

Chemistry Kickstart Workshops

Applying Chemical Ideas + Equilibrium (2.5 hours / 1 workshop session)

Module 5: Equilibrium and Acid Reactions

- **Determining the Equilibrium Constant / Le Chatelier's Principle Iron (III) Thiocyanate Equilibrium** (Covers Factors that Affect Equilibrium and Calculating the Equilibrium Constant, and Module 8: Analysis of Inorganic Substances)

Students will investigate the reaction between iron(III) nitrate and potassium thiocyanate to investigate the equilibrium constant (K_{eq}) for iron(III) thiocyanate. Students will use visible spectrometry to monitor the formation of $FeSCN^{2+}$ in order to calculate this constant.

Module 8: Applying Chemical Ideas

- **Qualitative test for the presence of sulfate ions** (Covers Analysis of Inorganic Substances)

Students react ammonium sulfate with barium chloride to produce insoluble barium sulfate. The students will conduct a gravimetric analysis to determine the concentration of sulfate ions. They will be using vacuum equipment and sintered glass filters that are not readily available in high school laboratories.

- **Complexometric titration with Mg^{2+} and EDTA** (Covers Analysis of Inorganic Substances)

This is a hands-on practical experiment facilitating students to master the very important chemical analysis technique of titration. It also utilises a complexation reaction between Mg^{2+} and EDTA to test for the presence of Mg^{2+} in water.

- **Determining the Chlorine Content in Natural Waters** (Covers Analysis of Inorganic Substances)

Students conduct a precipitation titration to analyse chlorine in water using chemicals not readily available to high schools. This experiment investigates the precipitation reaction that occurs when silver and chloride ions are mixed.

****Optional**:** if your students are not attending the Spectroscopy Instruments workshop, we may be able to swap one of the above experiments with the option below. Please reply to your confirmation email with your preference and we will do our best to accommodate this.

- **Atomic Absorption Spectroscopy** (Covers Analysis of Inorganic Substances)

Atomic absorption spectroscopy is a highly sensitive technique for detecting very low concentrations of metals in water, and students will conduct an experiment to determine the iron content in a sample of water. We also do a spectacular flame test for many of the salts.

Spectroscopy Instruments (2.5 hours / 1 workshop session)

Module 8: Applying Chemical Ideas

- **Nuclear magnetic resonance (NMR) spectroscopy**

Students will be introduced to the theory of nuclear magnetic resonance (NMR) spectroscopy. They will watch a demonstration of the collection of the one-dimensional proton NMR spectra of ethanol and acetic acid and will learn how to analyse these spectra.

- **Infrared spectroscopy**

Students will be introduced to the theory of infrared (IR) spectroscopy and its applications. They will learn about how it can be used to characterise organic compounds and will use Fourier Transform Infrared (FTIR) Spectrometers to produce spectra. They will also learn how to analyse these spectra.

- **Visible spectrophotometry**

A red-orange iron complex will be produced, and UV-Visible Spectrophotometry will be used to measure the absorbance of different solutions. This data will be used to obtain a Beer's Law Plot and which will be used to then calculate the iron content of a sample of unknown concentration.

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