Science in Motion - Ursinus College

https://www.ursinus.edu/offices/science-in-motion/

Chemistry Activities – Middle School

Alternative Energy:

Solar panels: Students compare the efficiency of solar panels exposed to light at different angles. (45 minutes)

Fuel cell cars: Students use solar panels to induce electrolysis of water and collect the hydrogen produced. The hydrogen is then used to run fuel cell cars. Students may also calculate the mpg for the fuel cell cars and compare that to traditional gasoline cars. (45-90 minutes; 1-2 class periods)

Heat energy of fuels: Students calculate the heat/energy produced from burning various fuels. Discussion at the end can lead to the pros & cons of using biodiesel and/or ethanol in our automobiles. (45-90 minutes; 1-2 class periods)

Solar homes: Students study the effects of thermal mass in passively heating a solar home. (45-60 minutes)

Boyle's Law

Uses a LabQuest and gas pressure sensor to determine the relationship between pressure and volume of the gas, and then predict the pressure at other volumes.

Density

Students will predict if a material will sink or float. Then they will measure mass and volume to determine density of a variety of cubes (metals, woods, plastics).

Electrolytes

Students experiment with strong, weak, and non-electrolytes using a conductivity probe to measure the conductivity of solutions. Students also investigate the conductivity of solutions resulting from compounds that dissociate to produce different numbers of ions.

Emission Spectra

Uses a LabQuest, SpectroVis, and Vernier Emissions Spectrum Tube Carousel to study the spectra of 6 known gases, then determine the identity of an unknown gas. Good introduction or follow-up of the Bohr model of the atom.

Heat Energy of Fuels

Students determine the heat energy of various fuels and compare them to ethanol and biodiesel. This is both a good activity for chemistry students and environmental studies students.

Heat Properties of Water

Students compare the rate at which water and land heat up, as well as the rate at which both cool down.

Melting Point

We have both Vernier Melt Stations and Mel-Temps. Students use this equipment to determine melting points of compounds – to learn about melting points, to identify an unknown compound, and to verify a compound synthesis and/or purity.

Nuclear Radiation

Students study nuclear radiation with small radioactive sources of Polonium-210, Strontium-90, and Cobalt-60. Activities can include some or all of the following: the penetrating ability of alpha, beta, and gamma radiation; the effect of distance on nuclear radiation; shielding and radiation.

Periodic Table Review – using Spheros

We have large periodic tables available. Teachers can ask a question, and students can drive Spheros to the correct location on the periodic table. Students can also program the Spheros to display the answer (up to two characters). Contact us for suggestions / help planning a unique lesson or review session!

Review / Test prep activities

We can design fun, unique review sessions for nearly any topic using our programmable Spheros. (No prior programming experience needed.) Ask us for suggestions for your next review session!

Soil Analysis

Comparison of potting soil to ground soil: students use probes to measure temperature, moisture, pH, conductivity/salinity, calcium, chloride, ammonium, and nitrate in potting soil and ground soil. An add-on is to compare plants grown in potting soil to those grown in ground soil.

Soil temperature: Students measure the temperature changes in soil from differing depths, daytime, and nighttime.

Spectrophotometric Analysis

Analysis of sunblock: students use a UV-Vis spectrometer to investigate the differences in a variety of sunblocks, and determine the most effective sunblock.

Visible spectra of commercial dyes: Students measure the spectrum of various dyes and dye mixtures, then identify the dyes in an unknown mixture.

Spheros

Spheros are paired with a Kindle Fire (provided) through the SpheroEdu app. Beginners can draw a path for the Sphero robot to follow, intermediate users can drag and drop blocks of code, and advanced users can write text programs using JavaScript. Provide your own activities, or use one of the SpheroEdu prepared modules aligned to NGSS, CCSS, and various state standards.

Thin Layer & Paper Chromatography

Analgesics: Students run TLC on acetaminophen, aspirin, caffeine, ibuprofen and/or naproxen. They then identify an unknown analgesic.

Ink: Students run TLC on various inks to determine an unknown ink sample (often designed as a forensics experiment).

Lipstick: Students run TLC on lipstick samples, then match an unknown sample to one of the knowns (often designed as a forensics experiment).

Marker: Students use paper chromatography to separate the inks in markers, then identify an unknown marker (often designed as a forensics experiment).

Equipment List:

Atomic Emission Spectra: spectrometers, spectrum tubes, and accessories
Flex Cams
LabPros
LabQuests
Macropipettes (0.5 – 5mL)
Micropipettes (2-20uL)
Molecular model kits
pH meters
Spec 20s
FTIR spectrometers
UV/Vis spectrometers
Vernier Mini Gas Chromatographs

Vernier Probes:

- Salinity
- Conductivity
- Current
- Charge
- Differential voltage
- Voltage
- CO_2 gas
- O_2 gas
- Chloride ion
- Calcium ion
- Nitrate ion
- Ammonium Ion
- Turbidity
- Colorimeter
- Melt Station
- Dissolved Oxygen
- Light Sensor
- Soil Moisture
- UVA
- UVB
- Gas Pressure
- pH
- Temperature
- Radiation
- Spectro Vis Optical Fiber
- SpectroVis & SpectroVis Plus
- UV/Vis spectrophotometer
- Fluorometers

We are always working on new activities to bring to your classroom. If you have any curriculum for which you do not see an activity, please let us know! We may be able to design one for you.