



Main Criteria: Minnesota Academic Standards

Secondary Criteria: JoVE

Subject: Science

Grade: 9-12

Correlation Options: Show Correlated

Adopted: 2009

CONTENT STANDARD / DOMAIN	MN.9.1.	The Nature of Science and Engineering
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.1.1.	The Practice of Science
INDICATORS OF PROGRESS / STRAND	9.1.1.1.	The student will understand that science is a way of knowing about the natural world that is characterized by empirical criteria, logical argument and skeptical review.
INDICATORS OF PROGRESS	9.1.1.1.1.	<p>Explain the implications of the assumption that the rules of the universe are the same everywhere and these rules can be discovered by careful and systematic investigation.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Degassing Liquids with Freeze-Pump-Thaw Cycling • Determining Rate Laws and the Order of Reaction • Determining the Empirical Formula • Ideal Gas Law • Schlenk Lines Transfer of Solvents • The Ideal Gas Law • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
INDICATORS OF PROGRESS	9.1.1.1.2.	<p>Understand that scientists conduct investigations for a variety of reasons: to discover new aspects of the natural world, to explain recently observed phenomena, to test the conclusions of prior investigations, or to test the predictions of current theories.</p> <p>JoVE</p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to Behavioral Neuroscience • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism

		<ul style="list-style-type: none"> • An Introduction to Cell Motility and Migration • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Cognition • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Endocytosis and Exocytosis • 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 Stem Cell Biology • An Overview of Epigenetics • An Overview of Genetic Analysis • An Overview of Genetic Engineering • An Overview of Genetics and Disease • Anterograde Amnesia • Anxiety Testing • Color Afterimages • Crowding • Fear Conditioning • Inattentive Blindness • Invasion Assay Using 3D Matrices • Invertebrate Lifespan Quantification • Modeling Social Stress • Motion-induced Blindness • Neuronal Transfection Methods • Object Substitution Masking • Primary Neuronal Cultures • Self-administration Studies • Spatial Cueing • The Attentional Blink • The Rubber Hand Illusion • The Transwell Migration Assay • Turbidity and Total Solids in Surface Water
<p>INDICATORS OF PROGRESS</p>	<p>9.1.1.1.4.</p>	<p>Explain how societal and scientific ethics impact research practices.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Algae Enumeration via Culturable Methodology • An Introduction to Aging and Regeneration • An Introduction to Developmental Genetics • An Introduction to Drosophila melanogaster • An Introduction to Organogenesis • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Introduction to the Laboratory Mouse: Mus

musculus

- Anesthesia Induction and Maintenance
- Aseptic Technique in Environmental Science
- Bacterial Growth Curve Analysis and its Environmental Applications
- Basic Care Procedures
- Basic Chick Care and Maintenance
- Basic Mouse Care and Maintenance
- Blood Withdrawal I
- Blood Withdrawal II
- C. elegans Maintenance
- Community DNA Extraction from Bacterial Colonies
- Compound Administration I
- Compound Administration II
- Compound Administration III
- Compound Administration IV
- Considerations for Rodent Surgery
- Culturing and Enumerating Bacteria from Soil Samples
- Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis
- Detection of Bacteriophages in Environmental Samples
- Diagnostic Necropsy and Tissue Harvest
- Drosophila Development and Reproduction
- Drosophila Maintenance
- Drosophila melanogaster Embryo and Larva Harvesting and Preparation
- Embryonic Stem Cell Culture and Differentiation
- Ethics in Psychology Research
- Explant Culture for Developmental Studies
- Fate Mapping
- Fundamentals of Breeding and Weaning
- Genetic Screens
- Gram Staining of Bacteria from Environmental Sources
- In ovo Electroporation of Chicken Embryos
- Induced Pluripotency
- Introducing Experimental Agents into the Mouse
- Invertebrate Lifespan Quantification
- Isolating Nucleic Acids from Yeast
- Isolation of Fecal Bacteria from Water Samples by Filtration
- Mouse Genotyping
- Neuronal Transfection Methods
- Passaging Cells
- Primary Neuronal Cultures
- Quantifying Environmental Microorganisms and Viruses Using qPCR
- Realism in Experimentation
- Regulating Temperature in the Lab: Applying Heat
- Regulating Temperature in the Lab: Preserving Samples Using Cold
- Reliability in Psychology Experiments

		<ul style="list-style-type: none"> • Rodent Handling and Restraint Techniques • Rodent Identification I • Rodent Identification II • Sterile Tissue Harvest • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Microinjection Techniques
<p>INDICATORS OF PROGRESS</p>	<p>9.1.1.1.5.</p>	<p>Identify sources of bias and how bias might influence the direction of research and the interpretation of data.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • 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 • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Cognition • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Drosophila melanogaster • An Introduction to Endocytosis and Exocytosis • 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 Chick: Gallus gallus domesticus • An Introduction to the Laboratory Mouse: Mus

musculus

- **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**
- **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**

- 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
- 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
- Comprehensive Breast Exam
- 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
- 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
- Detection of Bacteriophages in Environmental Samples
- Determination Of Nox in Automobile Exhaust Using

UV-VIS Spectroscopy

- **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**
- **Development of the Chick**
- **Diagnostic Necropsy and Tissue Harvest**
- **Dialysis: Diffusion Based Separation**
- **Dichotic Listening**
- **Dissolved Oxygen in Surface Water**
- **Drosophila Development and Reproduction**
- **Drosophila Larval IHC**
- **Drosophila Maintenance**
- **Drosophila melanogaster Embryo and Larva Harvesting and Preparation**
- **Ear Exam**
- **Elbow Exam**
- **Electro-encephalography (EEG)**
- **Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat**
- **Electrophoretic Mobility Shift Assay (EMSA)**
- **Embryonic Stem Cell Culture and Differentiation**
- **Emergency Tube Thoracostomy (Chest Tube Placement)**
- **Emergent Lateral Canthotomy and Inferior Catholysis**
- **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**
- **Experimentation using a Confederate**
- **Explant Culture for Developmental Studies**
- **Explant Culture of Neural Tissue**
- **Expression Profiling with Microarrays**
- **Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction**
- **Eye Exam**
- **Eye Tracking in Cognitive Experiments**
- **FM Dyes in Vesicle Recycling**
- **Fate Mapping**
- **Fear Conditioning**
- **Filamentous Fungi**
- **Finding Your Blind Spot and Perceptual Filling-in**
- **Foot Exam**

- Fractional Distillation
- Freezing-Point Depression to Determine an Unknown Compound
- From Theory to Design: The Role of Creativity in Designing Experiments
- Fundamentals of Breeding and Weaning
- Förster Resonance Energy Transfer (FRET)
- Gas Chromatography (GC) with Flame-Ionization Detection
- Gel Purification
- Gene Silencing with Morpholinos
- General Approach to the Physical Exam
- Genetic Crosses
- Genetic Engineering of Model Organisms
- Genetic Screens
- Genome Editing
- Gram Staining of Bacteria from Environmental Sources
- Growing Crystals for X-ray Diffraction Analysis
- Habituation: Studying Infants Before They Can Talk
- Hand and Wrist Exam
- High-Performance Liquid Chromatography (HPLC)
- Hip Exam
- Histological Staining of Neural Tissue
- How Children Solve Problems Using Causal Reasoning
- Ideal Gas Law
- Igneous Intrusive Rock
- Igneous Volcanic Rock
- In ovo Electroporation of Chicken Embryos
- Inattentive Blindness
- Incidental Encoding
- Induced Pluripotency
- Internal Standards
- Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation
- Intraosseous Needle Placement
- Introducing Experimental Agents into the Mouse
- Introduction to Catalysis
- Introduction to Mass Spectrometry
- Introduction to Titration
- Invasion Assay Using 3D Matrices
- Invertebrate Lifespan Quantification
- Ion-Exchange Chromatography
- Isolating Nucleic Acids from Yeast
- Isolation of Fecal Bacteria from Water Samples by Filtration
- Just-noticeable Differences
- Knee Exam
- 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**
- **Live Cell Imaging of Mitosis**
- **Lower Back Exam**
- **Lymph Node Exam**
- **MALDI-TOF Mass Spectrometry**
- **Making a Geologic Cross Section**
- **Male Rectal Exam**
- **Manipulating an Independent Variable through Embodiment**
- **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**
- **Molecular Cloning**
- **Motion-induced Blindness**
- **Motor Exam I**
- **Motor Exam II**
- **Motor Learning in Mirror Drawing**
- **Motor Maps**
- **Mouse Genotyping**
- **Multiple Object Tracking**
- **Murine In Utero Electroporation**
- **Mutual Exclusivity: How Children Learn the Meanings of Words**
- **Neck Exam**
- **Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment**
- **Neuronal Transfection Methods**
- **Nose, Sinuses, Oral Cavity and Pharynx Exam**
- **Nuclear Magnetic Resonance (NMR) Spectroscopy**
- **Numerical Cognition: More or Less**
- **Nutrients in Aquatic Ecosystems**
- **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
- Perspectives on Cognitive Psychology
- Perspectives on Experimental Psychology
- Perspectives on Neuropsychology
- Perspectives on Sensation and Perception
- 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
- Primary Neuronal Cultures
- Proper Adjustment of Patient Attire during the Physical Exam
- 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
- Recombineering and Gene Targeting
- Reconstitution of Membrane Proteins
- Reliability in Psychology Experiments
- Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry
- Respiratory Exam I: Inspection and Palpation
- Respiratory Exam II: Percussion and Auscultation

- Restriction Enzyme Digests
- Rodent Handling and Restraint Techniques
- Rodent Identification I
- Rodent Identification II
- 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
- Sensory Exam
- Separating Protein with SDS-PAGE
- Separation of Mixtures via Precipitation
- Shoulder Exam I
- Shoulder Exam II
- 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
- Spatial Cueing
- Spatial Memory Testing Using Mazes
- Spectrophotometric Determination of an Equilibrium Constant
- Sterile Tissue Harvest
- Surface Plasmon Resonance (SPR)
- Surgical Cricothyrotomy
- Tandem Mass Spectrometry
- Testing For Genetically Modified Foods
- The ATP Bioluminescence Assay
- The Ames Room
- The Attentional Blink
- The Costs and Benefits of Natural Pedagogy
- The ELISA Method
- The Factorial Experiment
- The Ideal Gas Law
- The Inverted-face Effect
- The McGurk Effect
- 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

		<p>Threshold</p> <ul style="list-style-type: none"> • The TUNEL Assay • The Transwell Migration Assay • The Western Blot • Thyroid Exam • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies • 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 • 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 Topographic Maps to Generate Topographic Profiles • 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 • Whole-Mount In Situ Hybridization • Within-subjects Repeated-measures Design • X-ray Fluorescence (XRF) • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development • fMRI: Functional Magnetic Resonance Imaging
<p>INDICATORS OF PROGRESS</p>	<p>9.1.1.1.6.</p>	<p>Describe how changes in scientific knowledge generally occur in incremental steps that include and build on earlier knowledge.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Abdominal Exam II: Percussion • An Introduction to Aging and Regeneration • An Introduction to Behavioral Neuroscience

- An Introduction to *Caenorhabditis elegans*
- An Introduction to Cell Death
- An Introduction to Cell Division
- An Introduction to Cell Metabolism
- An Introduction to Cell Motility and Migration
- An Introduction to Developmental Genetics
- An Introduction to Developmental Neurobiology
- An Introduction to *Drosophila melanogaster*
- An Introduction to Endocytosis and Exocytosis
- An Introduction to Learning and Memory
- An Introduction to Molecular Developmental Biology
- An Introduction to Neuroanatomy
- An Introduction to Neurophysiology
- An Introduction to Organogenesis
- An Introduction to *Saccharomyces cerevisiae*
- An Introduction to Stem Cell Biology
- An Introduction to the Chick: *Gallus gallus domesticus*
- An Introduction to the Laboratory Mouse: *Mus musculus*
- An Introduction to the Zebrafish: *Danio rerio*
- 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
- Anterograde Amnesia
- Auscultation
- *C. elegans* Maintenance
- Cell Cycle Analysis
- Color Afterimages
- Determining Spatial Orientation of Rock Layers with the Brunton Compass
- Development of the Chick
- *Drosophila* Maintenance
- General Approach to the Physical Exam
- Genetic Crosses
- Inattentional Blindness
- Le Châtelier's Principle
- Making a Geologic Cross Section
- Measuring Reaction Time and Donders' Method of Subtraction
- Motion-induced Blindness
- Object Substitution Masking
- Percussion
- Piaget's Conservation Task and the Influence of Task Demands
- Rotary Evaporation to Remove Solvent
- Spatial Cueing
- The Attentional Blink
- The Rubber Hand Illusion
- The Split Brain

		<ul style="list-style-type: none"> • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy • Yeast Transformation and Cloning
<p>INDICATORS OF PROGRESS</p>	<p>9.1.1.1.7.</p>	<p>Explain how scientific and technological innovations - as well as new evidence - can challenge portions of, or entire accepted theories and models including, but not limited to: cell theory, atomic theory, theory of evolution, plate tectonic theory, germ theory of disease, and the big bang theory.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Abdominal Exam II: Percussion • An Introduction to Aging and Regeneration • An Introduction to Behavioral Neuroscience • An Introduction to Caenorhabditis elegans • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Drosophila melanogaster • An Introduction to Endocytosis and Exocytosis • An Introduction to Learning and Memory • An Introduction to Molecular Developmental Biology • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Introduction to Organogenesis • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Laboratory Mouse: Mus musculus • An Introduction to the Zebrafish: Danio rerio • 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 • Anterograde Amnesia • Auscultation • C. elegans Maintenance • Cell Cycle Analysis • Color Afterimages • Degassing Liquids with Freeze-Pump-Thaw Cycling • Determining Spatial Orientation of Rock Layers with the Brunton Compass • Development of the Chick • Drosophila Maintenance • General Approach to the Physical Exam • Genetic Crosses

		<ul style="list-style-type: none"> • Ideal Gas Law • Igneous Intrusive Rock • Igneous Volcanic Rock • Inattentional Blindness • Le Châtelier's Principle • Making a Geologic Cross Section • Measuring Reaction Time and Donders' Method of Subtraction • Motion-induced Blindness • Object Substitution Masking • Passaging Cells • Percussion • Piaget's Conservation Task and the Influence of Task Demands • Rotary Evaporation to Remove Solvent • Schlenk Lines Transfer of Solvents • Spatial Cueing • The Attentional Blink • The Ideal Gas Law • The Rubber Hand Illusion • The Split Brain • Using Topographic Maps to Generate Topographic Profiles • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy • Yeast Transformation and Cloning
CONTENT STANDARD / DOMAIN	MN.9.1.	The Nature of Science and Engineering
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.1.1.	The Practice of Science
INDICATORS OF PROGRESS / STRAND	9.1.1.2.	The student will understand that scientific inquiry uses multiple interrelated processes to investigate and explain the natural world.
INDICATORS OF PROGRESS	9.1.1.2.1.	<p>Formulate a testable hypothesis, design and conduct an experiment to test the hypothesis, analyze the data, consider alternative explanations and draw conclusions supported by evidence from the investigation.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Ethics in Psychology Research • Experimentation using a Confederate • From Theory to Design: The Role of Creativity in Designing Experiments • Manipulating an Independent Variable through Embodiment • Observational Research • Pilot Testing • Placebos in Research • Realism in Experimentation

		<ul style="list-style-type: none"> • Reliability in Psychology Experiments • The Factorial Experiment • The Multi-group Experiment • The Simple Experiment: Two-group Design • Within-subjects Repeated-measures Design
INDICATORS OF PROGRESS	9.1.1.2.3.	<p>Identify the critical assumptions and logic used in a line of reasoning to judge the validity of a claim.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Aseptic Technique in Environmental Science • Calibration Curves • Capillary Electrophoresis (CE) • Chromatography-Based Biomolecule Purification Methods • Cyclic Voltammetry (CV) • Density Gradient Ultracentrifugation • Dialysis: Diffusion Based Separation • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Ethics in Psychology Research • Experimentation using a Confederate • From Theory to Design: The Role of Creativity in Designing Experiments • Gas Chromatography (GC) with Flame-Ionization Detection • High-Performance Liquid Chromatography (HPLC) • Internal Standards • Introduction to Mass Spectrometry • Ion-Exchange Chromatography • Manipulating an Independent Variable through Embodiment • Method of Standard Addition • Observational Research • Pilot Testing • Placebos in Research • Preparing Anhydrous Reagents and Equipment • Protein Crystallization • Raman Spectroscopy for Chemical Analysis • Reliability in Psychology Experiments • Sample Preparation for Analytical Preparation • Scanning Electron Microscopy (SEM) • Self-report vs. Behavioral Measures of Recycling • The Factorial Experiment • The Multi-group Experiment • The Simple Experiment: Two-group Design • Two-Dimensional Gel Electrophoresis • Within-subjects Repeated-measures Design • X-ray Fluorescence (XRF)
INDICATORS OF PROGRESS	9.1.1.2.4.	Use primary sources or scientific writings to identify and explain how different types of questions and their associated methodologies are used by scientists for

		<p>investigations in different disciplines.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to Behavioral Neuroscience • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Cognition • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Endocytosis and Exocytosis • 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 Stem Cell Biology • An Overview of Epigenetics • An Overview of Genetic Analysis • An Overview of Genetic Engineering • An Overview of Genetics and Disease • Anterograde Amnesia • Anxiety Testing • Color Afterimages • Crowding • Fear Conditioning • Inattentional Blindness • Invasion Assay Using 3D Matrices • Invertebrate Lifespan Quantification • Modeling Social Stress • Motion-induced Blindness • Neuronal Transfection Methods • Object Substitution Masking • Primary Neuronal Cultures • Self-administration Studies • Spatial Cueing • The Attentional Blink • The Rubber Hand Illusion • The Transwell Migration Assay
CONTENT STANDARD / DOMAIN	MN.9.1.	The Nature of Science and Engineering
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.1.2.	The Practice of Engineering

INDICATORS OF PROGRESS / STRAND	9.1.2.1.	The student will understand that engineering is a way of addressing human needs by applying science concepts and mathematical techniques to develop new products, tools, processes and systems.
INDICATORS OF PROGRESS	9.1.2.1.1.	<p>Understand that engineering designs and products must be continually checked and critiqued for alternatives, risks, costs and benefits, so that subsequent designs are refined and improved.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Abdominal Exam I: Inspection and Auscultation • 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 Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Cognition • An Introduction to Developmental Neurobiology • An Introduction to Drosophila melanogaster • An Introduction to Endocytosis and Exocytosis • An Introduction to Learning and Memory • 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 Laboratory Mouse: Mus musculus • An Introduction to the Micropipettor • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of Epigenetics • An Overview of Genetic Analysis • An Overview of Genetic Engineering • An Overview of Genetics and Disease • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Anesthesia Induction and Maintenance • Annexin V and Propidium Iodide Labeling • Arterial Line Placement • Assembly of a Reflux System for Heated Chemical Reactions • Auscultation

- **Bacterial Growth Curve Analysis and its Environmental Applications**
- **Bacterial Transformation: Electroporation**
- **Bacterial Transformation: The Heat Shock Method**
- **Basic Life Support: Cardiopulmonary Resuscitation and Defibrillation**
- **Biofuels: Producing Ethanol from Cellulosic Material**
- **Blood Pressure Measurement**
- **Blood Withdrawal I**
- **Blood Withdrawal II**
- **Calcium Imaging in Neurons**
- **Calibration Curves**
- **Capillary Electrophoresis (CE)**
- **Carbon and Nitrogen Analysis of Environmental Samples**
- **Cardiac Exam II: Auscultation**
- **Cardiac Exam III: Abnormal Heart Sounds**
- **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**
- **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**
- **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**
- **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**
- **Detection of Bacteriophages in Environmental Samples**
- **Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy**
- **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**
- **Diagnostic Necropsy and Tissue Harvest**
- **Dialysis: Diffusion Based Separation**
- **Dissolved Oxygen in Surface Water**
- **Ear Exam**
- **Electro-encephalography (EEG)**
- **Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat**
- **Electrophoretic Mobility Shift Assay (EMSA)**
- **Embryonic Stem Cell Culture and Differentiation**
- **Emergency Tube Thoracostomy (Chest Tube Placement)**
- **Emergent Lateral Canthotomy and Inferior Catholysis**
- **Enzyme Assays and Kinetics**
- **Event-related Potentials and the Oddball Task**
- **Explant Culture of Neural Tissue**
- **Expression Profiling with Microarrays**
- **Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction**
- **Eye Exam**
- **Eye Tracking in Cognitive Experiments**
- **FM Dyes in Vesicle Recycling**
- **Fate Mapping**
- **Fear Conditioning**
- **Finding Your Blind Spot and Perceptual Filling-in**
- **Fractional Distillation**
- **Freezing-Point Depression to Determine an Unknown Compound**
- **Förster Resonance Energy Transfer (FRET)**
- **Gas Chromatography (GC) with Flame-Ionization Detection**
- **Gel Purification**
- **General Approach to the Physical Exam**
- **Genetic Crosses**
- **Genetic Engineering of Model Organisms**
- **Genetic Screens**

- Genome Editing
- Gram Staining of Bacteria from Environmental Sources
- Growing Crystals for X-ray Diffraction Analysis
- High-Performance Liquid Chromatography (HPLC)
- Histological Sample Preparation for Light Microscopy
- Histological Staining of Neural Tissue
- Ideal Gas Law
- Induced Pluripotency
- Internal Standards
- Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation
- Intraosseous Needle Placement
- Introduction to Catalysis
- Introduction to Fluorescence Microscopy
- Introduction to Light Microscopy
- Introduction to Mass Spectrometry
- Introduction to Serological Pipettes and Pipettors
- Introduction to Titration
- Introduction to the Spectrophotometer
- Invasion Assay Using 3D Matrices
- Ion-Exchange Chromatography
- Isolation of Fecal Bacteria from Water Samples by Filtration
- 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
- Live Cell Imaging of Mitosis
- MALDI-TOF Mass Spectrometry
- Making Solutions in the Laboratory
- Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain
- Measuring Mass in the Laboratory
- Measuring Tropospheric Ozone
- Measuring Vital Signs
- Metabolic Labeling
- Method of Standard Addition
- Molecular Cloning
- Motion-induced Blindness
- Motor Exam II
- Motor Maps
- Murine In Utero Electroporation
- Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment
- Nose, Sinuses, Oral Cavity and Pharynx Exam
- Nuclear Magnetic Resonance (NMR) Spectroscopy
- Nutrients in Aquatic Ecosystems
- Object Substitution Masking
- Ophthalmoscopic Examination
- PCR: The Polymerase Chain Reaction
- Passaging Cells

- Patch Clamp Electrophysiology
- 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
- Photometric Protein Determination
- Physical Properties Of Minerals I: Crystals and Cleavage
- Physical Properties Of Minerals II: Polymineralic Analysis
- Physiological Correlates of Emotion Recognition
- Plasmid Purification
- Positive Reinforcement Studies
- Preparing Anhydrous Reagents and Equipment
- 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-Seq
- Raman Spectroscopy for Chemical Analysis
- Recombineering and Gene Targeting
- Reconstitution of Membrane Proteins
- Regulating Temperature in the Lab: Applying Heat
- Regulating Temperature in the Lab: Preserving Samples Using Cold
- Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry
- Respiratory Exam II: Percussion and Auscultation
- Restriction Enzyme Digests
- 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
- Separating Protein with SDS-PAGE
- 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

		<ul style="list-style-type: none"> • Soxhlet Extraction of Lipid Biomarkers from Sediment • Spatial Cueing • Spectrophotometric Determination of an Equilibrium Constant • Sterile Tissue Harvest • Surface Plasmon Resonance (SPR) • Surgical Cricothyrotomy • Tandem Mass Spectrometry • Testing For Genetically Modified Foods • The ATP Bioluminescence Assay • The Attentional Blink • The ELISA Method • The Ideal Gas Law • The Rubber Hand Illusion • The TUNEL Assay • The Transwell Migration Assay • The Western Blot • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies • 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 a pH Meter • Visual Attention: fMRI Investigation of Object-based Attentional Control • X-ray Fluorescence (XRF) • Yeast Transformation and Cloning • fMRI: Functional Magnetic Resonance Imaging
<p>INDICATORS OF PROGRESS</p>	<p>9.1.2.1.2.</p>	<p>Recognize that risk analysis is used to determine the potential positive and negative consequences of using a new technology or design, including the evaluation of causes and effects of failures.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Abdominal Exam I: Inspection and Auscultation • 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 Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism

- An Introduction to Cell Motility and Migration
- An Introduction to Cognition
- An Introduction to Developmental Neurobiology
- An Introduction to Drosophila melanogaster
- An Introduction to Endocytosis and Exocytosis
- An Introduction to Learning and Memory
- 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 Laboratory Mouse: Mus musculus
- An Introduction to the Micropipettor
- An Overview of Alkenone Biomarker Analysis for Paleothermometry
- An Overview of Epigenetics
- An Overview of Genetic Analysis
- An Overview of Genetic Engineering
- An Overview of Genetics and Disease
- An Overview of bGDGT Biomarker Analysis for Paleoclimatology
- Anesthesia Induction and Maintenance
- Annexin V and Propidium Iodide Labeling
- Arterial Line Placement
- Assembly of a Reflux System for Heated Chemical Reactions
- Auscultation
- Bacterial Growth Curve Analysis and its Environmental Applications
- Bacterial Transformation: Electroporation
- Bacterial Transformation: The Heat Shock Method
- Basic Life Support: Cardiopulmonary Resuscitation and Defibrillation
- Biofuels: Producing Ethanol from Cellulosic Material
- Blood Pressure Measurement
- Blood Withdrawal I
- Blood Withdrawal II
- Calcium Imaging in Neurons
- Calibration Curves
- Capillary Electrophoresis (CE)
- Carbon and Nitrogen Analysis of Environmental Samples
- Cardiac Exam II: Auscultation
- Cardiac Exam III: Abnormal Heart Sounds
- 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**
- **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**
- **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**
- **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**
- **Detection of Bacteriophages in Environmental Samples**
- **Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy**
- **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**
- **Diagnostic Necropsy and Tissue Harvest**

- **Dialysis: Diffusion Based Separation**
- **Dissolved Oxygen in Surface Water**
- **Ear Exam**
- **Electro-encephalography (EEG)**
- **Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat**
- **Electrophoretic Mobility Shift Assay (EMSA)**
- **Embryonic Stem Cell Culture and Differentiation**
- **Emergency Tube Thoracostomy (Chest Tube Placement)**
- **Emergent Lateral Canthotomy and Inferior Catholysis**
- **Enzyme Assays and Kinetics**
- **Event-related Potentials and the Oddball Task**
- **Explant Culture of Neural Tissue**
- **Expression Profiling with Microarrays**
- **Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction**
- **Eye Exam**
- **Eye Tracking in Cognitive Experiments**
- **FM Dyes in Vesicle Recycling**
- **Fate Mapping**
- **Fear Conditioning**
- **Finding Your Blind Spot and Perceptual Filling-in**
- **Fractional Distillation**
- **Freezing-Point Depression to Determine an Unknown Compound**
- **Förster Resonance Energy Transfer (FRET)**
- **Gas Chromatography (GC) with Flame-Ionization Detection**
- **Gel Purification**
- **General Approach to the Physical Exam**
- **Genetic Crosses**
- **Genetic Engineering of Model Organisms**
- **Genetic Screens**
- **Genome Editing**
- **Gram Staining of Bacteria from Environmental Sources**
- **Growing Crystals for X-ray Diffraction Analysis**
- **High-Performance Liquid Chromatography (HPLC)**
- **Histological Sample Preparation for Light Microscopy**
- **Histological Staining of Neural Tissue**
- **Ideal Gas Law**
- **Induced Pluripotency**
- **Internal Standards**
- **Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation**
- **Intraosseous Needle Placement**
- **Introduction to Catalysis**
- **Introduction to Fluorescence Microscopy**
- **Introduction to Light Microscopy**
- **Introduction to Mass Spectrometry**
- **Introduction to Serological Pipettes and Pipettors**

- Introduction to Titration
- Introduction to the Spectrophotometer
- Invasion Assay Using 3D Matrices
- Ion-Exchange Chromatography
- Isolation of Fecal Bacteria from Water Samples by Filtration
- 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
- Live Cell Imaging of Mitosis
- MALDI-TOF Mass Spectrometry
- Making Solutions in the Laboratory
- Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain
- Measuring Mass in the Laboratory
- Measuring Tropospheric Ozone
- Measuring Vital Signs
- Metabolic Labeling
- Method of Standard Addition
- Molecular Cloning
- Motion-induced Blindness
- Motor Exam II
- Motor Maps
- Murine In Utero Electroporation
- Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment
- Nose, Sinuses, Oral Cavity and Pharynx Exam
- Nuclear Magnetic Resonance (NMR) Spectroscopy
- Nutrients in Aquatic Ecosystems
- Object Substitution Masking
- Ophthalmoscopic Examination
- PCR: The Polymerase Chain Reaction
- Passaging Cells
- Patch Clamp Electrophysiology
- 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
- Photometric Protein Determination
- Physical Properties Of Minerals I: Crystals and Cleavage
- Physical Properties Of Minerals II: Polymineralic Analysis
- Physiological Correlates of Emotion Recognition

- Plasmid Purification
- Positive Reinforcement Studies
- Preparing Anhydrous Reagents and Equipment
- 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-Seq
- Raman Spectroscopy for Chemical Analysis
- Recombineering and Gene Targeting
- Reconstitution of Membrane Proteins
- Regulating Temperature in the Lab: Applying Heat
- Regulating Temperature in the Lab: Preserving Samples Using Cold
- Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry
- Respiratory Exam II: Percussion and Auscultation
- Restriction Enzyme Digests
- 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
- Separating Protein with SDS-PAGE
- 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
- Spatial Cueing
- Spectrophotometric Determination of an Equilibrium Constant
- Sterile Tissue Harvest
- Surface Plasmon Resonance (SPR)
- Surgical Cricothyrotomy
- Tandem Mass Spectrometry
- Testing For Genetically Modified Foods
- The ATP Bioluminescence Assay
- The Attentional Blink
- The ELISA Method
- The Ideal Gas Law
- The Rubber Hand Illusion
- The TUNEL Assay

		<ul style="list-style-type: none"> • The Transwell Migration Assay • The Western Blot • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies • 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 a pH Meter • Visual Attention: fMRI Investigation of Object-based Attentional Control • X-ray Fluorescence (XRF) • Yeast Transformation and Cloning • fMRI: Functional Magnetic Resonance Imaging
<p>INDICATORS OF PROGRESS</p>	<p>9.1.2.1.3.</p>	<p>Explain and give examples of how, in the design of a device or process, engineers consider how it is to be manufactured, operated, maintained, replaced and disposed of.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Abdominal Exam I: Inspection and Auscultation • 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 Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Cognition • An Introduction to Developmental Neurobiology • An Introduction to Drosophila melanogaster • An Introduction to Endocytosis and Exocytosis • An Introduction to Learning and Memory • 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 Laboratory Mouse: Mus musculus**
- **An Introduction to the Micropipettor**
- **An Overview of Alkenone Biomarker Analysis for Paleothermometry**
- **An Overview of Epigenetics**
- **An Overview of Genetic Analysis**
- **An Overview of Genetic Engineering**
- **An Overview of Genetics and Disease**
- **An Overview of bGDGT Biomarker Analysis for Paleoclimatology**
- **Anesthesia Induction and Maintenance**
- **Annexin V and Propidium Iodide Labeling**
- **Arterial Line Placement**
- **Assembly of a Reflux System for Heated Chemical Reactions**
- **Auscultation**
- **Bacterial Growth Curve Analysis and its Environmental Applications**
- **Bacterial Transformation: Electroporation**
- **Bacterial Transformation: The Heat Shock Method**
- **Basic Life Support: Cardiopulmonary Resuscitation and Defibrillation**
- **Biofuels: Producing Ethanol from Cellulosic Material**
- **Blood Pressure Measurement**
- **Blood Withdrawal I**
- **Blood Withdrawal II**
- **Calcium Imaging in Neurons**
- **Calibration Curves**
- **Capillary Electrophoresis (CE)**
- **Carbon and Nitrogen Analysis of Environmental Samples**
- **Cardiac Exam II: Auscultation**
- **Cardiac Exam III: Abnormal Heart Sounds**
- **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**
- **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
- 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
- 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
- Detection of Bacteriophages in Environmental Samples
- Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy
- 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
- Diagnostic Necropsy and Tissue Harvest
- Dialysis: Diffusion Based Separation
- Dissolved Oxygen in Surface Water
- Ear Exam
- Electro-encephalography (EEG)
- Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat
- Electrophoretic Mobility Shift Assay (EMSA)
- Embryonic Stem Cell Culture and Differentiation
- Emergency Tube Thoracostomy (Chest Tube Placement)
- Emergent Lateral Canthotomy and Inferior Catholysis
- Enzyme Assays and Kinetics
- Event-related Potentials and the Oddball Task
- Explant Culture of Neural Tissue
- Expression Profiling with Microarrays

- **Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction**
- **Eye Exam**
- **Eye Tracking in Cognitive Experiments**
- **FM Dyes in Vesicle Recycling**
- **Fate Mapping**
- **Fear Conditioning**
- **Finding Your Blind Spot and Perceptual Filling-in**
- **Fractional Distillation**
- **Freezing-Point Depression to Determine an Unknown Compound**
- **Förster Resonance Energy Transfer (FRET)**
- **Gas Chromatography (GC) with Flame-Ionization Detection**
- **Gel Purification**
- **General Approach to the Physical Exam**
- **Genetic Crosses**
- **Genetic Engineering of Model Organisms**
- **Genetic Screens**
- **Genome Editing**
- **Gram Staining of Bacteria from Environmental Sources**
- **Growing Crystals for X-ray Diffraction Analysis**
- **High-Performance Liquid Chromatography (HPLC)**
- **Histological Sample Preparation for Light Microscopy**
- **Histological Staining of Neural Tissue**
- **Ideal Gas Law**
- **Induced Pluripotency**
- **Internal Standards**
- **Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation**
- **Intraosseous Needle Placement**
- **Introduction to Catalysis**
- **Introduction to Fluorescence Microscopy**
- **Introduction to Light Microscopy**
- **Introduction to Mass Spectrometry**
- **Introduction to Serological Pipettes and Pipettors**
- **Introduction to Titration**
- **Introduction to the Spectrophotometer**
- **Invasion Assay Using 3D Matrices**
- **Ion-Exchange Chromatography**
- **Isolation of Fecal Bacteria from Water Samples by Filtration**
- **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**
- **Live Cell Imaging of Mitosis**
- **MALDI-TOF Mass Spectrometry**
- **Making Solutions in the Laboratory**
- **Measuring Grey Matter Differences with Voxel-based**

Morphometry: The Musical Brain

- Measuring Mass in the Laboratory
- Measuring Tropospheric Ozone
- Measuring Vital Signs
- Metabolic Labeling
- Method of Standard Addition
- Molecular Cloning
- Motion-induced Blindness
- Motor Exam II
- Motor Maps
- Murine In Utero Electroporation
- Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment
- Nose, Sinuses, Oral Cavity and Pharynx Exam
- Nuclear Magnetic Resonance (NMR) Spectroscopy
- Nutrients in Aquatic Ecosystems
- Object Substitution Masking
- Ophthalmoscopic Examination
- PCR: The Polymerase Chain Reaction
- Passaging Cells
- Patch Clamp Electrophysiology
- 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
- Photometric Protein Determination
- Physical Properties Of Minerals I: Crystals and Cleavage
- Physical Properties Of Minerals II: Polymineralic Analysis
- Physiological Correlates of Emotion Recognition
- Plasmid Purification
- Positive Reinforcement Studies
- Preparing Anhydrous Reagents and Equipment
- 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-Seq
- Raman Spectroscopy for Chemical Analysis
- Recombineering and Gene Targeting
- Reconstitution of Membrane Proteins
- Regulating Temperature in the Lab: Applying Heat

- **Regulating Temperature in the Lab: Preserving Samples Using Cold**
- **Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry**
- **Respiratory Exam II: Percussion and Auscultation**
- **Restriction Enzyme Digests**
- **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**
- **Separating Protein with SDS-PAGE**
- **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**
- **Spatial Cueing**
- **Spectrophotometric Determination of an Equilibrium Constant**
- **Sterile Tissue Harvest**
- **Surface Plasmon Resonance (SPR)**
- **Surgical Cricothyrotomy**
- **Tandem Mass Spectrometry**
- **Testing For Genetically Modified Foods**
- **The ATP Bioluminescence Assay**
- **The Attentional Blink**
- **The ELISA Method**
- **The Ideal Gas Law**
- **The Rubber Hand Illusion**
- **The TUNEL Assay**
- **The Transwell Migration Assay**
- **The Western Blot**
- **Tissue Regeneration with Somatic Stem Cells**
- **Transplantation Studies**
- **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**

		<ul style="list-style-type: none"> • Using a pH Meter • Visual Attention: fMRI Investigation of Object-based Attentional Control • X-ray Fluorescence (XRF) • Yeast Transformation and Cloning • fMRI: Functional Magnetic Resonance Imaging
CONTENT STANDARD / DOMAIN	MN.9.1.	The Nature of Science and Engineering
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.1.3.	Interactions Among Science, Technology, Engineering, Mathematics, and Society
INDICATORS OF PROGRESS / STRAND	9.1.3.1.	The student will understand that natural and designed systems are made up of components that act within a system and interact with other systems.
INDICATORS OF PROGRESS	9.1.3.1.1.	<p>Describe a system, including specifications of boundaries and subsystems, relationships to other systems, and identification of inputs and expected outputs.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Neurophysiology • Cyclic Voltammetry (CV)
INDICATORS OF PROGRESS	9.1.3.1.2.	<p>Identify properties of a system that are different from those of its parts but appear because of the interaction of those parts.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Neurophysiology • Cyclic Voltammetry (CV)
INDICATORS OF PROGRESS	9.1.3.1.3.	<p>Describe how positive and/or negative feedback occur in systems.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Behavioral Neuroscience • An Introduction to Caenorhabditis elegans • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Cognition • An Introduction to Developmental Neurobiology • An Introduction to Endocytosis and Exocytosis • 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 Reward and Addiction

- **An Introduction to Stem Cell Biology**
- **Anesthesia Induction and Maintenance**
- **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**
- **Basic Care Procedures**
- **Basic Chick Care and Maintenance**
- **Basic Mouse Care and Maintenance**
- **C. elegans Chemotaxis Assay**
- **C. elegans Development and Reproduction**
- **C. elegans Maintenance**
- **Calcium Imaging in Neurons**
- **Cell-surface Biotinylation Assay**
- **Chick ex ovo Culture**
- **Color Afterimages**
- **Considerations for Rodent Surgery**
- **Crowding**
- **Cyclic Voltammetry (CV)**
- **Decision-making and the Iowa Gambling Task**
- **Decoding Auditory Imagery with Multivoxel Pattern Analysis**
- **Detecting Reactive Oxygen Species**
- **Development and Reproduction of the Laboratory Mouse**
- **Development of the Chick**
- **Diagnostic Necropsy and Tissue Harvest**
- **Drosophila Development and Reproduction**
- **Drosophila Larval IHC**
- **Drosophila Maintenance**
- **Drosophila melanogaster Embryo and Larva Harvesting and Preparation**
- **Electro-encephalography (EEG)**
- **Embryonic Stem Cell Culture and Differentiation**
- **Event-related Potentials and the Oddball Task**
- **Executive Function and the Dimensional Change Card Sort Task**
- **Executive Function in Autism Spectrum Disorder**
- **Explant Culture of Neural Tissue**
- **Eye Tracking in Cognitive Experiments**
- **FM Dyes in Vesicle Recycling**
- **Fear Conditioning**
- **Finding Your Blind Spot and Perceptual Filling-in**
- **Fundamentals of Breeding and Weaning**
- **Habituation: Studying Infants Before They Can Talk**
- **Histological Staining of Neural Tissue**
- **How Children Solve Problems Using Causal Reasoning**
- **In ovo Electroporation of Chicken Embryos**
- **Inattentive Blindness**

- Incidental Encoding
- Induced Pluripotency
- Invasion Assay Using 3D Matrices
- Invertebrate Lifespan Quantification
- Isolating Nucleic Acids from Yeast
- Just-noticeable Differences
- Language: The N400 in Semantic Incongruity
- Learning and Memory: The Remember-Know Task
- Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain
- Measuring Reaction Time and Donders' Method of Subtraction
- Measuring Verbal Working Memory Span
- Mental Rotation
- Modeling Social Stress
- Motion-induced Blindness
- Motor Learning in Mirror Drawing
- Multiple Object Tracking
- Murine In Utero Electroporation
- Neuronal Transfection Methods
- Object Substitution Masking
- Patch Clamp Electrophysiology
- Physiological Correlates of Emotion Recognition
- Pilot Testing
- Positive Reinforcement Studies
- Primary Neuronal Cultures
- Prospect Theory
- RNAi in *C. elegans*
- Reconstitution of Membrane Proteins
- Rodent Handling and Restraint Techniques
- Rodent Stereotaxic Surgery
- Self-administration Studies
- Spatial Cueing
- Spatial Memory Testing Using Mazes
- Sterile Tissue Harvest
- The ATP Bioluminescence Assay
- The Ames Room
- The Attentional Blink
- The Inverted-face Effect
- The McGurk Effect
- The Morris Water Maze
- The Multi-group Experiment
- The Precision of Visual Working Memory with Delayed Estimation
- The Rubber Hand Illusion
- The Simple Experiment: Two-group Design
- The Staircase Procedure for Finding a Perceptual Threshold
- The TUNEL Assay
- The Transwell Migration Assay
- Tissue Regeneration with Somatic Stem Cells

		<ul style="list-style-type: none"> • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Using TMS to Measure Motor Excitability During Action Observation • Using Your Head: Measuring Infants' Rational Imitation of Actions • Verbal Priming • Visual Attention: fMRI Investigation of Object-based Attentional Control • Visual Search for Features and Conjunctions • Visual Statistical Learning • Within-subjects Repeated-measures Design • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Reproduction and Development • fMRI: Functional Magnetic Resonance Imaging
CONTENT STANDARD / DOMAIN	MN.9.1.	The Nature of Science and Engineering
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.1.3.	Interactions Among Science, Technology, Engineering, Mathematics, and Society
INDICATORS OF PROGRESS / STRAND	9.1.3.4.	The student will understand that science, technology, engineering and mathematics rely on each other to enhance knowledge and understanding.
INDICATORS OF PROGRESS	9.1.3.4.1.	<p>Describe how technological problems and advances often create a demand for new scientific knowledge, improved mathematics and new technologies.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Abdominal Exam I: Inspection and Auscultation • 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 Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Cognition • An Introduction to Developmental Neurobiology • An Introduction to Drosophila melanogaster • An Introduction to Endocytosis and Exocytosis • An Introduction to Learning and Memory • 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 Laboratory Mouse: Mus musculus
- An Introduction to the Micropipettor
- An Overview of Alkenone Biomarker Analysis for Paleothermometry
- An Overview of Epigenetics
- An Overview of Genetic Analysis
- An Overview of Genetic Engineering
- An Overview of Genetics and Disease
- An Overview of bGDGT Biomarker Analysis for Paleoclimatology
- Anesthesia Induction and Maintenance
- Annexin V and Propidium Iodide Labeling
- Arterial Line Placement
- Assembly of a Reflux System for Heated Chemical Reactions
- Auscultation
- Bacterial Growth Curve Analysis and its Environmental Applications
- Bacterial Transformation: Electroporation
- Bacterial Transformation: The Heat Shock Method
- Basic Life Support: Cardiopulmonary Resuscitation and Defibrillation
- Biofuels: Producing Ethanol from Cellulosic Material
- Blood Pressure Measurement
- Blood Withdrawal I
- Blood Withdrawal II
- Calcium Imaging in Neurons
- Calibration Curves
- Capillary Electrophoresis (CE)
- Carbon and Nitrogen Analysis of Environmental Samples
- Cardiac Exam II: Auscultation
- Cardiac Exam III: Abnormal Heart Sounds
- 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
- 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
- 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
- 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
- Detection of Bacteriophages in Environmental Samples
- Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy
- 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
- Diagnostic Necropsy and Tissue Harvest
- Dialysis: Diffusion Based Separation
- Dissolved Oxygen in Surface Water
- Ear Exam
- Electro-encephalography (EEG)
- Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat
- Electrophoretic Mobility Shift Assay (EMSA)
- Embryonic Stem Cell Culture and Differentiation
- Emergency Tube Thoracostomy (Chest Tube Placement)
- Emergent Lateral Canthotomy and Inferior Catholysis

- Enzyme Assays and Kinetics
- Event-related Potentials and the Oddball Task
- Explant Culture of Neural Tissue
- Expression Profiling with Microarrays
- Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction
- Eye Exam
- Eye Tracking in Cognitive Experiments
- FM Dyes in Vesicle Recycling
- Fate Mapping
- Fear Conditioning
- Finding Your Blind Spot and Perceptual Filling-in
- Fractional Distillation
- Freezing-Point Depression to Determine an Unknown Compound
- Förster Resonance Energy Transfer (FRET)
- Gas Chromatography (GC) with Flame-Ionization Detection
- Gel Purification
- General Approach to the Physical Exam
- Genetic Crosses
- Genetic Engineering of Model Organisms
- Genetic Screens
- Genome Editing
- Gram Staining of Bacteria from Environmental Sources
- Growing Crystals for X-ray Diffraction Analysis
- High-Performance Liquid Chromatography (HPLC)
- Histological Sample Preparation for Light Microscopy
- Histological Staining of Neural Tissue
- Ideal Gas Law
- Induced Pluripotency
- Internal Standards
- Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation
- Intraosseous Needle Placement
- Introduction to Catalysis
- Introduction to Fluorescence Microscopy
- Introduction to Light Microscopy
- Introduction to Mass Spectrometry
- Introduction to Serological Pipettes and Pipettors
- Introduction to Titration
- Introduction to the Spectrophotometer
- Invasion Assay Using 3D Matrices
- Ion-Exchange Chromatography
- Isolation of Fecal Bacteria from Water Samples by Filtration
- 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
- Live Cell Imaging of Mitosis

- MALDI-TOF Mass Spectrometry
- Making Solutions in the Laboratory
- Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain
- Measuring Mass in the Laboratory
- Measuring Tropospheric Ozone
- Measuring Vital Signs
- Metabolic Labeling
- Method of Standard Addition
- Molecular Cloning
- Motion-induced Blindness
- Motor Exam II
- Motor Maps
- Murine In Utero Electroporation
- Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment
- Nose, Sinuses, Oral Cavity and Pharynx Exam
- Nuclear Magnetic Resonance (NMR) Spectroscopy
- Nutrients in Aquatic Ecosystems
- Object Substitution Masking
- Ophthalmoscopic Examination
- PCR: The Polymerase Chain Reaction
- Passaging Cells
- Patch Clamp Electrophysiology
- 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
- Photometric Protein Determination
- Physical Properties Of Minerals I: Crystals and Cleavage
- Physical Properties Of Minerals II: Polymineralic Analysis
- Physiological Correlates of Emotion Recognition
- Plasmid Purification
- Positive Reinforcement Studies
- Preparing Anhydrous Reagents and Equipment
- 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-Seq
- Raman Spectroscopy for Chemical Analysis
- Recombineering and Gene Targeting

- Reconstitution of Membrane Proteins
- Regulating Temperature in the Lab: Applying Heat
- Regulating Temperature in the Lab: Preserving Samples Using Cold
- Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry
- Respiratory Exam II: Percussion and Auscultation
- Restriction Enzyme Digests
- 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
- Separating Protein with SDS-PAGE
- 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
- Spatial Cueing
- Spectrophotometric Determination of an Equilibrium Constant
- Sterile Tissue Harvest
- Surface Plasmon Resonance (SPR)
- Surgical Cricothyrotomy
- Tandem Mass Spectrometry
- Testing For Genetically Modified Foods
- The ATP Bioluminescence Assay
- The Attentional Blink
- The ELISA Method
- The Ideal Gas Law
- The Rubber Hand Illusion
- The TUNEL Assay
- The Transwell Migration Assay
- The Western Blot
- Tissue Regeneration with Somatic Stem Cells
- Transplantation Studies
- 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

		<p>Observation</p> <ul style="list-style-type: none"> • Using a pH Meter • Visual Attention: fMRI Investigation of Object-based Attentional Control • X-ray Fluorescence (XRF) • Yeast Transformation and Cloning • fMRI: Functional Magnetic Resonance Imaging
<p>INDICATORS OF PROGRESS</p>	<p>9.1.3.4.2.</p>	<p>Determine and use appropriate safety procedures, tools, computers and measurement instruments in science and engineering contexts.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Working in the Hood • An Introduction to the Centrifuge • An Introduction to the Micropipettor • Aseptic Technique in Environmental Science • Common Lab Glassware and Uses • Conducting Reactions Below Room Temperature • Histological Sample Preparation for Light Microscopy • Introducing Experimental Agents into the Mouse • Introduction to Fluorescence Microscopy • Introduction to Light Microscopy • Introduction to Serological Pipettes and Pipettors • Introduction to the Bunsen Burner • Introduction to the Microplate Reader • Introduction to the Spectrophotometer • Making Solutions in the Laboratory • Measuring Mass in the Laboratory • Regulating Temperature in the Lab: Applying Heat • Regulating Temperature in the Lab: Preserving Samples Using Cold • Understanding Concentration and Measuring Volumes
<p>INDICATORS OF PROGRESS</p>	<p>9.1.3.4.3.</p>	<p>Select and use appropriate numeric, symbolic, pictorial, or graphical representation to communicate scientific ideas, procedures and experimental results.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Behavioral Neuroscience • An Introduction to Caenorhabditis elegans • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cognition • An Introduction to Developmental Neurobiology • An Introduction to Drosophila melanogaster • An Introduction to Endocytosis and Exocytosis • An Introduction to Learning and Memory • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to Motor Control • An Introduction to Neurophysiology • An Introduction to Reward and Addiction

- An Overview of Alkenone Biomarker Analysis for Paleothermometry
- An Overview of Genetic Analysis
- An Overview of Genetics and Disease
- An Overview of bGDGT Biomarker Analysis for 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
- 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
- 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**
- **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**
- **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**
- **Freezing-Point Depression to Determine an Unknown Compound**
- **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**
- **Making a Geologic Cross Section**
- **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
- The Rouge Test: Searching for a Sense of Self
- The Split Brain
- The Staircase Procedure for Finding a Perceptual Threshold
- The TUNEL Assay
- The Transwell Migration Assay
- The Western Blot
- 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 TMS to Measure Motor Excitability During Action Observation
- Using Topographic Maps to Generate Topographic Profiles
- Using Your Head: Measuring Infants' Rational Imitation of Actions
- Using a pH Meter
- Verbal Priming
- Visual Attention: fMRI Investigation of Object-based Attentional Control

		<ul style="list-style-type: none"> • 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 • Yeast Maintenance • fMRI: Functional Magnetic Resonance Imaging
<p>INDICATORS OF PROGRESS</p>	<p>9.1.3.4.4.</p>	<p>Relate the reliability of data to consistency of results, identify sources of error, and suggest ways to improve data collection and analysis.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Aseptic Technique in Environmental Science • Calibration Curves • Capillary Electrophoresis (CE) • Chromatography-Based Biomolecule Purification Methods • Cyclic Voltammetry (CV) • Density Gradient Ultracentrifugation • Determining Spatial Orientation of Rock Layers with the Brunton Compass • Dialysis: Diffusion Based Separation • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Ethics in Psychology Research • Experimentation using a Confederate • From Theory to Design: The Role of Creativity in Designing Experiments • Gas Chromatography (GC) with Flame-Ionization Detection • High-Performance Liquid Chromatography (HPLC) • Internal Standards • Introduction to Mass Spectrometry • Ion-Exchange Chromatography • Manipulating an Independent Variable through Embodiment • Method of Standard Addition • Observational Research • Pilot Testing • Placebos in Research • Preparing Anhydrous Reagents and Equipment • Protein Crystallization • Raman Spectroscopy for Chemical Analysis • Realism in Experimentation • Reliability in Psychology Experiments • Sample Preparation for Analytical Preparation • Scanning Electron Microscopy (SEM) • Self-report vs. Behavioral Measures of Recycling • The Factorial Experiment • The Multi-group Experiment • The Simple Experiment: Two-group Design

		<ul style="list-style-type: none"> • Two-Dimensional Gel Electrophoresis • Within-subjects Repeated-measures Design • X-ray Fluorescence (XRF)
INDICATORS OF PROGRESS	9.1.3.4.5.	<p>Demonstrate how unit consistency and dimensional analysis can guide the calculation of quantitative solutions and verification of results.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining Rate Laws and the Order of Reaction • Determining the Density of a Solid and Liquid • Determining the Empirical Formula • Determining the Mass Percent Composition in an Aqueous Solution • Freezing-Point Depression to Determine an Unknown Compound • Ideal Gas Law • Introduction to Titration • Solutions and Concentrations • Spectrophotometric Determination of an Equilibrium Constant • The Ideal Gas Law • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy • Using a pH Meter
INDICATORS OF PROGRESS	9.1.3.4.6.	<p>Analyze the strengths and limitations of physical, conceptual, mathematical and computer models used by scientists and engineers.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining Spatial Orientation of Rock Layers with the Brunton Compass • Igneous Intrusive Rock • Igneous Volcanic Rock • Making a Geologic Cross Section • Using Topographic Maps to Generate Topographic Profiles
CONTENT STANDARD / DOMAIN	MN.9.2.	Physical Science
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.2.1.	Matter
INDICATORS OF PROGRESS / STRAND	9.2.1.1.	The student will understand that the structure of the atom determines chemical properties of elements.
INDICATORS OF PROGRESS	9.2.1.1.1.	<p>Describe the relative charges, masses, and locations of the protons, neutrons, and electrons in an atom of an element.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Coordination Chemistry Complexes • Nuclear Magnetic Resonance (NMR) Spectroscopy

		<ul style="list-style-type: none"> • Raman Spectroscopy for Chemical Analysis • Scanning Electron Microscopy (SEM) • X-ray Fluorescence (XRF)
INDICATORS OF PROGRESS	9.2.1.1.3.	<p>Explain the arrangement of the elements on the Periodic Table, including the relationships among elements in a given column or row.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Coordination Chemistry Complexes
INDICATORS OF PROGRESS	9.2.1.1.4.	<p>Explain that isotopes of an element have different numbers of neutrons and that some are unstable and emit particles and/or radiation.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Column Chromatography • Determining Rate Laws and the Order of Reaction • Metabolic Labeling
CONTENT STANDARD / DOMAIN	MN.9.2.	Physical Science
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.2.1.	Matter
INDICATORS OF PROGRESS / STRAND	9.2.1.2.	The student will understand that chemical reactions involve the rearrangement of atoms as chemical bonds are broken and formed through transferring or sharing of electrons and the absorption or release of energy.
INDICATORS OF PROGRESS	9.2.1.2.1.	<p>Describe the role of valence electrons in the formation of chemical bonds.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry • Coordination Chemistry Complexes • Determining the Solubility Rules of Ionic Compounds • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction • Purification of a Total Lipid Extract with Column Chromatography • Raman Spectroscopy for Chemical Analysis • Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment

		<ul style="list-style-type: none"> • Ultraviolet-Visible (UV-Vis) Spectroscopy • X-ray Fluorescence (XRF)
INDICATORS OF PROGRESS	9.2.1.2.3.	<p>Describe a chemical reaction using words and symbolic equations.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Assembly of a Reflux System for Heated Chemical Reactions • Conducting Reactions Below Room Temperature • Coordination Chemistry Complexes • Determining Rate Laws and the Order of Reaction • Determining the Empirical Formula • Determining the Solubility Rules of Ionic Compounds • Introduction to Catalysis • Introduction to Titration • Le Châtelier's Principle • Preparing Anhydrous Reagents and Equipment • Proton Exchange Membrane Fuel Cells • Solutions and Concentrations • Spectrophotometric Determination of an Equilibrium Constant • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
INDICATORS OF PROGRESS	9.2.1.2.4.	<p>Relate exothermic and endothermic chemical reactions to temperature and energy changes.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Conducting Reactions Below Room Temperature • Determining Rate Laws and the Order of Reaction • Le Châtelier's Principle • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
CONTENT STANDARD / DOMAIN	MN.9.2.	Physical Science
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.2.3.	Energy
INDICATORS OF PROGRESS / STRAND	9.2.3.2.	The student will understand that energy can be transformed within a system or transferred to other systems or the environment, but is always conserved.
INDICATORS OF PROGRESS	9.2.3.2.1.	<p>Identify the energy forms and explain the transfers of energy involved in the operation of common devices.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material • Proton Exchange Membrane Fuel Cells
INDICATORS OF PROGRESS	9.2.3.2.3.	Describe how energy is transferred through sound waves and how pitch and loudness are related to wave properties of amplitude and wavelength.

		<p>JoVE</p> <ul style="list-style-type: none"> • Abdominal Exam II: Percussion • Auscultation • Ear Exam • Percussion • The Staircase Procedure for Finding a Perceptual Threshold
INDICATORS OF PROGRESS	9.2.3.2.4.	<p>Explain and calculate current, voltage and resistance, and describe energy transfers in simple electric circuits.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Cyclic Voltammetry (CV) • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat
INDICATORS OF PROGRESS	9.2.3.2.5.	<p>Describe how an electric current produces a magnetic force, and how this interaction is used in motors and electromagnets to produce mechanical energy.</p> <p>JoVE</p> <ul style="list-style-type: none"> • fMRI: Functional Magnetic Resonance Imaging
INDICATORS OF PROGRESS	9.2.3.2.7.	<p>Describe the properties and uses of forms of electromagnetic radiation from radio frequencies through gamma radiation.</p> <p>JoVE</p> <ul style="list-style-type: none"> • An Introduction to Behavioral Neuroscience • An Introduction to Cognition • An Introduction to Learning and Memory • An Introduction to Motor Control • An Introduction to Neuroanatomy • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Auscultation • Central Venous Catheter Insertion: Femoral Vein with Ultrasound Guidance • Central Venous Catheter Insertion: Internal Jugular with Ultrasound Guidance • Color Afterimages • Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry • Decision-making and the Iowa Gambling Task • Decoding Auditory Imagery with Multivoxel Pattern Analysis • Electro-encephalography (EEG) • Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction • Eye Tracking in Cognitive Experiments

		<ul style="list-style-type: none"> • Fear Conditioning • Finding Your Blind Spot and Perceptual Filling-in • Growing Crystals for X-ray Diffraction Analysis • Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation • Introduction to Catalysis • Introduction to Mass Spectrometry • Learning and Memory: The Remember-Know Task • Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain • Metabolic Labeling • Motion-induced Blindness • Motor Maps • Nuclear Magnetic Resonance (NMR) Spectroscopy • Pericardiocentesis • Peripheral Vascular Exam • Peripheral Vascular Exam Using a Continuous Wave Doppler • Physical Properties Of Minerals I: Crystals and Cleavage • Protein Crystallization • Purifying Compounds by Recrystallization • Raman Spectroscopy for Chemical Analysis • Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry • Solid-Liquid Extraction • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment • Spatial Cueing • The Attentional Blink • The Rubber Hand Illusion • Ultraviolet-Visible (UV-Vis) Spectroscopy • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Using TMS to Measure Motor Excitability During Action Observation • Visual Attention: fMRI Investigation of Object-based Attentional Control • X-ray Fluorescence (XRF) • fMRI: Functional Magnetic Resonance Imaging
CONTENT STANDARD / DOMAIN	MN.9.2.	Physical Science
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.2.4.	Human Interaction with Physical Systems
INDICATORS OF PROGRESS / STRAND	9.2.4.1.	The student will understand that there are benefits, costs and risks to different means of generating and using energy.
INDICATORS OF PROGRESS	9.2.4.1.1.	Compare local and global environmental and economic advantages and disadvantages of generating electricity

		<p>using various sources or energy.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material • Proton Exchange Membrane Fuel Cells
INDICATORS OF PROGRESS	9.2.4.1.2.	<p>Describe the trade-offs involved when technological developments impact the way we use energy, natural resources, or synthetic materials.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material • Le Châtelier's Principle • Proton Exchange Membrane Fuel Cells
CONTENT STANDARD / DOMAIN	MN.9.3.	Earth and Space Science
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.3.1.	Earth Structure and Processes
INDICATORS OF PROGRESS / STRAND	9.3.1.1.	The student will understand that the relationships among earthquakes, mountains, volcanoes, fossil deposits, rock layers and ocean features provide evidence for the theory of plate tectonics.
INDICATORS OF PROGRESS	9.3.1.1.1.	<p>Compare and contrast the interaction of tectonic plates at convergent and divergent boundaries.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining Spatial Orientation of Rock Layers with the Brunton Compass • Igneous Intrusive Rock • Igneous Volcanic Rock • Making a Geologic Cross Section • Using Topographic Maps to Generate Topographic Profiles
INDICATORS OF PROGRESS	9.3.1.1.2.	<p>Use modern earthquake data to explain how seismic activity is evidence for the process of subduction.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Igneous Intrusive Rock
INDICATORS OF PROGRESS	9.3.1.1.3.	<p>Describe how the pattern of magnetic reversals and rock ages on both sides of a mid-ocean ridge provides evidence of sea-floor spreading.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining Spatial Orientation of Rock Layers with the Brunton Compass • Igneous Intrusive Rock • Igneous Volcanic Rock
INDICATORS OF PROGRESS	9.3.1.1.4.	Explain how the rock record provides evidence for plate movement.

		<u>JoVE</u> <ul style="list-style-type: none"> • Making a Geologic Cross Section
INDICATORS OF PROGRESS	9.3.1.1.5.	Describe how experimental and observational evidence led to the theory of plate tectonics. <u>JoVE</u> <ul style="list-style-type: none"> • Determining Spatial Orientation of Rock Layers with the Brunton Compass • Igneous Intrusive Rock • Igneous Volcanic Rock • Making a Geologic Cross Section • Using Topographic Maps to Generate Topographic Profiles
CONTENT STANDARD / DOMAIN	MN.9.3.	Earth and Space Science
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.3.1.	Earth Structure and Processes
INDICATORS OF PROGRESS / STRAND	9.3.1.3.	The student will understand that by observing rock sequences and using fossils to correlate the sequences at various locations, geologic events can be inferred and geologic time can be estimated.
INDICATORS OF PROGRESS	9.3.1.3.1.	Use relative dating techniques to explain how the structure of the Earth and life on Earth has changed over short and long periods of time. <u>JoVE</u> <ul style="list-style-type: none"> • Making a Geologic Cross Section
CONTENT STANDARD / DOMAIN	MN.9.3.	Earth and Space Science
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.3.2.	Interdependence Within the Earth System
INDICATORS OF PROGRESS / STRAND	9.3.2.1.	The student will understand that the Earth system has internal and external sources of energy, which produce heat and drive the motion of material in the oceans, atmosphere and solid earth.
INDICATORS OF PROGRESS	9.3.2.1.1.	Compare and contrast the energy sources of the Earth, including the sun, the decay of radioactive isotopes and gravitational energy. <u>JoVE</u> <ul style="list-style-type: none"> • Turbidity and Total Solids in Surface Water
CONTENT STANDARD / DOMAIN	MN.9.3.	Earth and Space Science

PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.3.2.	Interdependence Within the Earth System
INDICATORS OF PROGRESS / STRAND	9.3.2.2.	The student will understand that global climate is determined by distribution of energy from the sun at the Earth's surface.
INDICATORS OF PROGRESS	9.3.2.2.2.	<p>Explain how evidence from the geologic record, including ice core samples, indicates that climate changes have occurred at varying rates over geologic time and continue to occur today.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material
CONTENT STANDARD / DOMAIN	MN.9.3.	Earth and Space Science
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.3.2.	Interdependence Within the Earth System
INDICATORS OF PROGRESS / STRAND	9.3.2.3.	The student will understand that material in the Earth system cycles through different reservoirs, and is powered by the Earth's sources of energy.
INDICATORS OF PROGRESS	9.3.2.3.1.	<p>Trace the cyclical movement of carbon, oxygen and nitrogen through the lithosphere, hydrosphere, atmosphere and biosphere.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Dissolved Oxygen in Surface Water • Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction • Purification of a Total Lipid Extract with Column Chromatography • Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment • Using GIS to Investigate Urban Forestry
CONTENT STANDARD / DOMAIN	MN.9.3.	Earth and Space Science

PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.3.3.	The Universe
INDICATORS OF PROGRESS / STRAND	9.3.3.2.	The student will understand that the solar system, sun, and Earth formed over billions of years.
INDICATORS OF PROGRESS	9.3.3.2.2..	<p>Explain how the Earth evolved into its present habitable form through interactions among the solid earth, the oceans, the atmosphere and organisms.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry • Igneous Intrusive Rock • Igneous Volcanic Rock • Making a Geologic Cross Section • Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry • Using Topographic Maps to Generate Topographic Profiles
INDICATORS OF PROGRESS	9.3.3.2.3.	<p>Compare and contrast the environmental conditions that make life possible on Earth with conditions found on the other planets and moons of our solar system.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry • Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction • Purification of a Total Lipid Extract with Column Chromatography • Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment
CONTENT STANDARD / DOMAIN	MN.9.3.	Earth and Space Science
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.3.4.	Human Interactions with the Earth System

INDICATORS OF PROGRESS / STRAND	9.3.4.1.	The student will understand that people consider potential benefits, costs and risks to make decisions on how they interact with natural systems.
INDICATORS OF PROGRESS	9.3.4.1.1.	Analyze the benefits, costs, risks and tradeoffs associated with natural hazards, including the selection of land use and engineering mitigation. <u>JoVE</u> • Igneous Volcanic Rock
INDICATORS OF PROGRESS	9.3.4.1.2.	Explain how human activity and natural processes are altering the hydrosphere, biosphere, lithosphere and atmosphere, including pollution, topography and climate. <u>JoVE</u> • Biofuels: Producing Ethanol from Cellulosic Material • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Dissolved Oxygen in Surface Water • Igneous Intrusive Rock • Igneous Volcanic Rock • Introduction to Mass Spectrometry • Lead Analysis of Soil Using Atomic Absorption Spectroscopy • Making a Geologic Cross Section • Measuring Tropospheric Ozone • Nutrients in Aquatic Ecosystems • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method • Turbidity and Total Solids in Surface Water • Using Topographic Maps to Generate Topographic Profiles • Water Quality Analysis via Indicator Organisms
CONTENT STANDARD / DOMAIN	MN.9.4.	Life Science
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.4.1.	Structure and Function in Living Systems
INDICATORS OF PROGRESS / STRAND	9.4.1.1.	The student will understand that organisms use the interaction of cellular processes as well as tissues and organ systems to maintain homeostasis.
INDICATORS OF PROGRESS	9.4.1.1.1.	Explain how cell processes are influenced by internal and external factors, such as pH and temperature, and how cells and organisms respond to changes in their environment to maintain homeostasis. <u>JoVE</u> • Abdominal Exam I: Inspection and Auscultation • Abdominal Exam II: Percussion • Abdominal Exam III: Palpation • Abdominal Exam IV: Acute Abdominal Pain

Assessment

- **An Introduction to Cell Death**
- **An Introduction to Cell Division**
- **An Introduction to Cell Metabolism**
- **An Introduction to Cellular and Molecular Neuroscience**
- **An Introduction to Cognition**
- **An Introduction to Developmental Neurobiology**
- **An Introduction to Endocytosis and Exocytosis**
- **An Introduction to Learning and Memory**
- **An Introduction to Modeling Behavioral Disorders and Stress**
- **An Introduction to Molecular Developmental Biology**
- **An Introduction to Reward and Addiction**
- **An Introduction to Stem Cell Biology**
- **Anesthesia Induction and Maintenance**
- **Ankle Exam**
- **Annexin V and Propidium Iodide Labeling**
- **Anxiety Testing**
- **Arterial Line Placement**
- **Assessing Dexterity with Reaching Tasks**
- **Auscultation**
- **Balance and Coordination Testing**
- **Basic Care Procedures**
- **Basic Life Support Part II: Airway/Breathing and Continued Cardiopulmonary Resuscitation**
- **Basic Life Support: Cardiopulmonary Resuscitation and Defibrillation**
- **Basic Mouse Care and Maintenance**
- **Blood Pressure Measurement**
- **Blood Withdrawal I**
- **Blood Withdrawal II**
- **C. elegans Development and Reproduction**
- **Calcium Imaging in Neurons**
- **Cardiac Exam I: Inspection and Palpation**
- **Cardiac Exam II: Auscultation**
- **Cardiac Exam III: Abnormal Heart Sounds**
- **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**
- **Compound Administration I**
- **Compound Administration II**
- **Compound Administration III**
- **Compound Administration IV**
- **Comprehensive Breast Exam**
- **Considerations for Rodent Surgery**
- **Cranial Nerves Exam I (I-VI)**
- **Cranial Nerves Exam II (VII-XII)**
- **Detecting Reactive Oxygen Species**
- **Diagnostic Necropsy and Tissue Harvest**

- Ear Exam
- Elbow Exam
- Electro-encephalography (EEG)
- Embryonic Stem Cell Culture and Differentiation
- Emergency Tube Thoracostomy (Chest Tube Placement)
- Emergent Lateral Canthotomy and Inferior Catholysis
- Explant Culture of Neural Tissue
- Eye Exam
- FM Dyes in Vesicle Recycling
- Fear Conditioning
- Foot Exam
- General Approach to the Physical Exam
- Hand and Wrist Exam
- Hip Exam
- Histological Staining of Neural Tissue
- In ovo Electroporation of Chicken Embryos
- Induced Pluripotency
- Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation
- Intraosseous Needle Placement
- Isolating Nucleic Acids from Yeast
- Knee Exam
- Lower Back Exam
- Lymph Node Exam
- Male Rectal Exam
- Measuring Vital Signs
- Modeling Social Stress
- Motor Exam I
- Motor Exam II
- Murine In Utero Electroporation
- Neck Exam
- Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment
- Nose, Sinuses, Oral Cavity and Pharynx Exam
- Observation and Inspection
- Ophthalmoscopic Examination
- Palpation
- 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)
- Pericardiocentesis
- Peripheral Vascular Exam
- Peripheral Vascular Exam Using a Continuous Wave Doppler
- Peripheral Venous Cannulation
- Physiological Correlates of Emotion Recognition
- Pilot Testing
- Proper Adjustment of Patient Attire during the Physical

		<p>Exam</p> <ul style="list-style-type: none"> • Reconstitution of Membrane Proteins • Respiratory Exam I: Inspection and Palpation • Respiratory Exam II: Percussion and Auscultation • Self-administration Studies • Sensory Exam • Shoulder Exam I • Shoulder Exam II • Spatial Memory Testing Using Mazes • Sterile Tissue Harvest • Surgical Cricothyrotomy • The ATP Bioluminescence Assay • The TUNEL Assay • Thyroid Exam • Tissue Regeneration with Somatic Stem Cells • Tree Identification: How To Use a Dichotomous Key • Using a pH Meter • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Maintenance and Husbandry
<p>INDICATORS OF PROGRESS</p>	<p>9.4.1.1.2.</p>	<p>Describe how the functions of individual organ systems are integrated to maintain homeostasis in an organism.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Abdominal Exam I: Inspection and Auscultation • Abdominal Exam II: Percussion • Abdominal Exam III: Palpation • Abdominal Exam IV: Acute Abdominal Pain Assessment • An Introduction to Cognition • An Introduction to Learning and Memory • An Introduction to Reward and Addiction • Anesthesia Induction and Maintenance • Ankle Exam • Arterial Line Placement • Assessing Dexterity with Reaching Tasks • Auscultation • Balance and Coordination Testing • Basic Care Procedures • Basic Life Support Part II: Airway/Breathing and Continued Cardiopulmonary Resuscitation • Basic Life Support: Cardiopulmonary Resuscitation and Defibrillation • Basic Mouse Care and Maintenance • Blood Pressure Measurement • Blood Withdrawal I • Blood Withdrawal II • Cardiac Exam I: Inspection and Palpation • Cardiac Exam II: Auscultation • Cardiac Exam III: Abnormal Heart Sounds

- **Central Venous Catheter Insertion: Femoral Vein with Ultrasound Guidance**
- **Central Venous Catheter Insertion: Internal Jugular with Ultrasound Guidance**
- **Central Venous Catheter Insertion: Subclavian Vein**
- **Compound Administration I**
- **Compound Administration II**
- **Compound Administration III**
- **Compound Administration IV**
- **Comprehensive Breast Exam**
- **Considerations for Rodent Surgery**
- **Cranial Nerves Exam I (I-VI)**
- **Cranial Nerves Exam II (VII-XII)**
- **Diagnostic Necropsy and Tissue Harvest**
- **Ear Exam**
- **Elbow Exam**
- **Emergency Tube Thoracostomy (Chest Tube Placement)**
- **Emergent Lateral Canthotomy and Inferior Catholysis**
- **Eye Exam**
- **Fear Conditioning**
- **Foot Exam**
- **General Approach to the Physical Exam**
- **Hand and Wrist Exam**
- **Hip Exam**
- **Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation**
- **Intraosseous Needle Placement**
- **Knee Exam**
- **Lower Back Exam**
- **Lymph Node Exam**
- **Male Rectal Exam**
- **Measuring Vital Signs**
- **Motor Exam I**
- **Motor Exam II**
- **Neck Exam**
- **Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment**
- **Nose, Sinuses, Oral Cavity and Pharynx Exam**
- **Observation and Inspection**
- **Ophthalmoscopic Examination**
- **Palpation**
- **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)**
- **Pericardiocentesis**
- **Peripheral Vascular Exam**
- **Peripheral Vascular Exam Using a Continuous Wave Doppler**

		<ul style="list-style-type: none"> • Peripheral Venous Cannulation • Physiological Correlates of Emotion Recognition • Proper Adjustment of Patient Attire during the Physical Exam • Respiratory Exam I: Inspection and Palpation • Respiratory Exam II: Percussion and Auscultation • Self-administration Studies • Sensory Exam • Shoulder Exam I • Shoulder Exam II • Spatial Memory Testing Using Mazes • Sterile Tissue Harvest • Surgical Cricothyrotomy • Thyroid Exam • Tree Identification: How To Use a Dichotomous Key • Using a pH Meter • Zebrafish Maintenance and Husbandry
CONTENT STANDARD / DOMAIN	MN.9.4.	Life Science
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.4.1.	Structure and Function in Living Systems
INDICATORS OF PROGRESS / STRAND	9.4.1.2.	The student will understand that cells and cell structures have specific functions that allow an organism to grow, survive and reproduce.
INDICATORS OF PROGRESS	9.4.1.2.1.	<p>Recognize that cells are composed primarily of a few elements (carbon, hydrogen, oxygen, nitrogen, phosphorus, and sulfur), and describe the basic molecular structures of cells and the primary functions of carbohydrates, lipids, proteins and nucleic acids.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to Caenorhabditis elegans • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Endocytosis and Exocytosis • An Introduction to Molecular Developmental Biology • An Introduction to Neurophysiology • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Introduction to Transfection • 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
- Annexin V and Propidium Iodide Labeling
- Bacterial Growth Curve Analysis and its Environmental Applications
- Bacterial Transformation: Electroporation
- Bacterial Transformation: The Heat Shock Method
- Balance and Coordination Testing
- Biofuels: Producing Ethanol from Cellulosic Material
- C. elegans Development and Reproduction
- C. elegans Maintenance
- Calcium Imaging in Neurons
- Carbon and Nitrogen Analysis of Environmental Samples
- Cell Cycle Analysis
- Cell-surface Biotinylation Assay
- Chromatin Immunoprecipitation
- Chromatography-Based Biomolecule Purification Methods
- Co-Immunoprecipitation and Pull-Down Assays
- Column Chromatography
- Community DNA Extraction from Bacterial Colonies
- Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry
- Cytogenetics
- DNA Gel Electrophoresis
- DNA Ligation Reactions
- DNA Methylation Analysis
- Density Gradient Ultracentrifugation
- Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis
- Detecting Reactive Oxygen Species
- Development and Reproduction of the Laboratory Mouse
- Development of the Chick
- Dialysis: Diffusion Based Separation
- Drosophila Larval IHC
- Drosophila melanogaster Embryo and Larva Harvesting and Preparation
- Electro-encephalography (EEG)
- Electrophoretic Mobility Shift Assay (EMSA)
- Embryonic Stem Cell Culture and Differentiation
- Enzyme Assays and Kinetics
- Explant Culture for Developmental Studies
- Explant Culture of Neural Tissue
- Expression Profiling with Microarrays
- Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction

- **FM Dyes in Vesicle Recycling**
- **Förster Resonance Energy Transfer (FRET)**
- **Gel Purification**
- **Gene Silencing with Morpholinos**
- **Genetic Crosses**
- **Genetic Engineering of Model Organisms**
- **Genetic Screens**
- **Genome Editing**
- **Histological Staining of Neural Tissue**
- **In ovo Electroporation of Chicken Embryos**
- **Induced Pluripotency**
- **Introduction to Catalysis**
- **Introduction to Mass Spectrometry**
- **Invasion Assay Using 3D Matrices**
- **Invertebrate Lifespan Quantification**
- **Ion-Exchange Chromatography**
- **Isolating Nucleic Acids from Yeast**
- **Live Cell Imaging of Mitosis**
- **MALDI-TOF Mass Spectrometry**
- **Metabolic Labeling**
- **Molecular Cloning**
- **Mouse Genotyping**
- **Murine In Utero Electroporation**
- **Neuronal Transfection Methods**
- **Nutrients in Aquatic Ecosystems**
- **PCR: The Polymerase Chain Reaction**
- **Passaging Cells**
- **Patch Clamp Electrophysiology**
- **Photometric Protein Determination**
- **Plasmid Purification**
- **Primary Neuronal Cultures**
- **Protein Crystallization**
- **Purification of a Total Lipid Extract with Column Chromatography**
- **Quantifying Environmental Microorganisms and Viruses Using qPCR**
- **RNA Analysis of Environmental Samples Using RT-PCR**
- **RNA-Seq**
- **RNAi in *C. elegans***
- **Recombineering and Gene Targeting**
- **Reconstitution of Membrane Proteins**
- **Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry**
- **Restriction Enzyme Digests**
- **SNP Genotyping**
- **Separating Protein with SDS-PAGE**
- **Separation of Mixtures via Precipitation**
- **Soil Nutrient Analysis: Nitrogen, Phosphorus, and Potassium**
- **Sonication Extraction of Lipid Biomarkers from Sediment**
- **Soxhlet Extraction of Lipid Biomarkers from Sediment**

		<ul style="list-style-type: none"> • Spectrophotometric Determination of an Equilibrium Constant • Surface Plasmon Resonance (SPR) • Tandem Mass Spectrometry • Testing For Genetically Modified Foods • The ATP Bioluminescence Assay • The ELISA Method • The TUNEL Assay • The Transwell Migration Assay • The Western Blot • Tissue Regeneration with Somatic Stem Cells • Two-Dimensional Gel Electrophoresis • Ultraviolet-Visible (UV-Vis) Spectroscopy • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
<p>INDICATORS OF PROGRESS</p>	<p>9.4.1.2.2.</p>	<p>Recognize that the work of the cell is carried out primarily by proteins, most of which are enzymes, and that protein function depends on the amino acid sequence and the shape it takes as a consequence of the interactions between those amino acids.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Death • An Introduction to Cell Motility and Migration • An Introduction to Saccharomyces cerevisiae • An Overview of Epigenetics • An Overview of Gene Expression • Biofuels: Producing Ethanol from Cellulosic Material • Cell-surface Biotinylation Assay • Chromatin Immunoprecipitation • Co-Immunoprecipitation and Pull-Down Assays • DNA Ligation Reactions • DNA Methylation Analysis • Density Gradient Ultracentrifugation • Detecting Reactive Oxygen Species • Dialysis: Diffusion Based Separation • Drosophila Larval IHC • Electrophoretic Mobility Shift Assay (EMSA) • Enzyme Assays and Kinetics • Expression Profiling with Microarrays • FM Dyes in Vesicle Recycling • Förster Resonance Energy Transfer (FRET) • Gene Silencing with Morpholinos • Genetic Engineering of Model Organisms • Genome Editing • Introduction to Catalysis

		<ul style="list-style-type: none"> • Introduction to Mass Spectrometry • Invasion Assay Using 3D Matrices • Ion-Exchange Chromatography • Live Cell Imaging of Mitosis • MALDI-TOF Mass Spectrometry • Metabolic Labeling • Molecular Cloning • PCR: The Polymerase Chain Reaction • Photometric Protein Determination • Protein Crystallization • RNA Analysis of Environmental Samples Using RT-PCR • RNA-Seq • Reconstitution of Membrane Proteins • Restriction Enzyme Digests • Separating Protein with SDS-PAGE • Separation of Mixtures via Precipitation • Surface Plasmon Resonance (SPR) • Tandem Mass Spectrometry • The ELISA Method • The TUNEL Assay • The Transwell Migration Assay • The Western Blot • Two-Dimensional Gel Electrophoresis • Whole-Mount In Situ Hybridization • Yeast Transformation and Cloning
<p>INDICATORS OF PROGRESS</p>	<p>9.4.1.2.3.</p>	<p>Describe how viruses, prokaryotic cells and eukaryotic cells differ in relative size, complexity and general structure.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Motility and Migration • An Introduction to Saccharomyces cerevisiae • An Introduction to Transfection • An Overview of Genetic Engineering • Bacterial Growth Curve Analysis and its Environmental Applications • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • Culturing and Enumerating Bacteria from Soil Samples • Detection of Bacteriophages in Environmental Samples • Electrophoretic Mobility Shift Assay (EMSA) • Genetic Engineering of Model Organisms • Invasion Assay Using 3D Matrices • Molecular Cloning • Plasmid Purification • Recombineering and Gene Targeting • The Transwell Migration Assay • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning

INDICATORS OF PROGRESS	9.4.1.2.4.	<p>Explain the function and importance of cell organelles for prokaryotic and/or eukaryotic cells as related to the basic cell processes of respiration, photosynthesis, protein synthesis and cell reproduction.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Transfection • Annexin V and Propidium Iodide Labeling • Cell Cycle Analysis • Density Gradient Ultracentrifugation • Detecting Reactive Oxygen Species • Enzyme Assays and Kinetics • Isolating Nucleic Acids from Yeast • Live Cell Imaging of Mitosis • Metabolic Labeling • The ATP Bioluminescence Assay • The TUNEL Assay
INDICATORS OF PROGRESS	9.4.1.2.5.	<p>Compare and contrast passive transport (including osmosis and facilitated transport) with active transport, such as endocytosis and exocytosis.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Endocytosis and Exocytosis • An Introduction to Neurophysiology • An Introduction to Transfection • Calcium Imaging in Neurons • Cell-surface Biotinylation Assay • Detecting Reactive Oxygen Species • FM Dyes in Vesicle Recycling • In ovo Electroporation of Chicken Embryos • Patch Clamp Electrophysiology • Reconstitution of Membrane Proteins • The TUNEL Assay • Yeast Transformation and Cloning
INDICATORS OF PROGRESS	9.4.1.2.6.	<p>Explain the process of mitosis in the formation of identical new cells and maintaining chromosome number during asexual reproduction.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Division • An Introduction to <i>Saccharomyces cerevisiae</i> • Cell Cycle Analysis • Live Cell Imaging of Mitosis • Yeast Reproduction • Yeast Transformation and Cloning

CONTENT STANDARD / DOMAIN	MN.9.4.	Life Science
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.4.2.	Interdependence among Living Systems
INDICATORS OF PROGRESS / STRAND	9.4.2.1.	The student will understand that the interrelationship and interdependence of organisms generate dynamic biological communities in ecosystems.
INDICATORS OF PROGRESS	9.4.2.1.2.	Explain how ecosystems can change as a result of the introduction of one or more new species. <u>JoVE</u> <ul style="list-style-type: none"> • Analysis of Earthworm Populations in Soil • Tree Survey: Point-Centered Quarter Sampling Method
CONTENT STANDARD / DOMAIN	MN.9.4.	Life Science
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.4.2.	Interdependence among Living Systems
INDICATORS OF PROGRESS / STRAND	9.4.2.2.	The student will understand that matter cycles and energy flows through different levels of organization of living systems and the physical environment, as chemical elements are combined in different ways.
INDICATORS OF PROGRESS	9.4.2.2.1.	Use words and equations to differentiate between the processes of photosynthesis and respiration in terms of energy flow, beginning reactants and end products. <u>JoVE</u> <ul style="list-style-type: none"> • An Introduction to Cell Metabolism • Biofuels: Producing Ethanol from Cellulosic Material • Detecting Reactive Oxygen Species • The ATP Bioluminescence Assay
INDICATORS OF PROGRESS	9.4.2.2.2.	Explain how matter and energy in an ecosystem is transformed and transferred among organisms, and how energy is dissipated as heat into the environment. <u>JoVE</u> <ul style="list-style-type: none"> • Algae Enumeration via Culturable Methodology • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Analysis of Earthworm Populations in Soil • Bacterial Growth Curve Analysis and its Environmental Applications • Carbon and Nitrogen Analysis of Environmental Samples • Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry

		<ul style="list-style-type: none"> • Culturing and Enumerating Bacteria from Soil Samples • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Dissolved Oxygen in Surface Water • Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction • Filamentous Fungi • Fundamentals of Breeding and Weaning • Metabolic Labeling • Nutrients in Aquatic Ecosystems • Purification of a Total Lipid Extract with Column Chromatography • Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry • Soil Nutrient Analysis: Nitrogen, Phosphorus, and Potassium • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment • Using GIS to Investigate Urban Forestry
CONTENT STANDARD / DOMAIN	MN.9.4.	Life Science
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.4.3.	Evolution in Living Systems
INDICATORS OF PROGRESS / STRAND	9.4.3.1.	The student will understand that genetic information found in the cell provides information for assembling proteins, which dictate the expression of traits in an individual.
INDICATORS OF PROGRESS	9.4.3.1.1.	<p>Explain the relationships among DNA, genes and chromosomes.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to Caenorhabditis elegans • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Developmental Genetics • An Introduction to Drosophila melanogaster • An Introduction to Molecular Developmental Biology • An Introduction to Organogenesis • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Introduction to Transfection • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Zebrafish: Danio rerio • 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
- Annexin V and Propidium Iodide Labeling
- Bacterial Transformation: Electroporation
- Bacterial Transformation: The Heat Shock Method
- C. elegans Development and Reproduction
- C. elegans Maintenance
- Cell Cycle Analysis
- Chick ex ovo Culture
- Chromatin Immunoprecipitation
- Community DNA Extraction from Bacterial Colonies
- Cytogenetics
- DNA Gel Electrophoresis
- DNA Ligation Reactions
- DNA Methylation Analysis
- Density Gradient Ultracentrifugation
- Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis
- Development and Reproduction of the Laboratory Mouse
- Drosophila melanogaster Embryo and Larva Harvesting and Preparation
- Electrophoretic Mobility Shift Assay (EMSA)
- Embryonic Stem Cell Culture and Differentiation
- Enzyme Assays and Kinetics
- Explant Culture for Developmental Studies
- Expression Profiling with Microarrays
- Fate Mapping
- Förster Resonance Energy Transfer (FRET)
- Gel Purification
- Gene Silencing with Morpholinos
- Genetic Crosses
- Genetic Engineering of Model Organisms
- Genetic Screens
- Genome Editing
- In ovo Electroporation of Chicken Embryos
- Induced Pluripotency
- Isolating Nucleic Acids from Yeast
- Live Cell Imaging of Mitosis
- Molecular Cloning
- Mouse Genotyping
- Neuronal Transfection Methods
- PCR: The Polymerase Chain Reaction
- Photometric Protein Determination
- Plasmid Purification
- Primary Neuronal Cultures
- Protein Crystallization
- Quantifying Environmental Microorganisms and Viruses Using qPCR
- RNA Analysis of Environmental Samples Using RT-PCR
- RNA-Seq
- RNAi in C. elegans

		<ul style="list-style-type: none"> • Recombineering and Gene Targeting • Restriction Enzyme Digests • SNP Genotyping • Testing For Genetically Modified Foods • The TUNEL Assay • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies • Two-Dimensional Gel Electrophoresis • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
<p>INDICATORS OF PROGRESS</p>	<p>9.4.3.1.2.</p>	<p>In the context of a monohybrid cross, apply the terms phenotype, genotype, allele, homozygous and heterozygous.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Caenorhabditis elegans • An Introduction to Developmental Genetics • An Introduction to Drosophila melanogaster • An Introduction to the Zebrafish: Danio rerio • An Overview of Epigenetics • An Overview of Genetic Analysis • An Overview of Genetics and Disease • C. elegans Development and Reproduction • C. elegans Maintenance • Development and Reproduction of the Laboratory Mouse • Drosophila Development and Reproduction • Fundamentals of Breeding and Weaning • Gene Silencing with Morpholinos • Genetic Crosses • Genetic Engineering of Model Organisms • Genetic Screens • Mouse Genotyping • RNAi in C. elegans • SNP Genotyping • Whole-Mount In Situ Hybridization • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Reproduction and Development
<p>INDICATORS OF PROGRESS</p>	<p>9.4.3.1.3.</p>	<p>Describe the process of DNA replication and the role of DNA and RNA in assembling protein molecules.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Epigenetics • An Overview of Gene Expression • Chromatin Immunoprecipitation • DNA Methylation Analysis

		<ul style="list-style-type: none"> • Detecting Reactive Oxygen Species • Electrophoretic Mobility Shift Assay (EMSA) • Expression Profiling with Microarrays • Gene Silencing with Morpholinos • Genome Editing • Molecular Cloning • Quantifying Environmental Microorganisms and Viruses Using qPCR • RNA Analysis of Environmental Samples Using RT-PCR • RNA-Seq • Whole-Mount In Situ Hybridization
CONTENT STANDARD / DOMAIN	MN.9.4.	Life Science
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.4.3.	Evolution in Living Systems
INDICATORS OF PROGRESS / STRAND	9.4.3.2.	The student will understand that variation within a species is the natural result of new inheritable characteristics occurring from new combinations of existing genes or from mutations of genes in reproductive cells.
INDICATORS OF PROGRESS	9.4.3.2.1.	<p>Use concepts from Mendel's Laws of Segregation and Independent Assortment to explain how sorting and recombination (crossing over) of genes during sexual reproduction (meiosis) increases the occurrence of variation in a species.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Genetic Analysis • Drosophila Development and Reproduction • Genetic Crosses
INDICATORS OF PROGRESS	9.4.3.2.2.	<p>Use the processes of mitosis and meiosis to explain the advantages and disadvantages of asexual and sexual reproduction.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Caenorhabditis elegans • An Introduction to Cell Division • An Introduction to Saccharomyces cerevisiae • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Zebrafish: Danio rerio • C. elegans Development and Reproduction • Cell Cycle Analysis • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Drosophila Development and Reproduction • Drosophila melanogaster Embryo and Larva Harvesting and Preparation • Fundamentals of Breeding and Weaning

		<ul style="list-style-type: none"> • Genetic Crosses • Genetic Screens • Live Cell Imaging of Mitosis • Recombineering and Gene Targeting • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Reproduction and Development
INDICATORS OF PROGRESS	9.4.3.2.3.	<p>Explain how mutations like deletions, insertions, rearrangements or substitutions of DNA segments in gametes may have no effect, may harm, or rarely may be beneficial, and can result in genetic variation within a species.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to Caenorhabditis elegans • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Developmental Genetics • An Introduction to Drosophila melanogaster • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to Saccharomyces cerevisiae • An Introduction to Transfection • An Introduction to the Zebrafish: Danio rerio • An Overview of Epigenetics • An Overview of Gene Expression • An Overview of Genetic Analysis • An Overview of Genetics and Disease • Genetic Engineering of Model Organisms • Genetic Screens • Isolating Nucleic Acids from Yeast • Passaging Cells • The TUNEL Assay
CONTENT STANDARD / DOMAIN	MN.9.4.	Life Science
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.4.3.	Evolution in Living Systems
INDICATORS OF PROGRESS / STRAND	9.4.3.3.	The student will understand that evolution by natural selection is a scientific explanation for the history and diversity of life on Earth.
INDICATORS OF PROGRESS	9.4.3.3.1.	<p>Describe how evidence led Darwin to develop the theory of natural selection and common descent to explain evolution.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Genetic Analysis

<p>INDICATORS OF PROGRESS</p>	<p>9.4.3.3.2.</p>	<p>Use scientific evidence, including the fossil record, homologous structures, and genetic and/or biochemical similarities, to show evolutionary relationships among species.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to <i>Caenorhabditis elegans</i> • An Introduction to <i>Drosophila melanogaster</i> • An Introduction to the Chick: <i>Gallus gallus domesticus</i> • An Introduction to the Laboratory Mouse: <i>Mus musculus</i> • An Introduction to the Zebrafish: <i>Danio rerio</i> • An Overview of Genetic Analysis • <i>Drosophila</i> Development and Reproduction • <i>Drosophila melanogaster</i> Embryo and Larva Harvesting and Preparation • High-Performance Liquid Chromatography (HPLC)
<p>INDICATORS OF PROGRESS</p>	<p>9.4.3.3.3.</p>	<p>Recognize that artificial selection has led to offspring through successive generations that can be very different in appearance and behavior from their distant ancestors.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to <i>Drosophila melanogaster</i> • An Introduction to Molecular Developmental Biology • An Introduction to Organogenesis • An Introduction to Stem Cell Biology • An Introduction to Transfection • An Introduction to the Chick: <i>Gallus gallus domesticus</i> • An Introduction to the Laboratory Mouse: <i>Mus musculus</i> • An Introduction to the Zebrafish: <i>Danio rerio</i> • An Overview of Genetic Analysis • An Overview of Genetic Engineering • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • <i>C. elegans</i> Development and Reproduction • Chick ex ovo Culture • DNA Ligation Reactions • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Embryonic Stem Cell Culture and Differentiation • Explant Culture for Developmental Studies • Fate Mapping • Fundamentals of Breeding and Weaning • Gene Silencing with Morpholinos • Genetic Engineering of Model Organisms • In ovo Electroporation of Chicken Embryos • Induced Pluripotency • Invertebrate Lifespan Quantification

		<ul style="list-style-type: none"> • Molecular Cloning • Mouse Genotyping • Plasmid Purification • RNAi in <i>C. elegans</i> • Restriction Enzyme Digests • Solid-Liquid Extraction • Testing For Genetically Modified Foods • The TUNEL Assay • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies • Tree Identification: How To Use a Dichotomous Key • Whole-Mount In Situ Hybridization • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
INDICATORS OF PROGRESS	9.4.3.3.4.	<p>Explain why genetic variation within a population is essential for evolution to occur.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Genetic Analysis
INDICATORS OF PROGRESS	9.4.3.3.5.	<p>Explain how competition for finite resources and the changing environment promotes natural selection on offspring survival, depending on whether the offspring have characteristics that are advantageous or disadvantageous in the new environment.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Genetic Analysis
CONTENT STANDARD / DOMAIN	MN.9.4.	Life Science
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.4.4.	Human Interactions with Living Systems
INDICATORS OF PROGRESS / STRAND	9.4.4.1.	The student will understand that human activity has consequences on living organisms and ecosystems.
INDICATORS OF PROGRESS	9.4.4.1.1.	<p>Describe the social, economic and ecological risks and benefits of biotechnology in agriculture and medicine.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to <i>Drosophila melanogaster</i> • An Introduction to Molecular Developmental Biology • An Introduction to Organogenesis • An Introduction to <i>Saccharomyces cerevisiae</i> • An Introduction to Stem Cell Biology • An Introduction to Transfection • An Introduction to the Chick: <i>Gallus gallus domesticus</i> • An Introduction to the Laboratory Mouse: <i>Mus musculus</i>

		<ul style="list-style-type: none"> • An Introduction to the Zebrafish: Danio rerio • An Overview of Gene Expression • An Overview of Genetic Engineering • Bacterial Growth Curve Analysis and its Environmental Applications • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • Biofuels: Producing Ethanol from Cellulosic Material • C. elegans Development and Reproduction • Chick ex ovo Culture • Cyclic Voltammetry (CV) • DNA Ligation Reactions • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Embryonic Stem Cell Culture and Differentiation • Explant Culture for Developmental Studies • Explant Culture of Neural Tissue • Fate Mapping • Fundamentals of Breeding and Weaning • Gene Silencing with Morpholinos • Genetic Engineering of Model Organisms • In ovo Electroporation of Chicken Embryos • Induced Pluripotency • Invertebrate Lifespan Quantification • Molecular Cloning • Mouse Genotyping • Murine In Utero Electroporation • Neuronal Transfection Methods • Plasmid Purification • Primary Neuronal Cultures • RNA Analysis of Environmental Samples Using RT-PCR • RNAi in C. elegans • Recombineering and Gene Targeting • Restriction Enzyme Digests • Rodent Stereotaxic Surgery • Solid-Liquid Extraction • Testing For Genetically Modified Foods • The TUNEL Assay • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies • Whole-Mount In Situ Hybridization • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
INDICATORS OF PROGRESS	9.4.4.1.2.	Describe the social, economic and ecological risks and benefits of changing a natural ecosystem as a result of human activity.

		<p>JoVE</p> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Dissolved Oxygen in Surface Water • Lead Analysis of Soil Using Atomic Absorption Spectroscopy • Measuring Tropospheric Ozone • Nutrients in Aquatic Ecosystems • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method • Turbidity and Total Solids in Surface Water • Water Quality Analysis via Indicator Organisms
CONTENT STANDARD / DOMAIN	MN.9.4.	Life Science
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9.4.4.	Human Interactions with Living Systems
INDICATORS OF PROGRESS / STRAND	9.4.4.2.	The student will understand that personal and community health can be affected by the environment, body functions and human behavior.
INDICATORS OF PROGRESS	9.4.4.2.1.	<p>Describe how some diseases can sometimes be predicted by genetic testing and how this affects parental and community decisions.</p> <p>JoVE</p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Endocytosis and Exocytosis • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to Motor Control • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Overview of Gene Expression • An Overview of Genetic Analysis • An Overview of Genetic Engineering • An Overview of Genetics and Disease • Chromatography-Based Biomolecule Purification Methods • Cytogenetics • Embryonic Stem Cell Culture and Differentiation • Fundamentals of Breeding and Weaning • Gene Silencing with Morpholinos • SNP Genotyping • Tissue Regeneration with Somatic Stem Cells • Whole-Mount In Situ Hybridization
INDICATORS OF PROGRESS	9.4.4.2.2.	Explain how the body produces antibodies to fight disease and how vaccines assist this process.

		<p>JoVE</p> <ul style="list-style-type: none"> • An Introduction to the Laboratory Mouse: Mus musculus • Co-Immunoprecipitation and Pull-Down Assays • Histological Staining of Neural Tissue • The ELISA Method • The TUNEL Assay • The Western Blot
INDICATORS OF PROGRESS	9.4.4.2.3.	<p>Describe how the immune system sometimes attacks some of the body's own cells and how some allergic reactions are caused by the body's immune responses to usually harmless environmental substances.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Pelvic Exam III: Bimanual and Rectovaginal Exam
INDICATORS OF PROGRESS	9.4.4.2.4.	<p>Explain how environmental factors and personal decisions, such as water pollution, air quality and smoking affect personal and community health.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Dissolved Oxygen in Surface Water • Introduction to Mass Spectrometry • Lead Analysis of Soil Using Atomic Absorption Spectroscopy • Measuring Tropospheric Ozone • Nutrients in Aquatic Ecosystems • Peripheral Vascular Exam Using a Continuous Wave Doppler • Respiratory Exam I: Inspection and Palpation • Turbidity and Total Solids in Surface Water • Water Quality Analysis via Indicator Organisms
INDICATORS OF PROGRESS	9.4.4.2.5.	<p>Recognize that a gene mutation in a cell can result in uncontrolled cell division called cancer and how exposure of cells to certain chemicals and radiation increases mutations and thus increases the chance of cancer.</p> <p>JoVE</p> <ul style="list-style-type: none"> • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Organogenesis • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Zebrafish: Danio rerio • An Overview of Genetic Engineering • An Overview of Genetics and Disease • Cell Cycle Analysis

		<ul style="list-style-type: none"> • Chick ex ovo Culture • Coordination Chemistry Complexes • DNA Methylation Analysis • Detecting Reactive Oxygen Species • Ear Exam • Expression Profiling with Microarrays • Genome Editing • Introducing Experimental Agents into the Mouse • Invasion Assay Using 3D Matrices • Live Cell Imaging of Mitosis • Lymph Node Exam • Male Rectal Exam • Mouse Genotyping • Pelvic Exam II: Speculum Exam • Pelvic Exam III: Bimanual and Rectovaginal Exam • The TUNEL Assay • The Transwell Migration Assay
CONTENT STANDARD / DOMAIN	MN.9C.	Chemistry
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9C.1.	The Nature of Science and Engineering
INDICATORS OF PROGRESS / STRAND	9C.1.3.	Interactions Among Science, Technology, Engineering, Mathematics, and Society
INDICATORS OF PROGRESS	9C.1.3.3.	The student will understand that developments in chemistry affect society and societal concerns affect the field of chemistry.
INDICATOR	9C.1.3.3.1.	<p>Explain the political, societal, economic and environmental impact of chemical products and technologies.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Calibration Curves • Capillary Electrophoresis (CE) • Chromatography-Based Biomolecule Purification Methods • Co-Immunoprecipitation and Pull-Down Assays • Cyclic Voltammetry (CV) • Density Gradient Ultracentrifugation • Dialysis: Diffusion Based Separation • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Electrophoretic Mobility Shift Assay (EMSA) • Enzyme Assays and Kinetics • Förster Resonance Energy Transfer (FRET) • Gas Chromatography (GC) with Flame-Ionization Detection • High-Performance Liquid Chromatography (HPLC) • Internal Standards • Introduction to Mass Spectrometry

		<ul style="list-style-type: none"> • Ion-Exchange Chromatography • MALDI-TOF Mass Spectrometry • Metabolic Labeling • Method of Standard Addition • Nuclear Magnetic Resonance (NMR) Spectroscopy • Photometric Protein Determination • Protein Crystallization • Proton Exchange Membrane Fuel Cells • Raman Spectroscopy for Chemical Analysis • Reconstitution of Membrane Proteins • Sample Preparation for Analytical Preparation • Scanning Electron Microscopy (SEM) • Surface Plasmon Resonance (SPR) • Tandem Mass Spectrometry • Two-Dimensional Gel Electrophoresis • Ultraviolet-Visible (UV-Vis) Spectroscopy • X-ray Fluorescence (XRF)
CONTENT STANDARD / DOMAIN	MN.9C.	Chemistry
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9C.1.	The Nature of Science and Engineering
INDICATORS OF PROGRESS / STRAND	9C.1.3.	Interactions Among Science, Technology, Engineering, Mathematics, and Society
INDICATORS OF PROGRESS	9C.1.3.4.	The student will understand that physical and mathematical models are used to describe physical systems.
INDICATOR	9C.1.3.4.1.	<p>Use significant figures and an understanding of accuracy and precision in scientific measurements to determine and express the uncertainty of a result.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining Spatial Orientation of Rock Layers with the Brunton Compass • Method of Standard Addition • Observational Research • Sample Preparation for Analytical Preparation
CONTENT STANDARD / DOMAIN	MN.9C.	Chemistry
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9C.2.	Physical Science
INDICATORS OF PROGRESS / STRAND	9C.2.1.	Matter
INDICATORS OF PROGRESS	9C.2.1.1.	The student will understand that the periodic table illustrates how patterns in the physical and chemical properties of elements are related to atomic structure.
INDICATOR	9C.2.1.1.1.	Explain the relationship of an element's position on the periodic table to its atomic number and electron

		<p>configuration.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Coordination Chemistry Complexes
INDICATOR	9C.2.1.1.2.	<p>Identify and compare trends on the periodic table, including reactivity and relative sizes of atoms and ions; use the trends to explain the properties of subgroups, including metals, non-metals, alkali metals, alkaline earth metals, halogens and noble gases.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Coordination Chemistry Complexes • Surface Plasmon Resonance (SPR)
CONTENT STANDARD / DOMAIN	MN.9C.	Chemistry
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9C.2.	Physical Science
INDICATORS OF PROGRESS / STRAND	9C.2.1.	Matter
INDICATORS OF PROGRESS	9C.2.1.2.	The student will understand that chemical and physical properties of matter result from the ability of atoms to form bonds.
INDICATOR	9C.2.1.2.1.	<p>Explain how elements combine to form compounds through ionic and covalent bonding.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry • Determining the Solubility Rules of Ionic Compounds • Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction • Purification of a Total Lipid Extract with Column Chromatography • Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment • Ultraviolet-Visible (UV-Vis) Spectroscopy
INDICATOR	9C.2.1.2.2.	<p>Compare and contrast the structure, properties and uses of organic compounds, such as hydrocarbons, alcohols, sugars, fats and proteins.</p> <p><u>JoVE</u></p>

- An Introduction to *Caenorhabditis elegans*
- An Introduction to Cell Death
- An Introduction to Cell Division
- An Introduction to Cell Metabolism
- An Introduction to Cell Motility and Migration
- An Introduction to Developmental Genetics
- An Introduction to Molecular Developmental Biology
- An Introduction to *Saccharomyces cerevisiae*
- An Introduction to Transfection
- 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
- Annexin V and Propidium Iodide Labeling
- Assembly of a Reflux System for Heated Chemical Reactions
- Bacterial Transformation: Electroporation
- Bacterial Transformation: The Heat Shock Method
- *C. elegans* Maintenance
- Capillary Electrophoresis (CE)
- Cell Cycle Analysis
- Cell-surface Biotinylation Assay
- 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
- Cytogenetics
- DNA Gel Electrophoresis
- DNA Ligation Reactions
- DNA Methylation Analysis
- Density Gradient Ultracentrifugation
- Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis
- Detecting Reactive Oxygen Species
- Development and Reproduction of the Laboratory Mouse
- Development of the Chick
- Dialysis: Diffusion Based Separation
- *Drosophila* Larval IHC
- *Drosophila melanogaster* Embryo and Larva Harvesting

and Preparation

- Electrophoretic Mobility Shift Assay (EMSA)
- Embryonic Stem Cell Culture and Differentiation
- Enzyme Assays and Kinetics
- Explant Culture for Developmental Studies
- Expression Profiling with Microarrays
- Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction
- FM Dyes in Vesicle Recycling
- Fractional Distillation
- Förster Resonance Energy Transfer (FRET)
- Gel Purification
- Gene Silencing with Morpholinos
- Genetic Crosses
- Genetic Engineering of Model Organisms
- Genetic Screens
- Genome Editing
- In ovo Electroporation of Chicken Embryos
- Induced Pluripotency
- Introduction to Catalysis
- Introduction to Mass Spectrometry
- Invasion Assay Using 3D Matrices
- Invertebrate Lifespan Quantification
- Ion-Exchange Chromatography
- Isolating Nucleic Acids from Yeast
- Live Cell Imaging of Mitosis
- MALDI-TOF Mass Spectrometry
- Metabolic Labeling
- Molecular Cloning
- Mouse Genotyping
- Nuclear Magnetic Resonance (NMR) Spectroscopy
- PCR: The Polymerase Chain Reaction
- Performing 1D Thin Layer Chromatography
- Photometric Protein Determination
- Plasmid Purification
- Preparing Anhydrous Reagents and Equipment
- Protein Crystallization
- Purification of a Total Lipid Extract with Column Chromatography
- Quantifying Environmental Microorganisms and Viruses Using qPCR
- RNA Analysis of Environmental Samples Using RT-PCR
- RNA-Seq
- RNAi in *C. elegans*
- Recombineering and Gene Targeting
- Reconstitution of Membrane Proteins
- Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry
- Restriction Enzyme Digests
- SNP Genotyping
- Separating Protein with SDS-PAGE

		<ul style="list-style-type: none"> • Separation of Mixtures via Precipitation • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment • Surface Plasmon Resonance (SPR) • Tandem Mass Spectrometry • The ATP Bioluminescence Assay • The ELISA Method • The TUNEL Assay • The Transwell Migration Assay • The Western Blot • Two-Dimensional Gel Electrophoresis • Ultraviolet-Visible (UV-Vis) Spectroscopy • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
INDICATOR	9C.2.1.2.3.	<p>Use IUPAC (International Union of Pure and Applied Chemistry) nomenclature to write chemical formulas and name molecular and ionic compounds, including those that contain polyatomic ions.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining the Empirical Formula • Purification of a Total Lipid Extract with Column Chromatography • Sonication Extraction of Lipid Biomarkers from Sediment
INDICATOR	9C.2.1.2.4.	<p>Determine the molar mass of a compound from its chemical formula and a table of atomic masses; convert the mass of a molecular substance to moles, number of particles, or volume of gas at standard temperature and pressure.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Calibration Curves • Determining Rate Laws and the Order of Reaction • Determining the Empirical Formula • Determining the Mass Percent Composition in an Aqueous Solution • Freezing-Point Depression to Determine an Unknown Compound • Introduction to Titration • Method of Standard Addition • Solutions and Concentrations • Spectrophotometric Determination of an Equilibrium Constant

INDICATOR	9C.2.1.2.5.	<p>Determine percent composition, empirical formulas and molecular formulas of simple compounds.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining the Empirical Formula • Determining the Mass Percent Composition in an Aqueous Solution • Introduction to Mass Spectrometry • MALDI-TOF Mass Spectrometry • Tandem Mass Spectrometry
INDICATOR	9C.2.1.2.6.	<p>Describe the dynamic process by which solutes dissolve in solvents and calculate concentrations, including percent concentration, molarity and parts per million.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to the Micropipettor • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Assembly of a Reflux System for Heated Chemical Reactions • Calibration Curves • Capillary Electrophoresis (CE) • Column Chromatography • Conducting Reactions Below Room Temperature • Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry • Cyclic Voltammetry (CV) • Degassing Liquids with Freeze-Pump-Thaw Cycling • Density Gradient Ultracentrifugation • Determining Rate Laws and the Order of Reaction • Determining the Empirical Formula • Determining the Mass Percent Composition in an Aqueous Solution • Dialysis: Diffusion Based Separation • Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction • Freezing-Point Depression to Determine an Unknown Compound • Gas Chromatography (GC) with Flame-Ionization Detection • Growing Crystals for X-ray Diffraction Analysis • High-Performance Liquid Chromatography (HPLC) • Internal Standards • Introduction to Mass Spectrometry • Introduction to Serological Pipettes and Pipettors • Introduction to Titration • Introduction to the Microplate Reader • Introduction to the Spectrophotometer • Ion-Exchange Chromatography

		<ul style="list-style-type: none"> • Le Châtelier's Principle • MALDI-TOF Mass Spectrometry • Making Solutions in the Laboratory • Method of Standard Addition • Performing 1D Thin Layer Chromatography • Photometric Protein Determination • Purification of a Total Lipid Extract with Column Chromatography • Purifying Compounds by Recrystallization • Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry • Rotary Evaporation to Remove Solvent • Sample Preparation for Analytical Preparation • Schlenk Lines Transfer of Solvents • Solid-Liquid Extraction • Solutions and Concentrations • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment • Spectrophotometric Determination of an Equilibrium Constant • Tandem Mass Spectrometry • Understanding Concentration and Measuring Volumes
INDICATOR	9C.2.1.2.7.	<p>Explain the role of solubility of solids, liquids and gases in natural and designed systems.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry • Degassing Liquids with Freeze-Pump-Thaw Cycling • Determining the Solubility Rules of Ionic Compounds • Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction • Growing Crystals for X-ray Diffraction Analysis • Purification of a Total Lipid Extract with Column Chromatography • Purifying Compounds by Recrystallization • Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry • Sample Preparation for Analytical Preparation • Schlenk Lines Transfer of Solvents • Separation of Mixtures via Precipitation • Solid-Liquid Extraction • Solutions and Concentrations • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment

CONTENT STANDARD / DOMAIN	MN.9C.	Chemistry
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9C.2.	Physical Science
INDICATORS OF PROGRESS / STRAND	9C.2.1.	Matter
INDICATORS OF PROGRESS	9C.2.1.3.	The student will understand that chemical reactions describe a chemical change in which one or more reactants are transformed into one or more products.
INDICATOR	9C.2.1.3.1.	<p>Classify chemical reactions as double replacement, single replacement, synthesis, decomposition or combustion.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Conducting Reactions Below Room Temperature • Coordination Chemistry Complexes • Cyclic Voltammetry (CV) • Determining Rate Laws and the Order of Reaction • Determining the Solubility Rules of Ionic Compounds • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Enzyme Assays and Kinetics • Growing Crystals for X-ray Diffraction Analysis • Introduction to Catalysis • Introduction to Titration • Le Châtelier's Principle • Photometric Protein Determination • Preparing Anhydrous Reagents and Equipment • Proton Exchange Membrane Fuel Cells • Purifying Compounds by Recrystallization • Rotary Evaporation to Remove Solvent • Separation of Mixtures via Precipitation • Spectrophotometric Determination of an Equilibrium Constant • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy • Using a pH Meter
INDICATOR	9C.2.1.3.2.	<p>Use solubility and activity of ions to determine whether a double replacement or single replacement reaction will occur.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Conducting Reactions Below Room Temperature • Coordination Chemistry Complexes • Cyclic Voltammetry (CV) • Determining Rate Laws and the Order of Reaction • Determining the Solubility Rules of Ionic Compounds • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Enzyme Assays and Kinetics

		<ul style="list-style-type: none"> • Growing Crystals for X-ray Diffraction Analysis • Introduction to Catalysis • Introduction to Titration • Le Châtelier's Principle • Photometric Protein Determination • Preparing Anhydrous Reagents and Equipment • Proton Exchange Membrane Fuel Cells • Purifying Compounds by Recrystallization • Rotary Evaporation to Remove Solvent • Separation of Mixtures via Precipitation • Spectrophotometric Determination of an Equilibrium Constant • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy • Using a pH Meter
INDICATOR	9C.2.1.3.3.	<p>Relate the properties of acids and bases to the ions they contain and predict the products of an acid-base reaction.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Assembly of a Reflux System for Heated Chemical Reactions • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Introduction to Titration • Ion-Exchange Chromatography • Le Châtelier's Principle • Two-Dimensional Gel Electrophoresis • Using a pH Meter
INDICATOR	9C.2.1.3.4.	<p>Balance chemical equations by applying the laws of conservation of mass and constant composition.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Assembly of a Reflux System for Heated Chemical Reactions • Conducting Reactions Below Room Temperature • Coordination Chemistry Complexes • Determining Rate Laws and the Order of Reaction • Determining the Empirical Formula • Determining the Solubility Rules of Ionic Compounds • Introduction to Catalysis • Introduction to Titration • Preparing Anhydrous Reagents and Equipment • Proton Exchange Membrane Fuel Cells • Solutions and Concentrations • Spectrophotometric Determination of an Equilibrium Constant • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
INDICATOR	9C.2.1.3.5.	<p>Use the law of conservation of mass to describe and calculate relationships in a chemical reaction, including</p>

		<p>molarity, mole/mass relationships, mass/volume relations, limiting reactants and percent yield.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Calibration Curves • Capillary Electrophoresis (CE) • Cyclic Voltammetry (CV) • Determining Rate Laws and the Order of Reaction • Determining the Empirical Formula • Determining the Mass Percent Composition in an Aqueous Solution • Freezing-Point Depression to Determine an Unknown Compound • Gas Chromatography (GC) with Flame-Ionization Detection • High-Performance Liquid Chromatography (HPLC) • Internal Standards • Introduction to Titration • Introduction to the Microplate Reader • Introduction to the Spectrophotometer • Le Châtelier's Principle • Making Solutions in the Laboratory • Method of Standard Addition • Nuclear Magnetic Resonance (NMR) Spectroscopy • Photometric Protein Determination • Sample Preparation for Analytical Preparation • Solutions and Concentrations • Spectrophotometric Determination of an Equilibrium Constant • Understanding Concentration and Measuring Volumes
INDICATOR	9C.2.1.3.6.	<p>Describe the factors that affect the rate of a chemical reaction, including temperature, pressure, mixing, concentration, particle size, surface area and catalyst.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Conducting Reactions Below Room Temperature • Coordination Chemistry Complexes • Determining Rate Laws and the Order of Reaction • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Enzyme Assays and Kinetics • Introduction to Catalysis
INDICATOR	9C.2.1.3.7.	<p>Recognize that some chemical reactions are reversible and that not all chemical reactions go to completion.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Assembly of a Reflux System for Heated Chemical Reactions • Le Châtelier's Principle • Spectrophotometric Determination of an Equilibrium Constant

CONTENT STANDARD / DOMAIN	MN.9C.	Chemistry
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9C.2.	Physical Science
INDICATORS OF PROGRESS / STRAND	9C.2.1.	Matter
INDICATORS OF PROGRESS	9C.2.1.4.	The student will understand that states of matter can be described in terms of motion of molecules. The properties and behavior of gases can be explained using the Kinetic Molecular Theory.
INDICATOR	9C.2.1.4.1.	<p>Use kinetic molecular theory to explain how changes in energy content affect the state of matter (solid, liquid and gaseous phases).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Fractional Distillation • Ideal Gas Law • The Ideal Gas Law
INDICATOR	9C.2.1.4.2.	<p>Explain changes in temperature, pressure, volume and number of particles of a gas in terms of the random motion of molecules in an ideal gas.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining Rate Laws and the Order of Reaction • Ideal Gas Law • The Ideal Gas Law
CONTENT STANDARD / DOMAIN	MN.9P.	Physics
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9P.1.	The Nature of Science and Engineering
INDICATORS OF PROGRESS / STRAND	9P.1.3.	Interactions Among Science, Technology, Engineering, Mathematics, and Society
INDICATORS OF PROGRESS	9P.1.3.3.	The student will understand that developments in physics affect society and societal concerns affect the field of physics.
INDICATOR	9P.1.3.3.1.	<p>Describe changes in society that have resulted from significant discoveries and advances in technology in physics.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to the Centrifuge • Electro-encephalography (EEG) • Measuring Mass in the Laboratory
CONTENT STANDARD / DOMAIN	MN.9P.	Physics

PERFORMANCE INDICATOR / DOMAIN COMPONENT	9P.1.	The Nature of Science and Engineering
INDICATORS OF PROGRESS / STRAND	9P.1.3.	Interactions Among Science, Technology, Engineering, Mathematics, and Society
INDICATORS OF PROGRESS	9P.1.3.4.	The student will understand that physical and mathematical models are used to describe physical systems.
INDICATOR	9P.1.3.4.1.	<p>Use significant figures and an understanding of accuracy and precision in scientific measurements to determine and express the uncertainty of a result.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Determining Spatial Orientation of Rock Layers with the Brunton Compass • Method of Standard Addition • Observational Research
CONTENT STANDARD / DOMAIN	MN.9P.	Physics
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9P.2.	Physical Science
INDICATORS OF PROGRESS / STRAND	9P.2.2.	Motion
INDICATORS OF PROGRESS	9P.2.2.2.	The student will understand that when objects change their motion or interact with other objects in the absence of frictional forces, the total amount of mechanical energy remains constant.
INDICATOR	9P.2.2.2.2.	<p>Describe and calculate the change in velocity for objects when forces are applied perpendicular to the direction of motion.</p> <p>JoVE</p> <ul style="list-style-type: none"> • An Introduction to the Centrifuge
CONTENT STANDARD / DOMAIN	MN.9P.	Physics
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9P.2.	Physical Science
INDICATORS OF PROGRESS / STRAND	9P.2.3.	Energy
INDICATORS OF PROGRESS	9P.2.3.1.	The student will understand that sound waves are generated from mechanical oscillations of objects and travel through a medium.
INDICATOR	9P.2.3.1.3.	<p>Explain how wave properties, such as interference, resonance, refraction and reflection, affect sound waves.</p> <p>JoVE</p>

		<ul style="list-style-type: none"> • Abdominal Exam II: Percussion • Auscultation • Percussion • Peripheral Vascular Exam Using a Continuous Wave Doppler
INDICATOR	9P.2.3.1.4.	<p>Describe the Doppler effect changes that occur in an observed sound as a result of the motion of a source of the sound relative to a receiver.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Peripheral Vascular Exam Using a Continuous Wave Doppler
CONTENT STANDARD / DOMAIN	MN.9P.	Physics
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9P.2.	Physical Science
INDICATORS OF PROGRESS / STRAND	9P.2.3.	Energy
INDICATORS OF PROGRESS	9P.2.3.2.	The student will understand that electrons respond to electric fields and voltages by moving through electrical circuits and this motion generates magnetic fields.
INDICATOR	9P.2.3.2.1.	<p>Explain why currents flow when free charges are placed in an electrical field, and how that forms the basis for electrical circuits.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat
INDICATOR	9P.2.3.2.3.	<p>Describe how moving electric charges produce magnetic forces and moving magnets produce electric forces.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • fMRI: Functional Magnetic Resonance Imaging
CONTENT STANDARD / DOMAIN	MN.9P.	Physics
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9P.2.	Physical Science
INDICATORS OF PROGRESS / STRAND	9P.2.3.	Energy
INDICATORS OF PROGRESS	9P.2.3.3.	The student will understand that magnetic and electric fields interact to produce electromagnetic waves.
INDICATOR	9P.2.3.3.1.	<p>Describe the nature of the magnetic and electrical fields in a propagating electromagnetic wave.</p> <p><u>JoVE</u></p>

		<ul style="list-style-type: none"> • Nuclear Magnetic Resonance (NMR) Spectroscopy • Raman Spectroscopy for Chemical Analysis
INDICATOR	9P.2.3.3.4.	<p>Use properties of light, including reflection, refraction, interference, Doppler effect and the photoelectric effect, to explain phenomena and describe applications.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Color Afterimages • Crowding • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Finding Your Blind Spot and Perceptual Filling-in • Histological Sample Preparation for Light Microscopy • Inattentional Blindness • Introduction to Fluorescence Microscopy • Introduction to Light Microscopy • Introduction to the Spectrophotometer • Just-noticeable Differences • Lead Analysis of Soil Using Atomic Absorption Spectroscopy • Motion-induced Blindness • Nutrients in Aquatic Ecosystems • Object Substitution Masking • Photometric Protein Determination • Raman Spectroscopy for Chemical Analysis • Spatial Cueing • Spectrophotometric Determination of an Equilibrium Constant • Surface Plasmon Resonance (SPR) • The Ames Room • The Attentional Blink • The Inverted-face Effect • Turbidity and Total Solids in Surface Water • Ultraviolet-Visible (UV-Vis) Spectroscopy
INDICATOR	9P.2.3.3.5.	<p>Compare the wave model and particle model in explaining properties of light.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Förster Resonance Energy Transfer (FRET) • Introduction to Mass Spectrometry • MALDI-TOF Mass Spectrometry • Nuclear Magnetic Resonance (NMR) Spectroscopy • Raman Spectroscopy for Chemical Analysis • Tandem Mass Spectrometry • Ultraviolet-Visible (UV-Vis) Spectroscopy
INDICATOR	9P.2.3.3.6.	<p>Compare the wavelength, frequency and energy of different kinds of waves in the electromagnetic spectrum and describe their applications.</p> <p><u>JoVE</u></p>

- An Introduction to Behavioral Neuroscience
- An Introduction to Cognition
- An Introduction to Learning and Memory
- An Introduction to Motor Control
- An Introduction to Neuroanatomy
- Color Afterimages
- Community DNA Extraction from Bacterial Colonies
- Conducting Reactions Below Room Temperature
- Coordination Chemistry Complexes
- Decision-making and the Iowa Gambling Task
- Decoding Auditory Imagery with Multivoxel Pattern Analysis
- Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy
- Determining the Empirical Formula
- Electro-encephalography (EEG)
- Eye Tracking in Cognitive Experiments
- Fear Conditioning
- Finding Your Blind Spot and Perceptual Filling-in
- Förster Resonance Energy Transfer (FRET)
- Gas Chromatography (GC) with Flame-Ionization Detection
- Growing Crystals for X-ray Diffraction Analysis
- Internal Standards
- Introduction to Catalysis
- Introduction to Mass Spectrometry
- Introduction to the Spectrophotometer
- 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
- Nuclear Magnetic Resonance (NMR) Spectroscopy
- Nutrients in Aquatic Ecosystems
- Photometric Protein Determination
- Physical Properties Of Minerals I: Crystals and Cleavage
- Plasmid Purification
- Protein Crystallization
- Purifying Compounds by Recrystallization
- Raman Spectroscopy for Chemical Analysis
- Solid-Liquid Extraction
- Spatial Cueing
- Spectrophotometric Determination of an Equilibrium Constant
- Tandem Mass Spectrometry
- The Attentional Blink

		<ul style="list-style-type: none"> • The Rubber Hand Illusion • Ultraviolet-Visible (UV-Vis) Spectroscopy • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Using TMS to Measure Motor Excitability During Action Observation • Visual Attention: fMRI Investigation of Object-based Attentional Control • X-ray Fluorescence (XRF) • Yeast Maintenance • fMRI: Functional Magnetic Resonance Imaging
CONTENT STANDARD / DOMAIN	MN.9P.	Physics
PERFORMANCE INDICATOR / DOMAIN COMPONENT	9P.2.	Physical Science
INDICATORS OF PROGRESS / STRAND	9P.2.3.	Energy
INDICATORS OF PROGRESS	9P.2.3.4.	The student will understand that heat is energy transferred between objects or regions that are at different temperatures by the processes of convection, conduction and radiation.
INDICATOR	9P.2.3.4.1.	Describe and calculate the quantity of heat transferred between solids and/or liquids, using specific heat, density and temperatures. <u>JoVE</u> <ul style="list-style-type: none"> • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy

Grade: 9 - Adopted: 2010

CONTENT STANDARD / DOMAIN	MN.9.13.	Reading Benchmarks: Literacy in Science and Technical Subjects 6-12
PERFORMANCE INDICATOR / DOMAIN COMPONENT		Craft and Structure
INDICATORS OF PROGRESS / STRAND	9.13.4.4.	Determine the meaning of symbols, equations, graphical representations, tabular representations, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics. <u>JoVE</u> <ul style="list-style-type: none"> • 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
- An Introduction to Cell Division
- An Introduction to Cell Metabolism
- An Introduction to Cell Motility and Migration
- An Introduction to Cellular and Molecular Neuroscience
- An Introduction to Cognition
- An Introduction to Developmental Genetics
- An Introduction to Developmental Neurobiology
- An Introduction to Drosophila melanogaster
- An Introduction to Endocytosis and Exocytosis
- 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 Working in the Hood
- 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
- 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
- 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
- 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
- Comprehensive Breast Exam
- 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
- 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
- Detection of Bacteriophages in Environmental Samples
- 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
- Development of the Chick
- Diagnostic Necropsy and Tissue Harvest
- Dialysis: Diffusion Based Separation
- Dichotic Listening
- Dissolved Oxygen in Surface Water
- Drosophila Development and Reproduction
- Drosophila Larval IHC
- Drosophila Maintenance
- Drosophila melanogaster Embryo and Larva Harvesting and Preparation
- Ear Exam
- Elbow Exam
- Electro-encephalography (EEG)

- **Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat**
- **Electrophoretic Mobility Shift Assay (EMSA)**
- **Embryonic Stem Cell Culture and Differentiation**
- **Emergency Tube Thoracostomy (Chest Tube Placement)**
- **Emergent Lateral Canthotomy and Inferior Catholysis**
- **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**
- **Experimentation using a Confederate**
- **Explant Culture for Developmental Studies**
- **Explant Culture of Neural Tissue**
- **Expression Profiling with Microarrays**
- **Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction**
- **Eye Exam**
- **Eye Tracking in Cognitive Experiments**
- **FM Dyes in Vesicle Recycling**
- **Fate Mapping**
- **Fear Conditioning**
- **Filamentous Fungi**
- **Finding Your Blind Spot and Perceptual Filling-in**
- **Foot Exam**
- **Fractional Distillation**
- **Freezing-Point Depression to Determine an Unknown Compound**
- **From Theory to Design: The Role of Creativity in Designing Experiments**
- **Fundamentals of Breeding and Weaning**
- **Förster Resonance Energy Transfer (FRET)**
- **Gas Chromatography (GC) with Flame-Ionization Detection**
- **Gel Purification**
- **Gene Silencing with Morpholinos**
- **General Approach to the Physical Exam**
- **Genetic Crosses**
- **Genetic Engineering of Model Organisms**
- **Genetic Screens**
- **Genome Editing**
- **Gram Staining of Bacteria from Environmental Sources**
- **Growing Crystals for X-ray Diffraction Analysis**
- **Habituation: Studying Infants Before They Can Talk**
- **Hand and Wrist Exam**
- **High-Performance Liquid Chromatography (HPLC)**
- **Hip Exam**
- **Histological Sample Preparation for Light Microscopy**
- **Histological Staining of Neural Tissue**
- **How Children Solve Problems Using Causal Reasoning**

- Ideal Gas Law
- Igneous Intrusive Rock
- Igneous Volcanic Rock
- In ovo Electroporation of Chicken Embryos
- Inattentive Blindness
- Incidental Encoding
- Induced Pluripotency
- Internal Standards
- Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation
- Intraosseous Needle Placement
- Introducing Experimental Agents into the Mouse
- Introduction to Catalysis
- Introduction to Fluorescence Microscopy
- Introduction to Light Microscopy
- Introduction to Mass Spectrometry
- Introduction to Serological Pipettes and Pipettors
- Introduction to Titration
- Introduction to the Bunsen Burner
- Introduction to the Microplate Reader
- Introduction to the Spectrophotometer
- Invasion Assay Using 3D Matrices
- Invertebrate Lifespan Quantification
- Ion-Exchange Chromatography
- Isolating Nucleic Acids from Yeast
- Isolation of Fecal Bacteria from Water Samples by Filtration
- Just-noticeable Differences
- Knee Exam
- 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
- Live Cell Imaging of Mitosis
- Lower Back Exam
- Lymph Node Exam
- MALDI-TOF Mass Spectrometry
- Making Solutions in the Laboratory
- Making a Geologic Cross Section
- Male Rectal Exam
- Manipulating an Independent Variable through Embodiment
- Measuring Children's Trust in Testimony
- Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain
- Measuring Mass in the Laboratory
- 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**
- **Molecular Cloning**
- **Motion-induced Blindness**
- **Motor Exam I**
- **Motor Exam II**
- **Motor Learning in Mirror Drawing**
- **Motor Maps**
- **Mouse Genotyping**
- **Multiple Object Tracking**
- **Murine In Utero Electroporation**
- **Mutual Exclusivity: How Children Learn the Meanings of Words**
- **Neck Exam**
- **Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment**
- **Neuronal Transfection Methods**
- **Nose, Sinuses, Oral Cavity and Pharynx Exam**
- **Nuclear Magnetic Resonance (NMR) Spectroscopy**
- **Numerical Cognition: More or Less**
- **Nutrients in Aquatic Ecosystems**
- **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**
- **Perspectives on Cognitive Psychology**
- **Perspectives on Neuropsychology**
- **Perspectives on Sensation and Perception**
- **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**
- **Primary Neuronal Cultures**
- **Proper Adjustment of Patient Attire during the Physical Exam**
- **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**
- **Recombineering and Gene Targeting**
- **Reconstitution of Membrane Proteins**
- **Regulating Temperature in the Lab: Applying Heat**
- **Regulating Temperature in the Lab: Preserving Samples Using Cold**
- **Reliability in Psychology Experiments**
- **Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry**
- **Respiratory Exam I: Inspection and Palpation**
- **Respiratory Exam II: Percussion and Auscultation**
- **Restriction Enzyme Digests**
- **Rodent Handling and Restraint Techniques**
- **Rodent Identification I**
- **Rodent Identification II**
- **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**
- **Sensory Exam**
- **Separating Protein with SDS-PAGE**
- **Separation of Mixtures via Precipitation**
- **Shoulder Exam I**
- **Shoulder Exam II**

- **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**
- **Spatial Cueing**
- **Spatial Memory Testing Using Mazes**
- **Spectrophotometric Determination of an Equilibrium Constant**
- **Sterile Tissue Harvest**
- **Surface Plasmon Resonance (SPR)**
- **Surgical Cricothyrotomy**
- **Tandem Mass Spectrometry**
- **Testing For Genetically Modified Foods**
- **The ATP Bioluminescence Assay**
- **The Ames Room**
- **The Attentional Blink**
- **The Costs and Benefits of Natural Pedagogy**
- **The ELISA Method**
- **The Factorial Experiment**
- **The Ideal Gas Law**
- **The Inverted-face Effect**
- **The McGurk Effect**
- **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**
- **Tissue Regeneration with Somatic Stem Cells**
- **Transplantation Studies**
- **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**

		<ul style="list-style-type: none"> • Using TMS to Measure Motor Excitability During Action Observation • Using Topographic Maps to Generate Topographic Profiles • 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 • Whole-Mount In Situ Hybridization • Within-subjects Repeated-measures Design • X-ray Fluorescence (XRF) • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development • fMRI: Functional Magnetic Resonance Imaging
<p>INDICATORS OF PROGRESS / STRAND</p>	<p>9.13.5.5.</p>	<p>Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • 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 • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Cognition • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Drosophila melanogaster • An Introduction to Endocytosis and Exocytosis • 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 Working in the Hood**
- **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**
- **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**
- **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**
- **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**
- **Comprehensive Breast Exam**
- **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**
- **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**
- **Detection of Bacteriophages in Environmental Samples**
- **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**
- **Development of the Chick**
- **Diagnostic Necropsy and Tissue Harvest**
- **Dialysis: Diffusion Based Separation**
- **Dichotic Listening**
- **Dissolved Oxygen in Surface Water**
- **Drosophila Development and Reproduction**
- **Drosophila Larval IHC**
- **Drosophila Maintenance**
- **Drosophila melanogaster Embryo and Larva Harvesting and Preparation**
- **Ear Exam**
- **Elbow Exam**
- **Electro-encephalography (EEG)**
- **Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat**
- **Electrophoretic Mobility Shift Assay (EMSA)**
- **Embryonic Stem Cell Culture and Differentiation**
- **Emergency Tube Thoracostomy (Chest Tube Placement)**
- **Emergent Lateral Canthotomy and Inferior Catholysis**
- **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
- Experimentation using a Confederate
- Explant Culture for Developmental Studies
- Explant Culture of Neural Tissue
- Expression Profiling with Microarrays
- Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction
- Eye Exam
- Eye Tracking in Cognitive Experiments
- FM Dyes in Vesicle Recycling
- Fate Mapping
- Fear Conditioning
- Filamentous Fungi
- Finding Your Blind Spot and Perceptual Filling-in
- Foot Exam
- Fractional Distillation
- Freezing-Point Depression to Determine an Unknown Compound
- From Theory to Design: The Role of Creativity in Designing Experiments
- Fundamentals of Breeding and Weaning
- Förster Resonance Energy Transfer (FRET)
- Gas Chromatography (GC) with Flame-Ionization Detection
- Gel Purification
- Gene Silencing with Morpholinos
- General Approach to the Physical Exam
- Genetic Crosses
- Genetic Engineering of Model Organisms
- Genetic Screens
- Genome Editing
- Gram Staining of Bacteria from Environmental Sources
- Growing Crystals for X-ray Diffraction Analysis
- Habituation: Studying Infants Before They Can Talk
- Hand and Wrist Exam
- High-Performance Liquid Chromatography (HPLC)
- Hip Exam
- Histological Sample Preparation for Light Microscopy
- Histological Staining of Neural Tissue
- How Children Solve Problems Using Causal Reasoning
- Ideal Gas Law
- Igneous Intrusive Rock
- Igneous Volcanic Rock
- In ovo Electroporation of Chicken Embryos
- Inattentive Blindness
- Incidental Encoding
- Induced Pluripotency
- Internal Standards
- Intra-articular Shoulder Injection for Reduction

Following Anterior Shoulder Dislocation

- **Intraosseous Needle Placement**
- **Introducing Experimental Agents into the Mouse**
- **Introduction to Catalysis**
- **Introduction to Fluorescence Microscopy**
- **Introduction to Light Microscopy**
- **Introduction to Mass Spectrometry**
- **Introduction to Serological Pipettes and Pipettors**
- **Introduction to Titration**
- **Introduction to the Bunsen Burner**
- **Introduction to the Microplate Reader**
- **Introduction to the Spectrophotometer**
- **Invasion Assay Using 3D Matrices**
- **Invertebrate Lifespan Quantification**
- **Ion-Exchange Chromatography**
- **Isolating Nucleic Acids from Yeast**
- **Isolation of Fecal Bacteria from Water Samples by Filtration**
- **Just-noticeable Differences**
- **Knee Exam**
- **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**
- **Live Cell Imaging of Mitosis**
- **Lower Back Exam**
- **Lymph Node Exam**
- **MALDI-TOF Mass Spectrometry**
- **Making Solutions in the Laboratory**
- **Making a Geologic Cross Section**
- **Male Rectal Exam**
- **Manipulating an Independent Variable through Embodiment**
- **Measuring Children's Trust in Testimony**
- **Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain**
- **Measuring Mass in the Laboratory**
- **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**

- **Molecular Cloning**
- **Motion-induced Blindness**
- **Motor Exam I**
- **Motor Exam II**
- **Motor Learning in Mirror Drawing**
- **Motor Maps**
- **Mouse Genotyping**
- **Multiple Object Tracking**
- **Murine In Utero Electroporation**
- **Mutual Exclusivity: How Children Learn the Meanings of Words**
- **Neck Exam**
- **Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment**
- **Neuronal Transfection Methods**
- **Nose, Sinuses, Oral Cavity and Pharynx Exam**
- **Nuclear Magnetic Resonance (NMR) Spectroscopy**
- **Numerical Cognition: More or Less**
- **Nutrients in Aquatic Ecosystems**
- **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**
- **Perspectives on Sensation and Perception**
- **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**

- Primary Neuronal Cultures
- Proper Adjustment of Patient Attire during the Physical Exam
- 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
- Recombineering and Gene Targeting
- Reconstitution of Membrane Proteins
- Regulating Temperature in the Lab: Applying Heat
- Regulating Temperature in the Lab: Preserving Samples Using Cold
- Reliability in Psychology Experiments
- Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry
- Respiratory Exam I: Inspection and Palpation
- Respiratory Exam II: Percussion and Auscultation
- Restriction Enzyme Digests
- Rodent Handling and Restraint Techniques
- Rodent Identification I
- Rodent Identification II
- 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
- Sensory Exam
- Separating Protein with SDS-PAGE
- Separation of Mixtures via Precipitation
- Shoulder Exam I
- Shoulder Exam II
- 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
- Spatial Cueing

- Spatial Memory Testing Using Mazes
- Spectrophotometric Determination of an Equilibrium Constant
- Sterile Tissue Harvest
- Surface Plasmon Resonance (SPR)
- Surgical Cricothyrotomy
- Tandem Mass Spectrometry
- Testing For Genetically Modified Foods
- The ATP Bioluminescence Assay
- The Ames Room
- The Attentional Blink
- The Costs and Benefits of Natural Pedagogy
- The ELISA Method
- The Factorial Experiment
- The Ideal Gas Law
- The Inverted-face Effect
- The McGurk Effect
- 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
- Tissue Regeneration with Somatic Stem Cells
- Transplantation Studies
- 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 Topographic Maps to Generate Topographic Profiles
- Using Your Head: Measuring Infants' Rational Imitation of Actions
- Using a pH Meter

		<ul style="list-style-type: none"> • 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 • Whole-Mount In Situ Hybridization • Within-subjects Repeated-measures Design • X-ray Fluorescence (XRF) • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development • fMRI: Functional Magnetic Resonance Imaging
CONTENT STANDARD / DOMAIN	MN.9.13.	Reading Benchmarks: Literacy in Science and Technical Subjects 6-12
PERFORMANCE INDICATOR / DOMAIN COMPONENT		Integration of Knowledge and Ideas
INDICATORS OF PROGRESS / STRAND	9.13.7.7.	<p>Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • 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 Division • An Introduction to Cell Metabolism • An Introduction to Cognition • An Introduction to Developmental Neurobiology • An Introduction to Drosophila melanogaster • An Introduction to Endocytosis and Exocytosis • An Introduction to Learning and Memory • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to Motor Control • An Introduction to Neurophysiology • An Introduction to Reward and Addiction • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of Genetic Analysis • An Overview of Genetics and Disease • An Overview of bGDGT Biomarker Analysis for

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**
- **Experimentation using a Confederate**
- **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**
- **Freezing-Point Depression to Determine an Unknown Compound**
- **From Theory to Design: The Role of Creativity in Designing Experiments**
- **Förster Resonance Energy Transfer (FRET)**
- **Gas Chromatography (GC) with Flame-Ionization Detection**
- **Gene Silencing with Morpholinos**
- **Genetic Crosses**
- **Genetic Screens**
- **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**
- **Igneous Intrusive Rock**
- **Igneous Volcanic Rock**

- Inattentive 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
- 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
- Making a Geologic Cross Section
- Manipulating an Independent Variable through Embodiment
- 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
- 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
- Spatial Cueing

- Spatial Memory Testing Using Mazes
- Spectrophotometric Determination of an Equilibrium Constant
- Surface Plasmon Resonance (SPR)
- Tandem Mass Spectrometry
- Testing For Genetically Modified Foods
- The ATP Bioluminescence Assay
- The Attentional Blink
- The Costs and Benefits of Natural Pedagogy
- The ELISA Method
- The Factorial Experiment
- The Ideal Gas Law
- The Inverted-face Effect
- 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 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 Topographic Maps to Generate Topographic Profiles
- 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
- Within-subjects Repeated-measures Design

		<ul style="list-style-type: none"> • X-ray Fluorescence (XRF) • Yeast Maintenance • fMRI: Functional Magnetic Resonance Imaging
CONTENT STANDARD / DOMAIN	MN.9.14.	Writing Benchmarks: Literacy in Science and Technical Subjects 6-12
PERFORMANCE INDICATOR / DOMAIN COMPONENT		Text Types and Purposes
INDICATORS OF PROGRESS / STRAND	9.14.1.1.	Write arguments focused on discipline-specific content.
INDICATORS OF PROGRESS	9.14.1.1.a.	<p>Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • The Multi-group Experiment • The Simple Experiment: Two-group Design
CONTENT STANDARD / DOMAIN	MN.9.14.	Writing Benchmarks: Literacy in Science and Technical Subjects 6-12
PERFORMANCE INDICATOR / DOMAIN COMPONENT		Text Types and Purposes
INDICATORS OF PROGRESS / STRAND	9.14.2.2.	Write informative/explanatory texts, as they apply to each discipline and reporting format, including the narration of historical events, of scientific procedures/experiments, or description of technical processes.
INDICATORS OF PROGRESS	9.14.2.2.a.	<p>Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • The Multi-group Experiment • The Simple Experiment: Two-group Design
INDICATORS OF PROGRESS	9.14.2.2.d.	<p>Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • 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
- An Introduction to Cell Division
- An Introduction to Cell Metabolism
- An Introduction to Cell Motility and Migration
- An Introduction to Cellular and Molecular Neuroscience
- An Introduction to Cognition
- An Introduction to Developmental Genetics
- An Introduction to Developmental Neurobiology
- An Introduction to Drosophila melanogaster
- An Introduction to Endocytosis and Exocytosis
- 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 Working in the Hood
- 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**
- **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**
- **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**
- **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
- Comprehensive Breast Exam
- 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
- 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
- Detection of Bacteriophages in Environmental Samples
- 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
- Development of the Chick
- Diagnostic Necropsy and Tissue Harvest
- Dialysis: Diffusion Based Separation
- Dichotic Listening
- Dissolved Oxygen in Surface Water
- Drosophila Development and Reproduction
- Drosophila Larval IHC
- Drosophila Maintenance
- Drosophila melanogaster Embryo and Larva Harvesting and Preparation

- Ear Exam
- Elbow Exam
- Electro-encephalography (EEG)
- Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat
- Electrophoretic Mobility Shift Assay (EMSA)
- Embryonic Stem Cell Culture and Differentiation
- Emergency Tube Thoracostomy (Chest Tube Placement)
- Emergent Lateral Canthotomy and Inferior Catholysis
- 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
- Experimentation using a Confederate
- Explant Culture for Developmental Studies
- Explant Culture of Neural Tissue
- Expression Profiling with Microarrays
- Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction
- Eye Exam
- Eye Tracking in Cognitive Experiments
- FM Dyes in Vesicle Recycling
- Fate Mapping
- Fear Conditioning
- Filamentous Fungi
- Finding Your Blind Spot and Perceptual Filling-in
- Foot Exam
- Fractional Distillation
- Freezing-Point Depression to Determine an Unknown Compound
- From Theory to Design: The Role of Creativity in Designing Experiments
- Fundamentals of Breeding and Weaning
- Förster Resonance Energy Transfer (FRET)
- Gas Chromatography (GC) with Flame-Ionization Detection
- Gel Purification
- Gene Silencing with Morpholinos
- General Approach to the Physical Exam
- Genetic Crosses
- Genetic Engineering of Model Organisms
- Genetic Screens
- Genome Editing
- Gram Staining of Bacteria from Environmental Sources
- Growing Crystals for X-ray Diffraction Analysis
- Habituation: Studying Infants Before They Can Talk
- Hand and Wrist Exam
- High-Performance Liquid Chromatography (HPLC)

- Hip Exam
- Histological Sample Preparation for Light Microscopy
- Histological Staining of Neural Tissue
- How Children Solve Problems Using Causal Reasoning
- Ideal Gas Law
- Igneous Intrusive Rock
- Igneous Volcanic Rock
- In ovo Electroporation of Chicken Embryos
- Inattentive Blindness
- Incidental Encoding
- Induced Pluripotency
- Internal Standards
- Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation
- Intraosseous Needle Placement
- Introducing Experimental Agents into the Mouse
- Introduction to Catalysis
- Introduction to Fluorescence Microscopy
- Introduction to Light Microscopy
- Introduction to Mass Spectrometry
- Introduction to Serological Pipettes and Pipettors
- Introduction to Titration
- Introduction to the Bunsen Burner
- Introduction to the Microplate Reader
- Introduction to the Spectrophotometer
- Invasion Assay Using 3D Matrices
- Invertebrate Lifespan Quantification
- Ion-Exchange Chromatography
- Isolating Nucleic Acids from Yeast
- Isolation of Fecal Bacteria from Water Samples by Filtration
- Just-noticeable Differences
- Knee Exam
- 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
- Live Cell Imaging of Mitosis
- Lower Back Exam
- Lymph Node Exam
- MALDI-TOF Mass Spectrometry
- Making Solutions in the Laboratory
- Making a Geologic Cross Section
- Male Rectal Exam
- Manipulating an Independent Variable through Embodiment
- Measuring Children's Trust in Testimony
- Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain
- Measuring Mass in the Laboratory

- **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**
- **Molecular Cloning**
- **Motion-induced Blindness**
- **Motor Exam I**
- **Motor Exam II**
- **Motor Learning in Mirror Drawing**
- **Motor Maps**
- **Mouse Genotyping**
- **Multiple Object Tracking**
- **Murine In Utero Electroporation**
- **Mutual Exclusivity: How Children Learn the Meanings of Words**
- **Neck Exam**
- **Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment**
- **Neuronal Transfection Methods**
- **Nose, Sinuses, Oral Cavity and Pharynx Exam**
- **Nuclear Magnetic Resonance (NMR) Spectroscopy**
- **Numerical Cognition: More or Less**
- **Nutrients in Aquatic Ecosystems**
- **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**

- Perspectives on Sensation and Perception
- 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
- Primary Neuronal Cultures
- Proper Adjustment of Patient Attire during the Physical Exam
- 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
- Recombineering and Gene Targeting
- Reconstitution of Membrane Proteins
- Regulating Temperature in the Lab: Applying Heat
- Regulating Temperature in the Lab: Preserving Samples Using Cold
- Reliability in Psychology Experiments
- Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry
- Respiratory Exam I: Inspection and Palpation
- Respiratory Exam II: Percussion and Auscultation
- Restriction Enzyme Digests
- Rodent Handling and Restraint Techniques
- Rodent Identification I
- Rodent Identification II
- 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

- Sensory Exam
- Separating Protein with SDS-PAGE
- Separation of Mixtures via Precipitation
- Shoulder Exam I
- Shoulder Exam II
- 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
- Spatial Cueing
- Spatial Memory Testing Using Mazes
- Spectrophotometric Determination of an Equilibrium Constant
- Sterile Tissue Harvest
- Surface Plasmon Resonance (SPR)
- Surgical Cricothyrotomy
- Tandem Mass Spectrometry
- Testing For Genetically Modified Foods
- The ATP Bioluminescence Assay
- The Ames Room
- The Attentional Blink
- The Costs and Benefits of Natural Pedagogy
- The ELISA Method
- The Factorial Experiment
- The Ideal Gas Law
- The Inverted-face Effect
- The McGurk Effect
- 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
- Tissue Regeneration with Somatic Stem Cells
- Transplantation Studies
- 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

		<ul style="list-style-type: none"> • 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 Topographic Maps to Generate Topographic Profiles • 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 • Whole-Mount In Situ Hybridization • Within-subjects Repeated-measures Design • X-ray Fluorescence (XRF) • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development • fMRI: Functional Magnetic Resonance Imaging
CONTENT STANDARD / DOMAIN	MN.9.14.	Writing Benchmarks: Literacy in Science and Technical Subjects 6-12
PERFORMANCE INDICATOR / DOMAIN COMPONENT		Text Types and Purposes
INDICATORS OF PROGRESS / STRAND	9.14.3.3.	(See note; not applicable as a separate requirement)
INDICATORS OF PROGRESS	9.14.3.3.a.	<p>Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In history/social studies, students must be able to incorporate narrative accounts into their analyses of individuals or events of historical import.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Ethics in Psychology Research • Experimentation using a Confederate

		<ul style="list-style-type: none">• From Theory to Design: The Role of Creativity in Designing Experiments• Manipulating an Independent Variable through Embodiment• Observational Research• Pilot Testing• Placebos in Research• Realism in Experimentation• Reliability in Psychology Experiments• The Factorial Experiment• The Multi-group Experiment• The Simple Experiment: Two-group Design• Within-subjects Repeated-measures Design
--	--	---