



**Main Criteria:** Louisiana Academic Standards

**Secondary Criteria:** JoVE

**Subject:** Science

**Grade:** 9-12

**Correlation Options:** Show Correlated

**Adopted:** 2004

CONTENT STANDARD	LA.9-12.SI.	Science as Inquiry
BENCHMARK / GLE	9-12.SI.H.A.	The Abilities Necessary to Do Scientific Inquiry
GLE / PROFICIENCY	9-12.SI.H.A.1.	<p>Write a testable question or hypothesis when given a topic (SI-H-A1)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• The Multi-group Experiment</li> <li>• The Simple Experiment: Two-group Design</li> </ul>
GLE / PROFICIENCY	9-12.SI.H.A.2.	<p>Describe how investigations can be observation, description, literature survey, classification, or experimentation (SI-H-A2)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• An Introduction to Working in the Hood</li> <li>• An Introduction to the Centrifuge</li> <li>• An Introduction to the Micropipettor</li> <li>• Histological Sample Preparation for Light Microscopy</li> <li>• Introduction to Fluorescence Microscopy</li> <li>• Introduction to Light Microscopy</li> <li>• Introduction to Serological Pipettes and Pipettors</li> <li>• Introduction to the Bunsen Burner</li> <li>• Introduction to the Microplate Reader</li> <li>• Measuring Mass in the Laboratory</li> <li>• Regulating Temperature in the Lab: Applying Heat</li> <li>• Regulating Temperature in the Lab: Preserving Samples Using Cold</li> <li>• Turbidity and Total Solids in Surface Water</li> </ul>
GLE / PROFICIENCY	9-12.SI.H.A.3.	<p>Plan and record step-by-step procedures for a valid investigation, select equipment and materials, and identify variables and controls (SI-H-A2)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Calibration Curves</li> <li>• Ethics in Psychology Research</li> </ul>

		<ul style="list-style-type: none"> <li>• Experimentation using a Confederate</li> <li>• From Theory to Design: The Role of Creativity in Designing Experiments</li> <li>• Manipulating an Independent Variable through Embodiment</li> <li>• Observational Research</li> <li>• Pilot Testing</li> <li>• Placebos in Research</li> <li>• Realism in Experimentation</li> <li>• Reliability in Psychology Experiments</li> <li>• The Factorial Experiment</li> <li>• The Multi-group Experiment</li> <li>• The Simple Experiment: Two-group Design</li> <li>• Within-subjects Repeated-measures Design</li> </ul>
GLE / PROFICIENCY	9-12.SI.H.A.4.	<p>Conduct an investigation that includes multiple trials and record, organize, and display data appropriately (SI-H-A2)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• An Introduction to Behavioral Neuroscience</li> <li>• An Introduction to Caenorhabditis elegans</li> <li>• An Introduction to Cell Division</li> <li>• An Introduction to Cell Metabolism</li> <li>• An Introduction to Cognition</li> <li>• An Introduction to Developmental Neurobiology</li> <li>• An Introduction to Drosophila melanogaster</li> <li>• An Introduction to Endocytosis and Exocytosis</li> <li>• An Introduction to Learning and Memory</li> <li>• An Introduction to Modeling Behavioral Disorders and Stress</li> <li>• An Introduction to Motor Control</li> <li>• An Introduction to Neurophysiology</li> <li>• An Introduction to Reward and Addiction</li> <li>• An Overview of Alkenone Biomarker Analysis for Paleothermometry</li> <li>• An Overview of Genetic Analysis</li> <li>• An Overview of Genetics and Disease</li> <li>• An Overview of bGDGT Biomarker Analysis for Paleoclimatology</li> <li>• Analysis of Earthworm Populations in Soil</li> <li>• Annexin V and Propidium Iodide Labeling</li> <li>• Anterograde Amnesia</li> <li>• Anxiety Testing</li> <li>• Approximate Number Sense Test</li> <li>• Are You Smart or Hardworking? How Praise Influences Children's Motivation</li> <li>• Assessing Dexterity with Reaching Tasks</li> <li>• Bacterial Growth Curve Analysis and its Environmental Applications</li> <li>• Balance and Coordination Testing</li> <li>• Basic Mouse Care and Maintenance</li> <li>• Binocular Rivalry</li> </ul>

- **Biofuels: Producing Ethanol from Cellulosic Material**
- **Blood Pressure Measurement**
- **C. elegans Chemotaxis Assay**
- **Calcium Imaging in Neurons**
- **Calibration Curves**
- **Capillary Electrophoresis (CE)**
- **Carbon and Nitrogen Analysis of Environmental Samples**
- **Categories and Inductive Inferences**
- **Cell Cycle Analysis**
- **Cell-surface Biotinylation Assay**
- **Children's Reliance on Artist Intentions When Identifying Pictures**
- **Chromatin Immunoprecipitation**
- **Chromatography-Based Biomolecule Purification Methods**
- **Column Chromatography**
- **Community DNA Extraction from Bacterial Colonies**
- **Conducting Reactions Below Room Temperature**
- **Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry**
- **Coordination Chemistry Complexes**
- **Crowding**
- **Cyclic Voltammetry (CV)**
- **DNA Methylation Analysis**
- **Decision-making and the Iowa Gambling Task**
- **Decoding Auditory Imagery with Multivoxel Pattern Analysis**
- **Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis**
- **Detecting Reactive Oxygen Species**
- **Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy**
- **Determination of Moisture Content in Soil**
- **Determining Rate Laws and the Order of Reaction**
- **Dichotic Listening**
- **Electro-encephalography (EEG)**
- **Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat**
- **Enzyme Assays and Kinetics**
- **Event-related Potentials and the Oddball Task**
- **Executive Function and the Dimensional Change Card Sort Task**
- **Executive Function in Autism Spectrum Disorder**
- **Expression Profiling with Microarrays**
- **Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction**
- **Eye Tracking in Cognitive Experiments**
- **FM Dyes in Vesicle Recycling**
- **Fate Mapping**
- **Fear Conditioning**

- Fractional Distillation
- Förster Resonance Energy Transfer (FRET)
- Gas Chromatography (GC) with Flame-Ionization Detection
- Gene Silencing with Morpholinos
- Genetic Crosses
- Growing Crystals for X-ray Diffraction Analysis
- Habituation: Studying Infants Before They Can Talk
- High-Performance Liquid Chromatography (HPLC)
- How Children Solve Problems Using Causal Reasoning
- Ideal Gas Law
- Inattentive Blindness
- Incidental Encoding
- Internal Standards
- Introduction to Catalysis
- Introduction to Mass Spectrometry
- Introduction to Titration
- Introduction to the Microplate Reader
- Invasion Assay Using 3D Matrices
- Ion-Exchange Chromatography
- Isolating Nucleic Acids from Yeast
- Just-noticeable Differences
- Language: The N400 in Semantic Incongruity
- Le Châtelier's Principle
- Lead Analysis of Soil Using Atomic Absorption Spectroscopy
- Learning and Memory: The Remember-Know Task
- MALDI-TOF Mass Spectrometry
- Making Solutions in the Laboratory
- Measuring Children's Trust in Testimony
- Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain
- Measuring Reaction Time and Donders' Method of Subtraction
- Measuring Tropospheric Ozone
- Measuring Verbal Working Memory Span
- Measuring Vital Signs
- Memory Development: Demonstrating How Repeated Questioning Leads to False Memories
- Mental Rotation
- Metabolic Labeling
- Metacognitive Development: How Children Estimate Their Memory
- Method of Standard Addition
- Modeling Social Stress
- Motion-induced Blindness
- Motor Learning in Mirror Drawing
- Motor Maps
- Multiple Object Tracking
- Mutual Exclusivity: How Children Learn the Meanings of Words

- Nuclear Magnetic Resonance (NMR) Spectroscopy
- Numerical Cognition: More or Less
- Nutrients in Aquatic Ecosystems
- Object Substitution Masking
- PCR: The Polymerase Chain Reaction
- Patch Clamp Electrophysiology
- Performing 1D Thin Layer Chromatography
- Pericardiocentesis
- Peripheral Vascular Exam Using a Continuous Wave Doppler
- Perspectives on Cognitive Psychology
- Perspectives on Neuropsychology
- Photometric Protein Determination
- Physiological Correlates of Emotion Recognition
- Piaget's Conservation Task and the Influence of Task Demands
- Plasmid Purification
- Positive Reinforcement Studies
- Prospect Theory
- Protein Crystallization
- Purification of a Total Lipid Extract with Column Chromatography
- Purifying Compounds by Recrystallization
- Quantifying Environmental Microorganisms and Viruses Using qPCR
- RNA Analysis of Environmental Samples Using RT-PCR
- RNAi in *C. elegans*
- Raman Spectroscopy for Chemical Analysis
- Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry
- SNP Genotyping
- Self-administration Studies
- Separation of Mixtures via Precipitation
- Solid-Liquid Extraction
- Solutions and Concentrations
- Soxhlet Extraction of Lipid Biomarkers from Sediment
- Spatial Cueing
- Spatial Memory Testing Using Mazes
- Spectrophotometric Determination of an Equilibrium Constant
- Surface Plasmon Resonance (SPR)
- Tandem Mass Spectrometry
- The ATP Bioluminescence Assay
- The Attentional Blink
- The Costs and Benefits of Natural Pedagogy
- The ELISA Method
- The Ideal Gas Law
- The Inverted-face Effect
- The Morris Water Maze
- The Precision of Visual Working Memory with Delayed Estimation

		<ul style="list-style-type: none"> <li>• The Rouge Test: Searching for a Sense of Self</li> <li>• The Split Brain</li> <li>• The Staircase Procedure for Finding a Perceptual Threshold</li> <li>• The TUNEL Assay</li> <li>• The Transwell Migration Assay</li> <li>• The Western Blot</li> <li>• Turbidity and Total Solids in Surface Water</li> <li>• Ultraviolet-Visible (UV-Vis) Spectroscopy</li> <li>• Understanding Concentration and Measuring Volumes</li> <li>• Using Diffusion Tensor Imaging in Traumatic Brain Injury</li> <li>• Using TMS to Measure Motor Excitability During Action Observation</li> <li>• Using Your Head: Measuring Infants' Rational Imitation of Actions</li> <li>• Verbal Priming</li> <li>• Visual Attention: fMRI Investigation of Object-based Attentional Control</li> <li>• Visual Search for Features and Conjunctions</li> <li>• Visual Statistical Learning</li> <li>• Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy</li> <li>• Water Quality Analysis via Indicator Organisms</li> <li>• Yeast Maintenance</li> <li>• fMRI: Functional Magnetic Resonance Imaging</li> </ul>
GLE / PROFICIENCY	9-12.SI.H.A.5.	<p>Utilize mathematics, organizational tools, and graphing skills to solve problems (SI-H-A3)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Algae Enumeration via Culturable Methodology</li> <li>• An Introduction to Aging and Regeneration</li> <li>• An Introduction to Behavioral Neuroscience</li> <li>• An Introduction to Caenorhabditis elegans</li> <li>• An Introduction to Cell Division</li> <li>• An Introduction to Cell Metabolism</li> <li>• An Introduction to Cognition</li> <li>• An Introduction to Developmental Neurobiology</li> <li>• An Introduction to Drosophila melanogaster</li> <li>• An Introduction to Endocytosis and Exocytosis</li> <li>• An Introduction to Learning and Memory</li> <li>• An Introduction to Modeling Behavioral Disorders and Stress</li> <li>• An Introduction to Motor Control</li> <li>• An Introduction to Neurophysiology</li> <li>• An Introduction to Reward and Addiction</li> <li>• An Overview of Alkenone Biomarker Analysis for Paleothermometry</li> <li>• An Overview of Genetic Analysis</li> <li>• An Overview of Genetics and Disease</li> <li>• An Overview of bGDGT Biomarker Analysis for</li> </ul>

#### **Paleoclimatology**

- Analysis of Earthworm Populations in Soil
- Annexin V and Propidium Iodide Labeling
- Anterograde Amnesia
- Anxiety Testing
- Approximate Number Sense Test
- Are You Smart or Hardworking? How Praise Influences Children's Motivation
- Assembly of a Reflux System for Heated Chemical Reactions
- Assessing Dexterity with Reaching Tasks
- Bacterial Growth Curve Analysis and its Environmental Applications
- Balance and Coordination Testing
- Basic Mouse Care and Maintenance
- Binocular Rivalry
- Biofuels: Producing Ethanol from Cellulosic Material
- Blood Pressure Measurement
- C. elegans Chemotaxis Assay
- Calcium Imaging in Neurons
- Calibration Curves
- Capillary Electrophoresis (CE)
- Carbon and Nitrogen Analysis of Environmental Samples
- Categories and Inductive Inferences
- Cell Cycle Analysis
- Cell-surface Biotinylation Assay
- Children's Reliance on Artist Intentions When Identifying Pictures
- Chromatin Immunoprecipitation
- Chromatography-Based Biomolecule Purification Methods
- Co-Immunoprecipitation and Pull-Down Assays
- Column Chromatography
- Community DNA Extraction from Bacterial Colonies
- Conducting Reactions Below Room Temperature
- Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry
- Coordination Chemistry Complexes
- Crowding
- Culturing and Enumerating Bacteria from Soil Samples
- Cyclic Voltammetry (CV)
- DNA Methylation Analysis
- Decision-making and the Iowa Gambling Task
- Decoding Auditory Imagery with Multivoxel Pattern Analysis
- Degassing Liquids with Freeze-Pump-Thaw Cycling
- Density Gradient Ultracentrifugation
- Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis
- Detecting Reactive Oxygen Species

- **Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy**
- **Determination of Moisture Content in Soil**
- **Determining Rate Laws and the Order of Reaction**
- **Determining Spatial Orientation of Rock Layers with the Brunton Compass**
- **Determining the Density of a Solid and Liquid**
- **Determining the Empirical Formula**
- **Determining the Mass Percent Composition in an Aqueous Solution**
- **Determining the Solubility Rules of Ionic Compounds**
- **Development and Reproduction of the Laboratory Mouse**
- **Dialysis: Diffusion Based Separation**
- **Dichotic Listening**
- **Dissolved Oxygen in Surface Water**
- **Drosophila Development and Reproduction**
- **Electro-encephalography (EEG)**
- **Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat**
- **Electrophoretic Mobility Shift Assay (EMSA)**
- **Enzyme Assays and Kinetics**
- **Ethics in Psychology Research**
- **Event-related Potentials and the Oddball Task**
- **Executive Function and the Dimensional Change Card Sort Task**
- **Executive Function in Autism Spectrum Disorder**
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- **How Children Solve Problems Using Causal Reasoning**
- **Ideal Gas Law**



- Inattentional Blindness
- Incidental Encoding
- Internal Standards
- Introducing Experimental Agents into the Mouse
- Introduction to Catalysis
- Introduction to Mass Spectrometry
- Introduction to Titration
- Introduction to the Microplate Reader
- Introduction to the Spectrophotometer
- Invasion Assay Using 3D Matrices
- Invertebrate Lifespan Quantification
- Ion-Exchange Chromatography
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- Nuclear Magnetic Resonance (NMR) Spectroscopy
- Numerical Cognition: More or Less
- Nutrients in Aquatic Ecosystems
- Object Substitution Masking
- Observational Research

- PCR: The Polymerase Chain Reaction
- Patch Clamp Electrophysiology
- Performing 1D Thin Layer Chromatography
- Pericardiocentesis
- Peripheral Vascular Exam Using a Continuous Wave Doppler
- Perspectives on Cognitive Psychology
- Perspectives on Neuropsychology
- Photometric Protein Determination
- Physical Properties Of Minerals I: Crystals and Cleavage
- Physical Properties Of Minerals II: Polymineralic Analysis
- Physiological Correlates of Emotion Recognition
- Piaget's Conservation Task and the Influence of Task Demands
- Pilot Testing
- Placebos in Research
- Plasmid Purification
- Positive Reinforcement Studies
- Preparing Anhydrous Reagents and Equipment
- Prospect Theory
- Protein Crystallization
- Proton Exchange Membrane Fuel Cells
- Purification of a Total Lipid Extract with Column Chromatography
- Purifying Compounds by Recrystallization
- Quantifying Environmental Microorganisms and Viruses Using qPCR
- RNA Analysis of Environmental Samples Using RT-PCR
- RNA-Seq
- RNAi in *C. elegans*
- Raman Spectroscopy for Chemical Analysis
- Realism in Experimentation
- Reconstitution of Membrane Proteins
- Reliability in Psychology Experiments
- Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry
- Rotary Evaporation to Remove Solvent
- SNP Genotyping
- Sample Preparation for Analytical Preparation
- Scanning Electron Microscopy (SEM)
- Schlenk Lines Transfer of Solvents
- Self-administration Studies
- Self-report vs. Behavioral Measures of Recycling
- Separation of Mixtures via Precipitation
- Soil Nutrient Analysis: Nitrogen, Phosphorus, and Potassium
- Solid-Liquid Extraction
- Solutions and Concentrations
- Sonication Extraction of Lipid Biomarkers from Sediment

- Soxhlet Extraction of Lipid Biomarkers from Sediment
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- Spectrophotometric Determination of an Equilibrium Constant
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- The Rouge Test: Searching for a Sense of Self
- The Simple Experiment: Two-group Design
- The Split Brain
- The Staircase Procedure for Finding a Perceptual Threshold
- The TUNEL Assay
- The Transwell Migration Assay
- The Western Blot
- Tree Identification: How To Use a Dichotomous Key
- Tree Survey: Point-Centered Quarter Sampling Method
- Turbidity and Total Solids in Surface Water
- Two-Dimensional Gel Electrophoresis
- Ultraviolet-Visible (UV-Vis) Spectroscopy
- Understanding Concentration and Measuring Volumes
- Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
- Using Diffusion Tensor Imaging in Traumatic Brain Injury
- Using GIS to Investigate Urban Forestry
- Using TMS to Measure Motor Excitability During Action Observation
- Using Your Head: Measuring Infants' Rational Imitation of Actions
- Using a pH Meter
- Verbal Priming
- Visual Attention: fMRI Investigation of Object-based Attentional Control
- Visual Search for Features and Conjunctions
- Visual Statistical Learning
- Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy
- Water Quality Analysis via Indicator Organisms

		<ul style="list-style-type: none"> <li>• Within-subjects Repeated-measures Design</li> <li>• X-ray Fluorescence (XRF)</li> <li>• Yeast Maintenance</li> <li>• fMRI: Functional Magnetic Resonance Imaging</li> </ul>
GLE / PROFICIENCY	9-12.SI.H.A.6.	<p>Use technology when appropriate to enhance laboratory investigations and presentations of findings (SI-H-A3)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• An Introduction to Aging and Regeneration</li> <li>• An Introduction to Working in the Hood</li> <li>• An Introduction to the Centrifuge</li> <li>• An Introduction to the Micropipettor</li> <li>• An Overview of Gene Expression</li> <li>• An Overview of Genetic Engineering</li> <li>• Chromatin Immunoprecipitation</li> <li>• Common Lab Glassware and Uses</li> <li>• Community DNA Extraction from Bacterial Colonies</li> <li>• Conducting Reactions Below Room Temperature</li> <li>• Coordination Chemistry Complexes</li> <li>• DNA Ligation Reactions</li> <li>• Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis</li> <li>• Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy</li> <li>• Determining the Empirical Formula</li> <li>• Freezing-Point Depression to Determine an Unknown Compound</li> <li>• Förster Resonance Energy Transfer (FRET)</li> <li>• Gas Chromatography (GC) with Flame-Ionization Detection</li> <li>• Genetic Engineering of Model Organisms</li> <li>• Genetic Screens</li> <li>• Growing Crystals for X-ray Diffraction Analysis</li> <li>• Histological Sample Preparation for Light Microscopy</li> <li>• Internal Standards</li> <li>• Introduction to Catalysis</li> <li>• Introduction to Fluorescence Microscopy</li> <li>• Introduction to Light Microscopy</li> <li>• Introduction to Mass Spectrometry</li> <li>• Introduction to Serological Pipettes and Pipettors</li> <li>• Introduction to the Bunsen Burner</li> <li>• Introduction to the Microplate Reader</li> <li>• Introduction to the Spectrophotometer</li> <li>• Isolating Nucleic Acids from Yeast</li> <li>• Lead Analysis of Soil Using Atomic Absorption Spectroscopy</li> <li>• MALDI-TOF Mass Spectrometry</li> <li>• Making Solutions in the Laboratory</li> <li>• Measuring Mass in the Laboratory</li> <li>• Metabolic Labeling</li> <li>• Method of Standard Addition</li> </ul>

		<ul style="list-style-type: none"> <li>• Molecular Cloning</li> <li>• Mouse Genotyping</li> <li>• Nuclear Magnetic Resonance (NMR) Spectroscopy</li> <li>• Nutrients in Aquatic Ecosystems</li> <li>• PCR: The Polymerase Chain Reaction</li> <li>• Photometric Protein Determination</li> <li>• Plasmid Purification</li> <li>• Purifying Compounds by Recrystallization</li> <li>• Quantifying Environmental Microorganisms and Viruses Using qPCR</li> <li>• RNA Analysis of Environmental Samples Using RT-PCR</li> <li>• RNA-Seq</li> <li>• Raman Spectroscopy for Chemical Analysis</li> <li>• Recombineering and Gene Targeting</li> <li>• Regulating Temperature in the Lab: Applying Heat</li> <li>• Regulating Temperature in the Lab: Preserving Samples Using Cold</li> <li>• Restriction Enzyme Digests</li> <li>• SNP Genotyping</li> <li>• Solid-Liquid Extraction</li> <li>• Spectrophotometric Determination of an Equilibrium Constant</li> <li>• Tandem Mass Spectrometry</li> <li>• Testing For Genetically Modified Foods</li> <li>• Ultraviolet-Visible (UV-Vis) Spectroscopy</li> <li>• Understanding Concentration and Measuring Volumes</li> <li>• X-ray Fluorescence (XRF)</li> <li>• Yeast Maintenance</li> <li>• Zebrafish Maintenance and Husbandry</li> </ul>
GLE / PROFICIENCY	9-12.SI.H.A.7.	<p>Choose appropriate models to explain scientific knowledge or experimental results (e.g., objects, mathematical relationships, plans, schemes, examples, role-playing, computer simulations) (SI-H-A4)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Determining Rate Laws and the Order of Reaction</li> <li>• Determining Spatial Orientation of Rock Layers with the Brunton Compass</li> <li>• Determining the Density of a Solid and Liquid</li> <li>• Determining the Empirical Formula</li> <li>• Determining the Mass Percent Composition in an Aqueous Solution</li> <li>• Freezing-Point Depression to Determine an Unknown Compound</li> <li>• Ideal Gas Law</li> <li>• Igneous Intrusive Rock</li> <li>• Igneous Volcanic Rock</li> <li>• Introduction to Titration</li> <li>• Making a Geologic Cross Section</li> <li>• Solutions and Concentrations</li> <li>• Spectrophotometric Determination of an Equilibrium</li> </ul>

		<p><b>Constant</b></p> <ul style="list-style-type: none"> <li>• The Ideal Gas Law</li> <li>• Using Differential Scanning Calorimetry to Measure Changes in Enthalpy</li> <li>• Using Topographic Maps to Generate Topographic Profiles</li> <li>• Using a pH Meter</li> </ul>
<p><b>GLE / PROFICIENCY</b></p>	<p><b>9-12.SI.H.A.8.</b></p>	<p><b>Give an example of how new scientific data can cause an existing scientific explanation to be supported, revised, or rejected (SI-H-A5)</b></p> <p><b><u>JoVE</u></b></p> <ul style="list-style-type: none"> <li>• Abdominal Exam II: Percussion</li> <li>• Algae Enumeration via Culturable Methodology</li> <li>• An Introduction to Aging and Regeneration</li> <li>• An Introduction to Behavioral Neuroscience</li> <li>• An Introduction to Caenorhabditis elegans</li> <li>• An Introduction to Cell Death</li> <li>• An Introduction to Cell Division</li> <li>• An Introduction to Cell Metabolism</li> <li>• An Introduction to Cell Motility and Migration</li> <li>• An Introduction to Cellular and Molecular Neuroscience</li> <li>• An Introduction to Cognition</li> <li>• An Introduction to Developmental Genetics</li> <li>• An Introduction to Developmental Neurobiology</li> <li>• An Introduction to Drosophila melanogaster</li> <li>• An Introduction to Endocytosis and Exocytosis</li> <li>• An Introduction to Learning and Memory</li> <li>• An Introduction to Modeling Behavioral Disorders and Stress</li> <li>• An Introduction to Molecular Developmental Biology</li> <li>• An Introduction to Motor Control</li> <li>• An Introduction to Neuroanatomy</li> <li>• An Introduction to Neurophysiology</li> <li>• An Introduction to Organogenesis</li> <li>• An Introduction to Reward and Addiction</li> <li>• An Introduction to Saccharomyces cerevisiae</li> <li>• An Introduction to Stem Cell Biology</li> <li>• An Introduction to Transfection</li> <li>• An Introduction to the Chick: Gallus gallus domesticus</li> <li>• An Introduction to the Laboratory Mouse: Mus musculus</li> <li>• An Introduction to the Zebrafish: Danio rerio</li> <li>• An Overview of Epigenetics</li> <li>• An Overview of Gene Expression</li> <li>• An Overview of Genetic Analysis</li> <li>• An Overview of Genetic Engineering</li> <li>• An Overview of Genetics and Disease</li> <li>• Analysis of Earthworm Populations in Soil</li> <li>• Anesthesia Induction and Maintenance</li> <li>• Annexin V and Propidium Iodide Labeling</li> </ul>

- Anterograde Amnesia
- Anxiety Testing
- Approximate Number Sense Test
- Are You Smart or Hardworking? How Praise Influences Children's Motivation
- Aseptic Technique in Environmental Science
- Assembly of a Reflux System for Heated Chemical Reactions
- Assessing Dexterity with Reaching Tasks
- Auscultation
- Bacterial Growth Curve Analysis and its Environmental Applications
- Bacterial Transformation: Electroporation
- Bacterial Transformation: The Heat Shock Method
- Balance and Coordination Testing
- Basic Care Procedures
- Basic Chick Care and Maintenance
- Basic Mouse Care and Maintenance
- Binocular Rivalry
- Biofuels: Producing Ethanol from Cellulosic Material
- Blood Withdrawal I
- Blood Withdrawal II
- C. elegans Chemotaxis Assay
- C. elegans Development and Reproduction
- C. elegans Maintenance
- Calcium Imaging in Neurons
- Calibration Curves
- Capillary Electrophoresis (CE)
- Carbon and Nitrogen Analysis of Environmental Samples
- Categories and Inductive Inferences
- Cell Cycle Analysis
- Cell-surface Biotinylation Assay
- Chick ex ovo Culture
- Children's Reliance on Artist Intentions When Identifying Pictures
- Chromatin Immunoprecipitation
- Chromatography-Based Biomolecule Purification Methods
- Co-Immunoprecipitation and Pull-Down Assays
- Color Afterimages
- Column Chromatography
- Common Lab Glassware and Uses
- Community DNA Extraction from Bacterial Colonies
- Compound Administration I
- Compound Administration II
- Compound Administration III
- Compound Administration IV
- Conducting Reactions Below Room Temperature
- Considerations for Rodent Surgery
- Coordination Chemistry Complexes

- Crowding
- Culturing and Enumerating Bacteria from Soil Samples
- Cyclic Voltammetry (CV)
- Cytogenetics
- DNA Gel Electrophoresis
- DNA Ligation Reactions
- DNA Methylation Analysis
- Decision-making and the Iowa Gambling Task
- Decoding Auditory Imagery with Multivoxel Pattern Analysis
- Degassing Liquids with Freeze-Pump-Thaw Cycling
- Density Gradient Ultracentrifugation
- Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis
- Detecting Reactive Oxygen Species
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- Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy
- Determining Rate Laws and the Order of Reaction
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- Determining the Density of a Solid and Liquid
- Determining the Empirical Formula
- Determining the Mass Percent Composition in an Aqueous Solution
- Determining the Solubility Rules of Ionic Compounds
- Development and Reproduction of the Laboratory Mouse
- Development of the Chick
- Diagnostic Necropsy and Tissue Harvest
- Dialysis: Diffusion Based Separation
- Dichotic Listening
- Drosophila Development and Reproduction
- Drosophila Larval IHC
- Drosophila Maintenance
- Drosophila melanogaster Embryo and Larva Harvesting and Preparation
- Electro-encephalography (EEG)
- Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat
- Electrophoretic Mobility Shift Assay (EMSA)
- Embryonic Stem Cell Culture and Differentiation
- Enzyme Assays and Kinetics
- Ethics in Psychology Research
- Event-related Potentials and the Oddball Task
- Executive Function and the Dimensional Change Card Sort Task
- Executive Function in Autism Spectrum Disorder
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- Explant Culture of Neural Tissue



- Expression Profiling with Microarrays
- Eye Tracking in Cognitive Experiments
- FM Dyes in Vesicle Recycling
- Fate Mapping
- Fear Conditioning
- Filamentous Fungi
- Finding Your Blind Spot and Perceptual Filling-in
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- Freezing-Point Depression to Determine an Unknown Compound
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- Live Cell Imaging of Mitosis
- MALDI-TOF Mass Spectrometry
- Making a Geologic Cross Section
- Manipulating an Independent Variable through Embodiment
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- Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain
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- Mutual Exclusivity: How Children Learn the Meanings of Words
- Neuronal Transfection Methods
- Nuclear Magnetic Resonance (NMR) Spectroscopy
- Numerical Cognition: More or Less
- Object Substitution Masking
- Observational Research
- PCR: The Polymerase Chain Reaction
- Passaging Cells
- Patch Clamp Electrophysiology
- Percussion
- Performing 1D Thin Layer Chromatography
- Perspectives on Cognitive Psychology
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- Perspectives on Sensation and Perception
- Photometric Protein Determination
- Physiological Correlates of Emotion Recognition
- Piaget's Conservation Task and the Influence of Task Demands
- Pilot Testing
- Placebos in Research
- Plasmid Purification
- Positive Reinforcement Studies

- Preparing Anhydrous Reagents and Equipment
- Primary Neuronal Cultures
- Prospect Theory
- Protein Crystallization
- Proton Exchange Membrane Fuel Cells
- Purifying Compounds by Recrystallization
- Quantifying Environmental Microorganisms and Viruses Using qPCR
- RNA Analysis of Environmental Samples Using RT-PCR
- RNA-Seq
- RNAi in *C. elegans*
- Raman Spectroscopy for Chemical Analysis
- Realism in Experimentation
- Recombineering and Gene Targeting
- Reconstitution of Membrane Proteins
- Reliability in Psychology Experiments
- Restriction Enzyme Digests
- Rodent Handling and Restraint Techniques
- Rodent Identification I
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- Rodent Stereotaxic Surgery
- Rotary Evaporation to Remove Solvent
- SNP Genotyping
- Sample Preparation for Analytical Preparation
- Scanning Electron Microscopy (SEM)
- Schlenk Lines Transfer of Solvents
- Self-administration Studies
- Self-report vs. Behavioral Measures of Recycling
- Separating Protein with SDS-PAGE
- Separation of Mixtures via Precipitation
- Soil Nutrient Analysis: Nitrogen, Phosphorus, and Potassium
- Solid-Liquid Extraction
- Solutions and Concentrations
- Spatial Cueing
- Spatial Memory Testing Using Mazes
- Spectrophotometric Determination of an Equilibrium Constant
- Sterile Tissue Harvest
- Surface Plasmon Resonance (SPR)
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- Testing For Genetically Modified Foods
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- The Costs and Benefits of Natural Pedagogy
- The ELISA Method
- The Factorial Experiment
- The Ideal Gas Law
- The Inverted-face Effect
- The McGurk Effect

		<ul style="list-style-type: none"> <li>• The Morris Water Maze</li> <li>• The Multi-group Experiment</li> <li>• The Precision of Visual Working Memory with Delayed Estimation</li> <li>• The Rouge Test: Searching for a Sense of Self</li> <li>• The Rubber Hand Illusion</li> <li>• The Simple Experiment: Two-group Design</li> <li>• The Split Brain</li> <li>• The Staircase Procedure for Finding a Perceptual Threshold</li> <li>• The TUNEL Assay</li> <li>• The Transwell Migration Assay</li> <li>• The Western Blot</li> <li>• Tissue Regeneration with Somatic Stem Cells</li> <li>• Transplantation Studies</li> <li>• Two-Dimensional Gel Electrophoresis</li> <li>• Ultraviolet-Visible (UV-Vis) Spectroscopy</li> <li>• Using Differential Scanning Calorimetry to Measure Changes in Enthalpy</li> <li>• Using Diffusion Tensor Imaging in Traumatic Brain Injury</li> <li>• Using TMS to Measure Motor Excitability During Action Observation</li> <li>• Using Your Head: Measuring Infants' Rational Imitation of Actions</li> <li>• Using a pH Meter</li> <li>• Verbal Priming</li> <li>• Visual Attention: fMRI Investigation of Object-based Attentional Control</li> <li>• Visual Search for Features and Conjunctions</li> <li>• Visual Statistical Learning</li> <li>• Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy</li> <li>• Water Quality Analysis via Indicator Organisms</li> <li>• Whole-Mount In Situ Hybridization</li> <li>• Within-subjects Repeated-measures Design</li> <li>• X-ray Fluorescence (XRF)</li> <li>• Yeast Maintenance</li> <li>• Yeast Reproduction</li> <li>• Yeast Transformation and Cloning</li> <li>• Zebrafish Breeding and Embryo Handling</li> <li>• Zebrafish Maintenance and Husbandry</li> <li>• Zebrafish Microinjection Techniques</li> <li>• Zebrafish Reproduction and Development</li> <li>• fMRI: Functional Magnetic Resonance Imaging</li> </ul>
GLE / PROFICIENCY	9-12.SI.H.A.10.	<p>Given a description of an experiment, identify appropriate safety measures (SI-H-A7)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• An Introduction to Working in the Hood</li> <li>• An Introduction to the Centrifuge</li> </ul>

		<ul style="list-style-type: none"> <li>• An Introduction to the Micropipettor</li> <li>• Aseptic Technique in Environmental Science</li> <li>• Common Lab Glassware and Uses</li> <li>• Conducting Reactions Below Room Temperature</li> <li>• Histological Sample Preparation for Light Microscopy</li> <li>• Introducing Experimental Agents into the Mouse</li> <li>• Introduction to Fluorescence Microscopy</li> <li>• Introduction to Light Microscopy</li> <li>• Introduction to Serological Pipettes and Pipettors</li> <li>• Introduction to the Bunsen Burner</li> <li>• Introduction to the Microplate Reader</li> <li>• Introduction to the Spectrophotometer</li> <li>• Making Solutions in the Laboratory</li> <li>• Measuring Mass in the Laboratory</li> <li>• Regulating Temperature in the Lab: Applying Heat</li> <li>• Regulating Temperature in the Lab: Preserving Samples Using Cold</li> <li>• Understanding Concentration and Measuring Volumes</li> </ul>
<b>CONTENT STANDARD</b>	<b>LA.9-12.SI.</b>	<b>Science as Inquiry</b>
<b>BENCHMARK / GLE</b>	<b>9-12.SI.H.B.</b>	<b>Understanding Scientific Inquiry</b>
<b>GLE / PROFICIENCY</b>	<b>9-12.SI.H.B.11.</b>	<p>Evaluate selected theories based on supporting scientific evidence (SI-H-B1)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• An Introduction to Cell Division</li> <li>• An Overview of Genetic Analysis</li> <li>• Fractional Distillation</li> <li>• High-Performance Liquid Chromatography (HPLC)</li> <li>• Ideal Gas Law</li> <li>• The Ideal Gas Law</li> <li>• Using a pH Meter</li> </ul>
<b>GLE / PROFICIENCY</b>	<b>9-12.SI.H.B.12.</b>	<p>Cite evidence that scientific investigations are conducted for many different reasons (SI-H-B2)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Turbidity and Total Solids in Surface Water</li> </ul>
<b>GLE / PROFICIENCY</b>	<b>9-12.SI.H.B.13.</b>	<p>Identify scientific evidence that has caused modifications in previously accepted theories (SI-H-B2)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Abdominal Exam II: Percussion</li> <li>• An Introduction to Aging and Regeneration</li> <li>• An Introduction to Behavioral Neuroscience</li> <li>• An Introduction to Caenorhabditis elegans</li> <li>• An Introduction to Cell Death</li> <li>• An Introduction to Cell Division</li> <li>• An Introduction to Cell Metabolism</li> <li>• An Introduction to Cell Motility and Migration</li> <li>• An Introduction to Developmental Genetics</li> <li>• An Introduction to Developmental Neurobiology</li> </ul>

		<ul style="list-style-type: none"> <li>• An Introduction to Drosophila melanogaster</li> <li>• An Introduction to Endocytosis and Exocytosis</li> <li>• An Introduction to Learning and Memory</li> <li>• An Introduction to Molecular Developmental Biology</li> <li>• An Introduction to Neuroanatomy</li> <li>• An Introduction to Neurophysiology</li> <li>• An Introduction to Organogenesis</li> <li>• An Introduction to Saccharomyces cerevisiae</li> <li>• An Introduction to Stem Cell Biology</li> <li>• An Introduction to the Chick: Gallus gallus domesticus</li> <li>• An Introduction to the Laboratory Mouse: Mus musculus</li> <li>• An Introduction to the Zebrafish: Danio rerio</li> <li>• An Overview of Epigenetics</li> <li>• An Overview of Gene Expression</li> <li>• An Overview of Genetic Analysis</li> <li>• An Overview of Genetic Engineering</li> <li>• An Overview of Genetics and Disease</li> <li>• Anterograde Amnesia</li> <li>• Auscultation</li> <li>• C. elegans Maintenance</li> <li>• Cell Cycle Analysis</li> <li>• Color Afterimages</li> <li>• Determining Spatial Orientation of Rock Layers with the Brunton Compass</li> <li>• Development of the Chick</li> <li>• Drosophila Maintenance</li> <li>• General Approach to the Physical Exam</li> <li>• Genetic Crosses</li> <li>• Inattentional Blindness</li> <li>• Le Châtelier's Principle</li> <li>• Making a Geologic Cross Section</li> <li>• Measuring Reaction Time and Donders' Method of Subtraction</li> <li>• Motion-induced Blindness</li> <li>• Object Substitution Masking</li> <li>• Percussion</li> <li>• Piaget's Conservation Task and the Influence of Task Demands</li> <li>• Rotary Evaporation to Remove Solvent</li> <li>• Spatial Cueing</li> <li>• The Attentional Blink</li> <li>• The Rubber Hand Illusion</li> <li>• The Split Brain</li> <li>• Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy</li> <li>• Yeast Transformation and Cloning</li> </ul>
<b>GLE / PROFICIENCY</b>	<b>9-12.SI.H.B.14.</b>	Cite examples of scientific advances and emerging technologies and how they affect society (e.g., MRI, DNA in forensics) (SI-H-B3)

## **JoVE**

- **Abdominal Exam I: Inspection and Auscultation**
- **Abdominal Exam II: Percussion**
- **Abdominal Exam III: Palpation**
- **Abdominal Exam IV: Acute Abdominal Pain Assessment**
- **Algae Enumeration via Culturable Methodology**
- **An Introduction to Aging and Regeneration**
- **An Introduction to Behavioral Neuroscience**
- **An Introduction to Caenorhabditis elegans**
- **An Introduction to Cell Death**
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- **An Introduction to Learning and Memory**
- **An Introduction to Modeling Behavioral Disorders and Stress**
- **An Introduction to Molecular Developmental Biology**
- **An Introduction to Motor Control**
- **An Introduction to Neuroanatomy**
- **An Introduction to Neurophysiology**
- **An Introduction to Organogenesis**
- **An Introduction to Reward and Addiction**
- **An Introduction to Saccharomyces cerevisiae**
- **An Introduction to Stem Cell Biology**
- **An Introduction to Transfection**
- **An Introduction to the Centrifuge**
- **An Introduction to the Chick: Gallus gallus domesticus**
- **An Introduction to the Laboratory Mouse: Mus musculus**
- **An Introduction to the Micropipettor**
- **An Introduction to the Zebrafish: Danio rerio**
- **An Overview of Alkenone Biomarker Analysis for Paleothermometry**
- **An Overview of Epigenetics**
- **An Overview of Gene Expression**
- **An Overview of Genetic Analysis**
- **An Overview of Genetic Engineering**
- **An Overview of Genetics and Disease**
- **An Overview of bGDGT Biomarker Analysis for Paleoclimatology**
- **Analysis of Earthworm Populations in Soil**
- **Anesthesia Induction and Maintenance**
- **Ankle Exam**
- **Annexin V and Propidium Iodide Labeling**

- Anterograde Amnesia
- Anxiety Testing
- Approximate Number Sense Test
- Are You Smart or Hardworking? How Praise Influences Children's Motivation
- Arterial Line Placement
- Aseptic Technique in Environmental Science
- Assembly of a Reflux System for Heated Chemical Reactions
- Assessing Dexterity with Reaching Tasks
- Auscultation
- Bacterial Growth Curve Analysis and its Environmental Applications
- Bacterial Transformation: Electroporation
- Bacterial Transformation: The Heat Shock Method
- Balance and Coordination Testing
- Basic Care Procedures
- Basic Chick Care and Maintenance
- Basic Life Support Part II: Airway/Breathing and Continued Cardiopulmonary Resuscitation
- Basic Life Support: Cardiopulmonary Resuscitation and Defibrillation
- Basic Mouse Care and Maintenance
- Binocular Rivalry
- Biofuels: Producing Ethanol from Cellulosic Material
- Blood Pressure Measurement
- Blood Withdrawal I
- Blood Withdrawal II
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- C. elegans Development and Reproduction
- C. elegans Maintenance
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- Calibration Curves
- Capillary Electrophoresis (CE)
- Carbon and Nitrogen Analysis of Environmental Samples
- Cardiac Exam I: Inspection and Palpation
- Cardiac Exam II: Auscultation
- Cardiac Exam III: Abnormal Heart Sounds
- Categories and Inductive Inferences
- Cell Cycle Analysis
- Cell-surface Biotinylation Assay
- Central Venous Catheter Insertion: Femoral Vein with Ultrasound Guidance
- Central Venous Catheter Insertion: Internal Jugular with Ultrasound Guidance
- Central Venous Catheter Insertion: Subclavian Vein
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- Children's Reliance on Artist Intentions When Identifying Pictures
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- Conducting Reactions Below Room Temperature
- Considerations for Rodent Surgery
- Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry
- Coordination Chemistry Complexes
- Cranial Nerves Exam I (I-VI)
- Cranial Nerves Exam II (VII-XII)
- Crowding
- Culturing and Enumerating Bacteria from Soil Samples
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- Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment
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- Object Substitution Masking
- Observation and Inspection
- Observational Research
- Ophthalmoscopic Examination
- PCR: The Polymerase Chain Reaction
- Palpation
- Passaging Cells
- Patch Clamp Electrophysiology
- Pelvic Exam I: Assessment of the External Genitalia
- Pelvic Exam II: Speculum Exam
- Pelvic Exam III: Bimanual and Rectovaginal Exam
- Percussion
- Percutaneous Cricothyrotomy (Seldinger Technique)
- Performing 1D Thin Layer Chromatography
- Pericardiocentesis

- Peripheral Vascular Exam
- Peripheral Vascular Exam Using a Continuous Wave Doppler
- Peripheral Venous Cannulation
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- Perspectives on Experimental Psychology
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- Perspectives on Sensation and Perception
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- The Morris Water Maze
- The Multi-group Experiment
- The Precision of Visual Working Memory with Delayed Estimation
- The Rouge Test: Searching for a Sense of Self
- The Rubber Hand Illusion
- The Simple Experiment: Two-group Design
- The Split Brain
- The Staircase Procedure for Finding a Perceptual Threshold
- The TUNEL Assay
- The Transwell Migration Assay
- The Western Blot
- Thyroid Exam

		<ul style="list-style-type: none"> <li>• Tissue Regeneration with Somatic Stem Cells</li> <li>• Transplantation Studies</li> <li>• Tree Identification: How To Use a Dichotomous Key</li> <li>• Tree Survey: Point-Centered Quarter Sampling Method</li> <li>• Turbidity and Total Solids in Surface Water</li> <li>• Two-Dimensional Gel Electrophoresis</li> <li>• Ultraviolet-Visible (UV-Vis) Spectroscopy</li> <li>• Understanding Concentration and Measuring Volumes</li> <li>• Using Differential Scanning Calorimetry to Measure Changes in Enthalpy</li> <li>• Using Diffusion Tensor Imaging in Traumatic Brain Injury</li> <li>• Using GIS to Investigate Urban Forestry</li> <li>• Using TMS to Measure Motor Excitability During Action Observation</li> <li>• Using Topographic Maps to Generate Topographic Profiles</li> <li>• Using Your Head: Measuring Infants' Rational Imitation of Actions</li> <li>• Using a pH Meter</li> <li>• Verbal Priming</li> <li>• Visual Attention: fMRI Investigation of Object-based Attentional Control</li> <li>• Visual Search for Features and Conjunctions</li> <li>• Visual Statistical Learning</li> <li>• Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy</li> <li>• Water Quality Analysis via Indicator Organisms</li> <li>• Whole-Mount In Situ Hybridization</li> <li>• Within-subjects Repeated-measures Design</li> <li>• X-ray Fluorescence (XRF)</li> <li>• Yeast Maintenance</li> <li>• Yeast Reproduction</li> <li>• Yeast Transformation and Cloning</li> <li>• Zebrafish Breeding and Embryo Handling</li> <li>• Zebrafish Maintenance and Husbandry</li> <li>• Zebrafish Microinjection Techniques</li> <li>• Zebrafish Reproduction and Development</li> <li>• fMRI: Functional Magnetic Resonance Imaging</li> </ul>
GLE / PROFICIENCY	9-12.SI.H.B.15.	<p>Analyze the conclusion from an investigation by using data to determine its validity (SI-H-B4)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Aseptic Technique in Environmental Science</li> <li>• Calibration Curves</li> <li>• Capillary Electrophoresis (CE)</li> <li>• Chromatography-Based Biomolecule Purification Methods</li> <li>• Cyclic Voltammetry (CV)</li> <li>• Density Gradient Ultracentrifugation</li> <li>• Dialysis: Diffusion Based Separation</li> </ul>

		<ul style="list-style-type: none"> <li>• Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat</li> <li>• Ethics in Psychology Research</li> <li>• Experimentation using a Confederate</li> <li>• From Theory to Design: The Role of Creativity in Designing Experiments</li> <li>• Gas Chromatography (GC) with Flame-Ionization Detection</li> <li>• High-Performance Liquid Chromatography (HPLC)</li> <li>• Internal Standards</li> <li>• Introduction to Mass Spectrometry</li> <li>• Ion-Exchange Chromatography</li> <li>• Manipulating an Independent Variable through Embodiment</li> <li>• Method of Standard Addition</li> <li>• Observational Research</li> <li>• Pilot Testing</li> <li>• Placebos in Research</li> <li>• Preparing Anhydrous Reagents and Equipment</li> <li>• Protein Crystallization</li> <li>• Raman Spectroscopy for Chemical Analysis</li> <li>• Reliability in Psychology Experiments</li> <li>• Sample Preparation for Analytical Preparation</li> <li>• Scanning Electron Microscopy (SEM)</li> <li>• Self-report vs. Behavioral Measures of Recycling</li> <li>• The Factorial Experiment</li> <li>• The Multi-group Experiment</li> <li>• The Simple Experiment: Two-group Design</li> <li>• Two-Dimensional Gel Electrophoresis</li> <li>• Within-subjects Repeated-measures Design</li> <li>• X-ray Fluorescence (XRF)</li> </ul>
<b>CONTENT STANDARD</b>	<b>LA.9-12.SI.</b>	<b>Science as Inquiry</b>
<b>BENCHMARK / GLE</b>	<b>9-12.SI.H.B.</b>	<b>Understanding Scientific Inquiry</b>
<b>GLE / PROFICIENCY</b>	<b>9-12.SI.H.B.16.</b>	<b>Use the following rules of evidence to examine experimental results:</b>
<b>GRADE LEVEL EXPECTATION</b>	<b>9-12.SI.H.B.16.a.</b>	<p>Can an expert's technique or theory be tested, has it been tested, or is it simply a subjective, conclusive approach that cannot be reasonably assessed for reliability?</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Aseptic Technique in Environmental Science</li> <li>• Calibration Curves</li> <li>• Capillary Electrophoresis (CE)</li> <li>• Chromatography-Based Biomolecule Purification Methods</li> <li>• Cyclic Voltammetry (CV)</li> <li>• Density Gradient Ultracentrifugation</li> <li>• Dialysis: Diffusion Based Separation</li> <li>• Electrochemical Measurements of Supported Catalysts</li> </ul>



		<p>Using a Potentiostat/Galvanostat</p> <ul style="list-style-type: none"> <li>• Ethics in Psychology Research</li> <li>• Experimentation using a Confederate</li> <li>• From Theory to Design: The Role of Creativity in Designing Experiments</li> <li>• Gas Chromatography (GC) with Flame-Ionization Detection</li> <li>• High-Performance Liquid Chromatography (HPLC)</li> <li>• Internal Standards</li> <li>• Introduction to Mass Spectrometry</li> <li>• Ion-Exchange Chromatography</li> <li>• Manipulating an Independent Variable through Embodiment</li> <li>• Method of Standard Addition</li> <li>• Observational Research</li> <li>• Pilot Testing</li> <li>• Placebos in Research</li> <li>• Preparing Anhydrous Reagents and Equipment</li> <li>• Protein Crystallization</li> <li>• Raman Spectroscopy for Chemical Analysis</li> <li>• Reliability in Psychology Experiments</li> <li>• Sample Preparation for Analytical Preparation</li> <li>• Scanning Electron Microscopy (SEM)</li> <li>• Self-report vs. Behavioral Measures of Recycling</li> <li>• The Factorial Experiment</li> <li>• The Multi-group Experiment</li> <li>• The Simple Experiment: Two-group Design</li> <li>• Two-Dimensional Gel Electrophoresis</li> <li>• Within-subjects Repeated-measures Design</li> <li>• X-ray Fluorescence (XRF)</li> </ul>
<p><b>GRADE LEVEL EXPECTATION</b></p>	<p>9-12.SI.H.B.16.c.</p>	<p>What is the known or potential rate of error of the technique or theory when applied?</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Calibration Curves</li> <li>• Capillary Electrophoresis (CE)</li> <li>• Chromatography-Based Biomolecule Purification Methods</li> <li>• Cyclic Voltammetry (CV)</li> <li>• Density Gradient Ultracentrifugation</li> <li>• Dialysis: Diffusion Based Separation</li> <li>• Electrochemical Measurements of Supported Catalysts</li> </ul> <p>Using a Potentiostat/Galvanostat</p> <ul style="list-style-type: none"> <li>• Ethics in Psychology Research</li> <li>• Experimentation using a Confederate</li> <li>• From Theory to Design: The Role of Creativity in Designing Experiments</li> <li>• Gas Chromatography (GC) with Flame-Ionization Detection</li> <li>• High-Performance Liquid Chromatography (HPLC)</li> <li>• Internal Standards</li> </ul>

		<ul style="list-style-type: none"> <li>• Introduction to Mass Spectrometry</li> <li>• Ion-Exchange Chromatography</li> <li>• Manipulating an Independent Variable through Embodiment</li> <li>• Method of Standard Addition</li> <li>• Observational Research</li> <li>• Pilot Testing</li> <li>• Preparing Anhydrous Reagents and Equipment</li> <li>• Protein Crystallization</li> <li>• Raman Spectroscopy for Chemical Analysis</li> <li>• Realism in Experimentation</li> <li>• Reliability in Psychology Experiments</li> <li>• Sample Preparation for Analytical Preparation</li> <li>• Scanning Electron Microscopy (SEM)</li> <li>• Self-report vs. Behavioral Measures of Recycling</li> <li>• The Factorial Experiment</li> <li>• The Multi-group Experiment</li> <li>• The Simple Experiment: Two-group Design</li> <li>• Two-Dimensional Gel Electrophoresis</li> <li>• Within-subjects Repeated-measures Design</li> <li>• X-ray Fluorescence (XRF)</li> </ul>
<p><b>GRADE LEVEL EXPECTATION</b></p>	<p>9-12.SI.H.B.16.d.</p>	<p>Were standards and controls applied and maintained?</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Aseptic Technique in Environmental Science</li> <li>• Calibration Curves</li> <li>• Capillary Electrophoresis (CE)</li> <li>• Chromatography-Based Biomolecule Purification Methods</li> <li>• Cyclic Voltammetry (CV)</li> <li>• Density Gradient Ultracentrifugation</li> <li>• Dialysis: Diffusion Based Separation</li> <li>• Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat</li> <li>• Ethics in Psychology Research</li> <li>• Experimentation using a Confederate</li> <li>• From Theory to Design: The Role of Creativity in Designing Experiments</li> <li>• Gas Chromatography (GC) with Flame-Ionization Detection</li> <li>• High-Performance Liquid Chromatography (HPLC)</li> <li>• Internal Standards</li> <li>• Introduction to Mass Spectrometry</li> <li>• Ion-Exchange Chromatography</li> <li>• Manipulating an Independent Variable through Embodiment</li> <li>• Method of Standard Addition</li> <li>• Observational Research</li> <li>• Pilot Testing</li> <li>• Placebos in Research</li> <li>• Preparing Anhydrous Reagents and Equipment</li> </ul>

		<ul style="list-style-type: none"> <li>• Protein Crystallization</li> <li>• Raman Spectroscopy for Chemical Analysis</li> <li>• Reliability in Psychology Experiments</li> <li>• Sample Preparation for Analytical Preparation</li> <li>• Scanning Electron Microscopy (SEM)</li> <li>• Self-report vs. Behavioral Measures of Recycling</li> <li>• The Factorial Experiment</li> <li>• The Multi-group Experiment</li> <li>• The Simple Experiment: Two-group Design</li> <li>• Two-Dimensional Gel Electrophoresis</li> <li>• Within-subjects Repeated-measures Design</li> <li>• X-ray Fluorescence (XRF)</li> </ul>
<b>CONTENT STANDARD</b>	<b>LA.9.PS.</b>	<b>Physical Science</b>
<b>BENCHMARK / GLE</b>	<b>9.PS.H.A.</b>	<b>Measurement and Symbolic Representation</b>
<b>GLE / PROFICIENCY</b>	<b>9.SI.H.A.1.</b>	<p>Measure the physical properties of different forms of matter in metric system units (e.g., length, mass, volume, temperature) (PS-H-A1)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• An Introduction to the Micropipettor</li> <li>• Introduction to Serological Pipettes and Pipettors</li> <li>• Making Solutions in the Laboratory</li> <li>• Measuring Mass in the Laboratory</li> <li>• Regulating Temperature in the Lab: Applying Heat</li> <li>• Regulating Temperature in the Lab: Preserving Samples Using Cold</li> <li>• Understanding Concentration and Measuring Volumes</li> </ul>
<b>GLE / PROFICIENCY</b>	<b>9.SI.H.A.2.</b>	<p>Gather and organize data in charts, tables, and graphs (PS-H-A1)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Calibration Curves</li> <li>• Capillary Electrophoresis (CE)</li> <li>• Chromatography-Based Biomolecule Purification Methods</li> <li>• Column Chromatography</li> <li>• Conducting Reactions Below Room Temperature</li> <li>• Coordination Chemistry Complexes</li> <li>• Cyclic Voltammetry (CV)</li> <li>• Determining Rate Laws and the Order of Reaction</li> <li>• Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat</li> <li>• Enzyme Assays and Kinetics</li> <li>• Fractional Distillation</li> <li>• Förster Resonance Energy Transfer (FRET)</li> <li>• Gas Chromatography (GC) with Flame-Ionization Detection</li> <li>• Growing Crystals for X-ray Diffraction Analysis</li> <li>• High-Performance Liquid Chromatography (HPLC)</li> <li>• Ideal Gas Law</li> </ul>

		<ul style="list-style-type: none"> <li>• Internal Standards</li> <li>• Introduction to Catalysis</li> <li>• Introduction to Mass Spectrometry</li> <li>• Introduction to Titration</li> <li>• Introduction to the Microplate Reader</li> <li>• Ion-Exchange Chromatography</li> <li>• Le Châtelier's Principle</li> <li>• MALDI-TOF Mass Spectrometry</li> <li>• Making Solutions in the Laboratory</li> <li>• Metabolic Labeling</li> <li>• Method of Standard Addition</li> <li>• Nuclear Magnetic Resonance (NMR) Spectroscopy</li> <li>• Performing 1D Thin Layer Chromatography</li> <li>• Photometric Protein Determination</li> <li>• Protein Crystallization</li> <li>• Purifying Compounds by Recrystallization</li> <li>• Raman Spectroscopy for Chemical Analysis</li> <li>• Separation of Mixtures via Precipitation</li> <li>• Solid-Liquid Extraction</li> <li>• Solutions and Concentrations</li> <li>• Spectrophotometric Determination of an Equilibrium Constant</li> <li>• Surface Plasmon Resonance (SPR)</li> <li>• Tandem Mass Spectrometry</li> <li>• The Ideal Gas Law</li> <li>• Ultraviolet-Visible (UV-Vis) Spectroscopy</li> <li>• Understanding Concentration and Measuring Volumes</li> <li>• Using Differential Scanning Calorimetry to Measure Changes in Enthalpy</li> </ul>
GLE / PROFICIENCY	9.SI.H.A.3.	<p>Distinguish among symbols for atoms, ions, molecules, and equations for chemical reactions (PS-H-A2)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Assembly of a Reflux System for Heated Chemical Reactions</li> <li>• Conducting Reactions Below Room Temperature</li> <li>• Coordination Chemistry Complexes</li> <li>• Determining Rate Laws and the Order of Reaction</li> <li>• Determining the Empirical Formula</li> <li>• Determining the Solubility Rules of Ionic Compounds</li> <li>• Introduction to Catalysis</li> <li>• Introduction to Titration</li> <li>• Le Châtelier's Principle</li> <li>• Lead Analysis of Soil Using Atomic Absorption Spectroscopy</li> <li>• Preparing Anhydrous Reagents and Equipment</li> <li>• Proton Exchange Membrane Fuel Cells</li> <li>• Soil Nutrient Analysis: Nitrogen, Phosphorus, and Potassium</li> <li>• Solutions and Concentrations</li> <li>• Spectrophotometric Determination of an Equilibrium</li> </ul>

		<p>Constant</p> <ul style="list-style-type: none"> <li>Using Differential Scanning Calorimetry to Measure Changes in Enthalpy</li> </ul>
GLE / PROFICIENCY	9.SI.H.A.4.	<p>Name and write chemical formulas using symbols and subscripts (PS-H-A2)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>Determining the Empirical Formula</li> </ul>
<b>CONTENT STANDARD</b>	<b>LA.9.PS.</b>	<b>Physical Science</b>
<b>BENCHMARK / GLE</b>	<b>9.PS.H.B.</b>	<b>Atomic Structure</b>
GLE / PROFICIENCY	9.PS.H.B.5.	<p>Identify the three subatomic particles of an atom by location, charge, and relative mass (PS-H-B1)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>Coordination Chemistry Complexes</li> <li>Nuclear Magnetic Resonance (NMR) Spectroscopy</li> <li>Raman Spectroscopy for Chemical Analysis</li> <li>Scanning Electron Microscopy (SEM)</li> <li>X-ray Fluorescence (XRF)</li> </ul>
GLE / PROFICIENCY	9.PS.H.B.6.	<p>Determine the number of protons, neutrons, and electrons of elements by using the atomic number and atomic mass from the periodic table (PS-H-B1)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>Freezing-Point Depression to Determine an Unknown Compound</li> <li>Introduction to Mass Spectrometry</li> <li>MALDI-TOF Mass Spectrometry</li> <li>Tandem Mass Spectrometry</li> </ul>
GLE / PROFICIENCY	9.PS.H.B.7.	<p>Describe the results of loss/gain of electrons on charges of atoms (PS-H-B1) (PS-H-C5)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>Capillary Electrophoresis (CE)</li> <li>Chromatography-Based Biomolecule Purification Methods</li> <li>Determining the Solubility Rules of Ionic Compounds</li> <li>Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat</li> <li>Electrophoretic Mobility Shift Assay (EMSA)</li> <li>Introduction to Mass Spectrometry</li> <li>Ion-Exchange Chromatography</li> <li>MALDI-TOF Mass Spectrometry</li> <li>Tandem Mass Spectrometry</li> <li>Two-Dimensional Gel Electrophoresis</li> </ul>
GLE / PROFICIENCY	9.PS.H.B.8.	<p>Evaluate the uses and effects of radioactivity in people's daily lives (PS-H-B2)</p> <p><u>JoVE</u></p>

		<ul style="list-style-type: none"> <li>• An Introduction to Behavioral Neuroscience</li> <li>• An Introduction to Cognition</li> <li>• An Introduction to Learning and Memory</li> <li>• An Introduction to Motor Control</li> <li>• An Introduction to Neuroanatomy</li> <li>• Color Afterimages</li> <li>• Decision-making and the Iowa Gambling Task</li> <li>• Decoding Auditory Imagery with Multivoxel Pattern Analysis</li> <li>• Electro-encephalography (EEG)</li> <li>• Eye Tracking in Cognitive Experiments</li> <li>• Fear Conditioning</li> <li>• Finding Your Blind Spot and Perceptual Filling-in</li> <li>• Growing Crystals for X-ray Diffraction Analysis</li> <li>• Introduction to Catalysis</li> <li>• Introduction to Mass Spectrometry</li> <li>• Learning and Memory: The Remember-Know Task</li> <li>• Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain</li> <li>• Metabolic Labeling</li> <li>• Motion-induced Blindness</li> <li>• Motor Maps</li> <li>• Nuclear Magnetic Resonance (NMR) Spectroscopy</li> <li>• Physical Properties Of Minerals I: Crystals and Cleavage</li> <li>• Protein Crystallization</li> <li>• Purifying Compounds by Recrystallization</li> <li>• Solid-Liquid Extraction</li> <li>• Spatial Cueing</li> <li>• The Attentional Blink</li> <li>• The Rubber Hand Illusion</li> <li>• Using Diffusion Tensor Imaging in Traumatic Brain Injury</li> <li>• Using TMS to Measure Motor Excitability During Action Observation</li> <li>• Visual Attention: fMRI Investigation of Object-based Attentional Control</li> <li>• X-ray Fluorescence (XRF)</li> <li>• fMRI: Functional Magnetic Resonance Imaging</li> </ul>
GLE / PROFICIENCY	9.PS.H.B.9.	<p>Compare nuclear fission to nuclear fusion (PS-H-B2)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Determining Rate Laws and the Order of Reaction</li> </ul>
GLE / PROFICIENCY	9.PS.H.B.10.	<p>Identify the number of valence electrons of the first 20 elements based on their positions in the periodic table (PS-H-B3)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Coordination Chemistry Complexes</li> </ul>
<b>CONTENT STANDARD</b>	<b>LA.9.PS.</b>	<b>Physical Science</b>
<b>BENCHMARK / GLE</b>	<b>9.PS.H.C.</b>	<b>The Structure and Properties of Matter</b>

GLE / PROFICIENCY	9.PS.H.C.11.	<p>Investigate and classify common materials as elements, compounds, or mixtures (heterogeneous or homogeneous) based on their physical and chemical properties (PS-H-C1)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Assembly of a Reflux System for Heated Chemical Reactions</li> <li>• Calibration Curves</li> <li>• Capillary Electrophoresis (CE)</li> <li>• Chromatography-Based Biomolecule Purification Methods</li> <li>• Column Chromatography</li> <li>• Common Lab Glassware and Uses</li> <li>• Conducting Reactions Below Room Temperature</li> <li>• Cyclic Voltammetry (CV)</li> <li>• Degassing Liquids with Freeze-Pump-Thaw Cycling</li> <li>• Density Gradient Ultracentrifugation</li> <li>• Determining the Density of a Solid and Liquid</li> <li>• Determining the Empirical Formula</li> <li>• Determining the Mass Percent Composition in an Aqueous Solution</li> <li>• Determining the Solubility Rules of Ionic Compounds</li> <li>• Dialysis: Diffusion Based Separation</li> <li>• Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat</li> <li>• Fractional Distillation</li> <li>• Freezing-Point Depression to Determine an Unknown Compound</li> <li>• Gas Chromatography (GC) with Flame-Ionization Detection</li> <li>• Growing Crystals for X-ray Diffraction Analysis</li> <li>• High-Performance Liquid Chromatography (HPLC)</li> <li>• Internal Standards</li> <li>• Ion-Exchange Chromatography</li> <li>• Lead Analysis of Soil Using Atomic Absorption Spectroscopy</li> <li>• Method of Standard Addition</li> <li>• Performing 1D Thin Layer Chromatography</li> <li>• Photometric Protein Determination</li> <li>• Purifying Compounds by Recrystallization</li> <li>• Rotary Evaporation to Remove Solvent</li> <li>• Sample Preparation for Analytical Preparation</li> <li>• Schlenk Lines Transfer of Solvents</li> <li>• Separation of Mixtures via Precipitation</li> <li>• Soil Nutrient Analysis: Nitrogen, Phosphorus, and Potassium</li> <li>• Solid-Liquid Extraction</li> <li>• Solutions and Concentrations</li> <li>• Two-Dimensional Gel Electrophoresis</li> </ul>
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GLE / PROFICIENCY	9.PS.H.C.12.	<p>Classify elements as metals or nonmetals based on their positions in the periodic table (PS-H-C2)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Chromatography-Based Biomolecule Purification Methods</li> <li>• Coordination Chemistry Complexes</li> <li>• Determining the Solubility Rules of Ionic Compounds</li> <li>• Introduction to Mass Spectrometry</li> <li>• Surface Plasmon Resonance (SPR)</li> <li>• X-ray Fluorescence (XRF)</li> </ul>
GLE / PROFICIENCY	9.PS.H.C.13.	<p>Predict how factors such as particle size and temperature influence the rate of dissolving (PS-H-C3)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• An Overview of Alkenone Biomarker Analysis for Paleothermometry</li> <li>• An Overview of bGDGT Biomarker Analysis for Paleoclimatology</li> <li>• Conducting Reactions Below Room Temperature</li> <li>• Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry</li> <li>• Determining Rate Laws and the Order of Reaction</li> <li>• Determining the Solubility Rules of Ionic Compounds</li> <li>• Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat</li> <li>• Enzyme Assays and Kinetics</li> <li>• Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction</li> <li>• Growing Crystals for X-ray Diffraction Analysis</li> <li>• Introduction to Catalysis</li> <li>• Purification of a Total Lipid Extract with Column Chromatography</li> <li>• Purifying Compounds by Recrystallization</li> <li>• Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry</li> <li>• Sample Preparation for Analytical Preparation</li> <li>• Solutions and Concentrations</li> <li>• Sonication Extraction of Lipid Biomarkers from Sediment</li> <li>• Soxhlet Extraction of Lipid Biomarkers from Sediment</li> </ul>
GLE / PROFICIENCY	9.PS.H.C.14.	<p>Investigate and compare methods for separating mixtures by using the physical properties of the components (PS-H-C4) (PS-H-C1)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• An Introduction to the Centrifuge</li> <li>• Assembly of a Reflux System for Heated Chemical Reactions</li> <li>• Calibration Curves</li> <li>• Capillary Electrophoresis (CE)</li> </ul>



		<ul style="list-style-type: none"> <li>• Carbon and Nitrogen Analysis of Environmental Samples</li> <li>• Chromatography-Based Biomolecule Purification Methods</li> <li>• Co-Immunoprecipitation and Pull-Down Assays</li> <li>• Column Chromatography</li> <li>• Degassing Liquids with Freeze-Pump-Thaw Cycling</li> <li>• Density Gradient Ultracentrifugation</li> <li>• Determining the Empirical Formula</li> <li>• Determining the Mass Percent Composition in an Aqueous Solution</li> <li>• Determining the Solubility Rules of Ionic Compounds</li> <li>• Dialysis: Diffusion Based Separation</li> <li>• Electrophoretic Mobility Shift Assay (EMSA)</li> <li>• Fractional Distillation</li> <li>• Gas Chromatography (GC) with Flame-Ionization Detection</li> <li>• High-Performance Liquid Chromatography (HPLC)</li> <li>• Internal Standards</li> <li>• Ion-Exchange Chromatography</li> <li>• MALDI-TOF Mass Spectrometry</li> <li>• Performing 1D Thin Layer Chromatography</li> <li>• Purification of a Total Lipid Extract with Column Chromatography</li> <li>• Rotary Evaporation to Remove Solvent</li> <li>• Schlenk Lines Transfer of Solvents</li> <li>• Separation of Mixtures via Precipitation</li> <li>• Solid-Liquid Extraction</li> <li>• Tandem Mass Spectrometry</li> <li>• Two-Dimensional Gel Electrophoresis</li> </ul>
GLE / PROFICIENCY	9.PS.H.C.16.	<p>Name and write the formulas for simple ionic and covalent compounds (PS-H-C5)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Determining the Empirical Formula</li> <li>• Purification of a Total Lipid Extract with Column Chromatography</li> <li>• Sonication Extraction of Lipid Biomarkers from Sediment</li> </ul>
GLE / PROFICIENCY	9.PS.H.C.17.	<p>Name and predict the bond type formed between selected elements based on their locations in the periodic table (PS-H-C5)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• An Overview of Alkenone Biomarker Analysis for Paleothermometry</li> <li>• An Overview of bGDGT Biomarker Analysis for Paleoclimatology</li> <li>• Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry</li> <li>• Determining the Solubility Rules of Ionic Compounds</li> </ul>

		<ul style="list-style-type: none"> <li>• Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction</li> <li>• Purification of a Total Lipid Extract with Column Chromatography</li> <li>• Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry</li> <li>• Sonication Extraction of Lipid Biomarkers from Sediment</li> <li>• Soxhlet Extraction of Lipid Biomarkers from Sediment</li> <li>• Ultraviolet-Visible (UV-Vis) Spectroscopy</li> </ul>
GLE / PROFICIENCY	9.PS.H.C.18.	<p>Diagram or construct models of simple hydrocarbons (four or fewer carbons) with single, double, or triple bonds (PS-H-C6)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• An Overview of Alkenone Biomarker Analysis for Paleothermometry</li> <li>• An Overview of bGDGT Biomarker Analysis for Paleoclimatology</li> <li>• Assembly of a Reflux System for Heated Chemical Reactions</li> <li>• Chromatography-Based Biomolecule Purification Methods</li> <li>• Column Chromatography</li> <li>• Conducting Reactions Below Room Temperature</li> <li>• Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry</li> <li>• Coordination Chemistry Complexes</li> <li>• Density Gradient Ultracentrifugation</li> <li>• Dialysis: Diffusion Based Separation</li> <li>• Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction</li> <li>• Fractional Distillation</li> <li>• Introduction to Catalysis</li> <li>• MALDI-TOF Mass Spectrometry</li> <li>• Nuclear Magnetic Resonance (NMR) Spectroscopy</li> <li>• Performing 1D Thin Layer Chromatography</li> <li>• Preparing Anhydrous Reagents and Equipment</li> <li>• Purification of a Total Lipid Extract with Column Chromatography</li> <li>• Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry</li> <li>• Sonication Extraction of Lipid Biomarkers from Sediment</li> <li>• Soxhlet Extraction of Lipid Biomarkers from Sediment</li> <li>• Tandem Mass Spectrometry</li> <li>• Two-Dimensional Gel Electrophoresis</li> <li>• Ultraviolet-Visible (UV-Vis) Spectroscopy</li> </ul>
GLE / PROFICIENCY	9.PS.H.C.19.	Analyze and interpret a graph that relates temperature and heat energy absorbed during phase changes of water (PS-H-C7)

		<p><b>JoVE</b></p> <ul style="list-style-type: none"> <li>• Using Differential Scanning Calorimetry to Measure Changes in Enthalpy</li> </ul>
GLE / PROFICIENCY	9.PS.H.C.20.	<p>Predict the particle motion as a substance changes phases (PS-H-C7) (PS-H-C3)</p> <p><b>JoVE</b></p> <ul style="list-style-type: none"> <li>• Assembly of a Reflux System for Heated Chemical Reactions</li> <li>• Degassing Liquids with Freeze-Pump-Thaw Cycling</li> <li>• Fractional Distillation</li> <li>• Freezing-Point Depression to Determine an Unknown Compound</li> <li>• Growing Crystals for X-ray Diffraction Analysis</li> <li>• Ideal Gas Law</li> <li>• Preparing Anhydrous Reagents and Equipment</li> <li>• Purifying Compounds by Recrystallization</li> <li>• Rotary Evaporation to Remove Solvent</li> <li>• Schlenk Lines Transfer of Solvents</li> <li>• Separation of Mixtures via Precipitation</li> <li>• Solid-Liquid Extraction</li> <li>• Solutions and Concentrations</li> <li>• The Ideal Gas Law</li> <li>• Using Differential Scanning Calorimetry to Measure Changes in Enthalpy</li> </ul>
<b>CONTENT STANDARD</b>	<b>LA.9.PS.</b>	<b>Physical Science</b>
<b>BENCHMARK / GLE</b>	<b>9.PS.H.D.</b>	<b>Chemical Reactions</b>
GLE / PROFICIENCY	9.PS.H.D.21.	<p>Classify changes in matter as physical or chemical (PS-H-D1)</p> <p><b>JoVE</b></p> <ul style="list-style-type: none"> <li>• An Introduction to Cell Metabolism</li> <li>• Conducting Reactions Below Room Temperature</li> <li>• Cyclic Voltammetry (CV)</li> <li>• Detecting Reactive Oxygen Species</li> <li>• Determining the Solubility Rules of Ionic Compounds</li> <li>• Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat</li> <li>• Enzyme Assays and Kinetics</li> <li>• Freezing-Point Depression to Determine an Unknown Compound</li> <li>• Growing Crystals for X-ray Diffraction Analysis</li> <li>• Introduction to Catalysis</li> <li>• Introduction to Titration</li> <li>• Le Châtelier's Principle</li> <li>• Nuclear Magnetic Resonance (NMR) Spectroscopy</li> <li>• Photometric Protein Determination</li> <li>• Preparing Anhydrous Reagents and Equipment</li> <li>• Proton Exchange Membrane Fuel Cells</li> </ul>

		<ul style="list-style-type: none"> <li>• Purifying Compounds by Recrystallization</li> <li>• Rotary Evaporation to Remove Solvent</li> <li>• Separation of Mixtures via Precipitation</li> <li>• The ATP Bioluminescence Assay</li> <li>• The ELISA Method</li> <li>• Using Differential Scanning Calorimetry to Measure Changes in Enthalpy</li> <li>• Using a pH Meter</li> </ul>
GLE / PROFICIENCY	9.PS.H.D.22.	<p>Identify evidence of chemical changes (PS-H-D1)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• An Introduction to Cell Metabolism</li> <li>• Co-Immunoprecipitation and Pull-Down Assays</li> <li>• Conducting Reactions Below Room Temperature</li> <li>• Cyclic Voltammetry (CV)</li> <li>• Detecting Reactive Oxygen Species</li> <li>• Determining Rate Laws and the Order of Reaction</li> <li>• Determining the Solubility Rules of Ionic Compounds</li> <li>• Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat</li> <li>• Enzyme Assays and Kinetics</li> <li>• Growing Crystals for X-ray Diffraction Analysis</li> <li>• Introduction to Catalysis</li> <li>• Introduction to Titration</li> <li>• Le Châtelier's Principle</li> <li>• Nuclear Magnetic Resonance (NMR) Spectroscopy</li> <li>• Passaging Cells</li> <li>• Photometric Protein Determination</li> <li>• Physical Properties Of Minerals II: Polymineralic Analysis</li> <li>• Preparing Anhydrous Reagents and Equipment</li> <li>• Proton Exchange Membrane Fuel Cells</li> <li>• Purifying Compounds by Recrystallization</li> <li>• Rotary Evaporation to Remove Solvent</li> <li>• Separation of Mixtures via Precipitation</li> <li>• Spectrophotometric Determination of an Equilibrium Constant</li> <li>• The ATP Bioluminescence Assay</li> <li>• The ELISA Method</li> <li>• Using Differential Scanning Calorimetry to Measure Changes in Enthalpy</li> <li>• Using a pH Meter</li> </ul>
GLE / PROFICIENCY	9.PS.H.D.23.	<p>Classify unknowns as acidic, basic, or neutral using indicators (PS-H-D2)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Using a pH Meter</li> </ul>
GLE / PROFICIENCY	9.PS.H.D.24.	<p>Identify balanced equations as neutralization, combination, and decomposition reactions (PS-H-D3)</p>

		<p><b>JoVE</b></p> <ul style="list-style-type: none"> <li>• Co-Immunoprecipitation and Pull-Down Assays</li> <li>• Conducting Reactions Below Room Temperature</li> <li>• Coordination Chemistry Complexes</li> <li>• Cyclic Voltammetry (CV)</li> <li>• Determining Rate Laws and the Order of Reaction</li> <li>• Determining the Solubility Rules of Ionic Compounds</li> <li>• Electrochemical Measurements of Supported Catalysts</li> </ul> <p>Using a Potentiostat/Galvanostat</p> <ul style="list-style-type: none"> <li>• Enzyme Assays and Kinetics</li> <li>• Growing Crystals for X-ray Diffraction Analysis</li> <li>• Introduction to Catalysis</li> <li>• Introduction to Titration</li> <li>• Le Châtelier's Principle</li> <li>• Photometric Protein Determination</li> <li>• Preparing Anhydrous Reagents and Equipment</li> <li>• Proton Exchange Membrane Fuel Cells</li> <li>• Purifying Compounds by Recrystallization</li> <li>• Rotary Evaporation to Remove Solvent</li> <li>• Separation of Mixtures via Precipitation</li> <li>• Spectrophotometric Determination of an Equilibrium Constant</li> <li>• Using Differential Scanning Calorimetry to Measure Changes in Enthalpy</li> <li>• Using a pH Meter</li> </ul>
GLE / PROFICIENCY	9.PS.H.D.25.	<p>Determine the effect of various factors on reaction rate (e.g., temperature, surface area, concentration, agitation) (PS-H-D4)</p> <p><b>JoVE</b></p> <ul style="list-style-type: none"> <li>• Conducting Reactions Below Room Temperature</li> <li>• Coordination Chemistry Complexes</li> <li>• Determining Rate Laws and the Order of Reaction</li> <li>• Electrochemical Measurements of Supported Catalysts</li> </ul> <p>Using a Potentiostat/Galvanostat</p> <ul style="list-style-type: none"> <li>• Enzyme Assays and Kinetics</li> <li>• Introduction to Catalysis</li> </ul>
GLE / PROFICIENCY	9.PS.H.D.26.	<p>Illustrate the laws of conservation of matter and energy through balancing simple chemical reactions (PS-H-D5) (PS-H-D3) (PS-H-D7)</p> <p><b>JoVE</b></p> <ul style="list-style-type: none"> <li>• Assembly of a Reflux System for Heated Chemical Reactions</li> <li>• Conducting Reactions Below Room Temperature</li> <li>• Coordination Chemistry Complexes</li> <li>• Determining Rate Laws and the Order of Reaction</li> <li>• Determining the Empirical Formula</li> <li>• Determining the Solubility Rules of Ionic Compounds</li> <li>• Introduction to Catalysis</li> <li>• Introduction to Titration</li> </ul>

		<ul style="list-style-type: none"> <li>• Le Châtelier's Principle</li> <li>• Preparing Anhydrous Reagents and Equipment</li> <li>• Proton Exchange Membrane Fuel Cells</li> <li>• Solutions and Concentrations</li> <li>• Spectrophotometric Determination of an Equilibrium Constant</li> <li>• Using Differential Scanning Calorimetry to Measure Changes in Enthalpy</li> </ul>
GLE / PROFICIENCY	9.PS.H.D.27.	<p>Distinguish between endothermic and exothermic reactions (PS-H-D6)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Conducting Reactions Below Room Temperature</li> <li>• Determining Rate Laws and the Order of Reaction</li> <li>• Le Châtelier's Principle</li> <li>• Using Differential Scanning Calorimetry to Measure Changes in Enthalpy</li> </ul>
GLE / PROFICIENCY	9.PS.H.D.28.	<p>Identify chemical reactions that commonly occur in the home and nature (PS-H-D7)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• An Introduction to Cell Division</li> <li>• An Introduction to Cell Metabolism</li> <li>• An Introduction to Saccharomyces cerevisiae</li> <li>• An Introduction to Transfection</li> <li>• Bacterial Transformation: Electroporation</li> <li>• Bacterial Transformation: The Heat Shock Method</li> <li>• Cell Cycle Analysis</li> <li>• Cell-surface Biotinylation Assay</li> <li>• Chromatography-Based Biomolecule Purification Methods</li> <li>• Co-Immunoprecipitation and Pull-Down Assays</li> <li>• Conducting Reactions Below Room Temperature</li> <li>• Coordination Chemistry Complexes</li> <li>• Cyclic Voltammetry (CV)</li> <li>• DNA Gel Electrophoresis</li> <li>• DNA Ligation Reactions</li> <li>• Density Gradient Ultracentrifugation</li> <li>• Detecting Reactive Oxygen Species</li> <li>• Determining Rate Laws and the Order of Reaction</li> <li>• Determining the Solubility Rules of Ionic Compounds</li> <li>• Dialysis: Diffusion Based Separation</li> <li>• Drosophila Larval IHC</li> <li>• Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat</li> <li>• Electrophoretic Mobility Shift Assay (EMSA)</li> <li>• Enzyme Assays and Kinetics</li> <li>• FM Dyes in Vesicle Recycling</li> <li>• Fractional Distillation</li> <li>• Förster Resonance Energy Transfer (FRET)</li> <li>• Gel Purification</li> </ul>

		<ul style="list-style-type: none"> <li>• Growing Crystals for X-ray Diffraction Analysis</li> <li>• Introduction to Catalysis</li> <li>• Introduction to Mass Spectrometry</li> <li>• Introduction to Titration</li> <li>• Ion-Exchange Chromatography</li> <li>• Le Châtelier's Principle</li> <li>• MALDI-TOF Mass Spectrometry</li> <li>• Metabolic Labeling</li> <li>• Method of Standard Addition</li> <li>• Molecular Cloning</li> <li>• Nuclear Magnetic Resonance (NMR) Spectroscopy</li> <li>• PCR: The Polymerase Chain Reaction</li> <li>• Passaging Cells</li> <li>• Photometric Protein Determination</li> <li>• Plasmid Purification</li> <li>• Preparing Anhydrous Reagents and Equipment</li> <li>• Protein Crystallization</li> <li>• Proton Exchange Membrane Fuel Cells</li> <li>• Purifying Compounds by Recrystallization</li> <li>• Reconstitution of Membrane Proteins</li> <li>• Restriction Enzyme Digests</li> <li>• Rotary Evaporation to Remove Solvent</li> <li>• Sample Preparation for Analytical Preparation</li> <li>• Separating Protein with SDS-PAGE</li> <li>• Separation of Mixtures via Precipitation</li> <li>• Spectrophotometric Determination of an Equilibrium Constant</li> <li>• Surface Plasmon Resonance (SPR)</li> <li>• Tandem Mass Spectrometry</li> <li>• The ATP Bioluminescence Assay</li> <li>• The ELISA Method</li> <li>• The Western Blot</li> <li>• Two-Dimensional Gel Electrophoresis</li> <li>• Ultraviolet-Visible (UV-Vis) Spectroscopy</li> <li>• Using Differential Scanning Calorimetry to Measure Changes in Enthalpy</li> <li>• Using a pH Meter</li> </ul>
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<b>CONTENT STANDARD</b>	<b>LA.9.PS.</b>	<b>Physical Science</b>
<b>BENCHMARK / GLE</b>	<b>9.PS.H.E.</b>	<b>Forces and Motion</b>
<b>GLE / PROFICIENCY</b>	<b>9.PS.H.E.29.</b>	<p>Differentiate between mass and weight (PS-H-E1)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Determining the Density of a Solid and Liquid</li> <li>• Measuring Mass in the Laboratory</li> </ul>
<b>GLE / PROFICIENCY</b>	<b>9.PS.H.E.30.</b>	<p>Compare the characteristics and strengths of forces in nature (e.g., gravitational, electrical, magnetic, nuclear) (PS-H-E1)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Determining Spatial Orientation of Rock Layers with</li> </ul>

		<p>the Brunton Compass</p> <ul style="list-style-type: none"> <li>• Introduction to Mass Spectrometry</li> <li>• Nuclear Magnetic Resonance (NMR) Spectroscopy</li> </ul>
<b>CONTENT STANDARD</b>	<b>LA.9.PS.</b>	<b>Physical Science</b>
<b>BENCHMARK / GLE</b>	<b>9.PS.H.F.</b>	<b>Energy</b>
<b>GLE / PROFICIENCY</b>	<b>9.PS.H.F.40.</b>	<p>Demonstrate energy transformation and conservation in everyday actions (PS-H-F2)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• fMRI: Functional Magnetic Resonance Imaging</li> </ul>
<b>CONTENT STANDARD</b>	<b>LA.9.PS.</b>	<b>Physical Science</b>
<b>BENCHMARK / GLE</b>	<b>9.PS.H.G.</b>	<b>Interactions of Energy and Matter</b>
<b>GLE / PROFICIENCY</b>	<b>9.PS.H.G.42.</b>	<p>Describe the relationship between wavelength and frequency (PS-H-G1)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Auscultation</li> <li>• Percussion</li> <li>• Raman Spectroscopy for Chemical Analysis</li> <li>• Ultraviolet-Visible (UV-Vis) Spectroscopy</li> </ul>
<b>GLE / PROFICIENCY</b>	<b>9.PS.H.G.44.</b>	<p>Illustrate the production of static electricity (PS-H-G2)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat</li> <li>• Testing For Genetically Modified Foods</li> </ul>
<b>GLE / PROFICIENCY</b>	<b>9.PS.H.G.46.</b>	<p>Diagram a magnetic field (PS-H-G2)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Introduction to Mass Spectrometry</li> <li>• Nuclear Magnetic Resonance (NMR) Spectroscopy</li> </ul>
<b>GLE / PROFICIENCY</b>	<b>9.PS.H.G.47.</b>	<p>Explain how electricity and magnetism are related (PS-H-G2)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Gas Chromatography (GC) with Flame-Ionization Detection</li> <li>• fMRI: Functional Magnetic Resonance Imaging</li> </ul>
<b>GLE / PROFICIENCY</b>	<b>9.PS.H.G.48.</b>	<p>Compare properties of waves in the electromagnetic spectrum (PS-H-G3)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Ultraviolet-Visible (UV-Vis) Spectroscopy</li> </ul>
<b>GLE / PROFICIENCY</b>	<b>9.PS.H.G.49.</b>	<p>Describe the Doppler effect on sound (PS-H-G3)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Peripheral Vascular Exam Using a Continuous Wave Doppler</li> </ul>



GLE / PROFICIENCY	9.PS.H.G.50.	<p>Identify positive and negative effects of electromagnetic/mechanical waves on humans and human activities (e.g., sound, ultraviolet rays, X-rays, MRIs, fiber optics) (PS-H-G4) (PS-H-G3)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> <li>• Abdominal Exam I: Inspection and Auscultation</li> <li>• Abdominal Exam IV: Acute Abdominal Pain Assessment</li> <li>• An Introduction to Behavioral Neuroscience</li> <li>• An Introduction to Cognition</li> <li>• An Introduction to Drosophila melanogaster</li> <li>• An Introduction to Learning and Memory</li> <li>• An Introduction to Motor Control</li> <li>• An Introduction to Neuroanatomy</li> <li>• An Introduction to Neurophysiology</li> <li>• An Introduction to the Zebrafish: Danio rerio</li> <li>• An Overview of Alkenone Biomarker Analysis for Paleothermometry</li> <li>• An Overview of Genetics and Disease</li> <li>• An Overview of bGDGT Biomarker Analysis for Paleoclimatology</li> <li>• Auscultation</li> <li>• Central Venous Catheter Insertion: Femoral Vein with Ultrasound Guidance</li> <li>• Central Venous Catheter Insertion: Internal Jugular with Ultrasound Guidance</li> <li>• Color Afterimages</li> <li>• Community DNA Extraction from Bacterial Colonies</li> <li>• Conducting Reactions Below Room Temperature</li> <li>• Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry</li> <li>• Coordination Chemistry Complexes</li> <li>• Decision-making and the Iowa Gambling Task</li> <li>• Decoding Auditory Imagery with Multivoxel Pattern Analysis</li> <li>• Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy</li> <li>• Determining the Empirical Formula</li> <li>• Electro-encephalography (EEG)</li> <li>• Event-related Potentials and the Oddball Task</li> <li>• Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction</li> <li>• Eye Tracking in Cognitive Experiments</li> <li>• Fear Conditioning</li> <li>• Finding Your Blind Spot and Perceptual Filling-in</li> <li>• Förster Resonance Energy Transfer (FRET)</li> <li>• Gas Chromatography (GC) with Flame-Ionization Detection</li> <li>• Growing Crystals for X-ray Diffraction Analysis</li> <li>• Internal Standards</li> </ul>
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- Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation
- Introduction to Catalysis
- Introduction to Fluorescence Microscopy
- Introduction to Mass Spectrometry
- Introduction to the Microplate Reader
- Introduction to the Spectrophotometer
- Language: The N400 in Semantic Incongruity
- Lead Analysis of Soil Using Atomic Absorption Spectroscopy
- Learning and Memory: The Remember-Know Task
- MALDI-TOF Mass Spectrometry
- Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain
- Metabolic Labeling
- Method of Standard Addition
- Motion-induced Blindness
- Motor Maps
- Mouse Genotyping
- Nuclear Magnetic Resonance (NMR) Spectroscopy
- Nutrients in Aquatic Ecosystems
- Percussion
- Pericardiocentesis
- Peripheral Vascular Exam
- Peripheral Vascular Exam Using a Continuous Wave Doppler
- Photometric Protein Determination
- Physical Properties Of Minerals I: Crystals and Cleavage
- Plasmid Purification
- Protein Crystallization
- Purifying Compounds by Recrystallization
- Raman Spectroscopy for Chemical Analysis
- Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry
- Rodent Stereotaxic Surgery
- Solid-Liquid Extraction
- Sonication Extraction of Lipid Biomarkers from Sediment
- Soxhlet Extraction of Lipid Biomarkers from Sediment
- Spatial Cueing
- Spectrophotometric Determination of an Equilibrium Constant
- Tandem Mass Spectrometry
- The Attentional Blink
- The Rubber Hand Illusion
- The Staircase Procedure for Finding a Perceptual Threshold
- Ultraviolet-Visible (UV-Vis) Spectroscopy
- Using Diffusion Tensor Imaging in Traumatic Brain Injury
- Using TMS to Measure Motor Excitability During Action

		<b>Observation</b> <ul style="list-style-type: none"><li>• <b>Visual Attention: fMRI Investigation of Object-based Attentional Control</b></li><li>• <b>X-ray Fluorescence (XRF)</b></li><li>• <b>Yeast Maintenance</b></li><li>• <b>fMRI: Functional Magnetic Resonance Imaging</b></li></ul>
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