Clues in Solution

Use test results to evaluate claims about acids and bases.

CHE.6.a "Obtain, evaluate, and communicate information concerning the properties of acids and bases."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline each test result in the passage, then circle two statements that explain what a result cannot prove. Use both kinds of evidence when you answer the questions.

What Can a Test Tell Us?

1. At a school lab, three clear liquids are labeled lemon juice, baking soda solution, and distilled water. Students dip a fresh pH strip into each sample and compare its color with the package scale. Their readings are about 2, 9, and 7, respectively. A pH below 7 indicates an acidic solution, while a pH above 7 indicates a basic solution; 7 is neutral at room temperature. Acids increase the concentration of hydronium ions in water, while bases decrease it. The strip provides evidence about each sample's acidity, but a reading near 7 does not prove the liquid is safe to drink.

2. When students add a few drops of lemon juice to a small portion of baking soda solution, bubbles form as the acid reacts with bicarbonate, releasing carbon dioxide gas. This reaction supports the claim that the lemon juice behaves as an acid and that the solution contains bicarbonate. Yet bubbles alone cannot identify an unknown liquid: other reactions also produce gas. A cabbage-juice indicator also turns reddish in lemon juice and bluish-green in baking soda solution, but a strongly colored sample could hide the indicator's color change.

3. A second group measures electrical conductivity. Both lemon juice and baking soda solution conduct better than distilled water because they contain mobile ions. This result cannot tell an acid from a base: both can conduct electricity. The students record how much each sample was diluted before testing, since adding water can move an acid's pH closer to 7. A single pH reading does not reveal how much acid is present or whether a liquid is safe to handle. To communicate a sound conclusion, they report the measurements, explain which observations support it, and name the limits of each test.

2 ANSWER WITH EVIDENCE

Use the passage

1. What claims about the three liquids are supported by the pH strip readings? Include the readings as evidence.

2. Which observation supports the claim that lemon juice reacts with bicarbonate? Why would that observation alone not identify an unknown acid?

3. A student says that conductivity proves a liquid is a base. Evaluate the claim using the group's results.

4. A student says that a pH near 7 proves a liquid is safe and has never been acidic. Use two points from the passage to evaluate this statement.

3 YOUR TURN

Your own words

A garden club measures pH 5 in runoff from one site and pH 8 in runoff from another. Write a three-sentence note for the club that classifies each sample, uses the readings as evidence, and explains one conclusion the readings cannot support.

Clues in Solution

PART 1 · READ AND MARK

Underline each test result in the passage, then circle two statements that explain what a result cannot prove. Use both kinds of evidence when you answer the questions. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	What claims about the three liquids are supported by the pH strip readings? Include the readings as evidence.	**Lemon juice is acidic because its pH is about 2. Baking soda solution is basic at about 9, and distilled water is neutral at about 7.**
2	Which observation supports the claim that lemon juice reacts with bicarbonate? Why would that observation alone not identify an unknown acid?	**The mixture bubbles as carbon dioxide forms. Bubbles alone do not identify an acid because other reactions can also produce gas.**
3	A student says that conductivity proves a liquid is a base. Evaluate the claim using the group's results.	**The claim is not supported. Both acidic lemon juice and basic baking soda solution conducted better than distilled water, so conductivity alone cannot distinguish an acid from a base.**
4	A student says that a pH near 7 proves a liquid is safe and has never been acidic. Use two points from the passage to evaluate this statement.	**Neither conclusion follows. A pH near 7 does not prove safety, and dilution can move an acid's pH closer to 7.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The runoff with pH 5 is acidic because its pH is below 7. The runoff with pH 8 is basic because its pH is above 7. These readings do not identify what substances are in either sample.

Accept equivalent explanations that connect each claim to a specific observation. For the final task, the limit may concern a sample's contents, cause of its pH, or safety.