

## Sample Item A (WOTS 2 and Properties of Matter and Their Measurements)

In Ms. Quintana’s second-grade class, students explore the properties of different solids and liquids. Based on the exploration findings, students create definitions for solids and liquids. While completing the definition for liquids, one student makes the claim that “all substances that look like they take the shape of their containers are liquids.” Ms. Quintana is planning to include a follow-up activity for students to collect more data and refine their ideas. Which TWO of the following materials will best challenge the claim and help the student improve his or her definition?

- A) Maple syrup                      B) Ice block                      C) Salt                      D) Milk                      E) Rice

### Key and Rationale

C) Salt and E) Rice

Salt and rice are solids yet since they are granular, they appear to take the shape of their container when poured into something larger than the individual units. Ms. Quintana should select both materials to help students understand that small solids also appear to take the shape of the container—as liquids do, but individual shapes of the grains can be observed and do not change.

## Sample Item B (WOTS 4 and Changes in Matter)

Ms. Henderson’s fifth-grade class is making ice cream using milk, sugar, and vanilla flavoring. After mixing the ingredients in a baggie, the students observe the properties of the mixture, and are then asked to describe what happens to the sugar and vanilla in the milk. Nico says that there is no sugar or vanilla in the mixture because he cannot see them in the baggie. Ms. Henderson is considering several instructional moves to help develop Nico’s conceptual understanding of what happens to the sugar and vanilla.



For each instructional move, select the appropriate cell in the table to indicate whether or not the move will help develop Nico’s conceptual understanding.

Instructional Move	Will Help Develop Nico’s Conceptual Understanding	Will Not Help Develop Nico’s Conceptual Understanding
Slowly add vanilla to a small volume of milk. Then, have Nico observe the gradual change in color.		
Have Nico compare the total weight of the ingredients before and after mixing.		
Dissolve sugar in water and then evaporate the water so the sugar recrystallizes. Then, have Nico explain what happens to sugar when it is mixed with water.		
Have Nico compare two mixtures consisting of sugar and vanilla in both cold and warm milk.		

### Key and Rationale

The first three activities would help Nico see that a mixture is formed and that the sugar and vanilla are present in the mixture. The activities support Nico in developing a conceptual understanding that although the new mixture has different properties than their separate parts, the ingredients are all still present in the mixture.

In Instructional Move #1, the more vanilla added would gradually darken the milk, indicating that vanilla is present.

In Instructional Move #2, comparing the sum of the weights of the ingredients and the weight of the mixture, which would be the same, would show that the sugar and vanilla are still present in the mixture.

In Instructional Move #3, demonstrating that the sugar can be recrystallized from the mixture provides evidence that the sugar is present in a mixture even when it cannot be seen.

## Sample Item C (WOTS 5 and Properties of Matter and Their Measurements)

Ms. Fatu gives her fifth-grade students a white powder as well as the data table below. She then asks them to identify their unknown powder by making observations about its properties.

Powder	Color	Texture	Solubility in Water	Electrical Conductivity in Water
Baking Soda	White	Smooth	Yes	Somewhat
Cornstarch	White	Smooth	No	No
Sugar	White	Rough	Yes	No

The following discussion then takes place between the students.

**Eddie:** It's flour. It looks like flour.

**Ruvi:** But flour isn't one of our options.

**Eddie:** But it has to be flour.

**Nelson:** I disagree. I think it's cornstarch because the conductivity tester didn't beep when we put it in the dish of cornstarch and water.

**Nadia:** And it floated when we added it to water. Other groups had unknowns that disappeared. It has to be cornstarch.

Which TWO of the following questions could Ms. Fatu use to help her students develop stronger scientific argumentation skills?

- A) "Eddie, what is your evidence from the investigation?"
- B) "Ruvi, why wasn't flour an option?"
- C) "Nelson, what is your claim?"
- D) "Nadia, what do you mean when you say that the unknowns disappeared?"

### Key and Rationale

A and D

A) Eddie is using background knowledge to support his claim but is not using evidence from the investigation.

Prompting him to also use evidence from the investigation could help him understand the characteristics of scientific evidence.

D) Nadia is describing solubility with imprecise terms. She may think that some powders disappeared instead of dissolved. Prompting her to expand on this idea and to use more precise scientific language may help to uncover whether this is true and help her teammates better understand the point she is making.

## Sample Item D (WOTS 4 and Properties of Matter and Their Measurements)

Ms. Sanchez' fifth-grade class conducted an investigation in which students tested different objects and observed their physical properties to determine whether these objects were made of metal. Ms. Sanchez asked each student to support a claim about one of the objects using observations from their investigations. One student, Eric, chose a paper clip. He claimed that the paper clip was made of metal. He supported his claim with the following observations:

<i>It is a solid.</i>	<i>It is shiny.</i>	<i>It is gray.</i>	<i>It conducts electricity.</i>
-----------------------	---------------------	--------------------	---------------------------------

To help Eric refine his observations to focus on the properties typically used to characterize metals, which of the following investigations should Ms. Sanchez recommend?

- A) Test whether the properties of the paper clip also apply to aluminum foil.
- B) Test whether the same properties also apply to a copper paper clip.
- C) Test whether a paper clip can be used as a switch in an electrical circuit.
- D) Test whether the paper clip is attracted by a magnet.

### Key and Rationale

B) Test whether the same properties also apply to a copper paper clip.

Eric identified some properties of materials in his explanation: metals are solid, metals have luster, and metals are conductors. However, color is not a distinguishing property of metals. Testing different colored paper clips would help Eric challenge his claim.