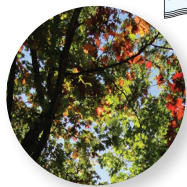


pH, Indicators and Dyes STEM Kit

NEW

Includes
Activity
Guide



This kit is a unique teaching tool for introducing your students to the chemistry behind plant pigments (the blueberry biopigment cyanidin) and how they can be used as pH indicators and fabric dyes. Students use their knowledge to create their own pH test strips and evaluate them against a commercial type.

Includes materials for four detailed activities featuring 'model' and 'inquiry' investigation paths - a total of 11 investigational activities, which can accommodate up to 40 students! Also contains a DVD with PDF Teacher and Student Guides and other digital content.

Covered concepts include: data analysis, accuracy vs. precision, biopigment structure, pH, pH scale, pH indicators, stains and dyes, acids, bases, acid-base interactions, solutions, and self-ionization of water.



Item No.

Description

AISPHKIT

pH, Indicators, and Dyes STEM Kit

Activity Summaries

Activity 1 - Learning About pH, Indicators & Dyes

(GUIDED - MODEL EXPERIMENT)

(BEGINNER - INTERMEDIATE)

OVERVIEW: In this STRUCTURED INVESTIGATION, students learn about biological pigments and how they are used as pH indicators and can be manipulated as fabric colorants.

OBJECTIVES: Students will...

- ✓ Understand the difference between a biological pigment and a dye.
- ✓ Understand what a solvent is and how water (the universal solvent) can be used to extract a biological pigment.
- ✓ Understand the concept of pH and the role of biological indicators in measuring pH.
- ✓ Use extracted biological pigments as pH indicators.
- ✓ Use biological pigments as fabric dyes.

INDEPENDENT INQUIRY

Students must decide which biopigment to extract to obtain a specific fabric dye color.

Activity 2 - Learning About the Chemistry of Plant Pigments

(GUIDED - MODEL EXPERIMENT)

(ADVANCED)

OVERVIEW: In this STRUCTURED INVESTIGATION, students are introduced to the diversity of plant pigments, their unique chemical structure, and how certain metal elements are incorporated into these biomolecules, as well as their similarity to other biomolecules. They learn a pigment extraction procedure, and investigate how pH change and metal ions affect plant pigment color by performing a number of chemical reactions.



OBJECTIVES: Students will...

- ✓ Learn how to harvest the biopigment anthocyanin that occurs in blueberries.
- ✓ Understand how certain metal ions (Mg^{2+} , Al^{3+}) can initiate a molecular change and thus affect pigment color.
- ✓ Perform chemical reactions:
 1. color change (removing Mg^{2+} from chlorophyll, changing it to pheophyllin).
 2. sodium hydroxide test for presence of Mg^{2+} ion.

INDEPENDENT INQUIRY

Students must decide which biopigment should be used for a specific pH range.

Activity 3 - Learning About Making pH Paper Strips

(GUIDED - MODEL EXPERIMENT)

(BEGINNER - INTERMEDIATE)

OVERVIEW: In this STRUCTURED INVESTIGATION, students design methods to impregnate various paper substrates (watercolor, office, commercial filter) with an extracted plant pigment indicator of their choosing made in ACTIVITY 2.

OBJECTIVES: Students will...

- ✓ Design and produce a pH test strip that consistently measures a specific pH of a test material.

Activity 4 - Learning About Evaluating pH Paper Test Strips

(GUIDED - MODEL EXPERIMENT)

(INTERMEDIATE)

OVERVIEW: In this STRUCTURED INVESTIGATION, students compare and evaluate their group-manufactured pH strips (ACTIVITY 3) against a commercial version on several known pH standard materials.

OBJECTIVES: Students will...

- ✓ Compare the group-manufactured pH test strip (ACTIVITY 3) pH determination value against a commercial pH strip determination value for three unknown pH test solutions.
- ✓ Understand the terms precision and accuracy.