

INSPIRE GK12 Lesson Plan



Lesson Title	I have the solution!
Length of Lesson	1 hour 15 min
Created By	Chris Ruhs
Subject	Chemistry
Grade Level	10-12 th Grade
State Standards	Chemistry 11: a,b, and d
DOK Level	DOK 3
DOK Application	Use concepts to solve non-routine problems
National Standards	9-12: A (Inquiry); B (Physical Science)
Graduate Research Element	I make and use solutions frequently in GC-MS work, including samples, standards, wet chemistry techniques, and cleanup.

Student Learning Goal:

MS 9-12th Grade:

11 (b) Express the concentration of a solution as percent by mass, molarity, molality, and mole fraction, given appropriate data. *Lecture and Worksheet will employ terms and concepts and allow the students to use them.* (d) Describe how to make a solution of given molarity in terms of mass needed, or vice-versa. *This lab includes step by step procedures for making a NaOH solution and allows the students to follow those steps.*

National Science Education Standards of Content 9-12:

A: Inquiry: Identify questions and concepts that guide scientific investigation. Design and conduct scientific investigations. *Students will be asked how they could check if their sodium hydroxide solution is accurate, and to perform the check, and what the results of that reaction would be, and then they will conduct the experiment, following the guidelines under close supervision.*

B: Physical Science: Chemical reactions. *Students will predict and realize an acid-base reaction, yielding salt-water.*

Materials Needed (supplies, hand-outs, resources):

Sodium Hydroxide, Erlenmeyer flasks, stir bars with base, stands, burettes, bromothymol blue, pre-made acid solution, gloves, goggles, aprons.

Lesson Performance Task/Assessment:

Formative: discussion on making a solution (including work that I do regularly for my research), worksheet covering with molarity, molality, and percent mass problems, students predictions on how to check what they've made, and what that reaction would yield, brief laboratory safety reminders.

Summative: making a 1.0M sodium hydroxide solution correctly and safely.



Lesson Relevance to Performance Task and Students:

At this point, students should already have a familiarity with solutions, acids, and bases. This lab allows the students to gain experience in making and verifying that they have made a 1.0M sodium hydroxide aqueous solution—an essential skill for all chemists.

Anticipatory Set/Capture Interest:

The lesson plan includes a laboratory exercise that allows the students to perform a useful chemical task and check their own work.

Guided Practice:

Discussion of solutions and worksheet of solution problems will provide pre-requisite background information necessary to performing the laboratory activity correctly and safely.

Independent Practice:

Students will be allowed to make a basic solution under close supervision.

Remediation and/or Enrichment:

Remediation:
Individual IEP

Enrichment: Students will be asked to write and balance the formula for the acid base reaction that takes place upon checking their work (adding acid to base to see a color change). Boiling the water off would show the students that salt water was indeed made.

Check(s) for Understanding:

Did the indicator change color when a specific amount of HCl was added to their solution?

Do students understand the acid-base reaction?

Are students proficient with mass, moles, and molarity?

Closure:

A student-lead, teacher-guided summary discussion will bring closure to the lesson plan.

Possible Alternate Subject Integrations:

This lesson plan is math heavy, requiring calculations between moles, mass, molarity, molality, and percent mass.

Teacher Notes:

Acid-base reactions are easily accomplished in the lab, and produce harmless products upon reaction, though, many precipitation reactions with dramatic color changes could be fun, effective and therefore preferred.