—which at room temperature is a gas in the air—can be made solid at a temperature of −78.5 °C (−109.3 °F). The solid is called dry ice. If you measured the carbon dioxide gas and the dry ice formed from it, the mass would be the same.

The same holds true for metals such as aluminum. A single aluminum can has a mass of about 15 grams. When a can is melted into its liquid form, its mass is still 15 grams. Even the gas form of an aluminum can has the same mass, 15 grams.

17 Predict How would the mass of an aluminum can compare with the mass of the liquid metal used to make it? Explain your answer.



These students are weighing a solid aluminum can full of liquid soda.