SN EDUCATOR GUIDE

February 11, 2023

Chemists Crack the Code to Ancient Roman Concrete

Student Discussion Worksheet

Directions: Answer the first set of questions with a partner, then read the article "These chemists cracked the code to long-lasting Roman concrete" and discuss the second set of questions. A version of the article, "Chemists Crack the Code to Ancient Roman Concrete," appears in the February 11, 2023 issue of *Science News*.

Changes in matter

1. When matter goes through a change, the process is either classified as chemical or physical. Look at the examples given below and discuss which group of examples you think show physical changes and which show chemical changes.

Crumbling paper, dissolving sugar, melting ice, bending a metal earring and diluting orange juice with water

A piece of paper burning, a car door rusting, food digesting, a banana ripening and a leaf photosynthesizing

2. What happens to matter when it goes through a physical change? What about a chemical change? Using your answers, write your own definition of physical change and chemical change.

3. Using the examples given, discuss what indicators you can use to determine whether a physical or chemical change has taken place.

4. Can observation always tell you whether a change in matter has occurred? Discuss why or why not.

5. Every substance has physical and chemical properties. Physical properties of a substance can be observed without changing the chemical makeup of the substance, such as density. Chemical properties of a substance describe how it can react with other substances. Describe some of the chemical and physical properties of at least three of the substances in the examples listed in question 1.

6. If a physical change occurs to a substance, do its physical and chemical properties change? What if a chemical change occurs?

Concrete creations and changes

1. The article mentions the Pantheon, an impressive Roman structure that is made of concrete. What other uses of concrete do you know about and see all the time? Name some physical and chemical properties of concrete based on your examples.

2. As the article highlights, many chemical and physical changes occur when concrete is made. Give examples of chemical and physical changes mentioned in the article. Discuss with your partner why you think they are physical or chemical changes. If you'd like to, look up additional information about the science around cement and concrete.

3. Are there any changes mentioned in the article that you cannot classify as physical or chemical? Discuss why you can't and note what additional information you will need to determine whether the changes are physical or chemical.

4. How did studying the physical and chemical properties of Roman concrete help researchers understand its "healing power?"