



Main Criteria: Rhode Island World-Class Standards

Secondary Criteria: JoVE

Subject: Science

Grade: 9-12

Correlation Options: Show Correlated

Adopted: 2006

DOMAIN	RI.ESS1.	Earth and Space Science: The earth and earth materials as we know them today have developed over long periods of time, through continual change processes.
STATEMENT OF ENDURING KNOWLEDGE	ESS1 (9-11) NOS-2.	Trace the development of the theory of plate tectonics or provide supporting geologic/geographic evidence that supports the validity of the theory of plate tectonics.
GSE STEM	ESS1 (9-11)-2.	Students demonstrate an understanding of processes and change over time within earth systems by...
SPECIFIC INDICATOR	2a.	<p>Using given data (diagrams, charts, narratives, etc.) and advances in technology to explain how scientific knowledge regarding plate tectonics has changed over time.</p> <p>JoVE</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
DOMAIN	RI.ESS1.	Earth and Space Science: The earth and earth materials as we know them today have developed over long periods of time, through continual change processes.
STATEMENT OF ENDURING KNOWLEDGE	ESS1 (9-11) SAE+ POC-3.	Explain how internal and external sources of heat (energy) fuel geologic processes (e.g., rock cycle, plate tectonics, sea floor spreading).
GSE STEM	ESS1 (9-11)-3.	Students demonstrate an understanding of processes and change over time within earth systems by...
SPECIFIC INDICATOR	3a.	<p>Explaining how heat (produced by friction, radioactive decay and pressure) affects the Rock Cycle.</p> <p>JoVE</p>

		<ul style="list-style-type: none"> • Igneous Intrusive Rock • Igneous Volcanic Rock
SPECIFIC INDICATOR	3b.	<p>Explaining how convection circulations of the mantle initiate the movement of the crustal plates which then cause plate movement and seismic activity.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Igneous Intrusive Rock • Igneous Volcanic Rock
SPECIFIC INDICATOR	3d.	<p>Explaining how the physical and chemical processes of the Earth alter the crust (e.g. seafloor spreading, hydrologic cycle, weathering, element cycling).</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 • Igneous Intrusive Rock • Igneous Volcanic Rock • Making a Geologic Cross Section • 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 • Turbidity and Total Solids in Surface Water • Using GIS to Investigate Urban Forestry • Using Topographic Maps to Generate Topographic Profiles
DOMAIN	RI.ESS1.	Earth and Space Science: The earth and earth materials as we know them today have developed over long periods of time, through continual change processes.
STATEMENT OF ENDURING KNOWLEDGE	ESS1 (9-11) SAE+ POC-3.	Explain how internal and external sources of heat (energy) fuel geologic processes (e.g., rock cycle, plate tectonics, sea floor spreading).
GSE STEM	ESS1 (Ext.)-3.	Example Extension(s): Students demonstrate an understanding of processes and change over time within earth systems by...
SPECIFIC INDICATOR	3bb.	Use computer modeling/ simulations to predict the effects of an increase in greenhouse gases on earth

		<p>systems (e.g. earth temperature, sea level, atmosphere composition).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Measuring Tropospheric Ozone
DOMAIN	RI.ESS1.	Earth and Space Science: The earth and earth materials as we know them today have developed over long periods of time, through continual change processes.
STATEMENT OF ENDURING KNOWLEDGE	ESS1 (9-11) INQ+POC+ MAS-4.	Relate how geologic time is determined using various dating methods (e.g. radioactive decay, rock sequences, fossil records).
GSE STEM	ESS1 (9-11)-4.	Students demonstrate an understanding of processes and change over time by...
SPECIFIC INDICATOR	4a.	<p>Describing various dating methods to determine the age of different rock structures.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Making a Geologic Cross Section
DOMAIN	RI.ESS1.	Earth and Space Science: The earth and earth materials as we know them today have developed over long periods of time, through continual change processes.
STATEMENT OF ENDURING KNOWLEDGE	ESS1 (9-11) INQ+POC+ MAS-4.	Relate how geologic time is determined using various dating methods (e.g. radioactive decay, rock sequences, fossil records).
GSE STEM	ESS1 (Ext.)-4.	Example Extension(s): Students demonstrate an understanding of processes and change over time by...
SPECIFIC INDICATOR	4bb.	<p>Analyzing samples of rock to determine the relative age of the rock structure.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Making a Geologic Cross Section
DOMAIN	RI.LS1.	Life Science: All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, & species).
STATEMENT OF ENDURING KNOWLEDGE	LS1 (9-11) INQ+SAE+FAF-1.	Use data and observation to make connections between, to explain, or to justify how specific cell organelles produce/regulate what the cell needs or what a unicellular or multi-cellular organism needs for survival (e.g., protein synthesis, DNA replication, nerve cells).
GSE STEM	LS1 (9-11)-1.	Students demonstrate understanding of structure and function-survival requirements by...
SPECIFIC INDICATOR	1a.	Explaining the relationships between and amongst the specialized structures of the cell and their functions (e.g. transport of materials, energy transfer, protein building, waste disposal, information feedback, and even

movement).

JoVE

- **An Introduction to Aging and Regeneration**
- **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 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**
- **Annexin V and Propidium Iodide Labeling**
- **Bacterial Transformation: Electroporation**
- **Bacterial Transformation: The Heat Shock Method**
- **Balance and Coordination Testing**
- ***C. elegans* Development and Reproduction**
- **Calcium Imaging in Neurons**
- **Cell Cycle Analysis**
- **Cell-surface Biotinylation Assay**
- **Cytogenetics**
- **DNA Ligation Reactions**
- **Density Gradient Ultracentrifugation**
- **Detecting Reactive Oxygen Species**
- **Electro-encephalography (EEG)**
- **Embryonic Stem Cell Culture and Differentiation**
- **Enzyme Assays and Kinetics**
- **Explant Culture of Neural Tissue**
- **FM Dyes in Vesicle Recycling**
- **Förster Resonance Energy Transfer (FRET)**
- **Gene Silencing with Morpholinos**
- **Genetic Crosses**
- **Histological Staining of Neural Tissue**
- **In ovo Electroporation of Chicken Embryos**
- **Induced Pluripotency**
- **Invasion Assay Using 3D Matrices**
- **Isolating Nucleic Acids from Yeast**
- **Live Cell Imaging of Mitosis**
- **Metabolic Labeling**
- **Molecular Cloning**
- **Murine In Utero Electroporation**
- **Neuronal Transfection Methods**
- **Passaging Cells**
- **Patch Clamp Electrophysiology**
- **Plasmid Purification**
- **Primary Neuronal Cultures**
- **Protein Crystallization**

		<ul style="list-style-type: none"> • Recombineering and Gene Targeting • Reconstitution of Membrane Proteins • Restriction Enzyme Digests • Surface Plasmon Resonance (SPR) • The ATP Bioluminescence Assay • The TUNEL Assay • The Transwell Migration Assay • The Western Blot • Tissue Regeneration with Somatic Stem Cells • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning
<p>SPECIFIC INDICATOR</p>	<p>1b.</p>	<p>Explaining that most multicellular organisms have specialized cells to survive, while unicellular organisms perform all survival functions. (e.g. nerve cells communicate with other cells, muscle cells contract, unicellular are not specialized).</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 Caenorhabditis elegans • An Introduction to Cell Division • 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 Drosophila melanogaster • An Introduction to Endocytosis and Exocytosis • 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 Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Overview of Epigenetics • An Overview of Gene Expression • Ankle Exam • Anterograde Amnesia • Bacterial Growth Curve Analysis and its Environmental Applications • Balance and Coordination Testing • C. elegans Development and Reproduction • Calcium Imaging in Neurons • Color Afterimages

- Cranial Nerves Exam I (I-VI)
- Cranial Nerves Exam II (VII-XII)
- Crowding
- DNA Methylation Analysis
- Development and Reproduction of the Laboratory Mouse
- Development of the Chick
- Drosophila Larval IHC
- Ear Exam
- Elbow Exam
- Electro-encephalography (EEG)
- Embryonic Stem Cell Culture and Differentiation
- Emergent Lateral Canthotomy and Inferior Catholysis
- Event-related Potentials and the Oddball Task
- Explant Culture for Developmental Studies
- Explant Culture of Neural Tissue
- Expression Profiling with Microarrays
- Eye Exam
- FM Dyes in Vesicle Recycling
- Fate Mapping
- Finding Your Blind Spot and Perceptual Filling-in
- Foot Exam
- Gene Silencing with Morpholinos
- Genetic Crosses
- Genetic Engineering of Model Organisms
- Hand and Wrist Exam
- Hip Exam
- Histological Staining of Neural Tissue
- Inattentive Blindness
- Induced Pluripotency
- Invasion Assay Using 3D Matrices
- Isolating Nucleic Acids from Yeast
- Just-noticeable Differences
- Knee Exam
- Lower Back Exam
- MALDI-TOF Mass Spectrometry
- Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain
- Motion-induced Blindness
- Motor Exam I
- Motor Exam II
- Murine In Utero Electroporation
- Neck Exam
- Neuronal Transfection Methods
- Object Substitution Masking
- Ophthalmoscopic Examination
- Passaging Cells
- Patch Clamp Electrophysiology
- Physiological Correlates of Emotion Recognition
- Primary Neuronal Cultures
- RNA-Seq

		<ul style="list-style-type: none"> • Rodent Stereotaxic Surgery • Sensory Exam • Shoulder Exam I • Shoulder Exam II • Spatial Cueing • The Ames Room • The Attentional Blink • The ELISA Method • The Inverted-face Effect • The McGurk Effect • The Rubber Hand Illusion • The Split Brain • The Staircase Procedure for Finding a Perceptual Threshold • The TUNEL Assay • The Transwell Migration Assay • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Using TMS to Measure Motor Excitability During Action Observation • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Reproduction and Development • fMRI: Functional Magnetic Resonance Imaging
SPECIFIC INDICATOR	1c.	<p>Comparing the role of various sub-cellular structures in unicellular organisms to comparable structures in multicellular organisms (e.g. oral groove, gullet, food vacuole in Paramecium compared to digestive systems in multicellular organisms).</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 Cell Motility and Migration • An Introduction to Drosophila melanogaster • An Introduction to Saccharomyces cerevisiae • Bacterial Growth Curve Analysis and its Environmental Applications • C. elegans Development and Reproduction • Genetic Crosses • Isolating Nucleic Acids from Yeast • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning

DOMAIN	RI.LS1.	Life Science: All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, & species).
STATEMENT OF ENDURING KNOWLEDGE	LS1 (9-11) INQ+SAE+FAF-1.	Use data and observation to make connections between, to explain, or to justify how specific cell organelles produce/regulate what the cell needs or what a unicellular or multi-cellular organism needs for survival (e.g., protein synthesis, DNA replication, nerve cells).
GSE STEM	LS1 (Ext)-1.	Example Extension(s): Students demonstrate understanding of structure and function-survival requirements by
SPECIFIC INDICATOR	1aa.	<p>Describing how the malfunction of cell organelles can lead to disease (e.g. 'leaky' lysosomes and rheumatoid arthritis)</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 • An Introduction to Behavioral Neuroscience • 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 Developmental Neurobiology • An Introduction to Drosophila melanogaster • An Introduction to Endocytosis and Exocytosis • An Introduction to Molecular Developmental Biology • 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 Genetics and Disease • Annexin V and Propidium Iodide Labeling • Blood Pressure Measurement • C. elegans Chemotaxis Assay • C. elegans Development and Reproduction • Calcium Imaging in Neurons • Cell-surface Biotinylation Assay • Chick ex ovo Culture • Detecting Reactive Oxygen Species • Electro-encephalography (EEG) • Embryonic Stem Cell Culture and Differentiation • Explant Culture of Neural Tissue • Eye Exam • FM Dyes in Vesicle Recycling • Gene Silencing with Morpholinos

		<ul style="list-style-type: none"> • Genetic Screens • Histological Staining of Neural Tissue • In ovo Electroporation of Chicken Embryos • Induced Pluripotency • Isolating Nucleic Acids from Yeast • Lymph Node Exam • Male Rectal Exam • Motor Exam I • Motor Exam II • Mouse Genotyping • Murine In Utero Electroporation • Ophthalmoscopic Examination • Patch Clamp Electrophysiology • Pelvic Exam II: Speculum Exam • Pelvic Exam III: Bimanual and Rectovaginal Exam • Peripheral Vascular Exam • Peripheral Vascular Exam Using a Continuous Wave Doppler • RNA-Seq • Recombineering and Gene Targeting • Reconstitution of Membrane Proteins • Respiratory Exam I: Inspection and Palpation • The ATP Bioluminescence Assay • The TUNEL Assay • Thyroid Exam • Tissue Regeneration with Somatic Stem Cells • Using a pH Meter • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • fMRI: Functional Magnetic Resonance Imaging
SPECIFIC INDICATOR	1bb.	<p>Identify various specialized cells and common unicellular organisms in diagrams, photographs and/or microscopic slides.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Metabolism • Density Gradient Ultracentrifugation • Reconstitution of Membrane Proteins • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy
SPECIFIC INDICATOR	1cc.	<p>Describing the origin and nature of stem cells and their potential for curing disease.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to Developmental Neurobiology • An Introduction to Organogenesis • An Introduction to Stem Cell Biology • An Overview of Gene Expression

		<ul style="list-style-type: none"> • C. elegans Development and Reproduction • Development and Reproduction of the Laboratory Mouse • Embryonic Stem Cell Culture and Differentiation • Fate Mapping • Genetic Engineering of Model Organisms • Induced Pluripotency • Murine In Utero Electroporation • Passaging Cells • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies
DOMAIN	RI.LS1.	Life Science: All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, & species).
STATEMENT OF ENDURING KNOWLEDGE	LS1 (9-11) FAF+ POC-2.	Explain or justify with evidence how the alteration of the DNA sequence may produce new gene combinations that make little difference, enhance capabilities, or can be harmful to the organism (e.g., selective breeding, genetic engineering, mutations).
GSE STEM	LS1 (9-11)-2.	Students demonstrate an understanding of the molecular basis for heredity by...
SPECIFIC INDICATOR	2a.	<p>Describing the DNA structure and relating the DNA sequence to the genetic code.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • 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 Molecular Developmental Biology • An Introduction to Saccharomyces cerevisiae • An Introduction to Transfection • 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 • Cell Cycle Analysis • 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

		<p>Polymerase Chain Reaction and Gel Electrophoresis</p> <ul style="list-style-type: none"> • 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 • 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 • PCR: The Polymerase Chain Reaction • Photometric Protein Determination • Plasmid Purification • Protein Crystallization • Quantifying Environmental Microorganisms and Viruses Using qPCR • RNA Analysis of Environmental Samples Using RT-PCR • RNA-Seq • Recombineering and Gene Targeting • Restriction Enzyme Digests • SNP Genotyping • Testing For Genetically Modified Foods • The TUNEL Assay • Two-Dimensional Gel Electrophoresis • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling
<p>SPECIFIC INDICATOR</p>	<p>2b.</p>	<p>Explaining how DNA may be altered and how this affects genes/heredity (e.g. substitution, insertion, or deletion).</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

		<ul style="list-style-type: none"> • 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
SPECIFIC INDICATOR	2c.	<p>Describing how DNA contains the code for the production of specific proteins.</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 • Detecting Reactive Oxygen Species • Electrophoretic Mobility Shift Assay (EMSA) • Expression Profiling with Microarrays • Gene Silencing with Morpholinos • Genome Editing • RNA Analysis of Environmental Samples Using RT-PCR • RNA-Seq • Whole-Mount In Situ Hybridization
DOMAIN	RI.LS1.	Life Science: All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, & species).
STATEMENT OF ENDURING KNOWLEDGE	LS1 (9-11) FAF+ POC-2.	Explain or justify with evidence how the alteration of the DNA sequence may produce new gene combinations that make little difference, enhance capabilities, or can be harmful to the organism (e.g., selective breeding, genetic engineering, mutations).
GSE STEM	LS1 (Ext)-2.	Example Extension(s): Students demonstrate an understanding of the molecular basis for heredity by...
SPECIFIC INDICATOR	2aa.	<p>Diagramming or modeling the relationship between chromosomes, genes and DNA, including histones and nucleosomes.</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

		<ul style="list-style-type: none"> • 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 <i>C. elegans</i> • 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
SPECIFIC INDICATOR	2bb.	<p>Describing the how foods are genetically modified and the potential health, environmental and economic advantages and disadvantages of doing so.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Genetic Engineering • Solid-Liquid Extraction • Testing For Genetically Modified Foods
SPECIFIC INDICATOR	2cc.	<p>Tracing in a diagram or model the information flow-DNA to RNA to Protein-through transcription and translation.</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 • 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

		<ul style="list-style-type: none"> • RNA-Seq • Whole-Mount In Situ Hybridization
DOMAIN	RI.LS2.	Life Science: Matter cycles and energy flows through an ecosystem.
STATEMENT OF ENDURING KNOWLEDGE	LS2 (9-11) INQ+SAE-3.	Using data from a specific ecosystem, explain relationships or make predictions about how environmental disturbance (human impact or natural events) affects the flow of energy or cycling of matter in an ecosystem.
GSE STEM	LS2 (9-11)-3.	Students demonstrate an understanding of equilibrium in an ecosystem by...
SPECIFIC INDICATOR	3b.	<p>Describing ways in which humans can modify ecosystems and describe and predict the potential impact (e.g. human population growth; technology; destruction of habitats; agriculture; pollution; and atmospheric changes).</p> <p><u>JoVE</u></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 • Introduction to Mass Spectrometry • Lead Analysis of Soil Using Atomic Absorption Spectroscopy • Measuring Tropospheric Ozone • Nutrients in Aquatic Ecosystems • Self-report vs. Behavioral Measures of Recycling • Turbidity and Total Solids in Surface Water • Water Quality Analysis via Indicator Organisms
DOMAIN	RI.LS2.	Life Science: Matter cycles and energy flows through an ecosystem.
STATEMENT OF ENDURING KNOWLEDGE	LS2 (9-11) INQ+SAE-3.	Using data from a specific ecosystem, explain relationships or make predictions about how environmental disturbance (human impact or natural events) affects the flow of energy or cycling of matter in an ecosystem.
GSE STEM	LS2 (Ext)-3.	Example Extension(s): Students demonstrate an understanding of equilibrium in an ecosystem by...
SPECIFIC INDICATOR	3bb.	<p>Researching and citing evidence of global warming to describe the potential impact on both the living and physical systems on Earth.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material
DOMAIN	RI.LS2.	Life Science: Matter cycles and energy flows through an ecosystem.

STATEMENT OF ENDURING KNOWLEDGE	LS2 (9-11) POC+ SAE-4.	Trace the cycling of matter (e.g., carbon cycle) and the flow of energy in a living system from its source through its transformation in cellular, biochemical processes (e.g., photosynthesis, cellular respiration, fermentation).
GSE STEM	LS2 (9-11)-4.	Students demonstrate an understanding of matter and energy flow in an ecosystem by...
SPECIFIC INDICATOR	4b.	<p>Explaining how the chemical elements and compounds that make up living things pass through food webs and are combined and recombined in different ways (e.g. nitrogen, carbon cycles, O₂, & H₂O cycles).</p> <p><u>JoVE</u></p> <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 • 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
DOMAIN	RI.LS2.	Life Science: Matter cycles and energy flows through an ecosystem.
STATEMENT OF ENDURING KNOWLEDGE	LS2 (9-11) POC+ SAE-4.	Trace the cycling of matter (e.g., carbon cycle) and the flow of energy in a living system from its source through its transformation in cellular, biochemical processes (e.g., photosynthesis, cellular respiration, fermentation).

GSE STEM	LS2 (Ext)-4.	Example Extension(s): Students demonstrate an understanding of matter and energy flow in an ecosystem by...
SPECIFIC INDICATOR	4aa.	<p>Explaining the energy transfer with cells in photosynthesis and cellular respiration, tracking ATP production and consumption.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • Biofuels: Producing Ethanol from Cellulosic Material • Detecting Reactive Oxygen Species • Invasion Assay Using 3D Matrices • The ATP Bioluminescence Assay • The Transwell Migration Assay
DOMAIN	RI.LS2.	Life Science: Matter cycles and energy flows through an ecosystem.
STATEMENT OF ENDURING KNOWLEDGE	LS2 (9-11) NOS-5.	Explain or evaluate potential bias in how evidence is interpreted in reports concerning a particular environmental factor that impacts the biology of humans.
GSE STEM	LS2 (9-11)-5.	Students will evaluate potential bias from a variety of media sources in how information is interpreted by...
SPECIFIC INDICATOR	5a.	<p>Analyzing claims from evidence and sources and evaluate based upon relevance, and validity.</p> <p><u>JoVE</u></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 • Reliability in Psychology Experiments • Self-report vs. Behavioral Measures of Recycling • The Factorial Experiment • The Multi-group Experiment • The Simple Experiment: Two-group Design • Within-subjects Repeated-measures Design
SPECIFIC INDICATOR	5b.	<p>Applying additional scientific data to develop logical arguments concerning environmental issues (e.g. tobacco company vs. cancer society articles on effects of smoking, government/big business vs. environmental perceptions of global climate change).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material

		<ul style="list-style-type: none"> • Determining the Mass Percent Composition in an Aqueous Solution • Determining the Solubility Rules of Ionic Compounds • Dissolved Oxygen in Surface Water • Isolation of Fecal Bacteria from Water Samples by Filtration • Le Châtelier's Principle • Lead Analysis of Soil Using Atomic Absorption Spectroscopy • Nutrients in Aquatic Ecosystems • Self-report vs. Behavioral Measures of Recycling • Solid-Liquid Extraction • Testing For Genetically Modified Foods • Turbidity and Total Solids in Surface Water
DOMAIN	RI.LS3.	Life Science: Groups of organisms show evidence of change over time (structures, behaviors, and biochemistry).
STATEMENT OF ENDURING KNOWLEDGE	LS3 (9-11) NOS-6.	Explain how evidence from technological advances supports or refutes the genetic relationships among groups of organisms (e.g., DNA analysis, protein analysis).
GSE STEM	LS3 (9-11)-6.	Students will demonstrate their understanding of the degree of genetic relationships among organisms by...
SPECIFIC INDICATOR	6a.	<p>Using given data (diagrams, charts, narratives, etc.) and advances in technology to explain how our understanding of genetic variation has developed over time.</p> <p>JoVE</p> <ul style="list-style-type: none"> • An Overview of Genetic Analysis • C. elegans Development and Reproduction • SNP Genotyping • Yeast Reproduction • Zebrafish Maintenance and Husbandry
DOMAIN	RI.LS3.	Life Science: Groups of organisms show evidence of change over time (structures, behaviors, and biochemistry).
STATEMENT OF ENDURING KNOWLEDGE	LS3 (9-11) NOS-6.	Explain how evidence from technological advances supports or refutes the genetic relationships among groups of organisms (e.g., DNA analysis, protein analysis).
GSE STEM	LS3 (Ext)-6.	Example Extension(s): Students will demonstrate their understanding of the degree of genetic relationships among organisms by...
SPECIFIC INDICATOR	6aa.	<p>Describing how the Human Genome Project has contributed to our understanding of both human heredity and the commonality of DNA sequences among organisms.</p> <p>JoVE</p> <ul style="list-style-type: none"> • An Introduction to Caenorhabditis elegans

		<ul style="list-style-type: none"> • An Introduction to Stem Cell Biology • An Introduction to the Laboratory Mouse: <i>Mus musculus</i> • An Overview of Gene Expression • An Overview of Genetics and Disease • Capillary Electrophoresis (CE) • DNA Methylation Analysis • Expression Profiling with Microarrays • Genetic Engineering of Model Organisms • Genome Editing • Molecular Cloning • RNA-Seq • Recombineering and Gene Targeting • SNP Genotyping
DOMAIN	RI.LS3.	Life Science: Groups of organisms show evidence of change over time (structures, behaviors, and biochemistry).
STATEMENT OF ENDURING KNOWLEDGE	LS3 (9-11) INQ POC-7.	Given a scenario, provide evidence that demonstrates how sexual reproduction results in a great variety of possible gene combinations and contributes to natural selection (e.g., Darwin's finches, isolation of a species, Tay Sach's disease).
GSE STEM	LS3 (9-11)-7.	Students demonstrate an understanding of Natural Selection/ evolution by...
SPECIFIC INDICATOR	7a.	<p>Investigating how information is passed from parents to offspring by encoded molecules (e.g. evidence from electrophoresis, DNA fingerprinting).</p> <p>JoVE</p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to <i>Caenorhabditis elegans</i> • An Introduction to Developmental Genetics • 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 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 Epigenetics • An Overview of Gene Expression • An Overview of Genetic Analysis • An Overview of Genetic Engineering • An Overview of Genetics and Disease • <i>C. elegans</i> Development and Reproduction • <i>C. elegans</i> Maintenance • Capillary Electrophoresis (CE) • Chick ex ovo Culture

- Chromatin Immunoprecipitation
- Cytogenetics
- DNA Gel Electrophoresis
- DNA Methylation Analysis
- Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis
- Development and Reproduction of the Laboratory Mouse
- Development of the Chick
- Drosophila Development and Reproduction
- Drosophila Larval IHC
- Drosophila Maintenance
- Drosophila melanogaster Embryo and Larva Harvesting and Preparation
- Electrophoretic Mobility Shift Assay (EMSA)
- Embryonic Stem Cell Culture and Differentiation
- Explant Culture for Developmental Studies
- Expression Profiling with Microarrays
- Fate Mapping
- Fundamentals of Breeding and Weaning
- 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
- Invertebrate Lifespan Quantification
- Isolating Nucleic Acids from Yeast
- Making Solutions in the Laboratory
- Molecular Cloning
- Mouse Genotyping
- Neuronal Transfection Methods
- PCR: The Polymerase Chain Reaction
- Plasmid Purification
- Primary Neuronal Cultures
- RNA-Seq
- RNAi in *C. elegans*
- Recombineering and Gene Targeting
- SNP Genotyping
- Testing For Genetically Modified Foods
- Tissue Regeneration with Somatic Stem Cells
- Transplantation Studies
- Two-Dimensional Gel Electrophoresis
- Understanding Concentration and Measuring Volumes
- Whole-Mount In Situ Hybridization
- Yeast Maintenance
- Yeast Reproduction
- Yeast Transformation and Cloning
- Zebrafish Breeding and Embryo Handling
- Zebrafish Maintenance and Husbandry

		<ul style="list-style-type: none"> • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
SPECIFIC INDICATOR	7b.	<p>Investigating how the sorting and recombination of genes in sexual reproduction results in a great variety of possible gene combinations in the offspring of any two parents. (e.g. manipulate models to represent and predict genotypes and phenotypes, Punnett Squares, probability activities).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Caenorhabditis elegans • An Introduction to Saccharomyces cerevisiae • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Zebrafish: Danio rerio • An Overview of Genetic Analysis • C. elegans Development and Reproduction • 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 • Genetic Crosses • Genetic Screens • SNP Genotyping • Yeast Maintenance • Yeast Reproduction • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Reproduction and Development
SPECIFIC INDICATOR	7c.	<p>Citing evidence of how natural selection and its evolutionary consequences provide a scientific explanation for the diversity and unity of past and present life forms on Earth. (e.g. Galapagos Islands, Hawaiian Islands, Australia, geographic isolation, adaptive radiation).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to the Chick: Gallus gallus domesticus • An Overview of Genetic Analysis • High-Performance Liquid Chromatography (HPLC)
DOMAIN	RI.LS3.	Life Science: Groups of organisms show evidence of change over time (structures, behaviors, and biochemistry).
STATEMENT OF ENDURING KNOWLEDGE	LS3 (9-11) INQ POC-7.	Given a scenario, provide evidence that demonstrates how sexual reproduction results in a great variety of possible gene combinations and contributes to natural selection (e.g., Darwin's finches, isolation of a species, Tay Sach's disease).

GSE STEM	LS3 (Ext)-7.	Example Extension(s): Students demonstrate an understanding of Natural Selection/ evolution by...
SPECIFIC INDICATOR	7aa.	Distinguishing the stages of mitosis and meiosis and how each contributes to the production of offspring with varying traits <u>JoVE</u> <ul style="list-style-type: none"> • An Introduction to Cell Division • An Introduction to Saccharomyces cerevisiae • Cell Cycle Analysis • Genetic Crosses • Live Cell Imaging of Mitosis • Recombineering and Gene Targeting • Yeast Reproduction • Yeast Transformation and Cloning
SPECIFIC INDICATOR	7bb.	Researching and reporting on the contributions of key scientist in understanding evolution and natural selection (e .g. Darwin, Wallace, Mendel). <u>JoVE</u> <ul style="list-style-type: none"> • An Overview of Genetic Analysis
DOMAIN	RI.LS3.	Life Science: Groups of organisms show evidence of change over time (structures, behaviors, and biochemistry).
STATEMENT OF ENDURING KNOWLEDGE	LS3 (9-11) INQ FAF+POC-8.	Given information about living or extinct organisms, cite evidence to explain the frequency of inherited characteristics of organisms in a population, OR explain the evolution of varied structures (with defined functions) that affected the organisms' survival in a specific environment (e.g., giraffe, wind pollination of flowers).
GSE STEM	LS3 (9-11)-8.	Students demonstrate an understanding of Natural Selection/ evolution by...
SPECIFIC INDICATOR	8a.	Illustrating that when an environment changes, the survival advantage/disadvantage of some characteristics may change. <u>JoVE</u> <ul style="list-style-type: none"> • An Overview of Genetic Analysis
SPECIFIC INDICATOR	8c.	Recognizing patterns in molecular and fossil evidence, to provide a scientific explanation for Natural Selection and its evolutionary consequences (e.g. survival, adaptation). <u>JoVE</u> <ul style="list-style-type: none"> • An Overview of Genetic Analysis • High-Performance Liquid Chromatography (HPLC)
SPECIFIC INDICATOR	8d.	Using data or models (charts, diagrams, table, narratives etc.) to analyze how organisms are organized into a hierarchy of groups and subgroups based on

		<p>evolutionary relationships. (e.g. creating a taxonomic key to organize a given set of examples).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Zebrafish: Danio rerio • Tree Identification: How To Use a Dichotomous Key
DOMAIN	RI.LS4.	Life Science: Humans are similar to other species in many ways, and yet are unique among Earth's life forms.
STATEMENT OF ENDURING KNOWLEDGE	LS4 (9-11) NOS+INQ-9.	Use evidence to make and support conclusions about the ways that humans or other organisms are affected by environmental factors or heredity (e.g., pathogens, diseases, medical advances, pollution, mutations).
GSE STEM	LS4 (9-11)-9.	Students demonstrate an understanding of how humans are affected by environmental factors and/or heredity by...
SPECIFIC INDICATOR	9a.	<p>Researching scientific information to explain how such things as radiation, chemicals, and other factors can cause gene mutations or disease.</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
SPECIFIC INDICATOR	9b.	<p>Providing an explanation of how the human species impacts the environment and other organisms (e.g. reducing the amount of the earth's surface available to those other species, interfering with their food sources, changing the temperature and chemical composition of their habitats, introducing foreign species into their ecosystems, and altering organisms directly through selective breeding and genetic engineering).</p>

		<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 • Introduction to Mass Spectrometry • Lead Analysis of Soil Using Atomic Absorption Spectroscopy • Measuring Tropospheric Ozone • Nutrients in Aquatic Ecosystems • Self-report vs. Behavioral Measures of Recycling • 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
DOMAIN	RI.LS4.	Life Science: Humans are similar to other species in many ways, and yet are unique among Earth's life forms.
STATEMENT OF ENDURING KNOWLEDGE	LS4 (9-11) NOS+INQ-9.	Use evidence to make and support conclusions about the ways that humans or other organisms are affected by environmental factors or heredity (e.g., pathogens, diseases, medical advances, pollution, mutations).
GSE STEM	LS4 (Ext)-9.	Example Extension(s): Students demonstrate an understanding of how humans are affected by environmental factors and/or heredity by...
SPECIFIC INDICATOR	9bb.	<p>Using a computer simulation to study the effects of human activities on a particular environment (actual or model).</p> <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 • Introduction to Mass Spectrometry • Lead Analysis of Soil Using Atomic Absorption Spectroscopy • Measuring Tropospheric Ozone • Nutrients in Aquatic Ecosystems • Self-report vs. Behavioral Measures of Recycling • Turbidity and Total Solids in Surface Water • Water Quality Analysis via Indicator Organisms
DOMAIN	RI.LS4.	Life Science: Humans are similar to other species in many ways, and yet are unique among Earth's life forms.
STATEMENT OF ENDURING KNOWLEDGE	LS4 (9-11) SAE+FAF-10.	Explain how the immune system, endocrine system, or nervous system works and draw conclusions about how systems interact to maintain homeostasis in the human body.
GSE STEM	LS4 (9-11)-10.	Students demonstrate an understanding of human body systems by...

SPECIFIC INDICATOR	10a.	<p>Explaining how the roles of the immune, endocrine, and nervous systems work together to maintain homeostasis.</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 <p>Assessment</p> <ul style="list-style-type: none"> • An Introduction to Behavioral Neuroscience • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Cognition • An Introduction to Developmental Neurobiology • An Introduction to Learning and Memory • An Introduction to Modeling Behavioral Disorders and Stress <ul style="list-style-type: none"> • An Introduction to Motor Control • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Introduction to Reward and Addiction • An Introduction to the Laboratory Mouse: Mus musculus <ul style="list-style-type: none"> • Ankle Exam • Anterograde Amnesia • Anxiety Testing • Arterial Line Placement • Assessing Dexterity with Reaching Tasks • Auscultation • Balance and Coordination Testing • Basic Life Support Part II: Airway/Breathing and Continued Cardiopulmonary Resuscitation • Basic Life Support: Cardiopulmonary Resuscitation and Defibrillation • Blood Pressure Measurement • Calcium Imaging in Neurons • 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 • Co-Immunoprecipitation and Pull-Down Assays • Color Afterimages • Comprehensive Breast Exam • Cranial Nerves Exam I (I-VI) • Cranial Nerves Exam II (VII-XII) • Crowding • Decision-making and the Iowa Gambling Task • Decoding Auditory Imagery with Multivoxel Pattern
--------------------	------	--

Analysis

- **Ear Exam**
- **Elbow Exam**
- **Electro-encephalography (EEG)**
- **Emergency Tube Thoracostomy (Chest Tube Placement)**
- **Emergent Lateral Canthotomy and Inferior Catholysis**
- **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 Exam**
- **Fear Conditioning**
- **Finding Your Blind Spot and Perceptual Filling-in**
- **Foot Exam**
- **General Approach to the Physical Exam**
- **Hand and Wrist Exam**
- **Hip Exam**
- **Histological Staining of Neural Tissue**
- **Inattentional Blindness**
- **Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation**
- **Intraosseous Needle Placement**
- **Just-noticeable Differences**
- **Knee Exam**
- **Language: The N400 in Semantic Incongruity**
- **Learning and Memory: The Remember-Know Task**
- **Lower Back Exam**
- **Lymph Node Exam**
- **MALDI-TOF Mass Spectrometry**
- **Male Rectal Exam**
- **Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain**
- **Measuring Vital Signs**
- **Modeling Social Stress**
- **Motion-induced Blindness**
- **Motor Exam I**
- **Motor Exam II**
- **Motor Maps**
- **Murine In Utero Electroporation**
- **Mutual Exclusivity: How Children Learn the Meanings of Words**
- **Neck Exam**
- **Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment**
- **Nose, Sinuses, Oral Cavity and Pharynx Exam**
- **Object Substitution Masking**
- **Observation and Inspection**
- **Ophthalmoscopic Examination**
- **Palpation**
- **Patch Clamp Electrophysiology**

		<ul style="list-style-type: none"> • 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 • Perspectives on Sensation and Perception • 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 • Rodent Stereotaxic Surgery • Self-administration Studies • Sensory Exam • Shoulder Exam I • Shoulder Exam II • Spatial Cueing • Spatial Memory Testing Using Mazes • Surgical Cricothyrotomy • The Ames Room • The Attentional Blink • The Inverted-face Effect • The McGurk Effect • The Rubber Hand Illusion • The Split Brain • The Staircase Procedure for Finding a Perceptual Threshold • The TUNEL Assay • Thyroid Exam • Tissue Regeneration with Somatic Stem Cells • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Using TMS to Measure Motor Excitability During Action Observation • Using a pH Meter • Verbal Priming • Visual Attention: fMRI Investigation of Object-based Attentional Control • Within-subjects Repeated-measures Design • fMRI: Functional Magnetic Resonance Imaging
SPECIFIC INDICATOR	10b.	<p>Investigating the factors that affect homeostasis (e.g. positive and negative feedback).</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
- An Introduction to Cognition
- An Introduction to Learning and Memory
- An Introduction to Modeling Behavioral Disorders and Stress
- An Introduction to Reward and Addiction
- Ankle Exam
- Anxiety Testing
- Arterial Line Placement
- Assessing Dexterity with Reaching Tasks
- Auscultation
- Balance and Coordination Testing
- Basic Life Support Part II: Airway/Breathing and Continued Cardiopulmonary Resuscitation
- Basic Life Support: Cardiopulmonary Resuscitation and Defibrillation
- Blood Pressure Measurement
- 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
- Comprehensive Breast Exam
- Cranial Nerves Exam I (I-VI)
- Cranial Nerves Exam II (VII-XII)
- 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
- Modeling Social Stress
- Motor Exam I

		<ul style="list-style-type: none"> • 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 • Peripheral Venous Cannulation • Physiological Correlates of Emotion Recognition • Pilot Testing • 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 • Surgical Cricothyrotomy • Thyroid Exam • Using a pH Meter
DOMAIN	RI.LS4.	Life Science: Humans are similar to other species in many ways, and yet are unique among Earth's life forms.
STATEMENT OF ENDURING KNOWLEDGE	LS4 (9-11) SAE+FAF-10.	Explain how the immune system, endocrine system, or nervous system works and draw conclusions about how systems interact to maintain homeostasis in the human body.
GSE STEM	LS4 (Ext)-10.	Example Extension(s): Students demonstrate an understanding of human body systems by...
SPECIFIC INDICATOR	10bb.	<p>Investigating and reporting on a human disease and its consequential disruption of homeostasis (e.g. diabetes, cancer, AIDS).</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 • An Introduction to Behavioral Neuroscience • An Introduction to Cell Metabolism

		<ul style="list-style-type: none"> • An Introduction to <i>Drosophila melanogaster</i> • An Introduction to Organogenesis • An Introduction to <i>Saccharomyces cerevisiae</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 • An Overview of Genetics and Disease • Blood Pressure Measurement • <i>C. elegans</i> Chemotaxis Assay • <i>C. elegans</i> Development and Reproduction • Chick ex ovo Culture • Co-Immunoprecipitation and Pull-Down Assays • Culturing and Enumerating Bacteria from Soil Samples • Detecting Reactive Oxygen Species • Detection of Bacteriophages in Environmental Samples • Eye Exam • Gene Silencing with Morpholinos • Genetic Crosses • Genetic Screens • Gram Staining of Bacteria from Environmental Sources • Isolation of Fecal Bacteria from Water Samples by Filtration • Lymph Node Exam • Male Rectal Exam • Motor Exam I • Motor Exam II • Mouse Genotyping • Ophthalmoscopic Examination • Pelvic Exam II: Speculum Exam • Pelvic Exam III: Bimanual and Rectovaginal Exam • Peripheral Vascular Exam • Peripheral Vascular Exam Using a Continuous Wave Doppler • Protein Crystallization • RNA Analysis of Environmental Samples Using RT-PCR • RNA-Seq • Recombineering and Gene Targeting • Respiratory Exam I: Inspection and Palpation • The ATP Bioluminescence Assay • Thyroid Exam • Using a pH Meter • Whole-Mount In Situ Hybridization • fMRI: Functional Magnetic Resonance Imaging
DOMAIN	RI.PS1.	Physical Science: All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another (independent of size or amount of substance).

STATEMENT OF ENDURING KNOWLEDGE	PS1 (9-11) INQ-1.	Use physical and chemical properties as determined through an investigation to identify a substance.
GSE STEM	PS1 (9-11)-1.	Students demonstrate an understanding of characteristic properties of matter by...
SPECIFIC INDICATOR	1b.	Determining the degree of change in pressure of a given volume of gas when the temperature changes incrementally (doubles, triples, etc.). <u>JoVE</u> <ul style="list-style-type: none"> • Ideal Gas Law • The Ideal Gas Law
DOMAIN	RI.PS1.	Physical Science: All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another (independent of size or amount of substance).
STATEMENT OF ENDURING KNOWLEDGE	PS1 (9-11) INQ-1.	Use physical and chemical properties as determined through an investigation to identify a substance.
GSE STEM	PS1 (Ext)-1.	Example Extension(s): Students demonstrate an understanding of characteristic properties of matter by...
SPECIFIC INDICATOR	1aa.	Explaining the states of a substance in terms of the particulate nature of matter and the forces of interaction between particles. <u>JoVE</u> <ul style="list-style-type: none"> • Fractional Distillation • Ideal Gas Law • The Ideal Gas Law
SPECIFIC INDICATOR	1bb.	Quantitatively determining how volume, pressure, temperature and amount of gas affect each other ($PV=nRT$) in a system. <u>JoVE</u> <ul style="list-style-type: none"> • Determining Rate Laws and the Order of Reaction • Ideal Gas Law • The Ideal Gas Law
DOMAIN	RI.PS1.	Physical Science: All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another (independent of size or amount of substance).
STATEMENT OF ENDURING KNOWLEDGE	PS1 (9-11) POC-3.	Explain how properties of elements and the location of elements on the periodic table are related.
GSE STEM	PS1 (9-11)-3.	Students demonstrate an understanding of characteristic properties of matter by...
SPECIFIC INDICATOR	3b.	Predicting the relative physical and chemical properties of an element based on its location within the Periodic

		<p>Table.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Coordination Chemistry Complexes
DOMAIN	RI.PS1.	Physical Science: All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another (independent of size or amount of substance).
STATEMENT OF ENDURING KNOWLEDGE	PS1 (9-11) MAS+ FAF-4.	Model and explain the structure of an atom or explain how an atom's electron configuration, particularly the outermost electron(s), determines how that atom can interact with other atoms.
GSE STEM	PS1 (9-11)-4.	Students demonstrate an understanding of the structure of matter by...
SPECIFIC INDICATOR	4a.	<p>Comparing the three subatomic particles of atoms (protons, electrons, neutrons) and their location within an atom, their relative mass, and their charge.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Coordination Chemistry Complexes • Nuclear Magnetic Resonance (NMR) Spectroscopy • Raman Spectroscopy for Chemical Analysis • Scanning Electron Microscopy (SEM) • X-ray Fluorescence (XRF)
SPECIFIC INDICATOR	4b.	<p>Writing formulae for compounds and developing basic (excluding transition elements) models using electron structure.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining the Empirical Formula
SPECIFIC INDICATOR	4c.	<p>Explaining or modeling how the electron configuration of atoms governs how atoms interact with one another (e.g. covalent, hydrogen and ionic 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 • 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

		<p>Adduction for Uk'37 Paleothermometry</p> <ul style="list-style-type: none"> • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment • Ultraviolet-Visible (UV-Vis) Spectroscopy • X-ray Fluorescence (XRF)
DOMAIN	RI.PS1.	Physical Science: All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another (independent of size or amount of substance).
STATEMENT OF ENDURING KNOWLEDGE	PS1 (9-11) MAS+ FAF-4.	Model and explain the structure of an atom or explain how an atom's electron configuration, particularly the outermost electron(s), determines how that atom can interact with other atoms.
GSE STEM	PS1 (Ext)-4.	Example Extension(s): Students demonstrate an understanding of the structure of matter by...
SPECIFIC INDICATOR	4aa.	<p>Writing an electron configuration to include s, p, d, and f orbitals and relating to atomic interactions.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Coordination Chemistry Complexes • Nuclear Magnetic Resonance (NMR) Spectroscopy • Raman Spectroscopy for Chemical Analysis • Ultraviolet-Visible (UV-Vis) Spectroscopy • X-ray Fluorescence (XRF)
SPECIFIC INDICATOR	4bb.	<p>Given specific reactants (e.g. Ba + Cl₂) write the balanced equation and determine the products, type of compound formed (ionic or molecular), and the properties of the compound (e.g. solubilities, electrolytic, etc).</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
DOMAIN	RI.PS2.	Physical Science: Energy is necessary for change to occur in matter. Energy can be stored, transferred, and transformed, but cannot be destroyed.

STATEMENT OF ENDURING KNOWLEDGE	PS2 (9-11) POC+SAE-5.	Demonstrate how transformations of energy produce some energy in the form of heat and therefore the efficiency of the system is reduced (chemical, biological, and physical systems).
GSE STEM	PS2 (9-11)-5.	Students demonstrate an understanding of energy by...
SPECIFIC INDICATOR	5a.	<p>Describing or diagramming the changes in energy (transformation) that occur in different systems (e.g. chemical = exo and endo thermic reactions, biological = food webs, physical = phase changes).</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 • Degassing Liquids with Freeze-Pump-Thaw Cycling • Determining Rate Laws and the Order of Reaction • Fractional Distillation • Freezing-Point Depression to Determine an Unknown Compound • Growing Crystals for X-ray Diffraction Analysis • Le Châtelier's Principle • Preparing Anhydrous Reagents and Equipment • Purifying Compounds by Recrystallization • Rotary Evaporation to Remove Solvent • Schlenk Lines Transfer of Solvents • Separation of Mixtures via Precipitation • Solid-Liquid Extraction • Solutions and Concentrations • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
DOMAIN	RI.PS2.	Physical Science: Energy is necessary for change to occur in matter. Energy can be stored, transferred, and transformed, but cannot be destroyed.
STATEMENT OF ENDURING KNOWLEDGE	PS2 (9-11) POC+SAE-5.	Demonstrate how transformations of energy produce some energy in the form of heat and therefore the efficiency of the system is reduced (chemical, biological, and physical systems).
GSE STEM	PS2 (Ext)-5.	Example Extension(s): Students demonstrate an understanding of energy by...
SPECIFIC INDICATOR	5aa.	<p>Identifying, measuring, calculating and analyzing qualitative and quantitative relationships associated with energy transfer or energy transformation.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
DOMAIN	RI.PS2.	Physical Science: Energy is necessary for change to occur in matter. Energy can be stored, transferred, and transformed, but cannot be destroyed.

STATEMENT OF ENDURING KNOWLEDGE	PS2 (9-11) INQ+SAE-6.	Using information provided about chemical changes, draw conclusions about and explain the energy flow in a given chemical reaction (e.g., exothermic reactions, endothermic reactions).
GSE STEM	PS2 (9-11)-6.	Students demonstrate an understanding of physical, chemical, and nuclear changes by...
SPECIFIC INDICATOR	6a.	<p>Writing simple balanced chemical equations to represent chemical reactions and illustrate the conservation of matter.</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
SPECIFIC INDICATOR	6b.	<p>Identifying whether a given chemical reaction or a biological process will release or consume energy (endothermic and exothermic) based on the information provided (e.g. given a table of energy values for reactants and products or an energy diagram).</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
SPECIFIC INDICATOR	6d.	<p>Explaining the concept of half-life and using the half-life principal to predict the approximate age of a material.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining Rate Laws and the Order of Reaction
DOMAIN	RI.PS2.	Physical Science: Energy is necessary for change to occur in matter. Energy can be stored, transferred, and transformed, but cannot be destroyed.
STATEMENT OF ENDURING KNOWLEDGE	PS2 (9-11) INQ+SAE-6.	Using information provided about chemical changes, draw conclusions about and explain the energy flow in a

		given chemical reaction (e.g., exothermic reactions, endothermic reactions).
GSE STEM	PS2 (Ext)-6.	Example Extension(s): Students demonstrate an understanding of physical, chemical, and nuclear changes by...
SPECIFIC INDICATOR	6aa.	<p>Using chemical equations and information about molar masses to predict quantitatively the masses of reactants and products in chemical reactions.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Calibration Curves • Capillary Electrophoresis (CE) • Co-Immunoprecipitation and Pull-Down Assays • Column Chromatography • Cyclic Voltammetry (CV) • Determining the Density of a Solid and Liquid • Determining the Empirical Formula • 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) • Introduction to Mass Spectrometry • Ion-Exchange Chromatography • MALDI-TOF Mass Spectrometry • Method of Standard Addition • Nuclear Magnetic Resonance (NMR) Spectroscopy • Performing 1D Thin Layer Chromatography • Photometric Protein Determination • 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 • The ELISA Method • Ultraviolet-Visible (UV-Vis) Spectroscopy • X-ray Fluorescence (XRF)
SPECIFIC INDICATOR	6bb.	<p>Using quantitative heat flow or calorimetric investigations to determine the energy released or consumed in the process.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
SPECIFIC INDICATOR	6bbb.	Qualitatively and/or quantitatively predicting reactants and products in a prescribed investigation. (e.g. Acid-

		base. Redox). <u>JoVE</u> <ul style="list-style-type: none"> • Determining the Mass Percent Composition in an Aqueous Solution • Freezing-Point Depression to Determine an Unknown Compound • Gas Chromatography (GC) with Flame-Ionization Detection • Internal Standards • The ELISA Method
DOMAIN	RI.PS2.	Physical Science: Energy is necessary for change to occur in matter. Energy can be stored, transferred, and transformed, but cannot be destroyed.
STATEMENT OF ENDURING KNOWLEDGE	PS2 (9-11)-SAE-7.	Explain relationships between and among electric charges, magnetic fields, electromagnetic forces, and atomic particles.
GSE STEM	PS2 (9-11)-7.	Students demonstrate an understanding of electromagnetism by...
SPECIFIC INDICATOR	7a.	Explaining through words, diagrams, models, or electrostatic demonstrations the principle that like charges repel and unlike charges attract. <u>JoVE</u> <ul style="list-style-type: none"> • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Testing For Genetically Modified Foods
SPECIFIC INDICATOR	7c.	Describing the relationship between moving electric charges and magnetic fields. <u>JoVE</u> <ul style="list-style-type: none"> • fMRI: Functional Magnetic Resonance Imaging
DOMAIN	RI.PS3.	Physical Science: The motion of an object is affected by forces.
STATEMENT OF ENDURING KNOWLEDGE	PS3 (9-11) SAE-10.	Explain the effects on wavelength and frequency as electromagnetic waves interact with matter (e.g., light diffraction, blue sky).
GSE STEM	PS3 (9-11)-10.	Students demonstrate an understanding of waves by...
SPECIFIC INDICATOR	10a.	Investigating examples of wave phenomena (e.g. ripples in water, sound waves, seismic waves). <u>JoVE</u> <ul style="list-style-type: none"> • Nuclear Magnetic Resonance (NMR) Spectroscopy • Raman Spectroscopy for Chemical Analysis
SPECIFIC INDICATOR	10b.	Comparing and contrasting electromagnetic waves to mechanical waves. <u>JoVE</u>

		<ul style="list-style-type: none"> • Nuclear Magnetic Resonance (NMR) Spectroscopy • Raman Spectroscopy for Chemical Analysis
SPECIFIC INDICATOR	10c.	<p>Qualifying the relationship between frequency and wavelength of any wave.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Raman Spectroscopy for Chemical Analysis

Grade: 9 - Adopted: 2010

DOMAIN	RI.RST.9-10.	Reading Standards for Literacy in Science and Technical Subjects
STATEMENT OF ENDURING KNOWLEDGE		Craft and Structure
GSE STEM	RST.9-10.4.	<p>Determine the meaning of symbols, 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.</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
- 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

GSE STEM	RST.9-10.5.	<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

		<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 • 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
DOMAIN	RI.RST.9-10.	Reading Standards for Literacy in Science and Technical Subjects
STATEMENT OF ENDURING KNOWLEDGE		Integration of Knowledge and Ideas
GSE STEM	RST.9-10.7.	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.

JoVE

- **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

		<ul style="list-style-type: none"> • 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 • X-ray Fluorescence (XRF) • Yeast Maintenance • fMRI: Functional Magnetic Resonance Imaging
DOMAIN	RI.WHST.9-10.	Writing Standards for Literacy in Science and Technical Subjects
STATEMENT OF ENDURING KNOWLEDGE		Text Types and Purposes
GSE STEM	WHST.9-10.1.	Write arguments focused on discipline-specific content.
SPECIFIC INDICATOR	WHST.9-10.1(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
DOMAIN	RI.WHST.9-10.	Writing Standards for Literacy in Science and Technical Subjects
STATEMENT OF ENDURING KNOWLEDGE		Text Types and Purposes
GSE STEM	WHST.9-10.2.	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

SPECIFIC INDICATOR	WHST.9-10.2(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
SPECIFIC INDICATOR	WHST.9-10.2(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
- 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

		<ul style="list-style-type: none"> • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development • fMRI: Functional Magnetic Resonance Imaging
DOMAIN	RI.WHST.9-10.	Writing Standards for Literacy in Science and Technical Subjects
STATEMENT OF ENDURING KNOWLEDGE		Text Types and Purposes
GSE STEM	WHST.9-10.3.	(See note; not applicable as a separate requirement)
SPECIFIC INDICATOR	WHST.9-10.3(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 science and technical subjects, students must be able to write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results.</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 • Reliability in Psychology Experiments • The Factorial Experiment • The Multi-group Experiment • The Simple Experiment: Two-group Design • Within-subjects Repeated-measures Design