

Main Criteria: Florida Standards
Secondary Criteria: JoVE
Subject: Science
Grade: 9-12
Correlation Options: Show Correlated
Adopted: 2008

BODY OF KNOWLEDGE	FL.SC.912.N.	Nature of Science
BIG IDEA	SC.912.N.1.	<p>The Practice of Science - A: Scientific inquiry is a multifaceted activity; The processes of science include the formulation of scientifically investigable questions, construction of investigations into those questions, the collection of appropriate data, the evaluation of the meaning of those data, and the communication of this evaluation. B: The processes of science frequently do not correspond to the traditional portrayal of "the scientific method." C: Scientific argumentation is a necessary part of scientific inquiry and plays an important role in the generation and validation of scientific knowledge. D: Scientific knowledge is based on observation and inference; it is important to recognize that these are very different things. Not only does science require creativity in its methods and processes, but also in its questions and explanations.</p>
BENCHMARK	SC.912.N.1.1.	<p>Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following:</p>
INDICATOR	SC.912.N.1.1.2.	<p>Conduct systematic observations</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Observational Research
INDICATOR	SC.912.N.1.1.5.	<p>Plan investigations</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

		<ul style="list-style-type: none"> • 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
INDICATOR	SC.912.N.1.1.6.	<p>Use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Working in the Hood • An Introduction to the Centrifuge • An Introduction to the Micropipettor • Common Lab Glassware and Uses • Freezing-Point Depression to Determine an Unknown Compound • Histological Sample Preparation for Light Microscopy • Introduction to Fluorescence Microscopy • Introduction to Light Microscopy • Introduction to Serological Pipettes and Pipettors • Introduction to the Bunsen Burner • Introduction to the Microplate Reader • Introduction to the Spectrophotometer • Making Solutions in the Laboratory • Measuring Mass in the Laboratory • Regulating Temperature in the Lab: Applying Heat • Regulating Temperature in the Lab: Preserving Samples Using Cold • Understanding Concentration and Measuring Volumes
INDICATOR	SC.912.N.1.1.8.	<p>Generate explanations that explicate or describe natural phenomena (inferences)</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Categories and Inductive Inferences • Children's Reliance on Artist Intentions When Identifying Pictures • How Children Solve Problems Using Causal Reasoning
BODY OF KNOWLEDGE	FL.SC.912.N.	Nature of Science
BIG IDEA	SC.912.N.1.	The Practice of Science - A: Scientific inquiry is a multifaceted activity; The processes of science include the formulation of scientifically investigable questions, construction of investigations into those questions, the collection of appropriate data, the evaluation of the meaning of those data, and the communication of this

		<p>evaluation. B: The processes of science frequently do not correspond to the traditional portrayal of "the scientific method." C: Scientific argumentation is a necessary part of scientific inquiry and plays an important role in the generation and validation of scientific knowledge. D: Scientific knowledge is based on observation and inference; it is important to recognize that these are very different things. Not only does science require creativity in its methods and processes, but also in its questions and explanations.</p>
<p>BENCHMARK</p>	<p>SC.912.N.1.3.</p>	<p>Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • How Children Solve Problems Using Causal Reasoning
<p>BENCHMARK</p>	<p>SC.912.N.1.4.</p>	<p>Identify sources of information and assess their reliability according to the strict standards of scientific investigation.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Aseptic Technique in Environmental Science • Calibration Curves • Capillary Electrophoresis (CE) • Chromatography-Based Biomolecule Purification Methods • Cyclic Voltammetry (CV) • Density Gradient Ultracentrifugation • Dialysis: Diffusion Based Separation • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Ethics in Psychology Research • Experimentation using a Confederate • From Theory to Design: The Role of Creativity in Designing Experiments • Gas Chromatography (GC) with Flame-Ionization Detection • High-Performance Liquid Chromatography (HPLC) • Internal Standards • Introduction to Mass Spectrometry • Ion-Exchange Chromatography • Manipulating an Independent Variable through Embodiment • Method of Standard Addition • Observational Research • Pilot Testing • Placebos in Research • Preparing Anhydrous Reagents and Equipment • Protein Crystallization

		<ul style="list-style-type: none"> • Raman Spectroscopy for Chemical Analysis • Reliability in Psychology Experiments • Sample Preparation for Analytical Preparation • Scanning Electron Microscopy (SEM) • Self-report vs. Behavioral Measures of Recycling • The Factorial Experiment • The Multi-group Experiment • The Simple Experiment: Two-group Design • Two-Dimensional Gel Electrophoresis • Within-subjects Repeated-measures Design • X-ray Fluorescence (XRF)
BENCHMARK	SC.912.N.1.5.	<p>Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Aseptic Technique in Environmental Science • Calibration Curves • Capillary Electrophoresis (CE) • Chromatography-Based Biomolecule Purification Methods • Cyclic Voltammetry (CV) • Density Gradient Ultracentrifugation • Dialysis: Diffusion Based Separation • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Ethics in Psychology Research • Experimentation using a Confederate • From Theory to Design: The Role of Creativity in Designing Experiments • Gas Chromatography (GC) with Flame-Ionization Detection • High-Performance Liquid Chromatography (HPLC) • Internal Standards • Introduction to Mass Spectrometry • Ion-Exchange Chromatography • Manipulating an Independent Variable through Embodiment • Method of Standard Addition • Observational Research • Pilot Testing • Placebos in Research • Preparing Anhydrous Reagents and Equipment • Protein Crystallization • Raman Spectroscopy for Chemical Analysis • Reliability in Psychology Experiments • Sample Preparation for Analytical Preparation • Scanning Electron Microscopy (SEM) • Self-report vs. Behavioral Measures of Recycling • The Factorial Experiment • The Multi-group Experiment

		<ul style="list-style-type: none"> • The Simple Experiment: Two-group Design • Two-Dimensional Gel Electrophoresis • Within-subjects Repeated-measures Design • X-ray Fluorescence (XRF)
BENCHMARK	SC.912.N.1.6.	<p>Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Categories and Inductive Inferences • Children's Reliance on Artist Intentions When Identifying Pictures • How Children Solve Problems Using Causal Reasoning
BENCHMARK	SC.912.N.1.7.	<p>Recognize the role of creativity in constructing scientific questions, methods and explanations.</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 • How Children Solve Problems Using Causal Reasoning • 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
BODY OF KNOWLEDGE	FL.SC.912.N.	Nature of Science
BIG IDEA	SC.912.N.2.	<p>The Characteristics of Scientific Knowledge - A: Scientific knowledge is based on empirical evidence, and is appropriate for understanding the natural world, but it provides only a limited understanding of the supernatural, aesthetic, or other ways of knowing, such as art, philosophy, or religion. B: Scientific knowledge is durable and robust, but open to change. C: Because science is based on empirical evidence it strives for objectivity, but as it is a human endeavor the processes, methods, and knowledge of science include subjectivity, as well as creativity and discovery.</p>
BENCHMARK	SC.912.N.2.2.	<p>Identify which questions can be answered through science and which questions are outside the boundaries of scientific investigation, such as questions addressed by other ways of knowing, such as art, philosophy, and religion.</p>

		<p>JoVE</p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to Behavioral Neuroscience • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Cognition • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Endocytosis and Exocytosis • An Introduction to Learning and Memory • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to Molecular Developmental Biology • An Introduction to Motor Control • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Introduction to Organogenesis • An Introduction to Reward and Addiction • An Introduction to Stem Cell Biology • An Overview of Epigenetics • An Overview of Genetic Analysis • An Overview of Genetic Engineering • An Overview of Genetics and Disease • Anterograde Amnesia • Anxiety Testing • Color Afterimages • Crowding • Fear Conditioning • Inattentional Blindness • Invasion Assay Using 3D Matrices • Invertebrate Lifespan Quantification • Modeling Social Stress • Motion-induced Blindness • Neuronal Transfection Methods • Object Substitution Masking • Primary Neuronal Cultures • Self-administration Studies • Spatial Cueing • The Attentional Blink • The Multi-group Experiment • The Rubber Hand Illusion • The Simple Experiment: Two-group Design • The Transwell Migration Assay
BENCHMARK	SC.912.N.2.4.	<p>Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because</p>

of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.

JoVE

- Abdominal Exam II: Percussion
- An Introduction to Aging and Regeneration
- An Introduction to Behavioral Neuroscience
- An Introduction to *Caenorhabditis elegans*
- An Introduction to Cell Death
- An Introduction to Cell Division
- An Introduction to Cell Metabolism
- An Introduction to Cell Motility and Migration
- An Introduction to Developmental Genetics
- An Introduction to Developmental Neurobiology
- An Introduction to *Drosophila melanogaster*
- An Introduction to Endocytosis and Exocytosis
- An Introduction to Learning and Memory
- An Introduction to Molecular Developmental Biology
- An Introduction to Neuroanatomy
- An Introduction to Neurophysiology
- An Introduction to Organogenesis
- An Introduction to *Saccharomyces cerevisiae*
- An Introduction to Stem Cell Biology
- An Introduction to the Chick: *Gallus gallus domesticus*
- An Introduction to the Laboratory Mouse: *Mus musculus*
- An Introduction to the Zebrafish: *Danio rerio*
- An Overview of Epigenetics
- An Overview of Gene Expression
- An Overview of Genetic Analysis
- An Overview of Genetic Engineering
- An Overview of Genetics and Disease
- Anterograde Amnesia
- Auscultation
- *C. elegans* Maintenance
- Cell Cycle Analysis
- Color Afterimages
- Determining Spatial Orientation of Rock Layers with the Brunton Compass
- Development of the Chick
- *Drosophila* Maintenance
- General Approach to the Physical Exam
- Genetic Crosses
- Inattentional Blindness
- Le Châtelier's Principle
- Making a Geologic Cross Section
- Measuring Reaction Time and Donders' Method of Subtraction
- Motion-induced Blindness
- Object Substitution Masking
- Percussion

		<ul style="list-style-type: none"> • Piaget's Conservation Task and the Influence of Task Demands • Rotary Evaporation to Remove Solvent • Spatial Cueing • The Attentional Blink • The Rubber Hand Illusion • The Split Brain • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy • Yeast Transformation and Cloning
BENCHMARK	SC.912.N.2.5.	<p>Describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena and describe that competing interpretations (explanations) of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Abdominal Exam II: Percussion • An Introduction to Aging and Regeneration • An Introduction to Behavioral Neuroscience • An Introduction to Caenorhabditis elegans • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Drosophila melanogaster • An Introduction to Endocytosis and Exocytosis • An Introduction to Learning and Memory • An Introduction to Molecular Developmental Biology • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Introduction to Organogenesis • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Laboratory Mouse: Mus musculus • An Introduction to the Zebrafish: Danio rerio • An Overview of Epigenetics • An Overview of Gene Expression • An Overview of Genetic Analysis • An Overview of Genetic Engineering • An Overview of Genetics and Disease • Anterograde Amnesia • Auscultation • C. elegans Maintenance

		<ul style="list-style-type: none"> • Cell Cycle Analysis • Color Afterimages • Determining Spatial Orientation of Rock Layers with the Brunton Compass • Development of the Chick • Drosophila Maintenance • General Approach to the Physical Exam • Genetic Crosses • Inattentive Blindness • Le Châtelier's Principle • Making a Geologic Cross Section • Measuring Reaction Time and Donders' Method of Subtraction • Motion-induced Blindness • Object Substitution Masking • Percussion • Piaget's Conservation Task and the Influence of Task Demands • Rotary Evaporation to Remove Solvent • Spatial Cueing • The Attentional Blink • The Rubber Hand Illusion • The Split Brain • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy • Yeast Transformation and Cloning
BODY OF KNOWLEDGE	FL.SC.912.N.	Nature of Science
BIG IDEA	SC.912.N.3.	The Role of Theories, Laws, Hypotheses, and Models - The terms that describe examples of scientific knowledge, for example: "theory," "law," "hypothesis" and "model" have very specific meanings and functions within science.
BENCHMARK	SC.912.N.3.3.	<p>Explain that scientific laws are descriptions of specific relationships under given conditions in nature, but do not offer explanations for those relationships.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Degassing Liquids with Freeze-Pump-Thaw Cycling • Determining Rate Laws and the Order of Reaction • Determining the Empirical Formula • Ideal Gas Law • Schlenk Lines Transfer of Solvents • The Ideal Gas Law • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
BENCHMARK	SC.912.N.3.4.	<p>Recognize that theories do not become laws, nor do laws become theories; theories are well supported explanations and laws are well supported descriptions.</p> <p><u>JoVE</u></p>

		<ul style="list-style-type: none"> • Degassing Liquids with Freeze-Pump-Thaw Cycling • Determining Rate Laws and the Order of Reaction • Determining the Empirical Formula • Ideal Gas Law • Schlenk Lines Transfer of Solvents • The Ideal Gas Law • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
BENCHMARK	SC.912.N.3.5.	<p>Describe the function of models in science, and identify the wide range of models used in science.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining Spatial Orientation of Rock Layers with the Brunton Compass • Igneous Intrusive Rock • Igneous Volcanic Rock • Making a Geologic Cross Section • Using Topographic Maps to Generate Topographic Profiles
BODY OF KNOWLEDGE	FL.SC.912.N.	Nature of Science
BIG IDEA	SC.912.N.4.	<p>Science and Society - As tomorrow's citizens, students should be able to identify issues about which society could provide input, formulate scientifically investigable questions about those issues, construct investigations of their questions, collect and evaluate data from their investigations, and develop scientific recommendations based upon their findings.</p>
BENCHMARK	SC.912.N.4.1.	<p>Explain how scientific knowledge and reasoning provide an empirically-based perspective to inform society's decision making.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Abdominal Exam I: Inspection and Auscultation • Abdominal Exam II: Percussion • Abdominal Exam III: Palpation • Abdominal Exam IV: Acute Abdominal Pain Assessment • Algae Enumeration via Culturable Methodology • An Introduction to Aging and Regeneration • An Introduction to Behavioral Neuroscience • An Introduction to Caenorhabditis elegans • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Cognition • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Drosophila melanogaster

- An Introduction to Endocytosis and Exocytosis
- An Introduction to Learning and Memory
- An Introduction to Modeling Behavioral Disorders and Stress
- An Introduction to Molecular Developmental Biology
- An Introduction to Motor Control
- An Introduction to Neuroanatomy
- An Introduction to Neurophysiology
- An Introduction to Organogenesis
- An Introduction to Reward and Addiction
- An Introduction to *Saccharomyces cerevisiae*
- An Introduction to Stem Cell Biology
- An Introduction to Transfection
- An Introduction to the Chick: *Gallus gallus domesticus*
- An Introduction to the Laboratory Mouse: *Mus musculus*
- An Introduction to the Zebrafish: *Danio rerio*
- An Overview of Alkenone Biomarker Analysis for Paleothermometry
- An Overview of Epigenetics
- An Overview of Gene Expression
- An Overview of Genetic Analysis
- An Overview of Genetic Engineering
- An Overview of Genetics and Disease
- An Overview of bGDGT Biomarker Analysis for Paleoclimatology
- Analysis of Earthworm Populations in Soil
- Anesthesia Induction and Maintenance
- Ankle Exam
- Annexin V and Propidium Iodide Labeling
- Anterograde Amnesia
- Anxiety Testing
- Approximate Number Sense Test
- Are You Smart or Hardworking? How Praise Influences Children's Motivation
- Arterial Line Placement
- Aseptic Technique in Environmental Science
- Assembly of a Reflux System for Heated Chemical Reactions
- Assessing Dexterity with Reaching Tasks
- Auscultation
- Bacterial Growth Curve Analysis and its Environmental Applications
- Bacterial Transformation: Electroporation
- Bacterial Transformation: The Heat Shock Method
- Balance and Coordination Testing
- Basic Care Procedures
- Basic Chick Care and Maintenance
- Basic Life Support Part II: Airway/Breathing and Continued Cardiopulmonary Resuscitation
- Basic Life Support: Cardiopulmonary Resuscitation and Defibrillation

- **Basic Mouse Care and Maintenance**
- **Binocular Rivalry**
- **Biofuels: Producing Ethanol from Cellulosic Material**
- **Blood Pressure Measurement**
- **Blood Withdrawal I**
- **Blood Withdrawal II**
- **C. elegans Chemotaxis Assay**
- **C. elegans Development and Reproduction**
- **C. elegans Maintenance**
- **Calcium Imaging in Neurons**
- **Calibration Curves**
- **Capillary Electrophoresis (CE)**
- **Carbon and Nitrogen Analysis of Environmental Samples**
- **Cardiac Exam I: Inspection and Palpation**
- **Cardiac Exam II: Auscultation**
- **Cardiac Exam III: Abnormal Heart Sounds**
- **Categories and Inductive Inferences**
- **Cell Cycle Analysis**
- **Cell-surface Biotinylation Assay**
- **Central Venous Catheter Insertion: Femoral Vein with Ultrasound Guidance**
- **Central Venous Catheter Insertion: Internal Jugular with Ultrasound Guidance**
- **Central Venous Catheter Insertion: Subclavian Vein**
- **Chick ex ovo Culture**
- **Children's Reliance on Artist Intentions When Identifying Pictures**
- **Chromatin Immunoprecipitation**
- **Chromatography-Based Biomolecule Purification Methods**
- **Co-Immunoprecipitation and Pull-Down Assays**
- **Color Afterimages**
- **Column Chromatography**
- **Common Lab Glassware and Uses**
- **Community DNA Extraction from Bacterial Colonies**
- **Compound Administration I**
- **Compound Administration II**
- **Compound Administration III**
- **Compound Administration IV**
- **Comprehensive Breast Exam**
- **Conducting Reactions Below Room Temperature**
- **Considerations for Rodent Surgery**
- **Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry**
- **Coordination Chemistry Complexes**
- **Cranial Nerves Exam I (I-VI)**
- **Cranial Nerves Exam II (VII-XII)**
- **Crowding**
- **Culturing and Enumerating Bacteria from Soil Samples**
- **Cyclic Voltammetry (CV)**
- **Cytogenetics**

- DNA Gel Electrophoresis
- DNA Ligation Reactions
- DNA Methylation Analysis
- Decision-making and the Iowa Gambling Task
- Decoding Auditory Imagery with Multivoxel Pattern Analysis
- Degassing Liquids with Freeze-Pump-Thaw Cycling
- Density Gradient Ultracentrifugation
- Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis
- Detecting Reactive Oxygen Species
- Detection of Bacteriophages in Environmental Samples
- Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy
- Determining Rate Laws and the Order of Reaction
- Determining Spatial Orientation of Rock Layers with the Brunton Compass
- Determining the Density of a Solid and Liquid
- Determining the Empirical Formula
- Determining the Mass Percent Composition in an Aqueous Solution
- Determining the Solubility Rules of Ionic Compounds
- Development and Reproduction of the Laboratory Mouse
- Development of the Chick
- Diagnostic Necropsy and Tissue Harvest
- Dialysis: Diffusion Based Separation
- Dichotic Listening
- Dissolved Oxygen in Surface Water
- Drosophila Development and Reproduction
- Drosophila Larval IHC
- Drosophila Maintenance
- Drosophila melanogaster Embryo and Larva Harvesting and Preparation
- Ear Exam
- Elbow Exam
- Electro-encephalography (EEG)
- Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat
- Electrophoretic Mobility Shift Assay (EMSA)
- Embryonic Stem Cell Culture and Differentiation
- Emergency Tube Thoracostomy (Chest Tube Placement)
- Emergent Lateral Canthotomy and Inferior Catholysis
- Enzyme Assays and Kinetics
- Ethics in Psychology Research
- Event-related Potentials and the Oddball Task
- Executive Function and the Dimensional Change Card Sort Task
- Executive Function in Autism Spectrum Disorder
- Experimentation using a Confederate
- Explant Culture for Developmental Studies

- **Explant Culture of Neural Tissue**
- **Expression Profiling with Microarrays**
- **Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction**
- **Eye Exam**
- **Eye Tracking in Cognitive Experiments**
- **FM Dyes in Vesicle Recycling**
- **Fate Mapping**
- **Fear Conditioning**
- **Filamentous Fungi**
- **Finding Your Blind Spot and Perceptual Filling-in**
- **Foot Exam**
- **Fractional Distillation**
- **Freezing-Point Depression to Determine an Unknown Compound**
- **From Theory to Design: The Role of Creativity in Designing Experiments**
- **Fundamentals of Breeding and Weaning**
- **Förster Resonance Energy Transfer (FRET)**
- **Gas Chromatography (GC) with Flame-Ionization Detection**
- **Gel Purification**
- **Gene Silencing with Morpholinos**
- **General Approach to the Physical Exam**
- **Genetic Crosses**
- **Genetic Engineering of Model Organisms**
- **Genetic Screens**
- **Genome Editing**
- **Gram Staining of Bacteria from Environmental Sources**
- **Growing Crystals for X-ray Diffraction Analysis**
- **Habituation: Studying Infants Before They Can Talk**
- **Hand and Wrist Exam**
- **High-Performance Liquid Chromatography (HPLC)**
- **Hip Exam**
- **Histological Staining of Neural Tissue**
- **How Children Solve Problems Using Causal Reasoning**
- **Ideal Gas Law**
- **Igneous Intrusive Rock**
- **Igneous Volcanic Rock**
- **In ovo Electroporation of Chicken Embryos**
- **Inattentive Blindness**
- **Incidental Encoding**
- **Induced Pluripotency**
- **Internal Standards**
- **Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation**
- **Intraosseous Needle Placement**
- **Introducing Experimental Agents into the Mouse**
- **Introduction to Catalysis**
- **Introduction to Mass Spectrometry**
- **Introduction to Titration**
- **Invasion Assay Using 3D Matrices**

- Invertebrate Lifespan Quantification
- Ion-Exchange Chromatography
- Isolating Nucleic Acids from Yeast
- Isolation of Fecal Bacteria from Water Samples by Filtration
- Just-noticeable Differences
- Knee Exam
- Language: The N400 in Semantic Incongruity
- Le Châtelier's Principle
- Lead Analysis of Soil Using Atomic Absorption Spectroscopy
- Learning and Memory: The Remember-Know Task
- Live Cell Imaging of Mitosis
- Lower Back Exam
- Lymph Node Exam
- MALDI-TOF Mass Spectrometry
- Making a Geologic Cross Section
- Male Rectal Exam
- Manipulating an Independent Variable through Embodiment
- Measuring Children's Trust in Testimony
- Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain
- Measuring Reaction Time and Donders' Method of Subtraction
- Measuring Tropospheric Ozone
- Measuring Verbal Working Memory Span
- Measuring Vital Signs
- Memory Development: Demonstrating How Repeated Questioning Leads to False Memories
- Mental Rotation
- Metabolic Labeling
- Metacognitive Development: How Children Estimate Their Memory
- Method of Standard Addition
- Modeling Social Stress
- Molecular Cloning
- Motion-induced Blindness
- Motor Exam I
- Motor Exam II
- Motor Learning in Mirror Drawing
- Motor Maps
- Mouse Genotyping
- Multiple Object Tracking
- Murine In Utero Electroporation
- Mutual Exclusivity: How Children Learn the Meanings of Words
- Neck Exam
- Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment
- Neuronal Transfection Methods
- Nose, Sinuses, Oral Cavity and Pharynx Exam

- Nuclear Magnetic Resonance (NMR) Spectroscopy
- Numerical Cognition: More or Less
- Nutrients in Aquatic Ecosystems
- Object Substitution Masking
- Observation and Inspection
- Observational Research
- Ophthalmoscopic Examination
- PCR: The Polymerase Chain Reaction
- Palpation
- Passaging Cells
- Patch Clamp Electrophysiology
- Pelvic Exam I: Assessment of the External Genitalia
- Pelvic Exam II: Speculum Exam
- Pelvic Exam III: Bimanual and Rectovaginal Exam
- Percussion
- Percutaneous Cricothyrotomy (Seldinger Technique)
- Performing 1D Thin Layer Chromatography
- Pericardiocentesis
- Peripheral Vascular Exam
- Peripheral Vascular Exam Using a Continuous Wave Doppler
- Peripheral Venous Cannulation
- Perspectives on Cognitive Psychology
- Perspectives on Experimental Psychology
- Perspectives on Neuropsychology
- Perspectives on Sensation and Perception
- Photometric Protein Determination
- Physical Properties Of Minerals I: Crystals and Cleavage
- Physical Properties Of Minerals II: Polymineralic Analysis
- Physiological Correlates of Emotion Recognition
- Piaget's Conservation Task and the Influence of Task Demands
- Pilot Testing
- Placebos in Research
- Plasmid Purification
- Positive Reinforcement Studies
- Preparing Anhydrous Reagents and Equipment
- Primary Neuronal Cultures
- Proper Adjustment of Patient Attire during the Physical Exam
- Prospect Theory
- Protein Crystallization
- Proton Exchange Membrane Fuel Cells
- Purification of a Total Lipid Extract with Column Chromatography
- Purifying Compounds by Recrystallization
- Quantifying Environmental Microorganisms and Viruses Using qPCR
- RNA Analysis of Environmental Samples Using RT-PCR
- RNA-Seq
- RNAi in *C. elegans*

- Raman Spectroscopy for Chemical Analysis
- Realism in Experimentation
- Recombineering and Gene Targeting
- Reconstitution of Membrane Proteins
- Reliability in Psychology Experiments
- Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry
- Respiratory Exam I: Inspection and Palpation
- Respiratory Exam II: Percussion and Auscultation
- Restriction Enzyme Digests
- Rodent Handling and Restraint Techniques
- Rodent Identification I
- Rodent Identification II
- Rodent Stereotaxic Surgery
- Rotary Evaporation to Remove Solvent
- SNP Genotyping
- Sample Preparation for Analytical Preparation
- Scanning Electron Microscopy (SEM)
- Schlenk Lines Transfer of Solvents
- Self-administration Studies
- Self-report vs. Behavioral Measures of Recycling
- Sensory Exam
- Separating Protein with SDS-PAGE
- Separation of Mixtures via Precipitation
- Shoulder Exam I
- Shoulder Exam II
- Soil Nutrient Analysis: Nitrogen, Phosphorus, and Potassium
- Solid-Liquid Extraction
- Solutions and Concentrations
- Sonication Extraction of Lipid Biomarkers from Sediment
- Soxhlet Extraction of Lipid Biomarkers from Sediment
- Spatial Cueing
- Spatial Memory Testing Using Mazes
- Spectrophotometric Determination of an Equilibrium Constant
- Sterile Tissue Harvest
- Surface Plasmon Resonance (SPR)
- Surgical Cricothyrotomy
- Tandem Mass Spectrometry
- Testing For Genetically Modified Foods
- The ATP Bioluminescence Assay
- The Ames Room
- The Attentional Blink
- The Costs and Benefits of Natural Pedagogy
- The ELISA Method
- The Factorial Experiment
- The Ideal Gas Law
- The Inverted-face Effect
- The McGurk Effect
- The Morris Water Maze

- The Multi-group Experiment
- The Precision of Visual Working Memory with Delayed Estimation
- The Rouge Test: Searching for a Sense of Self
- The Rubber Hand Illusion
- The Simple Experiment: Two-group Design
- The Split Brain
- The Staircase Procedure for Finding a Perceptual 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
- Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
- Using Diffusion Tensor Imaging in Traumatic Brain Injury
- Using GIS to Investigate Urban Forestry
- Using TMS to Measure Motor Excitability During Action Observation
- Using Topographic Maps to Generate Topographic Profiles
- Using Your Head: Measuring Infants' Rational Imitation of Actions
- Using a pH Meter
- Verbal Priming
- Visual Attention: fMRI Investigation of Object-based Attentional Control
- Visual Search for Features and Conjunctions
- Visual Statistical Learning
- Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy
- Water Quality Analysis via Indicator Organisms
- Whole-Mount In Situ Hybridization
- Within-subjects Repeated-measures Design
- X-ray Fluorescence (XRF)
- Yeast Maintenance
- Yeast Reproduction
- Yeast Transformation and Cloning
- Zebrafish Breeding and Embryo Handling
- Zebrafish Maintenance and Husbandry
- Zebrafish Microinjection Techniques
- Zebrafish Reproduction and Development
- fMRI: Functional Magnetic Resonance Imaging

<p>BENCHMARK</p>	<p>SC.912.N.4.2. Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Abdominal Exam I: Inspection and Auscultation • Abdominal Exam II: Percussion • Abdominal Exam III: Palpation • Abdominal Exam IV: Acute Abdominal Pain Assessment • Algae Enumeration via Culturable Methodology • An Introduction to Aging and Regeneration • An Introduction to Behavioral Neuroscience • An Introduction to Caenorhabditis elegans • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Cognition • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Drosophila melanogaster • An Introduction to Endocytosis and Exocytosis • An Introduction to Learning and Memory • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to Molecular Developmental Biology • An Introduction to Motor Control • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Introduction to Organogenesis • An Introduction to Reward and Addiction • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Introduction to Transfection • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Laboratory Mouse: Mus musculus • An Introduction to the Zebrafish: Danio rerio • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of Epigenetics • An Overview of Gene Expression • An Overview of Genetic Analysis • An Overview of Genetic Engineering • An Overview of Genetics and Disease • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Analysis of Earthworm Populations in Soil
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- Anesthesia Induction and Maintenance
- Ankle Exam
- Annexin V and Propidium Iodide Labeling
- Anterograde Amnesia
- Anxiety Testing
- Approximate Number Sense Test
- Are You Smart or Hardworking? How Praise Influences Children's Motivation
- Arterial Line Placement
- Aseptic Technique in Environmental Science
- Assembly of a Reflux System for Heated Chemical Reactions
- Assessing Dexterity with Reaching Tasks
- Auscultation
- Bacterial Growth Curve Analysis and its Environmental Applications
- Bacterial Transformation: Electroporation
- Bacterial Transformation: The Heat Shock Method
- Balance and Coordination Testing
- Basic Care Procedures
- Basic Chick Care and Maintenance
- Basic Life Support Part II: Airway/Breathing and Continued Cardiopulmonary Resuscitation
- Basic Life Support: Cardiopulmonary Resuscitation and Defibrillation
- Basic Mouse Care and Maintenance
- Binocular Rivalry
- Biofuels: Producing Ethanol from Cellulosic Material
- Blood Pressure Measurement
- Blood Withdrawal I
- Blood Withdrawal II
- C. elegans Chemotaxis Assay
- C. elegans Development and Reproduction
- C. elegans Maintenance
- Calcium Imaging in Neurons
- Calibration Curves
- Capillary Electrophoresis (CE)
- Carbon and Nitrogen Analysis of Environmental Samples
- Cardiac Exam I: Inspection and Palpation
- Cardiac Exam II: Auscultation
- Cardiac Exam III: Abnormal Heart Sounds
- Categories and Inductive Inferences
- Cell Cycle Analysis
- Cell-surface Biotinylation Assay
- Central Venous Catheter Insertion: Femoral Vein with Ultrasound Guidance
- Central Venous Catheter Insertion: Internal Jugular with Ultrasound Guidance
- Central Venous Catheter Insertion: Subclavian Vein
- Chick ex ovo Culture

- Children's Reliance on Artist Intentions When Identifying Pictures
- Chromatin Immunoprecipitation
- Chromatography-Based Biomolecule Purification Methods
- Co-Immunoprecipitation and Pull-Down Assays
- Color Afterimages
- Column Chromatography
- Common Lab Glassware and Uses
- Community DNA Extraction from Bacterial Colonies
- Compound Administration I
- Compound Administration II
- Compound Administration III
- Compound Administration IV
- Comprehensive Breast Exam
- Conducting Reactions Below Room Temperature
- Considerations for Rodent Surgery
- Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry
- Coordination Chemistry Complexes
- Cranial Nerves Exam I (I-VI)
- Cranial Nerves Exam II (VII-XII)
- Crowding
- Culturing and Enumerating Bacteria from Soil Samples
- Cyclic Voltammetry (CV)
- Cytogenetics
- DNA Gel Electrophoresis
- DNA Ligation Reactions
- DNA Methylation Analysis
- Decision-making and the Iowa Gambling Task
- Decoding Auditory Imagery with Multivoxel Pattern Analysis
- Degassing Liquids with Freeze-Pump-Thaw Cycling
- Density Gradient Ultracentrifugation
- Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis
- Detecting Reactive Oxygen Species
- Detection of Bacteriophages in Environmental Samples
- Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy
- Determining Rate Laws and the Order of Reaction
- Determining Spatial Orientation of Rock Layers with the Brunton Compass
- Determining the Density of a Solid and Liquid
- Determining the Empirical Formula
- Determining the Mass Percent Composition in an Aqueous Solution
- Determining the Solubility Rules of Ionic Compounds
- Development and Reproduction of the Laboratory Mouse
- Development of the Chick

- Diagnostic Necropsy and Tissue Harvest
- Dialysis: Diffusion Based Separation
- Dichotic Listening
- Dissolved Oxygen in Surface Water
- Drosophila Development and Reproduction
- Drosophila Larval IHC
- Drosophila Maintenance
- Drosophila melanogaster Embryo and Larva Harvesting and Preparation
- Ear Exam
- Elbow Exam
- Electro-encephalography (EEG)
- Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat
- Electrophoretic Mobility Shift Assay (EMSA)
- Embryonic Stem Cell Culture and Differentiation
- Emergency Tube Thoracostomy (Chest Tube Placement)
- Emergent Lateral Canthotomy and Inferior Catholysis
- Enzyme Assays and Kinetics
- Ethics in Psychology Research
- Event-related Potentials and the Oddball Task
- Executive Function and the Dimensional Change Card Sort Task
- Executive Function in Autism Spectrum Disorder
- Experimentation using a Confederate
- Explant Culture for Developmental Studies
- Explant Culture of Neural Tissue
- Expression Profiling with Microarrays
- Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction
- Eye Exam
- Eye Tracking in Cognitive Experiments
- FM Dyes in Vesicle Recycling
- Fate Mapping
- Fear Conditioning
- Filamentous Fungi
- Finding Your Blind Spot and Perceptual Filling-in
- Foot Exam
- Fractional Distillation
- Freezing-Point Depression to Determine an Unknown Compound
- From Theory to Design: The Role of Creativity in Designing Experiments
- Fundamentals of Breeding and Weaning
- Förster Resonance Energy Transfer (FRET)
- Gas Chromatography (GC) with Flame-Ionization Detection
- Gel Purification
- Gene Silencing with Morpholinos
- General Approach to the Physical Exam

- Genetic Crosses
- Genetic Engineering of Model Organisms
- Genetic Screens
- Genome Editing
- Gram Staining of Bacteria from Environmental Sources
- Growing Crystals for X-ray Diffraction Analysis
- Habituation: Studying Infants Before They Can Talk
- Hand and Wrist Exam
- High-Performance Liquid Chromatography (HPLC)
- Hip Exam
- Histological Staining of Neural Tissue
- How Children Solve Problems Using Causal Reasoning
- Ideal Gas Law
- Igneous Intrusive Rock
- Igneous Volcanic Rock
- In ovo Electroporation of Chicken Embryos
- Inattentive Blindness
- Incidental Encoding
- Induced Pluripotency
- Internal Standards
- Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation
- Intraosseous Needle Placement
- Introducing Experimental Agents into the Mouse
- Introduction to Catalysis
- Introduction to Mass Spectrometry
- Introduction to Titration
- Invasion Assay Using 3D Matrices
- Invertebrate Lifespan Quantification
- Ion-Exchange Chromatography
- Isolating Nucleic Acids from Yeast
- Isolation of Fecal Bacteria from Water Samples by Filtration
- Just-noticeable Differences
- Knee Exam
- Language: The N400 in Semantic Incongruity
- Le Châtelier's Principle
- Lead Analysis of Soil Using Atomic Absorption Spectroscopy
- Learning and Memory: The Remember-Know Task
- Live Cell Imaging of Mitosis
- Lower Back Exam
- Lymph Node Exam
- MALDI-TOF Mass Spectrometry
- Making a Geologic Cross Section
- Male Rectal Exam
- Manipulating an Independent Variable through Embodiment
- Measuring Children's Trust in Testimony
- Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain

- **Measuring Reaction Time and Donders' Method of Subtraction**
- **Measuring Tropospheric Ozone**
- **Measuring Verbal Working Memory Span**
- **Measuring Vital Signs**
- **Memory Development: Demonstrating How Repeated Questioning Leads to False Memories**
- **Mental Rotation**
- **Metabolic Labeling**
- **Metacognitive Development: How Children Estimate Their Memory**
- **Method of Standard Addition**
- **Modeling Social Stress**
- **Molecular Cloning**
- **Motion-induced Blindness**
- **Motor Exam I**
- **Motor Exam II**
- **Motor Learning in Mirror Drawing**
- **Motor Maps**
- **Mouse Genotyping**
- **Multiple Object Tracking**
- **Murine In Utero Electroporation**
- **Mutual Exclusivity: How Children Learn the Meanings of Words**
- **Neck Exam**
- **Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment**
- **Neuronal Transfection Methods**
- **Nose, Sinuses, Oral Cavity and Pharynx Exam**
- **Nuclear Magnetic Resonance (NMR) Spectroscopy**
- **Numerical Cognition: More or Less**
- **Nutrients in Aquatic Ecosystems**
- **Object Substitution Masking**
- **Observation and Inspection**
- **Observational Research**
- **Ophthalmoscopic Examination**
- **PCR: The Polymerase Chain Reaction**
- **Palpation**
- **Passaging Cells**
- **Patch Clamp Electrophysiology**
- **Pelvic Exam I: Assessment of the External Genitalia**
- **Pelvic Exam II: Speculum Exam**
- **Pelvic Exam III: Bimanual and Rectovaginal Exam**
- **Percussion**
- **Percutaneous Cricothyrotomy (Seldinger Technique)**
- **Performing 1D Thin Layer Chromatography**
- **Pericardiocentesis**
- **Peripheral Vascular Exam**
- **Peripheral Vascular Exam Using a Continuous Wave Doppler**
- **Peripheral Venous Cannulation**

- Perspectives on Cognitive Psychology
- Perspectives on Experimental Psychology
- Perspectives on Neuropsychology
- Perspectives on Sensation and Perception
- Photometric Protein Determination
- Physical Properties Of Minerals I: Crystals and Cleavage
- Physical Properties Of Minerals II: Polymineralic Analysis
- Physiological Correlates of Emotion Recognition
- Piaget's Conservation Task and the Influence of Task Demands
- Pilot Testing
- Placebos in Research
- Plasmid Purification
- Positive Reinforcement Studies
- Preparing Anhydrous Reagents and Equipment
- Primary Neuronal Cultures
- Proper Adjustment of Patient Attire during the Physical Exam
- Prospect Theory
- Protein Crystallization
- Proton Exchange Membrane Fuel Cells
- Purification of a Total Lipid Extract with Column Chromatography
- Purifying Compounds by Recrystallization
- Quantifying Environmental Microorganisms and Viruses Using qPCR
- RNA Analysis of Environmental Samples Using RT-PCR
- RNA-Seq
- RNAi in *C. elegans*
- Raman Spectroscopy for Chemical Analysis
- Realism in Experimentation
- Recombineering and Gene Targeting
- Reconstitution of Membrane Proteins
- Reliability in Psychology Experiments
- Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry
- Respiratory Exam I: Inspection and Palpation
- Respiratory Exam II: Percussion and Auscultation
- Restriction Enzyme Digests
- Rodent Handling and Restraint Techniques
- Rodent Identification I
- Rodent Identification II
- Rodent Stereotaxic Surgery
- Rotary Evaporation to Remove Solvent
- SNP Genotyping
- Sample Preparation for Analytical Preparation
- Scanning Electron Microscopy (SEM)
- Schlenk Lines Transfer of Solvents
- Self-administration Studies
- Self-report vs. Behavioral Measures of Recycling

- Sensory Exam
- Separating Protein with SDS-PAGE
- Separation of Mixtures via Precipitation
- Shoulder Exam I
- Shoulder Exam II
- Soil Nutrient Analysis: Nitrogen, Phosphorus, and Potassium
- Solid-Liquid Extraction
- Solutions and Concentrations
- Sonication Extraction of Lipid Biomarkers from Sediment
- Soxhlet Extraction of Lipid Biomarkers from Sediment
- Spatial Cueing
- Spatial Memory Testing Using Mazes
- Spectrophotometric Determination of an Equilibrium Constant
- Sterile Tissue Harvest
- Surface Plasmon Resonance (SPR)
- Surgical Cricothyrotomy
- Tandem Mass Spectrometry
- Testing For Genetically Modified Foods
- The ATP Bioluminescence Assay
- The Ames Room
- The Attentional Blink
- The Costs and Benefits of Natural Pedagogy
- The ELISA Method
- The Factorial Experiment
- The Ideal Gas Law
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- The McGurk Effect
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- The Transwell Migration Assay
- The Western Blot
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- Transplantation Studies
- Tree Identification: How To Use a Dichotomous Key
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- Two-Dimensional Gel Electrophoresis
- Ultraviolet-Visible (UV-Vis) Spectroscopy

		<ul style="list-style-type: none"> • 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
BODY OF KNOWLEDGE	FL.SC.912.E.	Earth and Space Science
BIG IDEA	SC.912.E.5.	Earth in Space and Time - The origin and eventual fate of the Universe still remains one of the greatest questions in science. Gravity and energy influence the development and life cycles of galaxies, including our own Milky Way Galaxy, stars, the planetary systems, Earth, and residual material left from the formation of the Solar System. Humankind's need to explore continues to lead to the development of knowledge and understanding of the nature of the Universe.
BENCHMARK	SC.912.E.5.4.	<p>Explain the physical properties of the Sun and its dynamic nature and connect them to conditions and events on Earth.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Turbidity and Total Solids in Surface Water
BODY OF KNOWLEDGE	FL.SC.912.E.	Earth and Space Science
BIG IDEA	SC.912.E.6.	Earth Structures - The scientific theory of plate tectonics provides the framework for much of modern geology.

		Over geologic time, internal and external sources of energy have continuously altered the features of Earth by means of both constructive and destructive forces. All life, including human civilization, is dependent on Earth's internal and external energy and material resources.
BENCHMARK	SC.912.E.6.1.	Describe and differentiate the layers of Earth and the interactions among them. <u>JoVE</u> <ul style="list-style-type: none"> • Igneous Intrusive Rock • Igneous Volcanic Rock • Using Topographic Maps to Generate Topographic Profiles
BENCHMARK	SC.912.E.6.2.	Connect surface features to surface processes that are responsible for their formation. <u>JoVE</u> <ul style="list-style-type: none"> • Determining Spatial Orientation of Rock Layers with the Brunton Compass • Igneous Intrusive Rock • Igneous Volcanic Rock • Making a Geologic Cross Section • Using Topographic Maps to Generate Topographic Profiles
BENCHMARK	SC.912.E.6.3.	Analyze the scientific theory of plate tectonics and identify related major processes and features as a result of moving plates. <u>JoVE</u> <ul style="list-style-type: none"> • Determining Spatial Orientation of Rock Layers with the Brunton Compass • Igneous Intrusive Rock • Igneous Volcanic Rock • Making a Geologic Cross Section • Using Topographic Maps to Generate Topographic Profiles
BENCHMARK	SC.912.E.6.4.	Analyze how specific geologic processes and features are expressed in Florida and elsewhere. <u>JoVE</u> <ul style="list-style-type: none"> • Determining Spatial Orientation of Rock Layers with the Brunton Compass • Igneous Intrusive Rock • Igneous Volcanic Rock • Making a Geologic Cross Section • Using Topographic Maps to Generate Topographic Profiles
BENCHMARK	SC.912.E.6.6.	Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.

		<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 • Fractional Distillation • Measuring Tropospheric Ozone • Proton Exchange Membrane Fuel Cells • Using GIS to Investigate Urban Forestry
BODY OF KNOWLEDGE	FL.SC.912.E.	Earth and Space Science
BIG IDEA	SC.912.E.7.	Earth Systems and Patterns - The scientific theory of the evolution of Earth states that changes in our planet are driven by the flow of energy and the cycling of matter through dynamic interactions among the atmosphere, hydrosphere, cryosphere, geosphere, and biosphere, and the resources used to sustain human civilization on Earth.
BENCHMARK	SC.912.E.7.1.	<p>Analyze the movement of matter and energy through the different biogeochemical cycles, including water and carbon.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Dissolved Oxygen in Surface Water • Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction • Purification of a Total Lipid Extract with Column Chromatography • Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment • Using GIS to Investigate Urban Forestry
BENCHMARK	SC.912.E.7.3.	<p>Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Igneous Intrusive Rock • Igneous Volcanic Rock • Making a Geologic Cross Section • Turbidity and Total Solids in Surface Water

		<ul style="list-style-type: none"> • Using Topographic Maps to Generate Topographic Profiles
BENCHMARK	SC.912.E.7.7.	<p>Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change.</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
BENCHMARK	SC.912.E.7.8.	<p>Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Igneous Volcanic Rock
BODY OF KNOWLEDGE	FL.SC.912.P.	Physical Science
BIG IDEA	SC.912.P.8.	<p>Matter - A. A working definition of matter is that it takes up space, has mass, and has measurable properties. Matter is comprised of atomic, subatomic, and elementary particles. B. Electrons are key to defining chemical and some physical properties, reactivity, and molecular structures. Repeating (periodic) patterns of physical and chemical properties occur among elements that define groups of elements with similar properties. The periodic table displays the repeating patterns, which are related to the atom's outermost electrons. Atoms bond with each other to form compounds. C. In a chemical reaction, one or more reactants are transformed into one or more new products. Many factors shape the nature of products and the rates of reaction. D. Carbon-based compounds are building-blocks of known life forms on earth and numerous useful natural and synthetic products.</p>
BENCHMARK	SC.912.P.8.1.	<p>Differentiate among the four states of matter.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Degassing Liquids with Freeze-Pump-Thaw Cycling • Fractional Distillation • Gas Chromatography (GC) with Flame-Ionization Detection • Growing Crystals for X-ray Diffraction Analysis • Ideal Gas Law • Physical Properties Of Minerals I: Crystals and Cleavage • Physical Properties Of Minerals II: Polymineralic Analysis • Protein Crystallization • Purifying Compounds by Recrystallization

		<ul style="list-style-type: none"> • Schlenk Lines Transfer of Solvents • Separation of Mixtures via Precipitation • Solid-Liquid Extraction • The Ideal Gas Law
BENCHMARK	SC.912.P.8.2.	<p>Differentiate between physical and chemical properties and physical and chemical changes of matter.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Metabolism • Assembly of a Reflux System for Heated Chemical Reactions • Common Lab Glassware and Uses • Cyclic Voltammetry (CV) • Degassing Liquids with Freeze-Pump-Thaw Cycling • Detecting Reactive Oxygen Species • Determining the Density of a Solid and Liquid • Determining the Mass Percent Composition in an Aqueous Solution • Enzyme Assays and Kinetics • Fractional Distillation • Freezing-Point Depression to Determine an Unknown Compound • Growing Crystals for X-ray Diffraction Analysis • Introduction to Titration • Preparing Anhydrous Reagents and Equipment • Proton Exchange Membrane Fuel Cells • 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 • The ATP Bioluminescence Assay • The ELISA Method • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy • Using a pH Meter
BENCHMARK	SC.912.P.8.4.	<p>Explore the scientific theory of atoms (also known as atomic theory) by describing the structure of atoms in terms of protons, neutrons and electrons, and differentiate among these particles in terms of their mass, electrical charges and locations within the atom.</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)

BENCHMARK	SC.912.P.8.5.	<p>Relate properties of atoms and their position in the periodic table to the arrangement of their electrons.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Coordination Chemistry Complexes
BENCHMARK	SC.912.P.8.6.	<p>Distinguish between bonding forces holding compounds together and other attractive forces, including hydrogen bonding and Van Der Waals forces.</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 Adduction for Uk'37 Paleothermometry • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment • Ultraviolet-Visible (UV-Vis) Spectroscopy • X-ray Fluorescence (XRF)
BENCHMARK	SC.912.P.8.7.	<p>Interpret formula representations of molecules and compounds in terms of composition and structure.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining the Empirical Formula
BENCHMARK	SC.912.P.8.8.	<p>Characterize types of chemical reactions, for example: redox, acid-base, synthesis, and single and double replacement reactions.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Conducting Reactions Below Room Temperature • Coordination Chemistry Complexes • Cyclic Voltammetry (CV) • Determining Rate Laws and the Order of Reaction • Determining the Solubility Rules of Ionic Compounds • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Enzyme Assays and Kinetics • Growing Crystals for X-ray Diffraction Analysis

		<ul style="list-style-type: none"> • Introduction to Catalysis • Introduction to Titration • Le Châtelier's Principle • Photometric Protein Determination • Preparing Anhydrous Reagents and Equipment • Proton Exchange Membrane Fuel Cells • Purifying Compounds by Recrystallization • Rotary Evaporation to Remove Solvent • Separation of Mixtures via Precipitation • Spectrophotometric Determination of an Equilibrium Constant • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy • Using a pH Meter
BENCHMARK	SC.912.P.8.9.	<p>Apply the mole concept and the law of conservation of mass to calculate quantities of chemicals participating in reactions.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Calibration Curves • Capillary Electrophoresis (CE) • Determining Rate Laws and the Order of Reaction • Determining the Mass Percent Composition in an Aqueous Solution • Freezing-Point Depression to Determine an Unknown Compound • Gas Chromatography (GC) with Flame-Ionization Detection • High-Performance Liquid Chromatography (HPLC) • Internal Standards • Introduction to Titration • Introduction to the Microplate Reader • Introduction to the Spectrophotometer • Le Châtelier's Principle • Making Solutions in the Laboratory • Photometric Protein Determination • Sample Preparation for Analytical Preparation • Solutions and Concentrations • Spectrophotometric Determination of an Equilibrium Constant • Understanding Concentration and Measuring Volumes
BENCHMARK	SC.912.P.8.10.	<p>Describe oxidation-reduction reactions in living and non-living systems.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Cyclic Voltammetry (CV) • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Introduction to Titration • Photometric Protein Determination • Proton Exchange Membrane Fuel Cells

BENCHMARK	SC.912.P.8.11.	<p>Relate acidity and basicity to hydronium and hydroxyl ion concentration and pH.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Assembly of a Reflux System for Heated Chemical Reactions • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • High-Performance Liquid Chromatography (HPLC) • Introduction to Titration • Ion-Exchange Chromatography • Le Châtelier's Principle • Passaging Cells • Two-Dimensional Gel Electrophoresis • Using a pH Meter
BENCHMARK	SC.912.P.8.12.	<p>Describe the properties of the carbon atom that make the diversity of carbon compounds possible.</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 • Assembly of a Reflux System for Heated Chemical Reactions • Chromatography-Based Biomolecule Purification Methods • Column Chromatography • Conducting Reactions Below Room Temperature • Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry • Coordination Chemistry Complexes • Degassing Liquids with Freeze-Pump-Thaw Cycling • Density Gradient Ultracentrifugation • Dialysis: Diffusion Based Separation • Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction • Fractional Distillation • Growing Crystals for X-ray Diffraction Analysis • Introduction to Catalysis • Ion-Exchange Chromatography • MALDI-TOF Mass Spectrometry • Metabolic Labeling • Nuclear Magnetic Resonance (NMR) Spectroscopy • Performing 1D Thin Layer Chromatography • Preparing Anhydrous Reagents and Equipment • Purification of a Total Lipid Extract with Column Chromatography • Purifying Compounds by Recrystallization • Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry

		<ul style="list-style-type: none"> • Rotary Evaporation to Remove Solvent • Schlenk Lines Transfer of Solvents • Separation of Mixtures via Precipitation • Solid-Liquid Extraction • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment • Tandem Mass Spectrometry • Two-Dimensional Gel Electrophoresis • Ultraviolet-Visible (UV-Vis) Spectroscopy
BENCHMARK	SC.912.P.8.13.	<p>Identify selected functional groups and relate how they contribute to properties of carbon compounds.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Coordination Chemistry Complexes • Ion-Exchange Chromatography • MALDI-TOF Mass Spectrometry • Metabolic Labeling • Purification of a Total Lipid Extract with Column Chromatography • Tandem Mass Spectrometry • Ultraviolet-Visible (UV-Vis) Spectroscopy
BODY OF KNOWLEDGE	FL.SC.912.P.	Physical Science
BIG IDEA	SC.912.P.10.	<p>Energy - A. Energy is involved in all physical and chemical processes. It is conserved, and can be transformed from one form to another and into work. At the atomic and nuclear levels energy is not continuous but exists in discrete amounts. Energy and mass are related through Einstein's equation $E=mc^2$. B. The properties of atomic nuclei are responsible for energy-related phenomena such as radioactivity, fission and fusion. C. Changes in entropy and energy that accompany chemical reactions influence reaction paths. Chemical reactions result in the release or absorption of energy. D. The theory of electromagnetism explains that electricity and magnetism are closely related. Electric charges are the source of electric fields. Moving charges generate magnetic fields. E. Waves are the propagation of a disturbance. They transport energy and momentum but do not transport matter.</p>
BENCHMARK	SC.912.P.10.1.	<p>Differentiate among the various forms of energy and recognize that they can be transformed from one form to others.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material • Proton Exchange Membrane Fuel Cells
BENCHMARK	SC.912.P.10.4.	Describe heat as the energy transferred by convection, conduction, and radiation, and explain the connection of heat to change in temperature or states of matter.

		<p>JoVE</p> <ul style="list-style-type: none"> • Assembly of a Reflux System for Heated Chemical Reactions • Degassing Liquids with Freeze-Pump-Thaw Cycling • Fractional Distillation • Freezing-Point Depression to Determine an Unknown Compound • Growing Crystals for X-ray Diffraction Analysis • 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
BENCHMARK	SC.912.P.10.5.	<p>Relate temperature to the average molecular kinetic energy.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Conducting Reactions Below Room Temperature • Freezing-Point Depression to Determine an Unknown Compound • Ideal Gas Law • Regulating Temperature in the Lab: Applying Heat • Regulating Temperature in the Lab: Preserving Samples Using Cold • The Ideal Gas Law
BENCHMARK	SC.912.P.10.7.	<p>Distinguish between endothermic and exothermic chemical processes.</p> <p>JoVE</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
BENCHMARK	SC.912.P.10.9.	<p>Describe the quantization of energy at the atomic level.</p> <p>JoVE</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)
BENCHMARK	SC.912.P.10.11.	<p>Explain and compare nuclear reactions (radioactive decay, fission and fusion), the energy changes associated with them and their associated safety issues.</p>

		<p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining Rate Laws and the Order of Reaction • Nuclear Magnetic Resonance (NMR) Spectroscopy
BENCHMARK	SC.912.P.10.12.	<p>Differentiate between chemical and nuclear reactions.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Conducting Reactions Below Room Temperature • Cyclic Voltammetry (CV) • Determining the Solubility Rules of Ionic Compounds • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Enzyme Assays and Kinetics • Growing Crystals for X-ray Diffraction Analysis • Introduction to Catalysis • Introduction to Titration • Le Châtelier's Principle • Nuclear Magnetic Resonance (NMR) Spectroscopy • Photometric Protein Determination • Preparing Anhydrous Reagents and Equipment • Proton Exchange Membrane Fuel Cells • Purifying Compounds by Recrystallization • Rotary Evaporation to Remove Solvent • Separation of Mixtures via Precipitation • The ELISA Method • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy • Using a pH Meter
BENCHMARK	SC.912.P.10.14.	<p>Differentiate among conductors, semiconductors, and insulators.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Assembly of a Reflux System for Heated Chemical Reactions • Surface Plasmon Resonance (SPR)
BENCHMARK	SC.912.P.10.15.	<p>Investigate and explain the relationships among current, voltage, resistance, and power.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Cyclic Voltammetry (CV) • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat
BENCHMARK	SC.912.P.10.16.	<p>Explain the relationship between moving charges and magnetic fields, as well as changing magnetic fields and electric fields, and their application to modern technologies.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining Spatial Orientation of Rock Layers with the Brunton Compass

		<ul style="list-style-type: none"> • Introduction to Mass Spectrometry • MALDI-TOF Mass Spectrometry • Nuclear Magnetic Resonance (NMR) Spectroscopy • Object Substitution Masking • Tandem Mass Spectrometry • fMRI: Functional Magnetic Resonance Imaging
BENCHMARK	SC.912.P.10.17.	<p>Explore the theory of electromagnetism by explaining electromagnetic waves in terms of oscillating electric and magnetic fields.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • fMRI: Functional Magnetic Resonance Imaging
BENCHMARK	SC.912.P.10.18.	<p>Explore the theory of electromagnetism by comparing and contrasting the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Behavioral Neuroscience • An Introduction to Cognition • An Introduction to Learning and Memory • An Introduction to Motor Control • An Introduction to Neuroanatomy • Color Afterimages • Community DNA Extraction from Bacterial Colonies • Conducting Reactions Below Room Temperature • Coordination Chemistry Complexes • Decision-making and the Iowa Gambling Task • Decoding Auditory Imagery with Multivoxel Pattern Analysis • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Determining the Empirical Formula • Electro-encephalography (EEG) • Eye Tracking in Cognitive Experiments • Fear Conditioning • Finding Your Blind Spot and Perceptual Filling-in • Förster Resonance Energy Transfer (FRET) • Gas Chromatography (GC) with Flame-Ionization Detection • Growing Crystals for X-ray Diffraction Analysis • Internal Standards • Introduction to Catalysis • Introduction to Mass Spectrometry • Introduction to the Spectrophotometer • Lead Analysis of Soil Using Atomic Absorption Spectroscopy • Learning and Memory: The Remember-Know Task • MALDI-TOF Mass Spectrometry • Measuring Grey Matter Differences with Voxel-based

		<p>Morphometry: The Musical Brain</p> <ul style="list-style-type: none"> • Metabolic Labeling • Method of Standard Addition • Motion-induced Blindness • Motor Maps • Nuclear Magnetic Resonance (NMR) Spectroscopy • Nutrients in Aquatic Ecosystems • Photometric Protein Determination • Physical Properties Of Minerals I: Crystals and Cleavage • Plasmid Purification • Protein Crystallization • Purifying Compounds by Recrystallization • Raman Spectroscopy for Chemical Analysis • Solid-Liquid Extraction • Spatial Cueing • Spectrophotometric Determination of an Equilibrium Constant • Tandem Mass Spectrometry • The Attentional Blink • The Rubber Hand Illusion • Ultraviolet-Visible (UV-Vis) Spectroscopy • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Using TMS to Measure Motor Excitability During Action Observation • Visual Attention: fMRI Investigation of Object-based Attentional Control • X-ray Fluorescence (XRF) • Yeast Maintenance • fMRI: Functional Magnetic Resonance Imaging
BENCHMARK	SC.912.P.10.19.	<p>Explain that all objects emit and absorb electromagnetic radiation and distinguish between objects that are blackbody radiators and those that are not.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Histological Sample Preparation for Light Microscopy • Introduction to Fluorescence Microscopy • Introduction to Light Microscopy • Introduction to the Spectrophotometer • Nuclear Magnetic Resonance (NMR) Spectroscopy • Nutrients in Aquatic Ecosystems • Photometric Protein Determination • Raman Spectroscopy for Chemical Analysis • Spectrophotometric Determination of an Equilibrium Constant • Turbidity and Total Solids in Surface Water • Ultraviolet-Visible (UV-Vis) Spectroscopy

BENCHMARK	SC.912.P.10.20.	Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another. <u>JoVE</u> • Raman Spectroscopy for Chemical Analysis
BENCHMARK	SC.912.P.10.21.	Qualitatively describe the shift in frequency in sound or electromagnetic waves due to the relative motion of a source or a receiver. <u>JoVE</u> • Peripheral Vascular Exam Using a Continuous Wave Doppler
BODY OF KNOWLEDGE	FL.SC.912.P.	Physical Science
BIG IDEA	SC.912.P.12.	Motion - A. Motion can be measured and described qualitatively and quantitatively. Net forces create a change in motion. When objects travel at speeds comparable to the speed of light, Einstein's special theory of relativity applies. B. Momentum is conserved under well-defined conditions. A change in momentum occurs when a net force is applied to an object over a time interval. C. The Law of Universal Gravitation states that gravitational forces act on all objects irrespective of their size and position. D. Gases consist of great numbers of molecules moving in all directions. The behavior of gases can be modeled by the kinetic molecular theory. E. Chemical reaction rates change with conditions under which they occur. Chemical equilibrium is a dynamic state in which forward and reverse processes occur at the same rates.
BENCHMARK	SC.912.P.12.5.	Apply the law of conservation of linear momentum to interactions, such as collisions between objects. <u>JoVE</u> • Raman Spectroscopy for Chemical Analysis
BENCHMARK	SC.912.P.12.10.	Interpret the behavior of ideal gases in terms of kinetic molecular theory. <u>JoVE</u> • Determining Rate Laws and the Order of Reaction • Ideal Gas Law • The Ideal Gas Law
BENCHMARK	SC.912.P.12.11.	Describe phase transitions in terms of kinetic molecular theory. <u>JoVE</u> • Fractional Distillation • Ideal Gas Law • The Ideal Gas Law

BENCHMARK	SC.912.P.12.12.	<p>Explain how various factors, such as concentration, temperature, and presence of a catalyst affect the rate of a chemical reaction.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Conducting Reactions Below Room Temperature • Coordination Chemistry Complexes • Determining Rate Laws and the Order of Reaction • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Enzyme Assays and Kinetics • Introduction to Catalysis
BENCHMARK	SC.912.P.12.13.	<p>Explain the concept of dynamic equilibrium in terms of reversible processes occurring at the same rates.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Assembly of a Reflux System for Heated Chemical Reactions • Determining Spatial Orientation of Rock Layers with the Brunton Compass • Dialysis: Diffusion Based Separation • Le Châtelier's Principle • Making a Geologic Cross Section • Separation of Mixtures via Precipitation • Spectrophotometric Determination of an Equilibrium Constant • Using Topographic Maps to Generate Topographic Profiles
BODY OF KNOWLEDGE	FL.SC.912.L.	Life Science
BIG IDEA	SC.912.L.14.	<p>Organization and Development of Living Organisms - A. Cells have characteristic structures and functions that make them distinctive. B. Processes in a cell can be classified broadly as growth, maintenance, reproduction, and homeostasis. C. Life can be organized in a functional and structural hierarchy ranging from cells to the biosphere. D. Most multicellular organisms are composed of organ systems whose structures reflect their particular function.</p>
BENCHMARK	SC.912.L.14.1.	<p>Describe the scientific theory of cells (cell theory) and relate the history of its discovery to the process of science.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Division
BENCHMARK	SC.912.L.14.2.	<p>Relate structure to function for the components of plant and animal cells. Explain the role of cell membranes as a highly selective barrier (passive and active transport).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration

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| | <ul style="list-style-type: none">• An Introduction to Cell Death• An Introduction to Cell Division• An Introduction to Cell Metabolism• An Introduction to Cell Motility and Migration• An Introduction to 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 <i>Saccharomyces cerevisiae</i>• 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• <i>C. elegans</i> 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• Recombineering and Gene Targeting• Reconstitution of Membrane Proteins• Restriction Enzyme Digests• Surface Plasmon Resonance (SPR) |
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		<ul style="list-style-type: none"> • The ATP Bioluminescence Assay • The TUNEL Assay • The Transwell Migration Assay • The Western Blot • Tissue Regeneration with Somatic Stem Cells • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning
BENCHMARK	SC.912.L.14.3.	<p>Compare and contrast the general structures of plant and animal cells. Compare and contrast the general structures of prokaryotic and eukaryotic cells.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Metabolism • An Introduction to Saccharomyces cerevisiae • An Introduction to Transfection • Bacterial Growth Curve Analysis and its Environmental Applications • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • Culturing and Enumerating Bacteria from Soil Samples • Density Gradient Ultracentrifugation • Electrophoretic Mobility Shift Assay (EMSA) • Plasmid Purification • Reconstitution of Membrane Proteins • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning
BENCHMARK	SC.912.L.14.4.	<p>Compare and contrast structure and function of various types of microscopes.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Division • Bacterial Growth Curve Analysis and its Environmental Applications • Culturing and Enumerating Bacteria from Soil Samples • Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis • Gram Staining of Bacteria from Environmental Sources • Histological Sample Preparation for Light Microscopy • Introduction to Fluorescence Microscopy • Introduction to Light Microscopy • Live Cell Imaging of Mitosis • X-ray Fluorescence (XRF)
BENCHMARK	SC.912.L.14.5.	<p>Explain the evidence supporting the scientific theory of the origin of eukaryotic cells (endosymbiosis).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Saccharomyces cerevisiae

		<ul style="list-style-type: none"> • An Introduction to the Chick: Gallus gallus domesticus • An Overview of Genetic Analysis • Electrophoretic Mobility Shift Assay (EMSA) • High-Performance Liquid Chromatography (HPLC) • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning
<p>BENCHMARK</p>	<p>SC.912.L.14.6.</p>	<p>Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health.</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 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 Drosophila melanogaster • An Introduction to Endocytosis and Exocytosis • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to Motor Control • 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 Gene Expression • An Overview of Genetic Analysis • An Overview of Genetic Engineering • An Overview of Genetics and Disease • Ankle Exam • Arterial Line Placement • Aseptic Technique in Environmental Science • Auscultation • Basic Chick Care and Maintenance • Basic Life Support Part II: Airway/Breathing and Continued Cardiopulmonary Resuscitation • Basic Life Support: Cardiopulmonary Resuscitation and Defibrillation • Blood Pressure Measurement • C. elegans Maintenance • Cardiac Exam I: Inspection and Palpation • Cardiac Exam II: Auscultation

- **Cardiac Exam III: Abnormal Heart Sounds**
- **Cell Cycle Analysis**
- **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**
- **Chromatography-Based Biomolecule Purification Methods**
- **Co-Immunoprecipitation and Pull-Down Assays**
- **Comprehensive Breast Exam**
- **Coordination Chemistry Complexes**
- **Cranial Nerves Exam I (I-VI)**
- **Cranial Nerves Exam II (VII-XII)**
- **Culturing and Enumerating Bacteria from Soil Samples**
- **Cyclic Voltammetry (CV)**
- **Cytogenetics**
- **DNA Methylation Analysis**
- **Detecting Reactive Oxygen Species**
- **Detection of Bacteriophages in Environmental Samples**
- **Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy**
- **Drosophila Development and Reproduction**
- **Drosophila melanogaster Embryo and Larva Harvesting and Preparation**
- **Ear Exam**
- **Elbow Exam**
- **Embryonic Stem Cell Culture and Differentiation**
- **Emergency Tube Thoracostomy (Chest Tube Placement)**
- **Emergent Lateral Canthotomy and Inferior Catholysis**
- **Expression Profiling with Microarrays**
- **Eye Exam**
- **Foot Exam**
- **Fundamentals of Breeding and Weaning**
- **Gene Silencing with Morpholinos**
- **General Approach to the Physical Exam**
- **Genetic Crosses**
- **Genetic Screens**
- **Genome Editing**
- **Gram Staining of Bacteria from Environmental Sources**
- **Hand and Wrist Exam**
- **Hip Exam**
- **Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation**
- **Intraosseous Needle Placement**
- **Introducing Experimental Agents into the Mouse**
- **Invasion Assay Using 3D Matrices**
- **Invertebrate Lifespan Quantification**
- **Isolation of Fecal Bacteria from Water Samples by**

		<p>Filtration</p> <ul style="list-style-type: none"> • Knee Exam • Lead Analysis of Soil Using Atomic Absorption Spectroscopy <p>Spectroscopy</p> <ul style="list-style-type: none"> • Live Cell Imaging of Mitosis • Lower Back Exam • Lymph Node Exam • Male Rectal Exam • Measuring Tropospheric Ozone • Measuring Vital Signs • Motor Exam I • Motor Exam II • Mouse Genotyping • 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 <p>Doppler</p> <ul style="list-style-type: none"> • Peripheral Venous Cannulation • Proper Adjustment of Patient Attire during the Physical Exam <p>Exam</p> <ul style="list-style-type: none"> • Protein Crystallization • Quantifying Environmental Microorganisms and Viruses Using qPCR <p>Viruses Using qPCR</p> <ul style="list-style-type: none"> • RNA Analysis of Environmental Samples Using RT-PCR • RNA-Seq • RNAi in <i>C. elegans</i> • Recombineering and Gene Targeting • Respiratory Exam I: Inspection and Palpation • Respiratory Exam II: Percussion and Auscultation • SNP Genotyping • Sensory Exam • Shoulder Exam I • Shoulder Exam II • Surgical Cricothyrotomy • The TUNEL Assay • The Transwell Migration Assay • Thyroid Exam • Tissue Regeneration with Somatic Stem Cells • Water Quality Analysis via Indicator Organisms
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BENCHMARK	SC.912.L.14.7.	<p>Relate the structure of each of the major plant organs and tissues to physiological processes.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method • Using GIS to Investigate Urban Forestry
BENCHMARK	SC.912.L.14.9.	<p>Relate the major structure of fungi to their functions.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to <i>Saccharomyces cerevisiae</i> • Aseptic Technique in Environmental Science • Biofuels: Producing Ethanol from Cellulosic Material • Filamentous Fungi • Genetic Crosses • Isolating Nucleic Acids from Yeast • Recombineering and Gene Targeting • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning
BENCHMARK	SC.912.L.14.10.	<p>Discuss the relationship between the evolution of land plants and their anatomy.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to the Chick: <i>Gallus gallus domesticus</i> • An Introduction to the Zebrafish: <i>Danio rerio</i> • An Overview of Genetic Analysis
BENCHMARK	SC.912.L.14.11.	<p>Classify and state the defining characteristics of epithelial tissue, connective tissue, muscle tissue, and nervous tissue.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to Cell Motility and Migration • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Molecular Developmental Biology • An Introduction to Organogenesis • An Introduction to Stem Cell Biology • <i>C. elegans</i> Development and Reproduction • Chick ex ovo Culture • Detecting Reactive Oxygen Species • Development and Reproduction of the Laboratory

		<p>Mouse</p> <ul style="list-style-type: none"> • Development of the Chick • Diagnostic Necropsy and Tissue Harvest • Drosophila Development and Reproduction • Drosophila Larval IHC • Embryonic Stem Cell Culture and Differentiation • Explant Culture for Developmental Studies • Explant Culture of Neural Tissue • Expression Profiling with Microarrays • Fate Mapping • Genetic Engineering of Model Organisms • Histological Sample Preparation for Light Microscopy • Histological Staining of Neural Tissue • In ovo Electroporation of Chicken Embryos • Induced Pluripotency • Murine In Utero Electroporation • Sterile Tissue Harvest • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies • Whole-Mount In Situ Hybridization • Zebrafish Reproduction and Development
<p>BENCHMARK</p>	<p>SC.912.L.14.12.</p>	<p>Describe the anatomy and histology of bone tissue.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Ankle Exam • Elbow Exam • Foot 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 • Neck Exam • Shoulder Exam I • Shoulder Exam II
<p>BENCHMARK</p>	<p>SC.912.L.14.13.</p>	<p>Distinguish between bones of the axial skeleton and the appendicular skeleton.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Motor Control • An Introduction to the Zebrafish: Danio rerio • Ankle Exam • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Elbow Exam • Foot Exam • Hand and Wrist Exam • Hip Exam

		<ul style="list-style-type: none"> • Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation • Intraosseous Needle Placement • Knee Exam • Lower Back Exam • Motor Exam I • Motor Exam II • Neck Exam • Shoulder Exam I • Shoulder Exam II • Zebrafish Reproduction and Development
BENCHMARK	SC.912.L.14.14.	<p>Identify the major bones of the axial and appendicular skeleton.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Motor Control • An Introduction to the Zebrafish: Danio rerio • Ankle Exam • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Elbow Exam • Foot 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 • Motor Exam I • Motor Exam II • Neck Exam • Shoulder Exam I • Shoulder Exam II • Zebrafish Reproduction and Development
BENCHMARK	SC.912.L.14.15.	<p>Identify major markings (such as foramina, fossae, tubercles, etc.) on a skeleton. Explain why these markings are important.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Motor Control • An Introduction to the Zebrafish: Danio rerio • Ankle Exam • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Elbow Exam • Foot Exam • Hand and Wrist Exam • Hip Exam

		<ul style="list-style-type: none"> • Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation • Intraosseous Needle Placement • Knee Exam • Lower Back Exam • Motor Exam I • Motor Exam II • Neck Exam • Shoulder Exam I • Shoulder Exam II • Zebrafish Reproduction and Development
BENCHMARK	SC.912.L.14.16.	<p>Describe the anatomy and histology, including ultra structure, of muscle tissue.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Motility and Migration • An Introduction to Motor Control • Ankle Exam • C. elegans Development and Reproduction • Development and Reproduction of the Laboratory Mouse • Elbow Exam • Foot Exam • Hand and Wrist Exam • Hip Exam • Invasion Assay Using 3D Matrices • Knee Exam • Lower Back Exam • Motor Exam I • Motor Exam II • Neck Exam • Shoulder Exam I • Shoulder Exam II • The Transwell Migration Assay • Zebrafish Reproduction and Development
BENCHMARK	SC.912.L.14.17.	<p>List the steps involved in the sliding filament of muscle contraction.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Motility and Migration • Ankle Exam • Assessing Dexterity with Reaching Tasks • Balance and Coordination Testing • Elbow Exam • Foot Exam • Hand and Wrist Exam • Hip Exam • Invasion Assay Using 3D Matrices • Knee Exam • Lower Back Exam • Motor Exam I

		<ul style="list-style-type: none"> • Motor Exam II • Neck Exam • Shoulder Exam I • Shoulder Exam II • The Transwell Migration Assay
BENCHMARK	SC.912.L.14.18.	<p>Describe signal transmission across a myoneural junction.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Developmental Neurobiology • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Introduction to Reward and Addiction • Calcium Imaging in Neurons • FM Dyes in Vesicle Recycling • Histological Staining of Neural Tissue • Patch Clamp Electrophysiology • Rodent Stereotaxic Surgery • Self-administration Studies
BENCHMARK	SC.912.L.14.19.	<p>Explain the physiology of skeletal muscle.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Ankle Exam • Assessing Dexterity with Reaching Tasks • Balance and Coordination Testing • Elbow Exam • Foot Exam • Hand and Wrist Exam • Hip Exam • Knee Exam • Lower Back Exam • Motor Exam I • Motor Exam II • Neck Exam • Shoulder Exam I • Shoulder Exam II
BENCHMARK	SC.912.L.14.20.	<p>Identify the major muscles of the human on a model or diagram.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Motor Control • Ankle Exam • Elbow Exam • Foot Exam • Hand and Wrist Exam • Hip Exam • Knee Exam • Lower Back Exam • Motor Exam I • Motor Exam II

		<ul style="list-style-type: none"> • Neck Exam • Shoulder Exam I • Shoulder Exam II
<p>BENCHMARK</p>	<p>SC.912.L.14.21.</p>	<p>Describe the anatomy, histology, and physiology of the central and peripheral nervous systems and name the major divisions of the nervous system.</p> <p><u>JoVE</u></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 • An Introduction to Motor Control • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Introduction to Reward and Addiction • Ankle Exam • Anterograde Amnesia • Anxiety Testing • Assessing Dexterity with Reaching Tasks • Balance and Coordination Testing • Basic Life Support Part II: Airway/Breathing and Continued Cardiopulmonary Resuscitation • Basic Life Support: Cardiopulmonary Resuscitation and Defibrillation • Binocular Rivalry • Calcium Imaging in Neurons • Color Afterimages • 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 • Detecting Reactive Oxygen Species • 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 • Executive Function and the Dimensional Change Card Sort Task • Executive Function in Autism Spectrum Disorder • Explant Culture of Neural Tissue • Eye Exam • FM Dyes in Vesicle Recycling

- Finding Your Blind Spot and Perceptual Filling-in
- Foot Exam
- Hand and Wrist Exam
- Hip Exam
- Histological Staining of Neural Tissue
- Inattentive Blindness
- Just-noticeable Differences
- Knee Exam
- Language: The N400 in Semantic Incongruity
- Learning and Memory: The Remember-Know Task
- Lower Back 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
- Neuronal Transfection Methods
- Object Substitution Masking
- Ophthalmoscopic Examination
- Patch Clamp Electrophysiology
- Pericardiocentesis
- Perspectives on Sensation and Perception
- Physiological Correlates of Emotion Recognition
- Primary Neuronal Cultures
- Rodent Stereotaxic Surgery
- Self-administration Studies
- Sensory Exam
- Shoulder Exam I
- Shoulder Exam II
- Solutions and Concentrations
- Spatial Cueing
- Spatial Memory Testing Using Mazes
- 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
- Tissue Regeneration with Somatic Stem Cells
- Using Diffusion Tensor Imaging in Traumatic Brain Injury
- Using TMS to Measure Motor Excitability During

		<p>Action Observation</p> <ul style="list-style-type: none"> • Verbal Priming • Visual Attention: fMRI Investigation of Object-based Attentional Control • Within-subjects Repeated-measures Design • fMRI: Functional Magnetic Resonance Imaging
<p>BENCHMARK</p>	<p>SC.912.L.14.22.</p>	<p>Describe the physiology of nerve conduction, including the generator potential, action potential, and the synapse.</p> <p><u>JoVE</u></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 Modeling Behavioral Disorders and Stress • An Introduction to Motor Control • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Introduction to Reward and Addiction • Ankle Exam • Anterograde Amnesia • Balance and Coordination Testing • Calcium Imaging in Neurons • Color Afterimages • Cranial Nerves Exam I (I-VI) • Cranial Nerves Exam II (VII-XII) • Crowding • Detecting Reactive Oxygen Species • 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 of Neural Tissue • Eye Exam • FM Dyes in Vesicle Recycling • Finding Your Blind Spot and Perceptual Filling-in • Foot Exam • Hand and Wrist Exam • Hip Exam • Histological Staining of Neural Tissue • Inattentive Blindness • Just-noticeable Differences • Knee Exam • Lower Back Exam • Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain

		<ul style="list-style-type: none"> • Motion-induced Blindness • Motor Exam I • Motor Exam II • Murine In Utero Electroporation • Neck Exam • Neuronal Transfection Methods • Object Substitution Masking • Ophthalmoscopic Examination • Patch Clamp Electrophysiology • Physiological Correlates of Emotion Recognition • Primary Neuronal Cultures • Rodent Stereotaxic Surgery • Self-administration Studies • Sensory Exam • Shoulder Exam I • Shoulder Exam II • Spatial Cueing • 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 • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Using TMS to Measure Motor Excitability During Action Observation • fMRI: Functional Magnetic Resonance Imaging
BENCHMARK	SC.912.L.14.23.	<p>Identify the parts of a reflex arc.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Motor Control • Motor Exam I • Motor Exam II
BENCHMARK	SC.912.L.14.24.	<p>Identify the general parts of a synapse and describe the physiology of signal transmission across a synapse.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Developmental Neurobiology • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Introduction to Reward and Addiction • Calcium Imaging in Neurons • FM Dyes in Vesicle Recycling • Histological Staining of Neural Tissue • Patch Clamp Electrophysiology • Rodent Stereotaxic Surgery • Self-administration Studies

BENCHMARK	SC.912.L.14.25.	<p>Identify the major parts of a cross section through the spinal cord.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Developmental Neurobiology • An Introduction to Motor Control • An Introduction to Neurophysiology • Hip Exam • Lower Back Exam • Motor Exam I • Motor Exam II • Neck Exam • Sensory Exam • Using TMS to Measure Motor Excitability During Action Observation
BENCHMARK	SC.912.L.14.26.	<p>Identify the major parts of the brain on diagrams or models.</p> <p><u>JoVE</u></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 • An Introduction to Motor Control • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Introduction to Reward and Addiction • Anterograde Amnesia • Anxiety Testing • Assessing Dexterity with Reaching Tasks • Balance and Coordination Testing • Binocular Rivalry • Color Afterimages • 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 • Dichotic Listening • Electro-encephalography (EEG) • Event-related Potentials and the Oddball Task • Executive Function and the Dimensional Change Card Sort Task • Executive Function in Autism Spectrum Disorder • Explant Culture of Neural Tissue • Eye Tracking in Cognitive Experiments

- Fear Conditioning
- Finding Your Blind Spot and Perceptual Filling-in
- Histological Staining of Neural Tissue
- Inattentional Blindness
- Incidental Encoding
- Just-noticeable Differences
- Language: The N400 in Semantic Incongruity
- Learning and Memory: The Remember-Know Task
- Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain
- Mental Rotation
- Modeling Social Stress
- Motion-induced Blindness
- Motor Exam I
- Motor Exam II
- Motor Learning in Mirror Drawing
- Motor Maps
- Murine In Utero Electroporation
- Mutual Exclusivity: How Children Learn the Meanings of Words
- Neuronal Transfection Methods
- Object Substitution Masking
- Physiological Correlates of Emotion Recognition
- Primary Neuronal Cultures
- Prospect Theory
- Rodent Stereotaxic Surgery
- Self-administration Studies
- Sensory Exam
- Spatial Cueing
- Spatial Memory Testing Using Mazes
- The Ames Room
- The Attentional Blink
- The Inverted-face Effect
- The McGurk Effect
- The Morris Water Maze
- The Rubber Hand Illusion
- The Split Brain
- The Staircase Procedure for Finding a Perceptual Threshold
- Using Diffusion Tensor Imaging in Traumatic Brain Injury
- Using TMS to Measure Motor Excitability During Action Observation
- Verbal Priming
- Visual Attention: fMRI Investigation of Object-based Attentional Control
- Visual Search for Features and Conjunctions
- Visual Statistical Learning
- Within-subjects Repeated-measures Design
- fMRI: Functional Magnetic Resonance Imaging

<p>BENCHMARK</p>	<p>SC.912.L.14.27.</p>	<p>Identify the functions of the major parts of the brain, including the meninges, medulla, pons, midbrain, hypothalamus, thalamus, cerebellum and cerebrum.</p> <p>JoVE</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 • An Introduction to Motor Control • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Introduction to Reward and Addiction • Anterograde Amnesia • Anxiety Testing • Assessing Dexterity with Reaching Tasks • Balance and Coordination Testing • Binocular Rivalry • Color Afterimages • 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 • Dichotic Listening • Electro-encephalography (EEG) • Event-related Potentials and the Oddball Task • Executive Function and the Dimensional Change Card Sort Task • Executive Function in Autism Spectrum Disorder • Explant Culture of Neural Tissue • Eye Tracking in Cognitive Experiments • Fear Conditioning • Finding Your Blind Spot and Perceptual Filling-in • Histological Staining of Neural Tissue • Inattentional Blindness • Incidental Encoding • Just-noticeable Differences • Language: The N400 in Semantic Incongruity • Learning and Memory: The Remember-Know Task • Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain • Mental Rotation • Modeling Social Stress • Motion-induced Blindness • Motor Exam I
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		<ul style="list-style-type: none"> • Motor Exam II • Motor Learning in Mirror Drawing • Motor Maps • Murine In Utero Electroporation • Mutual Exclusivity: How Children Learn the Meanings of Words • Neuronal Transfection Methods • Object Substitution Masking • Physiological Correlates of Emotion Recognition • Primary Neuronal Cultures • Prospect Theory • Rodent Stereotaxic Surgery • Self-administration Studies • Sensory Exam • Spatial Cueing • Spatial Memory Testing Using Mazes • The Ames Room • The Attentional Blink • The Inverted-face Effect • The McGurk Effect • The Morris Water Maze • The Rubber Hand Illusion • The Split Brain • The Staircase Procedure for Finding a Perceptual Threshold • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Using TMS to Measure Motor Excitability During Action Observation • Verbal Priming • Visual Attention: fMRI Investigation of Object-based Attentional Control • Visual Search for Features and Conjunctions • Visual Statistical Learning • Within-subjects Repeated-measures Design • fMRI: Functional Magnetic Resonance Imaging
BENCHMARK	SC.912.L.14.28.	<p>Identify the major functions of the spinal cord.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Developmental Neurobiology • An Introduction to Motor Control • An Introduction to Neurophysiology • Hip Exam • Lower Back Exam • Motor Exam I • Motor Exam II • Neck Exam • Sensory Exam • Using TMS to Measure Motor Excitability During Action Observation

BENCHMARK	SC.912.L.14.29.	<p>Define the terms endocrine and exocrine.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Anxiety Testing • Modeling Social Stress • Thyroid Exam
BENCHMARK	SC.912.L.14.30.	<p>Compare endocrine and neural controls of physiology.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Behavioral Neuroscience • An Introduction to Caenorhabditis elegans • An Introduction to 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 • An Introduction to Motor Control • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Introduction to Reward and Addiction • An Introduction to the Chick: Gallus gallus domesticus • Anesthesia Induction and Maintenance • Ankle Exam • Anterograde Amnesia • Anxiety Testing • Assessing Dexterity with Reaching Tasks • Balance and Coordination Testing • C. elegans Chemotaxis Assay • C. elegans Development and Reproduction • C. elegans Maintenance • Calcium Imaging in Neurons • Color Afterimages • Considerations for Rodent Surgery • 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 • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Elbow Exam • Electro-encephalography (EEG) • 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

- Finding Your Blind Spot and Perceptual Filling-in
- Foot Exam
- Hand and Wrist Exam
- Hip Exam
- Histological Staining of Neural Tissue
- Inattentive Blindness
- Just-noticeable Differences
- Knee Exam
- Language: The N400 in Semantic Incongruity
- Learning and Memory: The Remember-Know Task
- Lower Back Exam
- Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain
- 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
- Neuronal Transfection Methods
- Object Substitution Masking
- Patch Clamp Electrophysiology
- Perspectives on Sensation and Perception
- Physiological Correlates of Emotion Recognition
- Primary Neuronal Cultures
- Rodent Stereotaxic Surgery
- Self-administration Studies
- Sensory Exam
- Shoulder Exam I
- Shoulder Exam II
- Spatial Cueing
- Spatial Memory Testing Using Mazes
- 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
- 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
- Verbal Priming
- Visual Attention: fMRI Investigation of Object-based

		<p>Attentional Control</p> <ul style="list-style-type: none"> • Within-subjects Repeated-measures Design • Zebrafish Reproduction and Development • fMRI: Functional Magnetic Resonance Imaging
BENCHMARK	SC.912.L.14.31.	<p>Describe the physiology of hormones including the different types and the mechanisms of their action.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to Reward and Addiction • Development and Reproduction of the Laboratory Mouse • Self-administration Studies
BENCHMARK	SC.912.L.14.32.	<p>Describe the anatomy and physiology of the endocrine system.</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 • Anxiety Testing • Development and Reproduction of the Laboratory Mouse • Modeling Social Stress • Thyroid Exam
BENCHMARK	SC.912.L.14.33.	<p>Describe the basic anatomy and physiology of the reproductive system.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to the Chick: Gallus gallus domesticus • C. elegans Development and Reproduction • Comprehensive Breast Exam • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Fundamentals of Breeding and Weaning • Male Rectal Exam • Pelvic Exam I: Assessment of the External Genitalia • Pelvic Exam II: Speculum Exam • Pelvic Exam III: Bimanual and Rectovaginal Exam
BENCHMARK	SC.912.L.14.34.	<p>Describe the composition and physiology of blood, including that of the plasma and the formed elements.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Motility and Migration

		<ul style="list-style-type: none"> • Invasion Assay Using 3D Matrices • MALDI-TOF Mass Spectrometry • Tandem Mass Spectrometry • The Transwell Migration Assay
BENCHMARK	SC.912.L.14.35.	<p>Describe the steps in hemostasis, including the mechanism of coagulation. Include the basis for blood typing and transfusion reactions.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Motility and Migration • Invasion Assay Using 3D Matrices • The Transwell Migration Assay
BENCHMARK	SC.912.L.14.36.	<p>Describe the factors affecting blood flow through the cardiovascular system.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Genetics and Disease • Anxiety Testing • Arterial Line Placement • 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 • Emergent Lateral Canthotomy and Inferior Catholysis • Eye Exam • Measuring Vital Signs • Modeling Social Stress • Ophthalmoscopic Examination • Pericardiocentesis • Peripheral Vascular Exam • Peripheral Vascular Exam Using a Continuous Wave Doppler • Physiological Correlates of Emotion Recognition
BENCHMARK	SC.912.L.14.37.	<p>Explain the components of an electrocardiogram.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Behavioral Neuroscience • An Introduction to Cognition • An Introduction to Learning and Memory • An Introduction to Motor Control • An Introduction to Neurophysiology • Electro-encephalography (EEG) • Event-related Potentials and the Oddball Task • Language: The N400 in Semantic Incongruity • Pericardiocentesis

		<ul style="list-style-type: none"> • Rodent Stereotaxic Surgery • fMRI: Functional Magnetic Resonance Imaging
BENCHMARK	SC.912.L.14.38.	<p>Describe normal heart sounds and what they mean.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Anesthesia Induction and Maintenance • Basic Life Support Part II: Airway/Breathing and Continued Cardiopulmonary Resuscitation • Basic Life Support: Cardiopulmonary Resuscitation and Defibrillation • Blood Withdrawal I • Blood Withdrawal II • Compound Administration I • Compound Administration II • Compound Administration III • Compound Administration IV • Considerations for Rodent Surgery • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Measuring Vital Signs • Pericardiocentesis • Physiological Correlates of Emotion Recognition • Zebrafish Reproduction and Development
BENCHMARK	SC.912.L.14.39.	<p>Describe hypertension and some of the factors that produce it.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Anxiety Testing • Arterial Line Placement • Blood Pressure Measurement • Emergent Lateral Canthotomy and Inferior Catholysis • Eye Exam • Modeling Social Stress • Ophthalmoscopic Examination • Peripheral Vascular Exam • Peripheral Vascular Exam Using a Continuous Wave Doppler
BENCHMARK	SC.912.L.14.40.	<p>Describe the histology of the major arteries and veins of systemic, pulmonary, hepatic portal, and coronary circulation.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Anesthesia Induction and Maintenance • Arterial Line Placement • Basic Life Support Part II: Airway/Breathing and Continued Cardiopulmonary Resuscitation • Basic Life Support: Cardiopulmonary Resuscitation and Defibrillation • Blood Pressure Measurement

		<ul style="list-style-type: none"> • Blood Withdrawal I • Blood Withdrawal II • Cardiac Exam I: Inspection and Palpation • Cardiac Exam II: Auscultation • Cardiac Exam III: Abnormal Heart Sounds • Central Venous Catheter Insertion: Femoral Vein with Ultrasound Guidance • Central Venous Catheter Insertion: Internal Jugular with Ultrasound Guidance • Central Venous Catheter Insertion: Subclavian Vein • Compound Administration I • Compound Administration II • Compound Administration III • Compound Administration IV • Considerations for Rodent Surgery • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Eye Exam • Intraosseous Needle Placement • Measuring Vital Signs • Ophthalmoscopic Examination • Pericardiocentesis • Peripheral Vascular Exam • Peripheral Vascular Exam Using a Continuous Wave Doppler • Peripheral Venous Cannulation • Physiological Correlates of Emotion Recognition • Zebrafish Reproduction and Development
BENCHMARK	SC.912.L.14.41.	<p>Describe fetal circulation and changes that occur to the circulatory system at birth.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to Cell Motility and Migration • An Introduction to Organogenesis • An Introduction to Stem Cell Biology • Cytogenetics • Embryonic Stem Cell Culture and Differentiation • Fate Mapping • Passaging Cells • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies
BENCHMARK	SC.912.L.14.42.	<p>Describe the anatomy and the physiology of the lymph system.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to the Laboratory Mouse: Mus musculus • Comprehensive Breast Exam

		<ul style="list-style-type: none"> • Lymph Node Exam • The TUNEL Assay
BENCHMARK	SC.912.L.14.43.	<p>Describe the histology of the respiratory system.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Basic Life Support Part II: Airway/Breathing and Continued Cardiopulmonary Resuscitation • Cardiac Exam I: Inspection and Palpation • Cardiac Exam II: Auscultation • Cardiac Exam III: Abnormal Heart Sounds • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Emergency Tube Thoracostomy (Chest Tube Placement) • Measuring Vital Signs • Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment • Percutaneous Cricothyrotomy (Seldinger Technique) • Respiratory Exam I: Inspection and Palpation • Respiratory Exam II: Percussion and Auscultation • Surgical Cricothyrotomy
BENCHMARK	SC.912.L.14.44.	<p>Describe the physiology of the respiratory system including the mechanisms of ventilation, gas exchange, gas transport and the mechanisms that control the rate of ventilation.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Basic Life Support Part II: Airway/Breathing and Continued Cardiopulmonary Resuscitation • Cardiac Exam I: Inspection and Palpation • Cardiac Exam II: Auscultation • Cardiac Exam III: Abnormal Heart Sounds • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Emergency Tube Thoracostomy (Chest Tube Placement) • Measuring Vital Signs • Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment • Percutaneous Cricothyrotomy (Seldinger Technique) • Respiratory Exam I: Inspection and Palpation • Respiratory Exam II: Percussion and Auscultation • Surgical Cricothyrotomy
BENCHMARK	SC.912.L.14.45.	<p>Describe the histology of the alimentary canal and its associated accessory organs.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Abdominal Exam I: Inspection and Auscultation

		<ul style="list-style-type: none"> • Abdominal Exam II: Percussion • Abdominal Exam III: Palpation • Abdominal Exam IV: Acute Abdominal Pain Assessment • C. elegans Development and Reproduction • Development and Reproduction of the Laboratory Mouse • Male Rectal Exam • Zebrafish Reproduction and Development
BENCHMARK	SC.912.L.14.46.	<p>Describe the physiology of the digestive system, including mechanical digestion, chemical digestion, absorption and the neural and hormonal mechanisms of control.</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 • C. elegans Development and Reproduction • Development and Reproduction of the Laboratory Mouse • Male Rectal Exam • Zebrafish Reproduction and Development
BENCHMARK	SC.912.L.14.47.	<p>Describe the physiology of urine formation by the kidney.</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
BENCHMARK	SC.912.L.14.49.	<p>Identify the major functions associated with the sympathetic and parasympathetic nervous systems.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Modeling Behavioral Disorders and Stress • Anxiety Testing • Cranial Nerves Exam I (I-VI) • Cranial Nerves Exam II (VII-XII) • Modeling Social Stress • Physiological Correlates of Emotion Recognition • Spatial Memory Testing Using Mazes
BENCHMARK	SC.912.L.14.50.	<p>Describe the structure of vertebrate sensory organs. Relate structure to function in vertebrate sensory systems.</p>

		<p>JoVE</p> <ul style="list-style-type: none"> • An Introduction to Cognition • An Introduction to Motor Control • An Introduction to Neurophysiology • Balance and Coordination Testing • Binocular Rivalry • Calcium Imaging in Neurons • Color Afterimages • Cranial Nerves Exam I (I-VI) • Cranial Nerves Exam II (VII-XII) • Crowding • Decoding Auditory Imagery with Multivoxel Pattern Analysis • Dichotic Listening • Ear Exam • Emergent Lateral Canthotomy and Inferior Catholysis • Event-related Potentials and the Oddball Task • Eye Exam • Eye Tracking in Cognitive Experiments • Fear Conditioning • Finding Your Blind Spot and Perceptual Filling-in • Inattentive Blindness • Just-noticeable Differences • Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain • Measuring Reaction Time and Donders' Method of Subtraction • Motion-induced Blindness • Motor Maps • Nose, Sinuses, Oral Cavity and Pharynx Exam • Object Substitution Masking • Ophthalmoscopic Examination • Perspectives on Sensation and Perception • Sensory Exam • Spatial Cueing • 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 • Visual Attention: fMRI Investigation of Object-based Attentional Control • Visual Search for Features and Conjunctions • Visual Statistical Learning
BENCHMARK	SC.912.L.14.51.	<p>Describe the function of the vertebrate integumentary system.</p> <p>JoVE</p>

		<ul style="list-style-type: none"> • Abdominal Exam I: Inspection and Auscultation • Abdominal Exam IV: Acute Abdominal Pain Assessment • C. elegans Development and Reproduction • Development and Reproduction of the Laboratory Mouse • Observation and Inspection • Peripheral Vascular Exam • Peripheral Vascular Exam Using a Continuous Wave Doppler • Sensory Exam • The Rubber Hand Illusion • Zebrafish Reproduction and Development
BENCHMARK	SC.912.L.14.52.	<p>Explain the basic functions of the human immune system, including specific and nonspecific immune response, vaccines, and antibiotics.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to the Laboratory Mouse: Mus musculus • Co-Immunoprecipitation and Pull-Down Assays • Emergency Tube Thoracostomy (Chest Tube Placement) • Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation • MALDI-TOF Mass Spectrometry • Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment • The TUNEL Assay
BENCHMARK	SC.912.L.14.53.	<p>Discuss basic classification and characteristics of plants. Identify bryophytes, pteridophytes, gymnosperms, and angiosperms.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method • Using GIS to Investigate Urban Forestry
BODY OF KNOWLEDGE	FL.SC.912.L.	Life Science
BIG IDEA	SC.912.L.15.	Diversity and Evolution of Living Organisms - A. The scientific theory of evolution is the fundamental concept underlying all of biology. B. The scientific theory of evolution is supported by multiple forms of scientific evidence. C. Organisms are classified based on their evolutionary history. D. Natural selection is a primary mechanism leading to evolutionary change.
BENCHMARK	SC.912.L.15.1.	Explain how the scientific theory of evolution is supported by the fossil record, comparative anatomy, comparative embryology, biogeography, molecular biology, and observed evolutionary change.

		<p>JoVE</p> <ul style="list-style-type: none"> • An Overview of Genetic Analysis • High-Performance Liquid Chromatography (HPLC)
BENCHMARK	SC.912.L.15.4.	<p>Describe how and why organisms are hierarchically classified and based on evolutionary relationships.</p> <p>JoVE</p> <ul style="list-style-type: none"> • An Introduction to the Chick: <i>Gallus gallus domesticus</i> • An Introduction to the Zebrafish: <i>Danio rerio</i>
BENCHMARK	SC.912.L.15.5.	<p>Explain the reasons for changes in how organisms are classified.</p> <p>JoVE</p> <ul style="list-style-type: none"> • An Introduction to <i>Caenorhabditis elegans</i> • An Introduction to <i>Drosophila melanogaster</i> • 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> • Basic Chick Care and Maintenance • Basic Mouse Care and Maintenance • <i>C. elegans</i> Chemotaxis Assay • <i>C. elegans</i> Development and Reproduction • <i>C. elegans</i> Maintenance • Chick ex ovo Culture • Culturing and Enumerating Bacteria from Soil Samples • Detection of Bacteriophages in Environmental Samples • Development and Reproduction of the Laboratory Mouse • Development of the Chick • <i>Drosophila</i> Development and Reproduction • <i>Drosophila</i> Larval IHC • <i>Drosophila</i> Maintenance • <i>Drosophila melanogaster</i> Embryo and Larva Harvesting and Preparation • Filamentous Fungi • In ovo Electroporation of Chicken Embryos • Introducing Experimental Agents into the Mouse • Isolating Nucleic Acids from Yeast • Mouse Genotyping • RNAi in <i>C. elegans</i> • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method • Using GIS to Investigate Urban Forestry • 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
BENCHMARK	SC.912.L.15.6.	<p>Discuss distinguishing characteristics of the domains and kingdoms of living organisms.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Algae Enumeration via Culturable Methodology • An Introduction to Caenorhabditis elegans • An Introduction to Drosophila melanogaster • An Introduction to Saccharomyces cerevisiae • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Laboratory Mouse: Mus musculus • An Introduction to the Zebrafish: Danio rerio • Aseptic Technique in Environmental Science • Bacterial Growth Curve Analysis and its Environmental Applications • Basic Chick Care and Maintenance • Basic Mouse Care and Maintenance • Biofuels: Producing Ethanol from Cellulosic Material • C. elegans Chemotaxis Assay • C. elegans Development and Reproduction • C. elegans Maintenance • Chick ex ovo Culture • Culturing and Enumerating Bacteria from Soil Samples • Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis • Detection of Bacteriophages in Environmental Samples • Determination of Moisture Content in Soil • 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 • Filamentous Fungi • Genetic Crosses • Genetic Engineering of Model Organisms • Gram Staining of Bacteria from Environmental Sources • In ovo Electroporation of Chicken Embryos • Introducing Experimental Agents into the Mouse • Isolating Nucleic Acids from Yeast • Mouse Genotyping • RNAi in C. elegans • Recombineering and Gene Targeting • Sonication Extraction of Lipid Biomarkers from Sediment • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method

		<ul style="list-style-type: none"> • Using GIS to Investigate Urban Forestry • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
<p>BENCHMARK</p>	<p>SC.912.L.15.7.</p>	<p>Discuss distinguishing characteristics of vertebrate and representative invertebrate phyla, and chordate classes using typical examples.</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 Drosophila melanogaster • An Introduction to Transfection • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Laboratory Mouse: Mus musculus • An Introduction to the Zebrafish: Danio rerio • Anesthesia Induction and Maintenance • Basic Care Procedures • Basic Chick Care and Maintenance • Basic Mouse Care and Maintenance • Blood Withdrawal I • Blood Withdrawal II • C. elegans Chemotaxis Assay • C. elegans Development and Reproduction • C. elegans Maintenance • Chick ex ovo Culture • Compound Administration I • Compound Administration II • Compound Administration III • Compound Administration IV • Considerations for Rodent Surgery • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Diagnostic Necropsy and Tissue Harvest • Drosophila Development and Reproduction • Drosophila Larval IHC • Drosophila Maintenance • Drosophila melanogaster Embryo and Larva Harvesting and Preparation • Explant Culture for Developmental Studies • Fate Mapping • Fundamentals of Breeding and Weaning • Gene Silencing with Morpholinos

		<ul style="list-style-type: none"> • Genetic Screens • In ovo Electroporation of Chicken Embryos • Introducing Experimental Agents into the Mouse • Invertebrate Lifespan Quantification • Mouse Genotyping • RNAi in <i>C. elegans</i> • Rodent Handling and Restraint Techniques • Rodent Identification I • Rodent Identification II • Sterile Tissue Harvest • Transplantation Studies • Whole-Mount In Situ Hybridization • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
BENCHMARK	SC.912.L.15.8.	<p>Describe the scientific explanations of the origin of life on Earth.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to the Chick: <i>Gallus gallus domesticus</i> • An Overview of Genetic Analysis
BENCHMARK	SC.912.L.15.13.	<p>Describe the conditions required for natural selection, including: overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Genetic Analysis
BENCHMARK	SC.912.L.15.14.	<p>Discuss mechanisms of evolutionary change other than natural selection such as genetic drift and gene flow.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Genetic Analysis
BENCHMARK	SC.912.L.15.15.	<p>Describe how mutation and genetic recombination increase genetic variation.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to <i>Caenorhabditis elegans</i> • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Developmental Genetics • An Introduction to <i>Drosophila melanogaster</i> • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to <i>Saccharomyces cerevisiae</i> • An Introduction to Transfection • An Introduction to the Zebrafish: <i>Danio rerio</i> • An Overview of Epigenetics

		<ul style="list-style-type: none"> • An Overview of Gene Expression • An Overview of Genetic Analysis • An Overview of Genetics and Disease • C. elegans Development and Reproduction • Genetic Engineering of Model Organisms • Genetic Screens • Isolating Nucleic Acids from Yeast • Passaging Cells • SNP Genotyping • The TUNEL Assay • Yeast Reproduction • Zebrafish Maintenance and Husbandry
BODY OF KNOWLEDGE	FL.SC.912.L.	Life Science
BIG IDEA	SC.912.L.16.	Heredity and Reproduction - A. DNA stores and transmits genetic information. Genes are sets of instructions encoded in the structure of DNA. B. Genetic information is passed from generation to generation by DNA in all organisms and accounts for similarities in related individuals. C. Manipulation of DNA in organisms has led to commercial production of biological molecules on a large scale and genetically modified organisms. D. Reproduction is characteristic of living things and is essential for the survival of species.
BENCHMARK	SC.912.L.16.1.	<p>Use Mendel's laws of segregation and independent assortment to analyze patterns of inheritance.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Developmental Genetics • Genetic Crosses
BENCHMARK	SC.912.L.16.2.	<p>Discuss observed inheritance patterns caused by various modes of inheritance, including dominant, recessive, codominant, sex-linked, polygenic, and multiple alleles.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Caenorhabditis elegans • An Introduction to Developmental Genetics • An Introduction to Drosophila melanogaster • An Introduction to the Zebrafish: Danio rerio • An Overview of Epigenetics • An Overview of Genetic Analysis • An Overview of Genetics and Disease • C. elegans Development and Reproduction • C. elegans Maintenance • DNA Methylation Analysis • Development and Reproduction of the Laboratory Mouse • Drosophila Development and Reproduction • Fundamentals of Breeding and Weaning • Gene Silencing with Morpholinos • Genetic Crosses

		<ul style="list-style-type: none"> • Genetic Engineering of Model Organisms • Genetic Screens • Mouse Genotyping • RNAi in <i>C. elegans</i> • SNP Genotyping • Whole-Mount In Situ Hybridization • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Reproduction and Development
BENCHMARK	SC.912.L.16.3.	<p>Describe the basic process of DNA replication and how it relates to the transmission and conservation of the genetic information.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Division • Cell Cycle Analysis • DNA Ligation Reactions • Genetic Screens • Live Cell Imaging of Mitosis • Method of Standard Addition • Molecular Cloning • PCR: The Polymerase Chain Reaction • Restriction Enzyme Digests • Yeast Maintenance • Yeast Transformation and Cloning
BENCHMARK	SC.912.L.16.4.	<p>Explain how mutations in the DNA sequence may or may not result in phenotypic change. Explain how mutations in gametes may result in phenotypic changes in offspring.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to <i>Caenorhabditis elegans</i> • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Developmental Genetics • An Introduction to <i>Drosophila melanogaster</i> • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to <i>Saccharomyces cerevisiae</i> • An Introduction to Transfection • 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 Genetics and Disease • Genetic Engineering of Model Organisms • Genetic Screens • Isolating Nucleic Acids from Yeast • Passaging Cells • The TUNEL Assay

BENCHMARK	<p>SC.912.L.16.5. Explain the basic processes of transcription and translation, and how they result in the expression of genes.</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 Cellular and Molecular Neuroscience • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Molecular Developmental Biology • An Introduction to Organogenesis • An Introduction to Stem Cell Biology • 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 Genetic Engineering • An Overview of Genetics and Disease • Annexin V and Propidium Iodide Labeling • Chick ex ovo Culture • Chromatin Immunoprecipitation • DNA Methylation Analysis • Detecting Reactive Oxygen Species • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Drosophila Development and Reproduction • Drosophila melanogaster Embryo and Larva Harvesting and Preparation • Electrophoretic Mobility Shift Assay (EMSA) • Embryonic Stem Cell Culture and Differentiation • Explant Culture for Developmental Studies • Explant Culture of Neural Tissue • Expression Profiling with Microarrays • Fate Mapping • Gene Silencing with Morpholinos • Genetic Crosses • Genetic Engineering of Model Organisms • Genetic Screens • Genome Editing • Histological Staining of Neural Tissue • In ovo Electroporation of Chicken Embryos • Induced Pluripotency • Introduction to the Microplate Reader • Isolating Nucleic Acids from Yeast • Molecular Cloning • Mouse Genotyping • Murine In Utero Electroporation
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		<ul style="list-style-type: none"> • PCR: The Polymerase Chain Reaction • 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> • Rodent Stereotaxic Surgery • Testing For Genetically Modified Foods • The TUNEL Assay • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
<p>BENCHMARK</p>	<p>SC.912.L.16.6.</p>	<p>Discuss the mechanisms for regulation of gene expression in prokaryotes and eukaryotes at transcription and translation level.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to <i>Caenorhabditis elegans</i> • An Introduction to Cell Death • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Molecular Developmental Biology • An Introduction to Organogenesis • An Introduction to Stem Cell Biology • An Introduction to Transfection • 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 • Annexin V and Propidium Iodide Labeling • Chick ex ovo Culture • Chromatin Immunoprecipitation • DNA Methylation Analysis • Detecting Reactive Oxygen Species • Development and Reproduction of the Laboratory Mouse • Development of the Chick • <i>Drosophila</i> Development and Reproduction • <i>Drosophila melanogaster</i> Embryo and Larva Harvesting and Preparation • Electrophoretic Mobility Shift Assay (EMSA)

		<ul style="list-style-type: none"> • Embryonic Stem Cell Culture and Differentiation • Explant Culture for Developmental Studies • Explant Culture of Neural Tissue • Expression Profiling with Microarrays • Fate Mapping • Gene Silencing with Morpholinos • Genetic Crosses • Genetic Engineering of Model Organisms • Genetic Screens • Genome Editing • Histological Staining of Neural Tissue • In ovo Electroporation of Chicken Embryos • Induced Pluripotency • Introduction to the Microplate Reader • Isolating Nucleic Acids from Yeast • Molecular Cloning • Mouse Genotyping • Murine In Utero Electroporation • PCR: The Polymerase Chain Reaction • Protein Crystallization • Quantifying Environmental Microorganisms and Viruses Using qPCR • RNA Analysis of Environmental Samples Using RT-PCR • RNA-Seq • RNAi in C. elegans • Rodent Stereotaxic Surgery • Testing For Genetically Modified Foods • The TUNEL Assay • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
BENCHMARK	SC.912.L.16.7.	<p>Describe how viruses and bacteria transfer genetic material between cells and the role of this process in biotechnology.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Algae Enumeration via Culturable Methodology • An Introduction to Saccharomyces cerevisiae • An Introduction to Transfection • An Introduction to the Laboratory Mouse: Mus musculus • An Overview of Gene Expression • An Overview of Genetic Engineering • Aseptic Technique in Environmental Science • Bacterial Growth Curve Analysis and its Environmental Applications

		<ul style="list-style-type: none"> • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • Biofuels: Producing Ethanol from Cellulosic Material • Carbon and Nitrogen Analysis of Environmental Samples • Co-Immunoprecipitation and Pull-Down Assays • Community DNA Extraction from Bacterial Colonies • Culturing and Enumerating Bacteria from Soil Samples • Cyclic Voltammetry (CV) • DNA Ligation Reactions • Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis • Detection of Bacteriophages in Environmental Samples • Explant Culture of Neural Tissue • Genetic Crosses • Genetic Engineering of Model Organisms • Genetic Screens • Gram Staining of Bacteria from Environmental Sources • In ovo Electroporation of Chicken Embryos • Isolation of Fecal Bacteria from Water Samples by Filtration • Molecular Cloning • Mouse Genotyping • Murine In Utero Electroporation • Neuronal Transfection Methods • Plasmid Purification • Primary Neuronal Cultures • Protein Crystallization • Quantifying Environmental Microorganisms and Viruses Using qPCR • RNA Analysis of Environmental Samples Using RT-PCR • Recombineering and Gene Targeting • Restriction Enzyme Digests • Rodent Stereotaxic Surgery • Testing For Genetically Modified Foods • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy • Water Quality Analysis via Indicator Organisms • Yeast Transformation and Cloning
BENCHMARK	SC.912.L.16.8.	<p>Explain the relationship between mutation, cell cycle, and uncontrolled cell growth potentially resulting in cancer.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Organogenesis • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Zebrafish: Danio rerio

		<ul style="list-style-type: none"> • An Overview of Genetic Engineering • An Overview of Genetics and Disease • Cell Cycle Analysis • Chick ex ovo Culture • Coordination Chemistry Complexes • DNA Methylation Analysis • Detecting Reactive Oxygen Species • Ear Exam • Expression Profiling with Microarrays • Genome Editing • Introducing Experimental Agents into the Mouse • Invasion Assay Using 3D Matrices • Live Cell Imaging of Mitosis • Lymph Node Exam • Male Rectal Exam • Mouse Genotyping • Pelvic Exam II: Speculum Exam • Pelvic Exam III: Bimanual and Rectovaginal Exam • The TUNEL Assay • The Transwell Migration Assay
BENCHMARK	SC.912.L.16.9.	<p>Explain how and why the genetic code is universal and is common to almost all organisms.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Developmental Genetics • An Overview of Gene Expression • An Overview of Genetic Analysis • An Overview of Genetic Engineering
BENCHMARK	SC.912.L.16.10.	<p>Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to Drosophila melanogaster • An Introduction to Molecular Developmental Biology • An Introduction to Neurophysiology • 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 Laboratory Mouse: Mus musculus • An Introduction to the Zebrafish: Danio rerio • An Overview of Gene Expression • An Overview of Genetic Engineering • Bacterial Growth Curve Analysis and its Environmental Applications • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method

		<ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material • C. elegans Development and Reproduction • Chick ex ovo Culture • Cyclic Voltammetry (CV) • DNA Ligation Reactions • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Embryonic Stem Cell Culture and Differentiation • Explant Culture for Developmental Studies • Explant Culture of Neural Tissue • Fate Mapping • Fundamentals of Breeding and Weaning • Gene Silencing with Morpholinos • Genetic Crosses • Genetic Engineering of Model Organisms • Genetic Screens • Genome Editing • In ovo Electroporation of Chicken Embryos • Induced Pluripotency • Invertebrate Lifespan Quantification • Molecular Cloning • Mouse Genotyping • Murine In Utero Electroporation • Neuronal Transfection Methods • Plasmid Purification • Primary Neuronal Cultures • RNA Analysis of Environmental Samples Using RT-PCR • RNAi in C. elegans • Recombineering and Gene Targeting • Restriction Enzyme Digests • Rodent Stereotaxic Surgery • Solid-Liquid Extraction • Testing For Genetically Modified Foods • The TUNEL Assay • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies • Whole-Mount In Situ Hybridization • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
BENCHMARK	SC.912.L.16.11.	<p>Discuss the technologies associated with forensic medicine and DNA identification, including restriction fragment length polymorphism (RFLP) analysis.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • PCR: The Polymerase Chain Reaction
BENCHMARK	SC.912.L.16.12.	<p>Describe how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis,</p>

		<p>polymerase chain reaction, ligation, and transformation) is used to construct recombinant DNA molecules (DNA cloning).</p> <p>JoVE</p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to <i>Saccharomyces cerevisiae</i> • An Introduction to the Zebrafish: <i>Danio rerio</i> • An Overview of Gene Expression • An Overview of Genetic Engineering • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • Capillary Electrophoresis (CE) • Chromatin Immunoprecipitation • Community DNA Extraction from Bacterial Colonies • DNA Gel Electrophoresis • DNA Ligation Reactions • Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis • Electrophoretic Mobility Shift Assay (EMSA) • Explant Culture of Neural Tissue • Gel Purification • Genetic Engineering of Model Organisms • Genetic Screens • In ovo Electroporation of Chicken Embryos • Isolating Nucleic Acids from Yeast • Making Solutions in the Laboratory • Molecular Cloning • Mouse Genotyping • Murine In Utero Electroporation • Neuronal Transfection Methods • PCR: The Polymerase Chain Reaction • Plasmid Purification • Primary Neuronal Cultures • Quantifying Environmental Microorganisms and Viruses Using qPCR • RNA Analysis of Environmental Samples Using RT-PCR • RNA-Seq • Recombineering and Gene Targeting • Restriction Enzyme Digests • Rodent Stereotaxic Surgery • SNP Genotyping • Testing For Genetically Modified Foods • Two-Dimensional Gel Electrophoresis • Understanding Concentration and Measuring Volumes • Yeast Transformation and Cloning • Zebrafish Maintenance and Husbandry
BENCHMARK	SC.912.L.16.13.	Describe the basic anatomy and physiology of the human reproductive system. Describe the process of human development from fertilization to birth and major changes that occur in each trimester of pregnancy.

		<p>JoVE</p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to Cell Motility and Migration • An Introduction to Organogenesis • An Introduction to Stem Cell Biology • Comprehensive Breast Exam • Cytogenetics • Embryonic Stem Cell Culture and Differentiation • Fate Mapping • Invasion Assay Using 3D Matrices • Male Rectal Exam • Passaging Cells • Pelvic Exam I: Assessment of the External Genitalia • Pelvic Exam II: Speculum Exam • Pelvic Exam III: Bimanual and Rectovaginal Exam • The Transwell Migration Assay • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies
<p>BENCHMARK</p>	<p>SC.912.L.16.14.</p>	<p>Describe the cell cycle, including the process of mitosis. Explain the role of mitosis in the formation of new cells and its importance in maintaining chromosome number during asexual reproduction.</p> <p>JoVE</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 Developmental Neurobiology • An Introduction to Molecular Developmental Biology • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Zebrafish: Danio rerio • Annexin V and Propidium Iodide Labeling • Bacterial Growth Curve Analysis and its Environmental Applications • C. elegans Development and Reproduction • Cell Cycle Analysis • Detecting Reactive Oxygen Species • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Drosophila Development and Reproduction • Drosophila melanogaster Embryo and Larva Harvesting and Preparation • Embryonic Stem Cell Culture and Differentiation • Explant Culture of Neural Tissue • Fundamentals of Breeding and Weaning • Genetic Crosses • Genetic Screens

		<ul style="list-style-type: none"> • Induced Pluripotency • Live Cell Imaging of Mitosis • Murine In Utero Electroporation • Neuronal Transfection Methods • Primary Neuronal Cultures • The TUNEL Assay • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Reproduction and Development
BENCHMARK	SC.912.L.16.15.	<p>Compare and contrast binary fission and mitotic cell division.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Caenorhabditis elegans • An Introduction to Cell Division • An Introduction to Saccharomyces cerevisiae • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Zebrafish: Danio rerio • C. elegans Development and Reproduction • Cell Cycle Analysis • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Drosophila Development and Reproduction • Drosophila melanogaster Embryo and Larva Harvesting and Preparation • Fundamentals of Breeding and Weaning • Genetic Crosses • Genetic Screens • Live Cell Imaging of Mitosis • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Reproduction and Development
BENCHMARK	SC.912.L.16.16.	<p>Describe the process of meiosis, including independent assortment and crossing over. Explain how reduction division results in the formation of haploid gametes or spores.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Division • An Overview of Genetic Analysis • C. elegans Development and Reproduction • Cytogenetics • DNA Methylation Analysis • Drosophila Development and Reproduction • Embryonic Stem Cell Culture and Differentiation • Genetic Crosses

		<ul style="list-style-type: none"> • Recombineering and Gene Targeting • Yeast Reproduction
BENCHMARK	SC.912.L.16.17.	<p>Compare and contrast mitosis and meiosis and relate to the processes of sexual and asexual reproduction and their consequences for genetic variation.</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 Developmental Neurobiology • An Introduction to Molecular Developmental Biology • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Zebrafish: Danio rerio • Annexin V and Propidium Iodide Labeling • Bacterial Growth Curve Analysis and its Environmental Applications • C. elegans Development and Reproduction • Cell Cycle Analysis • Detecting Reactive Oxygen Species • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Drosophila Development and Reproduction • Drosophila melanogaster Embryo and Larva Harvesting and Preparation • Embryonic Stem Cell Culture and Differentiation • Explant Culture of Neural Tissue • Fundamentals of Breeding and Weaning • Genetic Crosses • Genetic Screens • Induced Pluripotency • Live Cell Imaging of Mitosis • Murine In Utero Electroporation • Neuronal Transfection Methods • Primary Neuronal Cultures • Recombineering and Gene Targeting • The TUNEL Assay • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Reproduction and Development
BODY OF KNOWLEDGE	FL.SC.912.L.	Life Science
BIG IDEA	SC.912.L.17.	<p>Interdependence - A. The distribution and abundance of organisms is determined by the interactions between organisms, and between organisms and the non-living environment. B. Energy and nutrients move within and between biotic and abiotic components of ecosystems</p>

		via physical, chemical and biological processes. C. Human activities and natural events can have profound effects on populations, biodiversity and ecosystem processes.
BENCHMARK	SC.912.L.17.1.	<p>Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Algae Enumeration via Culturable Methodology • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Laboratory Mouse: Mus musculus • An Introduction to the Zebrafish: Danio rerio • Analysis of Earthworm Populations in Soil • Aseptic Technique in Environmental Science • Bacterial Growth Curve Analysis and its Environmental Applications • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • Basic Mouse Care and Maintenance • C. elegans Maintenance • Culturing and Enumerating Bacteria from Soil Samples • Detection of Bacteriophages in Environmental Samples • Dissolved Oxygen in Surface Water • Drosophila Maintenance • Drosophila melanogaster Embryo and Larva Harvesting and Preparation • Filamentous Fungi • Isolation of Fecal Bacteria from Water Samples by Filtration • Passaging Cells • Plasmid Purification • Quantifying Environmental Microorganisms and Viruses Using qPCR • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method • Yeast Maintenance • Yeast Reproduction
BENCHMARK	SC.912.L.17.2.	<p>Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Dissolved Oxygen in Surface Water • Nutrients in Aquatic Ecosystems • Turbidity and Total Solids in Surface Water • Water Quality Analysis via Indicator Organisms • Zebrafish Maintenance and Husbandry
BENCHMARK	SC.912.L.17.3.	Discuss how various oceanic and freshwater processes, such as currents, tides, and waves, affect the abundance

		<p>of aquatic organisms.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Dissolved Oxygen in Surface Water • Nutrients in Aquatic Ecosystems • Turbidity and Total Solids in Surface Water • Water Quality Analysis via Indicator Organisms • Zebrafish Maintenance and Husbandry
BENCHMARK	SC.912.L.17.4.	<p>Describe changes in ecosystems resulting from seasonal variations, climate change and succession.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material
BENCHMARK	SC.912.L.17.5.	<p>Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Algae Enumeration via Culturable Methodology • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Laboratory Mouse: Mus musculus • An Introduction to the Zebrafish: Danio rerio • Analysis of Earthworm Populations in Soil • Aseptic Technique in Environmental Science • Bacterial Growth Curve Analysis and its Environmental Applications • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • Basic Mouse Care and Maintenance • C. elegans Maintenance • Culturing and Enumerating Bacteria from Soil Samples • Detection of Bacteriophages in Environmental Samples • Dissolved Oxygen in Surface Water • Drosophila Maintenance • Drosophila melanogaster Embryo and Larva Harvesting and Preparation • Filamentous Fungi • Isolation of Fecal Bacteria from Water Samples by Filtration • Passaging Cells • Plasmid Purification • Quantifying Environmental Microorganisms and Viruses Using qPCR • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method • Yeast Maintenance • Yeast Reproduction
BENCHMARK	SC.912.L.17.6.	<p>Compare and contrast the relationships among organisms, including predation, parasitism, competition,</p>

		<p>commensalism, and mutualism.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Analysis of Earthworm Populations in Soil • Bacterial Growth Curve Analysis and its Environmental Applications • C. elegans Development and Reproduction • Culturing and Enumerating Bacteria from Soil Samples • Dissolved Oxygen in Surface Water • Filamentous Fungi • Genetic Crosses • Recombineering and Gene Targeting • Tree Survey: Point-Centered Quarter Sampling Method • Using GIS to Investigate Urban Forestry • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy • Zebrafish Maintenance and Husbandry
BENCHMARK	SC.912.L.17.7.	<p>Characterize the biotic and abiotic components that define freshwater systems, marine systems and terrestrial systems.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Dissolved Oxygen in Surface Water • Nutrients in Aquatic Ecosystems • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method • Turbidity and Total Solids in Surface Water • Using GIS to Investigate Urban Forestry • Water Quality Analysis via Indicator Organisms • Zebrafish Maintenance and Husbandry
BENCHMARK	SC.912.L.17.8.	<p>Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Analysis of Earthworm Populations in Soil • Biofuels: Producing Ethanol from Cellulosic Material • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Dissolved Oxygen in Surface Water • Lead Analysis of Soil Using Atomic Absorption Spectroscopy • Measuring Tropospheric Ozone • Nutrients in Aquatic Ecosystems • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method • Turbidity and Total Solids in Surface Water • Water Quality Analysis via Indicator Organisms

BENCHMARK	SC.912.L.17.9.	<p>Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Algae Enumeration via Culturable Methodology • An Introduction to Drosophila melanogaster • An Introduction to the Chick: Gallus gallus domesticus • Analysis of Earthworm Populations in Soil • Bacterial Growth Curve Analysis and its Environmental Applications • C. elegans Maintenance • Carbon and Nitrogen Analysis of Environmental Samples • Culturing and Enumerating Bacteria from Soil Samples • Dissolved Oxygen in Surface Water • Filamentous Fungi • Quantifying Environmental Microorganisms and Viruses Using qPCR • RNA Analysis of Environmental Samples Using RT-PCR • Zebrafish Maintenance and Husbandry • Zebrafish Reproduction and Development
BENCHMARK	SC.912.L.17.10.	<p>Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle.</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

		<ul style="list-style-type: none"> • 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
BENCHMARK	SC.912.L.17.11.	<p>Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests.</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 • Fractional Distillation • Proton Exchange Membrane Fuel Cells • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method • Using GIS to Investigate Urban Forestry • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy
BENCHMARK	SC.912.L.17.12.	<p>Discuss the political, social, and environmental consequences of sustainable use of land.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material
BENCHMARK	SC.912.L.17.13.	<p>Discuss the need for adequate monitoring of environmental parameters when making policy decisions.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Lead Analysis of Soil Using Atomic Absorption Spectroscopy
BENCHMARK	SC.912.L.17.14.	<p>Assess the need for adequate waste management strategies.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Dissolved Oxygen in Surface Water • Isolation of Fecal Bacteria from Water Samples by Filtration • Nutrients in Aquatic Ecosystems • Self-report vs. Behavioral Measures of Recycling • Turbidity and Total Solids in Surface Water
BENCHMARK	SC.912.L.17.15.	<p>Discuss the effects of technology on environmental quality.</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 • Proton Exchange Membrane Fuel Cells • Turbidity and Total Solids in Surface Water • Water Quality Analysis via Indicator Organisms
BENCHMARK	SC.912.L.17.16.	<p>Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Algae Enumeration via Culturable Methodology • Biofuels: Producing Ethanol from Cellulosic Material • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Determining the Solubility Rules of Ionic Compounds • Dissolved Oxygen in Surface Water • Introduction to Mass Spectrometry • Le Châtelier's Principle • Lead Analysis of Soil Using Atomic Absorption Spectroscopy • Measuring Tropospheric Ozone • Nutrients in Aquatic Ecosystems • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method • Turbidity and Total Solids in Surface Water • Water Quality Analysis via Indicator Organisms
BENCHMARK	SC.912.L.17.17.	<p>Assess the effectiveness of innovative methods of protecting the environment.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Self-report vs. Behavioral Measures of Recycling
BENCHMARK	SC.912.L.17.18.	<p>Describe how human population size and resource use relate to environmental quality.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Nutrients in Aquatic Ecosystems
BENCHMARK	SC.912.L.17.19.	<p>Describe how different natural resources are produced and how their rates of use and renewal limit availability.</p> <p><u>JoVE</u></p>

		<ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material • Dissolved Oxygen in Surface Water • Proton Exchange Membrane Fuel Cells • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method • Using GIS to Investigate Urban Forestry • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy
BENCHMARK	SC.912.L.17.20.	<p>Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.</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 • 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
BODY OF KNOWLEDGE	FL.SC.912.L.	Life Science
BIG IDEA	SC.912.L.18.	<p>Matter and Energy Transformations - A. All living things are composed of four basic categories of macromolecules and share the same basic needs for life. B. Living organisms acquire the energy they need for life processes through various metabolic pathways (primarily photosynthesis and cellular respiration). C. Chemical reactions in living things follow basic rules of chemistry and are usually regulated by enzymes. D. The unique chemical properties of carbon and water make life on Earth possible.</p>
BENCHMARK	SC.912.L.18.1.	<p>Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.</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 Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Developmental Genetics • An Introduction to Molecular Developmental Biology

- **An Introduction to *Saccharomyces cerevisiae***
- **An Introduction to Transfection**
- **An Overview of Alkenone Biomarker Analysis for Paleothermometry**
- **An Overview of Epigenetics**
- **An Overview of Gene Expression**
- **An Overview of Genetic Analysis**
- **An Overview of Genetic Engineering**
- **An Overview of Genetics and Disease**
- **An Overview of bGDGT Biomarker Analysis for Paleoclimatology**
- **Annexin V and Propidium Iodide Labeling**
- **Bacterial Transformation: Electroporation**
- **Bacterial Transformation: The Heat Shock Method**
- ***C. elegans* Maintenance**
- **Capillary Electrophoresis (CE)**
- **Cell Cycle Analysis**
- **Cell-surface Biotinylation Assay**
- **Chromatin Immunoprecipitation**
- **Chromatography-Based Biomolecule Purification Methods**
- **Co-Immunoprecipitation and Pull-Down Assays**
- **Column Chromatography**
- **Community DNA Extraction from Bacterial Colonies**
- **Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry**
- **Cytogenetics**
- **DNA Gel Electrophoresis**
- **DNA Ligation Reactions**
- **DNA Methylation Analysis**
- **Density Gradient Ultracentrifugation**
- **Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis**
- **Detecting Reactive Oxygen Species**
- **Development and Reproduction of the Laboratory Mouse**
- **Development of the Chick**
- **Dialysis: Diffusion Based Separation**
- ***Drosophila* Larval IHC**
- ***Drosophila melanogaster* Embryo and Larva Harvesting and Preparation**
- **Electrophoretic Mobility Shift Assay (EMSA)**
- **Embryonic Stem Cell Culture and Differentiation**
- **Enzyme Assays and Kinetics**
- **Explant Culture for Developmental Studies**
- **Expression Profiling with Microarrays**
- **Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction**
- **FM Dyes in Vesicle Recycling**
- **Förster Resonance Energy Transfer (FRET)**
- **Gel Purification**
- **Gene Silencing with Morpholinos**

- Genetic Crosses
- Genetic Engineering of Model Organisms
- Genetic Screens
- Genome Editing
- In ovo Electroporation of Chicken Embryos
- Induced Pluripotency
- Introduction to Catalysis
- Introduction to Mass Spectrometry
- Invasion Assay Using 3D Matrices
- Invertebrate Lifespan Quantification
- Ion-Exchange Chromatography
- Isolating Nucleic Acids from Yeast
- Live Cell Imaging of Mitosis
- MALDI-TOF Mass Spectrometry
- Metabolic Labeling
- Molecular Cloning
- Mouse Genotyping
- PCR: The Polymerase Chain Reaction
- Photometric Protein Determination
- Plasmid Purification
- Protein Crystallization
- Purification of a Total Lipid Extract with Column Chromatography
- Quantifying Environmental Microorganisms and Viruses Using qPCR
- RNA Analysis of Environmental Samples Using RT-PCR
- RNA-Seq
- RNAi in *C. elegans*
- Recombineering and Gene Targeting
- Reconstitution of Membrane Proteins
- Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry
- Restriction Enzyme Digests
- SNP Genotyping
- Separating Protein with SDS-PAGE
- Separation of Mixtures via Precipitation
- Sonication Extraction of Lipid Biomarkers from Sediment
- Soxhlet Extraction of Lipid Biomarkers from Sediment
- Spectrophotometric Determination of an Equilibrium Constant
- Surface Plasmon Resonance (SPR)
- Tandem Mass Spectrometry
- Testing For Genetically Modified Foods
- The ATP Bioluminescence Assay
- The ELISA Method
- The TUNEL Assay
- The Transwell Migration Assay
- The Western Blot
- Two-Dimensional Gel Electrophoresis
- Ultraviolet-Visible (UV-Vis) Spectroscopy
- Whole-Mount In Situ Hybridization

		<ul style="list-style-type: none"> • Yeast Maintenance • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
BENCHMARK	SC.912.L.18.2.	<p>Describe the important structural characteristics of monosaccharides, disaccharides, and polysaccharides and explain the functions of carbohydrates in living things.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry • Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction • Purification of a Total Lipid Extract with Column Chromatography • Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment
BENCHMARK	SC.912.L.18.3.	<p>Describe the structures of fatty acids, triglycerides, phospholipids, and steroids. Explain the functions of lipids in living organisms. Identify some reactions that fatty acids undergo. Relate the structure and function of cell membranes.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Developmental Neurobiology • An Introduction to Endocytosis and Exocytosis • An Introduction to Neurophysiology • An Introduction to Transfection • Annexin V and Propidium Iodide Labeling • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • Calcium Imaging in Neurons • Cell Cycle Analysis • Cell-surface Biotinylation Assay • Detecting Reactive Oxygen Species • Electro-encephalography (EEG) • Explant Culture of Neural Tissue • FM Dyes in Vesicle Recycling • Histological Staining of Neural Tissue

		<ul style="list-style-type: none"> • In ovo Electroporation of Chicken Embryos • Live Cell Imaging of Mitosis • Murine In Utero Electroporation • Neuronal Transfection Methods • Patch Clamp Electrophysiology • Plasmid Purification • Primary Neuronal Cultures • Protein Crystallization • Reconstitution of Membrane Proteins • The TUNEL Assay • The Western Blot • Yeast Maintenance • Yeast Transformation and Cloning
BENCHMARK	SC.912.L.18.4.	<p>Describe the structures of proteins and amino acids. Explain the functions of proteins in living organisms. Identify some reactions that amino acids undergo. Relate the structure and function of enzymes.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Death • An Introduction to Cell Motility and Migration • An Introduction to Saccharomyces cerevisiae • An Overview of Epigenetics • An Overview of Gene Expression • Biofuels: Producing Ethanol from Cellulosic Material • Cell-surface Biotinylation Assay • Chromatin Immunoprecipitation • Co-Immunoprecipitation and Pull-Down Assays • DNA Ligation Reactions • Density Gradient Ultracentrifugation • Dialysis: Diffusion Based Separation • Drosophila Larval IHC • Electrophoretic Mobility Shift Assay (EMSA) • Enzyme Assays and Kinetics • FM Dyes in Vesicle Recycling • Förster Resonance Energy Transfer (FRET) • Genetic Engineering of Model Organisms • Introduction to Catalysis • Introduction to Mass Spectrometry • Invasion Assay Using 3D Matrices • Ion-Exchange Chromatography • Live Cell Imaging of Mitosis • MALDI-TOF Mass Spectrometry • Metabolic Labeling • Molecular Cloning • PCR: The Polymerase Chain Reaction • Photometric Protein Determination • Protein Crystallization • Reconstitution of Membrane Proteins • Restriction Enzyme Digests • Separating Protein with SDS-PAGE

		<ul style="list-style-type: none"> • Separation of Mixtures via Precipitation • Surface Plasmon Resonance (SPR) • Tandem Mass Spectrometry • The ELISA Method • The TUNEL Assay • The Transwell Migration Assay • The Western Blot • Two-Dimensional Gel Electrophoresis • Yeast Transformation and Cloning
BENCHMARK	SC.912.L.18.5.	<p>Discuss the use of chemiosmotic gradients for ATP production in chloroplasts and mitochondria.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • Detecting Reactive Oxygen Species • Invasion Assay Using 3D Matrices • The ATP Bioluminescence Assay • The Transwell Migration Assay
BENCHMARK	SC.912.L.18.6.	<p>Discuss the role of anaerobic respiration in living things and in human society.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material
BENCHMARK	SC.912.L.18.7.	<p>Identify the reactants, products, and basic functions of photosynthesis.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Metabolism
BENCHMARK	SC.912.L.18.8.	<p>Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Metabolism • Biofuels: Producing Ethanol from Cellulosic Material • Detecting Reactive Oxygen Species • The ATP Bioluminescence Assay
BENCHMARK	SC.912.L.18.9.	<p>Explain the interrelated nature of photosynthesis and cellular respiration.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Metabolism • Biofuels: Producing Ethanol from Cellulosic Material • Detecting Reactive Oxygen Species • The ATP Bioluminescence Assay
BENCHMARK	SC.912.L.18.10.	<p>Connect the role of adenosine triphosphate (ATP) to energy transfers within a cell.</p> <p><u>JoVE</u></p>

		<ul style="list-style-type: none"> • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • Detecting Reactive Oxygen Species • Invasion Assay Using 3D Matrices • The ATP Bioluminescence Assay • The Transwell Migration Assay
BENCHMARK	SC.912.L.18.11.	<p>Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzyme activity.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Death • Biofuels: Producing Ethanol from Cellulosic Material • Co-Immunoprecipitation and Pull-Down Assays • DNA Ligation Reactions • Enzyme Assays and Kinetics • Introduction to Catalysis • Live Cell Imaging of Mitosis • Molecular Cloning • PCR: The Polymerase Chain Reaction • Restriction Enzyme Digests • The ELISA Method • The TUNEL Assay
BENCHMARK	SC.912.L.18.12.	<p>Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determination of Moisture Content in Soil • Dissolved Oxygen in Surface Water • Nutrients in Aquatic Ecosystems • Turbidity and Total Solids in Surface Water • Water Quality Analysis via Indicator Organisms

Grade: 9 - Adopted: 2014

BODY OF KNOWLEDGE	FL.LAFS.910.RST.	READING STANDARDS FOR LITERACY IN SCIENCE AND TECHNICAL SUBJECTS 6-12
BIG IDEA	LAFS.910.RST.2.	Craft and Structure
BENCHMARK	LAFS.910.RST.2.4.	<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**
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- **Electrophoretic Mobility Shift Assay (EMSA)**
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- The TUNEL Assay
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		<p>Method</p> <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 • 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
BENCHMARK	LAFS.910.RST.2.5.	<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>JoVE</p> <ul style="list-style-type: none"> • Abdominal Exam I: Inspection and Auscultation • Abdominal Exam II: Percussion • Abdominal Exam III: Palpation • Abdominal Exam IV: Acute Abdominal Pain Assessment • Algae Enumeration via Culturable Methodology • An Introduction to Aging and Regeneration • An Introduction to Behavioral Neuroscience • An Introduction to Caenorhabditis elegans

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- The Multi-group Experiment
- The Precision of Visual Working Memory with Delayed Estimation
- The Rouge Test: Searching for a Sense of Self
- The Rubber Hand Illusion
- The Simple Experiment: Two-group Design
- The Split Brain
- The Staircase Procedure for Finding a Perceptual Threshold
- The TUNEL Assay
- The Transwell Migration Assay
- The Western Blot
- Thyroid Exam

		<ul style="list-style-type: none"> • 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
BODY OF KNOWLEDGE	FL.LAFS.910.RST.	READING STANDARDS FOR LITERACY IN SCIENCE AND TECHNICAL SUBJECTS 6-12
BIG IDEA	LAFS.910.RST.3.	Integration of Knowledge and Ideas
BENCHMARK	LAFS.910.RST.3.7.	<p>Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.</p> <p><u>JoVE</u></p>

- **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

		<ul style="list-style-type: none"> • Tree Survey: Point-Centered Quarter Sampling Method • Turbidity and Total Solids in Surface Water • Two-Dimensional Gel Electrophoresis • Ultraviolet-Visible (UV-Vis) Spectroscopy • Understanding Concentration and Measuring Volumes • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Using GIS to Investigate Urban Forestry • Using TMS to Measure Motor Excitability During Action Observation • Using Topographic Maps to Generate Topographic Profiles • Using Your Head: Measuring Infants' Rational Imitation of Actions • Using a pH Meter • Verbal Priming • Visual Attention: fMRI Investigation of Object-based Attentional Control • Visual Search for Features and Conjunctions • Visual Statistical Learning • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy • Water Quality Analysis via Indicator Organisms • Within-subjects Repeated-measures Design • X-ray Fluorescence (XRF) • Yeast Maintenance • fMRI: Functional Magnetic Resonance Imaging
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BODY OF KNOWLEDGE	FL.LAFS.910.WHST.	WRITING STANDARDS FOR LITERACY IN SCIENCE AND TECHNICAL SUBJECTS
BIG IDEA	LAFS.910.WHST.1.	Text Types and Purposes
BENCHMARK	LAFS.910.WHST.1.1.	Write arguments focused on discipline-specific content.
INDICATOR	LAFS.910.WHST.1.1.a.	<p>Introduce precise claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that establishes clear relationships among the claim(s), counterclaims, reasons, and evidence.</p> <p>JoVE</p> <ul style="list-style-type: none"> • The Multi-group Experiment • The Simple Experiment: Two-group Design
BODY OF KNOWLEDGE	FL.LAFS.910.WHST.	WRITING STANDARDS FOR LITERACY IN SCIENCE AND TECHNICAL SUBJECTS
BIG IDEA	LAFS.910.WHST.1.	Text Types and Purposes

BENCHMARK	LAFS.910.WHST.1.2.	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
INDICATOR	LAFS.910.WHST.1.2.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
INDICATOR	LAFS.910.WHST.1.2.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

		<ul style="list-style-type: none"> • 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
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		<ul style="list-style-type: none"> • 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
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		<ul style="list-style-type: none"> • 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
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		<ul style="list-style-type: none"> • 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
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- **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**

		<ul style="list-style-type: none"> • 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
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- 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

		<ul style="list-style-type: none"> • 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
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		<p>Action Observation</p> <ul style="list-style-type: none"> • 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
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