How Can We Identify Materials Based on Their Properties?

Unit Storyline

Focus Question 1: How can we use our senses to compare materials?

Lesson 1: Sweet and Salty

Properties can be used to identify materials.

Students use appropriate methods and tools to identify similarities and differences between sugar and salt. They represent their observations in a box and T chart to identify a pattern.

Lesson 2: Four New Solids

Sugar, salt, cornstarch, baking powder, baking soda, and alum can be compared using just our senses.

Students use appropriate methods and tools to identify similarities and differences between alum, cornstarch, baking powder, and baking soda. They represent their observations in a table and argue from evidence that six solids can be identified using just our senses.

Lesson 3: Plant Products

Sugar and cornstarch can be obtained from plants.

Students argue from evidence obtained from a text that the sugar and cornstarch we eat is made by plants.

Focus Question 2: What happens when materials are mixed with water?

Lesson 4: Sugar Water

When sugar is dissolved in water, there is no change in weight.

Students represent in a table the weight in grams of sugar and water before and after mixing. They draw a graph to show that the weight of sugar and water after mixing is the same as before.

Lesson 5: What We Can't See

Dissolving and evaporation can be explained by particles.

Students draw a model to show what happens to the very small particles of water and sugar during dissolving and evaporation. They use the model to explain why the weight of sugar and water after mixing is the same as before.

Lesson 6: Chemists Make Solutions

Solids can be compared based on how they mix with water.

Students carry out an investigation using a fair test to collect data on how six solids mix with water. They argue from evidence that six solids can be identified based on similarities and differences in how they mix with water.

Focus Question 3: How do heating and cooling affect materials?

Lesson 7: Lip Balm

A mixture of coconut oil and beeswax melts more easily than beeswax alone.

Students represent in a table, observations and the melting point in degrees Celsius of beeswax and a mixture of beeswax and coconut oil. They interpret the data to explain why lip balm is a mixture of beeswax and coconut oil.

Lesson 8: Melting and Freezing Points

Mixtures have different melting points and freezing points from pure materials.

Students obtain evidence from a text to construct an explanation that adding something to a pure material causes the melting point and freezing point to change.

Lesson 9: Cooking with Fire

Solids can be compared based on how they respond to heat.

Students carry out an investigation using a fair test to collect data on how different solids respond to heat. Students argue from evidence that six solids can be identified based on similarities and differences in how they respond to heat.

Focus Question 4: Does mixing materials together form a new material?

Lesson 10: Making Something New

Bubbles or a change in color can be observed when six solids are mixed with vinegar or iodine.

Students carry out an investigation using a fair test to collect data on how six solids mix with vinegar and iodine. Students argue from evidence that something new being formed can cause a color change or bubbles.

Source: Smithsonian Science Education Center, *How Can We Identify Materials Based on Their Properties?* in Smithsonian Science for the Classroom. Carolina Biological, Burlington, NC, 2019.

Lesson 11: Change Is All Around Us
Bubbles or a change in smell, color, or texture can be a sign that a new material has been made.

Students obtain information from a text that formation of a new material can cause bubbles or a change in color, smell, or texture. They use evidence from the text to construct an explanation that plants make sugar and oxygen from the chemical reaction of carbon dioxide and water.

Lesson 12: A Weighty Matter
When something new is formed, there is no change in weight.

Students represent in a table the weight in grams of iodine and cornstarch before and after mixing. They draw a graph and compare data from different groups to conclude that the weight after mixing is the same as before.

Science Challenge
Focus Question 5: How can we identify unknown kitchen materials?

Lesson 13: Kitchen Crisis Part 1
A model can be used to plan an investigation.

Students plan an investigation using a model to identify four unknown solids based on similarities and differences in properties.

Lesson 14: Kitchen Crisis Part 2
Unknown solids can be identified by comparing properties.

Students carry out an investigation using a fair test to identify four unknown solids based on similarities and differences in properties.

Lesson 15: Kitchen Crisis Part 3
Scientists use evidence when communicating their findings.

Students communicate information and argue from evidence that four unknown solids can be identified based on similarities and differences in properties.

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