

# The Next Generation Science Standards (NGSS)

## CHAPTER 6, LESSON 8: PH AND COLOR CHANGE

**MS-PS1-2. Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.**

### DISCIPLINARY CORE IDEAS

#### *PS1.A: Structure and Properties of Matter*

- Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants. (MS-PS1-2), (MS-PS1-5)

*Students see that an acid causes a pH indicator to turn from green to red and that a base makes the indicator change from green to purple. A molecular animation shows how water molecules and acid, base, and indicator molecules interact to produce a color change. Students see that acids and bases react chemically in characteristic ways.*

### SCIENCE AND ENGINEERING PRACTICES

#### *Developing and Using Models*

- Develop a model to describe unobservable mechanisms. (MS-PS3-2)

#### *Planning and carrying out investigations*

#### *Analyzing and interpreting data*

#### *Engaging in argument from evidence*

*Students investigate the question: How does the concentration of citric acid affect the color of universal indicator? Students conduct an investigation to see how the concentration of citric acid solution and the concentration of sodium carbonate solution affect the pH and color of universal indicator solution. Students use a molecular model animation showing the transfer of protons between water molecules and acid, base, and indicator molecules that result in a color change. Students use and further develop this molecular model and apply it to evidence they have observed to explain their observations on the molecular level and to answer the question to investigate.*

## CROSSCUTTING CONCEPTS

### *Cause and Effect*

- Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-PS1-4)

### *Scale, Proportion, and Quantity*

- Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small. (MS-PS1-1)

*Students use molecular model animations of water, indicator, acid, and base to explain how these substances interact to cause the observable color changes of the indicator.*