# JoVE Science Education Catalog

JoVE Science Education is a powerful tool and a comprehensive database of science videos designed to teach laboratory fundamentals through simple, easy to understand demonstrations. Each collection includes 15 educational videos demonstrating fundamental concepts and experimental methods in a specific discipline.

Available products include:

- Basic Biology
- Advanced Biology
- Psychology
- Environmental Sciences
- Chemistry (New!)
- Basic Clinical Medicine Skills (Coming September 2016)
- Clinical Skills

## Basic Biology

### SE1: GENERAL LABORATORY TECHNIQUES

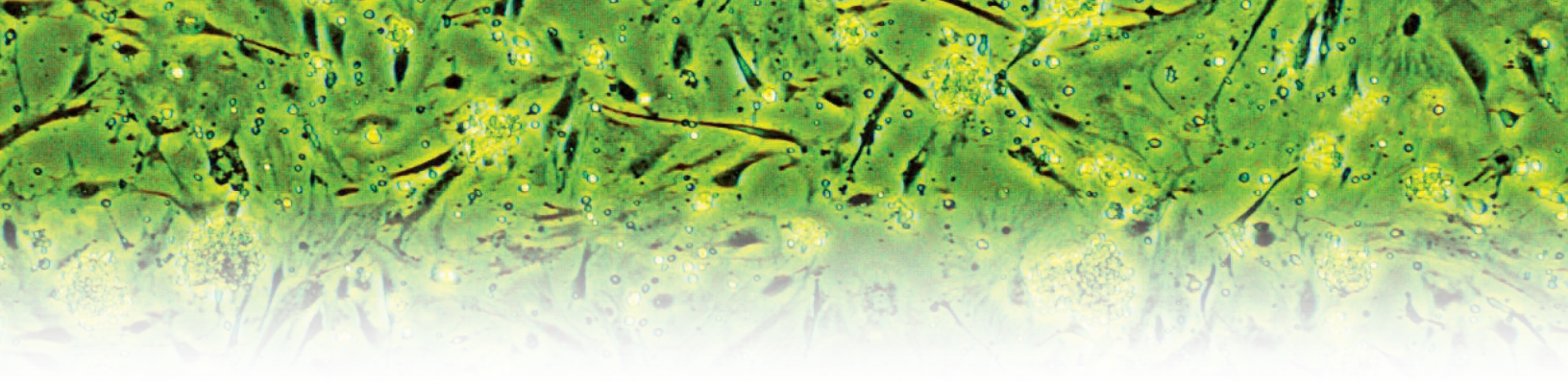
This premier collection illustrates how to use standard pieces of laboratory equipment essential to many experiments, as well as how to perform basic laboratory functions. *Topics include:*

- Introduction to Working in the Hood
- Measuring Mass in the Laboratory
- Making Solutions in the Laboratory
- Understanding Concentration and Measuring Volumes
- Introduction to the Spectrophotometer
- Introduction to Fluorescence Microscopy
- Introduction to Light Microscopy
- Histological Sample Preparation for Light Microscopy
- Regulating Temperature in the Lab: Preserving Samples Using Cold
- Regulating Temperature in the Lab: Applying Heat
- Introduction to the Centrifuge
- Introduction to the Microplate Reader
- Introduction to the Bunsen Burner
- Introduction to the Micropipettor
- Introduction to Serological Pipettes and Pipettors

### SE2: BASIC METHODS IN CELLULAR AND MOLECULAR BIOLOGY

This collection demonstrated basic techniques commonly used in cellular and molecular biology. *Topics include:*

- Using a Hemacytometer to Count Cells
- Passaging Cells
- PCR: The Polymerase Chain Reaction
- DNA Gel Electrophoresis
- Separating Protein with SDS-PAGE
- Bacterial Transformation: Electroporation
- Bacterial Transformation: The Heat Shock Method
- The ELISA Method
- Plasmid Purification
- Gel Purification
- The Western Blot
- Introduction to Transfection
- DNA Ligation Reactions
- Restriction Enzyme Digests
- Molecular Cloning



## SE3: ESSENTIALS OF BIOLOGY I: YEAST, DROSOPHILA AND C. ELEGANS

Three model organisms commonly used in life sciences research are highlighted: *S. cerevisiae* (baker's yeast), *D. melanogaster* (the fruit fly), and *C. elegans* (nematode roundworm). In addition to discussing the current and historical significance of these organisms, this collection includes concepts and methodology relating to how they are maintained and reproduce in the laboratory. *Topics include:*

***S. cerevisiae* (Baker's Yeast)**
- Introduction
- Maintenance
- Reproduction
- Isolating Nucleic Acids
- Transformation and Cloning

***D. melanogaster* (Fruit Fly)**
- Introduction
- Maintenance and Care
- Development and Reproduction
- Larval Immunohistochemistry
- Embryo and Larva Harvesting and Preparation

***C. elegans* (Nematode Roundworm)**
- Introduction
- Maintenance
- Development and Reproduction
- RNAi in C. elegans
- Chemotaxis Assay

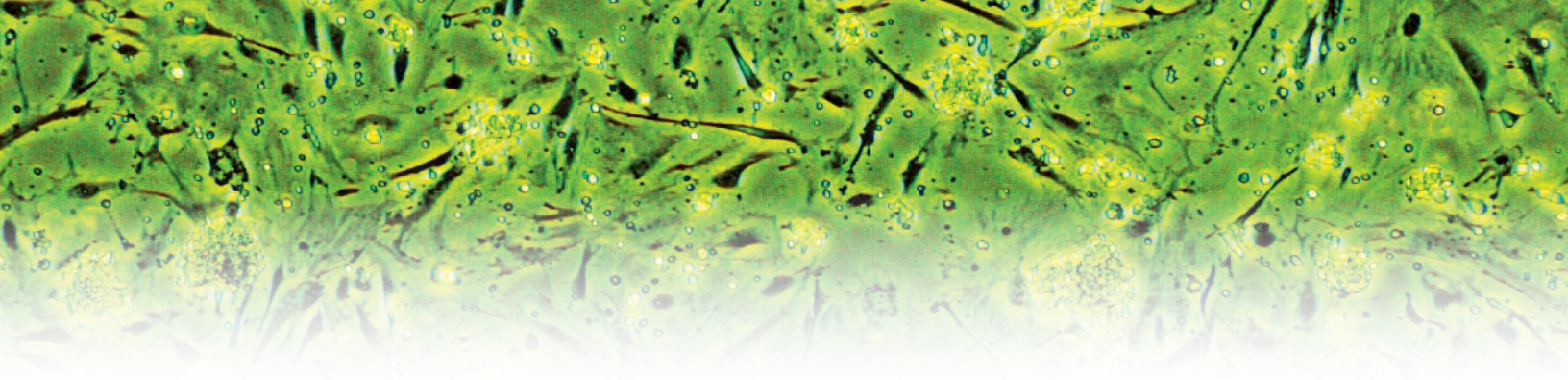
## SE4: ESSENTIALS OF BIOLOGY II: MOUSE, ZEBRAFISH AND CHICK

Three vertebrate species commonly used in life sciences research are featured: *M. musculus* (laboratory mouse), *G. g. domesticus* (chick), and *D. rerio* (zebrafish). In addition to discussing the current and historical significance of these organisms, this collection includes methodology relating to how they are maintained in the laboratory and reviews important concepts relating to their development. *Topics include:*

***M. musculus* (Laboratory Mouse)**
- Introduction
- Care and Maintenance
- Reproduction and Development
- Mouse Genotyping
- Introducing Experimental Agents Into the Mouse

***G. g. domesticus* (Chick)**
- Introduction
- Care and Maintenance
- Development
- *In ovo* Elewctroporation
- *Ex ovo* Culture

***D. rerio* (Zebrafish)**
- Introduction
- Maintenance and Husbandry
- Reproduction and Development
- Breeding and Embryo Handling
- Microinjection Techniques



## Advanced Biology

### SE5: ESSENTIALS OF NEUROSCIENCE

An introduction to neuroscience at a professional level, this collection offers an exploration of five major branches of study: neurophysiology, neuroanatomy, cell and molecular neuroscience, behavioral neuroscience, and developmental neuroscience. In addition to presenting the key questions asked by scientists from these subfields, this collection describes prominent methods used today, while describing exciting discoveries regarding nervous system function. *Topics include:*

**Neurophysiology**
- Introduction to Neurophysiology
- Patch Clamp Electrophysiology
- Calcium Imaging in Neurons

**Neuroanatomy**
- Introduction to Neuroanatomy
- Rodent Stereotaxis Surgery
- Histological Staining of Neural Tissue

**Developmental Neurobiology**
- Introduction to Neurobiology
- Murine *In utero* Electroporation
- Explant Cultures of Neural Tissue

**Behavioral Neuroscience**
- Introduction to Behavioral Neuroscience
- Morris Water Maze
- fMRI: Functional Magnetic Resonance Imaging

**Cellular and Molecular Neuroscience**
- Introduction to Cellular and Molecular Neuroscience
- Primary Neuronal Cultures
- Neural Transfection Methods

### SE6: ESSENTIALS OF DEVELOPMENTAL BIOLOGY

Developmental Biology researchers endeavor to understand the developmental processes that occur in organisms at every stage, starting from the single-celled embryo to the aging adult. The following videos provide a brief history of developmental biology research and discuss the common lab techniques used to answer key questions asked by experts in this field. *Topics include:*

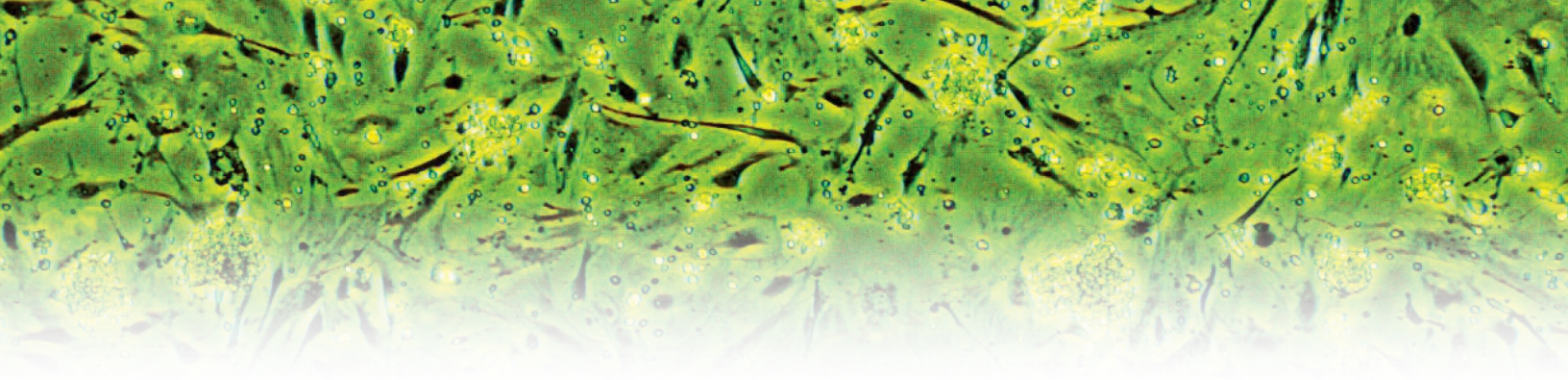
**Developmental Genetics**
- An Introduction to Developmental Genetics
- Gene Silencing with Morpholinos
- Genetic Engineering of Model Organisms

**Molecular Developmental Biology**
- An Introduction to Molecular Developmental Biology
- Explant Culture for Developmental Studies
- Whole-mount *In situ* Hybridization

**Stem Cell Biology**
- An Introduction to Stem Cell Biology
- Embryonic Stem Cell Culture and Differentiation
- Induced Pluripotency

**Organogenesis**
- An Introduction to Organogenesis
- Fate Mapping
- Transplantation Studies

**Aging and Regeneration**
- An Introduction to Aging and Regeneration
- Invertebrate Lifespan Quantification
- Tissue Regeneration with Somatic Stem Cell



## SE8: ESSENTIALS OF GENETICS

The physical and behavioral traits of all living organisms are shaped by the genetic information they inherit from their parents. This collection focuses on how genes build traits and how they are passed down from generation to generation. The videos highlight important discoveries and basic concepts of each field, introduce key questions being asked by geneticists today, and discuss common tools and experimental approaches used to study and manipulate genes. *Topics include:*

**Genetics Analysis**
- An Overview of Genetics Analysis
- Genetic Crosses
- Genetic Screens

**Genetics and Disease**
- An Overview of Genetics and Disease
- SNP Genotyping
- Cytogenetics

**Gene Expression**
- An Overview of Gene Expression
- Expression Profiling with Microarrays
- RNA-Seq

**Epigenetics**
- An Overview of Epigenetics
- DNA Methylation Analysis
- Chromatin Immunoprecipitation

**Genetic Engineering**
- An Overview of Genetic Engineering
- Recombineering and Gene Targeting
- Genome Editing

## SE9: ESSENTIALS OF CELL BIOLOGY

Despite the first observation of cells in the 1600s, scientists are still trying to decipher the questions related to the structure, growth, division, function, and dysfunction of cells. This collection profiles five important cellular phenomena: cell division, motility, endo- and exocytosis, metabolism, and cell death. The videos review some of the landmark discoveries associated with these phenomena, highlight a few unanswered questions, and introduce the prominent methods used in cell biology labs today. *Topics include:*

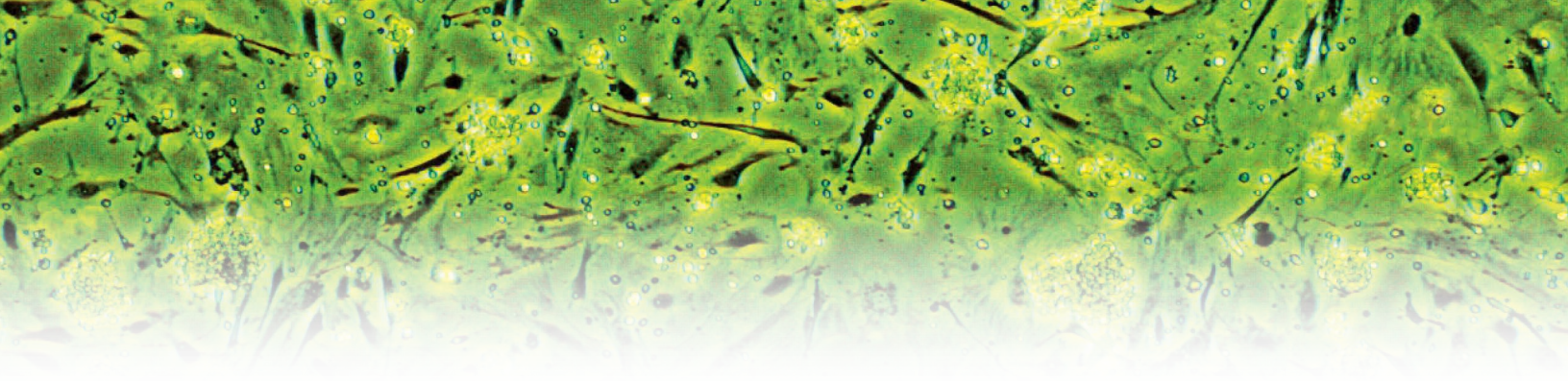
**Cell Division**
- An Introduction to Cell Division
- Cell Cycle Analysis
- Live Cell Imaging of Mitosis

**Cell Motility and Migration**
- An Introduction to Cell Motility and Migration
- The Transwell Migration Assay
- Invasion Assay Using 3D Matrices

**Endocytosis and Exocytosis**
- An Introduction to Endocytosis and Exocytosis
- Cell-surface Biotinylation Assay
- FM Dyes in Vesicle Recycling

**Cell Death**
- An Introduction to Cell Death
- Annexin V and Propidium Iodide Labeling
- The TUNEL Assay

**Cell Metabolism**
- An Introduction to Cell Metabolism
- The ATP Bioluminescence Assay
- Detecting Reactive Oxygen Species



## Psychology

### SE7: ESSENTIALS OF BEHAVIORAL SCIENCE

Behavior is a complex phenomenon and scientists are trying to decode the neural mechanisms that our systems produce, and that are affected by behavior. An overview of the neurobiology of behavior, concepts behind prominent techniques, important questions being asked by scientists, and protocols to run behavioral experiments are addressed. *Topics include:*

**Learning and Memory**
- An Introduction to Learning and Memory
- Fear Conditioning
- Spatial Memory Testing Using Mazes

**Cognition**
- An Introduction to Cognition
- Electroencephalography (EEG)
- Eye Tracking in Cognitive Experiments

**Motor Control**
- An Introduction to Motor Control
- Balance and Coordination Testing
- Assessing Dexterity with Reaching Tasks

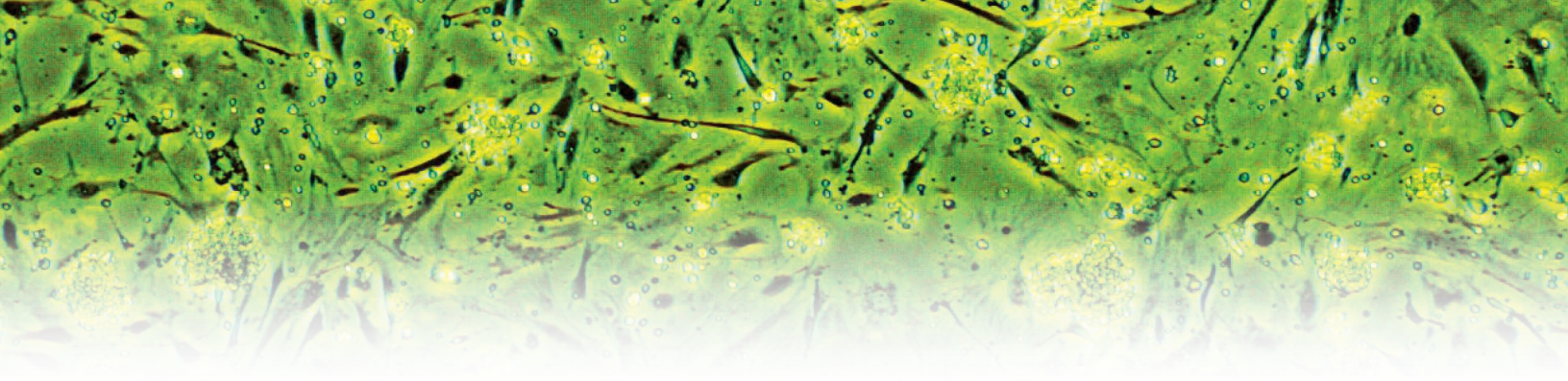
**Reward and Addiction**
- An Introduction to Reward and Addiction
- Positive Reinforcement Studies
- Self-administration Studies

**Modeling Behavioral Disorders and Stress**
- An Introduction to Modeling Behavioral Disorders and Stress
- Modeling Social Stress
- Anxiety Testing

### SE10: ESSENTIALS OF EXPERIMENTAL PSYCHOLOGY

This collection provides a framework for observing how psychological experiments are embedded in the actual process - from initial design to formulating conclusions. Understanding the methodology - how experimental psychologist arrive at conclusions - is as important as the facts and conclusions themeselves. This video series supports such learning, as a number of topics are creatively explained, ranging from the use of confederates to placebo effects and ethical considerations.

- Creativity in Designing Experiments
- Ethics in Psychology Research
- Perspectives on Experimental Psychology
- Realism in Research
- Pilot Testing
- Observational Research
- The Two-group Experiment
- The Multi-group Experiment
- Within-subjects Repeated-measures Design
- The Factorial Experiment
- Self-report vs. Behavioral Measures
- Reliability in Psychology Experiments
- Placebos in Research
- Embodiment
- Confederates in Research



## SE11: ESSENTIALS OF COGNITIVE PSYCHOLOGY

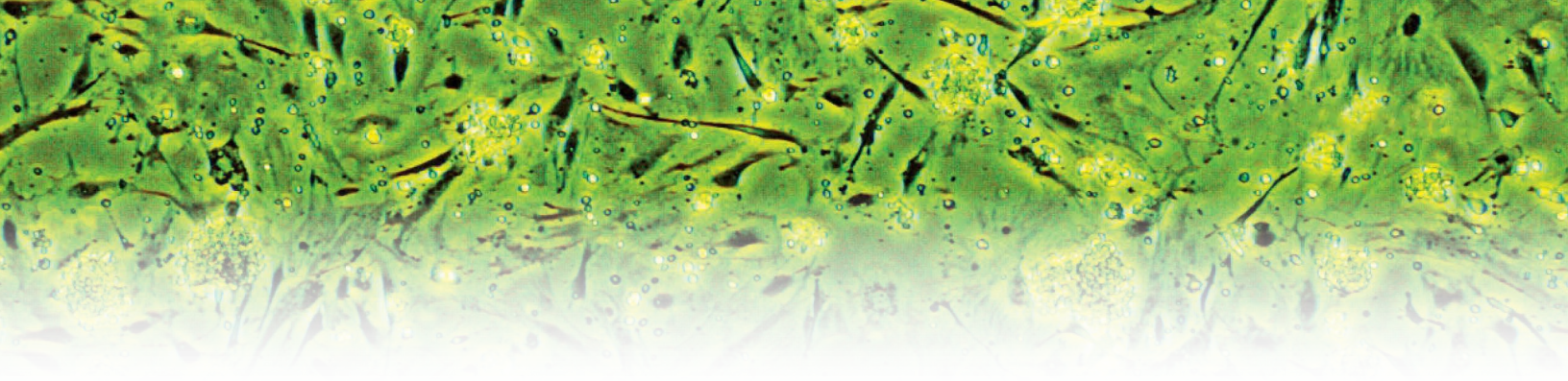
This collection describes a number of influential paradigms used to study complex mental processes underlying attention, perception, and learning and memory. The videos illustrate the chronology of experiments—how to design stimuli and obtain data for both simple, pen-and-paper approaches to more involved computer-based executions.

- Dichotic Listening
- Method of Subtraction
- Perspectives on Cognitive Psychology
- Visual Search
- Binocular Rivalry
- Multiple Object Tracking
- Approximate Number Sense Test
- Mental Rotation
- Prospect Theory
- Verbal Working Memory Span
- Delayed Estimation
- Verbal Priming
- Incidental Encoding
- Visual Statistical Learning
- Mirror Drawing

## SE14: ESSENTIALS OF DEVELOPMENTAL PSYCHOLOGY

This collection demonstrates key experimental approaches in studies of attention and perception, reasoning, social learning, and memory processes-highlighting the dynamic changes that emerges throughout infancy and childhood. Based upo many classic studies in the field, this series creatively illuminates the unique challenges in investigation of developmental processes, including how to study infants before they can talk, and how repeated questioning can lead children to form false memories.

- Habituation
- Rational Imitation
- Self-awareness
- Numerical Cognition
- Mutual Exclusivity
- Casual Reasoning
- Metacognition
- Excecutive Function
- Categories and Inductive Inferences
- Natural Pedagogy
- Influence of Task Demands
- Reliance on Intentions
- Measuring Trust
- Influence of Praise on Motivation
- False Memories



## Environmental Sciences

### SE12: ESSENTIALS OF ENVIRONMENTAL SCIENCE

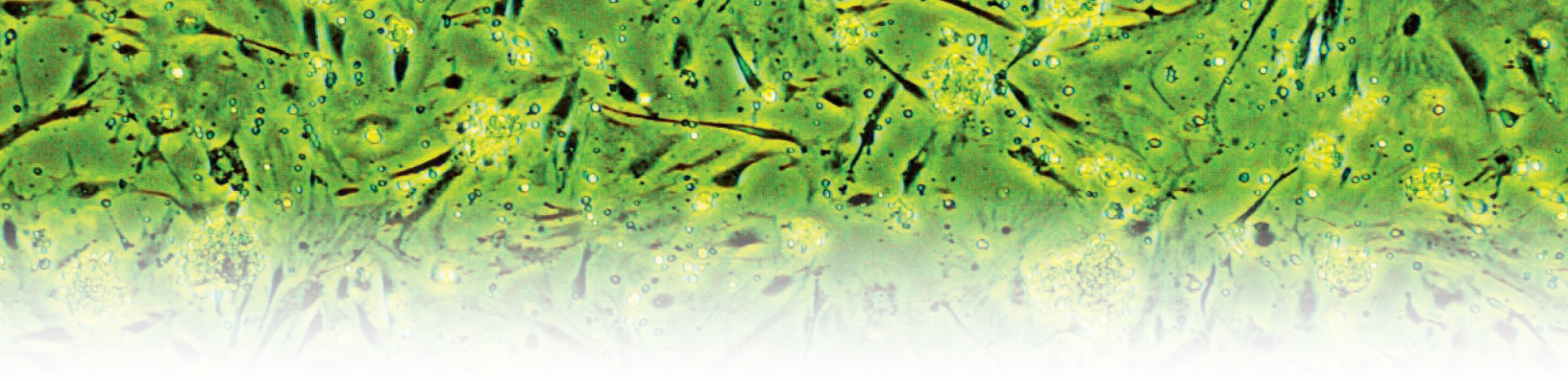
The twelfth collection of the JoVE Science Education series utilizes an interdisciplinary approach to exploring and evaluating environmental systems. This collection provides a framework for understanding and studying key aspects of the environment and for identifying and measuring environmental phenomena. These videos enables the viewer to look deeper into environmental issues by highlighting important topics ranging from soil and water contaminants and inasive species to alternative energy and forestry.

- Tree Identification
- Forest Survey
- Urban Forestry
- Fuel Cell Assembly
- Biofuel Production
- Testing for GM foods
- Turbudity and Total soils
- Measuring Dissolved Oxygen
- Nutrients in Aquatic Ecosystems
- Tropospheric Ozone
- Determination of NOx
- Lead Analysis of Soil
- Elemental Analysis of Soil
- Soil Nutrient Analysis
- Analysis of Earthworm Populations

### SE13: ESSENTIALS OF ENVIRONMENTAL MICROBIOLOGY

The microbial communities in the environment play essential roles in the Earth's ecosystems. This collection provides and introduction to these processes and communities, highlighting microbiological roles and systems including fungi, bacteria, viruses, and algae. These videos also explore common methods used to study environmental microbiology, including Gram staining, DNA extraction, the polymerase chain reaction, culturing, and enumeration techniques.

- Moisture in Soil
- Aseptic Technique
- Gram Staining
- Soil Microorganism
- Filamentous Fungi
- DNA Extraction from Soil
- Environmental PCR
- Reverse Transcription - PCR
- Quantitative PCR
- Water Quality Analysis
- Indicator Organisms by Filtration
- Bacteriophages
- Bacterial Enumeration
- Growth Curves
- Algae Enumeration



## SE15: ESSENTIALS OF EARTH SCIENCE

JoVE's Essentials of Earth Science is comprehensive collection featuring topics that range from geology to geochemistry. Several videos are dedicated to the analysis of large-scale rock formations, and illustrate how geologic cross section can be generated and then analyzed, in order to provide information about subsurface structure. On the smaller scale, othe videos examine the physical and chemical properties of minerals, including crystal formation and cleveage. With respect to geochemistry, this collection presents a series of methods aimed to isolate and quantify lipid biormarkers for paleoclimatology - the study of Earth's climate millions of years ago. Taken together, these geochmistry experiments demonstrate to students how a s series of techniques synergize to achieve and overall experimental goal. *Topics include:*

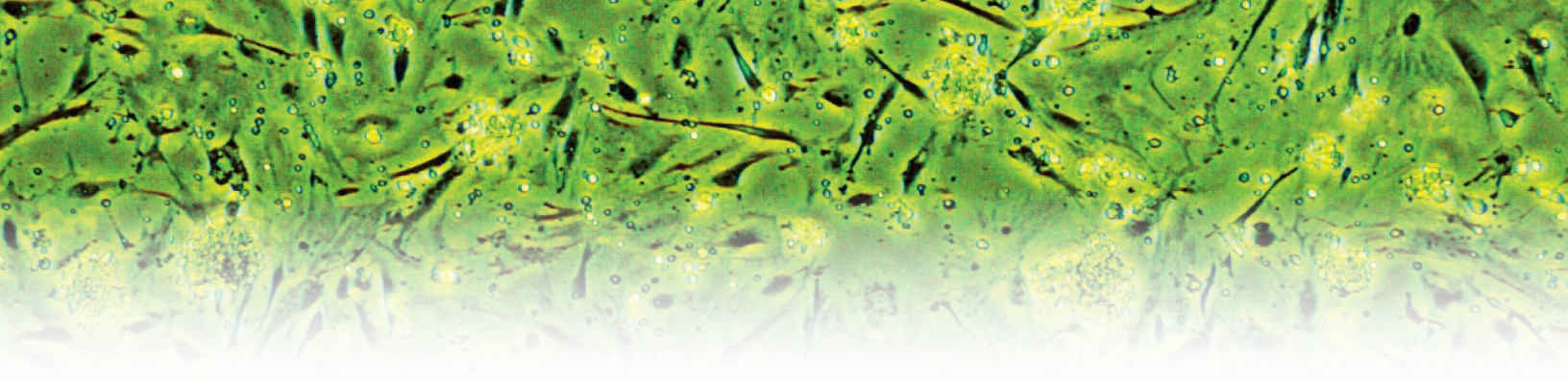
- Brunton Compass
- Topographic Profiles
- Geologic Cross-Sections
- Properties of Mineralls I
- Properties of Mineralls II
- Igneous Volcano Rocks
- Igneous Intrusive Rocks
- MBT/CBT Paleothermometry
- Uk'37 Paleothermometry
- Sonication Biomarker Extraction
- Soxhlet Biomarker Extration
- Saponification of FAMEs
- Column Chromatography for Paleoclimatology
- Urea Adduction for Paleoclimatology

# Chemistry

## SE16: ESSENTIALS OF GENERAL CHEMISTRY

The JoVE General Chemistry collection has three main goals: to showcase basic chemistry lab techniques, demonstrate commonly used equipment, and explore the theory behind fundamental methodology. Videos highlight practical topics, such as an introduction to common glassware, as well as the conceptual, like the experimental demonstration of the ideal gas law. As a whole, this collection provides the student with a solid foundation in General Chemistry to take forward into the laboratory.

- Common Glassware
- Solutions ad Concetration
- Density
- Empirical Formula
- Mass Percent
- Freeze-Point Depression
- Turbudity and Total soils
- pH Meter
- Titration
- Chemical Equilibrium
- Le Chatelier's Principle
- Ideal Gas Law
- Enthalpy
- Rate Laws
- Solubility Rules



## SE17: ESSENTIALS OF ORGANIC CHEMISTRY

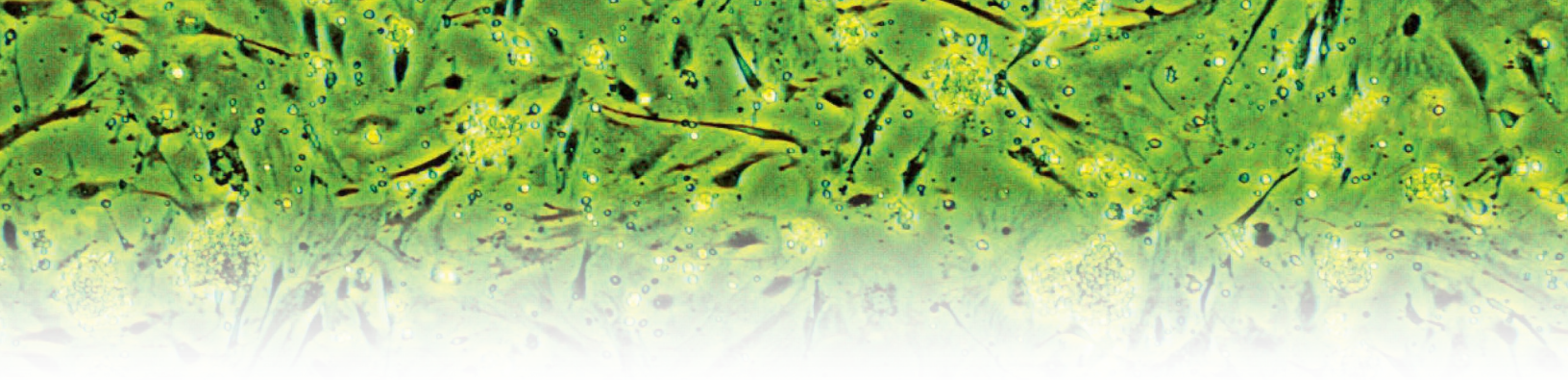
JoVE Organic Chemistry profiles the techniques and procedures routinely used in the organic chemistry lab. Videos focus on regulating temperature and atmosphere during reactions, as well as post-reaction refinement, through methods like distillation and rotary evaporation. Finally, common qualitative analysis is demonstrated through videos exploring chromatography and nuclear magnetic resonance spectroscopy.

- Catalysis
- Reflux System
- Reactions below Room Temperature
- Degassing Solvents
- The Schlenk Line
- Anhydrous Reagents
- Growing Cyrstals for Crystallography
- Recrystallation
- Separation of Mixtures
- Rotary Evaporation
- Solid-Liquid Extraction
- Fractional Distillation
- Thin Layer Chromatography
- Nuclear Magnetic Resonance Spectroscopy
- Column Chromatography

## SE18: ESSENTIALS OF ANALYTICAL CHEMISTRY

JoVE Analytical Chemistry takes a broad look at quantitative analysis. The first set of videos focus on sample handling, covering correct preparation, and minimization of sample loss. Subsequent videos cover a wide range of instrumentation including those used in electrochemistry, spectroscopy, chromatography, and mass spectrometry. Altogether, this collection provides a robust guide to sample handling and measurement in the chemistry laboratory.

- Sample Preparation
- Internal Standards
- Standard Additions
- Calibration Curves
- UV-Vis Spectroscopy
- Raman Spectroscopy
- X-ray Fluorescene
- Gas Chromatography
- High Performance Liquid Chromatography
- Ion-Exchange Chromatography
- Capillary Electrophoresis
- Mass Spectrometry
- Scanning Electron Microscopy
- Potentiometry
- Cyclic Voltammetry



## Clinical Skills

### SE19: ESSENTIALS OF PHYSICAL EXAMINATIONS I

JoVE's premier Clinical Skills collection provides the foundation for performing physical exams. The collection begins by introducing several universal concepts such as inspection, palpation, percussion, and auscultation. Techniques for measuring blood pressure and other vital signs are then demonstrated. Finally, the collection culminates with key pulmonary and cardiovascular physical exam techniques that can greatly assist in bedside diagnosis.

- General Approach to the Physical Exam
- Observation and Inspection
- Palpation
- Percussion
- Auscultation
- Proper Adjustment of Patient Attire during the Physical Exam
- Blood Pressure Measurement
- Measuring Vital Signs
- Respiratory Exam I
- Respiratory Exam II
- Cardiac Exam I
- Cardiac Exam II
- Cardiac Exam III
- Peripheral Vascular Exam
- Peripheral Vascular Exam Using a Continuous Wave Doppler

### SE20: ESSENTIALS OF PHYSICAL EXAMINATIONS II

JoVE Clinical Skills becomes more specialized in the second edition of the series. First, we provide methodology for performing the HEENT exams. We then proceed to demonstrate a series of abdominal exams, including the assessment of acute abdominal pain. Finally, the collection delves into some sensitive procedures such as the male rectal exam, comprehensive breast assessment and evaluation of female pelvic structures.

- Eye Exam
- Ophthalmoscopic Examination
- Ear Exam
- Nose, Sinuses, Oral Cavity and Pharynx Exam
- Thyroid Exam
- Lymph Node Exam
- Abdominal Exam I
- Abdominal Exam II
- Abdominal Exam III
- Abdominal Exam IV
- Male Rectal Exam
- Breast Exam
- Pelvic Exam I
- Pelvic Exam II
- Pelvic Exam III

## ABOUT JOVE

JoVE is the world's first PubMed-indexed scientific video journal. Its mission is to advance scientific research and education by increasing productivity, reproducibility, and efficiency of knowledge transfer for scientists, educators, and students worldwide through visual learning solutions. Today, JoVE has published over 5,000 video articles from institutions including Harvard, Stanford, MIT, and the NIH. These video articles present cutting-edge research in over a dozen different fields of study and are viewed by millions of users in over 900 institutions around the globe. Visit www.jove.com or call +1.617.401.7701 to learn more.