Main Criteria: Texas Essential Knowledge and Skills (TEKS)
Secondary Criteria: JoVE
Subject: Science
Grade: 9-12
Correlation Options: Show Correlated
Adopted: 2010

TEKS	TX.112.34.	Biology (One Credit).
STUDENT EXPECTATION	(9-11.1)	Scientific processes. The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:
GRADE LEVEL EXPECTATION	9-11.1 (A)	Demonstrate safe practices during laboratory and field investigations. JoVE • An Introduction to the Centrifuge • An Introduction to the Micropipettor • Aseptic Technique in Environmental Science • Histological Sample Preparation for Light Microscopy • Introducing Experimental Agents into the Mouse • Introduction to Fluorescence Microscopy • Introduction to Light Microscopy • Introduction to Serological Pipettes and Pipettors • Introduction to the Microplate Reader • Introduction to the Spectrophotometer • Regulating Temperature in the Lab: Applying Heat • Regulating Temperature in the Lab: Preserving Samples Using Cold
GRADE LEVEL EXPECTATION	9-11.1 (B)	Demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials. JoVE • An Introduction to the Centrifuge • An Introduction to the Micropipettor • Aseptic Technique in Environmental Science • Histological Sample Preparation for Light Microscopy • Introducing Experimental Agents into the Mouse • Introduction to Fluorescence Microscopy • Introduction to Light Microscopy

		• Introduction to Serological Pipettes and Pipettors • Introduction to the Microplate Reader • Introduction to the Spectrophotometer • Regulating Temperature in the Lab: Applying Heat • Regulating Temperature in the Lab: Preserving Samples Using Cold
TEKS	**TX.112.34.**	**Biology (One Credit).**
STUDENT EXPECTATION	**(9-11.2)**	**Scientific processes. The student uses scientific methods and equipment during laboratory and field investigations. The student is expected to:**
GRADE LEVEL EXPECTATION	**9-11.2 (B)**	**Know that hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories.** **JoVE** • The Multi-group Experiment • The Simple Experiment: Two-group Design
GRADE LEVEL EXPECTATION	**9-11.2 (D)**	**Distinguish between scientific hypotheses and scientific theories.** **JoVE** • The Multi-group Experiment • The Simple Experiment: Two-group Design
GRADE LEVEL EXPECTATION	**9-11.2 (E)**	**Plan and implement descriptive, comparative, and experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology.** **JoVE** • 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
GRADE LEVEL EXPECTATION	**9-11.2 (F)**	**Collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software,**

		data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, dissection equipment, meter sticks, and models, diagrams, or samples of biological specimens or structures. JoVE • An Introduction to the Centrifuge • An Introduction to the Micropipettor • Dialysis: Diffusion Based Separation • Drosophila Larval IHC • Histological Sample Preparation for Light Microscopy • Introduction to Fluorescence Microscopy • Introduction to Light Microscopy • Introduction to Serological Pipettes and Pipettors • Introduction to the Microplate Reader • Introduction to the Spectrophotometer • Regulating Temperature in the Lab: Applying Heat • Regulating Temperature in the Lab: Preserving Samples Using Cold
TEKS	TX.112.34.	Biology (One Credit).
STUDENT EXPECTATION	(9-11.3)	Scientific processes. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:
GRADE LEVEL EXPECTATION	9-11.3 (D)	Evaluate the impact of scientific research on society and the environment. JoVE • Abdominal Exam I: Inspection and Auscultation • Abdominal Exam II: Percussion • Abdominal Exam III: Palpation • Abdominal Exam IV: Acute Abdominal Pain Assessment • Algae Enumeration via Culturable Methodology • An Introduction to Aging and Regeneration • An Introduction to Behavioral Neuroscience • An Introduction to Caenorhabditis elegans • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Cognition • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Drosophila melanogaster

		• An Introduction to Endocytosis and Exocytosis • An Introduction to Learning and Memory • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to Molecular Developmental Biology • An Introduction to Motor Control • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Introduction to Organogenesis • An Introduction to Reward and Addiction • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Introduction to Transfection • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Laboratory Mouse: Mus musculus • An Introduction to the Zebrafish: Danio rerio • An Overview of Epigenetics • An Overview of Gene Expression • An Overview of Genetic Analysis • An Overview of Genetic Engineering • An Overview of Genetics and Disease • Analysis of Earthworm Populations in Soil • Anesthesia Induction and Maintenance • Ankle Exam • Annexin V and Propidium Iodide Labeling • Anterograde Amnesia • Anxiety Testing • Approximate Number Sense Test • Are You Smart or Hardworking? How Praise Influences Children's Motivation • Arterial Line Placement • Aseptic Technique in Environmental Science • 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 • 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 • Color Afterimages • Community DNA Extraction from Bacterial Colonies • 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) • Crowding • Culturing and Enumerating Bacteria from Soil Samples • Cytogenetics • DNA Gel Electrophoresis • DNA Ligation Reactions • DNA Methylation Analysis • Decision-making and the Iowa Gambling Task • Decoding Auditory Imagery with Multivoxel Pattern Analysis • Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis • Detecting Reactive Oxygen Species • Detection of Bacteriophages in Environmental Samples • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Diagnostic Necropsy and Tissue Harvest • 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)** **• Embryonic Stem Cell Culture and Differentiation** **• Emergency Tube Thoracostomy (Chest Tube Placement)** **• Emergent Lateral Canthotomy and Inferior Catholysis** **• Ethics in Psychology Research** **• Event-related Potentials and the Oddball Task** **• Executive Function and the Dimensional Change Card Sort Task** **• Executive Function in Autism Spectrum Disorder** **• Experimentation using a Confederate** **• Explant Culture for Developmental Studies** **• Explant Culture of Neural Tissue** **• Expression Profiling with Microarrays** **• Eye Exam** **• Eye Tracking in Cognitive Experiments** **• FM Dyes in Vesicle Recycling** **• Fate Mapping** **• Fear Conditioning** **• Filamentous Fungi** **• Finding Your Blind Spot and Perceptual Filling-in** **• Foot Exam** **• From Theory to Design: The Role of Creativity in Designing Experiments** **• Fundamentals of Breeding and Weaning** **• 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** **• Habituation: Studying Infants Before They Can Talk** **• Hand and Wrist Exam** **• Hip Exam** **• Histological Staining of Neural Tissue** **• How Children Solve Problems Using Causal Reasoning** **• In ovo Electroporation of Chicken Embryos** **• Inattentional Blindness** **• Incidental Encoding** **• Induced Pluripotency** **• Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation** **• Intraosseous Needle Placement** **• Introducing Experimental Agents into the Mouse** **• Invasion Assay Using 3D Matrices** **• Invertebrate Lifespan Quantification** **• 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 • Learning and Memory: The Remember-Know Task • Live Cell Imaging of Mitosis • Lower Back Exam • Lymph Node Exam • Male Rectal Exam • Manipulating an Independent Variable through Embodiment • Measuring Children's Trust in Testimony • Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain • Measuring Reaction Time and Donders' Method of Subtraction • Measuring Verbal Working Memory Span • Measuring Vital Signs • Memory Development: Demonstrating How Repeated Questioning Leads to False Memories • Mental Rotation • Metacognitive Development: How Children Estimate Their Memory • 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 • 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) • Pericardiocentesis • Peripheral Vascular Exam • Peripheral Vascular Exam Using a Continuous Wave Doppler • Peripheral Venous Cannulation • Perspectives on Cognitive Psychology • Perspectives on Experimental Psychology • Perspectives on Neuropsychology • Perspectives on Sensation and Perception • 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 • Primary Neuronal Cultures • Proper Adjustment of Patient Attire during the Physical Exam • Prospect Theory • Proton Exchange Membrane Fuel Cells • Quantifying Environmental Microorganisms and Viruses Using qPCR • RNA Analysis of Environmental Samples Using RT-PCR • RNA-Seq • RNAi in C. elegans • Realism in Experimentation • Recombineering and Gene Targeting • Reliability in Psychology Experiments • 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 • SNP Genotyping • Self-administration Studies • Self-report vs. Behavioral Measures of Recycling • Sensory Exam • Separating Protein with SDS-PAGE • Shoulder Exam I • Shoulder Exam II • Spatial Cueing • Spatial Memory Testing Using Mazes • Sterile Tissue Harvest • Surgical Cricothyrotomy • 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 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 • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Using GIS to Investigate Urban Forestry • Using TMS to Measure Motor Excitability During Action Observation • Using Your Head: Measuring Infants' Rational Imitation of Actions • 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 • 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

GRADE LEVEL EXPECTATION	**9-11.3 (F)**	**Research and describe the history of biology and contributions of scientists.** **JoVE** **• Abdominal Exam II: Percussion** **• An Introduction to Aging and Regeneration** **• An Introduction to Behavioral Neuroscience** **• An Introduction to Caenorhabditis elegans** **• An Introduction to Cell Death** **• An Introduction to Cell Division** **• An Introduction to Cell Metabolism** **• An Introduction to Cell Motility and Migration** **• An Introduction to Developmental Genetics** **• An Introduction to Developmental Neurobiology** **• An Introduction to Drosophila melanogaster** **• An Introduction to Endocytosis and Exocytosis** **• An Introduction to Molecular Developmental Biology** **• An Introduction to Neuroanatomy** **• An Introduction to Neurophysiology** **• An Introduction to Organogenesis** **• An Introduction to Saccharomyces cerevisiae** **• An Introduction to Stem Cell Biology** **• An Introduction to the Chick: Gallus gallus domesticus** **• An Introduction to the Laboratory Mouse: Mus musculus** **• An Introduction to the Zebrafish: Danio rerio** **• An Overview of Epigenetics** **• An Overview of Gene Expression** **• An Overview of Genetic Analysis** **• An Overview of Genetic Engineering** **• An Overview of Genetics and Disease** **• Anterograde Amnesia** **• Auscultation** **• C. elegans Maintenance** **• Color Afterimages** **• Development of the Chick** **• General Approach to the Physical Exam** **• Genetic Crosses** **• Inattentional Blindness** **• Measuring Reaction Time and Donders' Method of Subtraction** **• Motion-induced Blindness** **• Object Substitution Masking** **• Passaging Cells** **• Percussion** **• Piaget's Conservation Task and the Influence of Task Demands** **• Spatial Cueing** **• The Attentional Blink** **• The Rubber Hand Illusion** **• The Split Brain**

		• Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy
TEKS	TX.112.34.	Biology (One Credit).
STUDENT EXPECTATION	(9-11.4)	Science concepts. The student knows that cells are the basic structures of all living things with specialized parts that perform specific functions and that viruses are different from cells. The student is expected to:
GRADE LEVEL EXPECTATION	9-11.4 (A)	Compare and contrast prokaryotic and eukaryotic cells. JoVE • An Introduction to Saccharomyces cerevisiae • An Introduction to Transfection • Bacterial Growth Curve Analysis and its Environmental Applications • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • Culturing and Enumerating Bacteria from Soil Samples • Electrophoretic Mobility Shift Assay (EMSA) • Plasmid Purification • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning
GRADE LEVEL EXPECTATION	9-11.4 (B)	Investigate and explain cellular processes, including homeostasis, energy conversions, transport of molecules, and synthesis of new molecules. JoVE • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Developmental Neurobiology • An Introduction to Endocytosis and Exocytosis • An Introduction to Molecular Developmental Biology • An Introduction to Neurophysiology • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Introduction to Transfection • An Overview of Epigenetics • An Overview of Gene Expression • Annexin V and Propidium Iodide Labeling • Bacterial Growth Curve Analysis and its Environmental Applications • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • Biofuels: Producing Ethanol from Cellulosic Material • C. elegans Development and Reproduction • Calcium Imaging in Neurons • Cell Cycle Analysis

		• Cell-surface Biotinylation Assay • Chromatin Immunoprecipitation • Cytogenetics • DNA Ligation Reactions • DNA Methylation Analysis • Detecting Reactive Oxygen Species • Electro-encephalography (EEG) • Electrophoretic Mobility Shift Assay (EMSA) • Embryonic Stem Cell Culture and Differentiation • Enzyme Assays and Kinetics • Explant Culture of Neural Tissue • Expression Profiling with Microarrays • FM Dyes in Vesicle Recycling • Förster Resonance Energy Transfer (FRET) • Gene Silencing with Morpholinos • Genetic Crosses • Genome Editing • Histological Staining of Neural Tissue • In ovo Electroporation of Chicken Embryos • Induced Pluripotency • Invasion Assay Using 3D Matrices • Isolating Nucleic Acids from Yeast • Live Cell Imaging of Mitosis • Metabolic Labeling • Molecular Cloning • Murine In Utero Electroporation • Neuronal Transfection Methods • Passaging Cells • Patch Clamp Electrophysiology • Plasmid Purification • Primary Neuronal Cultures • RNA Analysis of Environmental Samples Using RT-PCR • RNA-Seq • Recombineering and Gene Targeting • Reconstitution of Membrane Proteins • Restriction Enzyme Digests • Surface Plasmon Resonance (SPR) • The ATP Bioluminescence Assay • The TUNEL Assay • The Transwell Migration Assay • The Western Blot • Tissue Regeneration with Somatic Stem Cells • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning
GRADE LEVEL EXPECTATION	9-11.4 (C)	Compare the structures of viruses to cells, describe viral reproduction, and describe the role of viruses in causing diseases such as human immunodeficiency virus (HIV)

		and influenza. JoVE • An Introduction to the Laboratory Mouse: Mus musculus • An Overview of Genetic Engineering • Co-Immunoprecipitation and Pull-Down Assays • Detection of Bacteriophages in Environmental Samples • Pelvic Exam III: Bimanual and Rectovaginal Exam • Protein Crystallization • Quantifying Environmental Microorganisms and Viruses Using qPCR • RNA Analysis of Environmental Samples Using RT-PCR
TEKS	TX.112.34.	Biology (One Credit).
STUDENT EXPECTATION	(9-11.5)	Science concepts. The student knows how an organism grows and the importance of cell differentiation. The student is expected to:
GRADE LEVEL EXPECTATION	9-11.5 (A)	Describe the stages of the cell cycle, including deoxyribonucleic acid (DNA) replication and mitosis, and the importance of the cell cycle to the growth of organisms. JoVE • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Developmental Neurobiology • An Introduction to Molecular Developmental Biology • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • Annexin V and Propidium Iodide Labeling • Bacterial Growth Curve Analysis and its Environmental Applications • C. elegans Development and Reproduction • Cell Cycle Analysis • Detecting Reactive Oxygen Species • Embryonic Stem Cell Culture and Differentiation • Explant Culture of Neural Tissue • Genetic Crosses • Induced Pluripotency • Live Cell Imaging of Mitosis • Murine In Utero Electroporation • Neuronal Transfection Methods • Primary Neuronal Cultures • Recombineering and Gene Targeting • The TUNEL Assay • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning
GRADE LEVEL EXPECTATION	9-11.5 (B)	Examine specialized cells, including roots, stems, and leaves of plants; and animal cells such as blood, muscle,

		and epithelium. **JoVE** **• An Introduction to Aging and Regeneration** **• An Introduction to Behavioral Neuroscience** **• An Introduction to Caenorhabditis elegans** **• An Introduction to Cell Metabolism** **• An Introduction to Cell Motility and Migration** **• An Introduction to Cellular and Molecular Neuroscience** **• An Introduction to Cognition** **• An Introduction to Developmental Genetics** **• An Introduction to Developmental Neurobiology** **• An Introduction to Endocytosis and Exocytosis** **• An Introduction to Modeling Behavioral Disorders and Stress** **• An Introduction to Molecular Developmental Biology** **• An Introduction to Motor Control** **• An Introduction to Neuroanatomy** **• An Introduction to Neurophysiology** **• An Introduction to Organogenesis** **• An Introduction to Reward and Addiction** **• An Introduction to Stem Cell Biology** **• An Introduction to the Laboratory Mouse: Mus musculus** **• An Overview of Epigenetics** **• An Overview of Gene Expression** **• Ankle Exam** **• Anterograde Amnesia** **• Balance and Coordination Testing** **• C. elegans Development and Reproduction** **• Calcium Imaging in Neurons** **• Color Afterimages** **• Cranial Nerves Exam I (I-VI)** **• Cranial Nerves Exam II (VII-XII)** **• Crowding** **• DNA Methylation Analysis** **• Density Gradient Ultracentrifugation** **• Detecting Reactive Oxygen Species** **• Development and Reproduction of the Laboratory Mouse** **• Development of the Chick** **• Drosophila Larval IHC** **• Ear Exam** **• Elbow Exam** **• Electro-encephalography (EEG)** **• Embryonic Stem Cell Culture and Differentiation** **• Emergent Lateral Canthotomy and Inferior Catholysis** **• Event-related Potentials and the Oddball Task** **• Explant Culture for Developmental Studies** **• Explant Culture of Neural Tissue** **• Expression Profiling with Microarrays**

		• Eye Exam • FM Dyes in Vesicle Recycling • Fate Mapping • Finding Your Blind Spot and Perceptual Filling-in • Foot Exam • Gene Silencing with Morpholinos • Genetic Engineering of Model Organisms • Hand and Wrist Exam • Hip Exam • Histological Staining of Neural Tissue • Inattentional Blindness • Induced Pluripotency • Invasion Assay Using 3D Matrices • Just-noticeable Differences • Knee Exam • Lower Back Exam • MALDI-TOF Mass Spectrometry • Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain • Motion-induced Blindness • Motor Exam I • Motor Exam II • Murine In Utero Electroporation • Neck Exam • Neuronal Transfection Methods • Object Substitution Masking • Ophthalmoscopic Examination • Passaging Cells • Patch Clamp Electrophysiology • Physiological Correlates of Emotion Recognition • Primary Neuronal Cultures • RNA-Seq • Reconstitution of Membrane Proteins • Rodent Stereotaxic Surgery • Self-administration Studies • Sensory Exam • Shoulder Exam I • Shoulder Exam II • Spatial Cueing • The Ames Room • The Attentional Blink • The ELISA Method • The Inverted-face Effect • The McGurk Effect • The Rubber Hand Illusion • The Split Brain • The Staircase Procedure for Finding a Perceptual Threshold • The TUNEL Assay • The Transwell Migration Assay • Tissue Regeneration with Somatic Stem Cells

		• Transplantation Studies • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Using TMS to Measure Motor Excitability During Action Observation • Whole-Mount In Situ Hybridization • Zebrafish Breeding and Embryo Handling • Zebrafish Reproduction and Development • fMRI: Functional Magnetic Resonance Imaging
GRADE LEVEL EXPECTATION	9-11.5 (C)	Describe the roles of DNA, ribonucleic acid (RNA), and environmental factors in cell differentiation. <u>JoVE</u> • 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 Motility and Migration • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Drosophila melanogaster • An Introduction to Molecular Developmental Biology • An Introduction to Organogenesis • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • 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 Development and Reproduction • C. elegans Maintenance • 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 • Development of the Chick

		• Drosophila Development and Reproduction • 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 • 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 • In ovo Electroporation of Chicken Embryos • Induced Pluripotency • 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 • 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
GRADE LEVEL EXPECTATION	**9-11.5 (D)**	**Recognize that disruptions of the cell cycle lead to diseases such as cancer.** **JoVE** • An Introduction to Aging and Regeneration • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • An Introduction to Drosophila melanogaster • An Introduction to Endocytosis and Exocytosis • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to Motor Control • An Introduction to Organogenesis • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Zebrafish: Danio rerio • An Overview of Gene Expression • An Overview of Genetic Analysis • An Overview of Genetic Engineering • An Overview of Genetics and Disease • Cell Cycle Analysis • Chick ex ovo Culture • Chromatography-Based Biomolecule Purification Methods • Coordination Chemistry Complexes • Cytogenetics • DNA Methylation Analysis • Detecting Reactive Oxygen Species • Ear Exam • Embryonic Stem Cell Culture and Differentiation • Expression Profiling with Microarrays • Gene Silencing with Morpholinos • Genome Editing • Introducing Experimental Agents into the Mouse • Invasion Assay Using 3D Matrices • Live Cell Imaging of Mitosis • Lymph Node Exam • Male Rectal Exam • Mouse Genotyping • Pelvic Exam II: Speculum Exam • Pelvic Exam III: Bimanual and Rectovaginal Exam • SNP Genotyping • The TUNEL Assay • The Transwell Migration Assay

		• Tissue Regeneration with Somatic Stem Cells • Whole-Mount In Situ Hybridization
TEKS	**TX.112.34.**	**Biology (One Credit).**
STUDENT EXPECTATION	**(9-11.6)**	**Science concepts. The student knows the mechanisms of genetics, including the role of nucleic acids and the principles of Mendelian Genetics. The student is expected to:**
GRADE LEVEL EXPECTATION	**9-11.6 (A)**	**Identify components of DNA, and describe how information for specifying the traits of an organism is carried in the DNA.** **JoVE** • An Introduction to Aging and Regeneration • An Introduction to Caenorhabditis elegans • An Introduction to Cell Death • An Introduction to Cell Division • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Developmental Genetics • An Introduction to Drosophila melanogaster • An Introduction to Molecular Developmental Biology • An Introduction to Organogenesis • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Introduction to Transfection • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Zebrafish: Danio rerio • An Overview of Epigenetics • An Overview of Gene Expression • An Overview of Genetic Analysis • An Overview of Genetic Engineering • An Overview of Genetics and Disease • Annexin V and Propidium Iodide Labeling • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • C. elegans Maintenance • Cell Cycle Analysis • Chick ex ovo Culture • Chromatin Immunoprecipitation • Community DNA Extraction from Bacterial Colonies • Cytogenetics • DNA Gel Electrophoresis • DNA Ligation Reactions • DNA Methylation Analysis • Density Gradient Ultracentrifugation • Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis • Development and Reproduction of the Laboratory Mouse • Drosophila melanogaster Embryo and Larva Harvesting and Preparation • Electrophoretic Mobility Shift Assay (EMSA)

		• Embryonic Stem Cell Culture and Differentiation • Enzyme Assays and Kinetics • Explant Culture for Developmental Studies • Expression Profiling with Microarrays • Fate Mapping • Förster Resonance Energy Transfer (FRET) • Gel Purification • Gene Silencing with Morpholinos • Genetic Crosses • Genetic Engineering of Model Organisms • Genetic Screens • Genome Editing • In ovo Electroporation of Chicken Embryos • Induced Pluripotency • Isolating Nucleic Acids from Yeast • Live Cell Imaging of Mitosis • Molecular Cloning • Mouse Genotyping • Neuronal Transfection Methods • PCR: The Polymerase Chain Reaction • Photometric Protein Determination • Plasmid Purification • Primary Neuronal Cultures • Protein Crystallization • Quantifying Environmental Microorganisms and Viruses Using qPCR • RNA Analysis of Environmental Samples Using RT-PCR • RNA-Seq • RNAi in C. elegans • Recombineering and Gene Targeting • Restriction Enzyme Digests • SNP Genotyping • Testing For Genetically Modified Foods • The TUNEL Assay • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies • Two-Dimensional Gel Electrophoresis • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
GRADE LEVEL EXPECTATION	9-11.6 (B)	Recognize that components that make up the genetic code are common to all organisms. JoVE • 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 • 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
GRADE LEVEL EXPECTATION	9-11.6 (C)	Explain the purpose and process of transcription and translation using models of DNA and RNA. <u>JoVE</u> • An Overview of Epigenetics • An Overview of Gene Expression • Chromatin Immunoprecipitation • DNA Methylation Analysis • Detecting Reactive Oxygen Species • Electrophoretic Mobility Shift Assay (EMSA) • Expression Profiling with Microarrays • Gene Silencing with Morpholinos • Genome Editing • Molecular Cloning • Quantifying Environmental Microorganisms and Viruses Using qPCR • RNA Analysis of Environmental Samples Using RT-PCR • RNA-Seq • Whole-Mount In Situ Hybridization
GRADE LEVEL EXPECTATION	9-11.6 (D)	Recognize that gene expression is a regulated process. <u>JoVE</u> • An Introduction to Aging and Regeneration • An Introduction to Caenorhabditis elegans • An Introduction to Cell Death • An Introduction to Cellular and Molecular Neuroscience • An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Molecular Developmental Biology • An Introduction to Organogenesis • An Introduction to Stem Cell Biology • An Introduction to Transfection • An Introduction to the Zebrafish: Danio rerio • An Overview of Epigenetics • An Overview of Gene Expression • An Overview of Genetic Analysis • An Overview of Genetic Engineering • An Overview of Genetics and Disease • Annexin V and Propidium Iodide Labeling • Chick ex ovo Culture

		• Chromatin Immunoprecipitation • DNA Methylation Analysis • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Drosophila Development and Reproduction • Drosophila melanogaster Embryo and Larva Harvesting and Preparation • Embryonic Stem Cell Culture and Differentiation • Explant Culture for Developmental Studies • Explant Culture of Neural Tissue • Expression Profiling with Microarrays • Fate Mapping • Gene Silencing with Morpholinos • Genetic Crosses • Genetic Engineering of Model Organisms • Genetic Screens • Histological Staining of Neural Tissue • In ovo Electroporation of Chicken Embryos • Induced Pluripotency • Introduction to the Microplate Reader • Isolating Nucleic Acids from Yeast • Mouse Genotyping • Murine In Utero Electroporation • PCR: The Polymerase Chain Reaction • Protein Crystallization • Quantifying Environmental Microorganisms and Viruses Using qPCR • RNA Analysis of Environmental Samples Using RT-PCR • RNA-Seq • RNAi in C. elegans • Rodent Stereotaxic Surgery • Testing For Genetically Modified Foods • The TUNEL Assay • Tissue Regeneration with Somatic Stem Cells • Transplantation Studies • Whole-Mount In Situ Hybridization • Yeast Maintenance • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
GRADE LEVEL EXPECTATION	9-11.6 (E)	Identify and illustrate changes in DNA and evaluate the significance of these changes. <u>JoVE</u> • 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 Developmental Genetics • An Introduction to Drosophila melanogaster • An Introduction to Endocytosis and Exocytosis • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to Motor Control • An Introduction to Organogenesis • An Introduction to Saccharomyces cerevisiae • An Introduction to Stem Cell Biology • An Introduction to Transfection • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Zebrafish: Danio rerio • An Overview of Epigenetics • An Overview of Gene Expression • An Overview of Genetic Analysis • An Overview of Genetic Engineering • An Overview of Genetics and Disease • Cell Cycle Analysis • Chick ex ovo Culture • Chromatography-Based Biomolecule Purification Methods • Coordination Chemistry Complexes • Cytogenetics • DNA Methylation Analysis • Detecting Reactive Oxygen Species • Ear Exam • Embryonic Stem Cell Culture and Differentiation • Expression Profiling with Microarrays • Fundamentals of Breeding and Weaning • Gene Silencing with Morpholinos • Genetic Engineering of Model Organisms • Genetic Screens • Genome Editing • Introducing Experimental Agents into the Mouse • Invasion Assay Using 3D Matrices • Isolating Nucleic Acids from Yeast • Live Cell Imaging of Mitosis • Lymph Node Exam • Male Rectal Exam • Mouse Genotyping • Passaging Cells • Pelvic Exam II: Speculum Exam • Pelvic Exam III: Bimanual and Rectovaginal Exam • SNP Genotyping • The TUNEL Assay • The Transwell Migration Assay • Tissue Regeneration with Somatic Stem Cells • Whole-Mount In Situ Hybridization
GRADE LEVEL EXPECTATION	9-11.6 (F)	Predict possible outcomes of various genetic combinations such as monohybrid crosses, dihybrid

		crosses and non-Mendelian inheritance. JoVE • Fundamentals of Breeding and Weaning • Genetic Crosses
GRADE LEVEL EXPECTATION	9-11.6 (G)	Recognize the significance of meiosis to sexual reproduction. JoVE • An Introduction to Cell Division • Genetic Crosses • Recombineering and Gene Targeting • Yeast Reproduction
GRADE LEVEL EXPECTATION	9-11.6 (H)	Describe how techniques such as DNA fingerprinting, genetic modifications, and chromosomal analysis are used to study the genomes of organisms. JoVE • An Introduction to Caenorhabditis elegans • An Introduction to Stem Cell Biology • An Introduction to the Laboratory Mouse: Mus musculus • An Overview of Gene Expression • An Overview of Genetics and Disease • Capillary Electrophoresis (CE) • Cytogenetics • DNA Methylation Analysis • Expression Profiling with Microarrays • Genetic Engineering of Model Organisms • Genome Editing • Molecular Cloning • PCR: The Polymerase Chain Reaction • RNA-Seq • Recombineering and Gene Targeting • SNP Genotyping
TEKS	TX.112.34.	Biology (One Credit).
STUDENT EXPECTATION	(9-11.7)	Science concepts. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life. The student is expected to:
GRADE LEVEL EXPECTATION	9-11.7 (A)	Analyze and evaluate how evidence of common ancestry among groups is provided by the fossil record, biogeography, and homologies, including anatomical, molecular, and developmental. JoVE • An Introduction to Caenorhabditis elegans • An Introduction to Drosophila melanogaster • 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 Analysis • Drosophila Development and Reproduction • Drosophila melanogaster Embryo and Larva Harvesting and Preparation • High-Performance Liquid Chromatography (HPLC)
GRADE LEVEL EXPECTATION	9-11.7 (B)	Analyze and evaluate scientific explanations concerning any data of sudden appearance, stasis, and sequential nature of groups in the fossil record. JoVE • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Zebrafish: Danio rerio • High-Performance Liquid Chromatography (HPLC)
GRADE LEVEL EXPECTATION	9-11.7 (C)	Analyze and evaluate how natural selection produces change in populations, not individuals. JoVE • An Overview of Genetic Analysis
GRADE LEVEL EXPECTATION	9-11.7 (D)	Analyze and evaluate how the elements of natural selection, including inherited variation, the potential of a population to produce more offspring than can survive, and a finite supply of environmental resources, result in differential reproductive success. JoVE • An Overview of Genetic Analysis
GRADE LEVEL EXPECTATION	9-11.7 (E)	Analyze and evaluate the relationship of natural selection to adaptation and to the development of diversity in and among species. JoVE • An Overview of Genetic Analysis
GRADE LEVEL EXPECTATION	9-11.7 (F)	Analyze and evaluate the effects of other evolutionary mechanisms, including genetic drift, gene flow, mutation, and recombination. JoVE • An Introduction to the Chick: Gallus gallus domesticus • An Overview of Genetic Analysis
GRADE LEVEL EXPECTATION	9-11.7 (G)	Analyze and evaluate scientific explanations concerning the complexity of the cell. JoVE • An Introduction to Cell Division • High-Performance Liquid Chromatography (HPLC)
TEKS	TX.112.34.	Biology (One Credit).
STUDENT EXPECTATION	(9-11.8)	Science concepts. The student knows that taxonomy is a branching classification based on the shared

		characteristics of organisms and can change as new discoveries are made. The student is expected to:
GRADE LEVEL EXPECTATION	**9-11.8 (A)**	**Define taxonomy and recognize the importance of a standardized taxonomic system to the scientific community.** **JoVE** **• Tree Identification: How To Use a Dichotomous Key**
GRADE LEVEL EXPECTATION	**9-11.8 (B)**	**Categorize organisms using a hierarchical classification system based on similarities and differences shared among groups.** **JoVE** **• Algae Enumeration via Culturable Methodology** **• An Introduction to Caenorhabditis elegans** **• An Introduction to Drosophila melanogaster** **• An Introduction to Saccharomyces cerevisiae** **• An Introduction to the Chick: Gallus gallus domesticus** **• An Introduction to the Laboratory Mouse: Mus musculus** **• An Introduction to the Zebrafish: Danio rerio** **• Aseptic Technique in Environmental Science** **• Bacterial Growth Curve Analysis and its Environmental Applications** **• Basic Chick Care and Maintenance** **• Basic Mouse Care and Maintenance** **• Biofuels: Producing Ethanol from Cellulosic Material** **• C. elegans Chemotaxis Assay** **• C. elegans Development and Reproduction** **• C. elegans Maintenance** **• Chick ex ovo Culture** **• Culturing and Enumerating Bacteria from Soil Samples** **• Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis** **• Detection of Bacteriophages in Environmental Samples** **• Determination of Moisture Content in Soil** **• Development and Reproduction of the Laboratory Mouse** **• Development of the Chick** **• Drosophila Development and Reproduction** **• Drosophila Larval IHC** **• Drosophila Maintenance** **• Drosophila melanogaster Embryo and Larva Harvesting and Preparation** **• Filamentous Fungi** **• Genetic Crosses** **• Genetic Engineering of Model Organisms** **• Gram Staining of Bacteria from Environmental Sources** **• In ovo Electroporation of Chicken Embryos** **• Introducing Experimental Agents into the Mouse** **• Isolating Nucleic Acids from Yeast**

		• Mouse Genotyping • RNAi in C. elegans • Recombineering and Gene Targeting • Sonication Extraction of Lipid Biomarkers from Sediment • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method • Using GIS to Investigate Urban Forestry • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
GRADE LEVEL EXPECTATION	9-11.8 (C)	Compare characteristics of taxonomic groups, including archaea, bacteria, protists, fungi, plants, and animals. <u>JoVE</u> • Algae Enumeration via Culturable Methodology • An Introduction to Caenorhabditis elegans • An Introduction to Drosophila melanogaster • An Introduction to Saccharomyces cerevisiae • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Laboratory Mouse: Mus musculus • An Introduction to the Zebrafish: Danio rerio • Aseptic Technique in Environmental Science • Bacterial Growth Curve Analysis and its Environmental Applications • Basic Chick Care and Maintenance • Basic Mouse Care and Maintenance • Biofuels: Producing Ethanol from Cellulosic Material • C. elegans Chemotaxis Assay • C. elegans Development and Reproduction • C. elegans Maintenance • Chick ex ovo Culture • Culturing and Enumerating Bacteria from Soil Samples • Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis • Detection of Bacteriophages in Environmental Samples • Determination of Moisture Content in Soil • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Drosophila Development and Reproduction • Drosophila Larval IHC • Drosophila Maintenance • Drosophila melanogaster Embryo and Larva Harvesting

		and Preparation • Filamentous Fungi • Genetic Crosses • Genetic Engineering of Model Organisms • Gram Staining of Bacteria from Environmental Sources • In ovo Electroporation of Chicken Embryos • Introducing Experimental Agents into the Mouse • Isolating Nucleic Acids from Yeast • Mouse Genotyping • RNAi in C. elegans • Recombineering and Gene Targeting • Sonication Extraction of Lipid Biomarkers from Sediment • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method • Using GIS to Investigate Urban Forestry • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Microinjection Techniques • Zebrafish Reproduction and Development
TEKS	**TX.112.34.**	**Biology (One Credit).**
STUDENT EXPECTATION	**(9-11.9)**	**Science concepts. The student knows the significance of various molecules involved in metabolic processes and energy conversions that occur in living organisms. The student is expected to:**
GRADE LEVEL EXPECTATION	**9-11.9 (A)**	**Compare the structures and functions of different types of biomolecules, including carbohydrates, lipids, proteins, and nucleic acids.** **JoVE** • 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 • Biofuels: Producing Ethanol from Cellulosic Material • 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 • 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
GRADE LEVEL EXPECTATION	9-11.9 (B)	Compare the reactants and products of photosynthesis and cellular respiration in terms of energy and matter. JoVE • An Introduction to Cell Metabolism • An Introduction to Cell Motility and Migration • Biofuels: Producing Ethanol from Cellulosic Material • Detecting Reactive Oxygen Species • Invasion Assay Using 3D Matrices • The ATP Bioluminescence Assay • The Transwell Migration Assay
GRADE LEVEL EXPECTATION	9-11.9 (C)	Identify and investigate the role of enzymes. JoVE • 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
GRADE LEVEL EXPECTATION	9-11.9 (D)	Analyze and evaluate the evidence regarding formation of simple organic molecules and their organization into long complex molecules having information such as the DNA molecule for self-replicating life. <u>JoVE</u> • 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** **• 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
TEKS	**TX.112.34.**	**Biology (One Credit).**
STUDENT EXPECTATION	**(9-11.10)**	**Science concepts. The student knows that biological systems are composed of multiple levels. The student is expected to:**
GRADE LEVEL EXPECTATION	**9-11.10 (A)**	**Describe the interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals.** **JoVE** • An Introduction to the Chick: Gallus gallus domesticus • Anesthesia Induction and Maintenance • Basic Care Procedures • Basic Mouse Care and Maintenance • Blood Withdrawal I • Blood Withdrawal II • C. elegans Development and Reproduction • Compound Administration I • Compound Administration II • Compound Administration III • Compound Administration IV • Considerations for Rodent Surgery • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Diagnostic Necropsy and Tissue Harvest • Fundamentals of Breeding and Weaning • Sterile Tissue Harvest • Zebrafish Maintenance and Husbandry • Zebrafish Reproduction and Development
GRADE LEVEL EXPECTATION	**9-11.10 (B)**	**Describe the interactions that occur among systems that perform the functions of transport, reproduction, and response in plants.** **JoVE** • Tree Identification: How To Use a Dichotomous Key
GRADE LEVEL EXPECTATION	**9-11.10 (C)**	**Analyze the levels of organization in biological systems and relate the levels to each other and to the whole system.** **JoVE** • An Introduction to Behavioral Neuroscience • An Introduction to Caenorhabditis elegans • An Introduction to Cellular and Molecular Neuroscience

		• An Introduction to Developmental Genetics • An Introduction to Developmental Neurobiology • An Introduction to Learning and Memory • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to Molecular Developmental Biology • An Introduction to Motor Control • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Introduction to Reward and Addiction • An Introduction to the Chick: Gallus gallus domesticus • An Introduction to the Zebrafish: Danio rerio • Analysis of Earthworm Populations in Soil • Anesthesia Induction and Maintenance • Anterograde Amnesia • Anxiety Testing • Approximate Number Sense Test • Assessing Dexterity with Reaching Tasks • Balance and Coordination Testing • Basic Care Procedures • Binocular Rivalry • Blood Withdrawal I • Blood Withdrawal II • C. elegans Chemotaxis Assay • C. elegans Development and Reproduction • C. elegans Maintenance • Calcium Imaging in Neurons • Co-Immunoprecipitation and Pull-Down Assays • Color Afterimages • Compound Administration I • Compound Administration II • Compound Administration III • Compound Administration IV • Considerations for Rodent Surgery • Crowding • Decoding Auditory Imagery with Multivoxel Pattern Analysis • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Diagnostic Necropsy and Tissue Harvest • Dichotic Listening • Drosophila Development and Reproduction • Drosophila Larval IHC • Explant Culture of Neural Tissue • Filamentous Fungi • Finding Your Blind Spot and Perceptual Filling-in • Fundamentals of Breeding and Weaning • Genetic Engineering of Model Organisms • Habituation: Studying Infants Before They Can Talk • Histological Staining of Neural Tissue

		• Inattentional Blindness • Incidental Encoding • Just-noticeable Differences • Learning and Memory: The Remember-Know Task • Measuring Reaction Time and Donders' Method of Subtraction • Measuring Verbal Working Memory Span • Mental Rotation • Modeling Social Stress • Motion-induced Blindness • Motor Learning in Mirror Drawing • Motor Maps • Multiple Object Tracking • Murine In Utero Electroporation • Neuronal Transfection Methods • Object Substitution Masking • Patch Clamp Electrophysiology • Physiological Correlates of Emotion Recognition • Primary Neuronal Cultures • Prospect Theory • Rodent Stereotaxic Surgery • Self-administration Studies • Spatial Cueing • Sterile Tissue Harvest • 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 • Tree Survey: Point-Centered Quarter Sampling Method • Verbal Priming • Visual Search for Features and Conjunctions • Visual Statistical Learning • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy • Zebrafish Reproduction and Development • fMRI: Functional Magnetic Resonance Imaging
TEKS	**TX.112.34.**	**Biology (One Credit).**
STUDENT EXPECTATION	**(9-11.11)**	**Science concepts. The student knows that biological systems work to achieve and maintain balance. The student is expected to:**
GRADE LEVEL EXPECTATION	**9-11.11 (A)**	**Describe the role of internal feedback mechanisms in the maintenance of homeostasis.** **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 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 • 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 a pH Meter • Yeast Maintenance • Yeast Reproduction • Yeast Transformation and Cloning • Zebrafish Maintenance and Husbandry
GRADE LEVEL EXPECTATION	**9-11.11 (B)**	**Investigate and analyze how organisms, populations, and communities respond to external factors.** **JoVE** • 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 Cognition • An Introduction to Developmental Neurobiology • An Introduction to Endocytosis and Exocytosis • An Introduction to Learning and Memory • An Introduction to Modeling Behavioral Disorders and Stress • An Introduction to Molecular Developmental Biology • An Introduction to Motor Control • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Introduction to Reward and Addiction • An Introduction to the Laboratory Mouse: Mus musculus • An Introduction to the Zebrafish: Danio rerio • Anesthesia Induction and Maintenance • Annexin V and Propidium Iodide Labeling • Anterograde Amnesia • Anxiety Testing • Approximate Number Sense Test • Are You Smart or Hardworking? How Praise Influences Children's Motivation • Assessing Dexterity with Reaching Tasks

		• Balance and Coordination Testing • Basic Care Procedures • Basic Chick Care and Maintenance • Basic Mouse Care and Maintenance • C. elegans Chemotaxis Assay • C. elegans Development and Reproduction • C. elegans Maintenance • Calcium Imaging in Neurons • Chick ex ovo Culture • Color Afterimages • Considerations for Rodent Surgery • Crowding • Decision-making and the Iowa Gambling Task • Decoding Auditory Imagery with Multivoxel Pattern Analysis • Detecting Reactive Oxygen Species • Development and Reproduction of the Laboratory Mouse • Development of the Chick • Diagnostic Necropsy and Tissue Harvest • Drosophila Development and Reproduction • Drosophila Larval IHC • Drosophila Maintenance • Drosophila melanogaster Embryo and Larva Harvesting and Preparation • Electro-encephalography (EEG) • Event-related Potentials and the Oddball Task • Executive Function and the Dimensional Change Card Sort Task • Executive Function in Autism Spectrum Disorder • Explant Culture of Neural Tissue • Eye Tracking in Cognitive Experiments • Fear Conditioning • Finding Your Blind Spot and Perceptual Filling-in • Fundamentals of Breeding and Weaning • Habituation: Studying Infants Before They Can Talk • Histological Staining of Neural Tissue • How Children Solve Problems Using Causal Reasoning • In ovo Electroporation of Chicken Embryos • Inattentional Blindness • Incidental Encoding • Invasion Assay Using 3D Matrices • Invertebrate Lifespan Quantification • Isolating Nucleic Acids from Yeast • Just-noticeable Differences • Language: The N400 in Semantic Incongruity • Learning and Memory: The Remember-Know Task • Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain • Measuring Reaction Time and Donders' Method of Subtraction

		• Measuring Verbal Working Memory Span • Mental Rotation • Modeling Social Stress • Motion-induced Blindness • Motor Learning in Mirror Drawing • Multiple Object Tracking • Murine In Utero Electroporation • Neuronal Transfection Methods • Object Substitution Masking • Patch Clamp Electrophysiology • Physiological Correlates of Emotion Recognition • Pilot Testing • Positive Reinforcement Studies • Primary Neuronal Cultures • Prospect Theory • RNAi in C. elegans • Rodent Handling and Restraint Techniques • Rodent Stereotaxic Surgery • Self-administration Studies • Spatial Cueing • Spatial Memory Testing Using Mazes • Sterile Tissue Harvest • The ATP Bioluminescence Assay • The Ames Room • The Attentional Blink • The Inverted-face Effect • The McGurk Effect • The Morris Water Maze • The Multi-group Experiment • The Precision of Visual Working Memory with Delayed Estimation • The Rubber Hand Illusion • The Simple Experiment: Two-group Design • The Staircase Procedure for Finding a Perceptual Threshold • The TUNEL Assay • The Transwell Migration Assay • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Using TMS to Measure Motor Excitability During Action Observation • Using Your Head: Measuring Infants' Rational Imitation of Actions • Verbal Priming • Visual Attention: fMRI Investigation of Object-based Attentional Control • Visual Search for Features and Conjunctions • Visual Statistical Learning • Within-subjects Repeated-measures Design • Yeast Maintenance • Yeast Reproduction

		• Zebrafish Breeding and Embryo Handling • Zebrafish Maintenance and Husbandry • Zebrafish Reproduction and Development • fMRI: Functional Magnetic Resonance Imaging
GRADE LEVEL EXPECTATION	**9-11.11 (C)**	**Summarize the role of microorganisms in both maintaining and disrupting the health of both organisms and ecosystems.** **JoVE** • Algae Enumeration via Culturable Methodology • An Introduction to Transfection • An Introduction to the Laboratory Mouse: Mus musculus • An Overview of Genetic Analysis • An Overview of Genetic Engineering • Analysis of Earthworm Populations in Soil • Aseptic Technique in Environmental Science • Bacterial Growth Curve Analysis and its Environmental Applications • Bacterial Transformation: Electroporation • Bacterial Transformation: The Heat Shock Method • Basic Care Procedures • Basic Mouse Care and Maintenance • Biofuels: Producing Ethanol from Cellulosic Material • C. elegans Maintenance • Carbon and Nitrogen Analysis of Environmental Samples • Co-Immunoprecipitation and Pull-Down Assays • Community DNA Extraction from Bacterial Colonies • Culturing and Enumerating Bacteria from Soil Samples • Cyclic Voltammetry (CV) • Detecting Environmental Microorganisms with the Polymerase Chain Reaction and Gel Electrophoresis • Detection of Bacteriophages in Environmental Samples • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Determination of Moisture Content in Soil • Dissolved Oxygen in Surface Water • Filamentous Fungi • Genetic Crosses • Genetic Engineering of Model Organisms • Genetic Screens • Gram Staining of Bacteria from Environmental Sources • Isolation of Fecal Bacteria from Water Samples by Filtration • Metabolic Labeling • Molecular Cloning • Nutrients in Aquatic Ecosystems • Pelvic Exam III: Bimanual and Rectovaginal Exam • Plasmid Purification • Protein Crystallization

		• Quantifying Environmental Microorganisms and Viruses Using qPCR • RNA Analysis of Environmental Samples Using RT-PCR • Recombineering and Gene Targeting • Soil Nutrient Analysis: Nitrogen, Phosphorus, and Potassium • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy • Water Quality Analysis via Indicator Organisms
TEKS	**TX.112.34.**	**Biology (One Credit).**
STUDENT EXPECTATION	**(9-11.12)**	**Science concepts. The student knows that interdependence and interactions occur within an environmental system. The student is expected to:**
GRADE LEVEL EXPECTATION	**9-11.12 (A)**	**Interpret relationships, including predation, parasitism, commensalism, mutualism, and competition among organisms.** **JoVE** • Analysis of Earthworm Populations in Soil • Bacterial Growth Curve Analysis and its Environmental Applications • C. elegans Development and Reproduction • Culturing and Enumerating Bacteria from Soil Samples • Dissolved Oxygen in Surface Water • Filamentous Fungi • Genetic Crosses • Recombineering and Gene Targeting • Tree Survey: Point-Centered Quarter Sampling Method • Using GIS to Investigate Urban Forestry • Visualizing Soil Microorganisms via the Contact Slide Assay and Microscopy • Zebrafish Maintenance and Husbandry
GRADE LEVEL EXPECTATION	**9-11.12 (B)**	**Compare variations and adaptations of organisms in different ecosystems.** **JoVE** • Dissolved Oxygen in Surface Water • Nutrients in Aquatic Ecosystems • Tree Identification: How To Use a Dichotomous Key • Tree Survey: Point-Centered Quarter Sampling Method • Turbidity and Total Solids in Surface Water • Using GIS to Investigate Urban Forestry • Water Quality Analysis via Indicator Organisms • Zebrafish Maintenance and Husbandry
GRADE LEVEL EXPECTATION	**9-11.12 (C)**	**Analyze the flow of matter and energy through trophic levels using various models, including food chains, food webs, and ecological pyramids.** **JoVE** • Introduction to Mass Spectrometry

		• Lead Analysis of Soil Using Atomic Absorption Spectroscopy • Turbidity and Total Solids in Surface Water
GRADE LEVEL EXPECTATION	9-11.12 (E)	Describe the flow of matter through the carbon and nitrogen cycles and explain the consequences of disrupting these cycles. JoVE • Algae Enumeration via Culturable Methodology • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • 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 • Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction • Filamentous Fungi • 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
GRADE LEVEL EXPECTATION	9-11.12 (F)	Describe how environmental change can impact ecosystem stability. JoVE • Analysis of Earthworm Populations in Soil • Determination of Moisture Content in Soil • Dissolved Oxygen in Surface Water • Nutrients in Aquatic Ecosystems • Tree Survey: Point-Centered Quarter Sampling Method • Turbidity and Total Solids in Surface Water
TEKS	TX.112.38.	Integrated Physics and Chemistry (One Credit).
STUDENT EXPECTATION	(9-10.1)	Scientific processes. The student, for at least 40% of instructional time, conducts laboratory and field

		investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:
GRADE LEVEL EXPECTATION	9-10.1 (B)	Demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials. JoVE • An Introduction to Working in the Hood • An Introduction to the Centrifuge • An Introduction to the Micropipettor • Aseptic Technique in Environmental Science • Common Lab Glassware and Uses • Conducting Reactions Below Room Temperature • Introduction to Serological Pipettes and Pipettors • Introduction to the Microplate Reader • Introduction to the Spectrophotometer • Making Solutions in the Laboratory • Regulating Temperature in the Lab: Applying Heat • Regulating Temperature in the Lab: Preserving Samples Using Cold • Understanding Concentration and Measuring Volumes
TEKS	TX.112.38.	Integrated Physics and Chemistry (One Credit).
STUDENT EXPECTATION	(9-10.2)	Scientific processes. The student uses scientific methods during laboratory and field investigations. The student is expected to:
GRADE LEVEL EXPECTATION	9-10.2 (B)	Plan and implement investigative procedures, including asking questions, formulating testable hypotheses, and selecting equipment and technology. JoVE • An Introduction to the Micropipettor • Common Lab Glassware and Uses • Introduction to Serological Pipettes and Pipettors • Introduction to the Microplate Reader • Introduction to the Spectrophotometer • Making Solutions in the Laboratory • Measuring Mass in the Laboratory • Regulating Temperature in the Lab: Applying Heat • Regulating Temperature in the Lab: Preserving Samples Using Cold • Understanding Concentration and Measuring Volumes
GRADE LEVEL EXPECTATION	9-10.2 (C)	Collect data and make measurements with precision. JoVE • Assembly of a Reflux System for Heated Chemical Reactions • Calibration Curves • Capillary Electrophoresis (CE) • Chromatography-Based Biomolecule Purification Methods

		• Co-Immunoprecipitation and Pull-Down Assays • Column Chromatography • Common Lab Glassware and Uses • Cyclic Voltammetry (CV) • Degassing Liquids with Freeze-Pump-Thaw Cycling • Density Gradient Ultracentrifugation • Determining Rate Laws and the Order of Reaction • Determining the Density of a Solid and Liquid • Determining the Empirical Formula • Determining the Mass Percent Composition in an Aqueous Solution • Dialysis: Diffusion Based Separation • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Electrophoretic Mobility Shift Assay (EMSA) • Enzyme Assays and Kinetics • Fractional Distillation • Freezing-Point Depression to Determine an Unknown Compound • Förster Resonance Energy Transfer (FRET) • Gas Chromatography (GC) with Flame-Ionization Detection • High-Performance Liquid Chromatography (HPLC) • Internal Standards • Introduction to Mass Spectrometry • Introduction to the Spectrophotometer • Ion-Exchange Chromatography • MALDI-TOF Mass Spectrometry • Making Solutions in the Laboratory • Metabolic Labeling • Method of Standard Addition • Nuclear Magnetic Resonance (NMR) Spectroscopy • Performing 1D Thin Layer Chromatography • Photometric Protein Determination • Raman Spectroscopy for Chemical Analysis • Rotary Evaporation to Remove Solvent • Schlenk Lines Transfer of Solvents • Separation of Mixtures via Precipitation • Solid-Liquid Extraction • Spectrophotometric Determination of an Equilibrium Constant • Surface Plasmon Resonance (SPR) • Tandem Mass Spectrometry • Two-Dimensional Gel Electrophoresis • Ultraviolet-Visible (UV-Vis) Spectroscopy • Understanding Concentration and Measuring Volumes • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy • Using a pH Meter • X-ray Fluorescence (XRF)
TEKS	**TX.112.38.**	**Integrated Physics and Chemistry (One Credit).**

STUDENT EXPECTATION	**(9-10.3)**	**Scientific processes. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions. The student is expected to:**
GRADE LEVEL EXPECTATION	**9-10.3 (D)**	**Evaluate the impact of research on scientific thought, society, and the environment.** **JoVE** **• Assembly of a Reflux System for Heated Chemical Reactions** **• Biofuels: Producing Ethanol from Cellulosic Material** **• Calibration Curves** **• Capillary Electrophoresis (CE)** **• Chromatography-Based Biomolecule Purification Methods** **• Co-Immunoprecipitation and Pull-Down Assays** **• Column Chromatography** **• Common Lab Glassware and Uses** **• Conducting Reactions Below Room Temperature** **• Coordination Chemistry Complexes** **• Cyclic Voltammetry (CV)** **• Degassing Liquids with Freeze-Pump-Thaw Cycling** **• Density Gradient Ultracentrifugation** **• Determining Rate Laws and the Order of Reaction** **• Determining the Density of a Solid and Liquid** **• Determining the Empirical Formula** **• Determining the Mass Percent Composition in an Aqueous Solution** **• Determining the Solubility Rules of Ionic Compounds** **• Dialysis: Diffusion Based Separation** **• Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat** **• Electrophoretic Mobility Shift Assay (EMSA)** **• Enzyme Assays and Kinetics** **• Fractional Distillation** **• Freezing-Point Depression to Determine an Unknown Compound** **• Förster Resonance Energy Transfer (FRET)** **• Gas Chromatography (GC) with Flame-Ionization Detection** **• Growing Crystals for X-ray Diffraction Analysis** **• High-Performance Liquid Chromatography (HPLC)** **• Ideal Gas Law** **• Internal Standards** **• Introduction to Catalysis** **• Introduction to Mass Spectrometry** **• Introduction to Titration** **• Ion-Exchange Chromatography** **• Le Châtelier's Principle** **• MALDI-TOF Mass Spectrometry** **• Metabolic Labeling** **• Method of Standard Addition**

		• Nuclear Magnetic Resonance (NMR) Spectroscopy • Performing 1D Thin Layer Chromatography • Photometric Protein Determination • Preparing Anhydrous Reagents and Equipment • Protein Crystallization • Proton Exchange Membrane Fuel Cells • Purifying Compounds by Recrystallization • Raman Spectroscopy for Chemical Analysis • Reconstitution of Membrane Proteins • Rotary Evaporation to Remove Solvent • Sample Preparation for Analytical Preparation • Scanning Electron Microscopy (SEM) • Schlenk Lines Transfer of Solvents • Separation of Mixtures via Precipitation • Solid-Liquid Extraction • Solutions and Concentrations • Spectrophotometric Determination of an Equilibrium Constant • Surface Plasmon Resonance (SPR) • Tandem Mass Spectrometry • The Ideal Gas Law • Two-Dimensional Gel Electrophoresis • Ultraviolet-Visible (UV-Vis) Spectroscopy • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy • Using a pH Meter • X-ray Fluorescence (XRF)
GRADE LEVEL EXPECTATION	9-10.3 (F)	Research and describe the history of physics and chemistry and contributions of scientists. JoVE • Degassing Liquids with Freeze-Pump-Thaw Cycling • Ideal Gas Law • Le Châtelier's Principle • Rotary Evaporation to Remove Solvent • Schlenk Lines Transfer of Solvents • The Ideal Gas Law
TEKS	TX.112.38.	Integrated Physics and Chemistry (One Credit).
STUDENT EXPECTATION	(9-10.4)	Science concepts. The student knows concepts of force and motion evident in everyday life. The student is expected to:
GRADE LEVEL EXPECTATION	9-10.4 (G)	Examine electrical force as a universal force between any two charged objects and compare the relative strength of the electrical force and gravitational force. JoVE • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Testing For Genetically Modified Foods
TEKS	TX.112.38.	Integrated Physics and Chemistry (One Credit).

STUDENT EXPECTATION	**(9-10.5)**	**Science concepts. The student recognizes multiple forms of energy and knows the impact of energy transfer and energy conservation in everyday life. The student is expected to:**
GRADE LEVEL EXPECTATION	**9-10.5 (A)**	**Recognize and demonstrate that objects and substances in motion have kinetic energy such as vibration of atoms, water flowing down a stream moving pebbles, and bowling balls knocking down pins.** **JoVE** **• Conducting Reactions Below Room Temperature** **• Determining Rate Laws and the Order of Reaction** **• Introduction to Catalysis**
GRADE LEVEL EXPECTATION	**9-10.5 (B)**	**Demonstrate common forms of potential energy, including gravitational, elastic, and chemical, such as a ball on an inclined plane, springs, and batteries.** **JoVE** **• An Introduction to Cell Metabolism** **• Cyclic Voltammetry (CV)** **• Detecting Reactive Oxygen Species** **• Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat** **• The ATP Bioluminescence Assay**
GRADE LEVEL EXPECTATION	**9-10.5 (C)**	**Demonstrate that moving electric charges produce magnetic forces and moving magnets produce electric forces.** **JoVE** **• fMRI: Functional Magnetic Resonance Imaging**
GRADE LEVEL EXPECTATION	**9-10.5 (E)**	**Investigate and demonstrate the movement of thermal energy through solids, liquids, and gases by convection, conduction, and radiation such as in weather, living, and mechanical systems.** **JoVE** **• Using Differential Scanning Calorimetry to Measure Changes in Enthalpy**
GRADE LEVEL EXPECTATION	**9-10.5 (F)**	**Evaluate the transfer of electrical energy in series and parallel circuits and conductive materials.** **JoVE** **• Assembly of a Reflux System for Heated Chemical Reactions**
GRADE LEVEL EXPECTATION	**9-10.5 (G)**	**Explore the characteristics and behaviors of energy transferred by waves, including acoustic, seismic, light, and waves on water as they superpose on one another, bend around corners, reflect off surfaces, are absorbed by materials, and change direction when entering new**

		materials. JoVE • Color Afterimages • Crowding • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Finding Your Blind Spot and Perceptual Filling-in • Histological Sample Preparation for Light Microscopy • Inattentional Blindness • Introduction to Fluorescence Microscopy • Introduction to Light Microscopy • Introduction to the Spectrophotometer • Just-noticeable Differences • Motion-induced Blindness • Nutrients in Aquatic Ecosystems • Object Substitution Masking • Photometric Protein Determination • Raman Spectroscopy for Chemical Analysis • Spatial Cueing • Spectrophotometric Determination of an Equilibrium Constant • Surface Plasmon Resonance (SPR) • The Ames Room • The Attentional Blink • The Inverted-face Effect • Turbidity and Total Solids in Surface Water • Ultraviolet-Visible (UV-Vis) Spectroscopy
GRADE LEVEL EXPECTATION	9-10.5 (H)	Analyze energy conversions such as those from radiant, nuclear, and geothermal sources; fossil fuels such as coal, gas, oil; and the movement of water or wind. JoVE • Biofuels: Producing Ethanol from Cellulosic Material • Proton Exchange Membrane Fuel Cells • Raman Spectroscopy for Chemical Analysis • fMRI: Functional Magnetic Resonance Imaging
GRADE LEVEL EXPECTATION	9-10.5 (I)	Critique the advantages and disadvantages of various energy sources and their impact on society and the environment. JoVE • Biofuels: Producing Ethanol from Cellulosic Material • Proton Exchange Membrane Fuel Cells
TEKS	TX.112.38.	Integrated Physics and Chemistry (One Credit).
STUDENT EXPECTATION	(9-10.6)	Science concepts. The student knows that relationships exist between the structure and properties of matter. The student is expected to:
GRADE LEVEL EXPECTATION	9-10.6 (A)	Examine differences in physical properties of solids, liquids, and gases as explained by the arrangement and

		motion of atoms, ions, or molecules of the substances and the strength of the forces of attraction between those particles. **JoVE** **• 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**
GRADE LEVEL EXPECTATION	**9-10.6 (B)**	**Relate chemical properties of substances to the arrangement of their atoms or molecules.** **JoVE** **• Cyclic Voltammetry (CV)** **• Introduction to Titration** **• Using a pH Meter**
GRADE LEVEL EXPECTATION	**9-10.6 (C)**	**Analyze physical and chemical properties of elements and compounds such as color, density, viscosity, buoyancy, boiling point, freezing point, conductivity, and reactivity.** **JoVE** **• 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 Differential Scanning Calorimetry to Measure Changes in Enthalpy** **• Using a pH Meter**
GRADE LEVEL EXPECTATION	**9-10.6 (D)**	**Relate the physical and chemical behavior of an element, including bonding and classification, to its placement on the Periodic Table.** **JoVE** **• Coordination Chemistry Complexes**

GRADE LEVEL EXPECTATION	**9-10.6 (E)**	**Relate the structure of water to its function as a solvent and investigate the properties of solutions and factors affecting gas and solid solubility, including nature of solute, temperature, pressure, pH, and concentration.** **JoVE** **• 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 • 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
TEKS	**TX.112.38.**	**Integrated Physics and Chemistry (One Credit).**
STUDENT EXPECTATION	**(9-10.7)**	**Science concepts. The student knows that changes in matter affect everyday life. The student is expected to:**
GRADE LEVEL EXPECTATION	9-10.7 (A)	Investigate changes of state as it relates to the arrangement of particles of matter and energy transfer. JoVE • 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
GRADE LEVEL EXPECTATION	9-10.7 (B)	Recognize that chemical changes can occur when substances react to form different substances and that these interactions are largely determined by the valence electrons. JoVE • An Introduction to Cell Metabolism • Conducting Reactions Below Room Temperature • Coordination Chemistry Complexes

		• Cyclic Voltammetry (CV) • Detecting Reactive Oxygen Species • Determining the Solubility Rules of Ionic Compounds • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Enzyme Assays and Kinetics • Growing Crystals for X-ray Diffraction Analysis • Introduction to Catalysis • Introduction to Titration • Le Châtelier's Principle • Nuclear Magnetic Resonance (NMR) Spectroscopy • Photometric Protein Determination • Preparing Anhydrous Reagents and Equipment • Proton Exchange Membrane Fuel Cells • Purifying Compounds by Recrystallization • Rotary Evaporation to Remove Solvent • Separation of Mixtures via Precipitation • The ATP Bioluminescence Assay • The ELISA Method • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy • Using a pH Meter
GRADE LEVEL EXPECTATION	9-10.7 (C)	Demonstrate that mass is conserved when substances undergo chemical change and that the number and kind of atoms are the same in the reactants and products. JoVE • Determining the Empirical Formula
GRADE LEVEL EXPECTATION	9-10.7 (D)	Analyze energy changes that accompany chemical reactions such as those occurring in heat packs, cold packs, and glow sticks and classify them as exothermic or endothermic reactions. JoVE • 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
GRADE LEVEL EXPECTATION	9-10.7 (E)	Describe types of nuclear reactions such as fission and fusion and their roles in applications such as medicine and energy production. JoVE • An Introduction to Behavioral Neuroscience • An Introduction to Cognition • An Introduction to Learning and Memory • An Introduction to Motor Control • An Introduction to Neuroanatomy • An Overview of Alkenone Biomarker Analysis for

		Paleothermometry **• An Overview of bGDGT Biomarker Analysis for Paleoclimatology** **• Auscultation** **• Central Venous Catheter Insertion: Femoral Vein with Ultrasound Guidance** **• Central Venous Catheter Insertion: Internal Jugular with Ultrasound Guidance** **• Color Afterimages** **• Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry** **• Decision-making and the Iowa Gambling Task** **• Decoding Auditory Imagery with Multivoxel Pattern Analysis** **• Electro-encephalography (EEG)** **• Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction** **• Eye Tracking in Cognitive Experiments** **• Fear Conditioning** **• Finding Your Blind Spot and Perceptual Filling-in** **• Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation** **• Introduction to Catalysis** **• Introduction to Mass Spectrometry** **• Learning and Memory: The Remember-Know Task** **• Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain** **• Metabolic Labeling** **• Motion-induced Blindness** **• Motor Maps** **• Nuclear Magnetic Resonance (NMR) Spectroscopy** **• Pericardiocentesis** **• Peripheral Vascular Exam** **• Peripheral Vascular Exam Using a Continuous Wave Doppler** **• Removal of Branched and Cyclic Compounds by Urea Adduction for Uk'37 Paleothermometry** **• Solid-Liquid Extraction** **• Sonication Extraction of Lipid Biomarkers from Sediment** **• Soxhlet Extraction of Lipid Biomarkers from Sediment** **• Spatial Cueing** **• The Attentional Blink** **• The Rubber Hand Illusion** **• Using Diffusion Tensor Imaging in Traumatic Brain Injury** **• Using TMS to Measure Motor Excitability During Action Observation** **• Visual Attention: fMRI Investigation of Object-based Attentional Control** **• fMRI: Functional Magnetic Resonance Imaging**

GRADE LEVEL EXPECTATION	9-10.7 (F)	Research and describe the environmental and economic impact of the end-products of chemical reactions such as those that may result in acid rain, degradation of water and air quality, and ozone depletion. JoVE • Biofuels: Producing Ethanol from Cellulosic Material • Calibration Curves • Capillary Electrophoresis (CE) • Chromatography-Based Biomolecule Purification Methods • Co-Immunoprecipitation and Pull-Down Assays • Cyclic Voltammetry (CV) • Density Gradient Ultracentrifugation • Dialysis: Diffusion Based Separation • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat • Electrophoretic Mobility Shift Assay (EMSA) • Enzyme Assays and Kinetics • Förster Resonance Energy Transfer (FRET) • Gas Chromatography (GC) with Flame-Ionization Detection • High-Performance Liquid Chromatography (HPLC) • Internal Standards • Introduction to Mass Spectrometry • 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)
TEKS	TX.112.39.	Physics (One Credit).
STUDENT EXPECTATION	(9-12.2)	Scientific processes. The student uses a systematic approach to answer scientific laboratory and field investigative questions. The student is expected to:
GRADE LEVEL EXPECTATION	9-12.2 (F)	Demonstrate the use of course apparatus, equipment, techniques, and procedures, including multimeters (current, voltage, resistance), triple beam balances, batteries, clamps, dynamics demonstration equipment, collision apparatus, data acquisition probes, discharge

		tubes with power supply (H, He, Ne, Ar), hand-held visual spectroscopes, hot plates, slotted and hooked lab masses, bar magnets, horseshoe magnets, plane mirrors, convex lenses, pendulum support, power supply, ring clamps, ring stands, stopwatches, trajectory apparatus, tuning forks, carbon paper, graph paper, magnetic compasses, polarized film, prisms, protractors, resistors, friction blocks, mini lamps (bulbs) and sockets, electrostatics kits, 90-degree rod clamps, metric rulers, spring scales, knife blade switches, Celsius thermometers, meter sticks, scientific calculators, graphing technology, computers, cathode ray tubes with horseshoe magnets, ballistic carts or equivalent, resonance tubes, spools of nylon thread or string, containers of iron filings, rolls of white craft paper, copper wire, Periodic Table, electromagnetic spectrum charts, slinky springs, wave motion ropes, and laser pointers. **JoVE** **• Common Lab Glassware and Uses** **• Community DNA Extraction from Bacterial Colonies** **• Conducting Reactions Below Room Temperature** **• Coordination Chemistry Complexes** **• Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy** **• Determining the Density of a Solid and Liquid** **• Determining the Empirical Formula** **• Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat** **• Freezing-Point Depression to Determine an Unknown Compound** **• Förster Resonance Energy Transfer (FRET)** **• Gas Chromatography (GC) with Flame-Ionization Detection** **• Growing Crystals for X-ray Diffraction Analysis** **• Internal Standards** **• Introduction to Catalysis** **• Introduction to Mass Spectrometry** **• Introduction to the Spectrophotometer** **• Lead Analysis of Soil Using Atomic Absorption Spectroscopy** **• MALDI-TOF Mass Spectrometry** **• Measuring Mass in the Laboratory** **• Metabolic Labeling** **• Method of Standard Addition** **• Nuclear Magnetic Resonance (NMR) Spectroscopy** **• Nutrients in Aquatic Ecosystems** **• Photometric Protein Determination** **• Plasmid Purification** **• Purifying Compounds by Recrystallization** **• Raman Spectroscopy for Chemical Analysis**

		• Solid-Liquid Extraction • Spectrophotometric Determination of an Equilibrium Constant • Tandem Mass Spectrometry • Ultraviolet-Visible (UV-Vis) Spectroscopy • X-ray Fluorescence (XRF) • Yeast Maintenance
GRADE LEVEL EXPECTATION	**9-12.2 (G)**	**Use a wide variety of additional course apparatus, equipment, techniques, materials, and procedures as appropriate such as ripple tank with wave generator, wave motion rope, micrometer, caliper, radiation monitor, computer, ballistic pendulum, electroscope, inclined plane, optics bench, optics kit, pulley with table clamp, resonance tube, ring stand screen, four inch ring, stroboscope, graduated cylinders, and ticker timer.** **JoVE** • Common Lab Glassware and Uses • Community DNA Extraction from Bacterial Colonies • Conducting Reactions Below Room Temperature • Coordination Chemistry Complexes • Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy • Determining the Density of a Solid and Liquid • Determining the Empirical Formula • Förster Resonance Energy Transfer (FRET) • Gas Chromatography (GC) with Flame-Ionization Detection • Growing Crystals for X-ray Diffraction Analysis • Internal Standards • Introduction to Catalysis • Introduction to Mass Spectrometry • Introduction to the Spectrophotometer • Lead Analysis of Soil Using Atomic Absorption Spectroscopy • MALDI-TOF Mass Spectrometry • Making Solutions in the Laboratory • Measuring Mass in the Laboratory • Metabolic Labeling • Method of Standard Addition • Nuclear Magnetic Resonance (NMR) Spectroscopy • Nutrients in Aquatic Ecosystems • Photometric Protein Determination • Plasmid Purification • Purifying Compounds by Recrystallization • Raman Spectroscopy for Chemical Analysis • Regulating Temperature in the Lab: Applying Heat • Regulating Temperature in the Lab: Preserving Samples Using Cold • Solid-Liquid Extraction • Spectrophotometric Determination of an Equilibrium

		Constant • Tandem Mass Spectrometry • Ultraviolet-Visible (UV-Vis) Spectroscopy • Understanding Concentration and Measuring Volumes • X-ray Fluorescence (XRF) • Yeast Maintenance
TEKS	TX.112.39.	Physics (One Credit).
STUDENT EXPECTATION	(9-12.5)	Science concepts. The student knows the nature of forces in the physical world. The student is expected to:
GRADE LEVEL EXPECTATION	9-12.5 (D)	Identify examples of electric and magnetic forces in everyday life. JoVE • 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
GRADE LEVEL EXPECTATION	9-12.5 (E)	Characterize materials as conductors or insulators based on their electrical properties. JoVE • Assembly of a Reflux System for Heated Chemical Reactions
GRADE LEVEL EXPECTATION	9-12.5 (F)	Design, construct, and calculate in terms of current through, potential difference across, resistance of, and power used by electric circuit elements connected in both series and parallel combinations. JoVE • Cyclic Voltammetry (CV) • Electrochemical Measurements of Supported Catalysts Using a Potentiostat/Galvanostat
GRADE LEVEL EXPECTATION	9-12.5 (G)	Investigate and describe the relationship between electric and magnetic fields in applications such as generators, motors, and transformers. JoVE • fMRI: Functional Magnetic Resonance Imaging
TEKS	TX.112.39.	Physics (One Credit).
STUDENT EXPECTATION	(9-12.6)	Science concepts. The student knows that changes occur within a physical system and applies the laws of conservation of energy and momentum. The student is expected to:
GRADE LEVEL EXPECTATION	9-12.6 (E)	Describe how the macroscopic properties of a thermodynamic system such as temperature, specific

		heat, and pressure are related to the molecular level of matter, including kinetic or potential energy of atoms. JoVE • Conducting Reactions Below Room Temperature • Freezing-Point Depression to Determine an Unknown Compound • Ideal Gas Law • Regulating Temperature in the Lab: Applying Heat • Regulating Temperature in the Lab: Preserving Samples Using Cold • The Ideal Gas Law • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
GRADE LEVEL EXPECTATION	9-12.6 (G)	Analyze and explain everyday examples that illustrate the laws of thermodynamics, including the law of conservation of energy and the law of entropy. JoVE • Using Differential Scanning Calorimetry to Measure Changes in Enthalpy
TEKS	TX.112.39.	Physics (One Credit).
STUDENT EXPECTATION	(9-12.7)	Science concepts. The student knows the characteristics and behavior of waves. The student is expected to:
GRADE LEVEL EXPECTATION	9-12.7 (A)	Examine and describe oscillatory motion and wave propagation in various types of media. JoVE • Abdominal Exam II: Percussion • Auscultation • Percussion • Raman Spectroscopy for Chemical Analysis
GRADE LEVEL EXPECTATION	9-12.7 (B)	Investigate and analyze characteristics of waves, including velocity, frequency, amplitude, and wavelength, and calculate using the relationship between wavespeed, frequency, and wavelength. JoVE • Raman Spectroscopy for Chemical Analysis
GRADE LEVEL EXPECTATION	9-12.7 (C)	Compare characteristics and behaviors of transverse waves, including electromagnetic waves and the electromagnetic spectrum, and characteristics and behaviors of longitudinal waves, including sound waves. JoVE • Abdominal Exam II: Percussion • Auscultation • Ear Exam • Nuclear Magnetic Resonance (NMR) Spectroscopy • Percussion

		• Raman Spectroscopy for Chemical Analysis • The Staircase Procedure for Finding a Perceptual Threshold • Ultraviolet-Visible (UV-Vis) Spectroscopy
GRADE LEVEL EXPECTATION	9-12.7 (D)	Investigate behaviors of waves, including reflection, refraction, diffraction, interference, resonance, and the Doppler effect. JoVE • Abdominal Exam II: Percussion • Auscultation • Color Afterimages • Crowding • Finding Your Blind Spot and Perceptual Filling-in • Histological Sample Preparation for Light Microscopy • Inattentional Blindness • Introduction to Fluorescence Microscopy • Introduction to Light Microscopy • Just-noticeable Differences • Motion-induced Blindness • Object Substitution Masking • Percussion • Peripheral Vascular Exam Using a Continuous Wave Doppler • Raman Spectroscopy for Chemical Analysis • Spatial Cueing • Spectrophotometric Determination of an Equilibrium Constant • Surface Plasmon Resonance (SPR) • The Ames Room • The Attentional Blink • The Inverted-face Effect
GRADE LEVEL EXPECTATION	9-12.7 (F)	Describe the role of wave characteristics and behaviors in medical and industrial applications. JoVE • Abdominal Exam I: Inspection and Auscultation • Abdominal Exam IV: Acute Abdominal Pain Assessment • An Introduction to Behavioral Neuroscience • An Introduction to Cognition • An Introduction to Learning and Memory • An Introduction to Motor Control • An Introduction to Neuroanatomy • An Introduction to Neurophysiology • An Overview of Alkenone Biomarker Analysis for Paleothermometry • An Overview of bGDGT Biomarker Analysis for Paleoclimatology • Auscultation • Central Venous Catheter Insertion: Femoral Vein with

		Ultrasound Guidance **• Central Venous Catheter Insertion: Internal Jugular with Ultrasound Guidance** **• Color Afterimages** **• Conversion of Fatty Acid Methyl Esters by Saponification for Uk'37 Paleothermometry** **• Cranial Nerves Exam I (I-VI)** **• Decision-making and the Iowa Gambling Task** **• Decoding Auditory Imagery with Multivoxel Pattern Analysis** **• Determination Of Nox in Automobile Exhaust Using UV-VIS Spectroscopy** **• Ear Exam** **• Electro-encephalography (EEG)** **• Emergent Lateral Canthotomy and Inferior Catholysis** **• Event-related Potentials and the Oddball Task** **• Extraction of Biomarkers from Sediments - Accelerated Solvent Extraction** **• Eye Exam** **• Eye Tracking in Cognitive Experiments** **• Fear Conditioning** **• Finding Your Blind Spot and Perceptual Filling-in** **• Growing Crystals for X-ray Diffraction Analysis** **• Histological Sample Preparation for Light Microscopy** **• Intra-articular Shoulder Injection for Reduction Following Anterior Shoulder Dislocation** **• Introduction to Catalysis** **• Introduction to Fluorescence Microscopy** **• Introduction to Light Microscopy** **• Introduction to Mass Spectrometry** **• Language: The N400 in Semantic Incongruity** **• Lead Analysis of Soil Using Atomic Absorption Spectroscopy** **• Learning and Memory: The Remember-Know Task** **• Measuring Grey Matter Differences with Voxel-based Morphometry: The Musical Brain** **• Metabolic Labeling** **• Motion-induced Blindness** **• Motor Maps** **• Nutrients in Aquatic Ecosystems** **• Ophthalmoscopic Examination** **• Percussion** **• Pericardiocentesis** **• Peripheral Vascular Exam** **• Peripheral Vascular Exam Using a Continuous Wave Doppler** **• Physical Properties Of Minerals I: Crystals and Cleavage** **• Protein Crystallization** **• Purifying Compounds by Recrystallization** **• Raman Spectroscopy for Chemical Analysis** **• Removal of Branched and Cyclic Compounds by Urea**

		Adduction for Uk'37 Paleothermometry • Rodent Stereotaxic Surgery • Solid-Liquid Extraction • Sonication Extraction of Lipid Biomarkers from Sediment • Soxhlet Extraction of Lipid Biomarkers from Sediment • Spatial Cueing • Surface Plasmon Resonance (SPR) • The Attentional Blink • The Rubber Hand Illusion • The Staircase Procedure for Finding a Perceptual Threshold • Turbidity and Total Solids in Surface Water • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Using TMS to Measure Motor Excitability During Action Observation • Visual Attention: fMRI Investigation of Object-based Attentional Control • X-ray Fluorescence (XRF) • fMRI: Functional Magnetic Resonance Imaging
TEKS	**TX.112.39.**	**Physics (One Credit).**
STUDENT EXPECTATION	**(9-12.8)**	**Science concepts. The student knows simple examples of atomic, nuclear, and quantum phenomena. The student is expected to:**
GRADE LEVEL EXPECTATION	9-12.8 (B)	Compare and explain the emission spectra produced by various atoms. JoVE • 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 • Method of Standard Addition • Nuclear Magnetic Resonance (NMR) Spectroscopy • Raman Spectroscopy for Chemical Analysis • Tandem Mass Spectrometry • X-ray Fluorescence (XRF)
GRADE LEVEL EXPECTATION	9-12.8 (D)	Give examples of applications of atomic and nuclear phenomena such as radiation therapy, diagnostic imaging, and nuclear power and examples of applications of quantum phenomena such as digital cameras. JoVE • An Introduction to Behavioral Neuroscience

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

		• Ultraviolet-Visible (UV-Vis) Spectroscopy • Using Diffusion Tensor Imaging in Traumatic Brain Injury • Using TMS to Measure Motor Excitability During Action Observation • Visual Attention: fMRI Investigation of Object-based Attentional Control • X-ray Fluorescence (XRF) • Yeast Maintenance • fMRI: Functional Magnetic Resonance Imaging