

Main Criteria: North Carolina Standard Course of Study

Secondary Criteria: JoVE

Subject: Science

Grade: 9-12

Correlation Options: Show Correlated

Adopted: 2010

CONTENT AREA / STRAND	NC.PSc.	Physical Science
STRAND / ESSENTIAL STANDARD		Matter: Properties and Change
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	PSc.2.1.	Understand types, properties, and structure of matter.
CLARIFYING OBJECTIVE	PSc.2.1.1.	<p>Classify matter as: homogeneous or heterogeneous; pure substance or mixture; element or compound; metals, nonmetals or metalloids; solution, colloid or suspension.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to the Micropipettor • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Assembly of a Reflux System for Heated Chemical Reactions • Calibration Curves • Capillary Electrophoresis (CE) • 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 • Cyclic Voltammetry (CV) • Degassing Liquids with Freeze-Pump-Thaw Cycling • Density Gradient Ultracentrifugation • 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**
- **Dialysis: Diffusion Based Separation**
- **Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat**
- **Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction**
- **Fractional Distillation**
- **Freezing-Point Depression to Determine an Unknown Compound**
- **Gas Chromatography (GC) with Flame-Ionization Detection**
- **Growing Crystals for X-ray Diffraction Analysis**
- **High-Performance Liquid Chromatography (HPLC)**
- **Internal Standards**
- **Introduction to Mass Spectrometry**
- **Introduction to Serological Pipettes and Pipettors**
- **Introduction to Titration**
- **Introduction to the Microplate Reader**
- **Introduction to the Spectrophotometer**
- **Ion-Exchange Chromatography**
- **Le Châtelier's Principle**
- **Lead Analysis of Soil Using Atomic Absorption Spectroscopy**
- **Making Solutions in the Laboratory**
- **Method of Standard Addition**
- **Performing 1D Thin Layer Chromatography**
- **Photometric Protein Determination**
- **Physical Properties Of Minerals I: Crystals and Cleavage**
- **Physical Properties Of Minerals II: Polymineralic Analysis**
- **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**
- **Rotary Evaporation to Remove Solvent**
- **Sample Preparation for Analytical Preparation**
- **Schlenk Lines Transfer of Solvents**
- **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**
- **Spectrophotometric Determination of an Equilibrium Constant**
- **Two-Dimensional Gel Electrophoresis**

		<ul style="list-style-type: none"> • Understanding Concentration and Measuring Volumes • Using a pH Meter • X-ray Fluorescence (XRF)
CLARIFYING OBJECTIVE	PSc.2.1.2.	<p>Explain the phases of matter and the physical changes that matter undergoes.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Freezing-Point Depression to Determine an Unknown Compound
CLARIFYING OBJECTIVE	PSc.2.1.3.	<p>Compare physical and chemical properties of various types of matter.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Common Lab Glassware and Uses • Cyclic Voltammetry (CV) • Determining the Density of a Solid and Liquid • Determining the Mass Percent Composition in an Aqueous Solution • Freezing-Point Depression to Determine an Unknown Compound • Introduction to Titration • Using a pH Meter
CONTENT AREA / STRAND	NC.PSc.	Physical Science
STRAND / ESSENTIAL STANDARD		Matter: Properties and Change
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	PSc.2.2.	Understand chemical bonding and chemical interactions.
CLARIFYING OBJECTIVE	PSc.2.2.1.	<p>Infer valence electrons, oxidation number, and reactivity of an element based on its location in the Periodic Table.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Coordination Chemistry Complexes
CLARIFYING OBJECTIVE	PSc.2.2.2.	<p>Infer the type of chemical bond that occurs, whether covalent, ionic or metallic, in a given substance.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry • Determining the Solubility Rules of Ionic Compounds • Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction • Purification of a Total Lipid Extract with Column

		<p>Chromatography</p> <ul style="list-style-type: none"> • 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)
CLARIFYING OBJECTIVE	PSc.2.2.3.	<p>Predict chemical formulas and names for simple compounds based on knowledge of bond formation and naming conventions.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining the Empirical Formula • Determining the Mass Percent Composition in an Aqueous Solution • Introduction to Mass Spectrometry • MALDI-TOF Mass Spectrometry • Purification of a Total Lipid Extract with Column Chromatography • Sonication Extraction of Lipid Biomarkers from Sediment • Tandem Mass Spectrometry
CLARIFYING OBJECTIVE	PSc.2.2.4.	<p>Exemplify the Law of Conservation of mass by balancing chemical equations.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Assembly of a Reflux System for Heated Chemical Reactions • Conducting Reactions Below Room Temperature • Coordination Chemistry Complexes • Determining Rate Laws and the Order of Reaction • Determining the Empirical Formula • Determining the Solubility Rules of Ionic Compounds • Introduction to Catalysis • Introduction to Titration • Preparing Anhydrous Reagents and Equipment • Proton Exchange Membrane Fuel Cells • Solutions and Concentrations • Spectrophotometric Determination of an Equilibrium Constant • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
CLARIFYING OBJECTIVE	PSc.2.2.5.	<p>Classify types of reactions such as synthesis, decomposition, single replacement or double replacement.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Conducting Reactions Below Room Temperature • Coordination Chemistry Complexes

		<ul style="list-style-type: none"> • Cyclic Voltammetry (CV) • Determining Rate Laws and the Order of Reaction • Determining the Solubility Rules of Ionic Compounds • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Enzyme Assays and Kinetics • Growing Crystals for X-ray Diffraction Analysis • Introduction to Catalysis • Introduction to Titration • Le Châtelier's Principle • Photometric Protein Determination • Preparing Anhydrous Reagents and Equipment • Proton Exchange Membrane Fuel Cells • Purifying Compounds by Recrystallization • Rotary Evaporation to Remove Solvent • Separation of Mixtures via Precipitation • Spectrophotometric Determination of an Equilibrium Constant • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy • Using a pH Meter
CLARIFYING OBJECTIVE	PSc.2.2.6.	<p>Summarize the characteristics and interactions of acids and bases.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Dissolved Oxygen in Surface Water • Introduction to Titration • Solutions and Concentrations • Using a pH Meter
CONTENT AREA / STRAND	NC.PSc.	Physical Science
STRAND / ESSENTIAL STANDARD		Matter: Properties and Change
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	PSc.2.3.	Understand the role of the nucleus in radiation and radioactivity.
CLARIFYING OBJECTIVE	PSc.2.3.1.	<p>Compare nuclear reactions including; alpha decay, beta decay and gamma decay; nuclear fusion and nuclear fission.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Nuclear Magnetic Resonance (NMR) Spectroscopy
CLARIFYING OBJECTIVE	PSc.2.3.2.	<p>Exemplify the radioactive decay of unstable nuclei using the concept of half-life.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining Rate Laws and the Order of Reaction

CONTENT AREA / STRAND	NC.PSc.	Physical Science
STRAND / ESSENTIAL STANDARD		Energy: Conservation and Transfer
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	PSc.3.1.	Understand the types of energy, conservation of energy and energy transfer.
CLARIFYING OBJECTIVE	PSc.3.1.1.	Explain thermal energy and its transfer. JoVE • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
CONTENT AREA / STRAND	NC.PSc.	Physical Science
STRAND / ESSENTIAL STANDARD		Energy: Conservation and Transfer
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	PSc.3.2.	Understand the nature of waves.
CLARIFYING OBJECTIVE	PSc.3.2.1.	Explain the relationships among wave frequency, wave period, wave velocity and wavelength through calculation and investigation. JoVE • Raman Spectroscopy for Chemical Analysis
CLARIFYING OBJECTIVE	PSc.3.2.2.	Compare waves (mechanical, electromagnetic, and surface) using their characteristics. JoVE • Nuclear Magnetic Resonance (NMR) Spectroscopy • Raman Spectroscopy for Chemical Analysis
CLARIFYING OBJECTIVE	PSc.3.2.4.	Illustrate the wave interactions of reflection, refraction, diffraction, and interference. JoVE • Raman Spectroscopy for Chemical Analysis
CONTENT AREA / STRAND	NC.PSc.	Physical Science
STRAND / ESSENTIAL STANDARD		Energy: Conservation and Transfer
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	PSc.3.3.	Understand electricity and magnetism and their relationship.
CLARIFYING OBJECTIVE	PSc.3.3.1.	Summarize static and current electricity.

		<p>JoVE</p> <ul style="list-style-type: none"> • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat
CLARIFYING OBJECTIVE	PSc.3.3.4.	<p>Explain magnetism in terms of domains, interactions of poles, and magnetic fields.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Determining Spatial Orientation of Rock Layers with the Brunton Compass • Introduction to Mass Spectrometry • MALDI-TOF Mass Spectrometry • Nuclear Magnetic Resonance (NMR) Spectroscopy • Tandem Mass Spectrometry
CLARIFYING OBJECTIVE	PSc.3.3.5.	<p>Explain the practical applications of magnetism.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Determining Spatial Orientation of Rock Layers with the Brunton Compass • Introduction to Mass Spectrometry • MALDI-TOF Mass Spectrometry • Nuclear Magnetic Resonance (NMR) Spectroscopy • Object Substitution Masking • Tandem Mass Spectrometry • fMRI: Functional Magnetic Resonance Imaging
CONTENT AREA / STRAND	NC.Bio.	Biology
STRAND / ESSENTIAL STANDARD		Structure and Functions of Living Organisms
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Bio.1.1.	Understand the relationship between the structures and functions of cells and their organelles.
CLARIFYING OBJECTIVE	Bio.1.1.1.	<p>Summarize the structure and function of organelles in eukaryotic cells (including: the nucleus, plasma membrane, cell wall, mitochondria, vacuoles, chloroplasts, and ribosomes) and ways that these organelles interact with each other to perform the function of the cell.</p> <p>JoVE</p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Transfection • Annexin V and Propidium Iodide Labeling • Cell Cycle Analysis • Density Gradient Ultracentrifugation • Detecting Reactive Oxygen Species • Enzyme Assays and Kinetics

		<ul style="list-style-type: none"> • Isolating Nucleic Acids from Yeast • Live Cell Imaging of Mitosis • Metabolic Labeling • The ATP Bioluminescence Assay • The TUNEL Assay
CLARIFYING OBJECTIVE	Bio.1.1.2.	<p>Compare prokaryotic and eukaryotic cells in terms of their general structures (plasma membrane and genetic material) and degree of complexity.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to <i>Saccharomyces cerevisiae</i> • 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 • Electrophoretic Mobility Shift Assay (EMSA) • Plasmid Purification • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning
CLARIFYING OBJECTIVE	Bio.1.1.3.	<p>Explain how instructions in DNA lead to cell differentiation and result in cells specialized to perform specific functions in multicellular organisms.</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 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 • An Overview of Epigenetics • An Overview of Gene Expression • <i>C. elegans</i> Development and Reproduction • DNA Methylation Analysis • Development and Reproduction of the Laboratory Mouse • Development of the Chick • <i>Drosophila</i> Larval IHC • 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 Engineering of Model Organisms • Induced Pluripotency

		<ul style="list-style-type: none"> • Murine In Utero Electroporation • RNA-Seq • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies • Whole-Mount In Situ Hybridization • Zebrafish Breeding and Embryo Handling • Zebrafish Reproduction and Development
CONTENT AREA / STRAND	NC.Bio.	Biology
STRAND / ESSENTIAL STANDARD		Structure and Functions of Living Organisms
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Bio.1.2.	Analyze the cell as a living system.
CLARIFYING OBJECTIVE	Bio.1.2.1.	<p>Explain how homeostasis is maintained in the cell and within an organism in various environments (including: temperature and pH).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Abdominal Exam I: Inspection and Auscultation • Abdominal Exam II: Percussion • Abdominal Exam III: Palpation • Abdominal Exam IV: Acute Abdominal Pain <p>Assessment</p> <ul style="list-style-type: none"> • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Cognition • An Introduction to Developmental Neurobiology • An Introduction to Endocytosis and Exocytosis • An Introduction to Learning and Memory • An Introduction to Molecular Developmental Biology • An Introduction to Reward and Addiction • An Introduction to Stem Cell Biology • Anesthesia Induction and Maintenance • Ankle Exam • Annexin V and Propidium Iodide Labeling • Arterial Line Placement • Assessing Dexterity with Reaching Tasks • Auscultation • Balance and Coordination Testing • Basic Care Procedures • Basic Life Support Part II: Airway/Breathing and Continued Cardiopulmonary Resuscitation • Basic Life Support: Cardiopulmonary Resuscitation and Defibrillation • Basic Mouse Care and Maintenance • Blood Pressure Measurement

- Blood Withdrawal I
- Blood Withdrawal II
- C. elegans Development and Reproduction
- Calcium Imaging in Neurons
- Cardiac Exam I: Inspection and Palpation
- Cardiac Exam II: Auscultation
- Cardiac Exam III: Abnormal Heart Sounds
- Cell-surface Biotinylation Assay
- Central Venous Catheter Insertion: Femoral Vein with Ultrasound Guidance
- Central Venous Catheter Insertion: Internal Jugular with Ultrasound Guidance
- Central Venous Catheter Insertion: Subclavian Vein
- Compound Administration I
- Compound Administration II
- Compound Administration III
- Compound Administration IV
- Comprehensive Breast Exam
- Considerations for Rodent Surgery
- Cranial Nerves Exam I (I-VI)
- Cranial Nerves Exam II (VII-XII)
- Detecting Reactive Oxygen Species
- Diagnostic Necropsy and Tissue Harvest
- Ear Exam
- Elbow Exam
- Electro-encephalography (EEG)
- Embryonic Stem Cell Culture and Differentiation
- Emergency Tube Thoracostomy (Chest Tube Placement)
- Emergent Lateral Canthotomy and Inferior Catholysis
- Explant Culture of Neural Tissue
- Eye Exam
- FM Dyes in Vesicle Recycling
- Fear Conditioning
- Foot Exam
- General Approach to the Physical Exam
- Hand and Wrist Exam
- Hip Exam
- Histological Staining of Neural Tissue
- In ovo Electroporation of Chicken Embryos
- Induced Pluripotency
- Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation
- Intraosseous Needle Placement
- Isolating Nucleic Acids from Yeast
- Knee Exam
- Lower Back Exam
- Lymph Node Exam
- Male Rectal Exam
- Measuring Vital Signs
- Motor Exam I
- Motor Exam II

		<ul style="list-style-type: none"> • Murine In Utero Electroporation • Neck Exam • Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment • Nose, Sinuses, Oral Cavity and Pharynx Exam • Observation and Inspection • Ophthalmoscopic Examination • Palpation • Patch Clamp Electrophysiology • Pelvic Exam I: Assessment of the External Genitalia • Pelvic Exam II: Speculum Exam • Pelvic Exam III: Bimanual and Rectovaginal Exam • Percussion • Percutaneous Cricothyrotomy (Seldinger Technique) • Pericardiocentesis • Peripheral Vascular Exam • Peripheral Vascular Exam Using a Continuous Wave Doppler • Peripheral Venous Cannulation • Physiological Correlates of Emotion Recognition • Proper Adjustment of Patient Attire during the Physical Exam • Reconstitution of Membrane Proteins • Respiratory Exam I: Inspection and Palpation • Respiratory Exam II: Percussion and Auscultation • Self-administration Studies • Sensory Exam • Shoulder Exam I • Shoulder Exam II • Spatial Memory Testing Using Mazes • Sterile Tissue Harvest • Surgical Cricothyrotomy • The ATP Bioluminescence Assay • The TUNEL Assay • Thyroid Exam • Tissue Regeneration with Somatic Stem Cells • Tree Identification: How To Use a Dichotomous Key • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Using a pH Meter • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Maintenance and Husbandry
<p>CLARIFYING OBJECTIVE</p>	<p>Bio.1.2.2.</p>	<p>Analyze how cells grow and reproduce in terms of interphase, mitosis and cytokinesis.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Division • An Introduction to Saccharomyces cerevisiae • Cell Cycle Analysis

		<ul style="list-style-type: none"> • Live Cell Imaging of Mitosis • Yeast Reproduction • Yeast Transformation and Cloning
CLARIFYING OBJECTIVE	Bio.1.2.3.	<p>Explain how specific cell adaptations help cells survive in particular environments (focus on unicellular organisms).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Division • An Introduction to Cell Motility and Migration • An Introduction to Saccharomyces cerevisiae • Bacterial Growth Curve Analysis and its Environmental Applications • Genetic Crosses • Isolating Nucleic Acids from Yeast • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning
CONTENT AREA / STRAND	NC.Bio.	Biology
STRAND / ESSENTIAL STANDARD		Ecosystems
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Bio.2.1.	Analyze the interdependence of living organisms within their environments.
CLARIFYING OBJECTIVE	Bio.2.1.1.	<p>Analyze the flow of energy and cycling of matter (water, carbon, nitrogen and oxygen) through ecosystems relating the significance of each to maintaining the health and sustainability of an ecosystem.</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

		<ul style="list-style-type: none"> • Fundamentals of Breeding and Weaning • Metabolic Labeling • Nutrients in Aquatic Ecosystems • Purification of a Total Lipid Extract with Column Chromatography • Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry • Soil Nutrient Analysis: Nitrogen, Phosphorus, and Potassium • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment • Using GIS to Investigate Urban Forestry
<p>CLARIFYING OBJECTIVE</p>	<p>Bio.2.1.2.</p>	<p>Analyze the survival and reproductive success of organisms in terms of behavioral, structural, and reproductive adaptations.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Caenorhabditis elegans • An Introduction to Cognition • An Introduction to Drosophila melanogaster • An Introduction to Learning and Memory • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Laboratory Mouse: Mus musculus • An Introduction to the Zebrafish: Danio rerio • Basic Chick Care and Maintenance • Basic Mouse Care and Maintenance • C. elegans Chemotaxis Assay • Development of the Chick • Drosophila Development and Reproduction • Drosophila Maintenance • Fear Conditioning • Positive Reinforcement Studies • Spatial Memory Testing Using Mazes • Yeast Maintenance
<p>CLARIFYING OBJECTIVE</p>	<p>Bio.2.1.3.</p>	<p>Explain various ways organisms interact with each other (including predation, competition, parasitism, mutualism) and with their environments resulting in stability within ecosystems.</p> <p><u>JoVE</u></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

		<ul style="list-style-type: none"> • 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
CONTENT AREA / STRAND	NC.Bio.	Biology
STRAND / ESSENTIAL STANDARD		Ecosystems
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Bio.2.2.	Understand the impact of human activities on the environment (one generation affects the next).
CLARIFYING OBJECTIVE	Bio.2.2.1.	<p>Infer how human activities (including population growth, pollution, global warming, burning of fossil fuels, habitat destruction and introduction of nonnative species) may impact the environment.</p> <p><u>JoVE</u></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 • Introduction to Mass Spectrometry • Isolation of Fecal Bacteria from Water Samples by Filtration • 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
CLARIFYING OBJECTIVE	Bio.2.2.2.	<p>Explain how the use, protection and conservation of natural resources by humans impact the environment from one generation to the next.</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 • Lead Analysis of Soil Using Atomic Absorption Spectroscopy • Measuring Tropospheric Ozone • Nutrients in Aquatic Ecosystems • Self-report vs. Behavioral Measures of Recycling

		<ul style="list-style-type: none"> • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method • Turbidity and Total Solids in Surface Water • Water Quality Analysis via Indicator Organisms
CONTENT AREA / STRAND	NC.Bio.	Biology
STRAND / ESSENTIAL STANDARD		Evolution & Genetics
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Bio.3.1.	Explain how traits are determined by the structure and function of DNA.
CLARIFYING OBJECTIVE	Bio.3.1.1.	<p>Explain the double-stranded, complementary nature of DNA as related to its function in the cell.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Caenorhabditis elegans • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Developmental Genetics • An Introduction to Molecular Developmental Biology • An Introduction to Saccharomyces cerevisiae • An Introduction to Transfection • An Overview of Epigenetics • An Overview of Gene Expression • An Overview of Genetic Analysis • An Overview of Genetic Engineering • An Overview of Genetics and Disease • Annexin V and Propidium Iodide Labeling • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • Cell Cycle Analysis • Chromatin Immunoprecipitation • Community DNA Extraction from Bacterial Colonies • Cytogenetics • DNA Gel Electrophoresis • DNA Ligation Reactions • DNA Methylation Analysis • Density Gradient Ultracentrifugation • Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis • Development and Reproduction of the Laboratory Mouse • Drosophila melanogaster Embryo and Larva Harvesting and Preparation • Electrophoretic Mobility Shift Assay (EMSA) • Embryonic Stem Cell Culture and Differentiation • Enzyme Assays and Kinetics • Explant Culture for Developmental Studies

		<ul style="list-style-type: none"> • Expression Profiling with Microarrays • Förster Resonance Energy Transfer (FRET) • Gel Purification • Gene Silencing with Morpholinos • Genetic Crosses • Genetic Engineering of Model Organisms • Genetic Screens • Genome Editing • In ovo Electroporation of Chicken Embryos • Induced Pluripotency • Isolating Nucleic Acids from Yeast • Live Cell Imaging of Mitosis • Molecular Cloning • Mouse Genotyping • PCR: The Polymerase Chain Reaction • Photometric Protein Determination • Plasmid Purification • Protein Crystallization • Quantifying Environmental Microorganisms and Viruses Using qPCR • RNA Analysis of Environmental Samples Using RT-PCR • RNA-Seq • Recombineering and Gene Targeting • Restriction Enzyme Digests • SNP Genotyping • Testing For Genetically Modified Foods • The TUNEL Assay • Two-Dimensional Gel Electrophoresis • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling
<p>CLARIFYING OBJECTIVE</p>	<p>Bio.3.1.2.</p>	<p>Explain how DNA and RNA code for proteins and determine traits.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to Caenorhabditis elegans • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Molecular Developmental Biology • An Introduction to Organogenesis • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Introduction to Transfection • An Introduction to the Zebrafish: Danio rerio • An Overview of Epigenetics • An Overview of Gene Expression

- An Overview of Genetic Analysis
- An Overview of Genetic Engineering
- An Overview of Genetics and Disease
- Annexin V and Propidium Iodide Labeling
- Bacterial Transformation: Electroporation
- Bacterial Transformation: The Heat Shock Method
- C. elegans Maintenance
- Cell Cycle Analysis
- Chick ex ovo Culture
- Chromatin Immunoprecipitation
- Community DNA Extraction from Bacterial Colonies
- Cytogenetics
- DNA Gel Electrophoresis
- DNA Ligation Reactions
- DNA Methylation Analysis
- Density Gradient Ultracentrifugation
- Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis
- 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
- Enzyme Assays and Kinetics
- Explant Culture for Developmental Studies
- Explant Culture of Neural Tissue
- Expression Profiling with Microarrays
- Fate Mapping
- Förster Resonance Energy Transfer (FRET)
- Gel Purification
- Gene Silencing with Morpholinos
- Genetic Crosses
- Genetic Engineering of Model Organisms
- Genetic Screens
- Genome Editing
- Histological Staining of Neural Tissue
- In ovo Electroporation of Chicken Embryos
- Induced Pluripotency
- Introduction to the Microplate Reader
- Invertebrate Lifespan Quantification
- Isolating Nucleic Acids from Yeast
- Live Cell Imaging of Mitosis
- Metabolic Labeling
- Method of Standard Addition
- Molecular Cloning
- Mouse Genotyping
- Murine In Utero Electroporation

		<ul style="list-style-type: none"> • PCR: The Polymerase Chain Reaction • Photometric Protein Determination • Plasmid Purification • Protein Crystallization • Quantifying Environmental Microorganisms and Viruses Using qPCR • RNA Analysis of Environmental Samples Using RT-PCR • RNA-Seq • RNAi in <i>C. elegans</i> • Recombineering and Gene Targeting • Restriction Enzyme Digests • Rodent Stereotaxic Surgery • SNP Genotyping • Spectrophotometric Determination of an Equilibrium Constant • Testing For Genetically Modified Foods • The TUNEL Assay • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies • Two-Dimensional Gel Electrophoresis • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
<p>CLARIFYING OBJECTIVE</p>	<p>Bio.3.1.3.</p>	<p>Explain how mutations in DNA that result from interactions with the environment (i.e. radiation and chemicals) or new combinations in existing genes lead to changes in function and phenotype.</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

		<ul style="list-style-type: none"> • Passaging Cells • The TUNEL Assay
CONTENT AREA / STRAND	NC.Bio.	Biology
STRAND / ESSENTIAL STANDARD		Evolution & Genetics
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Bio.3.2.	Understand how the environment, and/or the interaction of alleles, influences the expression of genetic traits.
CLARIFYING OBJECTIVE	Bio.3.2.1.	<p>Explain the role of meiosis in sexual reproduction and genetic variation.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Division • Genetic Crosses • Recombineering and Gene Targeting • Yeast Reproduction
CLARIFYING OBJECTIVE	Bio.3.2.2.	<p>Predict offspring ratios based on a variety of inheritance patterns (including: dominance, co-dominance, incomplete dominance, multiple alleles, and sex-linked traits).</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 Overview of Epigenetics • An Overview of Genetic Analysis • An Overview of Genetics and Disease • C. elegans Development and Reproduction • DNA Methylation Analysis • Drosophila Development and Reproduction • Fundamentals of Breeding and Weaning • Genetic Crosses • Genetic Screens • Mouse Genotyping
CLARIFYING OBJECTIVE	Bio.3.2.3.	<p>Explain how the environment can influence the expression of genetic traits.</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

		<ul style="list-style-type: none"> • Drosophila Development and Reproduction • Fundamentals of Breeding and Weaning • Gene Silencing with Morpholinos • Genetic Crosses • Genetic Engineering of Model Organisms • Genetic Screens • Mouse Genotyping • RNAi in C. elegans • SNP Genotyping • Whole-Mount In Situ Hybridization • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Reproduction and Development
CONTENT AREA / STRAND	NC.Bio.	Biology
STRAND / ESSENTIAL STANDARD		Evolution & Genetics
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Bio.3.3.	Understand the application of DNA technology.
CLARIFYING OBJECTIVE	Bio.3.3.1.	<p>Interpret how DNA is used for comparison and identification of organisms.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Genetic Analysis
CLARIFYING OBJECTIVE	Bio.3.3.2.	<p>Summarize how transgenic organisms are engineered to benefit society.</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 Organogenesis • 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 Genetic Engineering • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • C. elegans Development and Reproduction • Chick ex ovo Culture • DNA Ligation Reactions • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Embryonic Stem Cell Culture and Differentiation

		<ul style="list-style-type: none"> • Explant Culture for Developmental Studies • Fate Mapping • Fundamentals of Breeding and Weaning • Gene Silencing with Morpholinos • Genetic Engineering of Model Organisms • In ovo Electroporation of Chicken Embryos • Induced Pluripotency • Invertebrate Lifespan Quantification • Molecular Cloning • Mouse Genotyping • Plasmid Purification • RNAi in <i>C. elegans</i> • Restriction Enzyme Digests • Solid-Liquid Extraction • Testing For Genetically Modified Foods • The TUNEL Assay • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies • Whole-Mount In Situ Hybridization • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
<p>CLARIFYING OBJECTIVE</p>	<p>Bio.3.3.3.</p>	<p>Evaluate some of the ethical issues surrounding the use of DNA technology (including: cloning, genetically modified organisms, stem cell research, and Human Genome Project).</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 Developmental Neurobiology • An Introduction to Molecular Developmental Biology • An Introduction to Neurophysiology • An Introduction to Organogenesis • An Introduction to <i>Saccharomyces cerevisiae</i> • An Introduction to Stem Cell Biology • An Introduction to Transfection • An Introduction to the Chick: <i>Gallus gallus domesticus</i> • An Introduction to the Laboratory Mouse: <i>Mus musculus</i> • An Introduction to the Zebrafish: <i>Danio rerio</i> • An Overview of Gene Expression • An Overview of Genetic Engineering • An Overview of Genetics and Disease • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • <i>C. elegans</i> Development and Reproduction • Capillary Electrophoresis (CE) • Chick ex ovo Culture • DNA Ligation Reactions

		<ul style="list-style-type: none"> • DNA Methylation Analysis • 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 • Expression Profiling with Microarrays • 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 • PCR: The Polymerase Chain Reaction • Passaging Cells • Plasmid Purification • Primary Neuronal Cultures • RNA-Seq • RNAi in C. elegans • Recombineering and Gene Targeting • Restriction Enzyme Digests • Rodent Stereotaxic Surgery • SNP Genotyping • 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
CONTENT AREA / STRAND	NC.Bio.	Biology
STRAND / ESSENTIAL STANDARD		Evolution & Genetics
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Bio.3.4.	Explain the theory of evolution by natural selection as a mechanism for how species change over time.

CLARIFYING OBJECTIVE	Bio.3.4.1.	<p>Explain how fossil, biochemical, and anatomical evidence support the theory of evolution.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Genetic Analysis • High-Performance Liquid Chromatography (HPLC)
CLARIFYING OBJECTIVE	Bio.3.4.2.	<p>Explain how natural selection influences the changes in species over time.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Genetic Analysis
CLARIFYING OBJECTIVE	Bio.3.4.3.	<p>Explain how various disease agents (bacteria, viruses, chemicals) can influence natural selection.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Genetic Analysis
CONTENT AREA / STRAND	NC.Bio.	Biology
STRAND / ESSENTIAL STANDARD		Evolution & Genetics
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Bio.3.5.	Analyze how classification systems are developed based upon speciation.
CLARIFYING OBJECTIVE	Bio.3.5.1.	<p>Explain the historical development and changing nature of classification systems.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • 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 • Basic Chick Care and Maintenance • Basic Mouse Care and Maintenance • C. elegans Chemotaxis Assay • C. elegans Development and Reproduction • C. elegans 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 • Drosophila Development and Reproduction • Drosophila Larval IHC • Drosophila Maintenance • Drosophila melanogaster Embryo and Larva Harvesting

		<p>and Preparation</p> <ul style="list-style-type: none"> • 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 • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
CLARIFYING OBJECTIVE	Bio.3.5.2.	<p>Analyze the classification of organisms according to their evolutionary relationships (including: dichotomous keys and phylogenetic trees).</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> • Tree Identification: How To Use a Dichotomous Key
CONTENT AREA / STRAND	NC.Bio.	Biology
STRAND / ESSENTIAL STANDARD		Molecular Biology
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Bio.4.1.	Understand how biological molecules are essential to the survival of living organisms
CLARIFYING OBJECTIVE	Bio.4.1.1.	<p>Compare the structures and functions of the major biological molecules (carbohydrates, proteins, lipids, and nucleic acids) as related to the survival of living organisms.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to <i>Caenorhabditis elegans</i> • 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 <i>Saccharomyces cerevisiae</i> • An Introduction to Transfection • An Overview of Epigenetics • An Overview of Gene Expression

- An Overview of Genetic Analysis
- An Overview of Genetic Engineering
- An Overview of Genetics and Disease
- Annexin V and Propidium Iodide Labeling
- Bacterial Transformation: Electroporation
- Bacterial Transformation: The Heat Shock Method
- C. elegans Maintenance
- 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
- 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
- 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
- Isolating Nucleic Acids from Yeast
- Live Cell Imaging of Mitosis
- MALDI-TOF Mass Spectrometry

		<ul style="list-style-type: none"> • Metabolic Labeling • Molecular Cloning • Mouse Genotyping • PCR: The Polymerase Chain Reaction • Photometric Protein Determination • Plasmid Purification • Protein Crystallization • Quantifying Environmental Microorganisms and Viruses Using qPCR • RNA Analysis of Environmental Samples Using RT-PCR • RNA-Seq • RNAi in <i>C. elegans</i> • Recombineering and Gene Targeting • Reconstitution of Membrane Proteins • Restriction Enzyme Digests • SNP Genotyping • Separating Protein with SDS-PAGE • Spectrophotometric Determination of an Equilibrium Constant • 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 • Yeast Maintenance • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
<p>CLARIFYING OBJECTIVE</p>	<p>Bio.4.1.2.</p>	<p>Summarize the relationship among DNA, proteins and amino acids in carrying out the work of cells and how this is similar in all organisms.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to <i>Caenorhabditis elegans</i> • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Developmental Genetics • An Introduction to Molecular Developmental Biology • An Introduction to <i>Saccharomyces cerevisiae</i> • An Introduction to Transfection • An Overview of Epigenetics • An Overview of Gene Expression • An Overview of Genetic Analysis • An Overview of Genetic Engineering

- An Overview of Genetics and Disease
- Annexin V and Propidium Iodide Labeling
- Bacterial Transformation: Electroporation
- Bacterial Transformation: The Heat Shock Method
- Cell Cycle Analysis
- Chromatin Immunoprecipitation
- Community DNA Extraction from Bacterial Colonies
- Cytogenetics
- DNA Gel Electrophoresis
- DNA Ligation Reactions
- DNA Methylation Analysis
- Density Gradient Ultracentrifugation
- Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis
- Detecting Reactive Oxygen Species
- Development and Reproduction of the Laboratory Mouse
- Drosophila melanogaster Embryo and Larva Harvesting and Preparation
- Electrophoretic Mobility Shift Assay (EMSA)
- Embryonic Stem Cell Culture and Differentiation
- Enzyme Assays and Kinetics
- Explant Culture for Developmental Studies
- Expression Profiling with Microarrays
- Förster Resonance Energy Transfer (FRET)
- Gel Purification
- Gene Silencing with Morpholinos
- Genetic Crosses
- Genetic Engineering of Model Organisms
- Genetic Screens
- Genome Editing
- In ovo Electroporation of Chicken Embryos
- Induced Pluripotency
- Ion-Exchange Chromatography
- Isolating Nucleic Acids from Yeast
- Live Cell Imaging of Mitosis
- MALDI-TOF Mass Spectrometry
- Molecular Cloning
- Mouse Genotyping
- PCR: The Polymerase Chain Reaction
- Photometric Protein Determination
- Plasmid Purification
- Protein Crystallization
- Quantifying Environmental Microorganisms and Viruses Using qPCR
- RNA Analysis of Environmental Samples Using RT-PCR
- RNA-Seq
- Recombineering and Gene Targeting
- Restriction Enzyme Digests
- SNP Genotyping
- Tandem Mass Spectrometry

		<ul style="list-style-type: none"> • Testing For Genetically Modified Foods • The TUNEL Assay • Two-Dimensional Gel Electrophoresis • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling
CLARIFYING OBJECTIVE	Bio.4.1.3.	<p>Explain how enzymes act as catalysts for biological reactions.</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
CONTENT AREA / STRAND	NC.Bio.	Biology
STRAND / ESSENTIAL STANDARD		Molecular Biology
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Bio.4.2.	Analyze the relationships between biochemical processes and energy use in the cell.
CLARIFYING OBJECTIVE	Bio.4.2.1.	<p>Analyze photosynthesis and cellular respiration in terms of how energy is stored, released, and transferred within and between these systems.</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
CLARIFYING OBJECTIVE	Bio.4.2.2.	<p>Explain ways that organisms use released energy for maintaining homeostasis (active transport).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Endocytosis and Exocytosis • An Introduction to Neurophysiology • An Introduction to Transfection • Calcium Imaging in Neurons • Cell-surface Biotinylation Assay • Detecting Reactive Oxygen Species

		<ul style="list-style-type: none"> • FM Dyes in Vesicle Recycling • Patch Clamp Electrophysiology • Reconstitution of Membrane Proteins • The TUNEL Assay • Yeast Transformation and Cloning
CONTENT AREA / STRAND	NC.Chm.	Chemistry
STRAND / ESSENTIAL STANDARD		Matter: Properties & Change
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Chm.1.1.	Analyze the structure of atoms and ions.
CLARIFYING OBJECTIVE	Chm.1.1.1.	Analyze the structure of atoms, isotopes, and ions. <u>JoVE</u> <ul style="list-style-type: none"> • Capillary Electrophoresis (CE) • Chromatography-Based Biomolecule Purification Methods • Coordination Chemistry Complexes • Determining the Solubility Rules of Ionic Compounds • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Electrophoretic Mobility Shift Assay (EMSA) • Introduction to Mass Spectrometry • Ion-Exchange Chromatography • MALDI-TOF Mass Spectrometry • Metabolic Labeling • Nuclear Magnetic Resonance (NMR) Spectroscopy • Raman Spectroscopy for Chemical Analysis • Tandem Mass Spectrometry • Two-Dimensional Gel Electrophoresis • X-ray Fluorescence (XRF)
CLARIFYING OBJECTIVE	Chm.1.1.2.	Analyze an atom in terms of the location of electrons. <u>JoVE</u> <ul style="list-style-type: none"> • Determining the Empirical Formula
CLARIFYING OBJECTIVE	Chm.1.1.3.	Explain the emission of electromagnetic radiation in spectral form in terms of the Bohr model. <u>JoVE</u> <ul style="list-style-type: none"> • Coordination Chemistry Complexes • Förster Resonance Energy Transfer (FRET) • Gas Chromatography (GC) with Flame-Ionization Detection • Introduction to Fluorescence Microscopy • Introduction to the Microplate Reader • Lead Analysis of Soil Using Atomic Absorption Spectroscopy • MALDI-TOF Mass Spectrometry

		<ul style="list-style-type: none"> • Method of Standard Addition • Nuclear Magnetic Resonance (NMR) Spectroscopy • Raman Spectroscopy for Chemical Analysis • Tandem Mass Spectrometry • X-ray Fluorescence (XRF)
CLARIFYING OBJECTIVE	Chm.1.1.4.	<p>Explain the process of radioactive decay by the use of nuclear equations and half-life.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining Rate Laws and the Order of Reaction
CONTENT AREA / STRAND	NC.Chm.	Chemistry
STRAND / ESSENTIAL STANDARD		Matter: Properties & Change
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Chm.1.2.	Understand the bonding that occurs in simple compounds in terms of bond type, strength, and properties.
CLARIFYING OBJECTIVE	Chm.1.2.1.	<p>Compare (qualitatively) the relative strengths of ionic, covalent, and metallic bonds.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry • Determining the Solubility Rules of Ionic Compounds • Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction • Purification of a Total Lipid Extract with Column Chromatography • Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment • Ultraviolet-Visible (UV-Vis) Spectroscopy • X-ray Fluorescence (XRF)
CLARIFYING OBJECTIVE	Chm.1.2.2.	<p>Infer the type of bond and chemical formula formed between atoms.</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

		<ul style="list-style-type: none"> • Determining the Empirical Formula • 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
CLARIFYING OBJECTIVE	Chm.1.2.3.	<p>Compare inter- and intra- particle 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 • 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
CLARIFYING OBJECTIVE	Chm.1.2.4.	<p>Interpret the name and formula of compounds using IUPAC convention.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Purification of a Total Lipid Extract with Column Chromatography • Sonication Extraction of Lipid Biomarkers from Sediment
CLARIFYING OBJECTIVE	Chm.1.2.5.	<p>Compare the properties of ionic, covalent, metallic, and network compounds.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Chromatography-Based Biomolecule Purification Methods

		<ul style="list-style-type: none"> • Column Chromatography • Determining the Empirical Formula • Determining the Solubility Rules of Ionic Compounds • Dialysis: Diffusion Based Separation • Freezing-Point Depression to Determine an Unknown Compound • Growing Crystals for X-ray Diffraction Analysis • Performing 1D Thin Layer Chromatography • Purifying Compounds by Recrystallization • Separation of Mixtures via Precipitation
CONTENT AREA / STRAND	NC.Chm.	Chemistry
STRAND / ESSENTIAL STANDARD		Matter: Properties & Change
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Chm.1.3.	Understand the physical and chemical properties of atoms based on their position in the Periodic Table.
CLARIFYING OBJECTIVE	Chm.1.3.1.	<p>Classify the components of a periodic table (period, group, metal, metalloid, nonmetal, transition).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Coordination Chemistry Complexes • Lead Analysis of Soil Using Atomic Absorption Spectroscopy • Soil Nutrient Analysis: Nitrogen, Phosphorus, and Potassium • Surface Plasmon Resonance (SPR)
CLARIFYING OBJECTIVE	Chm.1.3.2.	<p>Infer the physical properties (atomic radius, metallic and nonmetallic characteristics) of an element based on its position on the Periodic Table.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Coordination Chemistry Complexes
CLARIFYING OBJECTIVE	Chm.1.3.3.	<p>Infer the atomic size, reactivity, electronegativity, and ionization energy of an element from its position in the Periodic Table.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Coordination Chemistry Complexes
CONTENT AREA / STRAND	NC.Chm.	Chemistry
STRAND / ESSENTIAL STANDARD		Energy: Conservation & Transfer
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Chm.2.1.	Understand the relationship among pressure, temperature, volume, and phase.

CLARIFYING OBJECTIVE	Chm.2.1.1.	<p>Explain the energetic nature of phase changes.</p> <p><u>JoVE</u></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 • Ideal Gas Law • 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 • The Ideal Gas Law • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
CLARIFYING OBJECTIVE	Chm.2.1.2.	<p>Explain heating and cooling curves (heat of fusion, heat of vaporization, heat, melting point, and boiling point).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
CLARIFYING OBJECTIVE	Chm.2.1.3.	<p>Interpret the data presented in phase diagrams.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
CLARIFYING OBJECTIVE	Chm.2.1.4.	<p>Infer simple calorimetric calculations based on the concepts of heat lost equals heat gained and specific heat.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
CLARIFYING OBJECTIVE	Chm.2.1.5.	<p>Explain the relationships between pressure, temperature, volume, and quantity of gas both qualitative and quantitative.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining Rate Laws and the Order of Reaction • Ideal Gas Law • The Ideal Gas Law
CONTENT AREA / STRAND	NC.Chm.	Chemistry

STRAND / ESSENTIAL STANDARD		Energy: Conservation & Transfer
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Chm.2.2.	Analyze chemical reactions in terms of quantities, product formation, and energy.
CLARIFYING OBJECTIVE	Chm.2.2.1.	<p>Explain the energy content of a chemical reaction.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Conducting Reactions Below Room Temperature • Determining Rate Laws and the Order of Reaction • Le Châtelier's Principle • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
CLARIFYING OBJECTIVE	Chm.2.2.2.	<p>Analyze the evidence of chemical change.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Assembly of a Reflux System for Heated Chemical Reactions • Conducting Reactions Below Room Temperature • Coordination Chemistry Complexes • Cyclic Voltammetry (CV) • Determining Rate Laws and the Order of Reaction • Determining the Empirical Formula • 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 • Passaging Cells • Photometric Protein Determination • Physical Properties Of Minerals II: Polymineralic Analysis • Preparing Anhydrous Reagents and Equipment • Proton Exchange Membrane Fuel Cells • Purifying Compounds by Recrystallization • Rotary Evaporation to Remove Solvent • Separation of Mixtures via Precipitation • Solutions and Concentrations • Spectrophotometric Determination of an Equilibrium Constant • The ELISA Method • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy • Using a pH Meter

<p>CLARIFYING OBJECTIVE</p>	<p>Chm.2.2.3.</p>	<p>Analyze the Law of Conservation of Matter and how it applies to various types of chemical equations (synthesis, decomposition, single replacement, double replacement, and combustion).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Assembly of a Reflux System for Heated Chemical Reactions • Conducting Reactions Below Room Temperature • Coordination Chemistry Complexes • Determining Rate Laws and the Order of Reaction • Determining the Empirical Formula • Determining the Solubility Rules of Ionic Compounds • Introduction to Catalysis • Introduction to Titration • Preparing Anhydrous Reagents and Equipment • Proton Exchange Membrane Fuel Cells • Solutions and Concentrations • Spectrophotometric Determination of an Equilibrium Constant • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
<p>CLARIFYING OBJECTIVE</p>	<p>Chm.2.2.4.</p>	<p>Analyze the stoichiometric relationships inherent in a chemical reaction.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Calibration Curves • Determining Rate Laws and the Order of Reaction • Determining the Empirical Formula • Determining the Mass Percent Composition in an Aqueous Solution • Freezing-Point Depression to Determine an Unknown Compound • Introduction to Mass Spectrometry • Introduction to Titration • MALDI-TOF Mass Spectrometry • Method of Standard Addition • Nuclear Magnetic Resonance (NMR) Spectroscopy • Solutions and Concentrations • Spectrophotometric Determination of an Equilibrium Constant • Tandem Mass Spectrometry
<p>CLARIFYING OBJECTIVE</p>	<p>Chm.2.2.5.</p>	<p>Analyze quantitatively the composition of a substance (empirical formula, molecular formula, percent composition, and hydrates).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining the Empirical Formula • Determining the Mass Percent Composition in an Aqueous Solution • Introduction to Mass Spectrometry

		<ul style="list-style-type: none"> • MALDI-TOF Mass Spectrometry • Tandem Mass Spectrometry
CONTENT AREA / STRAND	NC.Chm.	Chemistry
STRAND / ESSENTIAL STANDARD		Interactions of Matter and Energy
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Chm.3.1.	Understand the factors affecting rate of reaction and chemical equilibrium.
CLARIFYING OBJECTIVE	Chm.3.1.1.	<p>Explain the factors that affect the rate of a reaction (temperature, concentration, particle size and presence of a catalyst).</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
CLARIFYING OBJECTIVE	Chm.3.1.2.	<p>Explain the conditions of a system at equilibrium.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Assembly of a Reflux System for Heated Chemical Reactions • Le Châtelier's Principle • Separation of Mixtures via Precipitation • Spectrophotometric Determination of an Equilibrium Constant
CLARIFYING OBJECTIVE	Chm.3.1.3.	<p>Infer the shift in equilibrium when a stress is applied to a chemical system (Le Chatelier's Principle).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Assembly of a Reflux System for Heated Chemical Reactions • Le Châtelier's Principle • Separation of Mixtures via Precipitation • Spectrophotometric Determination of an Equilibrium Constant
CONTENT AREA / STRAND	NC.Chm.	Chemistry
STRAND / ESSENTIAL STANDARD		Interactions of Matter and Energy
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Chm.3.2.	Understand solutions and the solution process.

<p>CLARIFYING OBJECTIVE</p>	<p>Chm.3.2.1.</p>	<p>Classify substances using the hydronium and hydroxide ion concentrations.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Assembly of a Reflux System for Heated Chemical Reactions • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Introduction to Titration • Ion-Exchange Chromatography • Le Châtelier's Principle • Two-Dimensional Gel Electrophoresis • Using a pH Meter
<p>CLARIFYING OBJECTIVE</p>	<p>Chm.3.2.2.</p>	<p>Summarize the properties of acids and bases.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Assembly of a Reflux System for Heated Chemical Reactions • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Introduction to Titration • Ion-Exchange Chromatography • Le Châtelier's Principle • Two-Dimensional Gel Electrophoresis • Using a pH Meter
<p>CLARIFYING OBJECTIVE</p>	<p>Chm.3.2.3.</p>	<p>Infer the quantitative nature of a solution (molarity, dilution, and titration with a 1:1 molar ratio).</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

<p>CLARIFYING OBJECTIVE</p>	<p>Chm.3.2.4.</p>	<p>Summarize the properties of solutions.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to the Micropipettor • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Assembly of a Reflux System for Heated Chemical Reactions • Calibration Curves • Capillary Electrophoresis (CE) • Column Chromatography • Conducting Reactions Below Room Temperature • Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry • Cyclic Voltammetry (CV) • Degassing Liquids with Freeze-Pump-Thaw Cycling • Density Gradient Ultracentrifugation • Determining the Mass Percent Composition in an Aqueous Solution • Determining the Solubility Rules of Ionic Compounds • Dialysis: Diffusion Based Separation • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction • Freezing-Point Depression to Determine an Unknown Compound • Gas Chromatography (GC) with Flame-Ionization Detection • Growing Crystals for X-ray Diffraction Analysis • High-Performance Liquid Chromatography (HPLC) • Internal Standards • Introduction to Serological Pipettes and Pipettors • Introduction to Titration • Introduction to the Microplate Reader • Introduction to the Spectrophotometer • Ion-Exchange Chromatography • Le Châtelier's Principle • Making Solutions in the Laboratory • Method of Standard Addition • Performing 1D Thin Layer Chromatography • Photometric Protein Determination • 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 • Rotary Evaporation to Remove Solvent
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		<ul style="list-style-type: none"> • Sample Preparation for Analytical Preparation • Schlenk Lines Transfer of Solvents • Separation of Mixtures via Precipitation • Solid-Liquid Extraction • Solutions and Concentrations • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment • Spectrophotometric Determination of an Equilibrium Constant • Two-Dimensional Gel Electrophoresis • Understanding Concentration and Measuring Volumes • Using a pH Meter
<p>CLARIFYING OBJECTIVE</p>	<p>Chm.3.2.6.</p>	<p>Explain the solution process.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to the Micropipettor • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Assembly of a Reflux System for Heated Chemical Reactions • Calibration Curves • Capillary Electrophoresis (CE) • Column Chromatography • Conducting Reactions Below Room Temperature • Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry • Cyclic Voltammetry (CV) • Degassing Liquids with Freeze-Pump-Thaw Cycling • Density Gradient Ultracentrifugation • Determining the Mass Percent Composition in an Aqueous Solution • Determining the Solubility Rules of Ionic Compounds • Dialysis: Diffusion Based Separation • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction • Freezing-Point Depression to Determine an Unknown Compound • Gas Chromatography (GC) with Flame-Ionization Detection • Growing Crystals for X-ray Diffraction Analysis • High-Performance Liquid Chromatography (HPLC) • Internal Standards • Introduction to Serological Pipettes and Pipettors • Introduction to Titration • Introduction to the Microplate Reader • Introduction to the Spectrophotometer

		<ul style="list-style-type: none"> • Ion-Exchange Chromatography • Le Châtelier's Principle • Making Solutions in the Laboratory • Method of Standard Addition • Performing 1D Thin Layer Chromatography • Photometric Protein Determination • 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 • Rotary Evaporation to Remove Solvent • Sample Preparation for Analytical Preparation • Schlenk Lines Transfer of Solvents • Separation of Mixtures via Precipitation • Solid-Liquid Extraction • Solutions and Concentrations • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment • Spectrophotometric Determination of an Equilibrium Constant • Two-Dimensional Gel Electrophoresis • Understanding Concentration and Measuring Volumes • Using a pH Meter
CONTENT AREA / STRAND	NC.Phy.	Physics
STRAND / ESSENTIAL STANDARD		Forces and Motion
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Phy.1.2.	Analyze systems of forces and their interaction with matter.
CLARIFYING OBJECTIVE	Phy.1.2.5.	Analyze basic forces related to rotation in a circular path (Centripetal Force). <u>JoVE</u> <ul style="list-style-type: none"> • An Introduction to the Centrifuge
CONTENT AREA / STRAND	NC.Phy.	Physics
STRAND / ESSENTIAL STANDARD		Forces and Motion
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Phy.1.3.	Analyze the motion of objects based on the principles of conservation of momentum, conservation of energy and impulse.
CLARIFYING OBJECTIVE	Phy.1.3.1.	Analyze the motion of objects involved in completely elastic and completely inelastic collisions by using the

		<p>principles of conservation of momentum and conservation of energy.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Raman Spectroscopy for Chemical Analysis
CONTENT AREA / STRAND	NC.Phy.	Physics
STRAND / ESSENTIAL STANDARD		Energy: Conservation and Transfer
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Phy.2.2.	Analyze the behavior of waves.
CLARIFYING OBJECTIVE	Phy.2.2.1.	<p>Analyze how energy is transmitted through waves, using the fundamental characteristics of waves: wavelength, period, frequency, amplitude, and wave velocity.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Raman Spectroscopy for Chemical Analysis
CLARIFYING OBJECTIVE	Phy.2.2.2.	<p>Analyze wave behaviors in terms of transmission, reflection, refraction and interference.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Raman Spectroscopy for Chemical Analysis
CLARIFYING OBJECTIVE	Phy.2.2.3.	<p>Compare mechanical and electromagnetic waves in terms of wave characteristics and behavior (specifically sound and light).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Nuclear Magnetic Resonance (NMR) Spectroscopy • Raman Spectroscopy for Chemical Analysis
CONTENT AREA / STRAND	NC.Phy.	Physics
STRAND / ESSENTIAL STANDARD		Energy: Conservation and Transfer
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Phy.2.3.	Analyze the nature of moving charges and electric circuits.
CLARIFYING OBJECTIVE	Phy.2.3.2.	<p>Differentiate the behavior of moving charges in conductors and insulators.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Assembly of a Reflux System for Heated Chemical Reactions
CLARIFYING OBJECTIVE	Phy.2.3.3.	<p>Compare the general characteristics of AC and DC systems without calculations.</p>

		<u>JoVE</u> <ul style="list-style-type: none"> • Nuclear Magnetic Resonance (NMR) Spectroscopy
CLARIFYING OBJECTIVE	Phy.2.3.5.	Analyze systems with multiple potential differences and resistors connected in series and parallel circuits, both conceptually and mathematically, in terms of voltage, current and resistance. <u>JoVE</u> <ul style="list-style-type: none"> • Cyclic Voltammetry (CV) • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat
CONTENT AREA / STRAND	NC.Phy.	Physics
STRAND / ESSENTIAL STANDARD		Interactions of Energy and Matter
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Phy.3.1.	Explain charges and electrostatic systems.
CLARIFYING OBJECTIVE	Phy.3.1.1.	Explain qualitatively the fundamental properties of the interactions of charged objects. <u>JoVE</u> <ul style="list-style-type: none"> • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Introduction to Mass Spectrometry • Nuclear Magnetic Resonance (NMR) Spectroscopy • Testing For Genetically Modified Foods
CLARIFYING OBJECTIVE	Phy.3.1.5.	Explain how differences in electrostatic potentials relate to the potential energy of charged objects. <u>JoVE</u> <ul style="list-style-type: none"> • Cyclic Voltammetry (CV) • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat
CONTENT AREA / STRAND	NC.Phy.	Physics
STRAND / ESSENTIAL STANDARD		Interactions of Energy and Matter
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	Phy.3.2.	Explain the concept of magnetism.
CLARIFYING OBJECTIVE	Phy.3.2.1.	Explain the relationship between magnetic domains and magnetism. <u>JoVE</u> <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 • Tandem Mass Spectrometry
CLARIFYING OBJECTIVE	Phy.3.2.2.	<p>Explain how electric currents produce various magnetic fields.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • fMRI: Functional Magnetic Resonance Imaging
CLARIFYING OBJECTIVE	Phy.3.2.3.	<p>Explain how transformers and power distributions are applications of electromagnetism.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining Spatial Orientation of Rock Layers with the Brunton Compass • Introduction to Mass Spectrometry • MALDI-TOF Mass Spectrometry • Nuclear Magnetic Resonance (NMR) Spectroscopy • Object Substitution Masking • Tandem Mass Spectrometry • fMRI: Functional Magnetic Resonance Imaging
CONTENT AREA / STRAND	NC.EEn.	Earth/Environmental Science
STRAND / ESSENTIAL STANDARD		Earth in the Universe
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	EEn.1.1.	Explain the Earth's role as a body in space.
CLARIFYING OBJECTIVE	EEn.1.1.3.	<p>Explain how the sun produces energy which is transferred to the Earth by radiation.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Turbidity and Total Solids in Surface Water
CLARIFYING OBJECTIVE	EEn.1.1.4.	<p>Explain how incoming solar energy makes life possible on Earth.</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

		<p>Adduction for Uk'37 Paleothermometry</p> <ul style="list-style-type: none"> • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment • Turbidity and Total Solids in Surface Water
CONTENT AREA / STRAND	NC.EEn.	Earth/Environmental Science
STRAND / ESSENTIAL STANDARD		Earth: Systems, Structures and Processes
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	EEn.2.1.	Explain how processes and forces affect the lithosphere.
CLARIFYING OBJECTIVE	EEn.2.1.1.	<p>Explain how the rock cycle, plate tectonics, volcanoes, and earthquakes impact the lithosphere.</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
CLARIFYING OBJECTIVE	EEn.2.1.3.	<p>Explain how natural actions such as weathering, erosion (wind, water and gravity), and soil formation affect Earth's surface.</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 • Using Topographic Maps to Generate Topographic Profiles
CLARIFYING OBJECTIVE	EEn.2.1.4.	<p>Explain the probability of and preparation for geohazards such as landslides, avalanches, earthquakes and volcanoes in a particular area based on available data.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Igneous Volcanic Rock
CONTENT AREA / STRAND	NC.EEn.	Earth/Environmental Science
STRAND / ESSENTIAL STANDARD		Earth: Systems, Structures and Processes
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	EEn.2.2.	Understand how human influences impact the lithosphere.

CLARIFYING OBJECTIVE	EEn.2.2.1.	<p>Explain the consequences of human activities on the lithosphere (such as mining, deforestation, agriculture, overgrazing, urbanization, and land use) past and present.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material
CLARIFYING OBJECTIVE	EEn.2.2.2.	<p>Compare the various methods humans use to acquire traditional energy sources (such as peat, coal, oil, natural gas, nuclear fission, and wood).</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 • Fractional Distillation • Proton Exchange Membrane Fuel Cells
CONTENT AREA / STRAND	NC.EEn.	Earth/Environmental Science
STRAND / ESSENTIAL STANDARD		Earth: Systems, Structures and Processes
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	EEn.2.3.	<p>Explain the structure and processes within the hydrosphere.</p>
CLARIFYING OBJECTIVE	Een.2.3.2.	<p>Explain how ground water and surface water interact.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Making a Geologic Cross Section
CONTENT AREA / STRAND	NC.EEn.	Earth/Environmental Science
STRAND / ESSENTIAL STANDARD		Earth: Systems, Structures and Processes
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	EEn.2.4.	<p>Evaluate how humans use water.</p>
CLARIFYING OBJECTIVE	EEn.2.4.1.	<p>Evaluate human influences on freshwater availability.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determination of Moisture Content in Soil • Dissolved Oxygen in Surface Water • Making a Geologic Cross Section • Nutrients in Aquatic Ecosystems • Turbidity and Total Solids in Surface Water • Water Quality Analysis via Indicator Organisms
CLARIFYING OBJECTIVE	EEn.2.4.2.	<p>Evaluate human influences on water quality in North Carolina's river basins, wetlands and tidal environments.</p>

		<p>JoVE</p> <ul style="list-style-type: none"> • Algae Enumeration via Culturable Methodology • Detection of Bacteriophages in Environmental Samples • Dissolved Oxygen in Surface Water • Gram Staining of Bacteria from Environmental Sources • Introduction to Mass Spectrometry • Isolation of Fecal Bacteria from Water Samples by Filtration • Nutrients in Aquatic Ecosystems • Quantifying Environmental Microorganisms and Viruses Using qPCR • RNA Analysis of Environmental Samples Using RT-PCR • Turbidity and Total Solids in Surface Water • Water Quality Analysis via Indicator Organisms • Zebrafish Maintenance and Husbandry
CONTENT AREA / STRAND	NC.EEn.	Earth/Environmental Science
STRAND / ESSENTIAL STANDARD		Earth: Systems, Structures and Processes
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	EEn.2.5.	Understand the structure of and processes within our atmosphere.
CLARIFYING OBJECTIVE	EEn.2.5.1.	<p>Summarize the structure and composition of our atmosphere.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Measuring Tropospheric Ozone
CLARIFYING OBJECTIVE	EEn.2.5.5.	<p>Explain how human activities affect air quality.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Measuring Tropospheric Ozone • Proton Exchange Membrane Fuel Cells • Using GIS to Investigate Urban Forestry
CONTENT AREA / STRAND	NC.EEn.	Earth/Environmental Science
STRAND / ESSENTIAL STANDARD		Earth: Systems, Structures and Processes
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	EEn.2.6.	Analyze patterns of global climate change over time.
CLARIFYING OBJECTIVE	EEn.2.6.3.	Analyze the impacts that human activities have on global climate change (such as burning hydrocarbons,

		greenhouse effect, and deforestation). <u>JoVE</u> <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
CLARIFYING OBJECTIVE	EEn.2.6.4.	Attribute changes in Earth systems to global climate change (temperature change, changes in pH of ocean, sea level changes, etc.). <u>JoVE</u> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material
CONTENT AREA / STRAND	NC.EEn.	Earth/Environmental Science
STRAND / ESSENTIAL STANDARD		Earth: Systems, Structures and Processes
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	EEn.2.7.	Explain how the lithosphere, hydrosphere, and atmosphere individually and collectively affect the biosphere.
CLARIFYING OBJECTIVE	EEn.2.7.1.	Explain how abiotic and biotic factors interact to create the various biomes in North Carolina <u>JoVE</u> <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 • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy
CLARIFYING OBJECTIVE	EEn.2.7.2.	Explain why biodiversity is important to the biosphere. <u>JoVE</u> <ul style="list-style-type: none"> • Analysis of Earthworm Populations in Soil

		<ul style="list-style-type: none"> • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method
CLARIFYING OBJECTIVE	EEn.2.7.3.	<p>Explain how human activities impact the biosphere.</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 • Lead Analysis of Soil Using Atomic Absorption Spectroscopy • Measuring Tropospheric Ozone • Nutrients in Aquatic Ecosystems • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method • Turbidity and Total Solids in Surface Water • Water Quality Analysis via Indicator Organisms
CONTENT AREA / STRAND	NC.EEn.	Earth/Environmental Science
STRAND / ESSENTIAL STANDARD		Earth: Systems, Structures and Processes
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	EEn.2.8.	Evaluate human behaviors in terms of how likely they are to ensure the ability to live sustainably on Earth.
CLARIFYING OBJECTIVE	EEn.2.8.1.	<p>Evaluate alternative energy technologies for use in North Carolina.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Bacterial Growth Curve Analysis and its Environmental Applications • Biofuels: Producing Ethanol from Cellulosic Material • Proton Exchange Membrane Fuel Cells • Raman Spectroscopy for Chemical Analysis
CLARIFYING OBJECTIVE	EEn.2.8.2.	<p>Critique conventional and sustainable agriculture and aquaculture practices in terms of their environmental impacts.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Genetic Engineering • Biofuels: Producing Ethanol from Cellulosic Material • Carbon and Nitrogen Analysis of Environmental Samples • Determination of Moisture Content in Soil • Soil Nutrient Analysis: Nitrogen, Phosphorus, and Potassium • Testing For Genetically Modified Foods
CLARIFYING OBJECTIVE	EEn.2.8.3.	Explain the effects of uncontrolled population growth on the Earth's resources.

		<u>JoVE</u> • Nutrients in Aquatic Ecosystems
CLARIFYING OBJECTIVE	EEn.2.8.4.	Evaluate the concept of "reduce, reuse, recycle" in terms of impact on natural resources. <u>JoVE</u> • Self-report vs. Behavioral Measures of Recycling
CONTENT AREA / STRAND	NC.OBio.	Occupational Course of Study - Biology
STRAND / ESSENTIAL STANDARD		Structure and Functions of Living Organisms
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	O Bio.1.1.	Understand the relationship between the structures and functions of cells and their organelles.
CLARIFYING OBJECTIVE	Bio.1.1.1.	Summarize the structure and function of organelles in eukaryotic cells (including: the nucleus, plasma membrane, cell wall, mitochondria, vacuoles, chloroplasts, and ribosomes) and ways that these organelles interact with each other to perform the function of the cell. <u>JoVE</u> • An Introduction to Aging and Regeneration • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Transfection • Annexin V and Propidium Iodide Labeling • Cell Cycle Analysis • Density Gradient Ultracentrifugation • Detecting Reactive Oxygen Species • Enzyme Assays and Kinetics • Isolating Nucleic Acids from Yeast • Live Cell Imaging of Mitosis • Metabolic Labeling • The ATP Bioluminescence Assay • The TUNEL Assay
CLARIFYING OBJECTIVE	Bio.1.1.2.	Compare prokaryotic and eukaryotic cells in terms of their general structures (plasma membrane and genetic material) and degree of complexity. <u>JoVE</u> • An Introduction to <i>Saccharomyces cerevisiae</i> • An Introduction to Transfection • Bacterial Growth Curve Analysis and its Environmental Applications • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method

		<ul style="list-style-type: none"> • Culturing and Enumerating Bacteria from Soil Samples • Electrophoretic Mobility Shift Assay (EMSA) • Plasmid Purification • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning
CLARIFYING OBJECTIVE	Bio.1.1.3.	<p>Explain how instructions in DNA lead to cell differentiation and result in cells specialized to perform specific functions in multicellular organisms.</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 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 • An Overview of Epigenetics • An Overview of Gene Expression • C. elegans Development and Reproduction • DNA Methylation Analysis • Development and Reproduction of the Laboratory Mouse • Development of the Chick • 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 • Gene Silencing with Morpholinos • Genetic Engineering of Model Organisms • Induced Pluripotency • Murine In Utero Electroporation • RNA-Seq • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies • Whole-Mount In Situ Hybridization • Zebrafish Breeding and Embryo Handling • Zebrafish Reproduction and Development
CONTENT AREA / STRAND	NC.OBio.	Occupational Course of Study - Biology
STRAND / ESSENTIAL STANDARD		Structure and Functions of Living Organisms
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	OBio.1.2.	Analyze the cell as a living system.

<p>CLARIFYING OBJECTIVE</p>	<p>Bio.1.2.1.</p>	<p>Explain how homeostasis is maintained in the cell and within an organism in various environments (including: temperature and pH).</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 <p>Assessment</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 Cellular and Molecular Neuroscience • An Introduction to Cognition • An Introduction to Developmental Neurobiology • An Introduction to Endocytosis and Exocytosis • An Introduction to Learning and Memory • An Introduction to Molecular Developmental Biology • An Introduction to Reward and Addiction • An Introduction to Stem Cell Biology • Anesthesia Induction and Maintenance • Ankle Exam • Annexin V and Propidium Iodide Labeling • Arterial Line Placement • Assessing Dexterity with Reaching Tasks • Auscultation • Balance and Coordination Testing • Basic Care Procedures • Basic Life Support Part II: Airway/Breathing and Continued Cardiopulmonary Resuscitation • Basic Life Support: Cardiopulmonary Resuscitation and Defibrillation • Basic Mouse Care and Maintenance • Blood Pressure Measurement • Blood Withdrawal I • Blood Withdrawal II • C. elegans Development and Reproduction • Calcium Imaging in Neurons • Cardiac Exam I: Inspection and Palpation • Cardiac Exam II: Auscultation • Cardiac Exam III: Abnormal Heart Sounds • Cell-surface Biotinylation Assay • Central Venous Catheter Insertion: Femoral Vein with Ultrasound Guidance • Central Venous Catheter Insertion: Internal Jugular with Ultrasound Guidance • Central Venous Catheter Insertion: Subclavian Vein • Compound Administration I • Compound Administration II • Compound Administration III • Compound Administration IV
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- **Comprehensive Breast Exam**
- **Considerations for Rodent Surgery**
- **Cranial Nerves Exam I (I-VI)**
- **Cranial Nerves Exam II (VII-XII)**
- **Detecting Reactive Oxygen Species**
- **Diagnostic Necropsy and Tissue Harvest**
- **Ear Exam**
- **Elbow Exam**
- **Electro-encephalography (EEG)**
- **Embryonic Stem Cell Culture and Differentiation**
- **Emergency Tube Thoracostomy (Chest Tube Placement)**
- **Emergent Lateral Canthotomy and Inferior Catholysis**
- **Explant Culture of Neural Tissue**
- **Eye Exam**
- **FM Dyes in Vesicle Recycling**
- **Fear Conditioning**
- **Foot Exam**
- **General Approach to the Physical Exam**
- **Hand and Wrist Exam**
- **Hip Exam**
- **Histological Staining of Neural Tissue**
- **In ovo Electroporation of Chicken Embryos**
- **Induced Pluripotency**
- **Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation**
- **Intraosseous Needle Placement**
- **Isolating Nucleic Acids from Yeast**
- **Knee Exam**
- **Lower Back Exam**
- **Lymph Node Exam**
- **Male Rectal Exam**
- **Measuring Vital Signs**
- **Motor Exam I**
- **Motor Exam II**
- **Murine In Utero Electroporation**
- **Neck Exam**
- **Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment**
- **Nose, Sinuses, Oral Cavity and Pharynx Exam**
- **Observation and Inspection**
- **Ophthalmoscopic Examination**
- **Palpation**
- **Patch Clamp Electrophysiology**
- **Pelvic Exam I: Assessment of the External Genitalia**
- **Pelvic Exam II: Speculum Exam**
- **Pelvic Exam III: Bimanual and Rectovaginal Exam**
- **Percussion**
- **Percutaneous Cricothyrotomy (Seldinger Technique)**
- **Pericardiocentesis**
- **Peripheral Vascular Exam**
- **Peripheral Vascular Exam Using a Continuous Wave**

		<p>Doppler</p> <ul style="list-style-type: none"> • Peripheral Venous Cannulation • Physiological Correlates of Emotion Recognition • Proper Adjustment of Patient Attire during the Physical Exam • Reconstitution of Membrane Proteins • Respiratory Exam I: Inspection and Palpation • Respiratory Exam II: Percussion and Auscultation • Self-administration Studies • Sensory Exam • Shoulder Exam I • Shoulder Exam II • Spatial Memory Testing Using Mazes • Sterile Tissue Harvest • Surgical Cricothyrotomy • The ATP Bioluminescence Assay • The TUNEL Assay • Thyroid Exam • Tissue Regeneration with Somatic Stem Cells • Tree Identification: How To Use a Dichotomous Key • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Using a pH Meter • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Maintenance and Husbandry
<p>CLARIFYING OBJECTIVE</p>	<p>Bio.1.2.2.</p>	<p>Analyze how cells grow and reproduce in terms of interphase, mitosis and cytokinesis.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Division • An Introduction to Saccharomyces cerevisiae • Cell Cycle Analysis • Live Cell Imaging of Mitosis • Yeast Reproduction • Yeast Transformation and Cloning
<p>CLARIFYING OBJECTIVE</p>	<p>Bio.1.2.3.</p>	<p>Explain how specific cell adaptations help cells survive in particular environments (focus on unicellular organisms).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Division • An Introduction to Cell Motility and Migration • An Introduction to Saccharomyces cerevisiae • Bacterial Growth Curve Analysis and its Environmental Applications • Genetic Crosses • Isolating Nucleic Acids from Yeast • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning

CONTENT AREA / STRAND	NC.OBio.	Occupational Course of Study - Biology
STRAND / ESSENTIAL STANDARD		Ecosystems
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	OBio.2.1.	Analyze the interdependence of living organisms within their environments.
CLARIFYING OBJECTIVE	Bio.2.1.1.	<p>Compare the flow of energy and cycling of matter (water, carbon, nitrogen and oxygen) through ecosystems relating the significance of each to maintaining the health and sustainability of an ecosystem.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Algae Enumeration via Culturable Methodology • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Analysis of Earthworm Populations in Soil • Bacterial Growth Curve Analysis and its Environmental Applications • Carbon and Nitrogen Analysis of Environmental Samples • Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry • Culturing and Enumerating Bacteria from Soil Samples • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Dissolved Oxygen in Surface Water • Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction • Filamentous Fungi • Fundamentals of Breeding and Weaning • Metabolic Labeling • Nutrients in Aquatic Ecosystems • Purification of a Total Lipid Extract with Column Chromatography • Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry • Soil Nutrient Analysis: Nitrogen, Phosphorus, and Potassium • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment • Using GIS to Investigate Urban Forestry
CLARIFYING OBJECTIVE	Bio.2.1.2.	Analyze the survival and reproductive success of organisms in terms of behavioral, structural, and reproductive adaptations.

		<p>JoVE</p> <ul style="list-style-type: none"> • An Introduction to <i>Caenorhabditis elegans</i> • An Introduction to Cognition • An Introduction to <i>Drosophila melanogaster</i> • An Introduction to Learning and Memory • 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 • Development of the Chick • <i>Drosophila</i> Development and Reproduction • <i>Drosophila</i> Maintenance • Fear Conditioning • Positive Reinforcement Studies • Spatial Memory Testing Using Mazes • Yeast Maintenance
CLARIFYING OBJECTIVE	Bio.2.1.3.	<p>Explain various ways organisms interact with each other (including predation, competition, parasitism, mutualism) and with their environments resulting in stability within ecosystems.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Analysis of Earthworm Populations in Soil • Bacterial Growth Curve Analysis and its Environmental Applications • <i>C. elegans</i> 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
CONTENT AREA / STRAND	NC.OBio.	Occupational Course of Study - Biology
STRAND / ESSENTIAL STANDARD		Ecosystems
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	OBio.2.2.	Understand the impact of human activities on the environment (one generation affects the next).
CLARIFYING OBJECTIVE	Bio.2.2.1.	Infer how human activities (including population growth, pollution, global warming, burning of fossil fuels, habitat destruction and introduction of nonnative species) may

		<p>impact the environment.</p> <p><u>JoVE</u></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 • Introduction to Mass Spectrometry • Isolation of Fecal Bacteria from Water Samples by Filtration • 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
CLARIFYING OBJECTIVE	Bio.2.2.2.	<p>Explain how the use, protection and conservation of natural resources by humans impact the environment from one generation to the next.</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 • 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
CONTENT AREA / STRAND	NC.OBio.	Occupational Course of Study - Biology
STRAND / ESSENTIAL STANDARD		Evolution & Genetics
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	OBio.3.1.	Explain how traits are determined by the structure and function of DNA.
CLARIFYING OBJECTIVE	Bio.3.1.1.	<p>Explain the double-stranded, complementary nature of DNA as related to its function in the cell.</p> <p><u>JoVE</u></p>

- An Introduction to *Caenorhabditis elegans*
- An Introduction to Cell Death
- An Introduction to Cell Division
- An Introduction to Cellular and Molecular Neuroscience
- An Introduction to Developmental Genetics
- An Introduction to Molecular Developmental Biology
- An Introduction to *Saccharomyces cerevisiae*
- An Introduction to Transfection
- An Overview of Epigenetics
- An Overview of Gene Expression
- An Overview of Genetic Analysis
- An Overview of Genetic Engineering
- An Overview of Genetics and Disease
- Annexin V and Propidium Iodide Labeling
- Bacterial Transformation: Electroporation
- Bacterial Transformation: The Heat Shock Method
- Cell Cycle Analysis
- Chromatin Immunoprecipitation
- Community DNA Extraction from Bacterial Colonies
- Cytogenetics
- DNA Gel Electrophoresis
- DNA Ligation Reactions
- DNA Methylation Analysis
- Density Gradient Ultracentrifugation
- Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis
- Development and Reproduction of the Laboratory Mouse
- *Drosophila melanogaster* Embryo and Larva Harvesting and Preparation
- Electrophoretic Mobility Shift Assay (EMSA)
- Embryonic Stem Cell Culture and Differentiation
- Enzyme Assays and Kinetics
- Explant Culture for Developmental Studies
- Expression Profiling with Microarrays
- Förster Resonance Energy Transfer (FRET)
- Gel Purification
- Gene Silencing with Morpholinos
- Genetic Crosses
- Genetic Engineering of Model Organisms
- Genetic Screens
- Genome Editing
- In ovo Electroporation of Chicken Embryos
- Induced Pluripotency
- Isolating Nucleic Acids from Yeast
- Live Cell Imaging of Mitosis
- Molecular Cloning
- Mouse Genotyping
- PCR: The Polymerase Chain Reaction
- Photometric Protein Determination
- Plasmid Purification
- Protein Crystallization

		<ul style="list-style-type: none"> • Quantifying Environmental Microorganisms and Viruses Using qPCR • RNA Analysis of Environmental Samples Using RT-PCR • RNA-Seq • Recombineering and Gene Targeting • Restriction Enzyme Digests • SNP Genotyping • Testing For Genetically Modified Foods • The TUNEL Assay • Two-Dimensional Gel Electrophoresis • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling
<p>CLARIFYING OBJECTIVE</p>	<p>Bio.3.1.2.</p>	<p>Explain how DNA and RNA code for proteins and determine traits.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to Caenorhabditis elegans • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Molecular Developmental Biology • An Introduction to Organogenesis • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Introduction to Transfection • An Introduction to the Zebrafish: Danio rerio • An Overview of Epigenetics • An Overview of Gene Expression • An Overview of Genetic Analysis • An Overview of Genetic Engineering • An Overview of Genetics and Disease • Annexin V and Propidium Iodide Labeling • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • C. elegans Maintenance • Cell Cycle Analysis • Chick ex ovo Culture • Chromatin Immunoprecipitation • Community DNA Extraction from Bacterial Colonies • Cytogenetics • DNA Gel Electrophoresis • DNA Ligation Reactions • DNA Methylation Analysis • Density Gradient Ultracentrifugation • Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis

- 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
- Enzyme Assays and Kinetics
- Explant Culture for Developmental Studies
- Explant Culture of Neural Tissue
- Expression Profiling with Microarrays
- Fate Mapping
- Förster Resonance Energy Transfer (FRET)
- Gel Purification
- Gene Silencing with Morpholinos
- Genetic Crosses
- Genetic Engineering of Model Organisms
- Genetic Screens
- Genome Editing
- Histological Staining of Neural Tissue
- In ovo Electroporation of Chicken Embryos
- Induced Pluripotency
- Introduction to the Microplate Reader
- Invertebrate Lifespan Quantification
- Isolating Nucleic Acids from Yeast
- Live Cell Imaging of Mitosis
- Metabolic Labeling
- Method of Standard Addition
- Molecular Cloning
- Mouse Genotyping
- Murine In Utero Electroporation
- PCR: The Polymerase Chain Reaction
- Photometric Protein Determination
- Plasmid Purification
- Protein Crystallization
- Quantifying Environmental Microorganisms and Viruses Using qPCR
- RNA Analysis of Environmental Samples Using RT-PCR
- RNA-Seq
- RNAi in *C. elegans*
- Recombineering and Gene Targeting
- Restriction Enzyme Digests
- Rodent Stereotaxic Surgery
- SNP Genotyping
- Spectrophotometric Determination of an Equilibrium Constant
- Testing For Genetically Modified Foods
- The TUNEL Assay
- Tissue Regeneration with Somatic Stem Cells

		<ul style="list-style-type: none"> • Transplantation Studies • Two-Dimensional Gel Electrophoresis • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
CLARIFYING OBJECTIVE	Bio.3.1.3.	<p>Explain how mutations in DNA that result from interactions with the environment (i.e. radiation and chemicals) or new combinations in existing genes lead to changes in function and phenotype.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Aging and Regeneration • An Introduction to Caenorhabditis elegans • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Developmental Genetics • An Introduction to Drosophila melanogaster • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to Saccharomyces cerevisiae • An Introduction to Transfection • An Introduction to the Zebrafish: Danio rerio • An Overview of Epigenetics • An Overview of Gene Expression • An Overview of Genetic Analysis • An Overview of Genetics and Disease • Genetic Engineering of Model Organisms • Genetic Screens • Isolating Nucleic Acids from Yeast • Passaging Cells • The TUNEL Assay
CONTENT AREA / STRAND	NC.OBio.	Occupational Course of Study - Biology
STRAND / ESSENTIAL STANDARD		Evolution & Genetics
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	OBio.3.2.	Understand how the environment, and/or the interaction of alleles, influences the expression of genetic traits.
CLARIFYING OBJECTIVE	Bio.3.2.1.	<p>Explain the role of meiosis in sexual reproduction and genetic variation.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Cell Division • Genetic Crosses • Recombineering and Gene Targeting • Yeast Reproduction

<p>CLARIFYING OBJECTIVE</p>	<p>Bio.3.2.2.</p>	<p>Predict offspring ratios based on a variety of inheritance patterns (including: dominance, co-dominance, incomplete dominance, multiple alleles, and sex-linked traits).</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 Overview of Epigenetics • An Overview of Genetic Analysis • An Overview of Genetics and Disease • C. elegans Development and Reproduction • DNA Methylation Analysis • Drosophila Development and Reproduction • Fundamentals of Breeding and Weaning • Genetic Crosses • Genetic Screens • Mouse Genotyping
<p>CLARIFYING OBJECTIVE</p>	<p>Bio.3.2.3.</p>	<p>Explain how the environment can influence the expression of genetic traits.</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 • Drosophila Development and Reproduction • Fundamentals of Breeding and Weaning • Gene Silencing with Morpholinos • Genetic Crosses • Genetic Engineering of Model Organisms • Genetic Screens • Mouse Genotyping • RNAi in C. elegans • SNP Genotyping • Whole-Mount In Situ Hybridization • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Reproduction and Development
<p>CONTENT AREA / STRAND</p>	<p>NC.OBio.</p>	<p>Occupational Course of Study - Biology</p>
<p>STRAND / ESSENTIAL STANDARD</p>		<p>Evolution & Genetics</p>

ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	OBio.3.3.	Understand the application of DNA technology.
CLARIFYING OBJECTIVE	Bio.3.3.1.	<p>Interpret how DNA is used for comparison and identification of organisms.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Genetic Analysis
CLARIFYING OBJECTIVE	Bio.3.3.2.	<p>Summarize how transgenic organisms are engineered to benefit society.</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 Organogenesis • 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 Genetic Engineering • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • C. elegans Development and Reproduction • Chick ex ovo Culture • DNA Ligation Reactions • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Embryonic Stem Cell Culture and Differentiation • Explant Culture for Developmental Studies • Fate Mapping • Fundamentals of Breeding and Weaning • Gene Silencing with Morpholinos • Genetic Engineering of Model Organisms • In ovo Electroporation of Chicken Embryos • Induced Pluripotency • Invertebrate Lifespan Quantification • Molecular Cloning • Mouse Genotyping • Plasmid Purification • RNAi in C. elegans • Restriction Enzyme Digests • Solid-Liquid Extraction • Testing For Genetically Modified Foods • The TUNEL Assay • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies

		<ul style="list-style-type: none"> • Whole-Mount In Situ Hybridization • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
<p>CLARIFYING OBJECTIVE</p>	<p>Bio.3.3.3.</p>	<p>Evaluate some of the ethical issues surrounding the use of DNA technology (including: cloning, genetically modified organisms, stem cell research, and Human Genome Project).</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 Developmental Neurobiology • 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 • An Overview of Genetics and Disease • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • C. elegans Development and Reproduction • Capillary Electrophoresis (CE) • Chick ex ovo Culture • DNA Ligation Reactions • DNA Methylation Analysis • 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 • Expression Profiling with Microarrays • 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

		<ul style="list-style-type: none"> • Molecular Cloning • Mouse Genotyping • Murine In Utero Electroporation • Neuronal Transfection Methods • PCR: The Polymerase Chain Reaction • Passaging Cells • Plasmid Purification • Primary Neuronal Cultures • RNA-Seq • RNAi in <i>C. elegans</i> • Recombineering and Gene Targeting • Restriction Enzyme Digests • Rodent Stereotaxic Surgery • SNP Genotyping • 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
CONTENT AREA / STRAND	NC.OBio.	Occupational Course of Study - Biology
STRAND / ESSENTIAL STANDARD		Evolution & Genetics
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	O Bio.3.4.	Explain the theory of evolution by natural selection as a mechanism for how species change over time.
CLARIFYING OBJECTIVE	Bio.3.4.1.	<p>Explain how fossil, biochemical, and anatomical evidence support the theory of evolution.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Genetic Analysis • High-Performance Liquid Chromatography (HPLC)
CLARIFYING OBJECTIVE	Bio.3.4.2.	<p>Explain how natural selection influences the changes in species over time.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Genetic Analysis
CLARIFYING OBJECTIVE	Bio.3.4.3.	<p>Explain how various disease agents (bacteria, viruses, chemicals) can influence natural selection.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Overview of Genetic Analysis

CONTENT AREA / STRAND	NC.OBio.	Occupational Course of Study - Biology
STRAND / ESSENTIAL STANDARD		Evolution & Genetics
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	OBio.3.5.	Understand how classification systems are developed based upon speciation.
CLARIFYING OBJECTIVE	Bio.3.5.1.	<p>Explain the historical development and changing nature of classification systems.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • 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 • Basic Chick Care and Maintenance • Basic Mouse Care and Maintenance • C. elegans Chemotaxis Assay • C. elegans Development and Reproduction • C. elegans 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 • Drosophila Development and Reproduction • Drosophila Larval IHC • Drosophila Maintenance • Drosophila melanogaster 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 C. elegans • 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 • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development

CLARIFYING OBJECTIVE	Bio.3.5.2.	Analyze the classification of organisms according to their evolutionary relationships (including: dichotomous keys and phylogenetic trees). <u>JoVE</u> <ul style="list-style-type: none"> • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Zebrafish: Danio rerio • Tree Identification: How To Use a Dichotomous Key
CONTENT AREA / STRAND	NC.OBio.	Occupational Course of Study - Biology
STRAND / ESSENTIAL STANDARD		Molecular Biology
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	OBio.4.1.	Understand how biological molecules are essential to the survival of living organisms
CLARIFYING OBJECTIVE	Bio.4.1.1.	Compare the structures and functions of the major biological molecules (carbohydrates, proteins, lipids, and nucleic acids) as related to the survival of living organisms. <u>JoVE</u> <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 Epigenetics • An Overview of Gene Expression • An Overview of Genetic Analysis • An Overview of Genetic Engineering • An Overview of Genetics and Disease • Annexin V and Propidium Iodide Labeling • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • C. elegans Maintenance • 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 • 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
- 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
- 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
- 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
- Restriction Enzyme Digests
- SNP Genotyping
- Separating Protein with SDS-PAGE

		<ul style="list-style-type: none"> • Spectrophotometric Determination of an Equilibrium Constant • 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 • Yeast Maintenance • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
<p>CLARIFYING OBJECTIVE</p>	<p>Bio.4.1.2.</p>	<p>Summarize the relationship among DNA, proteins and amino acids in carrying out the work of cells and how this is similar in all organisms.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Caenorhabditis elegans • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Developmental Genetics • An Introduction to Molecular Developmental Biology • An Introduction to Saccharomyces cerevisiae • An Introduction to Transfection • An Overview of Epigenetics • An Overview of Gene Expression • An Overview of Genetic Analysis • An Overview of Genetic Engineering • An Overview of Genetics and Disease • Annexin V and Propidium Iodide Labeling • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • Cell Cycle Analysis • Chromatin Immunoprecipitation • Community DNA Extraction from Bacterial Colonies • Cytogenetics • DNA Gel Electrophoresis • DNA Ligation Reactions • DNA Methylation Analysis • Density Gradient Ultracentrifugation • Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis • Detecting Reactive Oxygen Species • Development and Reproduction of the Laboratory Mouse

		<ul style="list-style-type: none"> • Drosophila melanogaster Embryo and Larva Harvesting and Preparation • Electrophoretic Mobility Shift Assay (EMSA) • Embryonic Stem Cell Culture and Differentiation • Enzyme Assays and Kinetics • Explant Culture for Developmental Studies • Expression Profiling with Microarrays • Förster Resonance Energy Transfer (FRET) • Gel Purification • Gene Silencing with Morpholinos • Genetic Crosses • Genetic Engineering of Model Organisms • Genetic Screens • Genome Editing • In ovo Electroporation of Chicken Embryos • Induced Pluripotency • Ion-Exchange Chromatography • Isolating Nucleic Acids from Yeast • Live Cell Imaging of Mitosis • MALDI-TOF Mass Spectrometry • Molecular Cloning • Mouse Genotyping • PCR: The Polymerase Chain Reaction • Photometric Protein Determination • Plasmid Purification • Protein Crystallization • Quantifying Environmental Microorganisms and Viruses Using qPCR • RNA Analysis of Environmental Samples Using RT-PCR • RNA-Seq • Recombineering and Gene Targeting • Restriction Enzyme Digests • SNP Genotyping • Tandem Mass Spectrometry • Testing For Genetically Modified Foods • The TUNEL Assay • Two-Dimensional Gel Electrophoresis • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling
<p>CLARIFYING OBJECTIVE</p>	<p>Bio.4.1.3.</p>	<p>Explain how enzymes act as catalysts for biological reactions.</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

		<ul style="list-style-type: none"> • Live Cell Imaging of Mitosis • Molecular Cloning • PCR: The Polymerase Chain Reaction • Restriction Enzyme Digests • The ELISA Method • The TUNEL Assay
CONTENT AREA / STRAND	NC.OBio.	Occupational Course of Study - Biology
STRAND / ESSENTIAL STANDARD		Molecular Biology
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	OBio.4.2.	Analyze the relationships between biochemical processes and energy use.
CLARIFYING OBJECTIVE	Bio.4.2.1.	<p>Analyze photosynthesis and cellular respiration in terms of how energy is stored, released, and transferred within and between these systems.</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
CLARIFYING OBJECTIVE	Bio.4.2.2.	<p>Summarize ways that organisms use released energy for maintaining homeostasis (active transport).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • An Introduction to Endocytosis and Exocytosis • An Introduction to Neurophysiology • An Introduction to Transfection • Calcium Imaging in Neurons • Cell-surface Biotinylation Assay • Detecting Reactive Oxygen Species • FM Dyes in Vesicle Recycling • Patch Clamp Electrophysiology • Reconstitution of Membrane Proteins • The TUNEL Assay • Yeast Transformation and Cloning
CONTENT AREA / STRAND	NC.OA.	Occupational Course of Study - Applied Science
STRAND / ESSENTIAL STANDARD		Forces and Motion
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	OA1.1.	Understand force and motion.
CLARIFYING OBJECTIVE	OA1.1.1.	<p>Compare weight and mass.</p> <p><u>JoVE</u></p>

		<ul style="list-style-type: none"> • Determining the Density of a Solid and Liquid • Measuring Mass in the Laboratory
CLARIFYING OBJECTIVE	OA1.1.2.	<p>Classify types of force (gravity, friction, magnetism).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining Spatial Orientation of Rock Layers with the Brunton Compass • Introduction to Mass Spectrometry • Nuclear Magnetic Resonance (NMR) Spectroscopy
CONTENT AREA / STRAND	NC.OA.	Occupational Course of Study - Applied Science
STRAND / ESSENTIAL STANDARD		Energy
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	OA2.1.	Understand energy and its conservation.
CLARIFYING OBJECTIVE	OA2.1.1.	<p>Identify forms of energy (solar, nuclear, wind, chemical).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material • Proton Exchange Membrane Fuel Cells • Raman Spectroscopy for Chemical Analysis
CLARIFYING OBJECTIVE	OA2.1.2.	<p>Explain the effects of various forms of energy on the environment.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material • Proton Exchange Membrane Fuel Cells
CLARIFYING OBJECTIVE	OA2.1.3.	<p>Identify ways that consumers can conserve energy.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material • Proton Exchange Membrane Fuel Cells
CONTENT AREA / STRAND	NC.OA.	Occupational Course of Study - Applied Science
STRAND / ESSENTIAL STANDARD		Electricity and Magnetism
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	OA3.1.	Understand electricity and magnetism
CLARIFYING OBJECTIVE	OA3.1.1.	<p>Interpret a compass.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining Spatial Orientation of Rock Layers with the Brunton Compass

CLARIFYING OBJECTIVE	OA3.1.2.	<p>Explain how magnetic poles behave.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Determining Spatial Orientation of Rock Layers with the Brunton Compass • Introduction to Mass Spectrometry • MALDI-TOF Mass Spectrometry • Tandem Mass Spectrometry
CONTENT AREA / STRAND	NC.OA.	Occupational Course of Study - Applied Science
STRAND / ESSENTIAL STANDARD		Matter
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	OA4.1.	Understand properties of matter (color, shape, volume, density, texture).
CLARIFYING OBJECTIVE	OA4.1.1.	<p>Distinguish between the three states of matter (solid, liquid, gas).</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 • Schlenk Lines Transfer of Solvents • Separation of Mixtures via Precipitation • Solid-Liquid Extraction • The Ideal Gas Law
CONTENT AREA / STRAND	NC.OA.	Occupational Course of Study - Applied Science
STRAND / ESSENTIAL STANDARD		Chemicals
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	OA5.1.	Identify the uses and dangers of common chemicals.
CLARIFYING OBJECTIVE	OA5.1.1.	<p>Identify uses of common chemicals.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Calibration Curves • Capillary Electrophoresis (CE) • Chromatography-Based Biomolecule Purification

		<p>Methods</p> <ul style="list-style-type: none"> • Co-Immunoprecipitation and Pull-Down Assays • Cyclic Voltammetry (CV) • Density Gradient Ultracentrifugation • Dialysis: Diffusion Based Separation • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Electrophoretic Mobility Shift Assay (EMSA) • Enzyme Assays and Kinetics • Förster Resonance Energy Transfer (FRET) • Gas Chromatography (GC) with Flame-Ionization Detection • High-Performance Liquid Chromatography (HPLC) • Internal Standards • Introduction to Mass Spectrometry • Ion-Exchange Chromatography • MALDI-TOF Mass Spectrometry • Metabolic Labeling • Method of Standard Addition • Nuclear Magnetic Resonance (NMR) Spectroscopy • Photometric Protein Determination • Protein Crystallization • Proton Exchange Membrane Fuel Cells • Raman Spectroscopy for Chemical Analysis • Reconstitution of Membrane Proteins • Sample Preparation for Analytical Preparation • Scanning Electron Microscopy (SEM) • Surface Plasmon Resonance (SPR) • Tandem Mass Spectrometry • Two-Dimensional Gel Electrophoresis • Ultraviolet-Visible (UV-Vis) Spectroscopy • X-ray Fluorescence (XRF)
CLARIFYING OBJECTIVE	OA5.1.2.	<p>Identify dangers related to common household chemicals (chlorine bleach, antifreeze, chemicals for lawn and garden, insecticides, rodent poison, de-icing salt).</p> <p>JoVE</p> <ul style="list-style-type: none"> • C. elegans Chemotaxis Assay • Lead Analysis of Soil Using Atomic Absorption Spectroscopy
CONTENT AREA / STRAND	NC.OA.	Occupational Course of Study - Applied Science
STRAND / ESSENTIAL STANDARD		The Environment
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	OA6.1.	Understand how humans can have positive and negative effects on the environment.
CLARIFYING OBJECTIVE	OA6.1.1.	Explain how humans can have a positive impact on natural resources.

		<p>JoVE</p> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Dissolved Oxygen in Surface Water • Isolation of Fecal Bacteria from Water Samples by Filtration • Lead Analysis of Soil Using Atomic Absorption Spectroscopy • Making a Geologic Cross Section • Measuring Tropospheric Ozone • Nutrients in Aquatic Ecosystems • Proton Exchange Membrane Fuel Cells • 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
CLARIFYING OBJECTIVE	OA6.1.2.	<p>Explain the effects of pollution on the earth, air and waterways and what can be done at the individual, family and community level to reduce pollution.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Biofuels: Producing Ethanol from Cellulosic Material • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Dissolved Oxygen in Surface Water • Introduction to Mass Spectrometry • Isolation of Fecal Bacteria from Water Samples by Filtration • Lead Analysis of Soil Using Atomic Absorption Spectroscopy • Making a Geologic Cross Section • Measuring Tropospheric Ozone • Nutrients in Aquatic Ecosystems • Self-report vs. Behavioral Measures of Recycling • Turbidity and Total Solids in Surface Water • Water Quality Analysis via Indicator Organisms
CONTENT AREA / STRAND	NC.OA.	Occupational Course of Study - Applied Science
STRAND / ESSENTIAL STANDARD		Body Systems
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	OA7.1.	Understand the human body's basic needs and control systems.
CLARIFYING OBJECTIVE	OA7.1.1.	Explain the primary functions of the major systems of the human body and the major organs within these systems.

JoVE

- **Abdominal Exam I: Inspection and Auscultation**
- **Abdominal Exam II: Percussion**
- **Abdominal Exam III: Palpation**
- **Abdominal Exam IV: Acute Abdominal Pain**

Assessment

- **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**

Stress

- **An Introduction to Motor Control**
- **An Introduction to Neuroanatomy**
- **An Introduction to Neurophysiology**
- **An Introduction to Reward and Addiction**
- **An Introduction to the Laboratory Mouse: Mus musculus**

musculus

- **Ankle Exam**
- **Anterograde Amnesia**
- **Anxiety Testing**
- **Approximate Number Sense Test**
- **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**

Defibrillation

- **Binocular Rivalry**
- **Blood Pressure Measurement**
- **Calcium Imaging in Neurons**
- **Cardiac Exam I: Inspection and Palpation**
- **Cardiac Exam II: Auscultation**
- **Cardiac Exam III: Abnormal Heart Sounds**
- **Co-Immunoprecipitation and Pull-Down Assays**
- **Color Afterimages**
- **Comprehensive Breast Exam**
- **Cranial Nerves Exam I (I-VI)**
- **Cranial Nerves Exam II (VII-XII)**
- **Crowding**
- **Decision-making and the Iowa Gambling Task**
- **Decoding Auditory Imagery with Multivoxel Pattern Analysis**

Analysis

- **Dichotic Listening**
- **Elbow Exam**
- **Electro-encephalography (EEG)**
- **Emergency Tube Thoracostomy (Chest Tube Placement)**

Placement)

- **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
- Finding Your Blind Spot and Perceptual Filling-in
- Foot Exam
- Habituation: Studying Infants Before They Can Talk
- Hand and Wrist Exam
- Hip Exam
- Histological Staining of Neural Tissue
- Inattentive Blindness
- Incidental Encoding
- Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation
- Intraosseous Needle Placement
- Just-noticeable Differences
- Knee Exam
- Language: The N400 in Semantic Incongruity
- Learning and Memory: The Remember-Know Task
- Lower Back Exam
- Lymph Node Exam
- MALDI-TOF Mass Spectrometry
- Male Rectal Exam
- Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain
- Measuring Reaction Time and Donders' Method of Subtraction
- Measuring Verbal Working Memory Span
- Measuring Vital Signs
- Mental Rotation
- Modeling Social Stress
- Motion-induced Blindness
- Motor Exam I
- Motor Exam II
- Motor Learning in Mirror Drawing
- Motor Maps
- 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
- Object Substitution Masking
- Observation and Inspection
- Ophthalmoscopic Examination
- Patch Clamp Electrophysiology
- Pelvic Exam I: Assessment of the External Genitalia
- Pelvic Exam II: Speculum Exam
- Pelvic Exam III: Bimanual and Rectovaginal Exam
- Percutaneous Cricothyrotomy (Seldinger Technique)
- Pericardiocentesis
- Peripheral Vascular Exam

		<ul style="list-style-type: none"> • Peripheral Vascular Exam Using a Continuous Wave Doppler • Perspectives on Sensation and Perception • Physiological Correlates of Emotion Recognition • Prospect Theory • Respiratory Exam I: Inspection and Palpation • Respiratory Exam II: Percussion and Auscultation • Rodent Stereotaxic Surgery • Self-administration Studies • Sensory Exam • Shoulder Exam I • Shoulder Exam II • Spatial Cueing • Spatial Memory Testing Using Mazes • Surgical Cricothyrotomy • The Ames Room • The Attentional Blink • The Inverted-face Effect • The McGurk Effect • The Precision of Visual Working Memory with Delayed Estimation • The Rubber Hand Illusion • The Split Brain • The Staircase Procedure for Finding a Perceptual Threshold • The TUNEL Assay • Thyroid Exam • Tissue Regeneration with Somatic Stem Cells • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Using TMS to Measure Motor Excitability During Action Observation • 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>CLARIFYING OBJECTIVE</p>	<p>OA7.1.2.</p>	<p>Identify normal or desirable ranges for common health indicators (temperature, blood pressure, weight, cholesterol and blood glucose levels).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Abdominal Exam I: Inspection and Auscultation • Abdominal Exam II: Percussion • Abdominal Exam III: Palpation • Abdominal Exam IV: Acute Abdominal Pain Assessment • An Introduction to Cognition • An Introduction to Learning and Memory

- **An Introduction to Modeling Behavioral Disorders and Stress**
- **An Introduction to Reward and Addiction**
- **Ankle Exam**
- **Anxiety Testing**
- **Arterial Line Placement**
- **Assessing Dexterity with Reaching Tasks**
- **Auscultation**
- **Balance and Coordination Testing**
- **Basic Life Support Part II: Airway/Breathing and Continued Cardiopulmonary Resuscitation**
- **Basic Life Support: Cardiopulmonary Resuscitation and Defibrillation**
- **Blood Pressure Measurement**
- **Cardiac Exam I: Inspection and Palpation**
- **Cardiac Exam II: Auscultation**
- **Cardiac Exam III: Abnormal Heart Sounds**
- **Central Venous Catheter Insertion: Femoral Vein with Ultrasound Guidance**
- **Central Venous Catheter Insertion: Internal Jugular with Ultrasound Guidance**
- **Central Venous Catheter Insertion: Subclavian Vein**
- **Comprehensive Breast Exam**
- **Cranial Nerves Exam I (I-VI)**
- **Cranial Nerves Exam II (VII-XII)**
- **Ear Exam**
- **Elbow Exam**
- **Emergency Tube Thoracostomy (Chest Tube Placement)**
- **Emergent Lateral Canthotomy and Inferior Catholysis**
- **Eye Exam**
- **Fear Conditioning**
- **Foot Exam**
- **General Approach to the Physical Exam**
- **Hand and Wrist Exam**
- **Hip Exam**
- **Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation**
- **Intraosseous Needle Placement**
- **Knee Exam**
- **Lower Back Exam**
- **Lymph Node Exam**
- **Male Rectal Exam**
- **Measuring Vital Signs**
- **Modeling Social Stress**
- **Motor Exam I**
- **Motor Exam II**
- **Neck Exam**
- **Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment**
- **Nose, Sinuses, Oral Cavity and Pharynx Exam**

		<ul style="list-style-type: none"> • Observation and Inspection • Ophthalmoscopic Examination • Palpation • Pelvic Exam I: Assessment of the External Genitalia • Pelvic Exam II: Speculum Exam • Pelvic Exam III: Bimanual and Rectovaginal Exam • Percussion • Percutaneous Cricothyrotomy (Seldinger Technique) • Pericardiocentesis • Peripheral Vascular Exam • Peripheral Vascular Exam Using a Continuous Wave Doppler • Peripheral Venous Cannulation • Physiological Correlates of Emotion Recognition • Pilot Testing • Proper Adjustment of Patient Attire during the Physical Exam • Respiratory Exam I: Inspection and Palpation • Respiratory Exam II: Percussion and Auscultation • Self-administration Studies • Sensory Exam • Shoulder Exam I • Shoulder Exam II • Spatial Memory Testing Using Mazes • Surgical Cricothyrotomy • Thyroid Exam • Using a pH Meter
<p>CLARIFYING OBJECTIVE</p>	<p>OA7.1.3.</p>	<p>Classify health problems and symptoms in terms of whether they require or do not require medical attention.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Abdominal Exam I: Inspection and Auscultation • Abdominal Exam IV: Acute Abdominal Pain Assessment • An Introduction to 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 Endocytosis and Exocytosis • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to Motor Control • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • 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
- 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
- Blood Pressure Measurement
- *C. elegans* Chemotaxis Assay
- Cardiac Exam I: Inspection and Palpation
- Cardiac Exam II: Auscultation
- Cardiac Exam III: Abnormal Heart Sounds
- Chromatin Immunoprecipitation
- Chromatography-Based Biomolecule Purification
- Methods
- Co-Immunoprecipitation and Pull-Down Assays
- Cranial Nerves Exam I (I-VI)
- Cranial Nerves Exam II (VII-XII)
- Crowding
- Culturing and Enumerating Bacteria from Soil Samples
- Cytogenetics
- Decision-making and the Iowa Gambling Task
- Decoding Auditory Imagery with Multivoxel Pattern Analysis
- Detecting Reactive Oxygen Species
- Detection of Bacteriophages in Environmental Samples
- Dichotic Listening
- Ear Exam
- Elbow Exam
- Embryonic Stem Cell Culture and Differentiation
- Executive Function and the Dimensional Change Card Sort Task
- Executive Function in Autism Spectrum Disorder
- Eye Exam
- Eye Tracking in Cognitive Experiments
- Fear Conditioning
- Foot Exam
- Gene Silencing with Morpholinos
- Genetic Crosses
- Genetic Screens
- Gram Staining of Bacteria from Environmental Sources
- Hand and Wrist Exam
- Hip Exam
- Incidental Encoding

		<ul style="list-style-type: none"> • Isolation of Fecal Bacteria from Water Samples by Filtration • Knee Exam • Learning and Memory: The Remember-Know Task • Lower Back Exam • Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain • Measuring Verbal Working Memory Span • Modeling Social Stress • Motor Exam I • Motor Exam II • Motor Maps • Multiple Object Tracking • Neck Exam • Ophthalmoscopic Examination • Pelvic Exam III: Bimanual and Rectovaginal Exam • Pericardiocentesis • Physiological Correlates of Emotion Recognition • Prospect Theory • Protein Crystallization • RNA Analysis of Environmental Samples Using RT-PCR • RNA-Seq • Recombineering and Gene Targeting • Respiratory Exam I: Inspection and Palpation • SNP Genotyping • Self-administration Studies • Sensory Exam • Shoulder Exam I • Spatial Memory Testing Using Mazes • The ATP Bioluminescence Assay • The Inverted-face Effect • The Morris Water Maze • The Precision of Visual Working Memory with Delayed Estimation • 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 a pH Meter • Verbal Priming • Visual Search for Features and Conjunctions • Whole-Mount In Situ Hybridization • fMRI: Functional Magnetic Resonance Imaging
<p>CLARIFYING OBJECTIVE</p>	<p>OA7.1.4.</p>	<p>Identify appropriate sources of medical care for identified problems/symptoms.</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 *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 Cognition
- An Introduction to Endocytosis and Exocytosis
- An Introduction to Modeling Behavioral Disorders and Stress
- An Introduction to Motor Control
- An Introduction to Neuroanatomy
- An Introduction to Reward and Addiction
- 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 Genetic Engineering
- An Overview of Genetics and Disease
- Ankle Exam
- Anterograde Amnesia
- Arterial Line Placement
- Assembly of a Reflux System for Heated Chemical Reactions
- Auscultation
- Basic Life Support Part II: Airway/Breathing and Continued Cardiopulmonary Resuscitation
- Basic Life Support: Cardiopulmonary Resuscitation and Defibrillation
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- Blood Pressure Measurement
- Capillary Electrophoresis (CE)
- Cardiac Exam I: Inspection and Palpation
- Cardiac Exam II: Auscultation
- Cardiac Exam III: Abnormal Heart Sounds
- Cell Cycle Analysis
- Cell-surface Biotinylation Assay
- Central Venous Catheter Insertion: Femoral Vein with Ultrasound Guidance
- Central Venous Catheter Insertion: Internal Jugular with Ultrasound Guidance
- Central Venous Catheter Insertion: Subclavian Vein
- Chick ex ovo Culture
- Chromatin Immunoprecipitation
- Chromatography-Based Biomolecule Purification

Methods

- Co-Immunoprecipitation and Pull-Down Assays
- Community DNA Extraction from Bacterial Colonies
- Comprehensive Breast Exam
- Coordination Chemistry Complexes
- Cranial Nerves Exam I (I-VI)
- Cranial Nerves Exam II (VII-XII)
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- Invasion Assay Using 3D Matrices
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- Live Cell Imaging of Mitosis
- Lower Back Exam
- Lymph Node Exam

- MALDI-TOF Mass Spectrometry
- Male Rectal Exam
- Measuring Verbal Working Memory Span
- Measuring Vital Signs
- Metabolic Labeling
- Molecular Cloning
- Motor Exam I
- Motor Exam II
- Motor Learning in Mirror Drawing
- Multiple Object Tracking
- Neck Exam
- Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment
- Nose, Sinuses, Oral Cavity and Pharynx Exam
- Nuclear Magnetic Resonance (NMR) Spectroscopy
- Observation and Inspection
- Ophthalmoscopic Examination
- Palpation
- Pelvic Exam I: Assessment of the External Genitalia
- Pelvic Exam II: Speculum Exam
- Pelvic Exam III: Bimanual and Rectovaginal Exam
- Percussion
- Percutaneous Cricothyrotomy (Seldinger Technique)
- Pericardiocentesis
- Peripheral Vascular Exam
- Peripheral Vascular Exam Using a Continuous Wave Doppler
- Peripheral Venous Cannulation
- Proper Adjustment of Patient Attire during the Physical Exam
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- Sensory Exam
- Shoulder Exam I
- Shoulder Exam II
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CONTENT AREA / STRAND	NC.CC.9-10.RST.	Reading Standards for Literacy in Science and Technical Subjects
STRAND / ESSENTIAL STANDARD		Craft and Structure
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	9-10.RST.4.	<p>Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Abdominal Exam I: Inspection and Auscultation • Abdominal Exam II: Percussion • Abdominal Exam III: Palpation • Abdominal Exam IV: Acute Abdominal Pain Assessment • Algae Enumeration via Culturable Methodology • An Introduction to Aging and Regeneration • An Introduction to Behavioral Neuroscience • An Introduction to Caenorhabditis elegans • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Cognition • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Drosophila melanogaster • An Introduction to Endocytosis and Exocytosis • An Introduction to Learning and Memory • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to Molecular Developmental Biology • An Introduction to Motor Control • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Introduction to Organogenesis • An Introduction to Reward and Addiction • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Introduction to Transfection

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- Biofuels: Producing Ethanol from Cellulosic Material
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- *C. elegans* Development and Reproduction
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- Calcium Imaging in Neurons

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- 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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- Introducing Experimental Agents into the Mouse
- Introduction to Catalysis
- Introduction to Fluorescence Microscopy
- Introduction to Light Microscopy
- Introduction to Mass Spectrometry
- Introduction to Serological Pipettes and Pipettors
- Introduction to Titration
- Introduction to the Bunsen Burner
- Introduction to the Microplate Reader
- Introduction to the Spectrophotometer
- Invasion Assay Using 3D Matrices
- Invertebrate Lifespan Quantification
- Ion-Exchange Chromatography

- Isolating Nucleic Acids from Yeast
- Isolation of Fecal Bacteria from Water Samples by Filtration
- Just-noticeable Differences
- Knee Exam
- Language: The N400 in Semantic Incongruity
- Le Châtelier's Principle
- Lead Analysis of Soil Using Atomic Absorption Spectroscopy
- Learning and Memory: The Remember-Know Task
- Live Cell Imaging of Mitosis
- Lower Back Exam
- Lymph Node Exam
- MALDI-TOF Mass Spectrometry
- Making Solutions in the Laboratory
- Making a Geologic Cross Section
- Male Rectal Exam
- Manipulating an Independent Variable through Embodiment
- Measuring Children's Trust in Testimony
- Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain
- Measuring Mass in the Laboratory
- Measuring Reaction Time and Donders' Method of Subtraction
- Measuring Tropospheric Ozone
- Measuring Verbal Working Memory Span
- Measuring Vital Signs
- Memory Development: Demonstrating How Repeated Questioning Leads to False Memories
- Mental Rotation
- Metabolic Labeling
- Metacognitive Development: How Children Estimate Their Memory
- Method of Standard Addition
- Modeling Social Stress
- Molecular Cloning
- Motion-induced Blindness
- Motor Exam I
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- 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
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- Percutaneous Cricothyrotomy (Seldinger Technique)
- Performing 1D Thin Layer Chromatography
- Pericardiocentesis
- Peripheral Vascular Exam
- Peripheral Vascular Exam Using a Continuous Wave Doppler
- Peripheral Venous Cannulation
- Perspectives on Sensation and Perception
- Photometric Protein Determination
- Physical Properties Of Minerals I: Crystals and Cleavage
- Physical Properties Of Minerals II: Polymineralic Analysis
- Physiological Correlates of Emotion Recognition
- Piaget's Conservation Task and the Influence of Task Demands
- Pilot Testing
- Placebos in Research
- Plasmid Purification
- Positive Reinforcement Studies
- Preparing Anhydrous Reagents and Equipment
- Primary Neuronal Cultures
- Proper Adjustment of Patient Attire during the Physical Exam
- Prospect Theory
- Protein Crystallization
- Proton Exchange Membrane Fuel Cells
- Purification of a Total Lipid Extract with Column Chromatography
- Purifying Compounds by Recrystallization
- Quantifying Environmental Microorganisms and Viruses Using qPCR
- RNA Analysis of Environmental Samples Using RT-PCR
- RNA-Seq
- RNAi in *C. elegans*
- Raman Spectroscopy for Chemical Analysis
- Realism in Experimentation
- Recombineering and Gene Targeting

- Reconstitution of Membrane Proteins
- Regulating Temperature in the Lab: Applying Heat
- Regulating Temperature in the Lab: Preserving Samples Using Cold
- Reliability in Psychology Experiments
- Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry
- Respiratory Exam I: Inspection and Palpation
- Respiratory Exam II: Percussion and Auscultation
- Restriction Enzyme Digests
- Rodent Handling and Restraint Techniques
- Rodent Identification I
- Rodent Identification II
- Rodent Stereotaxic Surgery
- Rotary Evaporation to Remove Solvent
- SNP Genotyping
- Sample Preparation for Analytical Preparation
- Scanning Electron Microscopy (SEM)
- Schlenk Lines Transfer of Solvents
- Self-administration Studies
- Self-report vs. Behavioral Measures of Recycling
- Sensory Exam
- Separating Protein with SDS-PAGE
- Separation of Mixtures via Precipitation
- Shoulder Exam I
- Shoulder Exam II
- Soil Nutrient Analysis: Nitrogen, Phosphorus, and Potassium
- Solid-Liquid Extraction
- Solutions and Concentrations
- Sonication Extraction of Lipid Biomarkers from Sediment
- Soxhlet Extraction of Lipid Biomarkers from Sediment
- Spatial Cueing
- Spatial Memory Testing Using Mazes
- Spectrophotometric Determination of an Equilibrium Constant
- Sterile Tissue Harvest
- Surface Plasmon Resonance (SPR)
- Surgical Cricothyrotomy
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- Tree Survey: Point-Centered Quarter Sampling Method
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- Ultraviolet-Visible (UV-Vis) Spectroscopy
- Understanding Concentration and Measuring Volumes
- Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
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- Using GIS to Investigate Urban Forestry
- Using TMS to Measure Motor Excitability During Action Observation
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- Visual Attention: fMRI Investigation of Object-based Attentional Control
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- Water Quality Analysis via Indicator Organisms
- Whole-Mount In Situ Hybridization
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- Yeast Maintenance
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- 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>ESSENTIAL STANDARD / CLARIFYING OBJECTIVE</p>	<p>9-10.RST.5.</p>	<p>Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., force, friction, reaction force, energy).</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Abdominal Exam I: Inspection and Auscultation • Abdominal Exam II: Percussion • Abdominal Exam III: Palpation • Abdominal Exam IV: Acute Abdominal Pain Assessment • Algae Enumeration via Culturable Methodology • An Introduction to Aging and Regeneration • An Introduction to Behavioral Neuroscience • An Introduction to Caenorhabditis elegans • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Cognition • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Drosophila melanogaster • An Introduction to Endocytosis and Exocytosis • An Introduction to Learning and Memory • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to Molecular Developmental Biology • An Introduction to Motor Control • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Introduction to Organogenesis • An Introduction to Reward and Addiction • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Introduction to Transfection • An Introduction to Working in the Hood • An Introduction to the Centrifuge • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Laboratory Mouse: Mus musculus • An Introduction to the Micropipettor • An Introduction to the Zebrafish: Danio rerio • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of Epigenetics • An Overview of Gene Expression • An Overview of Genetic Analysis • An Overview of Genetic Engineering • An Overview of Genetics and Disease • An Overview of bGDGT Biomarker Analysis for
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- **Dissolved Oxygen in Surface Water**
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- **Drosophila Larval IHC**
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- **Freezing-Point Depression to Determine an Unknown Compound**
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- **Förster Resonance Energy Transfer (FRET)**
- **Gas Chromatography (GC) with Flame-Ionization Detection**

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- Gene Silencing with Morpholinos
- General Approach to the Physical Exam
- Genetic Crosses
- Genetic Engineering of Model Organisms
- Genetic Screens
- Genome Editing
- Gram Staining of Bacteria from Environmental Sources
- Growing Crystals for X-ray Diffraction Analysis
- Habituation: Studying Infants Before They Can Talk
- Hand and Wrist Exam
- High-Performance Liquid Chromatography (HPLC)
- Hip Exam
- Histological Sample Preparation for Light Microscopy
- Histological Staining of Neural Tissue
- How Children Solve Problems Using Causal Reasoning
- Ideal Gas Law
- Igneous Intrusive Rock
- Igneous Volcanic Rock
- In ovo Electroporation of Chicken Embryos
- Inattentive Blindness
- Incidental Encoding
- Induced Pluripotency
- Internal Standards
- Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation
- Intraosseous Needle Placement
- Introducing Experimental Agents into the Mouse
- Introduction to Catalysis
- Introduction to Fluorescence Microscopy
- Introduction to Light Microscopy
- Introduction to Mass Spectrometry
- Introduction to Serological Pipettes and Pipettors
- Introduction to Titration
- Introduction to the Bunsen Burner
- Introduction to the Microplate Reader
- Introduction to the Spectrophotometer
- Invasion Assay Using 3D Matrices
- Invertebrate Lifespan Quantification
- Ion-Exchange Chromatography
- Isolating Nucleic Acids from Yeast
- Isolation of Fecal Bacteria from Water Samples by Filtration
- Just-noticeable Differences
- Knee Exam
- Language: The N400 in Semantic Incongruity
- Le Châtelier's Principle
- Lead Analysis of Soil Using Atomic Absorption Spectroscopy
- Learning and Memory: The Remember-Know Task
- Live Cell Imaging of Mitosis

- Lower Back Exam
- Lymph Node Exam
- MALDI-TOF Mass Spectrometry
- Making Solutions in the Laboratory
- Making a Geologic Cross Section
- Male Rectal Exam
- Manipulating an Independent Variable through Embodiment
- Measuring Children's Trust in Testimony
- Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain
- Measuring Mass in the Laboratory
- Measuring Reaction Time and Donders' Method of Subtraction
- Measuring Tropospheric Ozone
- Measuring Verbal Working Memory Span
- Measuring Vital Signs
- Memory Development: Demonstrating How Repeated Questioning Leads to False Memories
- Mental Rotation
- Metabolic Labeling
- Metacognitive Development: How Children Estimate Their Memory
- Method of Standard Addition
- Modeling Social Stress
- Molecular Cloning
- Motion-induced Blindness
- Motor Exam I
- Motor Exam II
- Motor Learning in Mirror Drawing
- Motor Maps
- Mouse Genotyping
- Multiple Object Tracking
- Murine In Utero Electroporation
- Mutual Exclusivity: How Children Learn the Meanings of Words
- Neck Exam
- Needle Thoracostomy (needle Decompression) for Temporizing Tension Pneumothorax Treatment
- Neuronal Transfection Methods
- Nose, Sinuses, Oral Cavity and Pharynx Exam
- Nuclear Magnetic Resonance (NMR) Spectroscopy
- Numerical Cognition: More or Less
- Nutrients in Aquatic Ecosystems
- Object Substitution Masking
- Observation and Inspection
- Observational Research
- Ophthalmoscopic Examination
- PCR: The Polymerase Chain Reaction
- Palpation
- Passaging Cells

- Patch Clamp Electrophysiology
- Pelvic Exam I: Assessment of the External Genitalia
- Pelvic Exam II: Speculum Exam
- Pelvic Exam III: Bimanual and Rectovaginal Exam
- Percussion
- Percutaneous Cricothyrotomy (Seldinger Technique)
- Performing 1D Thin Layer Chromatography
- Pericardiocentesis
- Peripheral Vascular Exam
- Peripheral Vascular Exam Using a Continuous Wave Doppler
- Peripheral Venous Cannulation
- Perspectives on Sensation and Perception
- Photometric Protein Determination
- Physical Properties Of Minerals I: Crystals and Cleavage
- Physical Properties Of Minerals II: Polymineralic Analysis
- Physiological Correlates of Emotion Recognition
- Piaget's Conservation Task and the Influence of Task Demands
- Pilot Testing
- Placebos in Research
- Plasmid Purification
- Positive Reinforcement Studies
- Preparing Anhydrous Reagents and Equipment
- Primary Neuronal Cultures
- Proper Adjustment of Patient Attire during the Physical Exam
- Prospect Theory
- Protein Crystallization
- Proton Exchange Membrane Fuel Cells
- Purification of a Total Lipid Extract with Column Chromatography
- Purifying Compounds by Recrystallization
- Quantifying Environmental Microorganisms and Viruses Using qPCR
- RNA Analysis of Environmental Samples Using RT-PCR
- RNA-Seq
- RNAi in *C. elegans*
- Raman Spectroscopy for Chemical Analysis
- Realism in Experimentation
- Recombineering and Gene Targeting
- Reconstitution of Membrane Proteins
- Regulating Temperature in the Lab: Applying Heat
- Regulating Temperature in the Lab: Preserving Samples Using Cold
- Reliability in Psychology Experiments
- Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry
- Respiratory Exam I: Inspection and Palpation
- Respiratory Exam II: Percussion and Auscultation

- Restriction Enzyme Digests
- Rodent Handling and Restraint Techniques
- Rodent Identification I
- Rodent Identification II
- Rodent Stereotaxic Surgery
- Rotary Evaporation to Remove Solvent
- SNP Genotyping
- Sample Preparation for Analytical Preparation
- Scanning Electron Microscopy (SEM)
- Schlenk Lines Transfer of Solvents
- Self-administration Studies
- Self-report vs. Behavioral Measures of Recycling
- Sensory Exam
- Separating Protein with SDS-PAGE
- Separation of Mixtures via Precipitation
- Shoulder Exam I
- Shoulder Exam II
- Soil Nutrient Analysis: Nitrogen, Phosphorus, and Potassium
- Solid-Liquid Extraction
- Solutions and Concentrations
- Sonication Extraction of Lipid Biomarkers from Sediment
- Soxhlet Extraction of Lipid Biomarkers from Sediment
- Spatial Cueing
- Spatial Memory Testing Using Mazes
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		<p>Threshold</p> <ul style="list-style-type: none"> • The TUNEL Assay • The Transwell Migration Assay • The Western Blot • Thyroid Exam • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method • Turbidity and Total Solids in Surface Water • Two-Dimensional Gel Electrophoresis • Ultraviolet-Visible (UV-Vis) Spectroscopy • Understanding Concentration and Measuring Volumes • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Using GIS to Investigate Urban Forestry • Using TMS to Measure Motor Excitability During Action Observation • Using Topographic Maps to Generate Topographic Profiles • Using Your Head: Measuring Infants' Rational Imitation of Actions • Using a pH Meter • Verbal Priming • Visual Attention: fMRI Investigation of Object-based Attentional Control • Visual Search for Features and Conjunctions • Visual Statistical Learning • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy • Water Quality Analysis via Indicator Organisms • Whole-Mount In Situ Hybridization • Within-subjects Repeated-measures Design • X-ray Fluorescence (XRF) • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development • fMRI: Functional Magnetic Resonance Imaging
CONTENT AREA / STRAND	NC.CC.9-10.RST.	Reading Standards for Literacy in Science and Technical Subjects
STRAND / ESSENTIAL STANDARD		Integration of Knowledge and Ideas
ESSENTIAL STANDARD /	9-10.RST.7.	Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or

**CLARIFYING
OBJECTIVE**

mathematically (e.g., in an equation) into words.

JoVE

- **Algae Enumeration via Culturable Methodology**
- **An Introduction to Aging and Regeneration**
- **An Introduction to Behavioral Neuroscience**
- **An Introduction to Caenorhabditis elegans**
- **An Introduction to Cell Division**
- **An Introduction to Cell Metabolism**
- **An Introduction to Cognition**
- **An Introduction to Developmental Neurobiology**
- **An Introduction to Drosophila melanogaster**
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- **An Introduction to Learning and Memory**
- **An Introduction to Modeling Behavioral Disorders and Stress**
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- **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**
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- **Determining the Density of a Solid and Liquid**
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- **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**
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Sort Task

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CONTENT AREA / STRAND	NC.CC.9-10.WHST.	Writing Standards for Literacy in Science and Technical Subjects
STRAND / ESSENTIAL STANDARD		Text Types and Purposes
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	9-10.WHST.1.	Write arguments focused on discipline-specific content.
CLARIFYING OBJECTIVE	9-10.WHST.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
CONTENT AREA / STRAND	NC.CC.9-10.WHST.	Writing Standards for Literacy in Science and Technical Subjects
STRAND / ESSENTIAL STANDARD		Text Types and Purposes
ESSENTIAL STANDARD /	9-10.WHST.2.	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

CLARIFYING OBJECTIVE		
CLARIFYING OBJECTIVE	9-10.WHST.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
CLARIFYING OBJECTIVE	9-10.WHST.2.d.	<p>Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.</p> <p><u>JoVE</u></p> <ul style="list-style-type: none"> • Abdominal Exam I: Inspection and Auscultation • Abdominal Exam II: Percussion • Abdominal Exam III: Palpation • Abdominal Exam IV: Acute Abdominal Pain Assessment • Algae Enumeration via Culturable Methodology • An Introduction to Aging and Regeneration • An Introduction to Behavioral Neuroscience • An Introduction to Caenorhabditis elegans • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Cognition • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Drosophila melanogaster • An Introduction to Endocytosis and Exocytosis • An Introduction to Learning and Memory • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to Molecular Developmental Biology • An Introduction to Motor Control • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Introduction to Organogenesis • An Introduction to Reward and Addiction • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Introduction to Transfection • An Introduction to Working in the Hood • An Introduction to the Centrifuge • An Introduction to the Chick: Gallus gallus domesticus

- **An Introduction to the Laboratory Mouse: Mus musculus**
- **An Introduction to the Micropipettor**
- **An Introduction to the Zebrafish: Danio rerio**
- **An Overview of Alkenone Biomarker Analysis for Paleothermometry**
- **An Overview of Epigenetics**
- **An Overview of Gene Expression**
- **An Overview of Genetic Analysis**
- **An Overview of Genetic Engineering**
- **An Overview of Genetics and Disease**
- **An Overview of bGDGT Biomarker Analysis for Paleoclimatology**
- **Analysis of Earthworm Populations in Soil**
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- **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)
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- 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)
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- Executive Function and the Dimensional Change Card Sort Task
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- Introducing Experimental Agents into the Mouse
- Introduction to Catalysis
- Introduction to Fluorescence Microscopy
- Introduction to Light Microscopy
- Introduction to Mass Spectrometry
- Introduction to Serological Pipettes and Pipettors
- Introduction to Titration
- Introduction to the Bunsen Burner
- Introduction to the Microplate Reader
- Introduction to the Spectrophotometer
- Invasion Assay Using 3D Matrices
- Invertebrate Lifespan Quantification

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

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

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

- The Ideal Gas Law
- The Inverted-face Effect
- The McGurk Effect
- The Morris Water Maze
- The Multi-group Experiment
- The Precision of Visual Working Memory with Delayed Estimation
- The Rouge Test: Searching for a Sense of Self
- The Rubber Hand Illusion
- The Simple Experiment: Two-group Design
- The Split Brain
- The Staircase Procedure for Finding a Perceptual Threshold
- The TUNEL Assay
- The Transwell Migration Assay
- The Western Blot
- Thyroid Exam
- Tissue Regeneration with Somatic Stem Cells
- Transplantation Studies
- Tree Identification: How To Use a Dichotomous Key
- Tree Survey: Point-Centered Quarter Sampling Method
- Turbidity and Total Solids in Surface Water
- Two-Dimensional Gel Electrophoresis
- Ultraviolet-Visible (UV-Vis) Spectroscopy
- Understanding Concentration and Measuring Volumes
- Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
- Using Diffusion Tensor Imaging in Traumatic Brain Injury
- Using GIS to Investigate Urban Forestry
- Using TMS to Measure Motor Excitability During Action Observation
- Using Topographic Maps to Generate Topographic Profiles
- Using Your Head: Measuring Infants' Rational Imitation of Actions
- Using a pH Meter
- Verbal Priming
- Visual Attention: fMRI Investigation of Object-based Attentional Control
- Visual Search for Features and Conjunctions
- Visual Statistical Learning
- Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy
- Water Quality Analysis via Indicator Organisms
- Whole-Mount In Situ Hybridization
- Within-subjects Repeated-measures Design
- X-ray Fluorescence (XRF)
- Yeast Maintenance
- Yeast Reproduction
- Yeast Transformation and Cloning

		<ul style="list-style-type: none"> • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development • fMRI: Functional Magnetic Resonance Imaging
CONTENT AREA / STRAND	NC.CC.9-10.WHST.	Writing Standards for Literacy in Science and Technical Subjects
STRAND / ESSENTIAL STANDARD		Text Types and Purposes
ESSENTIAL STANDARD / CLARIFYING OBJECTIVE	9-10.WHST.3.	(See note; not applicable as a separate requirement)
CLARIFYING OBJECTIVE	9-10.WHST.3.a.	<p>Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In science and technical subjects, students must be able to write precise enough descriptions of the step-by-step procedures they use in their investigations or technical work that others can replicate them and (possibly) reach the same results.</p> <p>JoVE</p> <ul style="list-style-type: none"> • Ethics in Psychology Research • Experimentation using a Confederate • From Theory to Design: The Role of Creativity in Designing Experiments • Manipulating an Independent Variable through Embodiment • Observational Research • Pilot Testing • Placebos in Research • Realism in Experimentation • Reliability in Psychology Experiments • The Factorial Experiment • The Multi-group Experiment • The Simple Experiment: Two-group Design • Within-subjects Repeated-measures Design