

SOURCE Lesson Plans Detail

Chemical Forces

Topic	Chemistry
Program	Brown Science Prep
Developed by	Nihaal Mehta and Colin Gould
Developer Type	Undergraduate students

Overview / Purpose / Essential Questions

The goal of this lesson is to introduce students to the basic principles of chemical structure and bonding. We aim to answer the following questions: how can atoms come together to form molecules? how do chemical properties explain physical properties? how do we take advantage of these chemical properties?

Performance / Lesson Objective(s)

Identify the major subatomic particles, describe their basic properties, and provide a simplified model for atomic structure

Explain bonding in terms of following the octet rule, and identify the two major types of bonds

Demonstrate how bonding between different atoms of different elements creates bonds with unequal charge distribution (both ionic and polar covalent), and how molecules also have areas of partial positive/negative charges

Introduce the concept of intermolecular forces in order to provide an explanation for "like dissolves like"

Introduce paper chromatography as an application of solubility principles to a real-world problem

Lesson Materials

1. Paper coffee filters
2. A permanent marker
3. Several ink pens
4. A crayon
5. A cup full of water
6. Several sheets of paper
7. Small glasses or plastic containers
8. Rubbing alcohol
9. Pencils
10. Tape
11. Scissors
12. Ruler

Lesson Motivation

Chemical forces are crucial to understanding a grand number of other chemical along with biological principles.

Lesson Activities

This lesson includes a paper chromatography experiment to separate the various colors of ink in a permanent marker.

Procedure

Detailed information about the lessons plans and paper chromatograph are given in the link below.

Lesson note: Chemical Force

Experiment: Paper Chromatography

Wrap up / Conclusion

Chemical forces are important concepts that determines physical properties and chemical properties of a substance.

Pre Assessment Plan

How can atoms come together to form molecules?

How do chemical properties explain physical properties?

How do we take advantage of these chemical properties?

What governs the relative melting/boiling points of two substances?

What determines the solubility and vapor pressure of molecules?

Post Assessment Plan

How can atoms come together to form molecules?

How do chemical properties explain physical properties?

How do we take advantage of these chemical properties?

What governs the relative melting/boiling points of two substances?

What determines the solubility and vapor pressure of molecules?

Alignment Info

Audience(s)	High school students
STEM Area(s)	Chemistry
Standard(s)	<i>Physical Sciences (RI GSE) PS1.9–11.4a</i> Students demonstrate an understanding of the structure of matter by ... comparing the three subatomic particles of atoms (protons, electrons, neutrons) and their location within an atom, their relative mass, and their charge. <i>Physical Sciences (RI GSE) PS1.9–11.4b</i> Students demonstrate an understanding of the structure of matter by ... writing formulae for compounds and developing basic (excluding transition elements) models using electron structure. <i>Physical Sciences (RI GSE) PS1.9–11.4c</i> Students demonstrate an understanding of the structure of matter by ... explaining or modeling how the electron configuration of atoms governs how atoms interact with one another (e.g. covalent, hydrogen and ionic bonding). <i>Physical Sciences (RI GSE) PS1.EXT.4aa</i> Students demonstrate an understanding of the structure of matter by ... writing an electron configuration to include s, p, d, and f orbitals and relating to atomic interactions. <i>Physical Sciences (RI GSE) PS1.EXT.4bb</i> Students demonstrate an understanding of the structure of matter by ... given specific reactants (e.g. Ba + Cl₂) write the balanced equation and determine the products, type of compound formed (ionic or molecular), and the properties of the compound (e.g. solubilities, electrolytic, etc).
Activity Type(s)	Hands-on Lecture
Grade Level(s)	High School
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