Chemical Excelets: Interactive Excel Spreadsheets for General Chemistry

These interactive spreadsheets (aka - simulations) are used in-class and as out-of-class projects. Through the use of numerical experimentation and "what if" scenarios, we have a powerful discovery learning tool for students using readily available off-the-shelf software. For a discussion on using Excelets, see Chemical Spreadsheet Investigations: Empowering Student Learning of Concepts via Camouflaged Mathematical Exploration.

How do I interact with the spreadsheet?

The interactivity on the spreadsheets occurs as cells with a yellow background, where the number can be entered by typing in a value, or sliders, where one can drag the center bar or click on the terminal arrows, are changed. Likewise, the spinner works by clicking on the arrows. You may also see check boxes or option buttons which perform the indicated task. A response will occur on the graph and/or data by adjusting any of these items. List boxes are also used to select information. Comment cells (red triangle in upper right corner) are used to deliver information as well.

The Collection

Here are a variety of Excelets (hold the cursor over the link for a brief description) and some pdf handouts for topics in General Chemistry, including the laboratory. Some of these are simple calculation aids, while others explore concepts by bringing the mathematics alive. A number of the more recent Excelets, marked with an * consider the influence of random and/or systematic error. (Note - In Excel, you may need to resize these spreadsheets to fit your screen by going to View on the menu bar and selecting Zoom.)

Excelets (Javaless Applets) (For best results - right click and then select Save Target As... to download, then open directly in Excel) See Materials and Measurements on the MatSci Excelets webpage.	
The Temperature Scales on Thermometers: How are they related? (handout)	Interactive Periodic Trends (handout) (prelab)
Bond Energy Calculator (handout)	Dissolving an ionic compound - endothermic or exothermic process?
Welcome to the Calorie Calculator	Potential Energy Diagram (handout)
The Ideal Gas Law* (handout)	Arrhenius Equation

P-V II - The Tubing Error*	Initial Rates
Boyle's Law Simulator* (article) (article describes error analysis)	How is the rate influenced when you double the concentration for a variety of orders?
P-V-T Surface Plot	How do the coefficients in the reaction influence the rate?
Velocity of Gas Particles	Chemical Kinetics Simulator (handout)
Graham's Law of Gaseous Diffusion	An Interactive Graphical Approach to Chemical Kinetics
Generating Atomic Line Spectra	Transforming Chemical Kinetics Data to Determine Reaction Order
DNA and Thermal Denaturation	Chemical Equilibrium: The Kinetics of Reversible Reactions
Mixing Colored Solutions - How does the absorption spectrum behave?	Using "Solver" to Solve Equilibrium Calculations
Spectrophotometric Determination of an Acid-Base Indicator Constant*	Examining the Formation of a Complex Ion: $Ag(NH3)_2^+$
What is an autocatalyzed reaction?	Kinetics of Optical Isomer Conversion (handout)
Exploring an Oscillating Chemical Reaction	Kinetics of Multi-step Reactions (handout)
Scatter Plot for measurement variation	PE Diagrams for Consecutive and Competing Reactions
Quadratic Equation root finder and graph	Homogeneous Catalysis
The Basics of Spectrophotometric Measurements	The Le Chatelier Meter

Beer's Law Simulator (handout)	The Behavior of Weak Acids
Thinking with Beer	Calculating the pH of the strong acids
Single-point Calibration and Its Error	The Five Percent Rule
Beer's Law Simulator II: Exploring Errors* (handout)	ICE Chart Calculations for Acid-Base Equilibria
When Beer Spoils	Chlorination of Natural Waters
Exploring the Kinetics of the Crystal Violet/Hydroxide Reaction	Discovering Buffers
Bromocresol Green	Reacting a strong acid or base with a buffer
Vapor Pressure Curve of Water	Buffer Selection
When are dissolved oxygen levels in natural water higher?	Behavior of Weak Acids Using Distribution Diagrams (handout for monoprotic acids)
What happens to the vapor pressure of a solvent as solute is added?	Buffer Capacity
Exploring Osmotic Pressure	Exploring Acid-Base Titration Curves
Diffusion - a moving molecular process	Tracking an Acid-Base Titration
Predicting if a Chemical Reaction is Spontaneous	Calibrating a pH Electrode
Discovering Faraday's Law of Electrolysis	What is an isotope?

Comparison of Total Dissolved Solids (TDS) Methods	The Chemical Elements and Their Stable Isotopes
Energy Profiles for Internal Rotation	Exploring Half-Life
$Fe(SCN)^{2+}$ equilibrium constant (experiment)	Exploring Radioactive Decay* (handout)
Estimating the Wave Number (Energy) of IR Stretching Vibrations (experiment)	Exploring Radioactive Decay II
Exploring Error in the Water Hardness Determination by EDTA Titration* (experiment)	Investigating Activity vs. Distance from a Radioactive Source*
Analysis of a Sand and Gravel Mixture* (experiment)	Effective Half-life
Standard Additions	The Kinetics of Enzyme Reactions* (activity)
Radiometric Dating* (article) (activity) Radiometric Dating II: Assumptions and Error Analysis*	The Kinetics of Enzyme Reactions II: Exploring Enzymes with Multiple Subunits and Reactive Sites
Radiocarbon Dating (article) (activity)	Enzyme Kinetics (simple intro.)
Carbon-14 Dating and the Influence of Contamination	Properties of Alkyl Halides
Mean Lifetime for Radioactive Decay	Dilution
Discovering the Uranium and Thorium Decay Series (updated)	Chromatography Kinetics
	How does the freezing point of a solution behave? (Google Sheets - collaborative project) (in Google Sheets, go to File > Make a copy... to have an interactive spreadsheet)

For information on designing Excelets and links to mathematical modeling of data support materials, see Developer's Guide to Excelets. For more Excelets in materials science espeically for materials, measurement and error plus further exploration of the periodic table and solid state stuff, see the MatSci Excelets page.

Please e-mail any corrections, modifications, suggestions, or questions.
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