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Curriculum Catalog

Chemistry

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**UNIT 1: MEASUREMENT AND ANALYSIS**


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Assignment	Summary	Video Demo	Supplies
*Report: Metric System	In this report, you will research and describe the history of measurement and its impact on the advancement of science and societies.	No	<ul style="list-style-type: none"> <li>research resources</li> </ul>
Project: Practice in Measuring Metric Volumes	In this project, you will judge metric volume measurements in the 100 to 500 mL range to within +/- 20 mL.	No	<ul style="list-style-type: none"> <li>fifteen containers, five large (the size of a soda can), five medium, and five small</li> <li>at least one (preferably two) 100-mL graduated cylinder</li> <li>colored water</li> <li>paper</li> <li>pencil</li> </ul>
Project: Measuring Length with Precision	In this project, you will demonstrate proficiency in using a metric ruler to make precise measurements	No	<ul style="list-style-type: none"> <li>metric ruler</li> </ul>
Experiment: Masses	In this experiment, you will demonstrate proficiency in using a centigram balance to make precise measurements.	Yes	<ul style="list-style-type: none"> <li>centigram balance</li> <li>various small objects</li> </ul>
Learning to Make Useful and Detailed Observations	In this assignment, you will practice our powers of observation.	No	<ul style="list-style-type: none"> <li>an unlighted candle</li> <li>matches or a lighter</li> </ul>
*Project: Tutorial for Making A Scatter Plot Using An Electronic Spreadsheet Program	In this project, you will be designing a scatter plot (a type of line graph) based on information given to you in a data table.	No	<ul style="list-style-type: none"> <li>Microsoft® Excel®</li> </ul>
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A

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## UNIT 2: STARTING THE INVESTIGATION: HOW TO IDENTIFY ELEMENTS, COMPOUNDS, AND MIXTURES

Assignment	Summary	Video Demo	Supplies
Experiment: Observation of a Phase Change	In this experiment, you will Identify differences in energy content of various phases and how these can be visually demonstrated, interpret graphs produced from data collected during the phase change process, and communicate conclusion.	Yes	<ul style="list-style-type: none"> <li>test tube with 12-15 grams paradichlorobenzene (PDCB) (moth crystals) (Not suggested if you do not have access to a fume hood or good ventilation system to perform. Paraffin wax may then be used in place of PDCB.)</li> <li>text tube with 12 - 15 grams of paraffin wax. (substitute for PDCB)</li> <li>three Pyrex beakers the same size, 150 mL to 500 mL range</li> <li>two 250 mL Pyrex beakers</li> <li>two thermometers</li> <li>beaker stand</li> <li>water</li> <li>heat source</li> <li>three dye tablets or egg-coloring tablets</li> </ul>
*Experiment: Sand and Salt	In this activity you will make a mixture of salt and sand and then devise a way to separate them into the original sample of pure salt and pure sand.	No	<ul style="list-style-type: none"> <li>pure white sand</li> <li>1/2 sand and 1\2 salt mixture</li> <li>pure salt</li> <li>filter funnel</li> <li>filter paper or heavy paper hand towel</li> </ul>
*Report: Density	In this report, you will test an object that you think might contain one of the materials you tested.	No	<ul style="list-style-type: none"> <li>three objects of which you are sure of their identity, such as aluminum foil (crumpled or in a ball), copper wire or iron nails.</li> </ul>
Experiment: Using the Tyndall Effect to Identify Colloids	In this experiment, you will Differentiate between a solution and a colloid based on the Tyndall Effect, clearly state the basis for the Tyndall Effect and communicate findings	No	<ul style="list-style-type: none"> <li>3 clear glasses with smooth sides</li> <li>laser pointer or flashlight</li> <li>red Jell-O</li> <li>red food coloring</li> <li>sugar</li> <li>water</li> </ul>
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A

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**UNIT 3: EXPLORING LAWS FOR GASES AND CONSERVATION OF MASS**


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Assignment	Summary	Video Demo	Supplies
*Project: Graphing Kinetic Energy	Apply the principles of Kinetic Molecular Theory to graphs of molecular motion	No	<ul style="list-style-type: none"> <li>graph paper</li> <li>pencil</li> </ul>
Experiment: Finding Absolute Zero Experimentally	In this experiment, you will predict how the volume of a gas will change with the temperature is raised or lowered, calculate what the change in volume of a gas should be when the temperature is changed, visualize the relationship between the temperature and volume of a gas, and make/use graphs to predict the volume of gas at different temperatures and communicate findings	Yes	<ul style="list-style-type: none"> <li>250 mL Erlenmeyer flask</li> <li>wire gauze</li> <li>short piece of plastic tube</li> <li>rubber stop, 1-hole to fit flask</li> <li>water</li> <li>beaker to fit flask</li> </ul> <ul style="list-style-type: none"> <li>ice</li> <li>burner or hot plate</li> <li>ring stand</li> <li>ring</li> <li>thermometer</li> </ul> <p>If a gas jet burner is used:</p> <ul style="list-style-type: none"> <li>ring</li> <li>wire gauze</li> </ul>
*Experiment: Charles's Law and a Metal Can	In this experiment, you will describe experimental outcomes in terms of established laws	No	<ul style="list-style-type: none"> <li>a gallon metal can with a lid</li> <li>a Bunsen burner</li> <li>cold water</li> </ul>
*Project: Absolute Zero: Real or Theoretical?	Will a real gas ever reach absolute zero? Will an ideal gas ever reach absolute zero? Why or why not? Compose a report in your REPORT document on these two questions.	No	<ul style="list-style-type: none"> <li>research resources</li> </ul>
*Essay: Biography	In this essay, you will research and describe the important contributions of investigators to the science of chemistry	No	<ul style="list-style-type: none"> <li>research resources</li> </ul>
*Project: Examining the Use of Certain Gases as Propellants	In this project, you will Describe the sources and properties of specific gases important to ozone depletion reactions and understand the interaction of energy (sunlight) and matter (chemicals) in the stratosphere of Earth	No	<ul style="list-style-type: none"> <li>research resources</li> </ul>
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A

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**UNIT 4: THE DISCOVERY OF ATOMS: NATURE'S BUILDING BLOCKS**


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Assignment	Summary	Video Demo	Supplies
*Experiment: Physical Properties Of Elements	In this experiment, you will be exploring some of the physical properties of some common elements.	Yes	<ul style="list-style-type: none"> <li>a printout of the data table that is in the assignment</li> <li>pure materials such as: iron nails, aluminum foil, copper wire, magnesium ribbon, or lead fishing sinkers.</li> </ul>
* Experiment: Chemical Properties of Some Metals	In this experiment you will test certain metals for their ability to burn.	No	<ul style="list-style-type: none"> <li>tin can lid with 4 indentations</li> <li>support stand and ring</li> <li>Bunsen burner or propane burner</li> <li>samples of iron, copper, magnesium, and lead</li> </ul>
*Report: Fission Reactors	In this report, you will prepare a 500-word report on fission reactors in use today.	No	<ul style="list-style-type: none"> <li>research materials</li> </ul>
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A

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**UNIT 5: MOLECULAR STRUCTURE**


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Assignment	Summary	Video Demo	Supplies
Experiment: Demonstrating Polar Properties	Some substances are polar, and some are not. It is not so difficult to demonstrate a difference between these two classes of materials. This experiment is designed to help reveal the properties of polar and nonpolar substances.	No	<ul style="list-style-type: none"> <li>acetate (overhead transparency material) strip and tissue paper</li> <li>vinyl strip and woolen cloth</li> <li>slow, steady stream of water from a faucet</li> </ul>
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A

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**UNIT 7: CHEMICAL REACTIONS, RATES AND EQUILIBRIUM**


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Assignment	Summary	Video Demo	Supplies
Experiment: Observing Chemical Changes	In this experiment, you will conceptualize various indicators for chemical change	Yes	<ul style="list-style-type: none"> <li>0.01 M NaCl solution - To make the salt solution, pour 0.58 g of table salt in 1 liter of distilled water and stir to dissolve.</li> <li>0.01 M K<sub>2</sub>CrO<sub>4</sub> solution - To make the potassium chromate solution pour 1.94 g of K<sub>2</sub>CrO<sub>4</sub> into 1 liter of distilled water and stir to dissolve. Potassium chromate solid can be purchased at drug, hobby, or photo supply store</li> <li>0.01 M AgNO<sub>3</sub> solution - To make the silver nitrate solution pour 1.7 g of /L of AgNO<sub>3</sub> into 1 liter of distilled water and stir to dissolve. The solution can also be purchased at a local drug or photo supply store</li> <li>several small test tubes</li> <li>several eye droppers, one for each solution</li> </ul>
* Experiment: Chemical Reactions	In this experiment, you will see what happens when reactants are combined.	Yes	<ul style="list-style-type: none"> <li>0.01 M acidified iron (II) sulfate, FeSO<sub>4</sub> - 1.52 g/liter of solution and 1 mL concentrated HCl; solid FeSO<sub>4</sub> can be purchased at drug or hobby store. WEAR GOGGLES WHEN HANDLING CONCENTRATED HCl AND WORK IN A WELL-VENTILATED AREA.</li> <li>0.01 M potassium permanganate, KMnO<sub>4</sub> - 1.58 g/liter of solution; solid KMnO<sub>4</sub> can be purchased at drug, hobby, or chemical supply store</li> <li>0.01 M NaCl solution - 0.58g/liter of solution; table salt</li> <li>0.01 M ammonium nitrate, NH<sub>4</sub>NO<sub>3</sub> - 0.80 g/liter of solution; solid ammonium nitrate can be purchased at drug or fertilizer store</li> <li>several test tubes or baby-food jars</li> <li>several medicine (eye) droppers</li> <li>graduated cylinders or marked disposable pipettes</li> </ul>

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*Experiment: Ammonium Nitrate	After completing this experiment, you will answer some questions.	No	<ul style="list-style-type: none"> <li>• solid sodium hydroxide, NaOH - lye, can be purchased in grocery store</li> <li>• solid ammonium nitrate, NH<sub>4</sub>NO<sub>3</sub>, can be purchased from a drug or fertilizer store</li> <li>• concentrated hydrochloric acid, HCl</li> <li>• phenolphthalein solution (or other indicator) - can be purchased from a hobby shop</li> <li>• thermometer to fit test tubes</li> <li>• forceps (tweezers)</li> <li>• water</li> <li>• test tubes with stoppers.</li> <li>• graduated cylinders or marked disposable pipettes</li> </ul>
Experiment: Effect of Solution Concentration on Reaction Rate	In this experiment, you will observe how a trend in solution concentration for a specific solution affects reaction rate and communicate findings.	No	<ul style="list-style-type: none"> <li>• chalk crumbs or dust. Other sources of calcium carbonate may be used including crushed antacids tablets, reptile calcium powder, calcium supplement, and eggshell.</li> <li>• 0.1 M HCl - see previous experiment.</li> <li>• clean test tubes (5)</li> <li>• metric balance</li> <li>• weighing paper</li> </ul>
Activity: Exploring Factors that Affect Equilibrium	In this activity, you will evaluate experimental results showing equilibria shifts due to temperature change.	No	N/A
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A



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**UNIT 8: EQUILIBRIUM SYSTEMS**


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Assignment	Summary	Video Demo	Supplies
Experiment: Solubility Trends	In this experiment, you will form a testable hypothesis; collect, analyze and display results of investigative procedures; draw conclusions from experimental data concerning solubility trends; and communicate findings.	Yes	<ul style="list-style-type: none"> <li>• rock salt (water softener crystals)</li> <li>• glycerin</li> <li>• 2 baby-food jars with lids</li> <li>• water</li> <li>• rubbing alcohol (isopropyl alcohol)</li> <li>• stirring rod</li> <li>• test tubes</li> </ul>
*Experiment: Acid Strength	In this experiment, you will form a testable hypothesis for what happens when HCl and marble interact based on a chemical reaction; determine how acid strength affects the speed and strength of the reaction; collect, analyze and display results of investigative procedures; and communicate findings.	Yes	<ul style="list-style-type: none"> <li>• distilled water</li> <li>• 0.1 M HCl (8.3 mL concentrated HCl per 1 L of solution) CAUTION: WEAR GOGGLES! HANDLE CONCENTRATED ACIDS UNDER ADULT SUPERVISION IN AN AREA WITH ADEQUATE VENTILATION. ALWAYS ADD ACID TO THE PRE-MEASURED WATER.</li> <li>• 0.001 M HCl (1 mL 0.1 M HCl per 100 mL of solution)</li> <li>• 0.00001 M HCl (1 mL 0.001 M HCl per 100 mL of solution)</li> <li>• marble, limestone, or chalk chips</li> <li>• pipette (glass with suction bulb or disposable)</li> <li>• 4 test tubes</li> <li>• goggles</li> </ul>
Activity: Solution Concentration vs. Conductivity	In this activity, you will graph experimental data and interpret results for peer review	No	<ul style="list-style-type: none"> <li>• graph paper</li> <li>• pencil</li> </ul>
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A

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**UNIT 9: CARBON CHEMISTRY: HYDROCARBONS**


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Assignment	Summary	Video Demo	Supplies
*Experiment: Volatility	In this investigation, we will study the volatility of several organic compounds	No	<ul style="list-style-type: none"> <li>acetone - Available in the paint department of stores</li> <li>isopropyl alcohol - 90% rubbing alcohol available at drug stores</li> <li>mineral oil</li> <li>water</li> <li>4 test tubes or other equal size glass containers</li> <li>grease marker or masking tape</li> <li>ruler</li> <li>goggles</li> </ul>
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A

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**UNIT 10: CARBON CHEMISTRY: FUNCTIONAL GROUPS**


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Assignment	Summary	Video Demo	Supplies
Experiment: Preparation of a Polymer	In this experiment, you will take polyvinyl alcohol and add Sodium borate (borax) to make the polyvinyl alcohol polymerize.	No	<ul style="list-style-type: none"> <li>3 small beakers</li> <li>stirring rod</li> <li>polyvinyl alcohol</li> <li>borax</li> <li>food coloring (optional)</li> </ul>
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A

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**UNIT 11: CHEMISTRY REVIEW**


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Assignment	Summary	Video Demo	Supplies
*Special Project	Use this Special Project template to create your own assignment for this unit.	N/A	N/A

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\* indicates an alternative assignment