Name:_____

Changes from Heating and Cooling

Reversible Changes: Melted and Frozen Matter

Heating and cooling can cause physical changes to matter. Some of these changes can be undone, which means they are reversible. For example, when solid ice is heated by warm air, it melts into liquid water. If that liquid water is placed into a cold freezer, it cools down and turns back into solid ice. Liquid chocolate behaves in the same way. Heating a bar of chocolate makes it melt into a liquid, but cooling the melted chocolate makes it harden back into a solid bar. In these examples, changing the temperature alters the physical state of the material, but cooling can return the material to its original form.



Irreversible Changes: Permanent Transformation

Other changes caused by heat cannot be undone. When a change cannot be reversed, it is called irreversible. For instance, heating a raw egg in a hot pan cooks the egg white and yolk into a solid meal. Cooling the cooked egg will not turn it back into a liquid raw egg. Similarly, when bread dough is baked in a hot oven, heat causes chemical changes that turn the dough into bread. No matter how much you cool the baked loaf of bread, it cannot turn back into soft dough. Burning wood in a campfire is another irreversible change because the wood turns into ash and smoke, which cannot be cooled back into solid wood.



Evidence for Sorting Changes

To determine whether a change caused by heating or cooling is reversible or irreversible, scientists observe what happens after the temperature changes back. If cooling a warmed object restores its original traits—such as shape, hardness, and liquid or solid state—the change is reversible. If cooling does not restore the original traits, or if a new substance is formed (like ash or cooked food), the change is irreversible. Observing whether materials return to their starting condition provides the evidence needed to classify heating and cooling effects.

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1. Which **two** details from the passage support the argument that some changes caused by heating or cooling are reversible?

A. Heating a raw egg in a hot pan cooks it into a solid meal.

B. Liquid water cools down in a freezer and turns back into solid ice.

C. Baking bread dough in an oven forms a loaf that cannot become dough again.

D. Melted liquid chocolate hardens back into a solid bar when it cools.

E. Burning wood produces ash and smoke that cannot turn back into wood.

2. This question has two parts.

Part A

What is the main idea of the section "Irreversible Changes: Permanent Transformation"?

A. Some changes caused by heating permanently alter matter so it cannot return to its original form.

B. Raw eggs taste better after they are heated in a hot pan.

C. Cooling baked bread causes it to turn back into soft dough.

D. Campfires burn wood faster than ovens bake bread.

Part B

Which detail from the section best supports the answer to Part A?

A. "Other changes caused by heat cannot be undone."

B. "Heating a raw egg in a hot pan cooks the egg white and yolk into a solid meal."

C. "No matter how much you cool the baked loaf of bread, it cannot turn back into soft dough."

D. "Burning wood in a campfire is another irreversible change..."

3. A student heats a solid stick of butter until it turns into a yellow liquid. Then, the student places the liquid butter into a refrigerator, and it becomes solid again.

Which statement best uses evidence from the text to classify this change?

A. It is an irreversible change because heat was used to change the butter.

B. It is a reversible change because cooling returned the butter to its solid state.

C. It is an irreversible change because liquid butter cannot be used again.

D. It is a reversible change because the butter changed color when heated.

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