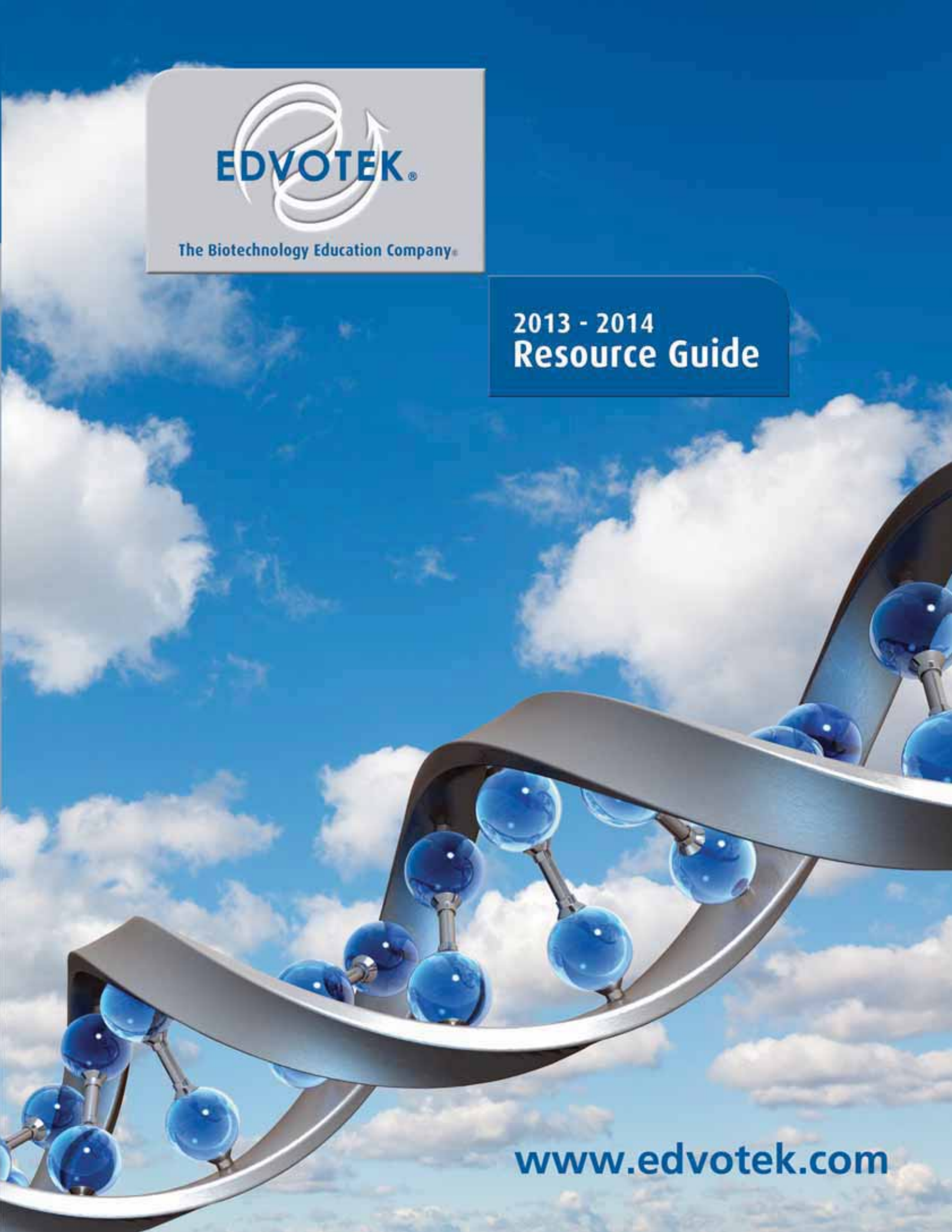
EDVOTEK®

The Biotechnology Education Company®

2013 - 2014
Resource Guide



www.edvotek.com

Our Philosophy

Teaching should always be fun
Learning should always be enjoyable

Experiments should foster learning
Preparation should always be easy

Science shouldn't be expensive
The environment shouldn't suffer

Lessons should always be relevant
Science should never be called boring

DNA is nothing to be scared of
Science is a way of life

This catalog is printed on paper from sustainable sources

Contents

EDVOTEK®

Quantity of lab groups per kit | Time required | Product order number | Related products

*Advanced Placement Program is a registered trademark of the College Entrance Examination Board.

eco friendly education

Science Education that Doesn't Cost the Earth!

what have we done so far?

- We reduced our Resource Guide by a third. This saves a huge amount of paper!
- The reduced weight of our Resource Guide means less energy was used to transport this copy to you.
- We use wood-free or near wood-free paper for the Resource Guide.
- We now send more direct shipments to our customers. This greatly improves our service and helps the environment.
- We use recycled cardboard in our kit box outer packaging.
- We recycle all our toner cartridges and paper.
- Employees commute using public transportation to further reduce our carbon footprint. We also encourage people to walk, jog, and bicycle. Several of our employees telecommute.
- We moved into a renovated historic building centrally located in downtown Washington, DC. Reusing an existing structure saves a tremendous amount of energy! We also installed state-of-the-art high efficiency energy and water systems throughout.
- We are now offering professional development courses on-site, and our new building sits at the nexus of multiple public and private transportation networks for green convenience.

what will we do next?

- Reduce our use of plastics & non-recyclable materials in our kits.
- Plant trees and take part in projects that enable us to offset our carbon emissions.
- Provide our instruction manuals online so less paper is used.
- Use recycled paper or wood-free paper.
- We feel that it is through small changes by many rather than grand actions by few that will make the difference.

We Partner with You...

from professional development to the sharing of our best products, we are always with you every step along the way!

- **EDVOTEK® Professional Development Workshops!**
  Learn cutting-edge techniques and best practices from our experienced team of bioeducation specialists!
- **Science Conferences**
  Join us at science education conferences around the country to stay abreast of the latest in biotechnology education.
- **On-Site**
  Partner with Edvotek bioeducation specialists to develop a curriculum tailored to your needs, which they then teach at your institution.
- **EDVOTEK® Biotech Institute**
  Attend professional development classes to update your skills at EDVOTEK's state-of-the-art facility located in downtown Washington, DC.

The new EDVOTEK headquarters in Washington, DC

EDVOTEK®

Thank you for 25 years of support!

What's New?

Biotech Made EASY!
QuickStrips™ are pre-aliquoted samples saving prep time! InstaStain® is a faster, safer and less messy way to stain gels! DuraGels™ are reusable plastic gels similar to the real thing for practice pipetting!

New UV Transilluminators!
Midrange UV transilluminator with a 7x14 cm viewing area and a UV blocking cover for $499! See p. 112!

MegaCycler™
Taking Classroom PCR one step further! NEW 49-place block! See p. 110!

MATH • SCIENCE • TECH - NOLOGY • ENGINEERING •

STEM-based Experiments
Students explore principles of:
Science
Technology
Engineering &
Mathematics!

Worms!
Three new experiments explore the behavior of ***C. elegans!***
See p. 82-83!

SYBR® Safe, an ultra-sensitive dye, that is safe for the biotechnolgy classroom! See p. 123!

TetraSource™ 300
Power any combination of electropohoresis units with this mighty supply. See p. 107!

NEW Cell Culture Experiment
Lean basics of cell culture as a platform for studies on viability and cell growth. See p. 68!

BactoBeads™ - All you need to do is to place a BactoBead™ on the agar plate, watch it dissolve, and streak for isolated colonies. See p. 125!

BIG IDEA AP BIOLOGY

AP CLASSIC™ Biology

NEW AP Biology Labs
Bring AP's new curriculum to your classroom! See p. 94.

SECTION ONE

1 Introduction to DNA

We have discovered the secret of life!

FRANCIS CRICK, AT THE EAGLE PUB, CAMBRIDGE, 28TH FEBRUARY 1953

In The Beginning...

The starting point for every molecular biology experiment is the extraction of DNA.

This was as true of Watson and Crick's unravelling of the DNA double helix structure as it was of the much more recent Human Genome Project. It is still true of present day DNA research and key to DNA fingerprinting, genetic testing and genetic engineering. Thus, it is important for students to understand how this fundamental technique is carried out.

It is also amazing to see DNA for the first time! Your students will enjoy extracting DNA from fruit and vegetables. However it's even more exciting for your students to see their own DNA as they can with our Genes in a Tube™ Kit. This will also help to de-mystify DNA for students, in contrast to its mythical portrayal in the media.

However, DNA extraction was just the beginning. By understanding its structure, the genetic code was revealed and this led to more complete understanding of transcription and translation today.

To help your students understand the molecular nature of life, our Genes of Fortune™ and Genetic Dice™ games explain the genetic code. To enhance these concepts further, your students can use our colorful models of DNA, RNA and protein synthesis.

We hope you enjoy helping your students discover the secret of life for themselves!

The Basics

What Does DNA Look Like?

BEST SELLER

This fun and easy lab activity shows your students what real chromosomal DNA looks like and allows them to explore the procedures involved in DNA extraction. Just overlay with 95% ethanol or isopropyl alcohol and spool the DNA on the glass rod!

For 10 Lab Groups
Complete in 30 minutes
Cat. #S-10
(Formerly Cat. #107)

Kit includes: instructions, DNA extraction buffer, DNA sample in capped test tube, transfer pipets, minilinks, glass rod, DNA spooling rods, test tubes, salt.

All you need: pipet, beakers, isopropanol, distilled water, ice.

How Do You Clone A Gene?

In this kit, a set of multicolored links demonstrate a variety of molecular biology simulations. Students learn about digesting DNA with restriction enzymes, cloning genes in plasmids, protein structure and more!

For 5 Lab Groups
Complete in 30 minutes
Cat. #S-20

Kit includes: instructions, molecular biology models, small plastic bags.

All you need: Your students!

What is Osmosis?

Students will be introduced to the principles of osmosis. Activities will be performed utilizing dialysis tubing and various concentrations of salt. Dyes of different molecular weights will also be used to visually demonstrate the size selectivity of membranes.

For 10 Lab Groups
Complete in 45 minutes
Cat. #S-74

Kit includes: instructions, high & low molecular weight dyes, dialysis tubing, transfer pipets.

All you need: 300-400 ml beakers, table salt, apple and beet juice, distilled water.

Genes in a Tube™

Teach your students how to extract and spool their own DNA in this exciting and easy activity. Students can transfer their DNA to a tube that can be used as a pendant on a necklace!

For 26 students
Complete in 30 minutes
Cat. #119

Kit includes: instructions, lysis buffer, NaCl solution, Protease, Tris buffer, FlashBlue™ solution, microcentrifuge tubes, sterile cotton tipped applicators, transfer pipets, tubes for DNA precipitation, Gene Tubes™, and string.

All you need: ice cold ethanol or isopropanol, waterbath, test tube rack.

Do Onions, Strawberries and Bananas Have DNA?

Your students can construct DNA models and then extract DNA from onions, strawberries or bananas. You provide the fruit or vegetables and 95-100% isopropyl alcohol, your students extract DNA.

For 10 Lab Groups
Complete in 30 minutes
Cat. #S-75

Kit includes: instructions, DNA extraction buffer, DNA sample in capped test tube, transfer pipets, pop beads, glass rod, DNA spooling rods, test tubes, salt.

All you need: fruit, vegetables, and 95-100% isopropyl alcohol.

Principles of DNA Sequencing

DNA sequencing is used to determine the primary structure of DNA. This experiment is a dry lab that explains DNA sequencing and analysis. Actual autoradiograms from DNA sequencing experiments are provided for identification of mutated nucleotides.

5 Autoradiograms
Complete in 20-30 min.
Cat. #106

Kit includes: instructions, 5 autoradiograms

All you need: white light visualization system

Classroom Molecular Biology Toys & Games

BEST SELLER

Gene of Fortune™ Game

This novel "Bingo" game is an excellent resource to introduce concepts of the genetic code. The games can be played over several class periods. Concepts reinforced include the genetic code, single and three letter amino acid abbreviations, and the characteristics of amino acids. The game includes a Gene of Fortune™ Spinner, 10 different cards, game chips, and instruction manual.

Genetic Dice™ Game

Using Genetic Dice™, students will have fun while they learn about DNA. This resource utilizes a set of game boards, genetic dice, and game chips to reinforce concepts centering on Watson-Crick DNA base pair rules.

For 10 Student Groups

Cat. #S-80

Colored DNA Beads

A set of colored beads that can be designated to represent the Watson-Crick DNA bases (A, T, G, C). The beads can be used in a variety of ways to demonstrate concepts related to the structure and biology of DNA. Includes detailed outline of various sample demonstrations. Includes 150 beads of each color.

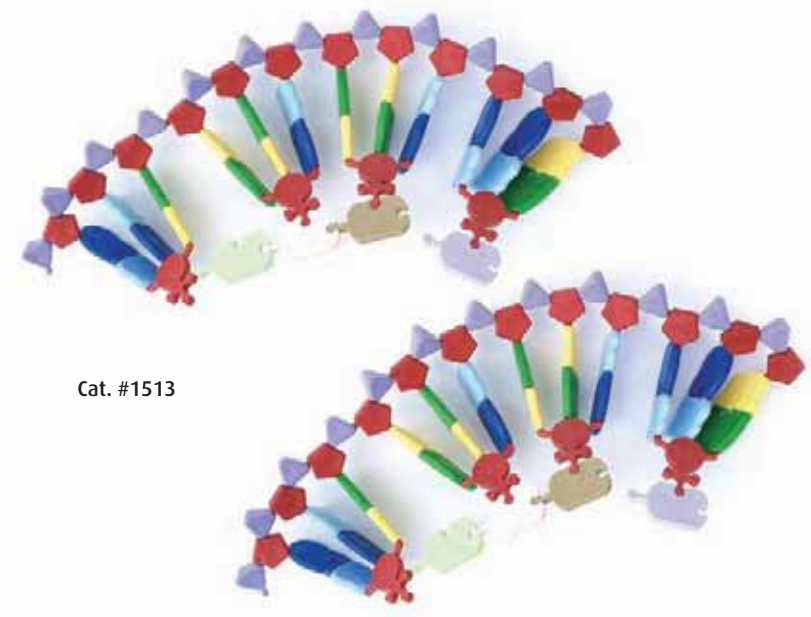
Cat. #1500

DNA Models

Your students can build a model of DNA with this simple and colorful system. The parts are color-coded to represent the purines, pyrimidines, deoxyribose and phosphodiester groups that make up the double helix of DNA. This kit includes differently sized purines and pyrimidines, the correct number of hydrogen bonds and the minor and major grooves are shown. Ideal for modelling DNA replication. Use together with the RNA Protein Synthesis Kit to model transcription and translation.

Cat. #1511 12 Layer Kit
Cat. #1512 22 Layer Kit
Cat. #1513 RNA Protein Synthesis Kit

Cat. #1511



Cat. #1513

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SECTION TWO

2 Discovering DNA Electrophoresis

...although the work we did was often tedious and sometimes frustrating, it was generally great fun and a deep pleasure and joy to get an understanding to what seemed initially to be a great mystery.

CHRISTIANE NÜSSLEIN-VOLHARD, NOBEL PRIZE FOR FRUITFLY GENETICS

DNA Electrophoresis Made Easy

DNA electrophoresis is an easy, fun, exciting and safe activity to perform in the classroom. It is a widely used technique that is carried out in DNA fingerprinting, paternity testing, genetic testing and genetic engineering. For example, DNA electrophoresis was used to prove that Dolly the sheep was the world's first cloned mammal.

You can bring a wide variety of exciting classroom activities into your lessons with our electrophoresis kits. We save you time by providing complete scenarios that can be used with ANY age group!

See page 15
for the basic equipment
you will need to get started!

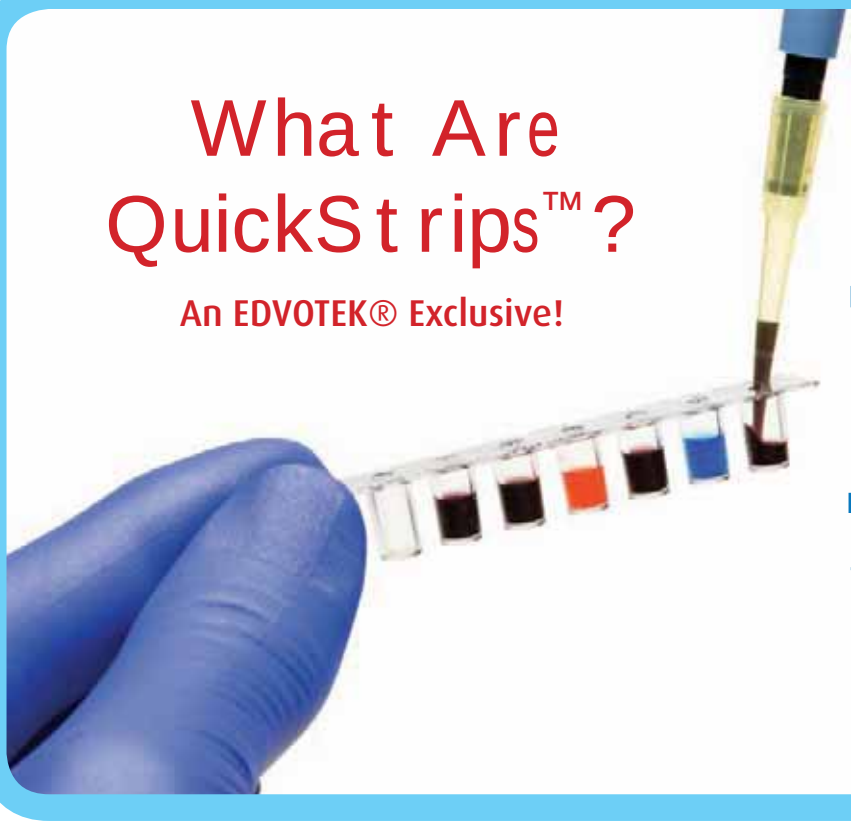
Using colorful dyes is simple and rapid because no staining is needed. And data analysis is fun and easy to understand. For electrophoresis using real DNA, check out our Ready-to-Load™ Electrophoresis kits, or our DNA Extraction and Analysis kits.

Our classroom gel electrophoresis system enables you to simply and affordably introduce DNA electrophoresis into your lessons. All you need is an electrophoresis apparatus, power supply and one of our electrophoresis kits to get started!

We think you'll be amazed at how easy classroom electrophoresis can be!

What Are QuickStrips™?

An EDVOTEK® Exclusive!



Spending a lot of time preparing for your labs?

QuickStrips™ conveniently provide each student group the required samples and eliminate the need for PreLab teacher sample preparation.

Each single-serve mini-tube is sealed with leak-proof foil that is easily punctured with a pipet tip!

Provided in all EDVOTEK® 100 series kits at no additional cost!

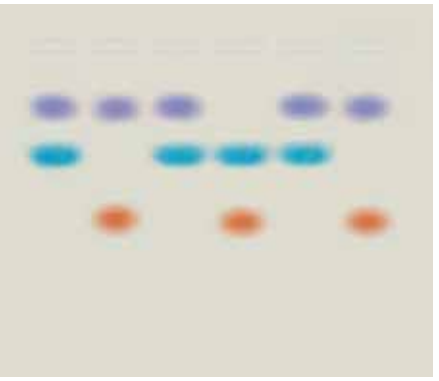
Whose DNA Was Left Behind?

DNA obtained from a single hair left behind at a crime scene can be used to identify a criminal. In this experiment your students will compare simulated crime scene DNA with that of two suspects.

For 10 Lab Groups
Complete in 45 minutes
Cat. #S-51

Kit includes: instructions, Ready-to-Load™ dye samples, agarose powder, practice gel loading solution, electrophoresis buffer, microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, microwave or hot plate.



In Search of My Father

Your class will enjoy discovering the true identity of two boys who were separated from their parents a decade ago. Their mothers are identified by mitochondrial DNA and their fathers from chromosomal DNA. Will it be a happy ending?

For 10 Lab Groups
Complete in 45 minutes
Cat. #S-49

Kit includes: instructions, Ready-to-Load™ dye samples, agarose powder, practice gel loading solution, buffer, microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, microwave or hot plate.

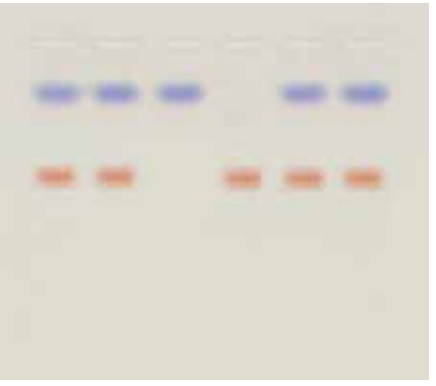
Why Do People Look Different?

Teach your students how an individual's physical traits are a reflection of one's genes. In this simulation, your students will use electrophoresis to separate dyes which represent genetic traits.

For 10 Lab Groups
Complete in 45 minutes
Cat. #S-50

Kit includes: instructions, Ready-to-Load™ dye samples, agarose powder, practice gel loading solution, buffer, microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, microwave or hot plate.



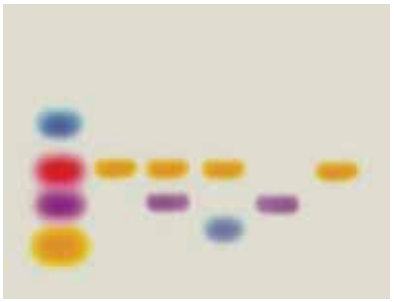
Micropipetting Basics

Teach your students how to use a micropipet with ease and accuracy with multicolored dyes. A fun and cost effective way to learn this important skill.

For 10 Lab Groups
Complete in 45 minutes
Cat. #S-44

Kit includes: instructions, various colored dye samples and a Pipet Card™.

All you need: micropipet and tips.



What Size Are Your Genes?

READY TO LOAD

Teach your students how agarose electrophoresis acts to separate different sized pieces of DNA quickly and simply using brightly colored dyes.

- For 10 Lab Groups
- Complete in 45 minutes
- **Cat. #S-45**

Kit includes: instructions, Ready-to-Load™ dye samples, agarose powder, practice gel loading solution, electrophoresis buffer, microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, microwave or hot plate.

What Is PCR & How Does It Work?

READY TO LOAD

This simulation experiment demonstrates the process of DNA amplification by PCR and how the amplified product is detected by separating the reaction mixture by agarose gel electrophoresis.

- For 10 Lab Groups
- Complete in 45 minutes
- **Cat. #S-48**

Kit includes: instructions, Ready-to-Load™ dye samples, agarose powder, practice gel loading solution, electrophoresis buffer, microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, microwave or hot plate.

What is qPCR & How Does It Work?

NEW

Quantitative real time PCR (qPCR) is used to determine the amount of a specific target DNA at the same time they are amplifying it. In this simulation, students will explore the principles of qPCR using colorful dye samples. Using agarose gel electrophoresis, they observe the relationship between cycle number and the quantity of DNA present within the sample. Students will perform data analysis to support these observations, making it easy to incorporate STEM into your classroom. No qPCR instrument is necessary!

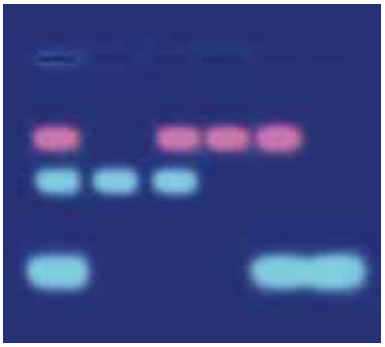
• SCIENCE • TECH - MATH STEM NOLOGY • ENGINEERING •

READY TO LOAD

- For 10 Lab Groups
- Complete in 45 minutes
- **Cat. #S-54**

Kit includes: instructions, Ready-to-Load™ dye samples, agarose powder, practice gel loading solution, electrophoresis buffer, microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, microwave or hot plate, and black light (Cat. #969 recommended).



The Case of the Invisible Bands

READY TO LOAD

This experiment models the separation of DNA molecules by size using agarose gel electrophoresis. Bring the excitement of fluorescence to your electrophoresis lab with this innovative and exciting experiment! Students will perform electrophoresis of dye samples that only become visible when excited by UV light.

- For 10 Lab Groups
- Complete in 45 minutes
- **Cat. #S-52**

Kit includes: instructions, Ready-to-Load™ dye samples, agarose powder, practice gel loading solution, electrophoresis buffer, microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, microwave or hot plate, and black light (Cat. #969 recommended).

Principles & Practice of Agarose Gel Electrophoresis

BEST SELLER READY TO LOAD

Demonstrate to your class how electrophoresis separates molecules on the basis of size and charge. A safe, colorful, fast and simple way to teach a technique that will engage your students.

For 6 Gels
Complete in 45 minutes
Cat. #101

Kit includes: instructions, Ready-to-Load™ dye samples, agarose powder, practice gel loading solution, electrophoresis buffer, microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, microwave or hot plate.

ALSO Available - Dye Samples Only
Cat. #101-B 12 Gels
Cat. #101-C 24 Gels

Mystery of the Crooked Cell

READY TO LOAD

This simple lab demonstrates detection of the mutation that causes Sickle Cell Anemia. In this simulation, your students will use electrophoresis to separate dyes that represent patient samples and controls.

For 10 Gels
Complete in 45 minutes
Cat. #S-53

Kit includes: instructions, Ready-to-Load™ dye samples, agarose powder, practice gel loading solution, electrophoresis buffer, microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, microwave or hot plate.

Developed in Partnership with:

CityLab
Boston University School of Medicine

NIH Department of Health and Human Services · National Institutes of Health
Supported by a Science Education Partnership Award (SEPA) from the National Center for Research Resources.

Linking STEM to Agarose Gel Electrophoresis

NEW READY TO LOAD

• SCIENCE • TECH - MATH STEM NOLOGY • ENGINEERING •

Link important STEM concepts using Agarose Gel Electrophoresis. Help your students learn about the application of gel electrophoresis in DNA Fingerprinting, DNA Paternity Testing, Genetics (related to health and well-being), and the detection of Genetically Modified Foods. These dyes can be separated in agarose gels and students will use core STEM tools to determine band size and utilize critical thinking and reasoning skills. Four unique module options are supplied.

For 10 Lab Groups
Complete in 45 minutes
Cat. #S-46

Kit includes: instructions, Ready-to-Load™ dye samples, agarose powder, practice gel loading solution, electrophoresis buffer, microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, microwave or hot plate.

DNA DuraGel™

DNA DuraGel™ gels are permanent polymer gels that allow students to practice the critically important skill of pipetting/gel loading. The clear, reusable gels are designed for the practice of loading 5 - 35 µl of samples. The gel grids are imprinted with a ruler for sizing DNA fragments. Also included are simulated FlashBlue™ and Ethidium Bromide gel images, ideal for representing how actual gels are stained with Methylene Blue and Ethidium Bromide.

Kit Includes: Reusable DNA DuraGel™; Flash Blue™ and Ethidium Bromide gel images, practice gel load solution and mini-transfer pipets.

All you need: micropipets are recommended.

For 12 to 24 students

Cat # S-43

6 Gels and 8 images (4 FlashBlue™ & 4 Ethidium Bromide gel images)

For 4 students or classroom demo

Cat # S-43-20

2 Gels and 4 images (2 FlashBlue™ & 2 Ethidium Bromide gel images)

What Equipment Do I Need?

M36 HexaGel™ DNA Electrophoresis Apparatus
Cat. #515

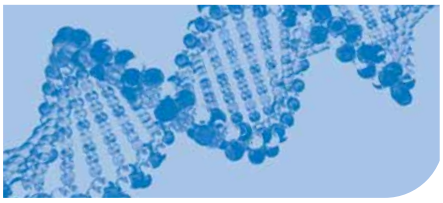
DuoSource™ 75 Power Supply
Cat. #507

EDVOTEK® Fixed Volume 40 µl MiniPipet™
Cat. #588

All you need to carry out any these dye experiments is an electrophoresis apparatus, power supply & pipets.
See our **EQUIPMENT** section for our full range of electrophoresis and power supplies.

SECTION THREE

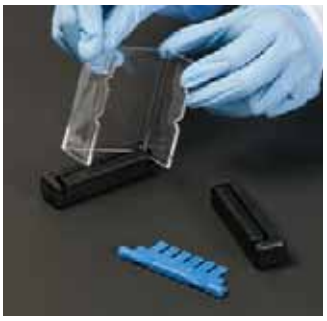
3 Ready-to-Load™ DNA Electrophoresis



Any sufficiently advanced technology is indistinguishable from magic.

SIR ARTHUR C. CLARKE, SCIENCE-FICTION AUTHOR, INVENTOR, AND FUTURIST.

Quick Guide to Agarose Gel Electrophoresis



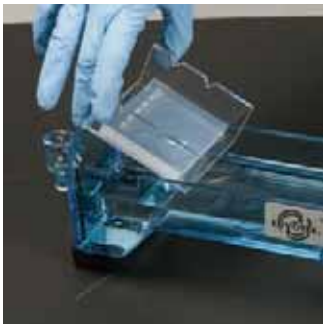
1. Prepare the tray for gel casting by sealing the ends with rubber end caps.

2. Place a comb in the appropriate notches.

3. Prepare the agarose gel solution. Cool to 60°C and then pour the gel.

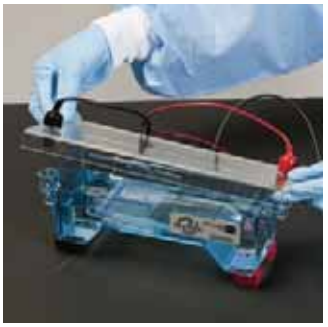
4. After approx. 20 min. the gel will solidify. Remove the comb from the gel tray.

5. Slowly remove the rubber end caps. Be very careful not to damage or tear the gel!



6. Place the gel (on its tray) into the electrophoresis chamber. The gel should be completely submerged under electrophoresis buffer.

7. Load samples into wells in consecutive order, starting with the first well on the left.



8. After samples are loaded, attach the safety cover, connect the leads to the D.C power source and set the power source at the required voltage.

Cutting Edge Experiments Without the Hassle!

Easy to use. Fast to set up. Up to date topics. And affordable!

Our Ready-to-Load™ kits make teaching classroom biotech experiments easier than ever. Using state-of-the-art technology, our scientists have developed our QuickStrip™ system to deliver your DNA samples into ready to use sample tubes. All you have to do is snap off a strip for each student lab station and off they go!

Ready-to-Load™ kits also feature our exclusive InstaStain® cards. Not only will you save time and minimize chemical waste, but our InstaStain® cards produce superior staining results.

Biotechnology couldn't be easier!

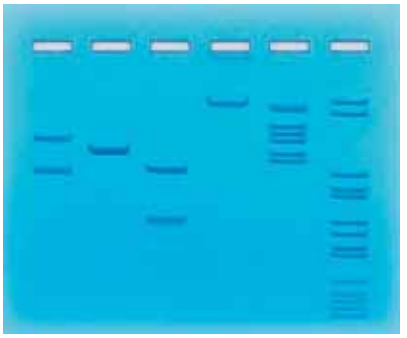
Restriction Enzyme Cleavage of Plasmid and Lambda DNA

Plasmid and lambda DNA are pre-digested with restriction enzymes - endonucleases that recognize and cut double-stranded DNA within or near defined base sequences. Digests are separated by agarose gel electrophoresis.

- For 6 Gels
- Complete in 45 minutes
- **Cat. #102**

Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, white light visualization system.



ALSO Available - DNA Samples Only
Cat. #102-B 12 Gels
Cat. #102-C 24 Gels

Principles of PCR

This experiment introduces students to the principles and applications of the Polymerase Chain Reaction (PCR). This simulation experiment does not contain human DNA and does not require a thermal cycler.

- For 6 Gels
- Complete in 45 minutes
- **Cat. #103**

Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, white light visualization system.

ALSO Available - DNA Samples Only
Cat. #103-B 12 Gels
Cat. #103-C 24 Gels

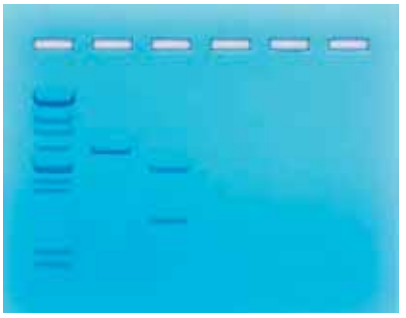
Size Determination of DNA Restriction Fragments

DNA sizing is an excellent tool used in many biotech applications, such as DNA mapping and forensic science. Your students will separate DNAs on agarose gels and learn how to use a standard curve to determine the sizes of unknown fragments.

- For 6 Gels
- Complete in 45 minutes
- **Cat. #104**

Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, white light visualization system.



ALSO Available - DNA Samples Only
Cat. #104-B 12 Gels
Cat. #104-C 24 Gels

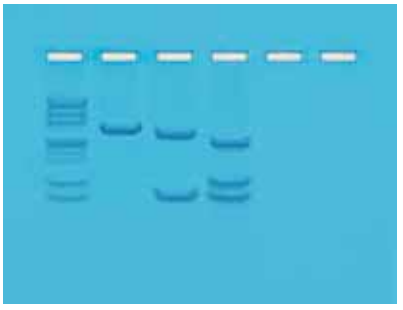
Mapping of Restriction Sites on Plasmid DNA

DNA mapping is a common procedure used to determine the location of genes. In this experiment, DNA markers and pre-digested plasmid DNA fragments are mapped using agarose gel electrophoresis.

- For 6 Gels
- Complete in 45 minutes
- **Cat. #105**

Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, white light visualization system.



ALSO Available - DNA Samples Only
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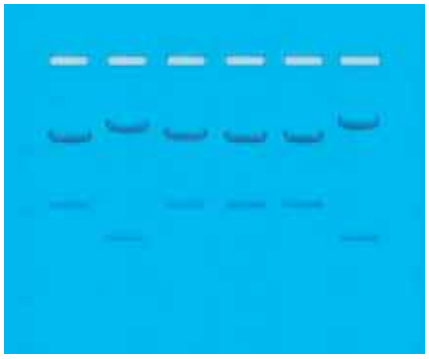
Cat. #105-C 24 Gels



ALSO Available - DNA Samples Only
Cat. #109-B 12 Gels
Cat. #109-C 24 Gels

DNA Fingerprinting by Restriction Enzyme Patterns

BEST SELLER · READY TO LOAD · InstaStain® Blue · FlashBlue™

Basic concepts of DNA fingerprinting are featured in this lab by comparing crime scene DNA with suspect DNAs. Fingerprint patterns are separated by agarose gel electrophoresis and the students determine who may have done it!

For 6 Gels
Complete in 45 minutes
Cat. #109

Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, white light visualization system.

ALSO Available - DNA Samples Only
Cat. #112-B 12 Gels
Cat. #112-C 24 Gels

Restriction Enzyme Analysis of DNA

BEST SELLER · READY TO LOAD · InstaStain® Blue · FlashBlue™

Introduce your students to the use of restriction enzymes as a tool to digest lambda DNA at specific nucleotide sequences. This lab fulfills the A.P.* Biology Lab 6 electrophoresis portion of the curriculum. See Section 14 for our complete A.P.* Biology curriculum.

For 6 Gels
Complete in 45 minutes
Cat. #112

Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, white light visualization system.

Standard Markers

Standard DNA Fragments (a)

The size of the DNA fragments, in base pairs, are 23130, 9416, 6557, 4361, 3000, 2322, 2027, 725, and 570. The 3000 and 725 base pair fragments have been added to facilitate staining. Many of our experiments have DNA standard markers however, they are also available as a stand alone item.

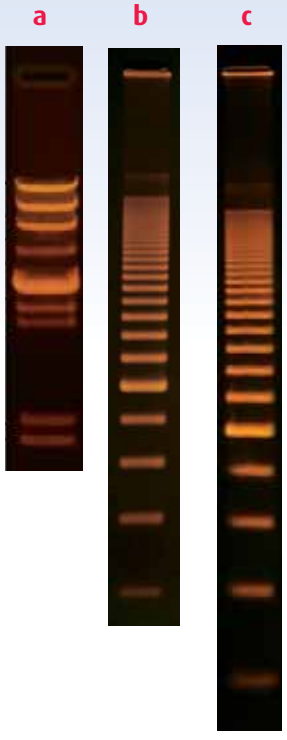
See Catalog #750 on page 123 or visit our website for more information.

200 bp Ladder (b)

33 Blunt Ended Bands range from 200 bp to 6,600 bp in 200 bp increments. High Intensity Band at 1,000 bp for easy band identification.

100 bp Ladder (c)

40 Blunt Ended Bands range from 100 bp to 4,000 bp in 100 bp increments. High Intensity Band at 500 bp for easy band identification.



Ready-to-Load™ DNA Sequencing

NEW

Introduce your students to the exciting science of DNA Sequencing. This kit contains the four Ready-to-Load sequenced DNAs (nucleotides A, C, G, & T) in an easy to use, safe format. Students load the four separate reactions into agarose gels, run the gels, stain them, and actually read the DNA sequence. This experiment can be used to introduce genome concepts and help your students gain a better understanding of the science behind DNA sequencing.

- For 6 Gels
- Complete in 60 minutes
- **Cat. #120**

Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, white light visualization system.

Principles of Real Time PCR (qPCR)

NEW

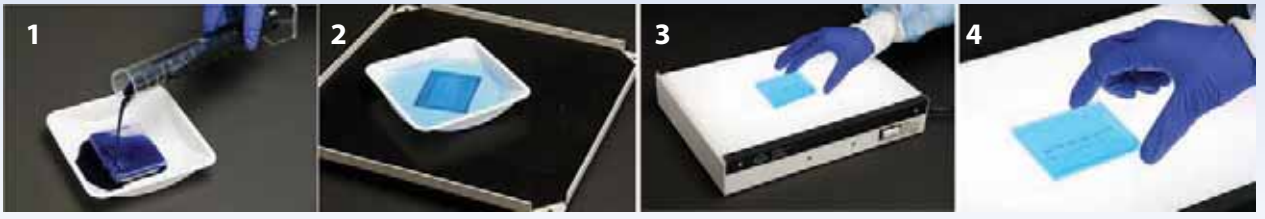
Scientists use quantitative PCR (qPCR) to determine the amount of a specific DNA while it is being amplified. In this experiment, your students will explore the principles of qPCR using real DNA in this Ready-to-Load experiment. Using agarose gel electrophoresis, your students will observe the relationship between cycle number and the quantity of DNA present within the sample. Students will perform data analysis to support these observations, making it easy to incorporate STEM into your classroom.

- For 6 Gels
- Complete in 60 minutes
- **Cat. #125**

Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, white light visualization system.

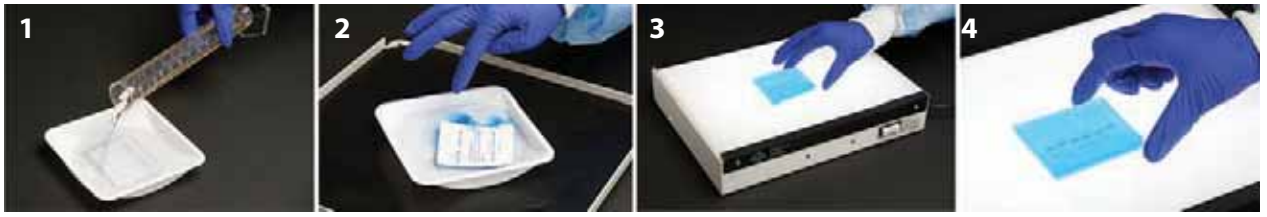
FlashBlue™ Stain • Simple & Rapid • Stain in Less Than 5 Minutes!



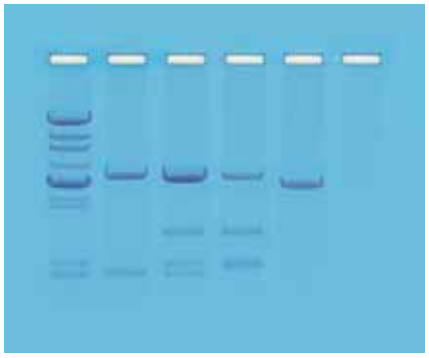
1. After electrophoresis, wear gloves and place the gel in a small gel staining tray. Pour 75 ml of 1x FlashBlue™ stain into the tray, enough to cover the gel. Allow the gel to stain for no longer than 5 minutes.
2. Transfer the gel to another container with 250-300 ml distilled water. Gently agitate container every few minutes or place on a shaking platform. Destain for at least an hour (longer periods will yield better results).
3. After destaining, gel should have a light blue background and well-stained DNA bands.
4. For optimal visibility, examine the gel on a white light visualization system.

See page 123 for ordering information for stains.

InstaStain® Blue • Saves time & minimizes chemical waste!



1. Remove the agarose gel from its bed and totally submerse the gel in a small, clean tray. To stain a 7 x 7 cm gel, add 75 ml of distilled or deionized water. The agarose gel should be completely covered with liquid.
2. Gently float a card of InstaStain® Blue with the stain side facing the liquid. Remove the card after 30 seconds. Let the gel soak in the liquid for approx. 1 hr. For best results, cover the gel and soak in the liquid overnight.
3. No destaining is necessary. The gel is now ready for visualization and photodocumentation.
4. For optimum visibility, transfer the gel to a white light visualization system.



ALSO Available - DNA Samples Only
Cat. #114-B 12 Gels
Cat. #114-C 24 Gels

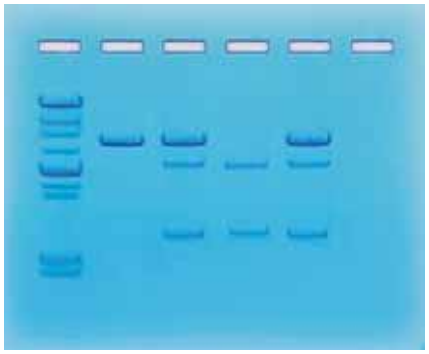
DNA Paternity Testing Simulation

This experiment introduces students to the use of DNA fingerprinting in a simulated paternity determination. A child's DNA fingerprint is compared with his parents. The experiment does not contain human DNA.

For 6 Gels
Complete in 45 minutes
Cat. #114

Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, white light visualization system.



ALSO Available - DNA Samples Only
Cat. #115-B 12 Gels
Cat. #115-C 24 Gels

Cancer Gene Detection

In this experiment, students create a pedigree for a family thought to be carriers of a mutation in their p53 genes. This is followed by an analysis using agaorse gel electrophoresis to diagnose the state of the p53 gene in individual family members.

Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, white light visualization system.

For 6 Gels
Complete in 45 minutes
Cat. #115

ALSO Available - DNA Samples Only
Cat. #116-B 12 Gels
Cat. #116-C 24 Gels

Sickle Cell Gene Detection (DNA-based)

Sickle Cell Anemia is a common genetic disease that causes misshapen red blood cells, giving them a "sickled" appearance. These cells get stuck in small capillaries of the blood stream leading to oxygen deprivation which causes pain and organ damage. Sickle Cell Anemia is caused by a single point mutation in the hemoglobin gene that results in a faulty protein. In this experiment, your students will investigate the restriction enzyme that discriminates between HbA (normal) and HbS (disease) genes and perform a simulated test on a patient.

For 6 Gels
Complete in 45 minutes
Cat. #116

Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

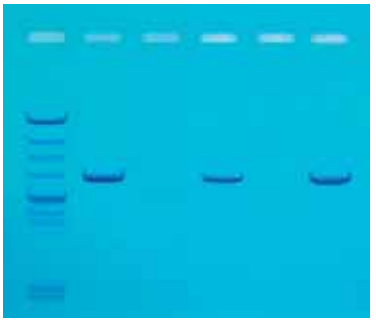
All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, white light visualization system.

DNA Electrophoresis Reagents can be found on page 123.

Detection of Mad Cow Disease

InstaStain® Blue FlashBlue™ READY TO LOAD

Bovine spongiform encephalopathy (BSE), better known as mad cow disease, is a neurodegenerative, fatal condition in cattle. Consuming BSE-infected beef is believed to be the cause of a similar condition in humans, Creutzfeldt-Jakob disease. In this experiment, students examine simulated PCR products from several feed mills, to determine any possible violations of a 1997 ban which ended the practice of including animal parts in cattle feed.



For 6 Gels

Complete in 45 minutes

Cat. #117

Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

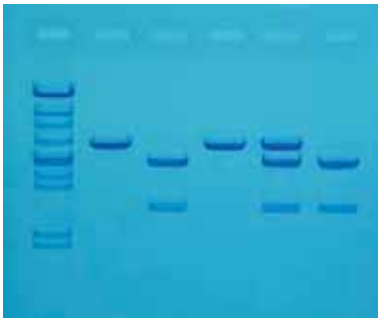
All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, white light visualization system.

ALSO Available - DNA Samples Only
Cat. #117-B 12 Gels
Cat. #117-C 24 Gels

Cholesterol Diagnostics

READY TO LOAD InstaStain® Blue FlashBlue™

Elevated blood cholesterol has been established as a serious risk factor for coronary heart disease and stroke which are leading causes of death in the United States. A disease known as familial hypercholesterolemia (FH) causes an increase in blood levels of the "bad" form of cholesterol, known as low density lipoprotein (LDL). In this experiment, a simulated genetic test for FH is demonstrated in which patients are tested for a DNA polymorphism linked to the FH gene.



For 6 Gels

Complete in 45 minutes

Cat. #118

Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, white light visualization system.

ALSO Available - DNA Samples Only
Cat. #118-B 12 Gels
Cat. #118-C 24 Gels

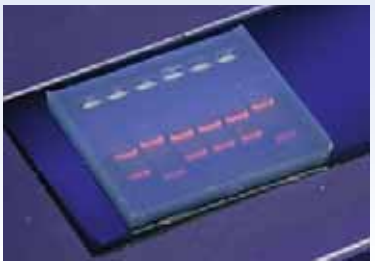
Q-Series Kits

DNA Electrophoresis with InstaStain® Ethidium Bromide or SYBR® Safe Stain*!

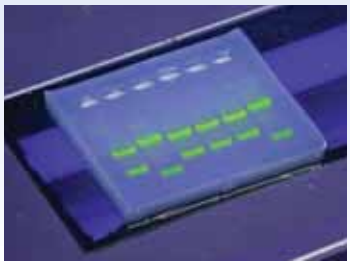
READY TO LOAD

Our "Q-Series" Kits are Ready-to-Load™, just like their "Blue" counterparts, only the Q-Series kits are designed for 12 gels (not six) and feature InstaStain® Ethidium Bromide or SYBR® Safe stain* (available upon request).

Using thin gels, in only 2-4 minutes, your agarose gels are stained and ready for visualization on a UV or blue light transilluminator**!



InstaStain® ETBR



SYBR® Safe

Q-Series is available for the following kits:
102, 103, 104, 105, 109, 112, 114, 115, 116, 117, 118, 124, and 130.

For 12 Gels

Complete in 40 min.

* SYBR® Safe Stain can be substituted for InstaStain® Ethidium Bromide upon request.
** Cat. #558 UV Transilluminator is recommended.
InstaStain is a trademark of Edvotek, Inc. SYBR® Safe is a trademark of Life Technologies Corporation.

See pages 112 and 113 for more info on Gel Visualization Options.
See page 123 for more info on Staining Options.

ALSO Available - DNA Samples Only
Cat. #124-B 12 Gels
Cat. #124-C 24 Gels

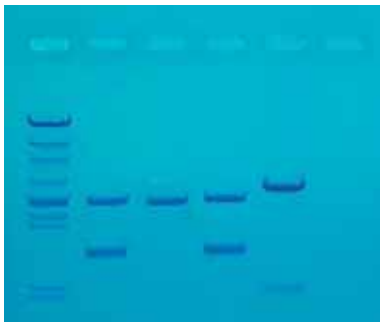
DNA Screening for Smallpox

In this simulated bioterrorism scenario, students will perform a DNA fingerprinting test to detect the presence of smallpox. **This experiment does NOT contain smallpox.**

For 6 Gels
Complete in 45 minutes
Cat. #124

Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, white light visualization system.



ALSO Available - DNA Samples Only
Cat. #130-B 12 Gels
Cat. #130-C 24 Gels

DNA Fingerprinting by PCR Amplification

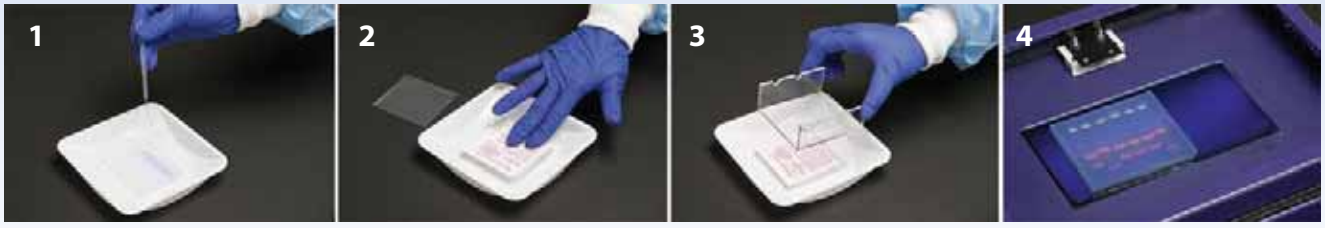
Forensic DNA fingerprinting has become a universally accepted crime-fighting tool. Recent advances use the polymerase chain reaction (PCR) to amplify human DNA obtained from crime scenes. This experiment, based on a crime scene scenario, has an inquiry-based component.

For 6 Gels
Complete in 45 minutes
Cat. #130

Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, white light visualization system.

InstaStain® Ethidium Bromide • Minimizes chemical waste • Stain in 3-5 Minutes!



1. After electrophoresis, wear gloves and place the gel in a small gel staining tray. Moisten with a few drops of buffer.
2. Remove clear plastic protector and place the unprinted side of the InstaStain® Ethidium Bromide card on the gel. Firmly run your fingers over the entire surface of the card. Do this several times.
3. Place a small weight on top to ensure the card maintains direct contact with the gel. Stain the gel for 3-5 minutes.
4. After staining, remove the InstaStain® card. View gel on a UV transilluminator. Be sure to wear UV protective goggles.

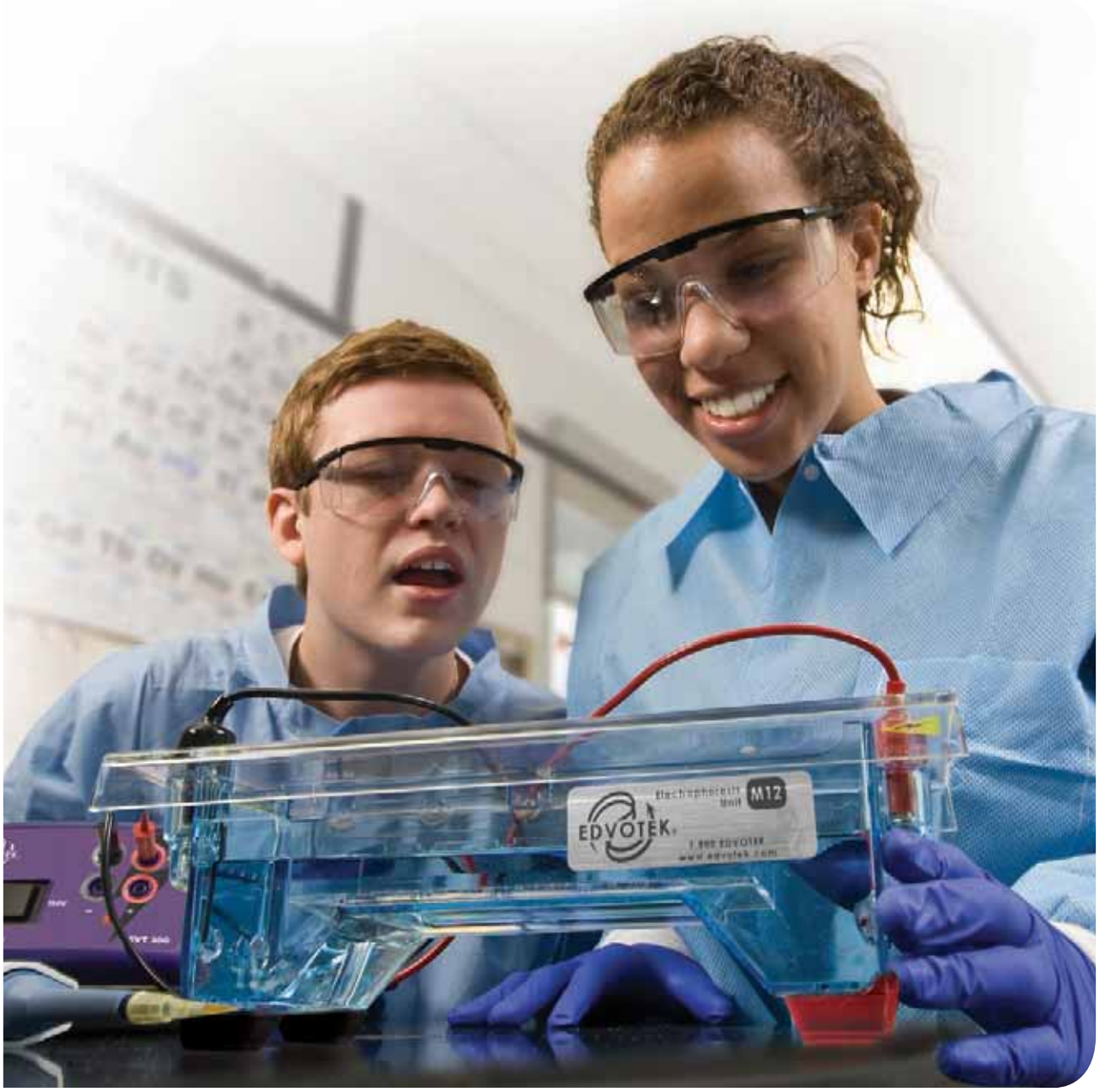
SYBR® Safe DNA Stain • Non-mutagenic • Ultra-sensitive • Safe • Stain in 10-15 Minutes!

1. After electrophoresis, wear gloves and place the gel in a small gel staining tray. Add approx. 75 ml of 1x SYBR® Safe stain to the tray, enough to cover the gel.
2. Cover with foil and allow the gel to stain for 10-15 minutes. (Agitation is optional.)
3. Wearing gloves, carefully remove the gel and transfer to a short/mid-range UV Transilluminator or blue bright light box.
4. Be sure to wear UV protective goggles. while visualizing DNA bands.

See page 123 for ordering information for stains.

SECTION FOUR

4 Advanced DNA Applications



Science is a way of thinking much more than it is a body of knowledge.

CARL SAGAN, ASTRONOMER AND ASTROCHEMIST.

Curriculum Modules NEW

Our NEW Curriculum Modules are designed for undergraduate Biotechnology, Molecular & Cell Biology, Immunology and Forensics courses. Each module contains a comprehensive set of experiments focusing on related concepts in emerging Life Science Technologies which can be incorporated in Biology or Life Science courses. The experiments also feature core basic science concepts for undergraduate Biomedical Sciences.

Forensic Science

CURRICULUM MODULE 1

Features both DNA-based and Classical forensic techniques that are being utilized in the forensic field on a daily basis. Students will enjoy solving a mystery through actual finger-printing, blood typing simulated blood and DNA fingerprinting with dyes or real DNA. Bring the exciting world of modern forensics into your classroom!

Includes: Curriculum guides and 9 different experiments.

Cat. #401

Polymerase Chain Reaction

CURRICULUM MODULE 2

PCR enables researchers to produce millions of copies of a specific DNA sequence in a short amount of time. This automated process bypasses the need to use bacteria for amplifying DNA. In this Curriculum Module, you will find a variety of kits to teach the PCR technique.

Includes: Curriculum guides and 4 different experiments.

Cat. #402

DNA Analysis & Cloning

CURRICULUM MODULE 3

Features a variety of stimulating experiments to help students learn about the science of DNA and its application. The power of molecular cloning and restriction enzyme is remarkable. Help your students discover the secret of life for themselves!

Includes: Curriculum guides and 13 different experiments.

Cat. #403

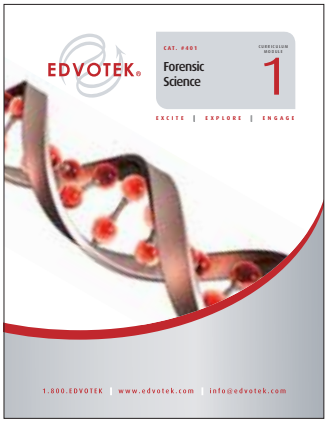
Health & Disease

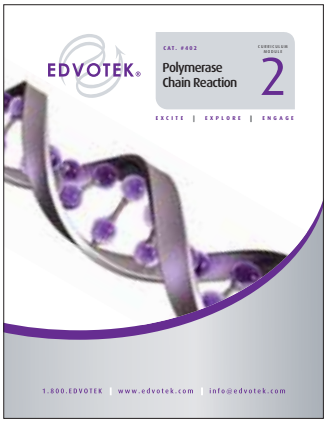
CURRICULUM MODULE 4

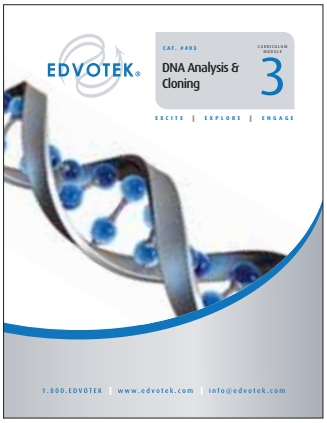
Immunology & Biomedical diagnostic concepts are featured in this module utilizing a comprehensive set of experiments focusing on related concepts. Your students will learn the basic principles of immunology and further explore its applications in the field of immunobiotechnology and biomedical diagnostics!

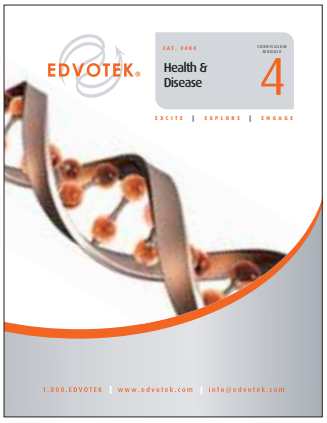
Includes: Curriculum guides and 17 different experiments.

Cat. #404









Visit our website www.edvotek.com for more details!

Mini-Prep Isolation of Plasmid DNA

FlashBlue™

INCLUDES LYPHOCELLS

Small-scale rapid isolation of plasmid DNA is a routine procedure used for screening and analysis of recombinant DNAs in cloning and sub-cloning experiments. In this experiment, students isolate plasmid DNA without the use of toxic chemicals such as phenol or chloroform.

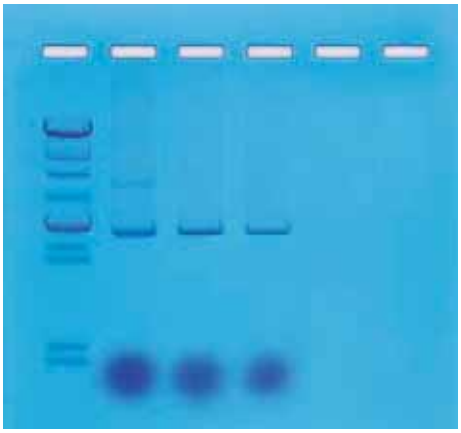
For 40 plasmid isolations and 5 gels

Isolation of Plasmid DNA 60 min. Electrophoresis 45 min.

Cat. #202

Kit includes: instructions, Plasmid LyphoCells™, various solutions and buffers, agarose powder, FlashBlue™ Stain.

All you need: electrophoresis apparatus and power supply, water-bath, balance, microcentrifuge, microwave or hot plate, automatic pipet with tips, visualization (white light), misc. labware, 95-100% isopropanol, distilled or deionized water, ice.



Isolation of *E. coli* Chromosomal DNA

FlashBlue™

INCLUDES LYPHOCELLS

Isolation of high molecular weight chromosomal DNA is the first step in molecular cloning since it is the source of genes in cells. This experiment provides DNA Extraction LyphoCells™ and reagents for isolating chromosomal DNA from *E. coli*. After spooling from solution, the DNA can be dissolved and analyzed by agarose gel electrophoresis as an optional lab extension activity.

For 20 DNA isolations and 5 gels

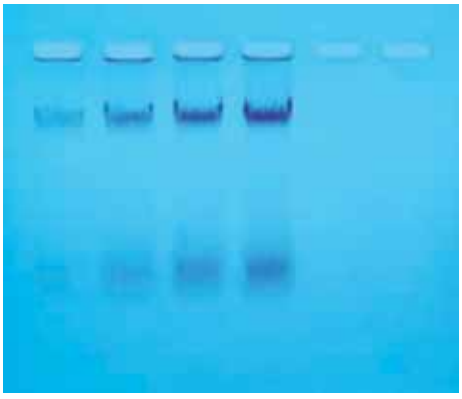
Isolation of Plasmid DNA 60 min. Electrophoresis 45 min.

Cat. #203

Kit includes: instructions, Chromosomal LyphoCells™, various solutions and buffers, agarose powder, FlashBlue™ Stain.

All you need: waterbath, pipet pumps or bulbs, lab glassware, distilled or deionized water, 95-100% isopropanol.

For optional electrophoresis: electrophoresis apparatus, power supply, automatic micropipet with tips, balance, microwave or hot plate, misc. labware, white light visualization system, and photodocumentation system.



Separation of RNA and DNA by Gel Filtration Chromatography

FlashBlue™

Gel filtration chromatography separates molecules on the basis of size and shape. This experiment provides a LyphoSample™ mixture of RNA and DNA that is separated on a gel exclusion column. The collected fractions of DNA and RNA are analyzed using agarose gel electrophoresis.

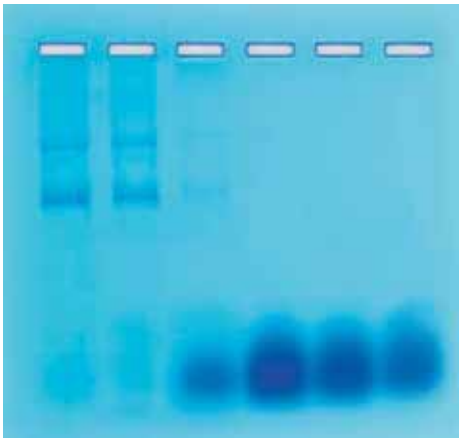
For 5 separations and 5 gels

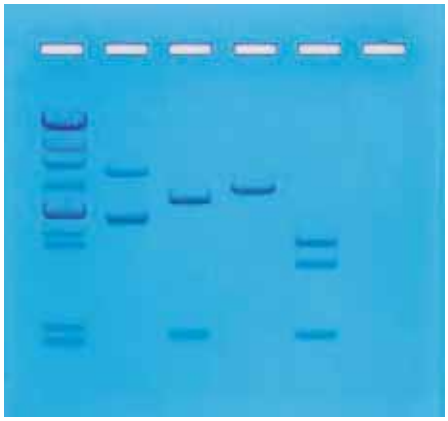
Gel Filtration Chromatography 45 min. Electrophoresis 45 min.

Cat. #204

Kit includes: instructions, DNA/RNA LyphoSample™, dry matrix, chromatography columns, agarose powder, various solutions and buffers, FlashBlue™ Stain.

All you need: electrophoresis apparatus and power supply, ring stands and clamps, balance, microwave or hot plate, automatic pipet with tips, pipet pumps or bulbs, labware, visualization (white light), photodocumentation system (optional).





Restriction Enzyme Mapping

FlashBlue™

In this experiment, a plasmid DNA is cleaved with different combinations of restriction enzymes. By determining the fragment size and using agarose gel electrophoresis, the relative positions of the restriction sites can be mapped. Requires wet ice shipment for next day delivery (by 3:00 pm in most areas).

6 Sets of Restriction Digestions.

Restriction Enzyme Digests 35-60 min. Electrophoresis 45 min.

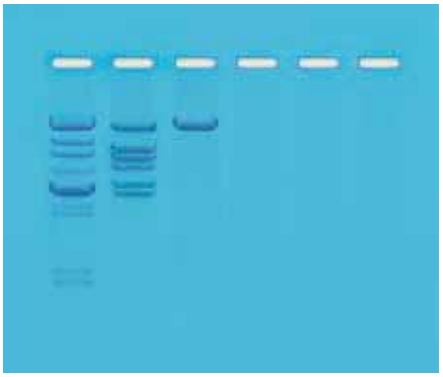
Cat. #206

Kit includes: instructions, Hind III & Bgl I restriction enzymes, plasmid DNA, buffers, enzyme grade water, standard DNA fragments, gel loading solution, agarose, electrophoresis buffer, FlashBlue™ Stain.

All you need: electrophoresis apparatus and power supply, automatic micropipet with tips, balance, microwave or hot plate, waterbath, floating racks, misc. lab glassware, ice.

Cleavage of Lambda DNA with *Eco* RI Restriction Enzyme

FlashBlue™



The DNA from bacteriophage lambda is a well-characterized linear molecule containing six recognition sites for Eco RI (generating 5 fragments with distinct sizes and 2 fragments that are very close in size). In this experiment, Lambda DNA is digested by the Eco RI endonuclease. The digestion products are analyzed using agarose gel electrophoresis.

Kit includes: instructions, Lambda DNA, Dryzymes®, Reconstitution buffer, Restriction enzyme reaction buffer, enzyme grade water, Standard DNA Fragments, various solutions and buffers, agarose powder, FlashBlue™ Stain.

All you need: electrophoresis apparatus, power supply, automatic pipet with tips, waterbath, balance, microwave or hot plate, visualization (white light), misc. lab glassware, pipet pumps or bulbs, metric rulers, floating racks, distilled or deionized water, ice.

For 10 restriction digestions and 5 gels

Complete in 90 min.

Cat. #212

Dryzymes® No Ice Shipment

Cleavage of DNA with Restriction Enzymes

This open-ended laboratory activity allows students to design experiments that will generate specific DNA fragments and determine the accuracy of predicted sizes after separation by agarose gel electrophoresis. Gels are stained with InstaStain® Blue or FlashBlue™ Stain.

Kit includes: instructions, plasmid DNAs, Lambda DNA, Standard DNA Fragments, Dryzymes® - *Eco* RI and Bam HI, Restriction enzyme dilution and reaction buffers, enzyme grade water, various solutions and buffers, agarose powder, InstaStain® Blue and FlashBlue™ Stain.

All you need: electrophoresis apparatus, power supply, automatic pipet with tips, waterbath, balance, microwave or hot plate, visualization (white light), misc. labware, pipet pumps or bulbs, metric rulers, floating racks, distilled or deionized water, ice.

For 6 Lab Groups

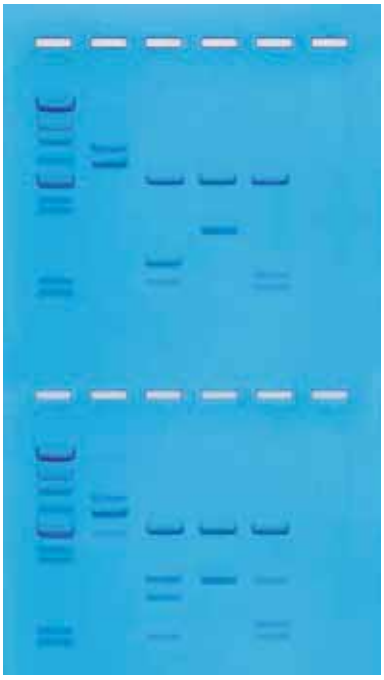
Restriction Enzyme Digests 35 min. (can be extended to 60 min.)
Electrophoresis 45 min.

Cat. #213

Dryzymes® No Ice Shipment

FlashBlue™

InstaStain® Blue



DNA Fingerprinting Using Restriction Enzymes

BEST SELLER

Teach your students about restriction enzyme digests in the context of forensic science! Your students will cut DNA with restriction enzymes and then compare the banding pattern of the crime scene DNA versus that of two suspects using agarose gel electrophoresis.

FlashBlue™

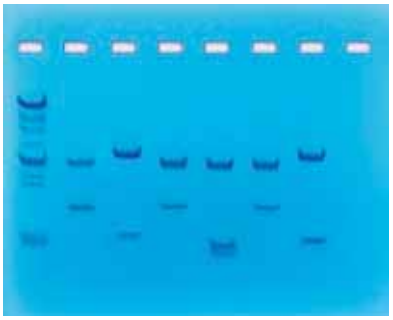
Kit includes: instructions, Ready-to-Load™ "crime scene" DNA samples, Standard DNA Fragments, Dryzymes® - *Eco* RI and Hind III, various solutions & buffers, plasmid DNA, enzyme grade water, agarose powder, FlashBlue™ Stain.

All you need: electrophoresis apparatus, power supply, automatic pipet with tips, waterbath, balance, microwave or hot plate, visualization (white light), misc. labware, pipet pumps or bulbs, metric rulers, floating racks, distilled or deionized water, ice.

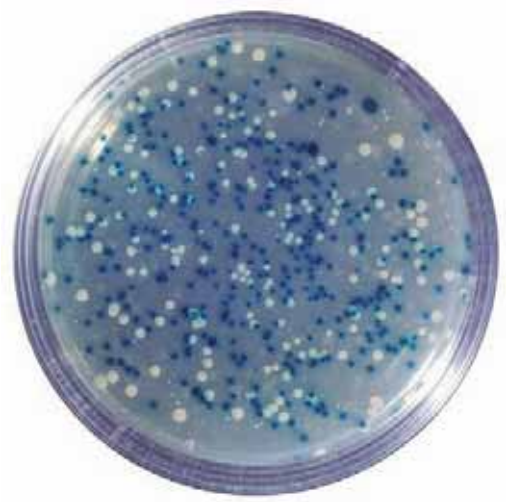
For 6 Gels

Restriction Enzyme Digests 35 min. (can be extended to 60 min.)
Electrophoresis 45 min.

Cat. #225



Dryzymes® No Ice Shipment



Blue/White Cloning of a DNA Fragment and Assay of ß-galactosidase

NEW & improved!

When DNA is subcloned in the pUC polylinker region, ß-galactosidase production is interrupted, resulting in the inability of cells to hydrolyze X-Gal. This results in the production of white colonies amongst a background of blue colonies. This experiment provides a DNA fragment, linearized plasmid, and T4 DNA Ligase. Following the ligation to synthesize the recombinant plasmid, competent *E. coli* cells are transformed and the number of recombinant antibiotic resistant white and blue colonies are counted. ß-galactosidase activity is assayed from blue and white bacterial cells. This experiment can be broken down into three modules: ligation, transformation, and assay of ß-galactosidase.

BactoBeads™

Cat. #300 and #301 are recommended for college level courses.

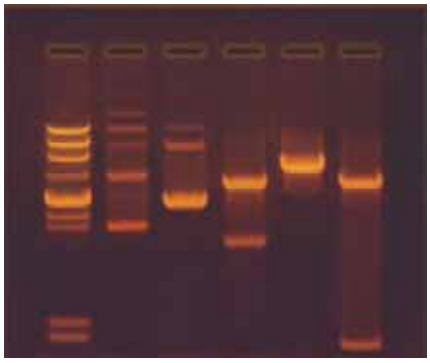
For 5 Lab Groups

Module I: Ligation - 70 min.
Module II: Transformation and Selection - 60 min.
Module III: Assay of ß-galactosidase - 60 min.

Cat. #300

Kit includes: instructions, Linearized pUC plasmid & DNA fragment, T4 Ligase, BactoBeads™ for transformation, reconstitution buffer, X-Gal in solvent, IPTG, calcium chloride, antibiotic, ReadyPour™ Luria Broth Agar, Luria broth media for recovery, growth media, assay components, plastic supplies.

All you need: incubation oven, two waterbaths, shaking incubator or shaking waterbath, microwave or hot plate, automatic micropipet and tips, spectrophotometer, balance, centrifuge, microcentrifuge, glassware and cuvettes, distilled water, ice.



Construction & Cloning of a DNA Recombinant

NEW & improved!

Cloning is frequently performed to study gene structure, function, and to enhance gene expression. This experiment is divided into five modules. Clones are constructed by ligation of a vector and a fragment insert. The constructs are then transformed into competent cells and the cells are grown and selected for resistance. Plasmid DNA is then isolated from the transformants, cleaved with restriction enzymes, and analyzed by agarose gel electrophoresis. Recommended for college level courses.

BactoBeads™

This experiment requires wet ice shipment for next day delivery (by 3:00 pm in most areas).

For 5 Plasmid Constructs & Analyses

Module I: 70 min.
Module II: 70 min.
Module III: 15 min.
Module IV: 65-80 min.
Module V: 70 min.
Electrophoresis 45 min.

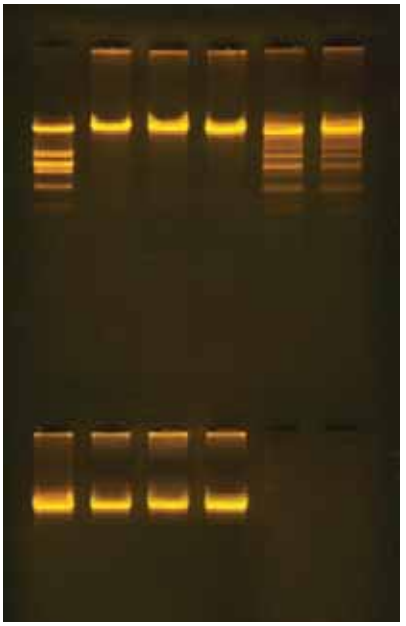
Cat. #301

Kit includes: instructions, BactoBeads™, enzymes, plasmid DNA, restriction enzyme dilution buffer, enzyme grade water, standard DNA fragments, restriction enzyme reaction buffer, gel loading solution, agarose powder, electrophoresis buffer, stains, calibrated pipet.

All you need: electrophoresis apparatus and power supply, automatic micropipet with tips, balance, microwave or hot plate, waterbath, large weigh boats for staining, UV transilluminator, floating racks for microtest tubes, pipet pump or bulb, 5 or 10 ml pipets, laboratory glassware, metric rulers, distilled water, ice.

InstaStain® ETBR

Purification of the Restriction Enzyme *Eco* RI



In this experiment, students actually purify the restriction enzyme, *Eco* RI! This procedure utilizes an ion exchange chromatography step for *Eco* RI purification. Column fractions are assayed for the enzyme using Lambda DNA and digestion products are identified by agarose gel electrophoresis. Fractions that contain *Eco* RI are identified and pooled. The total and specific activities are calculated. Recommended for college level courses.

For 5 Purifications

Packing column 45 min.
Restriction analysis A 35 min.
Restriction analysis B 50 min.
Gel Prep 30 min.
Electrophoresis 30 min.
Staining & Destaining 2 min.

Cat. #302

Kit includes: instructions, ion exchange matrix, chromatography columns, *E. coli* RY-13 cell extract, equilibration & elution buffer, Lambda DNA, Lambda/*Eco* RI Marker, KCl, glycerol, dilution & reaction buffers, gel loading solution, agarose, electrophoresis buffer, InstaStain® Ethidium Bromide.

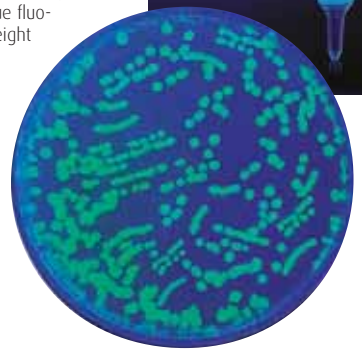
All you need: horizontal gel electrophoresis apparatus, power supply, UV visualization system, waterbath, microcentrifuge, microwave or hot plate, UV spectrophotometer & cuvettes, automatic micropipet with tips, ring stands & clamps, 10 ml pipets, lab glassware, ice and ice buckets.

Cat. #302 is recommended for college level courses.

• SCIENCE • TECH - MATH STEM NOLOGY • ENGINEERING •

InstaStain® ETBR

Exploring Biotechnology with Green Fluorescent Protein (GFP)



Four experimental modules are combined into one experiment to provide a **comprehensive** biotechnology exploration focusing on the green fluorescent protein (GFP). Bacterial cells are transformed to express the green fluorescent protein (GFP). Then, the transformed cells are grown and the GFP is purified by column chromatography. Finally, the purity of the protein fractions are analyzed by SDS polyacrylamide gel electrophoresis.

For 6 experiments with 4 modules each

Module I: Transformation - 45 min.
Module II: Isolation of GFP - 45 min.
Module III: Purification of GFP by Chromatography - 45 min.
Module IV: Analysis of GFP by Denaturing SDS Gel Electrophoresis - 60 min.

Cat. #303

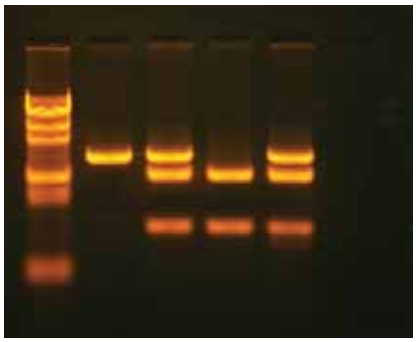
Kit includes: instructions, BactoBeads™, plasmid DNA for GFP, IPTG, ampicillin antibiotic, calcium chloride, ReadyPour™ luria broth agar, luria broth media for recovery, petri plates, pipets, calibrated transfer pipets, inoculating loops, microtest tubes with attached caps, toothpicks, dry matrix for columns, chromatography columns, green and blue fluorescent protein extracts, elution buffer, protein molecular weight standards, protein denaturation solution, glycerol solution, Tris-Glycine-SDS buffer, Protein InstaStain®.

All you need: incubation oven, two waterbaths, microwave or hot plate, automatic micropipet and tips, pipet pumps or bulbs, ice, long wave UV light, ring stand and clamps, lab glassware, ice, vertical gel electrophoresis apparatus and power supply, 3 Polyacrylamide Gels (12%), plastic trays or large weigh boats for optional staining & destaining, glacial acetic acid, methanol.

Now also includes a classroom demonstration option!

BactoBeads™

InstaStain® Protein



InstaStain® ETBR

In Search of the Cancer Gene

Suppressor genes such as p53 are essential for cell functions. Mutations in the p53 gene can be correlated to predisposition for certain cancers. Mutations in genes can either be inherited or accumulated due to environmental insults. This experiment deals with a family pedigree determination of several generations relating to cancer formation due to p53 gene mutation. This experiment does not contain human DNA.

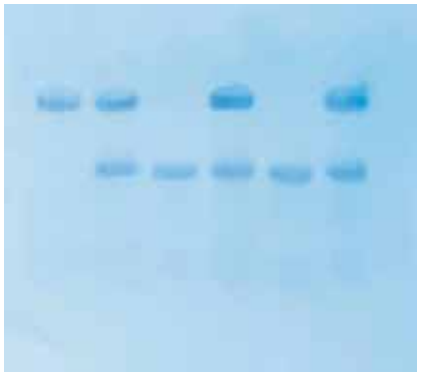
For 6 groups

Complete in 60 min.

Cat. #314

Kit includes: instructions, Ready-to-load™ Predigested DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Ethidium Bromide, pipet, 5 autoradiograms.

All you need: electrophoresis apparatus & power supply, automatic micropipet with tips, balance, microwave or hot plate, waterbath (65° C), UV Transilluminator, pipet pump or bulb, 250 ml Flasks, distilled or deionized water.



In Search of the Sickle Cell Gene by Southern Blot

READY TO LOAD

Southern blotting is an important technique used widely in clinical genetics and research. By transferring DNA from an agarose gel onto a membrane, the method allows you to analyze and identify the DNA bands on a gel precisely. Your students will use Southern blotting to identify the presence of a point mutation in the hemoglobin gene that indicates Sickle Cell Anemia.

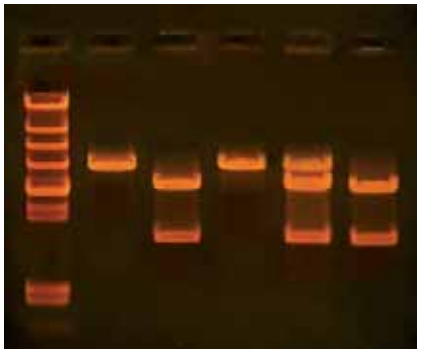
For 5 Lab Groups

Electrophoresis 45 min.
Blotting overnight
Staining & destaining 10 min.

Cat. #315

Kit includes: instructions, Ready-to-Load™ DNA samples, agarose, electrophoresis buffer, nylon membranes, filter paper, blot stain.

All you need: electrophoresis apparatus, power supply, microwave or hot plate, waterbath and 80° C incubation oven.



InstaStain® ETBR

In Search of the Cholesterol Gene

Coronary heart disease and stroke are major causes of death in the Western world. Elevated blood cholesterol levels are a serious risk factor for both conditions. The genetic disease familial hypercholesterolemia (FH) causes an increase in blood levels of the "bad" form of cholesterol, low density lipoprotein (LDL). In untreated patients with the mutant FH gene, the condition can cause premature death. This experiment includes reagents for the colorimetric enzymatic reaction which is the basis of the clinical cholesterol test. In addition, using agarose gel electrophoresis, students will analyze a simulated genetic screening for a disease.

For 10 Groups

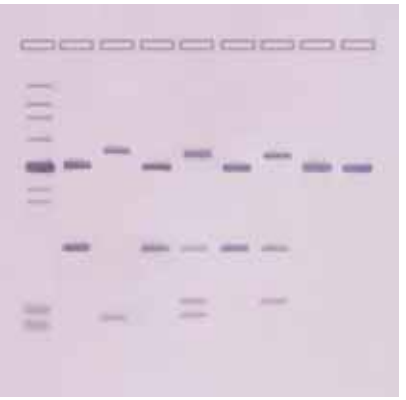
Gel Prep 30 min.
Electrophoresis 45 min.
Staining 2 min.
Cholesterol assay 60 min.

Cat. #316

Kit includes: instructions, cholesterol standard solution, standard DNA markers, control samples, simulated patient serum samples and DNA samples, cholesterol oxidase enzyme, potassium iodide, acidification solution, color enhancer & color developer, agarose, electrophoresis buffer, InstaStain® Ethidium Bromide.

All you need: horizontal gel electrophoresis apparatus, power supply, automatic micropipet with tips, balance, microwave or hot plate, incubation oven or waterbath, spectrophotometer and cuvettes, UV transilluminator, pipet pumps or bulbs, lab glassware, large weigh boats.

DNA Fingerprinting by Southern Blot



In this experiment, students gain experience in non-isotopic DNA detection & the use of Southern Blot analysis in DNA fingerprinting for a hypothetical paternity test. Includes three modules: agarose gel electrophoresis, Southern Blot transfer, and non-isotopic detection of DNA.

For 5 groups

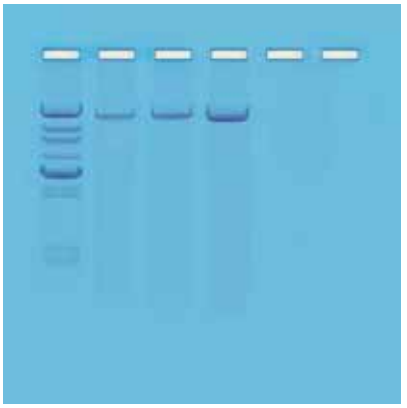
Electrophoresis - 45 min
Blotting - overnight
Non-Isotopic Detection 3-4 hrs.

Cat. #311

Kit includes: instructions, predigested DNA samples, buffers, NBT/BCIP tablets, streptavidin-Alkaline Phosphatase, nylon membranes, filter paper, UltraSpec-Agarose™ powder.

All you need: electrophoresis apparatus & power supply, automatic micropipet with tips, balance, microwave or hot plate, waterbath, incubation oven, pipet pumps or bulbs, pipets, floating Racks for microtest tubes, lab glassware, plastic wrap, distilled or deionized water, NaCl, NaOH, Concentrated HCl, ice.

Isolation and Gel Analysis of DNA from Plants



A complete experiment kit for the isolation of plant DNA from pea plants. Students will grow and then harvest plants, air dry them, and perform the steps necessary to isolate the plant DNA. The DNA is analyzed by agarose gel electrophoresis.

For 10 Extractions and 6 Gels

Isolation of DNA 120 min.
Electrophoresis 45 min.

Cat. #907

Kit includes: instructions, pea seeds, DNA extraction buffer, B-mercaptoethanol, Ammonium acetate, TE buffer, standard genomic DNA, gel loading solution, UltraSpec-Agarose™ powder, electrophoresis buffer, InstaStain® Blue and FlashBlue™ Stain.

All you need: electrophoresis apparatus, power supply, waterbath, Sorvall centrifuge, micropipet, balance, microcentrifuge, microwave or hot plate, visualization system, 95-100% isopropanol, distilled or deionized water, horticulture grade vermiculite, misc. labware.

InstaStain® Blue FlashBlue™

Sequencing the Human Genome

Actual data representing important genes from automated DNA Sequencers are provided. Students will determine the DNA sequence, compare and extrapolate database information and identify the gene product and other closely related proteins. Data is discussed within the framework of the Human Genome Project.

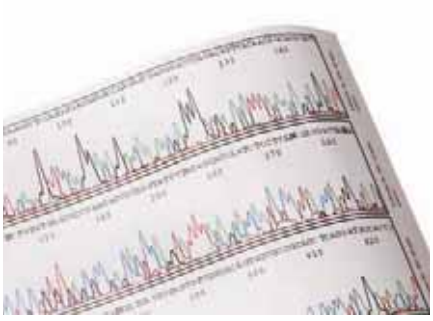
Kit includes: instructions, automated sequencing printouts

All you need: computer access to the internet

Sequences for 10 groups.

Complete in 45 min.

Cat. #339



DNA Bioinformatics

DNA sequence information is being compiled by various genome initiatives and numerous research groups around the world. The management of this data is known as bioinformatics. This information is stored in various DNA sequence databases which can be readily accessed via the internet. In this experiment, students read x-rays containing DNA sequences which represent segments of important cellular genes. Using bioinformatics databases, students compare and extrapolate database information and identify the gene product.

For 12 groups.

Complete in 45 min.

Cat. #340

Kit includes: instructions, 3 sets of 4 autoradiograms

All you need: white light visualization system, computer access to the internet.

SECTION FIVE

5 Polymerase Chain Reaction

The imagination of nature is far, far greater than the imagination of man.

RICHARD FEYNMAN, NOBEL PRIZE WINNING PHYSICIST

Nobel Prize Winning Science in Your Classroom!

The invention of the Polymerase Chain Reaction (PCR) radically changed biology. The technique was considered so important that the Nobel Prize was awarded to its inventor, Kary Mullis, in 1993.

Thanks to this technique, very small samples of DNA (from as little as a single cell) can be analyzed. PCR works by making billions of copies of DNA in just a few hours. PCR is now routinely used in forensic investigations, infectious disease testing and screening for genetic disease. Amazingly, without harming it, a single cell can be removed from an 8-cell human embryo to test for many different genetic diseases at once (although these types of tests can raise many ethical issues).

PCR is the systematic copying (or amplifying) of a target sequence of DNA using DNA polymerase from the heat stable bacteria *Thermus aquaticus (Taq*). The target sequence is located in the genome using primers. Primers are short pieces of DNA that are complementary to the ends of the target sequence. The DNA, primers and *Taq* DNA polymerase are mixed together, then cycled through three temperatures. This causes the DNA to be amplified. Originally, this was carried out by painstakingly moving tubes from waterbath to waterbath. Now, this is carried out using a thermal cycler or PCR machine. Following amplification, the DNA is then analyzed using electrophoresis.

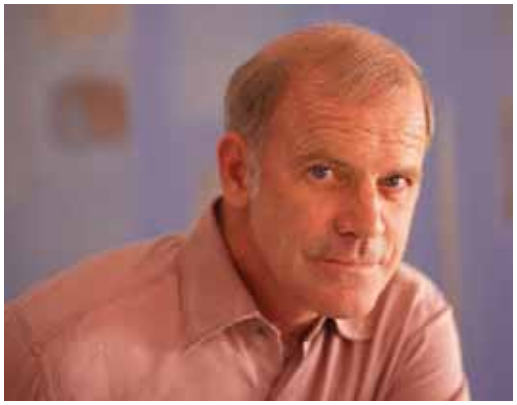
In this section, you will find kits to teach PCR to suit all student abilities and all budgets. With our Ready-to-Load™ kits, you can demonstrate the concept of PCR without using a thermal cycler! Alternatively, your students can try amplifying their own DNA.

We have developed two affordable PCR machines for the classroom, the EdvoCycler™ and the MegaCycler™. Details can be found on page 42 and in the equipment section. Please see our equipment section for details of all of our electrophoresis equipment designed to suit any class size (page 102).

Give your students the opportunity to perform this Nobel Prize winning technique!

"EUREKA!!!! I stopped the car at mile marker 46,7 on Highway 128. Somehow, I thought, it had to be an illusion. Otherwise it would change DNA chemistry forever. Otherwise it would make me famous. It was too easy. Someone else would have done it and I would surely have heard of it. We would be doing it all the time."

Kary Mullis
Nobel Prize winning inventor
of Polymerase Chain Reaction (PCR)



POLYMERASE CHAIN REACTION

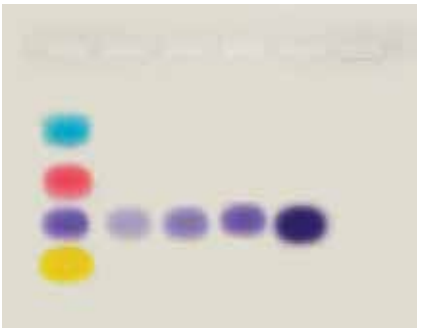
Experimenting with PCR

What is PCR and How Does it Work?

BEST SELLER

READY TO LOAD

Teach your students about PCR without a thermal cycler! Using colorful dyes, your students will see how an increasing number of cycles produces more DNA. NO preparation & NO staining!



For 10 Lab Groups

Complete in 45 minutes

Cat. #S-48

Kit includes: instructions, Ready-to-Load™ dye samples, agarose powder, practice gel loading solution, electrophoresis buffer, microtipped transfer pipets.

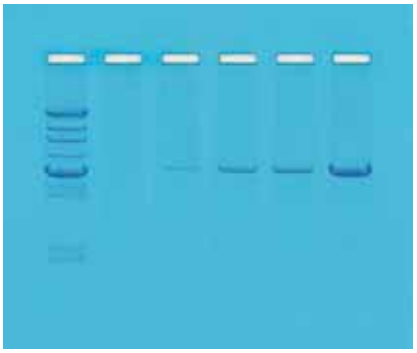
All you need: electrophoresis apparatus, power supply, microwave or hot plate.

Principles of PCR

READY TO LOAD

FlashBlue™

Your students will learn the principles of PCR using real DNA in this Ready-to-Load™ experiment. Using gel electrophoresis your students will see for themselves that more DNA is produced with every cycle of the reaction. No thermal cycler is required.



For 6 Lab Groups

Complete in 45 minutes

Cat. #103

Kit includes: instructions, Ready-to-Load™ DNA samples, agarose, practice gel loading solution, electrophoresis buffer, microtipped transfer pipets, FlashBlue™ stain.

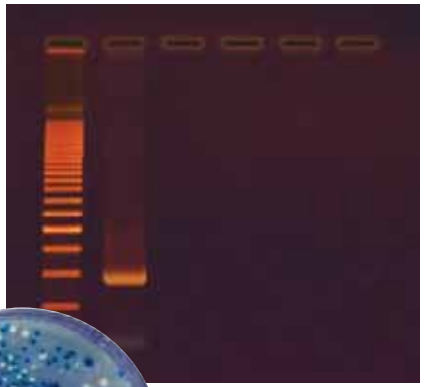
All you need: electrophoresis apparatus, power supply, microwave or hot plate.

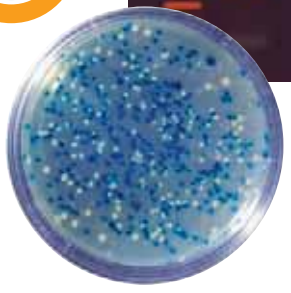
Cloning of a PCR Amplified Gene

Advanced Topic

NEW & improved!

Teach your students about cloning with this exciting and exclusive lab! An antibiotic gene is amplified using PCR and then the size is determined by using DNA standard markers and agarose gel electrophoresis. T4 DNA Ligase is used to insert the antibiotic gene into a plasmid vector and the resulting recombinant DNA ("clone") is used to transform *E. coli* LyphoCells™. The transformed cells are plated and transformants are counted to determine transformation efficiency.





For 5 Lab Groups

Module I:
Amplification by PCR - 2 hours or overnight
Electrophoresis - 45 to 60 min.
Module II:
Preparation for Ligation - 90 to 110 min.
Module III:
Ligation into pUC - 19 to 30 min.
Module IV:
Transformation - 50 to 60 min.

Cat. #331

BactoBeads™

Kit includes: instructions, biologicals, buffers and reagents for PCR, ligation and transformation, ReadyPour™ Luria Broth agar, DNA size ladder, wax beads, agarose, electrophoresis buffer, InstaStain® Ethidium Bromide.

All you need: thermal cycler, two waterbaths, incubation oven, electrophoresis apparatus, power supply, automatic micropipet with tips, microwave or hot plate, UV transilluminator.

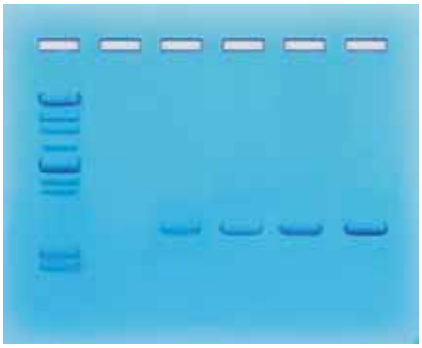
InstaStain® ETBR

PCR Amplification of DNA

BEST SELLER

FlashBlue™

In this easy PCR experiment, students will make billions of copies of a small amount of DNA in just 90 minutes! They will just need to mix template DNA & primers with PCR EdvoBeads™ that contain all of the other components required to carry out a PCR reaction. Students will see the increasing amounts of DNA for themselves, taking samples every few cycles and analyzing them on a DNA gel.



For 10 Lab Groups

PCR 3 hours or overnight
Electrophoresis 45 min.

Cat. #330

Kit includes: instructions, PCR EdvoBeads™, DNA template and primers, DNA size ladder, ultrapure water, wax beads, gel loading dye, agarose, electrophoresis buffer, InstaStain® Ethidium Bromide, and FlashBlue™ stain.

All you need: 5-50 µl adjustable micropipets, tips, thermal cycler, electrophoresis apparatus, power supply, microwave or hot plate, UV transilluminator.

Quick PCR

NEW

This experiment uses PCR to amplify a small section of Lambda DNA via a two-step process, which saves valuable classroom time and allows for completion of the lab in one session.

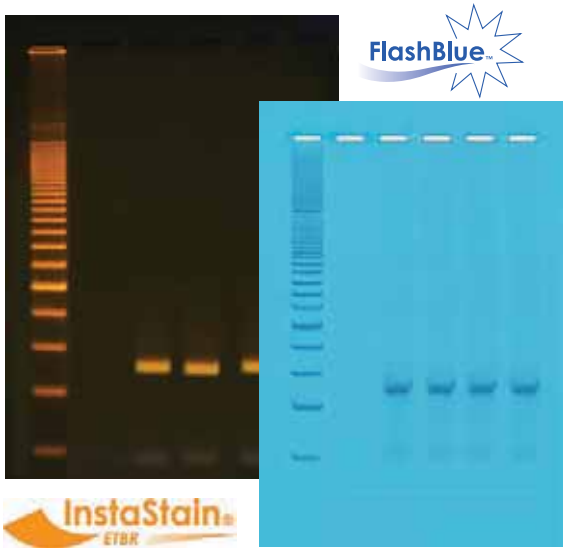
Kit includes: instructions, PCR EdvoBeads™, DNA template & primers, DNA size ladder, ultrapure water, wax beads, gel loading dye, agarose, electrophoresis buffer, InstaStain® Ethidium Bromide and FlashBlue™ stain.

All you need: 5-50 µl adjustable micropipets, tips, thermal cycler, electrophoresis apparatus, power supply, microwave or hot plate, UV transilluminator.

For 10 Lab Groups

Complete in 60 min.

Cat. #372



What Customers Are Saying...

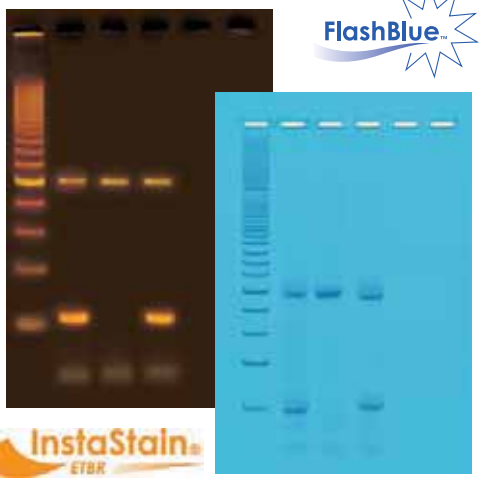
From Kevin Jankowski, Professor
Harry S. Truman College:

"We recently purchased your thermocycler as part of a LabStation. It's so user-friendly that everyone doing PCR wants to use it over our other 'high end' thermocycler. The results are the same for a fraction of the price. It's the ultimate in 'concise' technology. Our students no longer get lost in the software of the machine and can concentrate on their experiments. This greatly enhances their learning experience. This also makes my life easier: 5-10 minutes of instruction and they are ready to go. Kudos to Edvotek! Thank you!"

Drosophila Genotyping Using PCR

Advanced Topic

Students will learn about DNA polymorphisms by amplifying DNA regions that vary between wild & mutant *Drosophila*. Amplified DNA from wild-type and white-eyed flies are separated by agarose gel electrophoresis and analyzed.



For 10 Lab Groups

Set up 30 min.
PCR 2 hours or overnight
Electrophoresis 90 min.

Cat. #337

Kit includes: instructions, PCR EdvoBeads™, primers, DNA extraction buffer, 200 bp ladder, Proteinase K, *Drosophila* (wild type and white eye), agarose, electrophoresis buffer, InstaStain® Ethidium Bromide and FlashBlue™ stain.

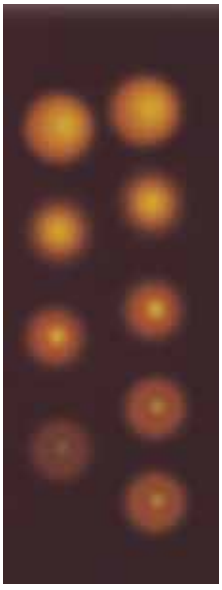
All you need: thermal cycler, electrophoresis apparatus and power supply, automatic micropipet with tips, microwave or hot plate, waterbath, UV transilluminator, microcentrifuge.

Kit contains LIVE materials which must be requested 3 weeks prior to lab.

Simulation of Real Time PCR (qPCR)

Advanced Topic

In Real Time PCR, amplification is monitored while the reaction is ongoing and allows for a quantitative analysis. A fluorescent dye added to the PCR reaction, binds to the DNA as it is being amplified, and the resulting fluorescence is measured during the reaction. In this Real Time PCR experiment, the reaction will be monitored for product throughout the cycling steps without the use of agarose gel electrophoresis.



For 10 Lab Groups

PCR 90 min.
Experimental Procedures 15 min.

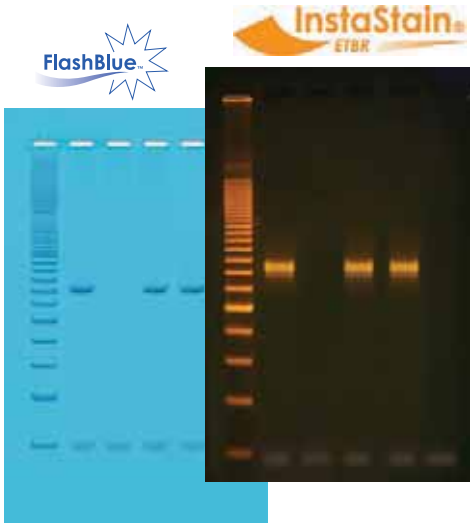
Cat. #370

Kit includes: instructions, PCR EdvoBeads™, DNA template and primers, Ultrapure water, wax beads, ethidium bromide, microtiter plates.

All you need: thermal cycler, automatic micropipet with tips, microcentrifuge, balance, UV transilluminator.

www.edvotek.com

PCR Water Analysis



PCR-based Testing of Water Contaminants

WATER QUALITY TESTING II

Now your students can use PCR to detect water pollution due to sewage contamination. In this experiment, **safe** bacterial strains will be provided to simulate the detection of microbes in contaminated water. As an extension to this experiment, students will be able to test for water contamination in samples they provide.

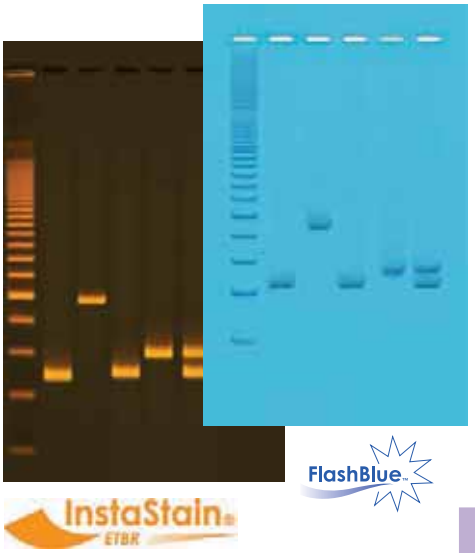
For 25 Students

Set up 60 min.
PCR 2 hours or overnight
Electrophoresis 45 min.

Cat. #952

Kit includes: instructions, control DNA and primers, DNA ladder, BactoBeads™, chelating agent, proteinase K, PCR EdvoBeads™, gel loading dye, agarose, electrophoresis buffer, InstaStain® Ethidium Bromide and FlashBlue™ stain, Ultrapure water.

All you need: micropipets to measure between 5 and 50 µl, tips, water-bath, microcentrifuge, thermal cycler, electrophoresis apparatus, power supply, microwave or hot plate, UV transilluminator.



Multiplex PCR-based Testing of Water Contaminants

WATER QUALITY TESTING III

Your students will investigate Multiplex PCR to search for gene markers of three different microbes used to simulate contaminants in water. Multiplex PCR products are analyzed on agarose gels.

For 25 Students

Set up 60 min.
PCR 2 hours or overnight
Electrophoresis 45 min.

Cat. #953

Kit includes: instructions, control DNAs and primers, DNA ladder, BactoBeads™, proteinase K, PCR EdvoBeads™, gel loading dye, agarose, electrophoresis buffer, InstaStain® Ethidium Bromide and FlashBlue™ stain..

All you need: micropipets to measure between 5 and 50 µl, tips, waterbath, microcentrifuge, thermal cycler, electrophoresis apparatus, power supply, microwave or hot plate, UV transilluminator.

PCR EdvoBeads™

30 Beads

Cat. #625

Each PCR EdvoBead™ contains:
- *Taq* DNA Polymerase
- *Taq* DNA Polymerase Buffer
- dNTP Mixture
- $MgCl_2$

POLYMERASE CHAIN REACTION

Human PCR

Mitochondrial DNA Analysis Using PCR

NEW & improved!

The mitochondria are thought to have evolved from a symbiotic relationship between prokaryotic and eukaryotic cells. Mitochondria have their own DNA and are only inherited via the maternal line. In this experiment, your students will amplify two regions of their mitochondrial DNA.

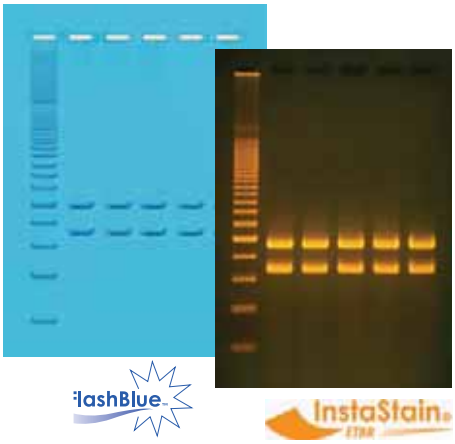
For 25 Students

Set up 30 min.
PCR 2 hours or overnight
Electrophoresis 45 min.

Cat. #332

Kit includes: instructions, proteinase K, PCR EdvoBeads™, control DNA & primers, microtubes, chelating agent, agarose, DNA ladder, practice gel loading solution, gel loading dye, buffer, InstaStain® Ethidium Bromide and FlashBlue™ stain.

All you need: micropipets to measure between 5 and 50 µl, tips, water-bath, thermal cycler, electrophoresis apparatus, power supply, microwave or hot plate, UV transilluminator.



Alu-Human DNA Typing Using PCR

BEST SELLER

NEW & improved!

Your students use primers for a 300 base pair Alu insertion in chromosome 16 (PV92) to determine their own genotype! They can then compare their class results with others around the world via the internet.

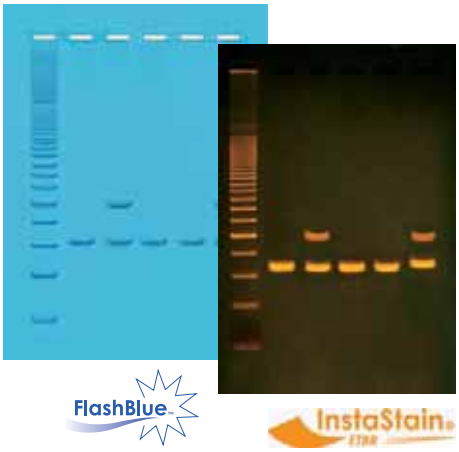
For 25 Students

Set up 30 min.
PCR 2 hours or overnight
Electrophoresis 45 min.

Cat. #333

Kit includes: instructions, proteinase K, PCR EdvoBeads™, control DNA and primers, microtubes, chelating agent, agarose, DNA ladder, practice gel loading solution, gel loading dye, buffer, InstaStain® Ethidium Bromide and FlashBlue™ stain.

All you need: micropipets to measure between 5 and 50 µl, tips, water-bath, thermal cycler, electrophoresis apparatus, power supply, microwave or hot plate, UV transilluminator.



VNTR Human DNA Typing Using PCR

BEST SELLER

NEW & improved!

In DNA fingerprinting, variable number tandem repeats (VNTR) are used to identify individuals. In this kit, students will type themselves at the D1S80 locus on chromosome 1. This region contains between 14 and 40 copies of a 16 base pair repeat.

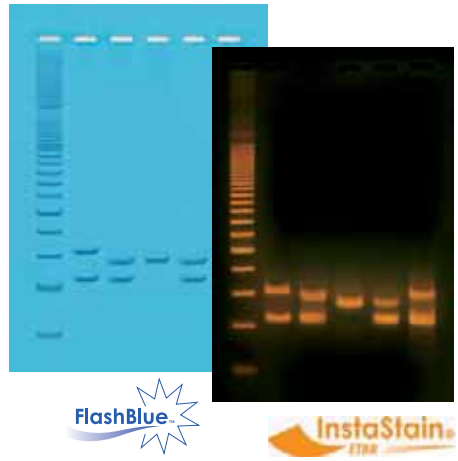
For 25 Students

Set up 30 min.
PCR 2 hours or overnight
Electrophoresis 45 min.

Cat. #334

Kit includes: instructions, proteinase K, PCR EdvoBeads™, control DNA and primers, microtubes, chelating agent, agarose, DNA ladder, practice gel loading solution, gel loading dye, buffer, InstaStain® Ethidium Bromide and FlashBlue™ stain.

All you need: micropipets to measure between 5 and 50 µl, tips, waterbath, thermal cycler, electrophoresis apparatus, power supply, microwave or hot plate, UV transilluminator.



Reverse Transcription PCR (RT-PCR): The Molecular Biology of HIV Replication

Advanced Topic

A specific mRNA is reverse transcribed to double-stranded DNA. This DNA product is then amplified by PCR. This reaction demonstrates the mode of replication of HIV, which contains reverse transcriptase. This experiment is the first introduction of a commercial RNA experiment for the classroom laboratory.

Kit includes: instructions, RNA Template, Primer Mix, RT-PCR reaction beads, RNase-free water, DNA size ladder, agarose, electrophoresis buffer, InstaStain® Ethidium Bromide.

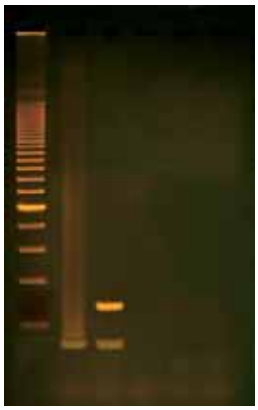
All you need: thermal cycler, electrophoresis apparatus, power supply, automatic micropipet with tips, microwave or hot plate, waterbath, UV transilluminator.

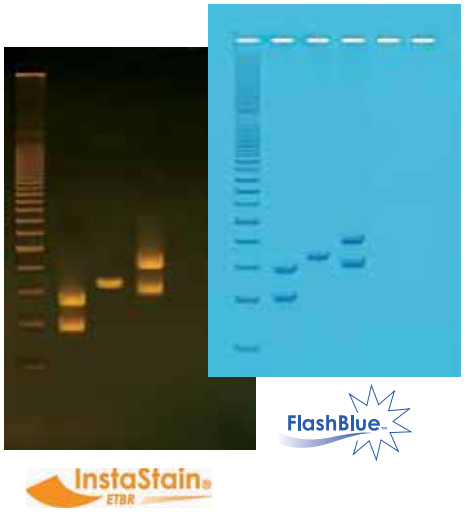
InstaStain® ETBR

For 6 Lab Groups

Reverse Transcription 35 min.
PCR 2 hours or overnight
Electrophoresis 45 min.

Cat. #335





Human PCR Tool Box™

NEW & improved!

Carry out three PCR experiments in your class at once! This kit provides three sets of primers to carry out the PCR amplification of Alu element (PV92) on chromosome 16, the VNTR locus (D1S80) on chromosome 1, and two regions of the mitochondrial gene.

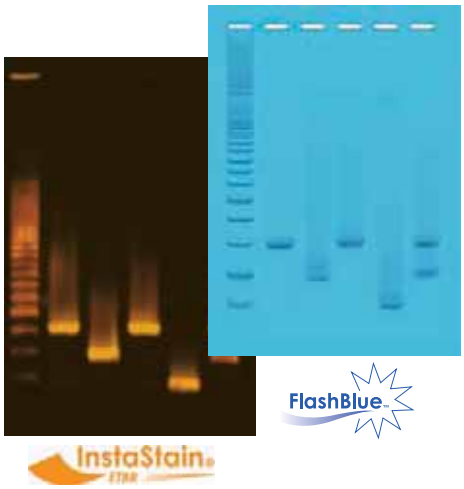
For 25 students

Set up 30 min.
PCR 2 hours or overnight
Electrophoresis 45 min.

Cat. #369

Kit includes: instructions, proteinase K, PCR EdvoBeads™, control and primer DNA, microtubes, chelating agent, agarose, DNA ladder, practice gel loading solution, gel loading dye, electrophoresis buffer, InstaStain® Ethidium Bromide and FlashBlue™ stain.

All you need: micropipets to measure between 5 and 50 µl, tips, waterbath, thermal cycler, electrophoresis apparatus, power supply, microwave or hot plate, UV transilluminator.



DNA Fingerprinting Using PCR

Advanced Topic

Your students can solve a crime using PCR. Plasmid DNA is provided that, when amplified by PCR, provides products that represent individual DNA profiles. Your students can then solve a crime!

For 25 students working in 5 groups.

Set up 30 min.
PCR 2 hours or overnight
Electrophoresis 45 min.

Cat. #371

Kit includes: instructions, PCR EdvoBeads™, DNA templates, primers, DNA ladder, ultrapure water, wax beads, agarose, loading dye, electrophoresis buffer, InstaStain® Ethidium Bromide and FlashBlue™ stain.

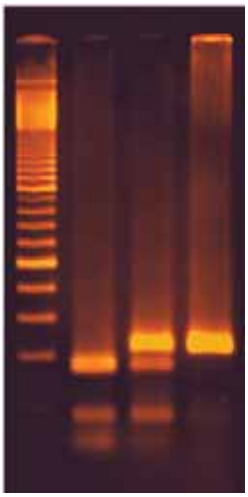
All you need: micropipets to measure between 5 and 50 µl, tips, waterbath, thermal cycler, electrophoresis apparatus, power supply, microwave or hot plate, UV transilluminator.

Exploring the Genetics of Taste: SNP Analysis of the PTC Gene Using PCR

NEW

InstaStain® ETBR

The objective of this experiment is to identify the presence of the single nucleotide polymorphism (SNP) in an amplified segment of the PTC gene that links detection of the characteristic taste of PTC paper. This is a set of five modules that starts with (I) extraction of DNA from buccal cells (II) amplifying the segment that contains the polymorphic nucleotide (III) digestion of the amplified fragment with the restriction enzyme that recognizes the SNP (IV) analysis by gel electrophoresis (V) tasting the PTC paper to confirm the results obtained.



For 25 reactions

DNA Extraction 20 min.
PCR 1.5 hours or overnight
Restriction Enzyme Digestion 35 min.
Electrophoresis 55 min.
PTC activity 10 min.

Cat. #345

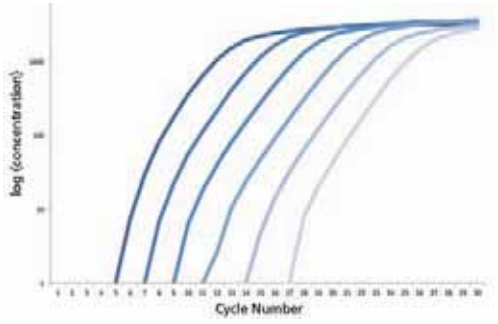
Kit includes: instructions, Primer mix, DNA template, PCR Edvobead™, DNA size ladder, Restriction Enzyme, Restriction Enzyme Reaction and Dilution Buffers, Lysis buffer, agarose, electrophoresis buffer, Instastain® Ethidium Bromide stain, PTC paper.

All you need: thermal cycler, electrophoresis apparatus, power supply, automatic micropipette, microwave or hot plate, waterbath, UV transilluminator.

Principles of Quantitative Real-Time PCR (qPCR)

NEW

Quantitative PCR (qPCR) is a molecular technique that allows us to visualize the amplification of a specific DNA in real time; it also allows us to quantify the exact amount of the target DNA in the sample. To do this, a dye is added to the PCR sample that fluoresces when bound to double-stranded DNA. As such, any increase in fluorescence correlates to an increase in DNA in the sample. This allows scientists to precisely quantitate the amount of DNA in a sample as it is being amplified. In this experiment, students will explore the principles of qPCR by analyzing a dilution series. The resulting samples can also be analyzed by agarose gel electrophoresis.



Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and Flash-Blue™ stain, calibrated pipet, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, visualization system, qPCR machine.

For 6 gels

Completes in 60 min.

Cat. #380

EdvoCycler™ & MegaCycler™

MADE IN THE USA

The Edvoycler™ and MegaCycler™ are stand alone classroom PCR machines that are easy to use! Both come pre-programmed with all EDVOTEK PCR protocols. These programs may be modified or deleted, plus there is extra memory slots for more!

See page 110 for more information!

EdvoCycler™
Holds 25 x 0.2 ml sample tubes.
Cat. #541

MegaCycler™
Holds 49 x 0.2 ml sample tubes.
Cat. #542

NIH Research supported in part by NIH SBIR NCRR Grant #R44RR18670

Plant PCR

QuickPlant™ Genetics Using PCR

Your students will see for themselves the relationship between genotype and phenotype by performing PCR using DNA extracted from Edvotek® Quick-Plants™. Unlike the wild type QuickPlants™, the *glabra* mutant lacks trichomes (single-celled hairs) on its leaves. Using PCR, your students will compare a region of DNA that differs between the *glabra* mutant and the wild type plants, so they will see this variation at the DNA level.

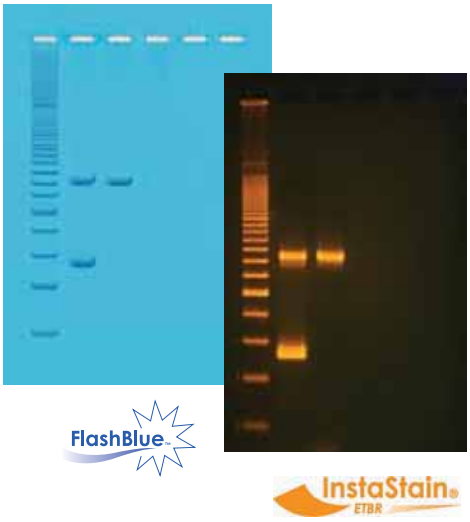
For 10 Lab Groups

Set up 30 min.
PCR 2 hours or overnight
Electrophoresis 45 min.

Cat. #336

Kit includes: instructions, QuickPlant™ seeds, potting soil pellets and pots, PCR EdvoBeads™, microtubes, primers, DNA extraction buffer, plant homogenization pestles with tubes, agarose, electrophoresis buffer, DNA ladder, InstaStain® Ethidium Bromide and FlashBlue™ stain.

All you need: micropipets to measure between 5 and 50 µl, tips, water-bath, thermal cycler, electrophoresis apparatus, power supply, microwave or hot plate, UV transilluminator.



Identification of Genetically Modified Foods Using PCR

Some foods contain raw materials from genetically modified organisms (GMO). Examples include tofu, corn flakes and corn meal. In this experiment, your students will extract DNA from food or plant material and perform PCR to determine if any GM indicator genes are present. Amplified DNA is separated and sized by agarose gel electrophoresis.

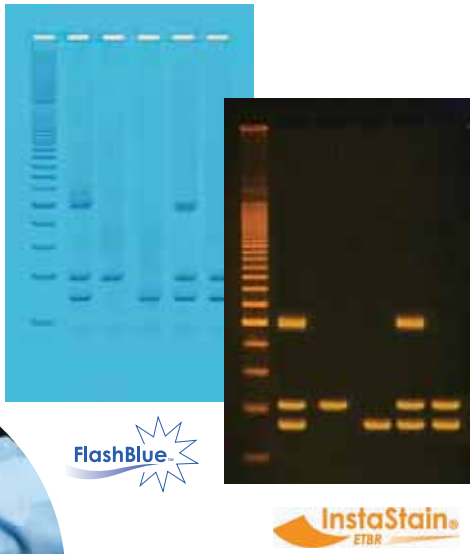
For 10 Lab Groups

Set up 30 min.
PCR 2 hours or overnight
Electrophoresis 45 min.

Cat. #962
(Combined with former Cat. #961)

Kit includes: instructions, DNA extraction reagents, PCR EdvoBeads™, microtubes, primers, DNA ladder, ultrapure water, wax beads, gel loading dye, agarose, electrophoresis buffer, InstaStain® Ethidium Bromide and FlashBlue™ stain.

All you need: micropipets to measure between 5 and 50 µl, tips, waterbath, microcentrifuge, thermal cycler, electrophoresis apparatus, power supply, microwave or hot plate, UV transilluminator.



SECTION SIX

6 Introduction to RNA

As science progresses, our knowledge expands, we think we understand, and too often we become overconfident. The fact is, I think we almost always underestimate the complexity of life and nature.

CRAIG C. MELLO, NOBEL PRIZE SPEECH 2006

Don't Shoot the Messenger

Until recently, RNA was only of interest in its role as an intermediary in transcription and translation. However, that has now all changed forever! The discovery that RNA has an important role in controlling gene expression through RNA interference (or RNAi) has led scientists to reassess the significance of RNA and even to ask the question, "How important is DNA?"

As with many major breakthroughs in science, the role of RNAi was discovered by chance through studying petunia genetics. However, RNA wasn't understood until the late 1990s, when researchers Craig C. Mello and Andrew Fire worked on the nematode worm *C. elegans,* that RNAi was first understood.

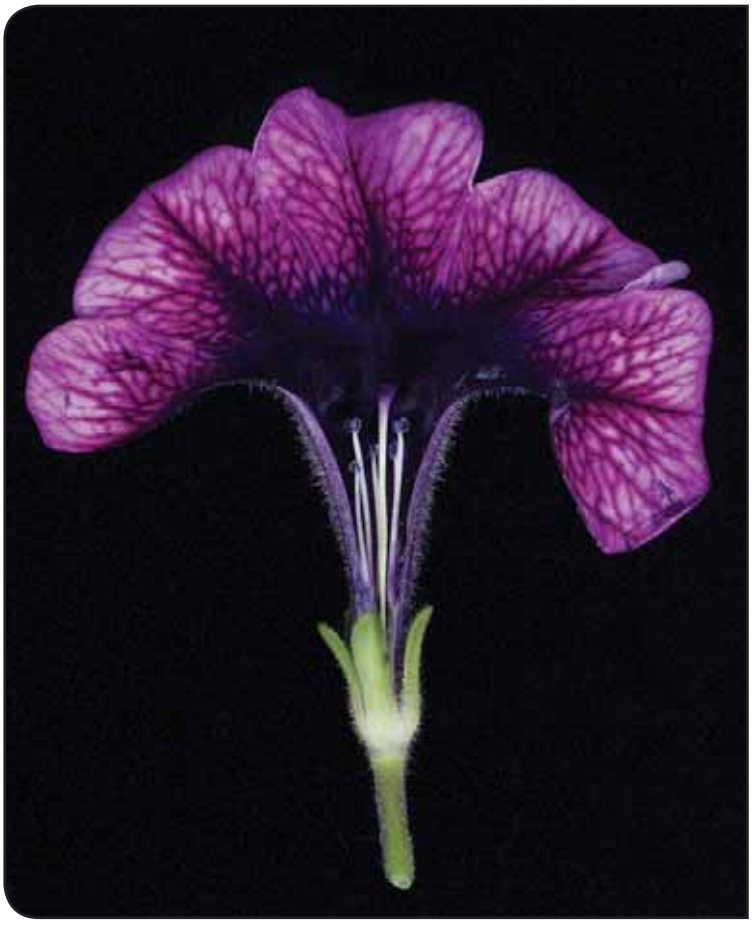
Mello and Fire discovered that short complimentary RNA fragments (called small interfering RNA strands or siRNA) can bind with specific messenger RNA to switch off (or silence) specific genes. These double stranded RNAs are degraded by cellular enzymes. It provides a completely new level of complexity in a cell's ability to control its gene expression.

The biological role of RNAi is thought to be very ancient – at least one billion years old! As with restriction enzymes in bacteria, RNAi acts as a viral defense mechanism– still used in plants to protect them against double stranded RNA viruses.

RNAi also reminds us of the importance of RNA in the evolution of life on Earth. The so-called RNA World Hypothesis proposes that RNA was the original way life stored genetic information (with DNA being a later addition). Given this, perhaps it is not so surprising that RNA plays such a crucial role in the control of genetic information rather than just as a passive messenger.

As a research tool, RNAi has become something of a craze! RNAi has replaced expensive & laborious knock-out technologies for deleting a gene's activity to see what it does. This highly selective "gene silencing" reveals what genes are doing so that both where and when the gene is stopped can be controlled more easily. Perhaps this is because, unlike other mechanisms for switching off genes, RNAi mimics a natural process.

It is expected that RNAi will have a major impact in how genetic research is done and also in how we are able to selectively treat diseases in the future. For this reason, the Nobel Prize was jointly awarded to Craig C. Mello and Andrew Fire in 2006.



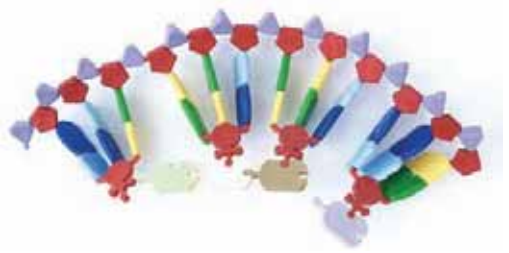
Introduction to RNA

RNA Protein Synthesis Kit

BEST SELLER

Your students can build a model of RNA with this simple and colorful system. Ideal for modeling translation.

Cat. #1513



RNA: Extraction and Digestion by RNAse

In this experiment, your students will discover the enzymatic activity of Ribonuclease (RNase), a type of nuclease that catalyzes the degradation of Ribonucleic Acid (RNA). The RNase Inhibitor (RI), capable of inhibiting the RNases, is also used to protect the RNA degradation by RNases.

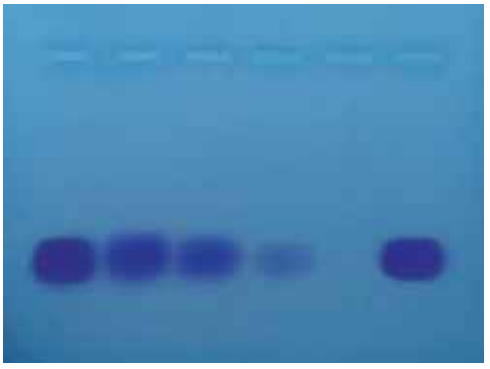
For 10 Groups

Complete in 90 min.

Cat. #208

Kit includes: instructions, Total RNA, RNases, RNase Inhibitor, buffer, gel loading dye, agarose, electrophoresis buffer, InstaStain® Blue cards and FlashBlue™ liquid stain.

All you need: electrophoresis apparatus, power supply, automatic micropipet with tips, microwave or hot plate, and white light visualization system.



InstaStain® Blue FlashBlue™

Separation of RNA & DNA by Gel Filtration Chromatography

Gel filtration chromatography separates molecules on the basis of size and shape. This experiment provides a LyphoSample™ mixture of RNA and DNA that is separated on a gel exclusion column. The purified fractions of DNA and RNA are analyzed by agarose gel electrophoresis.

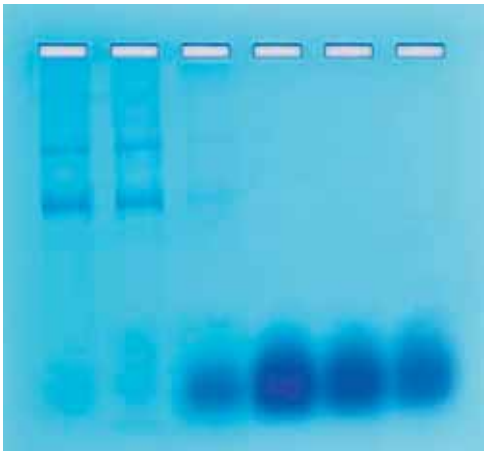
For 5 Separations & 5 Gels

Gel Filtration Chromatography 45 min.
Electrophoresis 45 min.

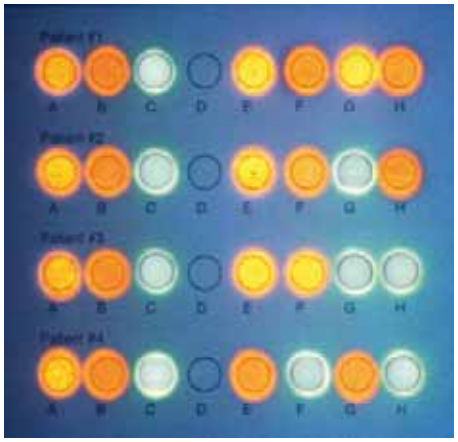
Cat. #204

Kit includes: instructions, DNA/RNA LyphoSample™, Dry matrix, elution buffer, chromatography columns, agarose, gel loading solution, buffer, InstaStain® Blue & FlashBlue™ stain.

All you need: electrophoresis apparatus, power supply, ring stands with clamps, automatic micropipet with tips, microwave or hot plate, pipet pumps or bulbs, 5 or 10 ml pipets, balance, lab glassware, weigh boats, white light visualization system, distilled water.



InstaStain® Blue FlashBlue™



DNA/RNA Microarrays

Membrane microarray technology is enabling scientists to screen large numbers of samples in one assay. This technology has led to cost savings by reducing the sample size, while saving time and yielding accurate results. Students will apply simulated DNA and RNA samples to a membrane to screen for positive and negative samples.

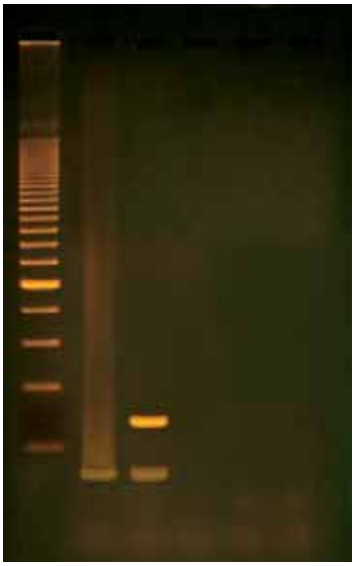
For 10 Groups

Complete in 60 min.

Cat. #235

Kit includes: instructions, simulated patient DNA and RNA samples & controls, microarray cards, plastic bags to incubate membrane, microtest tubes, pipets.

All you need: automatic micropipets and tips, distilled water, beakers or flasks.



InstaStain® ETBR

Reverse Transcription PCR (RT-PCR): The Molecular Biology of HIV Replication

A specific mRNA provided in this experiment is reverse transcribed to double-stranded DNA. This DNA product is then amplified by PCR. This reaction demonstrates the mode of replication of HIV, which contains reverse transcriptase. This experiment is the first introduction of a commercial RNA experiment for the classroom laboratory.

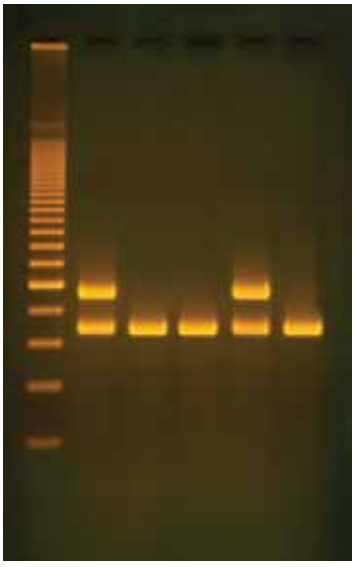
For 6 sets of reactions

Reverse Transcription 35 min.
PCR 120 min.
Gel Prep 30 min.
Electrophoresis 45 min.
Staining/Destaining 2 min.

Cat. #335

Kit includes: instructions, RNA template, primer mix, RT-PCR reaction beads, RNase-Free water, standard DNA markers, agarose, electrophoresis buffer, InstaStain® Ethidium Bromide, gel loading solution.

All you need: thermal cycler, electrophoresis apparatus, power supply, automatic micropipet with tips, balance, microwave or hot plate, waterbath, UV transilluminator, pipet pump or bulb, lab glassware, distilled water.



InstaStain® ETBR

Using Reverse Transcription PCR (RT-PCR) to Detect Influenza

NEW

The "gold standard" for flu identification is a molecular technique called reverse-transcriptase polymerase chain reaction (RT-PCR). This technique identifies the flu based on the molecular sequence of the viral RNA genome. In this experiment, your students will use RT-PCR to analyze simulated patient samples in order to determine which patient has an influenza infection

For 10 sets of reactions

Reverse Transcription 35 min.
PCR 120 min.
Gel Prep 30 min.
Electrophoresis 45 min.
Staining/Destaining 2 min.

Cat. #338

Kit includes: instructions, "patient" and control RNA samples, primer mix, RT-PCR reaction beads, RNase-Free water, standard DNA markers, agarose, electrophoresis buffer, InstaStain® Ethidium Bromide, gel loading solution.

All you need: thermal cycler, electrophoresis apparatus, power supply, automatic micropipet with tips, balance, microwave or hot plate, waterbath, UV transilluminator, pipet pump or bulb, lab glassware, distilled water.

SECTION SEVEN

7 Forensic Science

At first the images looked a complicated mess. Then the penny dropped. We had found a method of DNA-based biological identification.

PROF SIR ALEC JEFFREYS, INVENTOR OF DNA FINGERPRINTING

Science In The News!

Use forensic science to excite your students about DNA!

Biological evidence left behind at a crime scene is essential to identifying possible suspects. Traditionally, suspects have been found by matching descriptions about appearance, fingerprints and blood typing. Modern forensics can use DNA extracted from a single hair to identify an individual.

When Alec Jeffreys first announced his discovery that DNA fingerprints could be used to identify individuals, the news media became fascinated by DNA. Since that announcement in 1985, DNA fingerprinting has been widely used in forensics. Today, DNA analysis is mentioned daily on television crime shows and in the news. It should be remembered that this technique is not only used as evidence to convict criminals, but also to exonerate the innocent.

Give your students the opportunity to learn about DNA and biotechnology in the exciting context of forensics. Your students will enjoy solving a mystery through actual fingerprinting, blood typing simulated blood, and DNA Fingerprinting with dyes or real DNA.

Using our kits, your students will compare "crime scene" DNA with "suspect" DNA! Try our DNA Fingerprinting by PCR Amplification (kit #130), DNA Fingerprinting Using Restriction Enzymes (kit #225), or DNA Fingerprinting Using PCR (kit #371).

Bring the exciting world of modern forensics into your classroom!

For Pregnancy & Paternity Experiments, see our Medical Diagnostics section, pages 74 & 75.

For Human DNA Typing PCR, experiments #333 & 334 see page 40.

"It is well known in teaching that students learn best by doing, less well by seeing and even less by hearing. In my experience they also learn best when they are interested, active and enjoying themselves. Hands on biotechnology has all of those essential elements. It grabs their interest because they can relate it to issues they hear about. It keeps them active because there are unusual pieces of equipment and new techniques to master. It is enjoyable because it is surprising and new."

Zoe Manning
Biology Teacher, Strode College

Crime Solving and DNA Fingerprinting

Whose Fingerprints Were Left Behind?

BEST SELLER

After a crime has been committed, the evidence left behind can identify a potential culprit, although a single piece of evidence is not usually enough to convict someone. Even in this age of DNA, fingerprints and blood stains are still important at helping to identify a criminal. In this experiment your students will solve a crime by dusting for fingerprints and will use fluorescent dust to search for and identify trace amounts of blood.

For 10 Lab Groups

Complete in 50 minutes

Cat. #S-91

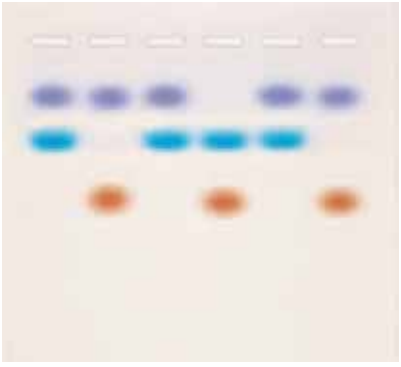
Kit includes: instructions, brushes, magnifying lens, fingerprint cards, black dusting powder, fluorescent green and gray dye dusting powder, fingerprint lifters.

All you need: long wave U.V. light.

Whose DNA Was Left Behind?

READY TO LOAD

Incredibly, DNA obtained from a single hair left at a crime scene can be used to identify a criminal. In this experiment your students will use DNA fingerprinting to compare simulated crime scene DNA with that of two suspects and try to catch the criminal!



For 10 Lab Groups

Complete in 45 minutes

Cat. #S-51

Kit includes: instructions, Ready-to-Load™ dye samples, agarose powder, practice gel loading solution, electrophoresis buffer, microtipped transfer pipets.

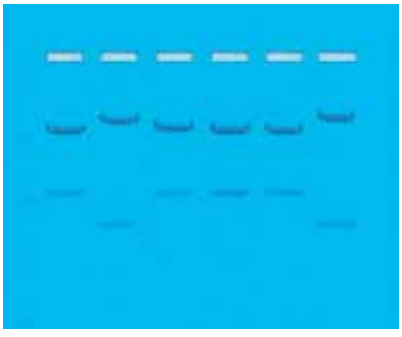
All you need: electrophoresis apparatus , power supply, microwave or hot plate.

DNA Fingerprinting by Restriction Enzyme Patterns

READY TO LOAD

BEST SELLER

Basic concepts of DNA fingerprinting are featured in this lab by comparing crime scene DNA with suspect DNA. Fingerprint patterns are separated by agarose gel electrophoresis and the students determine who may have done-it!



InstaStain® Blue

FlashBlue™

For 6 Gels

Complete in 60 min.

Cat. #109

Kit includes: instructions, Ready-to-Load™ DNA samples, agarose powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue, FlashBlue™ stain, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet with tips, balance, microwave or hot plate, 65° C waterbath, white light visualization system.

DNA Fingerprinting by PCR Amplification

READY TO LOAD

Your students will solve a crime using real DNA! This simple, Ready-to-Load™ kit means you can quickly teach DNA fingerprinting in your class and show your students how DNA evidence is used in modern forensics. The experiment allows for varied results depending on the selection of DNA fingerprinting patterns.

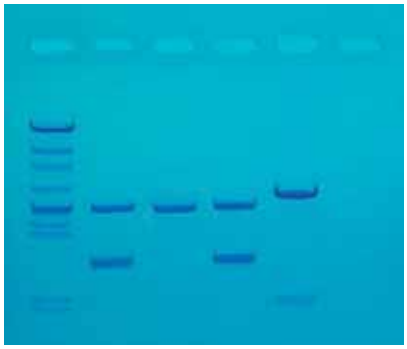
For 6 Gels

Complete in 60 min.

Cat. #130

Kit includes: instructions, Ready-to-Load™ DNA samples, agarose powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue, FlashBlue™ stain, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet with tips, balance, microwave or hot plate, 65° C waterbath, white light visualization system.



InstaStain® Blue FlashBlue™

DNA Fingerprinting Using Restriction Enzymes

Teach your students about restriction enzyme digests in the context of forensic science! Students will cut DNA with restriction enzymes and then compare the banding pattern of the crime scene DNA versus that of two suspects using agarose gel electrophoresis.

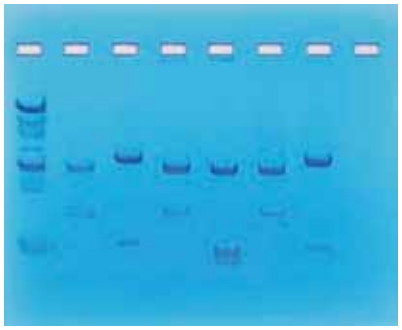
For 6 Gels

Restriction Enzyme Digests 35-60 min.
Electrophoresis 45 min.

Cat. #225

Kit includes: instructions, DNA samples, DNA ladder, Dryzymes® (*Eco* RI and Hind III), agarose, practice gel loading solution, loading dye, buffer, microtipped transfer pipets, FlashBlue™ stain.

All you need: micropipets to measure between 5 & 50 µl (or 5, 10, 15 µl fixed volume minipipets), tips, waterbath, electrophoresis apparatus, power supply, microwave or hot plate.



InstaStain® Blue FlashBlue™

DNA Fingerprinting Using PCR

Give your students the opportunity to carry out PCR in the classroom! This kit provides easy to follow instructions for your students to develop various crime scene scenarios independently. Plasmid DNA, when amplified by PCR, provides products that represent individual DNA profiles. Your students can then solve a crime!

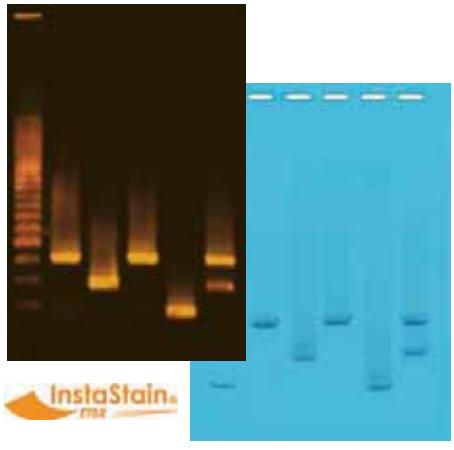
For 25 students working in 5 groups.

Set up 30 min.
PCR 2 hours or overnight
Electrophoresis 45 min.

Cat. #371

Kit includes: instructions, PCR beads, DNA template, primers, DNA ladder, ultra pure water, wax beads, agarose, loading dye, electrophoresis buffer, InstaStain® Ethidium Bromide and FlashBlue™ stain.

All you need: micropipets to measure between 5 & 50 µl (or 5, 10, 30, 50 µl fixed volume minipipets), tips, thermal cycler, electrophoresis apparatus, power supply, microwave or hot plate, UV transilluminator.



InstaStain® FlashBlue™

www.edvotek.com

Experimenting with Forensics

Forensic Blood Typing

What Forensic Information Does Blood Typing Provide?

Detectives, investigating a murder crime scene, have discovered possible blood residue on a gun dropped at the scene. After identifying three potential suspects, each with a probable motive, the detectives act to match a blood sample from each suspect to the residue found on the gun handle. This is completed while they await DNA testing. In this classroom experiment, students will first identify whether or not the recovered residue from the gun handle is blood and will then use a rapid blood type test to further the investigation.

For 10 groups

Complete in 50 min.

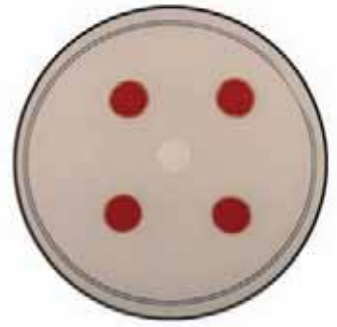
Cat. # 191

Kit includes: instructions, Control ABO simulated blood samples, simulated crime scene, and suspect blood samples, anti-A and Anti-B serums, blood detection stock solutions, transfer pipets, microtiter plates, tubes, filter paper, cotton swab.

All you need: 95-100% Ethanol, marking pen, distilled water
Optional: automatic micropipet (5 – 50 µl).

Forensic Antigen Detection

Can A Cat Assist A Murder Investigation?



An athletic young woman and her cat live alone in a penthouse. Last seen during an afternoon jog, her worried friends report her as missing to the police following two days of absence. Upon entering her apartment, the detectives happen across the cat, which lies deceased in a pool of blood. A thin trail of blood leads from the cat to the bed of his owner. The detective concludes that both the cat and his owner were brutally murdered and that during the hasty cover-up and disposal of the woman's body, the intruder overlooked this trail of blood. In an effort to determine if the blood came from the cat or a human, the detective collected samples of the blood surrounding the cat, as well as of the bloodstain leading to the bed. In this experiment, students will determine the validity of the hypothesis set forth by the detective.

For 10 groups

Module I: Complete in 35 min.
Module II: Incubation overnight.

Cat. #192

Kit includes: instructions, Simulated control and crime scene blood samples, antigen/antibody detection reagents, microtiter plates, UltraSpec-Agarose™, practice loading solution, petri plates, well-cutters.

All you need: Distilled or deionized water, beakers, 37°C Incubation oven, disposable lab gloves, safety goggles, automatic micropipets (100 µl) and tips recommended, Plastic container, plastic wrap, Pipets - 5 or 10 ml, marking pen, measuring spatula or toothpicks, hot plate, Bunsen burner, or microwave, paper towels, waterbath.

Forensic Enzymology

Can Enzymes Be Utilized As Evidence?

In a head-on automobile collision, each driver claimed the other driver caused the accident by falling asleep at the wheel. The two passengers, one from each car, were critically injured, yet the drivers walked away with barely a scratch. Upon arrival at the local hospital, one of the passengers succumbed to his injuries and the accident is now a case of vehicular manslaughter. The attending physician completed a thorough examination of the two drivers by collecting blood and urine samples, as well as by taking their temperature. The physician saved the disposable plastic mouthpiece and tongue depressor used during the examination, knowing that sleep deprivation causes the level of saliva amylase to increase in humans. Students will determine the level of saliva amylase for the two drivers to discover who was responsible for the accident.

Kit includes: instructions, simulated control and driver saliva samples, starch, HCl, Iodine, and detection solutions, transfer pipets, microtiter plates, microtest tubes.

All you need: visible wavelength spectrophotometer, test tube racks, lab permanent markers, test tubes, beakers, distilled water, linear graph paper.

For 10 groups

Modules I and II: Complete in 45 min. each

Cat. #193

Perfect Partner

UNICO® S1000 Educational Spectrophotometer
Cat. #566

Forensic Enhancement Techniques

Can You Detect The Invisible To Determine The Truth?

Trace amounts of blood are often sufficient to identify the individual responsible for any number of crimes, including murder, burglary, or assault. Enhancement procedures can make a small stain of body fluid or tissue visible to the naked eye. In this experiment, students will act as detectives following the aftermath of a drug bust involving gang warfare over territory. Reagents that are routinely used as a first screen will be utilized to detect simulated blood and DNA. In addition, biological materials will be recovered from splatters, blood trajectory, and small droplets of simulated human materials.

For 10 groups

Complete in 35 min.

Cat. #194

Kit includes: instructions, simulated blood, leucocrystal violet solution, luminol solution, spray bottle, transfer pipets, microtest tubes.

All you need: gloves, paper towel, face masks. Optional - fume hood.

SECTION EIGHT

8 Genetic Engineering & Transformation

It is not the strongest of the species that survives, nor the most intelligent that survives. It is the one that is the most adaptable to change.

CHARLES DARWIN

Gene Transfer: An Old Controversy

Many modern medicines, such as insulin or growth hormones, are made using genetically engineered bacteria. Bacterial transformation is used to genetically engineer bacteria to produce medicines. It is now one of the most important and widely used techniques in genetics research but it has a controversial past.

The versatility of the genetic code has enabled scientists to transfer DNA between all sorts of organisms. This is mediated by DNA vectors, of which the most frequently used are plasmids. These extrachromosomal loops of DNA naturally occur in bacteria and carry genes that confer a selective advantage to the host. Unfortunately, this can lead to antibiotic resistance and the emergence of "super-bugs" such as MRSA. For genetic engineering, safe plasmids had to be developed. In the early 1970's, a group of scientists developed the first useful plasmid for genetic engineering, which was pBR322 (the "B" stands for Bolivar and the "R" for Rodriguez, after the scientists who created it).

Around this time, when gene transfer became possible, scientists were so fearful that they imposed a voluntary moratorium on this research. This began in 1974 with the "Berg letter" from Paul Berg and other eminent scientists to the science journals, *Nature* and *Science*. The voluntary moratorium was in place until 1976 when safety guidelines were produced for conducting such experiments.

Today, bacterial transformation is one of the most widely carried out procedures in molecular biology.

What Are Fluorescent Proteins?

Many jellyfish use bioluminescence (biologically produced light) to attract prey, defend themselves and to find a mate. Bioluminescence is produced using special fluorescent proteins that, when illuminated with one wavelength of light, emit light in a different wavelength.

Scientists have studied this most closely in the jellyfish *Aequorea victoria*. The bioluminsence protein Green Fluorescent Protein (GFP) was identified from these jellyfish in the 1960's and the gene characterized in 1992.

This amazing jellyfish gene can cause bioluminescence in many other types of organisms including bacteria, mammals and plants! By attaching the GFP gene to another gene, you can follow where the second gene is switched on (or expressed) in living cells. GFP has been so useful that scientists have introduced a mutation to generate Blue Fluorescent Protein (BFP).

Transformation of *E.coli* with Blue and Green Fluorescent Proteins

NEW & improved!

Green Fluorescent Protein (GFP), which is responsible for bioluminescence in the jellyfish *Aequorea victoria,* is used extensively in all areas of science. Many organisms have been transformed with the GFP gene. It has proven to be so useful that scientists have mutated it to produce Blue Fluorescent Protein (BFP). In this simple experiment, your students will transform bacteria either with GFP, BFP or both!

- For 10 Lab Groups
- Complete in 50 minutes and grow overnight
- **Cat. #222**

Kit includes: instructions, cells, plasmid DNA, IPTG, BactoBeads™, Ampicillin, transformation solution, ReadyPour™ Agar, Luria broth, petri dishes, sterile pipets and loops.

All you need: waterbath, 37°C incubation oven, microwave or hot plate, long wave UV lamp.

Transformation of *E.coli* with Green Fluorescent Protein

BEST SELLER

NEW & improved!

Transformed cells take up a plasmid containing the GFP gene. The GFP gene was isolated from the jellyfish *Aequorea victoria*. Transformed colonies expressing the GFP protein are visibly green in normal light but will fluoresce brightly when exposed to long wave UV light.

- For 10 Lab Groups
- Set Up & Plating 50 min. Incubation overnight Transformation efficiency 15 min.
- **Cat. #223**

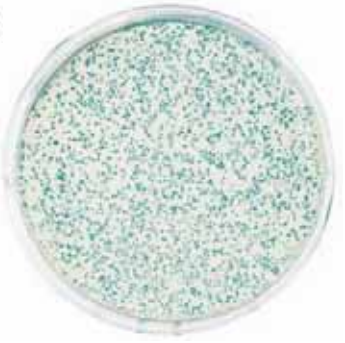
Kit includes: instructions, cells, plasmid DNA, IPTG, BactoBeads™, ampicillin, transformation solution, ReadyPour™ Agar, Luria broth, petri dishes, sterile pipets, loops and microtubes.

All you need: waterbath, 37°C incubation oven, microwave or hot plate, long wave UV lamp.

Transformation of *E.coli* with pGAL™ (Blue colony)

BEST SELLER

NEW & improved!



In this experiment, your students can see a blue color change in transformed cells due to the switching on of a gene. The pGAL™ plasmid gives them a blue color due to the production of the ß-galactosidase protein by the *lacZ* gene. IPTG is not required in this experiment since pGAL™ contains the complete *lacZ* gene.

- For 10 Lab Groups
- Complete in 50 minutes and grow overnight
- **Cat. #221**

Kit includes: instructions, BactoBeads™, plasmid DNA, buffer, media, ampicillin, X-Gal, ReadyPour™ Agar, petri dishes, sterile pipets, loops and microtubes.

All you need: 37°C incubation oven, waterbath, microwave or hot plate.

Transformation of *E.coli* with pBR322

NEW & improved!

Transformation is of central importance in molecular cloning since it allows for the selection, propagation, expression and purification of a gene. Positive selection for cells containing plasmid DNA is accomplished by antibiotic growth selection. In this experiment, your students will transform bacteria with the first plasmid made for genetic engineering in 1970, pBR322.

- For 10 Lab Groups
- Complete in 50 minutes and grow overnight
- **Cat. #201**

Kit includes: instructions, plasmid DNA, buffer, BactoBeads™, ampicillin, calcium chloride, ReadyPour™ Agar, Luria broth, petri dishes, sterile pipets and loops, microtubes.

All you need: 37°C incubation oven, waterbath, microwave or hot plate.

Purification and Size Determination of Green and Blue Fluorescent Proteins

When bacteria are used to make medicinally useful proteins by transformation, the protein of interest must be separated from all of the other cellular proteins. In this experiment, the unique fluorescent properties of GFP and BFP will be used as an assay during their purification from an *E. coli* extract. The column fractions containing GFP or BFP will be identified by fluorescence and then purified. As an optional activity, purified protein fractions can be separated by SDS polyacrylamide gel electrophoresis to estimate the purity and size of the GFP and BFP proteins.

For 6 Lab Groups

Packing & running column 45 min.
Optional electrophoresis 60 min.
Staining 30 min.
Destaining 2 hours

Cat. #255

Kit includes: instructions, columns and matrix, GFP and BFP extracts, buffer, protein gel reagents for optional activity.

All you need: waterbath, long wave UV lamp, ring stand & clamps, automatic micropipet, vertical gel electrophoresis apparatus, power supply, microwave or hot plate, polyacrylamide gels (12%).

Biofuel from Alcohol Fermentation NEW

Ethanol fermentation is a common biological process widely used in industry for its diverse applications (food, liquor and energy). In this kit, Saccharomyces cerevisiae is used to break down sugar into ethanol. The conditions that are controlled with mechanical devices are aeration and temperature. The pH, bacterial growth and ethanol production are monitored using specific probes over a period of 5 hours.

For 10 Lab Groups

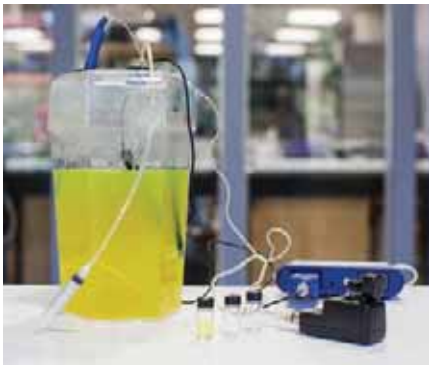
Completes in 5-6 hours

Cat. #304

Kit includes: instructions,BactoBeads™, LB Medium, GFP chemical reagents, plastic lab material.

All you need: centrifuge, pH probe, Temperature probe, Colorimeter and Fermentor vessel.

Fermentation and Bioprocessing of GFP NEW



The Green Fluorescent Protein (GFP) has existed in the jellyfish, *Aequorea victoria*, for millions of years. Because of its bright fluorescence, GFP has become widely used in research as a reporter molecule. Today, the GFP protein is often fused to other proteins to study various biochemical processes. In this kit, student will express GFP protein using *Escherichia coli* in a small-scale fermentor. The conditions that are controlled during the fermentation are aeration, temperature, and IPTG concentrations. Bacterial growth and weight of GFP bacteria are monitored throughout the fermentation.

For 10 Lab Groups

Completes in 5-6 hours

Cat. #305

Kit includes: instructions, BactoBeads™ with supercoiled pFluoroGreen, Yeast Medium, plastic lab material.

All you need: long wave UV light, centrifuge, pH probe, Temperature probe, Colorimeter and Fermentor vessel.

Transformation Supplies

Small Petri Dishes
60 x 15 mm (one shelf pack)
Cat. #633

Large Petri Dishes
100 x 15 mm (one shelf pack)
Cat. #643

Luria Broth Media
Cat. #611

Bacterial Plating Agar
Cat. #612

IPTG, 100 mg
Cat. #613

X-Gal, 250 mg
Cat. #614

ReadyPour™ Luria Broth (LB) Agar Base
Cat. #615

ReadyPour™ Luria Broth (LB) Agar with Ampicillin
Cat. #616

Transformation Reagents
Includes AMP, X-Gal, and pGal™.
Cat. #617

NEW **_E. coli_ JM109 BactoBeads™**
Cat. #726 5 beads

NEW **_E. coli_ Fluorescent Protein Host BactoBeads™**
Cat. #728 5 beads

All our BactoBeads™ can be found on page 125.

SECTION NINE

9 Immunology

"...we believed (ELISA) would provide a substantial improvement... but we never imagined it would have the impact it has had."

Dr. Eva Engvall, Inventor of the ELISA Technique

Can Cows Save the World?

Vaccinations were first developed by British doctor Edward Jenner in 1796. He famously noticed that milk maids were resistant to the disease, small pox. He made the connection that it was because of their exposure to the much milder cow pox. His highly unethical experiment to prove his theory involved exposing an eight year old boy to pus from cow pox pustule and then showing that the boy was immune to small pox.

Since then, many of our medical advances have centered on developing new ways to tackle old diseases. We are also using molecular biology to understand how diseases work and for their accurate diagnosis – often as crucial as the right treatment. However, prevention is still better than cure for infectious diseases so vaccinations play an important role in our medical care system.

In 1998, vaccinations became a topic of controversy when British scientists, led by Andrew Wakefield, suggested there was a link between autism and the MMR (measles, Mumps and Rubella) vaccination. The media picked up the story and ran with it. No one in the scientific community seriously believes such a link exists. Regardless, the level of childhood vaccinations has fallen and children are once again developing old diseases like mumps.

Organizations like the Centers for Disease Control & Prevention in the U.S. and the National Health Service in the UK, advise that there is no evidence of a connection between MMR and autism. It is merely a coincidence that these diseases emerge around the age that children are given the MMR vaccination.

What Customers Are Saying...

From Katherine J. Turner PhD:

"Just wanted to let you know that the revised and updated ELISA (Kit #278) worked beautifully last week. I had zero expectations. To my surprise and to the delight for the students it worked very well. Stabilizing the substrate seems to have done the trick. Thanks!"

The ELISA technique

In 1971, two scientists, Eva Engvall and Peter Perlman invented a new test that completely changed diagnostic testing forever. The Enzyme-Linked Immunosorbent Assay (ELISA) test uses antibodies to seek out the presence of hormones or viruses. These convenient tests have many applications (such as detecting HIV or determining pregnancy) and can be performed in a matter of minutes.

Right, Photograph of Dr Eva Engvall
Inventor of the ELISA technique

Intro to Immunology

Introduction to ELISA Reactions

BEST SELLER

Your students will learn the basic principles of the Enzyme-linked Immunosorbent Assay (ELISA) in this precise and sensitive antibody-based detection kit. Experiment components do not contain human serum.

For 10 Lab Groups

Complete in 45 minutes

Cat. #269

Kit includes: instructions, antigens, primary & secondary antibodies, peroxide co-substrate, hydrogen peroxide, ABTS substrate, phosphate buffered saline, tubes, plates, and transfer pipets.

All you need: distilled or deionized water, 37° C incubation oven, automatic micropipets with tips, laboratory glassware.

Single Antibody ELISA Diagnostics

Teach your students the ELISA technique in less than half the time of traditional ELISAs! This experiment eliminates the need for the primary and secondary antibody normally needed for ELISAs because the detection antibody has an enzyme linked to it directly. Simply add substrate to discover which patient is infected.

Kit includes: instructions, antigens & antibodies, substrate, phosphate buffered saline, tubes, plates, and transfer pipets.

All you need: distilled or deionized water, 37° C incubation oven, automatic micropipets with tips, laboratory glassware.

For 10 Lab Groups

Complete in 20 minutes

Cat. #267

Quantitative ELISA

Now with NEW substrate! Antibodies are highly specific in their recognition of antigens. This ELISA experiment demonstrates the quantitation of varying concentrations of viral antigens as detected by the intensity of the color reaction due to the accumulation of products. This laboratory activity meets the requirements in the BSCS Blue Biology curriculum.

For 6 Lab Groups

Complete in 2 hours

Cat. #278

Kit includes: instructions, antigens, primary & secondary antibodies, substrate solution, phosphate buffered saline, blocking agent, tubes, plates, and transfer pipets.

All you need: distilled or deionized water, 37° C incubation oven, automatic micropipets with tips, laboratory glassware.

Antigen-Antibody Interaction: The Ouchterlony Procedure

EDVOTEK® exclusive!

Introduce your students to the principles of antigen-antibody interactions by using the Ouchterlony procedure. Antibodies and antigens form complexes that precipitate, making it possible to assay antibody-antigen systems. The binding interaction results in the formation of a white precipitate after diffusion in agarose.

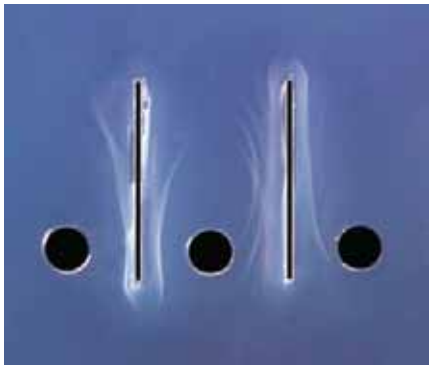
For 10 sets of reactions

Set up 35 min.
Incubation overnight

Cat. #270

Kit includes: instructions, animal serum antigens & antibodies, practice gel loading solution, agarose, powdered buffer, transfer pipets, petri plates, well cutters, microtest tubes.

All you need: automatic micropipets with tips, 5 or 10 ml pipets, 55°C waterbath, measuring spatulas or toothpicks, microwave or hot plate, distilled water, incubation oven (optional).



Immunoelectrophoresis

EDVOTEK® exclusive!

Learn how immunoelectrophoresis identifies proteins based on their combined electrophoretic and immunological properties. This method is useful to monitor antigen and antigen-antibody purity and to identify a single antigen in a mixture of antigens. In this experiment, serum proteins are separated by agarose gel electrophoresis and the point of equivalence is observed by the antigen-antibody complex formation.

For 10 separations

Electrophoresis 60 min.
Incubation overnight

Cat. #272

Kit includes: instructions, proteins, antibodies & reagents, agarose, buffer, transfer pipets, well cutters, paper wicks.

All you need: horizontal electrophoresis apparatus, power supply, automatic micropipets with tips, waterbath, microwave or hot plate, incubation oven, laboratory glassware, microscope slides, paper towels, distilled water.

Radial Immunodiffusion

EDVOTEK® exclusive!

Radial immunodiffusion quantitatively determines the level of an antigen. Antibody is incorporated into liquefied agar and allowed to gel. The antigen is added to small wells and radiates throughout the antibody-containing medium, leaving a precipitate throughout the gel. The amount of diffusion is quantified.

For 10 quantifications
6 reactions each

Incubation overnight

Cat. #273

Kit includes: instructions, antigen and antibody, petri plates, pipets, well cutters, agarose, buffer, microtest tubes.

All you need: automatic micropipets with tips, waterbath, microwave or hot plate, incubation oven, laboratory glassware, pipet pumps or bulbs, rulers, paper towels, distilled water.

Affinity Chromatography of Glucose Binding Proteins

EDVOTEK® exclusive!

In this experiment, students will prepare a seed extract from Jack Bean Meal, fractionate the extract by affinity chromatography, and elute the bound glucose binding protein. The presence of biological activity is determined by an immunoblot enzyme assay.

For 10 groups

Requires 2 hours

Cat. #277

Kit includes: instructions, affinity gel, jack bean meal, various solutions and buffers, membranes, petri plates, columns with tips, conical tubes and transfer pipets.

All you need: clinical centrifuge, vortex or shaking platform, micropipet and tips, ring stands and clamps, lab glassware, pipets & pumps, microtest tubes, forceps, water.

Immunobiotechnology™

AIDS Kit I: Simulation of HIV Detection by ELISA

BEST SELLER

An HIV test detects HIV infection indirectly using an ELISA test against HIV antibodies in the blood. The test works by taking antibodies from the patient's blood and adding them to a microtiter plate coated with HIV antigen. If HIV antibodies are present in the blood, they will bind to the antigens on the plate. This binding is detected with an enzyme-linked secondary antibody that causes a color change upon addition of substrate. In this experiment, your students will perform an ELISA test by coating microtiter plate wells with simulated HIV antigen and then test simulated donor serum for anti-HIV antibodies.

For 10 groups
Requires 1 hour
Cat. #271

Kit includes: instructions, serum samples, antigens and antibodies, various solutions, microtiter plates, various pipets and microtest tubes.

All you need: 37°C incubation oven, automatic micropipets with tips, pipet pumps, laboratory glassware, distilled or deionized water.

In Search of the "Kissing Disease"

Infectious mononucleosis is commonly known as the "kissing disease". The causative agent is Epstein-Barr virus (EBV) which can be transmitted through saliva during kissing. In this experiment, students search for the presence of EBV using the ELISA reaction to detect specific viral proteins.

For 10 groups
Requires 50 min.
Cat. #274

Kit includes: instructions, samples, antigens & antibodies, various solutions and reagents, pipets and microtest tubes.

All you need: 37°C incubation oven, automatic micropipets with tips, laboratory glassware, distilled or deionized water.

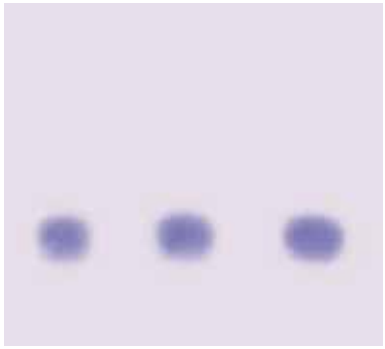
Immunology of Pregnancy Tests

One of the most commonly used over-the-counter diagnostic tests is the pregnancy test, based on the Enzyme-linked Immunosorbent Assay (ELISA). The experimental concepts and methodology involved with the ELISA will be introduced in the context of testing for pregnancy. None of the components have been prepared from human sources.

For 10 groups
Complete in 60 min.
Cat. #279

Kit includes: instructions, simulated patient and control samples, antibodies, various solutions and reagents, microtiter strips, pipets and tubes.

All you need: 37°C incubation oven, automatic micropipets with tips (optional), laboratory glassware, distilled or deionized water.



AIDS Kit II: Simulation of HIV Detection by Western Blot

The second assay used to confirm a positive HIV ELISA result is the Western Blot. Students separate protein samples from hypothetical patients on agarose gels, transfer the samples to a membrane and detect the simulated HIV proteins. This kit is an introductory level experiment. For a comprehensive advanced course, we recommend Cat. #317.

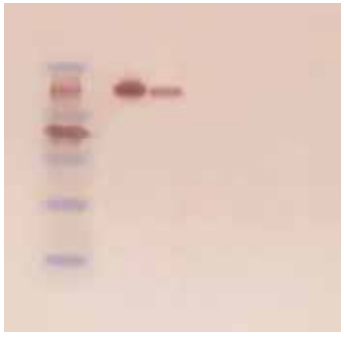
For 6 Blots

Electrophoresis 45 min.
Blot overnight
Detection 25 min.

Cat. #275

Kit includes: instructions, samples, standard molecular weight markers, protein agarose, various buffers and reagents, PVDF membrane, filter paper, stain, 1 ml pipet, 100 ml graduated cylinder.

All you need: electrophoresis apparatus, power supply, automatic micropipets with tips, microwave or hot plate, incubation oven, shaker platform, lab glassware, small plastic trays, microtest tubes, pipet pumps or bulbs, metric rulers, distilled water, isopropanol, glacial acetic acid.



Western Blot Analysis (Polyacrylamide-based)

In Western blot analysis, protein identification is based on antibody and antigen reactions. Proteins are separated on polyacrylamide gels and are transferred (blotted) to a nylon membrane. The membrane is exposed to solutions containing primary antibody, followed by a secondary antibody coupled to an enzyme. The membrane is then soaked in a substrate solution to develop the color reaction, which results in identification of the antigen protein band. The molecular weights of the visible bands are measured using prestained protein markers of known molecular weight. This kit does not require an electrotransfer apparatus.

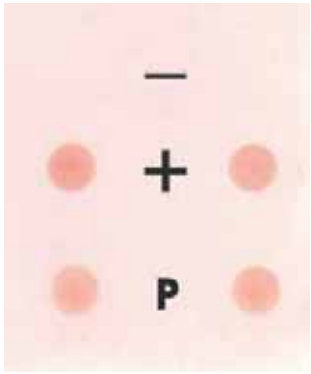
For 6 Blots

Electrophoresis 60 min.
Blot overnight
Detection 2.5 hours

Cat. #317

Kit includes: instructions, negative control, all samples & antibodies, various reagents and buffers, membrane and filter paper.

All you need: 3 polyacrylamide gels (12%), Vertical gel electrophoresis apparatus, power supply, automatic micropipet with fine tips, laboratory glassware, metric rulers, distilled or deionized water, glacial acetic acid, methanol.



Clinical Diagnostic Immunoblot

The dot blot technique is used to determine the presence of an antigen. Clinical diagnostic kits employ the principles of the dot blot. In this experiment, antigens are absorbed to a membrane that is then treated with an antigen-specific antibody solution and then a secondary antibody conjugated to an enzyme. The reaction generates a color product that precipitates onto the membrane, indicating a positive reaction. No human serum is used in this experiment.

For 10 groups

Set up 45 min.
Experiment 1.5 - 2 hrs.

Cat. #276

Kit includes: instructions, antigen & antibodies, various reagents and buffers, instant nonfat dry milk, hydrogen peroxide, nylon membranes and petri dishes.

All you need: automatic micropipet with tips, pipet pumps, forceps, distilled water, shaking platform (optional)

www.edvotek.com

SECTION TEN

10 Biomedical Diagnostics

Nothing in life is to be feared. It is only to be understood.

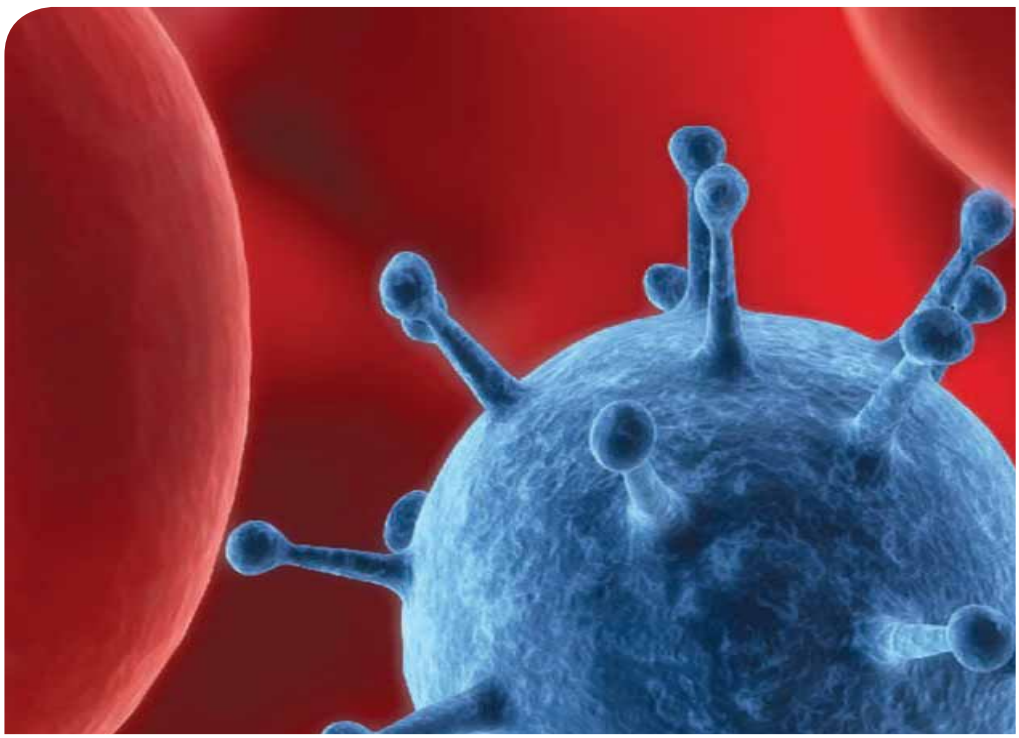
MADAME MARIE CURIE, NOBEL PRIZE WINNING SCIENTIST

New hope but at a price

In recent years, there has been a revolution in how medical diagnosis is carried out. The Human Genome Project has offered new ways of screening for diseases and our understanding of the molecular basis of cancer, infectious disease and inherited disease has helped to develop new therapies. For instance, although more needs to be done, there has been a dramatic rise in the survival rates for all cancers and huge strides have been made in our understanding of how this disease develops. As we begin to understand, we can begin to develop new treatments.

Scientists are also developing new ways of testing for disease. With the availability of genetic tests, we have a chance to screen out many diseases that have occurred for thousands of years. Some of these, such as Sickle Cell Anemia, may have given humanity an advantage through improved resistance to malaria in the past. But now they pose a problem themselves. We can screen for these diseases in children and adults, in the womb before birth, or even *in vitro* before embryo implantation. These tests offer great hope and promise but raise huge ethical, social and moral issues for society.

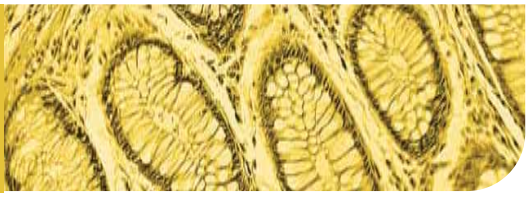
Thus, the revolution in our understanding of disease offers improvements in diagnosis leading to more accurate treatments and improved quality of life but the science needs to be understood in the wider social context.



Photos:
(Page 64) Students performing new Kit #1001, Eukaryotic Cell Biology, see page 68.

(This Page) Computer generated image of a virus.

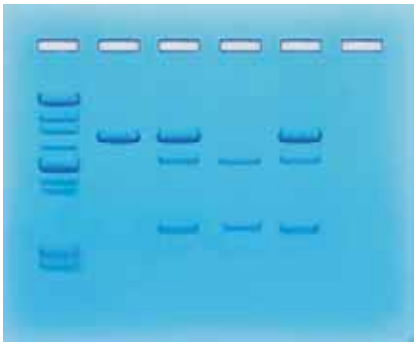
Cancer



Cancer Gene Detection

READY TO LOAD

Immortality through uncontrolled cell division is a characteristic of cancer cells. The p53 gene is a tumor suppressor gene which prevents this. Mutations in this gene are present in more than 50% of cancers. Testing people for mutations in their p53 gene can indicate an increased risk in developing cancer. These tests raise intriguing ethical questions for both the individual tested and the family of an individual who chooses to be tested. In this experiment, students determine a pedigree for a family suspected to be carriers of mutations in their p53 genes. A DNA test indicates their likelihood of developing cancer.



FlashBlue™ InstaStain® Blue

For 6 groups
Complete in 60 min.
Cat. #115

Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, visualization system.

Blood-based Cancer Diagnostics

Cancer cells differ from normal cells by the combinations of proteins that are present on their surfaces. Antibodies against these proteins will specifically bind to cancer cells and not to normal cells. This allows early detection of cancer and potentially a way of delivering cancer therapies. In this simulation experiment, the reaction of cancer cell markers and their corresponding antigens are demonstrated.

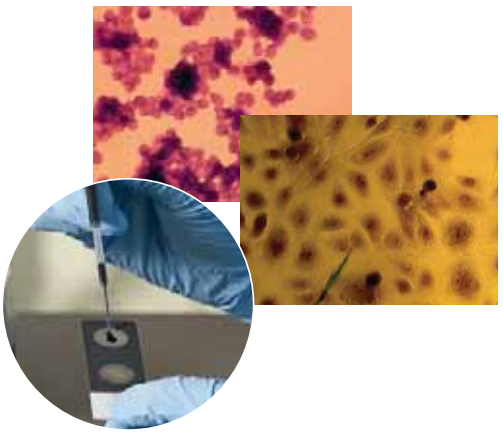
For 10 groups
Complete in 35 min.
Cat. #141

Kit includes: instructions, microtiter plates, cancer cell markers, normal cell markers, transfer pipets, buffer.

All you need: automatic micropipet (5-50 µl) with tips (optional).

Morphology of Cancer Cells

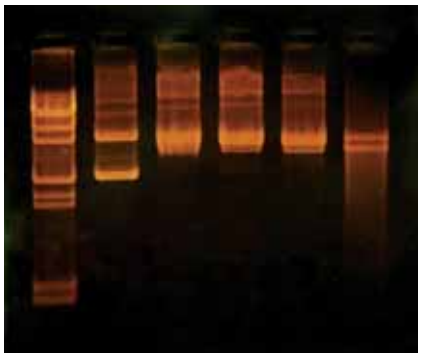
When normal cells are grown in culture they stop growing when they become overcrowded. This is called contact inhibition. Cancer cells in culture grow in an uncontrolled way because they have lost this property. This helps tumors to form in the body. In addition, many different cell types can be present in a single tumor. This experiment allows students to see the differences between normal and cancer cells in both their growth and cell types.



For 6 lab groups
Complete in 35 min.
Cat. #990

Kit includes: instructions, multispot slides (2 cell types each), fixing agent, eosin and FlashBlue™ stain, mounting medium, cover slips, transfer pipets, immersion troughs.

All you need: microscope with 400x magnification.



DNA Damage and Repair

NEW & improved!

InstaStain

According to the World Health Organization, between 2 and 3 million cases of skin cancer occur globally every year. Many of these cancers are caused by preventable damage to DNA by UV light during sunbathing. In this experiment, your students will expose plasmid DNA to shortwave UV light to simulate the effect of sunbathing. The DNA is then analyzed by agarose gel electrophoresis to observe the damage.

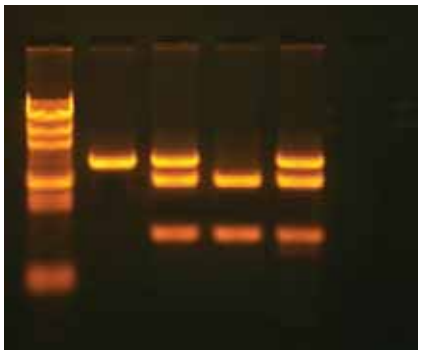
For 10 groups

Complete in 2 hours

Cat. #957

Kit includes: instructions, standard DNA fragments, plasmid DNA, gel loading solution, agarose, electrophoresis buffer, 1 ml pipet, microtest tubes, 100 ml graduated cylinder, InstaStain® Ethidium Bromide stain.

All you need: UV transilluminator (254 nm or short wave), electrophoresis apparatus, power supply, microwave or hot plate.



In Search of the Cancer Gene

READY TO LOAD

InstaStain

Suppressor genes such as p53 are essential for cell functions. Mutations in the p53 gene can be correlated to predisposition for certain cancers. Mutations in genes can either be inherited or accumulated due to environmental insults. This experiment deals with a family pedigree determination of several generations relating to cancer formation due to p53 gene mutation. This experiment does not contain human DNA.

For 6 groups

Complete in 60 min.

Cat. #314

Kit includes: instructions, Ready-to-load™ Predigested DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Ethidium Bromide, pipet, 5 autoradiograms.

All you need: electrophoresis apparatus, power supply, automatic micropipet with tips, balance, microwave or hot plate, waterbath (65°C), UV Transilluminator, pipet pump or bulb, 250 ml Flasks, distilled or deionized water.

NEW

Midrange UV Transilluminator

The all-new Midrange UV Transilluminator is designed to visualize DNA stained with ethidium bromide. UV filter size is 7 x 14 cm and is optimal for visualizing almost every EDVOTEK® experiment kit utilizing ethidium bromide. Safety features include a UV-blocking cover and a power cut-off switch when the cover is opened.

Cat. #558 7 x 14 cm UV Filter

Cell Culture

Blood Typing

BEST SELLER

ABO and Rh typing of blood left at the scene of a crime can help to narrow down a list of suspects. In this experiment your students will use agglutination to identify the blood group of unknown blood samples as a step to identify a criminal.

- For 10 Lab Groups
- Complete in 45 minutes
- **Cat. #140**
- **Cat. #140-B**

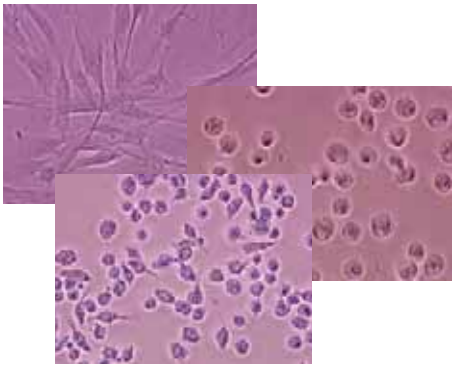
Kit includes: instructions, control ABO Rh simulated blood samples, unknown simulated blood samples, transfer pipets, microtiter plate.

All you need: automatic micropipet (5-50 µl) with tips (optional).

Comparison of Mammalian Cell Types

NEW & improved!

BEST SELLER



Your students will be amazed at the differences they observe between various mammalian cell types and how these cells function. Cells are fixed on microscope slides and students stain the cells on the slide to view morphological characteristics of the cell types. These cells are very safe for classroom use.

- For 6 groups
- Complete in 35 min.
- **Cat. #986**

Kit includes: instructions, multispot slides (4 cell types each), eosin and FlashBlue™ stain, mounting medium, cover slips, transfer pipets, immersion troughs.

All you need: is a microscope with 400x magnification.

Eukaryotic Cell Biology

NEW

Cell Culture is a vital technology used in life science research and in biotechnology laboratories. The study of basic cell biology, diseases and cancer, the development and testing of new therapeutics, and the production of new drugs relies on using the techniques introduced in this experiment. Students will learn how to grow eukaryotic cells in culture, basic cell staining and how to count cells. The techniques used in these experiments will provide the student with a skill set desired in both academic research and industry.

Kit includes: instructions, growth media, flasks, Giemsa stain, Trypan blue dye, sterile T25 flasks, sterile culture dishes, sterile large pipets, small pipets, cell counting chambers, Sf9 insect cells.

All you need: Microscope and spray bottle with 70% ethanol or methanol.

Supported by NCMHD grant R43 MD005202 from the National Center on Minority Health and Health Disparities.

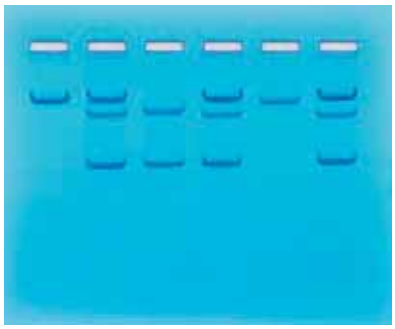
- For 6 groups
- Basic cell culture techniques - 30 min
  Examination of Insect cells cultures - 30 min
  Maintenance of Insect Cell Cultures - 1 hour
  Cell viability using trypan blue - 30 min
  Differential staining using giemsa stain - Overnight
- **Cat. #1001**

IMPORTANT:
Kit contains LIVE materials which must be requested 2 weeks prior to day of the lab.

Culturing of cells is required upon receipt.

Additional medium may be required if culturing of cells or if the experiment is not performed within 3 days upon receipt.

Inherited Diseases



InstaStain® Blue FlashBlue™

Sickle Cell Gene Detection (DNA-based)

READY TO LOAD

Sickle Cell Anemia is a common genetic disease that causes long rods in red blood cells, giving them a "sickled" appearance. These cells get stuck in small capillaries of the blood stream leading to oxygen deprivation that causes pain and organ damage. Sickle Cell Anemia is caused by a single point mutation in the hemoglobin gene that results in a faulty protein. In this experiment, students will investigate the restriction enzyme that discriminates between HbA (normal) and HbS (disease) genes and perform a simulated test on a patient.

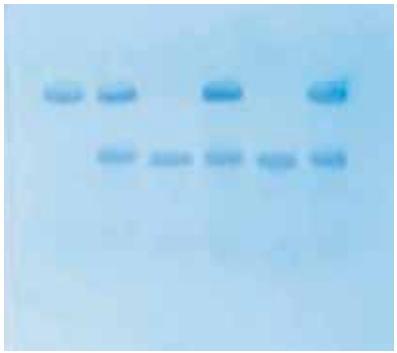
For 6 groups

Complete in 45 min.

Cat. #116

Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, visualization system.



In Search of the Sickle Cell Gene by Southern Blot

READY TO LOAD

Southern blotting is an important technique widely used in clinical genetics and research. By transferring DNA from an agarose gel onto a membrane, the method allows you to analyze and identify the DNA bands on a gel precisely. Students will use Southern blotting to find a point mutation in the hemoglobin gene indicating Sickle Cell Anemia.

For 5 Lab Groups

Electrophoresis 45 min
Blotting overnight
Staining & destaining 10 min

Cat. #315

Kit includes: instructions, Ready-to-Load™ DNA samples, agarose, electrophoresis buffer, nylon membranes, filter paper, blot stain.

All you need: electrophoresis apparatus, power supply, microwave or hot plate, waterbath, 80° C incubation oven.

Infectious Diseases

What is an Epidemic and How Does An Infection Spread?

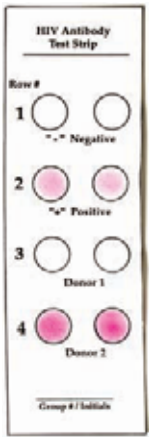
Infectious agents such as bacteria & viruses can spread rapidly through a population and cause widespread disease and death. In this experiment, your students will use colored solutions to simulate the spreading of a disease in the classroom.

For 10 groups
Complete in 30 min.
Cat. #S-68

Kit includes: instructions, HCl solution, NaOH, color indicator, test tubes & pipets.

All you need: students!

How Does a Doctor Test for AIDS?



Your body defends itself from attack by infectious agents like bacteria & viruses by producing antibodies. Enzyme Linked Immunosorbent Assays (ELISA) test for antibodies present in the blood, which indicate infection. In this kit, students perform a simulated ELISA test to identify infected samples & compare them to control samples.

For 10 groups
Complete in 45 min.
Cat. #S-70

Kit includes: instructions, antigens, positive and negative controls, sera, secondary antibody, substrate, detection strips, transfer pipets and test tubes.

All you need: Just water!

Detection of a Simulated Infectious Agent

An infectious outbreak requires prompt & accurate identification of the biological agent. Often, early clinical symptoms are first identified in exposed individuals & then infectious agents are identified by lab tests. In this kit, students will transmit a simulated infectious agent (chemical dye) between classmates. The simulated infectious agent is only visible under long UV light. The pattern of transmission and primary source will be documented.

For 25 students
Requires in 30-45 min.
Cat. #166

Kit includes: instructions, reagents for simulating an infectious agent (fluorescent dye indicator and negative sample), test tubes & caps, transfer pipets, one long UV mini-light, cotton swabs, petroleum jelly, gloves.

All you need: students!

In Search of the "Kissing Disease"

Infectious mononucleosis is commonly known as the "kissing disease". The causative agent is Epstein-Barr virus (EBV) which can be transmitted through saliva during kissing. In this experiment, students search for the presence of EBV using the ELISA reaction to detect specific viral proteins.

For 10 groups
Requires 50 min.
Cat. #274

Kit includes: instructions, samples, antigens & antibodies, various solutions and reagents, pipets and microtest tubes.

All you need: 37°C incubation oven, automatic micropipets with tips, laboratory glassware, distilled or deionized water.

Single Antibody ELISA Diagnostics

Teach your students the ELISA technique in less than half the time of traditional ELISAs! This experiment eliminates the need for the primary and secondary antibody normally needed for ELISAs because the detection antibody has an enzyme linked to it directly. Simply add substrate to discover which patient is infected.

For 10 Lab Groups
Complete in 20 min.
Cat. #267

Kit includes: instructions, antigens & antibodies, substrate, phosphate buffered saline, tubes, plates, and transfer pipets.

All you need: distilled or deionized water, 37° C incubation oven, automatic micropipets with tips, laboratory glassware.

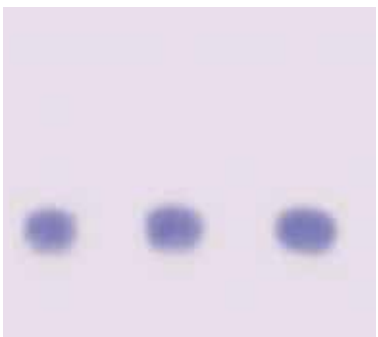
AIDS Kit I: Simulation of HIV Detection by ELISA

An HIV test detects HIV infection indirectly using an ELISA test against HIV antibodies in the blood. The test works by taking antibodies from the patient's blood and adding them to a microtiter plate coated with HIV antigen. If HIV antibodies are present, they will bind to the antigens on the plate. In this experiment, your students will perform an ELISA test by coating microtiter plate wells with simulated HIV antigen and then test simulated donor serum for anti-HIV antibodies.

For 10 groups
Requires 1 hour
Cat. #271

Kit includes: instructions, simulated HIV antigens, positive and negative controls, simulated donor serum, secondary antibody, substrate, microtiter plates, transfer pipets, microtubes.

All you need: 37°C incubation oven



AIDS Kit II: Simulation of HIV Detection by Western Blot

The second assay used to confirm a positive HIV ELISA result is the Western Blot. Your students will separate protein samples from hypothetical patients on agarose gels. The proteins are then transferred to a membrane and simulated HIV proteins are detected. This kit is an introductory level experiment. For a comprehensive advanced course, we recommend Cat. #317.

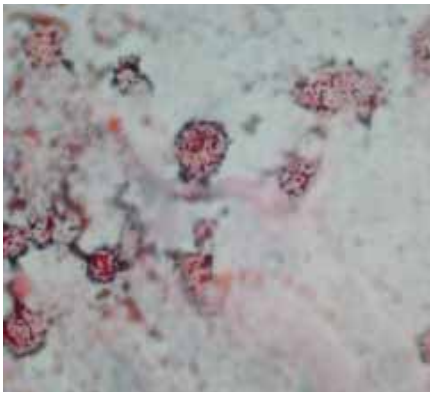
For 6 Blots
Electrophoresis 45 min.
Blot overnight
Detection 25 min.
Cat. #275

Kit includes: instructions, samples, standard molecular weight markers, protein agarose, various buffers and reagents, PVDF membrane, filter paper, stain, 1 ml pipet, 100 ml graduated cylinder.

All you need: electrophoresis apparatus, power supply, automatic micropipets with tips, microwave or hot plate, incubation oven, shaker platform, lab glassware, small plastic trays, microtest tubes, pipet pumps or bulbs, metric rulers, distilled water, isopropanol, glacial acetic acid.

Lifestyle Diseases

Differentiation of Fat Cells



Preadipocytes are the precursors of fat cells (adipocytes) but they are hard to study in the body as they are uncommon. Thus, scientists have developed a cell culture model of adipocyte differentiation to understand the steps involved. It is hoped that by chemically blocking one or more of these steps, it will be possible to stop adipocyte development and thus prevent obesity.

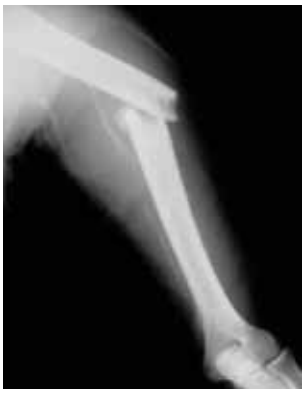
When cells called fibroblasts are treated with a combination of growth factors, they become preadipocytes. In this experiment, your students will be able to see the difference between adipocytes and preadipocytes by staining with Oil Red O.

For 6 Lab Groups
Complete in 35 min.
Cat. #992

Kit includes: instructions, cell fixing agent, slide cover slips, fixing reagent, stains.

All you need: microscope with 400x magnification.

The Biochemistry of Osteoporosis



Osteoporosis is a disease of decreased bone density that affects the entire skeleton. Osteoporosis is caused by an increase in the activity of bone-destroying cells known as osteoclasts. In this experiment, students will model the bone-destroying effects of osteoclasts by placing bones in acid and protease and observing their deterioration (as would occur in osteoporosis).

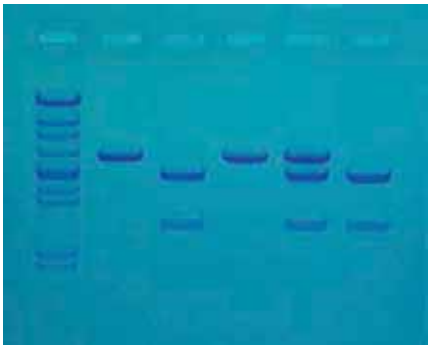
For 10 groups
Several weeks of observation.
Cat. #138

Kit includes: instructions, plastic petri dishes, collagenase enzyme, buffer.

All you need: chicken, turkey or steak bones, glacial acetic acid, automatic pipets, pipet bulbs or pumps, balance, distilled or deionized water.

Cholesterol Diagnostics

READY TO LOAD



Coronary heart disease and stroke are major causes of death in the western world. Elevated blood cholesterol levels are a serious risk factor for both conditions. The genetic disease familial hypercholesterolemia (FH) causes an increase in blood levels of the "bad" form of cholesterol, low density lipoprotein (LDL). In untreated patients with the mutant FH gene, the condition can cause premature death. In this experiment, your students will carry out a simulated genetic test to identify patients carrying the mutant FH gene.

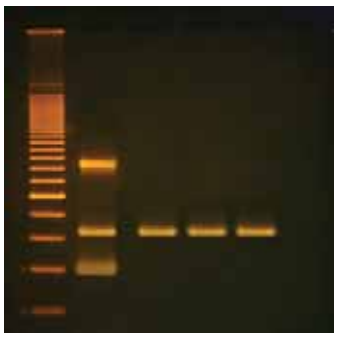
For 6 groups
Complete in 45 min.
Cat. #118

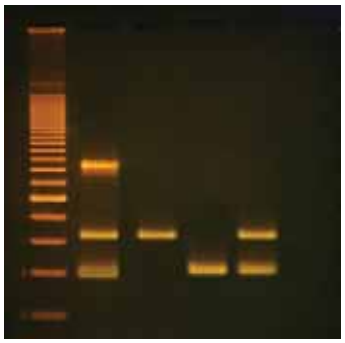
Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, visualization system.

InstaStain® Blue

FlashBlue™





InstaStain® ETBR

In Search of the Alcohol Gene

NEW

The rate of an individual's alcohol metabolism is dependent on several environmental and genetic factors (body weight, food intake, gender, genetics). In this experiment, students will identify a simulated Alcohol Dehydrogenase (ADH) polymorphic gene sequence by PCR amplification and digestion of the PCR products. When the digested DNA samples are analyzed on an agarose gel, students will identify several polymorphic genes.

Kit includes: instructions, DNA template, primer mix, PCR reaction beads, RNAse-free water, DNA size ladder, *Eco* RI restriction enzyme, restriction enzyme reaction & dilution buffers, agarose, electrophoresis buffer gel, InstaStain® Ethidium Bromide gel stain.

All you need: thermal cycler, electrophoresis apparatus, power supply, automatic micropipet, microwave or hot plate, waterbath, UV transilluminator.

For 6 groups

PCR	2 hrs. 15 min.
Restriction Enzyme Digestion	65 min.
Electrophoresis	55 min.
Staining	15 min.

Cat. #346

NIAAA National Institute on Alcohol

Supported by SBIR grant R44 AA 015026 from the National Institute on Alcohol Abuse and Alcoholism.

EdvoCycler™ and MegaCycler™

MADE IN THE USA

NIH Research supported in part by NIH SBIR NCRR Grant #R44RR18670

The Edvoycler™ and MegaCycler™ are stand alone classroom PCR machines that are easy to use! Both come pre-programmed with all EDVOTEK PCR protocols. These programs may be modified or deleted, plus there is extra memory slots for more!

See page 110 for more information!

EdvoCycler™
Holds 25 x 0.2 ml sample tubes.
Cat. #541

MegaCycler™
Holds 49 x 0.2 ml sample tubes.
Cat. #542

Pregnancy & Paternity

In Search of My Father

BEST SELLER

READY TO LOAD

Your class will enjoy discovering the true identity of two boys who were separated from their parents a decade ago. Their mothers are identified by mitochondrial DNA and their fathers from chromosomal DNA. Will it be a happy ending?

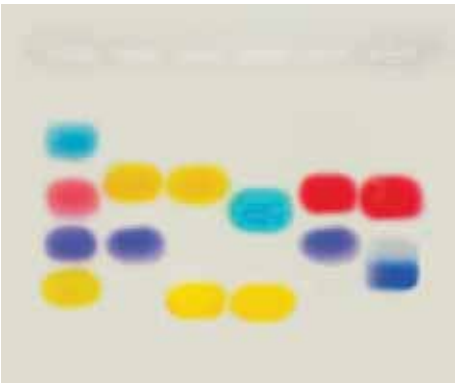
For 10 groups

Complete in 45 min.

Cat. #S-49

Kit includes: instructions, Ready-to-Load™ dye samples, practice gel loading solution, agarose, electrophoresis buffer, microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, microwave or hot plate.



Immunology of Pregnancy Tests

One of the most commonly used over-the-counter diagnostic tests is the pregnancy test, based on the Enzyme-linked Immunosorbent Assay (ELISA). The experimental concepts and methodology involved with the ELISA will be introduced in the context of testing for pregnancy. None of the components have been prepared from human sources.

For 10 groups

Complete in 60 min.

Cat. #279

Kit includes: instructions, simulated patient and control samples, antibodies, various solutions and reagents, microtiter strips, pipets and tubes.

All you need: 37°C incubation oven, automatic micropipets with tips (optional), laboratory glassware, distilled or deionized water.

Human PCR Tool Box™

NEW & improved!

Polymerase Chain Reaction (PCR) is commonly used to determine paternity as it is a very sensitive method for DNA analysis. Your students will gain an understanding of the principles behind this non-forensic use of DNA Fingerprinting using their own DNA! This kit provides three sets of primers to carry out the PCR amplification of Alu element (PV92) on chromosome 16, the VNTR locus (D1S80) on chromosome 1, or 2 mitochondrial genes.

For 25 students

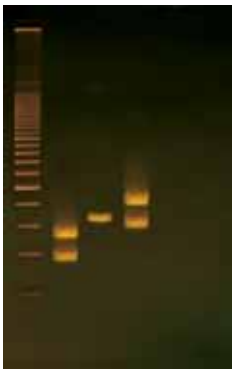
Set up 30 min.
PCR 2 hours or overnight
Electrophoresis 45 min.

Cat. #369

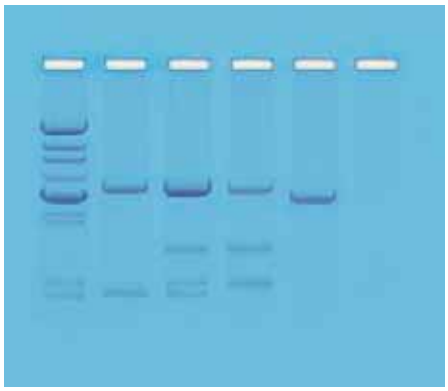
Kit includes: instructions, proteinase K, PCR Beads, control and primer DNA, microtubes, chelating agent, agarose, DNA ladder, practice gel loading solution, gel loading dye, electrophoresis buffer, InstaStain® Ethidium Bromide and FlashBlue™ stain.

All you need: micropipets to measure between 5 and 50 µl (or 5,10, 30, 50 µl fixed volume minipipets), waterbath, thermal cycler, electrophoresis apparatus, power supply, microwave or hot plate, UV transilluminator.

FlashBlue™



InstaStain®



InstaStain® Blue

FlashBlue™

DNA Paternity Testing Simulation

READY TO LOAD

Your students will compare a child's DNA with DNA from two possible fathers to find out which is the biological father. The experiment is an excellent way to teach one of the most compelling and difficult social issues to arise from DNA testing. The kit also teaches your class the fundamentals of DNA electrophoresis.

For 6 Gels

Complete in 45 min.

Cat. #114

Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, visualization system.

Southern Blot Analysis

READY TO LOAD

This experiment introduces your students to Southern blotting as a tool for "DNA Fingerprinting" in a hypothetical paternity determination. DNA fragments are first separated by agarose gel electrophoresis, then transferred to a nylon membrane and finally visualized by staining.

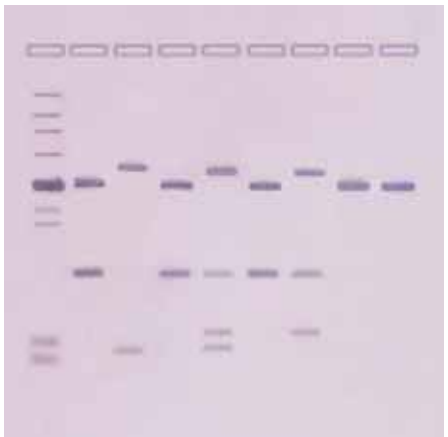
For 5 Lab Groups

Electrophoresis 45 min.
Blotting overnight
Staining & destaining 10 min.

Cat. #207

Kit includes: instructions, DNA samples for electrophoresis, practice gel loading solution, UltraSpec-Agarose™, electrophoresis buffer, pipets, 5 pre-cut nylon membranes, 5 pre-cut blotting filter papers, Blue-Blot DNA Stain™.

All you need: electrophoresis apparatus, power supply, 65° C Waterbath, DNA visualization system, staining net & tray, automatic micropipets, lab glassware, microwave or hot plate, distilled water, NaCl, NaOH, concentrated HCl, plastic wrap, forceps.



DNA Fingerprinting by Southern Blot

In this experiment, students gain experience in non-isotopic DNA detection & the use of Southern Blot analysis in DNA fingerprinting for a hypothetical paternity test. Includes three modules: agarose gel electrophoresis, Southern Blot transfer, and non-isotopic detection of DNA.

For 5 groups

Electrophoresis - 45 min
Blotting - overnight
Non-Isotopic Detection 3-4 hrs.

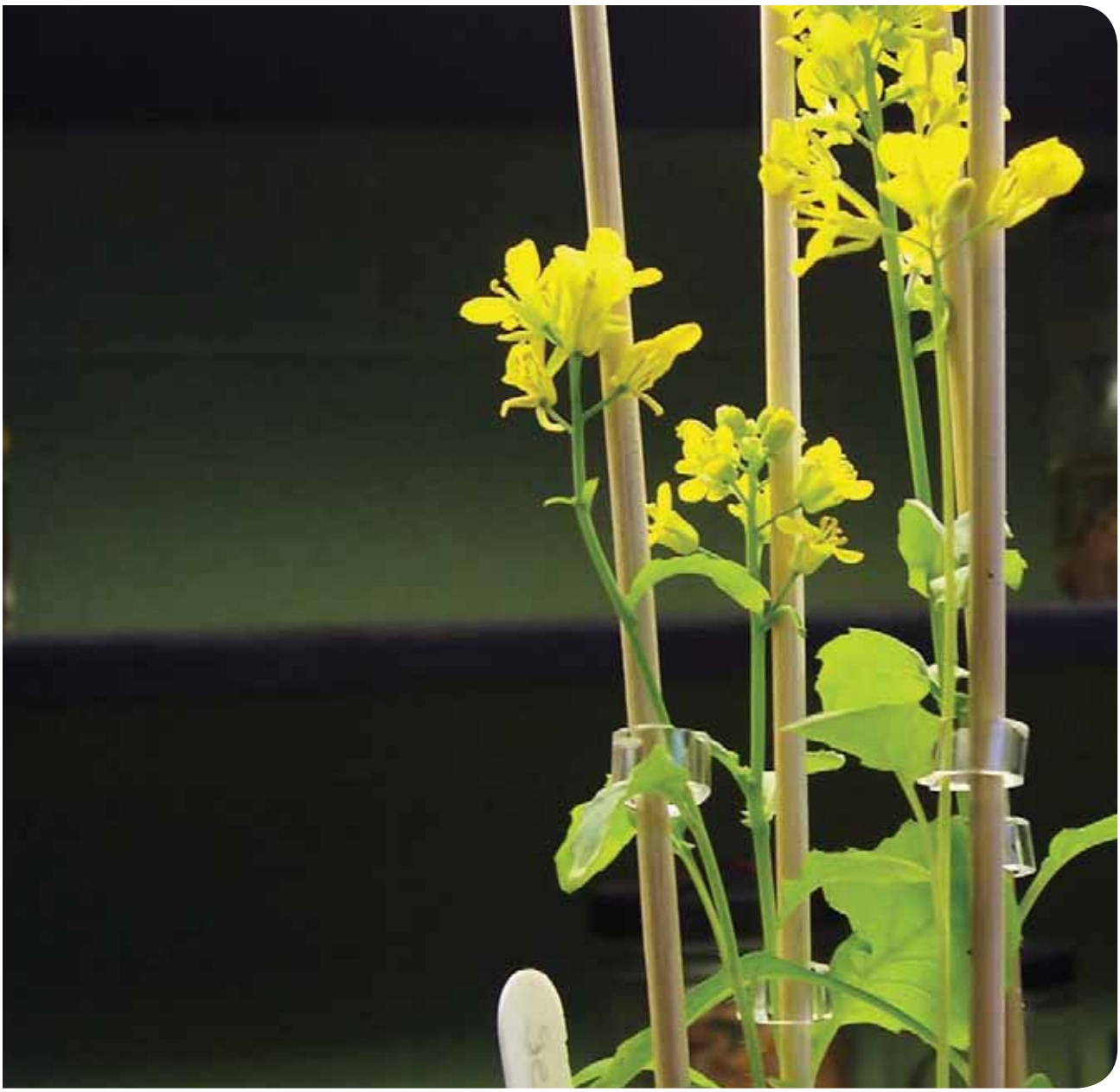
Cat. #311

Kit includes: instructions, predigested DNA samples, buffers, NBT/BCIP tablets, streptavidin-Alkaline Phosphatase, nylon membranes, filter paper, UltraSpec-Agarose™ powder.

All you need: electrophoresis apparatus, power supply, automatic micropipet with tips, balance, microwave or hot plate, waterbath, incubation oven, pipet pumps or bulbs, pipets, floating Racks for microtest tubes, lab glassware, plastic wrap, distilled or deionized water, NaCl, NaOH, Concentrated HCl, ice.

SECTION ELEVEN

11 Plant Biotechnology



My scientific studies have afforded me great gratification; and I am convinced that it will not be long before the whole world acknowledges the results of my work.

GREGOR MENDEL

From Peas to PCR!

Our present day understanding of the basis of genetics stems from Gregor Mendel's study of pea plants over one hundred years ago. In recent years, the techniques of molecular biology have opened up our understanding of how plants evolve, develop, and can be used as crops and even as pharmaceutical factories.

The first plant genome to be sequenced in 2000 was that of the humblest member of the *Brassicacea* family, *Arabidopsis thaliana*. As with its animal counterpart, the fruit fly *Drosophila melanogaster, Arabidopsis* has been used to unravel the molecular genetics of the plant kingdom.

Similar to *Drosophila*, many thousands of *Arabidopsis* mutants are available for scientists to study and understand how plant genes function. These studies have not only contributed to the controversial developments of GM plants for food, but also to plants for producing medicines and plants to supplement people's diets in the developing world. They have also allowed horticulturists to develop new varieties for gardeners. A new classification of plants has emerged with the molecular basis supplementing morphological systems of classification.

The future of plant genetics is likely to remain controversial but with the current interest in climate change fueling speculation over what best to use as carbon sinks, perhaps a new chapter will emerge for nature's very own carbon sinks – plants. And who said plants were boring?

Engage your students with some of the key techniques of molecular biology that are changing the way we view and use plants. From growing mutants to tissue culture to PCR, we have something for you to try out in your classroom.

Supported in part by NSF SBIR grants.

Plant Biotechnology

Which QuickPlant™ Is the Mutant?

BEST SELLER

Gregor Mendel studied pea plants over the course of many years to understand inheritance. Now your students can use 3 different genetic strains of *Brassica* QuickPlants™ to see the genetic ratios for themselves.

For 15 Lab Groups

Requires several weeks for growth

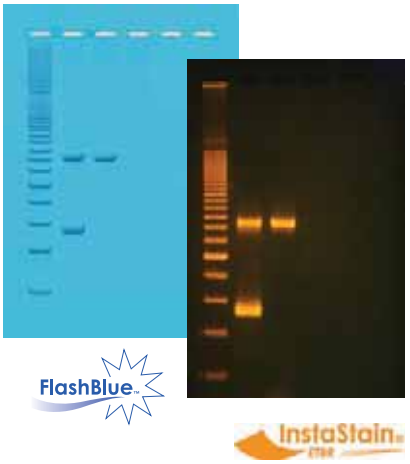
Cat. #S-41

Kit includes: instructions, *Brassica* QuickPlant™ seeds, seed gel, peat pellets, growth containers, fertilizer, and magnifying glasses.

All you need: fluorescent plant growth lights (recommended), spray bottle for fertilizer, and distilled water.

QuickPlant™ Genetics Using PCR

Your students will see for themselves the relationship between genotype and phenotype by performing PCR using DNA extracted from QuickPlants™. Unlike the wild type QuickPlants™, the *glabra* mutant lacks trichomes (single-celled hairs) on its leaves. Using PCR your students will compare a region of DNA that differs between the *glabra* mutant and wild type plants, so they will see this variation at the DNA level.



For 10 Lab Groups

Set up 30 min.
PCR 2 hrs or overnight
Electrophoresis 45 min.

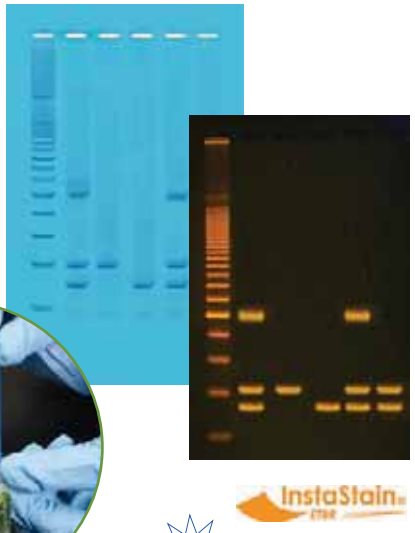
Cat. #336

Kit includes: instructions, QuickPlant™ seeds, potting soil pellets and pots, PCR Beads, microtubes, primers, DNA extraction buffer, plant homogenization pestles with tubes, agarose, electrophoresis buffer, DNA ladder, InstaStain® Ethidium Bromide & FlashBlue™ stain.

All you need: micropipets to measure between 5 and 50 µl (or 5,10, 30, 50 µl fixed volume MiniPipets™), waterbath, thermal cycler, electrophoresis apparatus and power supply, microwave or hot plate, UV transilluminator.

Identification of Genetically Modified Foods Using PCR

Some foods contain raw materials from genetically modified organisms (GMO). Examples include tofu, corn flakes and corn meal. In this experiment, your students will extract DNA from food or plant material and perform PCR to determine if any GM indicator genes are present. Amplified DNA is separated and sized by agarose gel electrophoresis.



For 10 Lab Groups

Set up 30 min.
PCR 2 hours or overnight
Electrophoresis 45 min.

Cat. #962
(Combined with former Cat. #961)

Kit includes: instructions, DNA extraction reagents, PCR beads, microtubes, primers, DNA ladder, ultrapure water, wax beads, gel loading dye, agarose, electrophoresis buffer, InstaStain® Ethidium Bromide & FlashBlue™ stain.

All you need: micropipets to measure between 5 and 50 µl, tips, waterbath, microcentrifuge, thermal cycler, electrophoresis apparatus and power supply, microwave or hot plate, UV transilluminator.

Biochemical Analysis of Plant Enzymes

With this experiment, your students will demonstrate general enzyme principles using specific plant enzymes which have important functions in biotechnology. Students perform tissue prints of seeds to examine what happens during malting. An additional activity allows students to quantify the activity of the enzyme amylase.

For 10 Preparations

Requires 60 min.

Cat. #904

Kit includes: instructions, 3 types of barley seeds, iodine solution/stain, reaction buffer, starch, amylase enzyme powder, 1 ml pipets, starch indicator paper, petri plates, graph paper template.

All you need: single edge razor blades, 2 waterbaths, spectrophotometer, automatic micropipet with tips, test tubes, microscope or magnifying lens, hot plate, cutting board, forceps, test tube racks, pipet pumps, lab glassware, 1N HCl, distilled water, ice & ice bucket.

Introduction to Plant Cell Culture

Genetic modification of plants is a highly controversial area of biotechnology. Experiments in plants begin with establishing plant cells in culture. This involves de-differentiating plant cells to form plant "stem cells". In this experiment, students will establish cell cultures of African Violets from leaves. They will then use plant growth regulators to encourage root growth from the cultured cells, and produce a mature plant.

For 10 Lab Groups

Complete in 60 min. plus several weeks for growth

Cat. #908

Kit includes: instructions, shoot initiation and elongation growth medium, Tween, Petri dishes, growth containers, peat pellets.

All you need: A healthy African Violet (*Saintpaulia ionantha*), microwave or hot plate.

Isolation of Chloroplasts, Mitochondria and Extraction of Plant Genomic DNA

In this two-part experiment, your students will explore the techniques used to isolate plant organelles. Two cell organelles are isolated from pea seedlings by differential centrifugation. First, students identify mitochondria by the enzyme activity of cytochrome oxidase. Then, chloroplasts are isolated and identified under the microscope.

For 6 Lab Groups

Requires approx. 5.5 hrs. for completion over three consecutive lab periods.

Cat. #910

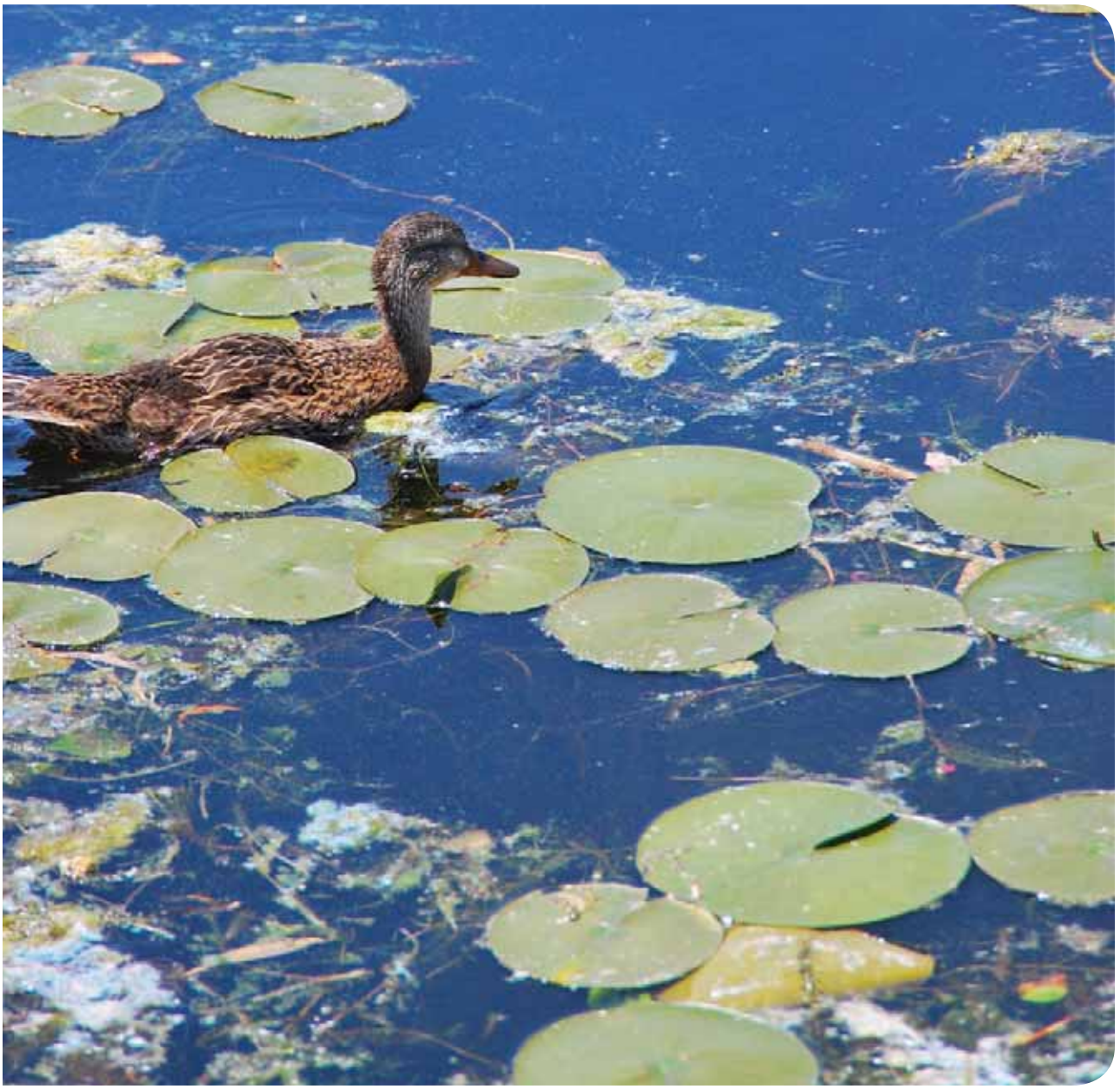
Kit includes: instructions, chloroplast isolation reagents, mitochondrial DNA isolation reagents, transfer pipets, pea seeds.

All you need: microscope and slides, spectrophotometer, blender, waterbath, microcentrifuge & tubes, clinical or high speed centrifuge (10,000 x g), pipet pumps & bulbs, cheesecloth, distilled water, ice and ice bucket, acetone, vermiculite, nursery fat, automatic micropipets & tips, lab glassware, scissors or razor blades, pasteur pipets, funnels, isopropanol, ethanol.

www.edvotek.com

SECTION TWELVE

12 Environmental Monitoring & Protection



Water is essential for life. Yet many millions of people around the world face water shortages. Many millions of children die every year from water-borne diseases. And drought regularly afflicts some of the world's poorest countries. The world needs to respond much better.

KOFI ANNAN FORMER UNITED NATIONS SECRETARY-GENERAL

Can Biotechnology Help the Environment?

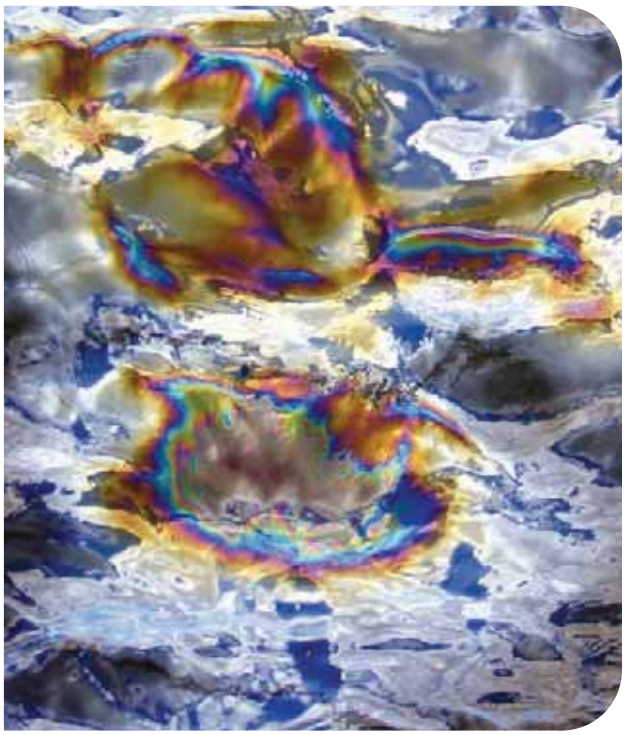
Biotechnology and the environment are not usually associated in a positive way these days. However, the use of molecular biology techniques has rapidly improved environmental monitoring in recent years and biotechnology may help to solve some environmental problems in the future.

The sensitivity of molecular biology enables scientists to quickly and accurately identify both the type of contamination and its source, and whether it is microbial or man made. For instance, use of Polymerase Chain Reaction (PCR) enables the identification of outbreaks of pathogens such as MRSA much more quickly than was possible using traditional microbiology techniques. Such methods could take days or even weeks to identify a pathogen and could never be sure to identify the source of contamination with complete accuracy. This has now all changed thanks to molecular biology.

Your students can try both traditional and molecular techniques for analyzing contamination. In Kit #S-30 How Clean Is the Water We Drink and Air We Breathe, your students can identify contamination using simple microbiology techniques. They can try more sophisticated microbiological techniques using fluorescent dyes in Kit #951 Water Quality Test I: Chromogenic Analysis of Water Contaminants.

However, for the latest in molecular techniques, try one of our PCR kits. Kit #952 Water Quality Test II shows how PCR is used to detect water contamination whereas Kit #962 Identification of Genetically Modified Foods Using PCR can be used to look for GMO products in the environment.

In parallel with the increased use of molecular techniques to detect and identify contamination and pollution, the same techniques are being developed to remove pollution once it has happened. Traditional methods to clean up oil spills with detergents cause almost as much harm as the oil itself. New methods using oil eating bacteria remove the oil without causing harm to the environment. Your students can try this for themselves with Kit #956 Bioremediation by Oil Eating Bacteria.



Oil spillages cause devastation to marine environments. Biotechnology offers new solutions.

Effects of Alcohol on *C. elegans*

NEW

You can not imagine how similar we are to worms! The genome of the tiny worm, *Caenorhabditis elegans*, was sequenced and its genome was found to be 40% similar to us. This little nematode, that is just 1 mm in length (the smallest division in the foot ruler on your desk), has provided a wealth of information for researchers around the world. It has been used as a model system to address fundamental questions in developmental biology, neurobiology and behavioral biology. In this experiment, students will study the effect of alcohol on the locomotion and health of the worms.

Kit includes: instructions, *C.elegans*-normal, *C.elegans* Alcohol -resistant, petri dishes, NGM medium, *E. coli* OP50 Bactobeads™, cell counting chambers, buffer, pipets, sterile loops, tubes, and 10% alcohol.

All you need: ethanol, timers, microscopes, covered box.

For 10 Lab Groups

Growing bacteria: overnight
Plating worms: 15 minutes
Worm Growth: 3-4 days
Alcohol Experiment: 45-60 min.

Cat. # 851

Kit contains LIVE materials which must be requested 1 week prior to lab.

NIAAA National Institute on Alcohol Abuse and Alcoholism

Supported by SBIR grant R44 AA 015026 from the National Institute on Alcohol Abuse and Alcoholism.

Chemotaxis: The Science of Attraction in *C. elegans*

NEW

All organisms are affected by "scent" molecules in the environment. Ants find a picnic lunch, people get attention by the cologne they use, and we all want to go into a bakery that smells like fresh cookies. Allow your students to have the wonderful experience of working with a multicellular organism called *Caenorhabditis elegans,* which can be attracted to a number of scent molecules. These worms are composed of 959 somatic cells of which 300 are neurons comprising organs for taste, smell, temperature and touch. In this experiment your students will explore positive and negative chemotaxis in C. elegans using volatile chemical compounds like vinegar, vanilla, bleach and acids.

Kit includes: instructions, *C.elegans*- normal, *C.elegans* Chemotaxis- mutant, petri dishes, NGM medium, *E. coli* OP50 Bactobeads™, cell counting chambers, buffer, pipets, sterile loops, tubes and chemical compounds.

All you need: ethanol, timers, microscopes, covered box.

For 10 Lab Groups

Growing bacteria: overnight
Plating worms: 15 minutes
Worm Growth: 3-4 days
Chemotaxis Expt: 45-60 min.

Cat. # 852

Kit contains LIVE materials which must be requested 1 week prior to lab.

NIAAA National Institute on Alcohol Abuse and Alcoholism

Supported by SBIR grant R44 AA 015026 from the National Institute on Alcohol Abuse and Alcoholism.

C. elegans Ecology Platform NEW

After one week of working with *C.elegans* under a microscope, your students will feel like real scientists! *Caenorhabditis elegans* is a soil nematode that has great potential for educational research, partly because of its rapid (3-day) life cycle, small size (1.0-mm-long adult), and ease of laboratory growth cultivation. Thousands of animals can grow on a single petri dish seeded with a lawn of *Escherichia coli* as the food source. Students will engage in an environmental toxicity scenario and will use pre-diluted concentrations of heavy metal solution to determine the effect on the worms. Time courses will be assessed and LD toxicity will be determined.

Kit includes: instructions, *C.elegans*-normal, *C.elegans*-Toxicity mutant, petri dishes, NGM medium, *E. coli* OP50 Bactobeads™, cell counting chambers, buffer, pipets, sterile loops, tubes and heavy metal compounds.

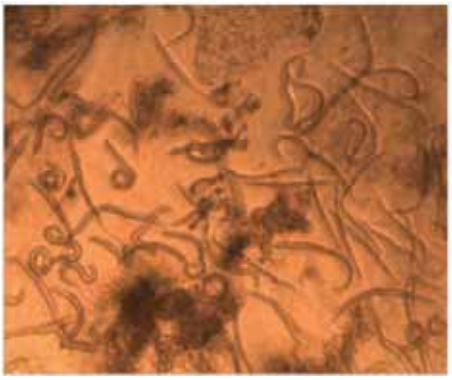
All you need: ethanol, timers, microscopes, covered box.

For 10 Lab Groups

Growing bacteria: overnight
Plating worms: 15 minutes
Worm Growth: 3-4 days
Alcohol Experiment: 45-60 min.

Cat. # 856

Kit contains LIVE materials which must be requested 1 week prior to lab.



Supported in part by NIH SBIR NCRR Grant.

Bioremediation by Oil Eating Bacteria BEST SELLER

Oil spills cause devastation to the environment killing sea life, birds, and coastal plants. Spraying areas of contamination with oil-eating microbes accelerates the degradation of the oil. This process is known as bioremediation. In this open-ended experiment, students will grow a mixture of oil-eating bacteria and observe their effectiveness at degrading a variety of oils.

For 10 Lab Groups

After establishment of cultures, lab requires 50 min. (Can be done over several days or weeks.)

Cat. # 956

Kit includes: instructions, oil-eating bacteria, growth medium, pipets.

All you need: shaking incubation oven (optional) or stir plate and stir bars, growth flasks, vegetable oil (or other food oils), distilled water, pipet pumps.

How Clean Is the Water We Drink & the Air We Breathe?

Your class will make the invisible, visible! With this kit, your students will sample water and air and then grow any microbes present overnight. A safe and simple way to teach pollution.

For 10 Lab Groups

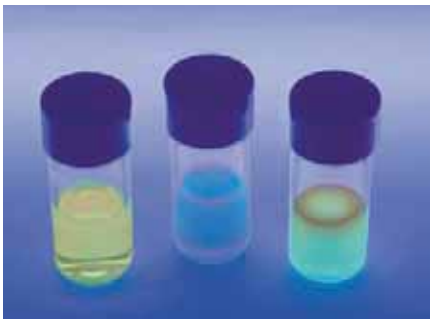
Complete in 30 minutes and grow overnight

Cat. #S-30

Kit includes: instructions, Ready Pour agar, Petri plates, pipets, sterile water sample.

All you need: water samples, test tubes, pipet pump or bulb, hot plate or water bath, aluminum foil or plastic wrap, 10% bleach solution.

Water Quality Testing I: Chromogenic Analysis of Water Contaminants



Testing drinking water for every possible type of pathogenic bacteria is slow and costly. Thus, drinking water is tested for coliforms - including the familiar *E. coli*. Presence of coliforms is an indicator of fecal contamination.

In this experiment, students will test for coliforms in simulated contaminated water using color and fluorescent reagents. They can use these same reagents to test water samples from the environment. As an extension activity, a Gram Stain test can be performed on the collected samples.

For 10 Lab Groups

Complete in 30 minutes and grow overnight

Cat. #951

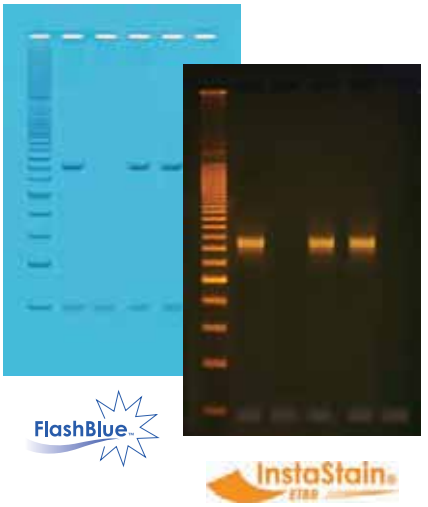
Kit includes: instructions, ReadyPour™ Agar, fluorescent reagents, BactoBeads™, Petri dishes, inoculating loops, sterile swabs, microtubes.

All you need: long wave UV lamp, microscope, slides and coverslips.

Perfect Partner
Long Wave UV Mini Lamp
Cat. #969

EDVOTEK® has received two Small Business Innovation Research (SBIR) grants from the National Institute of Health/ National Center for Research Resources for the development of experiments for Environmental Science. Opinions expressed are those of the authors and not necessarily those of the NIH/NCRR. NIH Grant #SBIR-IR44-RR018670

Water Quality Testing II: PCR-based Testing of Water Contaminants



Now your students can use PCR to detect water pollution due to sewage contamination. In this experiment, safe bacterial strains will be provided and dilutions will be made to determine the number of bacterial cells that are required to obtain a successful PCR result. As an extension to this experiment students will be able to test for water contamination in samples they provide.

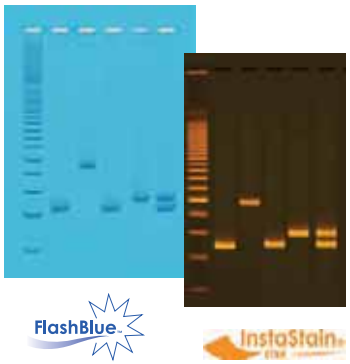
For 25 Students

Set Up 60 min.
PCR 120 min. or overnight
Electrophoresis 45 min.

Cat. #952

Kit includes: instructions, control DNA and primers, BactoBeads™, DNA ladder, chelating agent, proteinase K, PCR beads, gel loading dye, agarose, electrophoresis buffer, InstaStain® Ethidium Bromide and FlashBlue™ stain.

All you need: micropipets to measure between 5 and 50 µl (or 5,10, 30, 50 µl fixed volume minipipets), waterbath, microcentrifuge, thermal cycler, electrophoresis apparatus, power supply, microwave or hot plate, UV transilluminator.



Water Quality Testing III: Multiplex PCR-based Testing of Water Contaminants

Drinking water is routinely tested for contamination. If a screening tests positive, more sophisticated tests are required. One such test uses PCR in multiplex format. In this experiment, students will test for the presence of three separate, classroom-safe organisms in a water sample using a single PCR reaction.

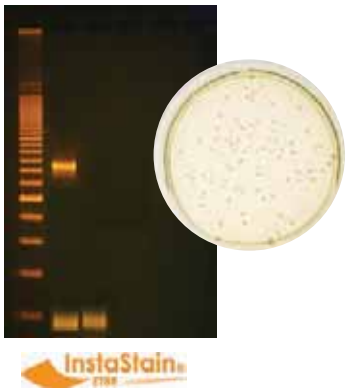
For 25 Students

Set Up 60 min.
PCR 120 min. or overnight
Electrophoresis 60 min.

Cat. #953

Kit includes: instructions, control DNA and primers, DNA ladder, BactoBeads™, proteinase K, PCR beads, gel loading dye, agarose, buffer, InstaStain® Ethidium Bromide and FlashBlue™ stain.

All you need: thermal cycler, waterbaths or heating blocks for PCR, waterbath, electrophoresis apparatus, power supply, micropipets with tips, balance, microcentrifuge, microwave or hot plate, UV transilluminator, water & ice.



Water Quality Testing IV: Comparison of Classical and PCR Detection of Water Contaminants

Your students will compare traditional vs. PCR detection of water contaminants in this open-ended experiment. The traditional method of detecting (and quantifying) water contamination requires spreading a water sample on agar plates that contains bacterial medium. Bacteria will grow on the nutrient agar after 2-3 days of incubation. To more rapidly and efficiently detect water bacterial contamination, the polymerase chain reaction (PCR) may be used. Additionally, students will determine if PCR is sensitive enough to detect the maximum allowable contamination permitted by state and federal laws. No pathogenic materials are included in this experiment.

For 10 Lab Groups

Set Up 60 min.
PCR 120 min. or overnight
Electrophoresis 60 min.

Cat. #948

Kit includes: instructions, control DNA and primers, DNA ladder, BactoBeads™, chelating agent, proteinase K, PCR beads, gel loading dye, agarose, electrophoresis buffer, InstaStain® Ethidium Bromide.

All you need: thermal cycler, waterbaths or heating blocks for PCR, waterbath, electrophoresis apparatus, power supply, micropipets with tips, balance, microcentrifuge, microwave oven or hot plate, UV transilluminator, water & ice.

NIH
Supported in part by NIH SBIR NCRR Grant.

Toxicity Detection of Pollutants in Freshwater

This experiment has been adapted from a freshwater quality test which uses *Daphnia magna* to determine toxicity levels of freshwater. A simulated "toxicant" is provided to simulate environmental pollution in freshwater lakes, rivers and streams. Hydrolysis of a fluorescent substrate by *Daphnia* is used to determine the level of toxicants. Results are observed by using long wave ultraviolet light. Calculations for lethal concentration are determined.

For 5 Lab Groups

Requires 90 min.

Cat. #954

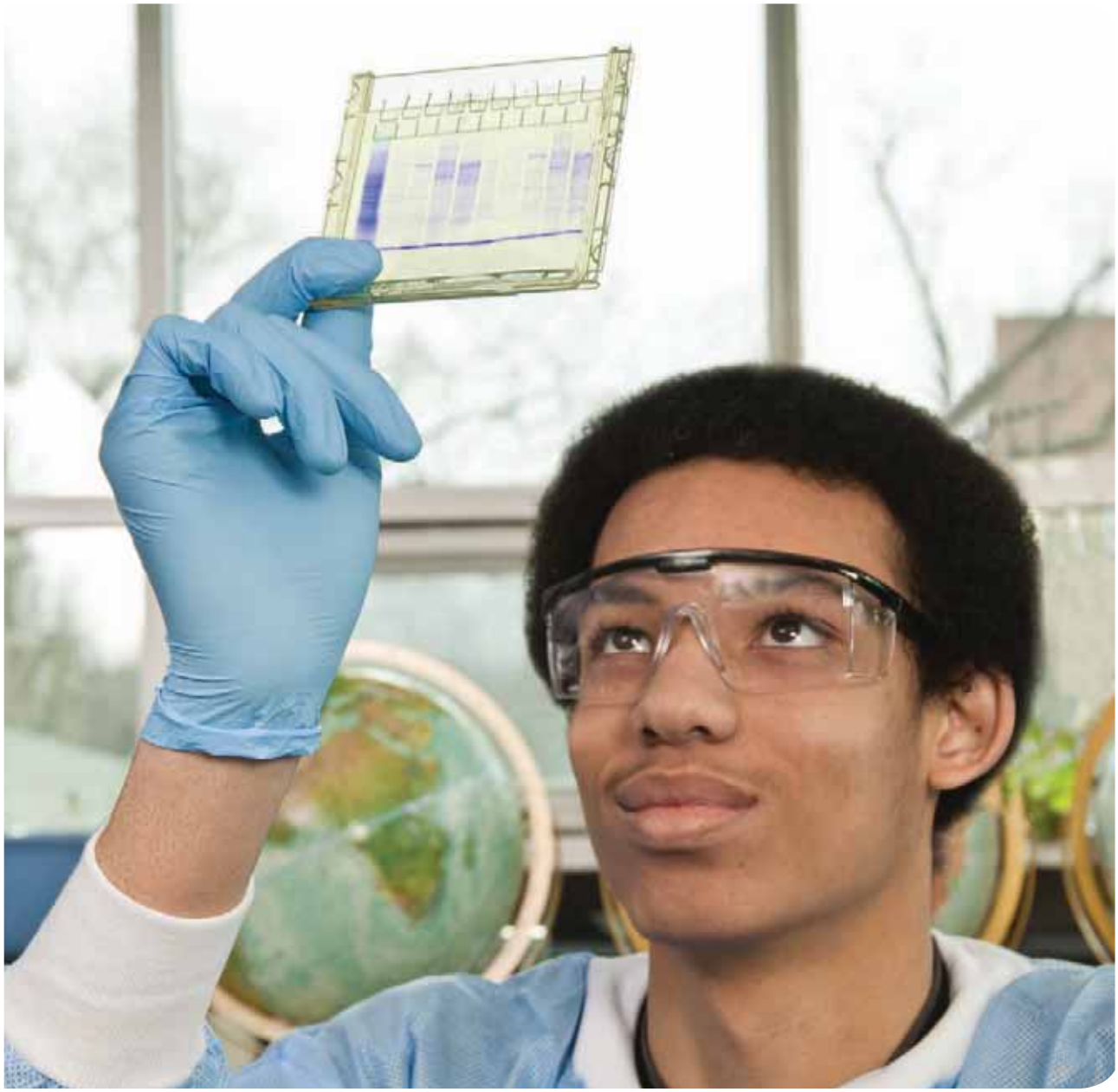
Kit includes: instructions, fluorescent detection substrate, simulated toxicant concentrate, toxicity reduction reagent, 1 molded exposure chamber (Note: 5 required), wide bore transfer pipets, calibrated plastic pipets.

All you need: *Daphnia magna*, 4 additional molded exposure chambers (Cat. #965), long wave UV light, white light visualization system, microscope or hand magnifier, large glass vessel, beakers, UV protective goggles, spring water, test tubes, 5 ml pipets and pumps.

Perfect Partner
Molded Exposure Chambers - 5 pack
Cat. #965

SECTION THIRTEEN

13 Proteins, Enzymes & Chromatography



Systems biology is the science of discovering, modelling, understanding and ultimately engineering at the molecular level the dynamic relationships between the biological processes that define living organisms.

LEROY HOOD, PRESIDENT OF THE INSTITUTE FOR SYSTEMS BIOLOGY

Back to the Future

Alongside the genome, scientists now talk of the proteome (proteins), transcriptome (mRNA) and even the metabolome (metabolic pathways). These individual fields are gradually coming together (along with bioinformatics and other computer based technologies) under a single umbrella called "systems biology".

The idea behind the phenomenon of systems biology is that you must study all of the parts of the organisms from the molecular and cellular level through to the highest level together in a complete way to understand the complex multi-level interactions that govern what we call life. The theory underpinning systems biology is the old adage that the whole equals more than the sum of the parts.

A key element is the idea that the component parts, when combined together, have what are called "emergent properties". The Institute for Systems Biology in Seattle, uses the (non-eco) light bulb to explain this. When the parts of such a light bulb are taken individually (tungsten wire, metal cap and glass bulb) they don't give a clue that together they produce the emergent property of light! Complex systems (like life) have even less predictable emergent properties, so it is necessary to study the whole, as well as the parts, for a full understanding.

Systems biology is a paradigm shift in our approach to biology away from the reductionist extremism of molecular biology. It sounds like an interesting approach and one that offers great hope for the future. It is also refreshing to see a return to a more traditional whole organism approach to biology. Maybe macro and micro meet at last!

Electrophoresis of Proteins

Molecular Weight Determination of Proteins (Agarose-based)

BEST SELLER

Introduce a simple method to determine protein subunit molecular weights using horizontal electrophoresis. Because the protein standards and "unknowns" are prestained, the separation of proteins can be observed during electrophoresis. Included in the experiment is EDVOTEK®'s formulation of protein grade agarose, which provides an alternative to the use of polyacrylamide gels.

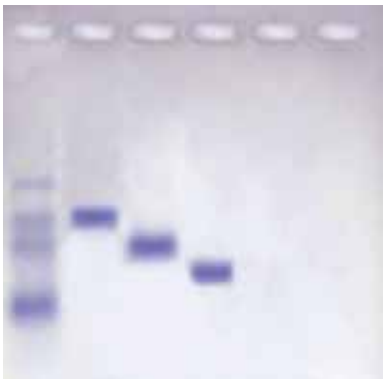
For 4 Gels

Gel Prep 40 min.
Electrophoresis 60 min.

Cat. #110

Kit includes: instructions, prestained LyphoProtein™ samples, gel loading solution, agarose, electrophoresis buffer, Protein InstaStain®, SDS solution.

All you need: horizontal electrophoresis apparatus, power supply, white light visualization system, automatic micropipet with tips, microwave or hot plate, waterbath, metric rulers, lab glassware, methanol, glacial acetic acid, distilled or deionized water.



InstaStain® Protein

Electrophoretic Properties of Native Proteins (Agarose-based)

Proteins are complex biomolecules with varying charge, size and shape that can be analyzed by agarose gel electrophoresis. Gel analysis of native proteins enables students to evaluate natural charge and shape characteristics of proteins. Following electrophoresis, the protein samples are stained for visualization.

For 6 Gels

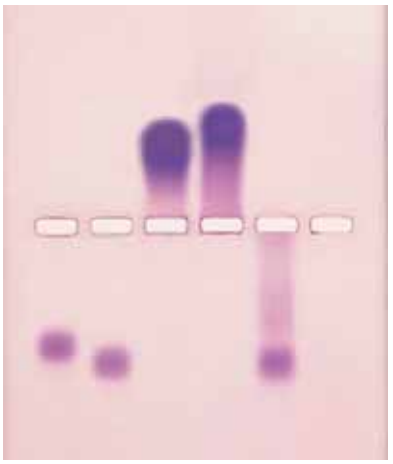
Gel Prep 30 min.
Electrophoresis 45 min.
Staining 60 min.
Destaining overnight

Cat. #111

Kit includes: instructions, protein samples, gel loading solution, agarose, electrophoresis buffer, Protein InstaStain®.

InstaStain® Protein

All you need: horizontal electrophoresis apparatus, power supply, white light visualization system, automatic micropipet with tips, microwave or hot plate, waterbath, metric rulers, lab glassware, methanol, glacial acetic acid, distilled or deionized water.



Western Blot Analysis

In Western blot analysis, protein identification is based on antibody and antigen reactions. Proteins are separated on polyacrylamide gels and are transferred (blotted) to a nylon membrane. The membrane is exposed to solutions containing primary antibody, followed by a secondary antibody coupled to an enzyme. The membrane is then soaked in a substrate solution to develop the color reaction, which results in identification of the antigen protein band. The molecular weights of the visible bands are measured using prestained protein markers of known molecular weight. This kit does not require an electrotransfer apparatus.

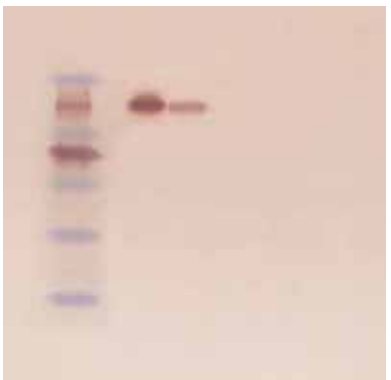
For 6 Blots

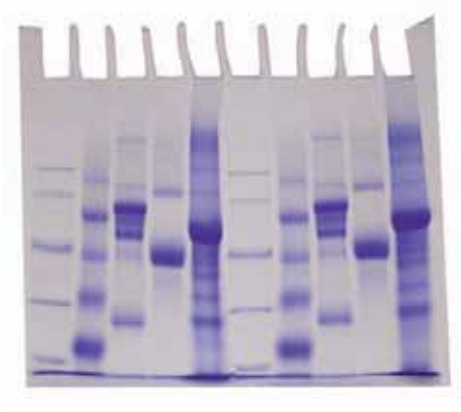
Electrophoresis 60 min.
Blot overnight
Detection 2.5 hours

Cat. #317

Kit includes: instructions, negative control, all samples & antibodies, various reagents and buffers, membrane and filter paper.

All you need: 3 polyacrylamide gels (12%), Vertical gel electrophoresis apparatus, power supply, automatic micropipet with fine tips, laboratory glassware, metric rulers, distilled or deionized water, glacial acetic acid, methanol.





Survey of Protein Diversity

BEST SELLER

Learn about the diversity of proteins by studying the electrophoretic profiles of various sources. Your students will separate proteins from bacterial, plant, serum, and milk proteins alongside a standard protein marker.

For 6 Groups sharing 3 gels

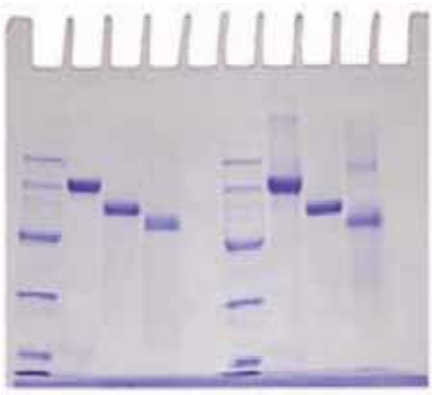
Electrophoresis 60 min. Staining 20 min. Destaining 2 hours

Cat. #150

Kit includes: instructions, denatured LyphoProtein™ samples, standard protein markers, gel loading solution, buffer, Protein InstaStain®.

InstaStain® Protein

All you need: 3 polyacrylamide gels (12%), vertical gel electrophoresis apparatus, power supply, hot plate or burner, white light visualization system, automatic micropipet with fine tips, microtest tube holder, lab glassware, methanol, glacial acetic acid, distilled or deionized water.



Determination of Protein Molecular Weight

Using prestained LyphoProteins™, subunit molecular weights are determined by analysis using denaturing SDS vertical polyacrylamide gel electrophoresis. Prestained Proteins with unknown molecular weights are assigned molecular weights based on the relative mobility of prestained standard protein markers.

For 6 Groups sharing 3 gels

Electrophoresis 60 min. Staining 20 min. Destaining 2 hours

Cat. #153

Kit includes: instructions, denatured LyphoProtein™ samples, standard protein markers, gel loading solution, buffer, Protein InstaStain®.

InstaStain® Protein

All you need: 3 polyacrylamide gels (12%), vertical gel electrophoresis apparatus, power supply, hot plate or burner, white light visualization system, automatic micropipet with fine tips, microtest tube holder, lab glassware, methanol, glacial acetic acid, distilled or deionized water.

MV10 Vertical Protein Electrophoresis Apparatus

NEW

For 1 Group

Designed for separation of proteins on polyacrylamide gels. The MV10 allows you to run one vertical polyacrylamide gel. All parts are color coded to ensure proper orientation.

Cat. #581

Protein Bulk Replenishers

PROTEIN SAMPLES ONLY FOR 12 GROUPS

Survey of Protein Diversity

LyphoProtein™ samples for 12 groups

Cat. #150-B

Determination of Protein Molecular Weights

LyphoProtein™ samples for 12 groups

Cat. #153-B

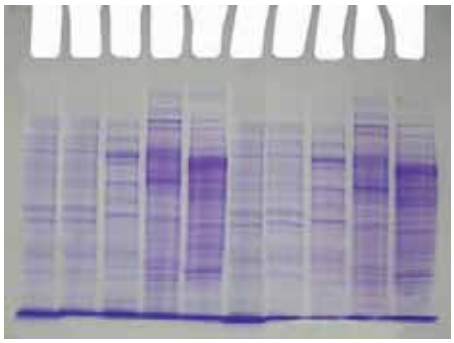
Diversity of Fish Proteins

LyphoProtein™ samples for 12 groups

Cat. #253-B

Fingerprinting of Bacterial Proteins

In this experiment, total protein extracts from several bacterial sources are compared. The unique patterns of protein bands, obtained by SDS vertical polyacrylamide electrophoresis, can be used to identify various bacterial strains.



For 6 Groups sharing 3 gels

Day One Set Up 15 min.
Day Two Set Up 60 min.
Electrophoresis 60 min.
Staining 20 min.
Destaining 2 hours

Cat. #252

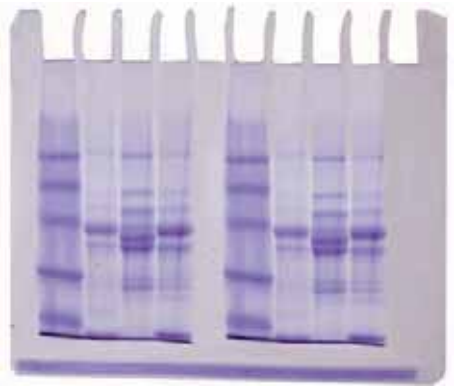
Kit includes: instructions, bacterial cultures and reagents, LyphoProteins™, Lysozyme, buffers, Protein InstaStain®, practice gel loading solution, protein sample buffer, unknown proteins ready for electrophoresis, ReadyPour™ Agar, nutrient broth.

All you need: 3 polyacrylamide gels (12%), vertical gel electrophoresis apparatus, power supply, Microcentrifuge, incubation oven, hot plate or burner, white light visualization system, automatic micropipet with fine tips, lab glassware, methanol, glacial acetic acid, distilled water.

Diversity of Fish Proteins

BEST SELLER

Study the diversity of fish with these pre-stained, lyophilized proteins. Total protein from Perch, Walleye and Salmon is extracted and pre-stained using an indicator dye. Each fish protein sample has a characteristic banding pattern when separated by denaturing SDS-polyacrylamide gel electrophoresis, which can be used to identify the specific species.



For 6 Groups sharing 3 gels

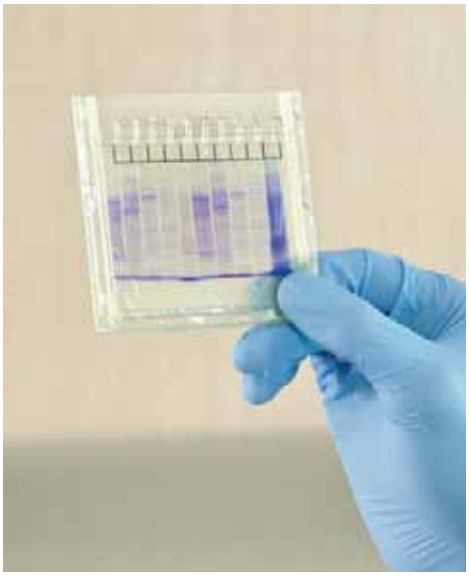
Electrophoresis 60 min.
Staining 20 min.
Destaining 2 hours

Cat. #253

Kit includes: instructions, fish Lypho-Protein™ samples, protein molecular weight standards, practice gel loading solution, buffer, Protein InstaStain®.

All you need: 3 polyacrylamide gels (12%), vertical gel electrophoresis apparatus, power supply, microcentrifuge, hot plate or burner, vortex, white light visualization system, automatic micropipet with fine tips, test tube holders, lab glassware, methanol, glacial acetic acid, distilled water.

Protein Reagents



Precast Polyacrylamide Gels
Cat. #651 3 gels (12%)
Cat. #652 6 gels (12%)

Tris-glycine-SDS Buffer
For vertical polyacrylamide gel electrophoresis
Cat. #655 (10x for 5 L) (500 ml)

Tris-glycine Buffer
For vertical polyacrylamide gel electrophoresis
Cat. #656 (10x for 5 L)

Tris-HCl-SDS-2-Mercaptoethanol
This sample preparation buffer contains mercaptoethanol to break disulfide bonds in proteins. This buffer solution can be used for molecular weight determination. Requires -20°C freezer storage.
Cat. #658 10 ml

Prestained Lyophilized Protein Standard Marker
Molecular Weight Standards
Cat. #752 For 6 gels

Protein InstaStain®
Protein InstaStain® sheets stain gels faster than conventional methods. Protein InstaStain® gives high quality and uniform gel staining with excellent results for photography. They are also environmentally friendly because they use a solid matrix, avoiding large amounts of liquid stain and waste disposal.

Cat. # 2016 For 15 gels, 10x10 cm
Cat. # 2017 For 30 gels, 10x10 cm

Protein & Enzyme Analysis

Enzyme Microarrays

Microplate microarray technology is a new technology that allows scientists to screen large numbers of samples simultaneously. This technology has led to cost savings by saving time and reducing sample size, while yielding accurate results. Students will apply various reagents to enzyme reactions in a microtiter plate to screen for positive and negative reactions. They will also make quantitative determinations based on the colorimetric product.

For 10 Groups
Requires 60 min.
Cat. #246

Kit includes: instructions, enzymes and substrates, microtiter plates, microtest tubes, pipets.

All you need: 37°C incubation oven, automatic micropipet with tips, flasks or beakers, distilled water.

Principles of Enzyme Catalysis

This easy and safe experiment allows your students to learn about enzyme catalysis, the nature of enzyme action and protein structure-function relationships. Students will perform an enzyme assay and determine the rate of the enzymatic reaction.

For 10 Groups
Requires 30-45 min.
Cat. #282

Kit includes: instructions, catalase solution, hydrogen peroxide, phosphate buffer, assay reagent, acidification solution, color enhancer & developer.

All you need: visible wavelength spectrophotometer, timer, pipet pumps or bulbs, 1 ml pipets, test tubes & tube racks, beakers, 1, 5 & 10 ml pipets, linear graph paper, ice, lab markers, distilled water.

Biochemical Analysis of Plant Enzymes

With this experiment, your students will demonstrate general enzyme principles using specific plant enzymes which have important functions in biotechnology. Students perform tissue prints of seeds to examine what happens during malting. An additional activity allows students to quantify the activity of the enzyme amylase.

For 10 Groups
Requires 2 hours
Cat. #904

Kit includes: instructions, 3 types of barley seeds, iodine solution/stain, reaction buffer, starch, amylase enzyme powder, 1 ml pipets, starch indicator paper, petri plates, graph paper template.

All you need: single edge razor blades, 2 waterbaths, spectrophotometer, automatic micropipet with tips, test tubes, microscope or magnifying lens, hot plate, cutting board, forceps, test tube racks, pipet pumps, lab glassware, 1N HCl, distilled water, ice and ice bucket.

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Chromatography & Purification

Principles of Gel Filtration Chromatography

BEST SELLER

Introduce chromatographic separation to your class and show them how dyes of different colors separate on the basis of their size and shape. Columns may be rinsed and reused.

• SCIENCE • TECH • MATH STEM NOLOGY • ENGINEERING •

For 10 Separations

Packing Column 20 min.
Column Separation 40 min.

Cat. #108

Kit includes: instructions, sample mixture, chromatography columns, dry matrix, elution buffer, transfer pipets, microtest tubes.

All you need: 50 or 100 ml beakers, 25 ml beaker or test tube, ring stands with clamps, distilled water.

Principles of Thin Layer Chromatography

This experiment introduces chromatographic theory and methods of thin layer chromatography. A mixture of dyes are separated on a cellulose-based TLC plate using two different solvent systems.

For 8 Separations

Spotting Plates 20 min.
TLC Separation 5 min.

Cat. #113

Kit includes: instructions, samples, reagents and solvents, cellulose thin layer plate, 5 µl glass capillary pipets.

All you need: 250 ml beakers, metric rulers, pipet pump, 5 or 10 ml pipets, distilled water.

Ion Exchange Chromatography

• SCIENCE • TECH • MATH STEM NOLOGY • ENGINEERING •

Most molecules have a net charge within a pH range of 2 to 10. When the pH is altered, the net charge on molecules can change drastically. In this experiment, a mixture of two chemicals is absorbed onto a solid support ion-exchange column and separated during elution under conditions that influence their net charge.

For 6 Separations

Requires 60-90 min.

Cat. #243

Kit includes: instructions, ion exchanger, chemical mixture, potassium acetate buffer, chromatography columns.

All you need: spectrophotometer & cuvettes, ring stands and clamps, test tubes, lab glassware, distilled water, 5 ml pipets and pumps.

Affinity Chromatography of Glucose Binding Proteins

In this experiment, students will prepare a seed extract from Jack Bean Meal, fractionate the extract using affinity chromatography, and elute the bound glucose binding protein. The presence of biological activity is determined by an immunoblot enzyme assay.

For 10 groups

Requires 2 hours

Cat. #277

Kit includes: instructions, affinity gel, jack bean meal, various solutions and buffers, membranes, petri plates, columns with tips, conical tubes and transfer pipets.

All you need: clinical centrifuge, vortex or shaking platform, micropipet and tips, ring stands and clamps, lab glassware, pipets & pumps, microtest tubes, forceps, water.

Purification and Size Determination of Green & Blue Fluorescent Proteins

BEST SELLER

When bacteria are used to make medicinally useful proteins by transformation, the protein of interest must be separated from all of the other cellular proteins. In this experiment, the unique fluorescent properties of GFP and BFP will be used as an assay during their purification from an *E. coli* extract. The column fractions containing GFP or BFP will be identified by fluorescence and then purified. As an optional activity, purified protein fractions can be separated by SDS polyacrylamide gel electrophoresis (SDS-PAGE) to estimate the purity and size of the GFP and BFP proteins.

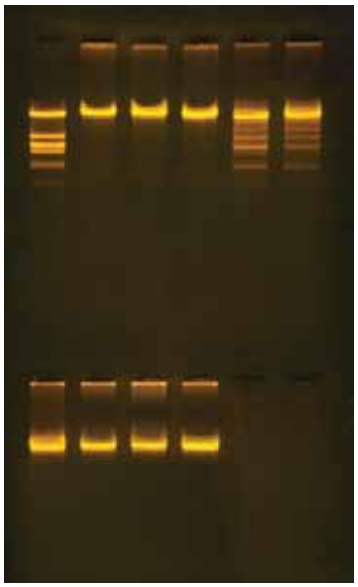
For 6 Lab Groups

Packing & running column 45 min.
Optional electrophoresis 60 min.
Staining 30 min.
Destaining 2 hours

Cat. #255

Kit includes: instructions, columns and matrix, GFP and BFP extracts, buffer, protein gel reagents for optional activity.

All you need: waterbath, long wave UV lamp, ring stand & clamps, automatic micropipet, vertical gel electrophoresis apparatus, power supply, polyacrylamide gels (12%).



Purification of the Restriction Enzyme *Eco* RI

Advanced Topic

• SCIENCE • TECH • MATH • ENGINEERING • TECHNOLOGY
STEM

In this experiment, students actually purify the restriction enzyme, *Eco* RI! This procedure utilizes an ion exchange chromatography step for *Eco* RI purification. Column fractions are assayed for the enzyme using Lambda DNA and digestion products are identified by agarose gel electrophoresis. Fractions that contain *Eco* RI are identified and pooled. The total and specific activities are calculated. Recommended for college level courses.

For 5 Purifications

Packing column 45 min.
Restriction analysis A 35 min.
Restriction analysis B 50 min.
Gel Prep 30 min.
Electrophoresis 30 min.
Staining & Destaining 2 min.

Cat. #302

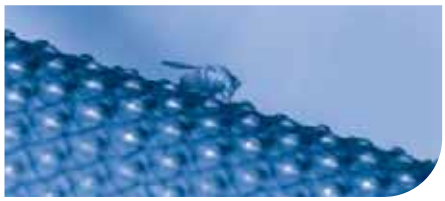
InstaStain® ETBR

Kit includes: instructions, ion exchange matrix, chromatography columns, *E.coli* cell extract, equilibration & elution buffer, Lambda DNA, Lambda/*Eco* RI Marker, KCl, glycerol, dilution & reaction buffers, gel loading solution, agarose, electrophoresis buffer, stain.

All you need: horizontal gel electrophoresis apparatus, power supply, UV visualization system, waterbath, microcentrifuge, microwave or hot plate, UV spectrophotometer & cuvettes, automatic micropipet with tips, ring stands & clamps, 10 ml pipets, lab glassware, ice and ice buckets.

SECTION FOURTEEN

14 A.P. Biology



"Equipped with his five senses, man explores the universe around him and calls the adventure Science."

EDWIN POWELL HUBBLE, THE NATURE OF SCIENCE, 1954

BIG IDEA AP BIOLOGY

SPECIAL PACKAGE

Big Idea 1: Evolution
Investigation 1: Artificial Selection
Investigation 2: Mathematical Modeling: Hardy-Weinberg
Investigation 3: Comparing DNA Sequences to Understand Evolutionary Relationships with BLAST

Big Idea 2: Cellular Processes - Energy and Communication
Investigation 4: Diffusion and Osmosis
Investigation 5: Photosynthesis
Investigation 6: Cellular Respiration

Big Idea 3: Genetics and Information Transfer
Investigation 7: Cell Division: Mitosis and Meiosis
Investigation 8: Biotechnology: Bacterial Transformation
Investigation 9: Biotechnology: Restriction Enzyme Analysis of DNA

Big Idea 4: Interactions
Investigation 10: Energy Dynamics
Investigation 11: Transpiration
Investigation 12: Fruit Fly Behavior
Investigation 13: Enzyme Activity

Cat. # AP-PKG

Our AP Biology kits are designed for 10 lab groups!

EDVOTEK's Big Idea AP Biology labs were designed to reflect the changes to the AP curriculum that took effect in the 2012-13 academic year.

Visit our website www.edvotek.com for more info!

Advanced Placement® Biology*

The AP Biology curriculum, developed by the College Board, offers high school students the opportunity to gain credit for introductory college level biology courses. Since 1991, EDVOTEK® has proudly offered reagents and equipment for all labs necessary to fulfill the AP Biology Lab requirement.

The EDVOTEK Advantage:
EDVOTEK® offers two separate selections: **BIG IDEA AP Biology Investigations** and **AP Classic™ Biology Labs** (found on page 101). Although slightly different in content, both lab selections are designed with three principles in mind: safety, value, and reproducibility. We've eliminated the need for using toxic chemicals that not only have the potential for causing harm to students, but also pose a threat to the environment. Our labs provide the most value and are tested to ensure that you get the results you expect.

Help your high school students prepare for higher education as they learn the core concepts of this innovative and exciting introductory level college course!

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BIG IDEA 1: Evolution

Our AP Biology kits are designed for 10 lab groups!

Investigation 1: Artificial Selection

Students will perform artificial selection on a population of Quick Plant™, and identify traits that vary in the population. Then they will perform artificial selection by cross-pollinating only selected plants and observe the trait differences between the two populations to learn how selection works.

For 10 Lab Groups

30 min. lab periods over the course of 5-7 weeks.

Cat. #AP01

Kit includes: instructions, Quick Plant™ seeds, Nylon mason twine, potting mix, Miracle-Gro Fertilizer, vermiculite, bees, plastic magnifier, and wooden toothpicks.

All you need: growing system (reused plastic soda or water bottles (500 ml)), light box system, Digital cameras, Lab notebook, water, tape, razor.

Investigation 2: Mathematical Modeling - Hardy-Weinberg

The application of the Hardy-Weinberg law of genetic equilibrium demonstrates that mutations, genetic drift and natural selection have a dramatic effect on gene frequency in a population. Using computer and Internet access, students will explore how a hypothetical gene pool changes from one generation to the next.

	A	a
A	AA	Aa
a	Aa	aa

For 10 Lab Groups

Requires 2 hours.

Cat. #AP02

Kit includes: instructions, PTC taste paper and control taste paper.

All you need: computer with spreadsheet software and calculator with square root function.

Investigation 2 Alternative: Cat. #333 PCR-based Alu-Human DNA Typing See pages 40 and 101

Investigation 3: Comparing DNA Sequences to Understand Evolutionary Relationships with BLAST

In this experiment, several genes will be submitted to an internet database to identify and compare the genes. Students will then use this information to construct a cladogram - a phylogenetic tree representing evolutionary relatedness of species.

For 10 Lab Groups

Requires 45 min.

Cat. #AP03

Kit includes: instructions.

All you need: computer with internet access.

Investigation 3 Alternatives: Cat. #339 Sequencing the Human Genome See page 33
Cat. #340 DNA Informatics See page 33

BIG IDEA 2: Cellular Processes Energy & Communication

Our AP Biology kits are designed for 10 lab groups!

Investigation 4: Diffusion and Osmosis

In this experiment, students use artificial cells to study the relationship of surface area and volume. Then they will create models of living cells to explore osmosis and diffusion, and observe osmosis in living cells. Various diffusion and osmosis principles are performed in this lab.

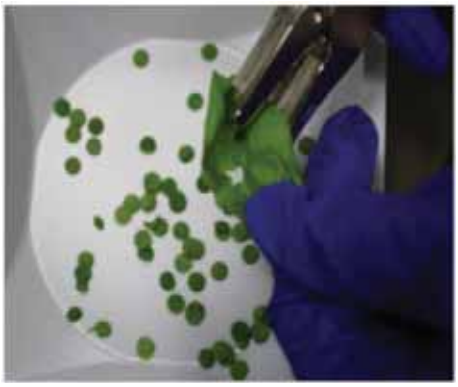
- For 10 Lab Groups
- Complete in 60-90 min.
- **Cat. #AP04**

Kit includes: instructions, Agar powder, phenolphthalein solution, sodium hydroxide (NaOH) pellets, powdered sucrose, NaCl, powdered glucose, ovalbumin, dialysis tubing, large transfer pipets, microscope slides and cover slips.

All you need: beaker, ruler, razor, plastic spoon, paper towel, timer, scales, graph paper, distilled or deionized water, elodea tip or Moss, microscope.

Investigation 5: Photosynthesis

In this experiment, students will learn how to measure the rate of photosynthesis indirectly by studying the floating leaf disk assay, and test different variables that might affect the photosynthesis process.



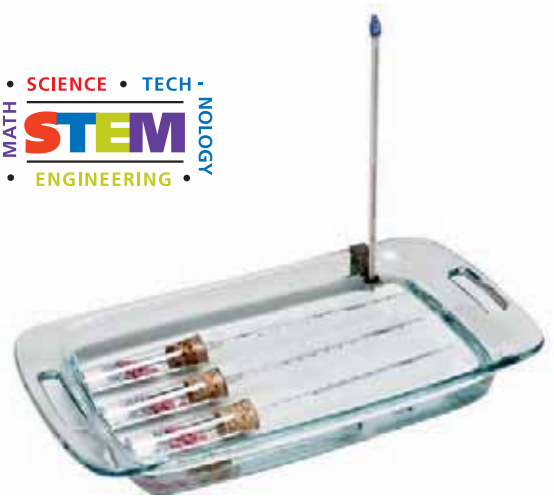
- For 10 Lab Groups
- Complete 1.75 hours (2 lab periods).
- **Cat. #AP05**

Kit includes: instructions, Sodium Bicarbonate (baking soda), liquid soap, plastic syringes, transfer pipets, plastic cups, metric rulers.

All you need: leaves, timer, light source, hand-held hole punch, beakers.

Investigation 6: Cellular Respiration

In this experiment, students learn how to apply the gas laws to the function of the microrespirometer. Students will observe cell respiration of germinating seeds and describe the effects of temperature on the rate of cell respiration.



- For 10 Lab Groups
- Requires 2 hours (2 lab periods).
- **Cat. #AP06**

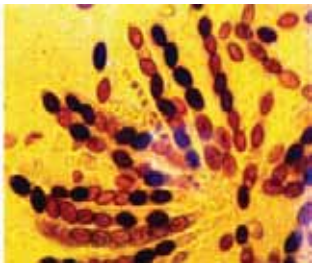
Kit includes: instructions, 1 ml pipet, glass beads, peas, potassium hydroxide solution, cork stoppers, absorbent cotton, nonabsorbent cotton, plastic vials, parafilm.

All you need: thermometers, trays (at least 14" long), silicon glue, ice, cork borer, tape, timers.

BIG IDEA 3: Genetics and Information Transfer

Our AP Biology kits are designed for 10 lab groups!

Investigation 7: Cell Division - Mitosis and Meiosis



Students learn to identify and differentiate various stages in mitosis and meiosis. Onion root tips are stained to identify the various stages and duration of mitosis. Meiosis and Crossing Over in Sordaria are also demonstrated in this experiment. Students will also have an opportunity to analyze the mechanism involved with loss of cell cycle control in cancer.

For 10 Lab Groups

Requires 60 min.

Cat. #AP07

Kit includes: instructions, Pipe cleaners (in 2 colors), plastic beads, carbol-fuschin (Ziehl-Neelson) stain, lectin, plastic bags, slides, cover slips, sand, conical tubes, plastic cups.

All you need: colored pencils (2 colors), microscope, 10 onion bulbs, ethanol, glacial acetic acid, hydrochloric acid, razor blades, scissors, scientific cleaning wipes (kimwipes), disposable gloves.

Investigation 8: Biotechnology - Bacterial Transformation

Transformation with Green Fluorescent Protein

In this experiment, transformed cells take up a plasmid containing the GFP gene, which has been isolated from the jellyfish *Aequorea victoria*. Transformed colonies expressing the GFP protein are visibly green in normal light but will fluoresce brightly when exposed to long wave UV light.

For 10 Lab Groups

Set Up & Plating 50 min.
Incubation overnight
Transformation efficiency 15 min.

Cat. #AP08

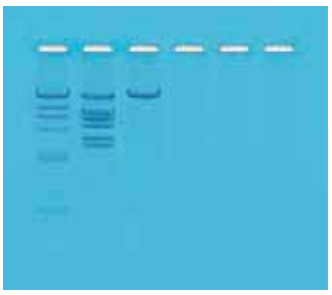
Kit includes: instructions, BactoBeads™ E. coli GFP Host, supercoiled pFluoroGreen™, ampicillin, IPTG, CaCl2, Bottle ReadyPour™ Luria Broth Agar (sterile), bottle Luria Broth Medium for Recovery (sterile), petri plates (small), petri plates (large), plastic microtipped transfer pipets, wrapped 10 ml pipet (sterile), toothpicks (sterile), inoculating loops (sterile), microcentrifuge tubes.

All you need: automatic micropipet (5-50 µl) and tips, two water baths (37°C and 42°C), thermometer, incubation oven (37°C), pipet pumps or bulbs, ice, marking pens, bunsen burner, hot plate or microwave, hot gloves, long wave UV light.

Investigation 8 Alternative:
Cat. #221 Transformation of E.coli with pGAL *See pages 56 & 101*

Investigation 9: Biotechnology - Restriction Enzyme Analysis of DNA

Restriction Enzyme Cleavage of Lambda DNA



This experiment introduces the use of restriction enzymes as a tool to digest DNA at specific nucleotide sequences. Bacteriophage lambda DNA has a linear structure and 6 *Eco RI* recognition sites. Separation by agarose gel electrophoresis of an *Eco RI* digest of lambda DNA will yield 6 bands (5 distinct bands, two are very close in size) corresponding to the DNA fragments.

For 6 Gels

Complete in 60 min.

Cat. #AP09

Kit includes: instructions, DNA samples (packaged as either Pre-aliquoted QuickStrip™ connected tubes or as Individual 1.5 ml (or 0.5 ml) microcentrifuge tubes), UltraSpec-Agarose™ powder, concentrated electrophoresis buffer, FlashBlue™ DNA stain, InstaStain® Blue cards, practice gel loading solution, 1 ml pipet, and microtipped transfer pipets.

All you need: horizontal gel electrophoresis apparatus, D.C. power supply, automatic micropipets with tips, balance, microwave, hot plate or burner, pipet pump, 250 ml flasks or beakers, hot gloves, safety goggles and disposable laboratory gloves, small plastic trays or large weigh boats (for gel destaining), DNA visualization system (white light), and distilled or deionized water

BIG IDEA 3: Genetics and Information Transfer

Our AP Biology kits are designed for 10 lab groups!

Investigation 9: Biotechnology - Restriction Enzyme Analysis of DNA (Alternative)

Cleavage of Lambda DNA with Eco RI Restriction Enzyme

The DNA from bacteriophage lambda is a well-characterized linear molecule containing six recognition sites for Eco RI (5 distinct sites; 2 are very close in size). In this experiment, Lambda DNA is digested by the Eco RI endonuclease. The digestion products are analyzed by agarose gel electrophoresis.

InstaStain® Blue FlashBlue™

- For 10 restriction digestions and 5 gels
- Complete in 90 min.
- Cat. #212

Kit includes: instructions, Lambda DNA, Dryzymes®, Reconstitution buffer, Restriction enzyme reaction buffer, enzyme grade water, Standard DNA Fragments, various solutions and buffers, agarose powder, InstaStain® Blue and FlashBlue™ stain.

All you need: electrophoresis apparatus, power supply, automatic pipet with tips, waterbath, balance, microwave or hot plate, visualization (white light), misc. lab glassware, pipet pumps or bulbs, metric rulers, floating racks, distilled or deionized water, ice.

Investigation 9: Biotechnology - Restriction Enzyme Analysis of DNA (Alternative)

DNA Fingerprinting by Restriction Enzyme Patterns

Basic concepts of Restriction Enzyme and DNA fingerprinting are featured in this lab by comparing crime scene DNA with suspect DNA. Fingerprint patterns are separated by agarose gel electrophoresis and the students determine who may have done-it!

InstaStain® Blue FlashBlue™

- For 6 Gels
- Complete in 60 min.
- Cat. #109

Kit includes: instructions, Ready-to-Load™ QuickStrip™ DNA samples, UltraSpec-Agarose™ powder, practice gel loading solution, electrophoresis buffer, InstaStain® Blue and FlashBlue™ stain, calibrated pipet, and microtipped transfer pipets.

All you need: electrophoresis apparatus, power supply, automatic micropipet and tips, balance, microwave or hot plate, visualization system.

Investigation 9 Alternative:
Cat. #225 DNA Fingerprinting Using Restriction Enzymes *See pages 28 & 51*

BIG IDEA 4: Interactions

Our AP Biology kits are designed for 10 lab groups!

Investigation 10: Energy Dynamics

The objective of this experiment is to introduce students to the basic ecological concepts of energy flow and the complex interactions between organisms. EDVOTEK® recommends using Milkweed plants and the Monarch butterfly to investigate energy dynamics as these organisms do not present a potential risk to the environment.

EDVOTEK® does not advocate the use of dangerous plant pests that can damage valuable agriculture crops.

For 10 Lab Groups

Requires 30 min. lab periods over the course of 5-7 weeks

Cat. #AP10

Kit includes: instructions.

All you need: Monarch butterfly eggs, Milkweed plants, nylon mason twine, Miracle-Gro fertilizer, vermiculite, potting mix, wooden toothpicks, growing system (resused plastic soda or water bottles (500 ml), lighting (light box system), digital cameras, balance (with 0.001 gram precision), push pin (for poking holes), laboratory notebook, plastic container, water, tape, and razor.

Investigation 11: Transpiration

The principles of diffusion and osmosis are applied to the movement of water within plants. Emphasis is given to water potential transport and the effect of the plant environment on transpiration.

For 10 Lab Groups

Requires 1-2 hours

Cat. #AP11

Kit includes: instructions, Bush Bean seeds (Phaseolus vulgaris), 2x Toluidine Blue O stain, parawax, plastic tubing, mictrotomes (nuts and bolts), petri plates, 0.1 mL pipets.

All you need: 10 mL pipets, petroleum jelly, light source with 100 Watt bulb, fans(s), plant mister (a spray bottle), potting soil, large plastic bags, ring stands & clamps (or buret holder), microscope slides, microscope(s), cover slips, slide mounting medium (i.e. 50% glycerol), 50% ethanol, new razor or scalpel blades, weighing scale or balance, small spatula.

Investigation 12: Fruit Fly Behavior

The objective of this experiment is to introduce students to the concept of distribution of organisms in a resource gradient and to learn the difference between kinesis and taxis.

For 10 Lab Groups

Requires 1.5 - 2 hours

Cat. #AP12

Kit includes: instructions, transfer pipets, cotton balls, Edvotek® Instant *Drosophila* Growth Media, *Drosophila* vials, vial plugs.

All you need: Wild-type *Drosophila*, plastic water bottles (2 per group and extra caps), any combination of household condiments, fruits, and lab chemicals, laboratory notebook, dissecting microscopes, color pens (for graphing), transparent colored film (for wrapping chamber), clear tape, goggles, funnel, timer, water.

Investigation 13: Enzyme Activity

This easy and safe experiment allows your students to learn about enzyme catalysis, the nature of enzyme action and protein structure-function relationships. Students will perform an enzyme assay and determine the rate of the enzymatic reaction. This experiment uses a safer system that eliminates the need for sulfuric acid and potassium permanganate.

For 10 Lab Groups

Requires 30-45 min.

Cat. #AP13

Kit includes: instructions, hydrogen peroxide solution, guaiacol solution, phosphate buffer pH 3, phosphate buffer pH 7, phosphate buffer pH 10, phosphate buffer pH 14.

All you need: turnip root, distilled or dionized water, pipet pumps or bulbs, Erlenmeyer flask, 500 ml, spectrophotometer, water baths, filter paper and funnel, test tube racks, test tubes (13 x 150 mm), thermometer, cheesecloth, parafilm, hot plate, timer or clock with second hand, lab permanent markers, ice, razor, goggles, and blender.

EDVOTEK's Classic AP Biology Labs are based on the curriculum prior to The College Board's major 2012 revision.

Kit Contents, Requirements and Replenishers can be found on our website:

www.edvotek.com

LAB 1: Principles & Practice of Diffusion and Osmosis
Materials and dialysis tubing are provided to perform procedures involving diffusion, dialysis, water potential and to determine osmotic potential.
Cat. #281

LAB 2: Principles of Enzyme Catalysis
Learn about enzyme catalysis by performing an enzyme assay to determine the rate of enzymatic reaction.
Cat. #282

Lab 2 Alternative - Cat. #246 Enzyme Microarrays, see page 91

LAB 3: Analysis of Cell Mitosis and DNA Extraction
Identify the various stages and duration of mitosis using onion root tips. Purified DNA is spooled for visualization.
Cat. #283

LAB 4: Plant Pigment Chromatography and Photosynthesis
Chromatographic separation is performed by thin layer chromatography. Key reagents are included to demonstrate photosynthesis.
Cat. #284

LAB 5: Cell Respiration Kit
O_2 consumption is determined by measuring changes in H_2O levels in the respirometer using germinating or non-germinating seeds.
Cat. #285

LAB 6: Restriction Enzyme Analysis of DNA
Separation by agarose gel electrophoresis of an *Eco* RI digest of lambda DNA will yield 6 bands (5 distinct bands, two are very close in size) corresponding to the DNA fragments.
Cat. #112

Lab 6 Alternative - Cat. #212 Cleavage of Lambda DNA with Eco RI Restriction Enzyme, See page 27

LAB 6: Transformation of *E. coli* with pGAL™ (Blue colony)
Students transform *E. coli* cells, giving the cells antibiotic resistance. Transformants exhibit a blue color due to the incorporation and expression of ß-galactosidase.
Cat. #221

Lab 6 Alternative - Cat. #223 Transformation of E. coli with Green Fluorescent Protein, See page 56

LAB 7: *Drosophila* Genetics
Drosophila provide a lesson in manipulation of genetic crosses. Students collect data from several generations and compare several crosses.
Cat. #287

Lab 7 Alternative - Cat. #337 Drosophila Genotyping Using PCR, see page 38

LAB 8: Population Genetics & Evolution
The application of the Hardy-Weinberg law of genetic equilibrium demonstrates that mutations, genetic drift and natural selection have a dramatic effect on gene frequency in a population.
Cat. #288

LAB 8 *(Extension)*: Alu Human DNA Typing Using PCR
Your students use primers for a 300 base pair Alu insertion in chromosome 16 (PV92) to determine their own genotype! They can then compare their class results over the internet with others around the world.
Cat. #333

LAB 9: Principles of Transpiration
The principles of diffusion and osmosis are applied to the movement of water within plants. Emphasis is given to water potential transport and the effect of the plant environment on transpiration.
Cat. #289

LAB 10: Physiology of the Circulatory System
Pulse rate and blood pressure under different physiological conditions are measured and correlated to physical fitness. The Q10 of *Daphnia magna* is determined from the relationship between temperature and heart rate.
Cat. #290

LAB 11: Animal Behavior
In this experiment, students are introduced to the concept of distribution of organisms in a resource gradient and learn the difference between kinesis and taxis. Pillbugs and *Drosophila* must be requested 3 weeks prior to use.
Cat. #291

LAB 12: Dissolved Oxygen & Aquatic Primary Productivity
The experiment measures dissolved oxygen concentration in water samples using the Winkler technique and primary productivity of an ecosystem.
Cat. #292

SECTION FIFTEEN

15 Biotechnology Laboratory Equipment

Technology Drives Biology

These days, advances in our understanding of biology are driven as much by advances in technology as in our ability to come up with new theories. The human genome project could not have happened until super fast DNA sequencing machines were developed nor could the data be interpreted until super fast computers were built. With advances in technology comes an ability to ask new questions.

Bring your students into this exciting world. Using the latest in molecular biology equipment, your classroom will be transformed into a state-of-the-art research lab!

See page 110

For information about our EdvoCycler™ and MegaCycler™

What Are LabStations™?

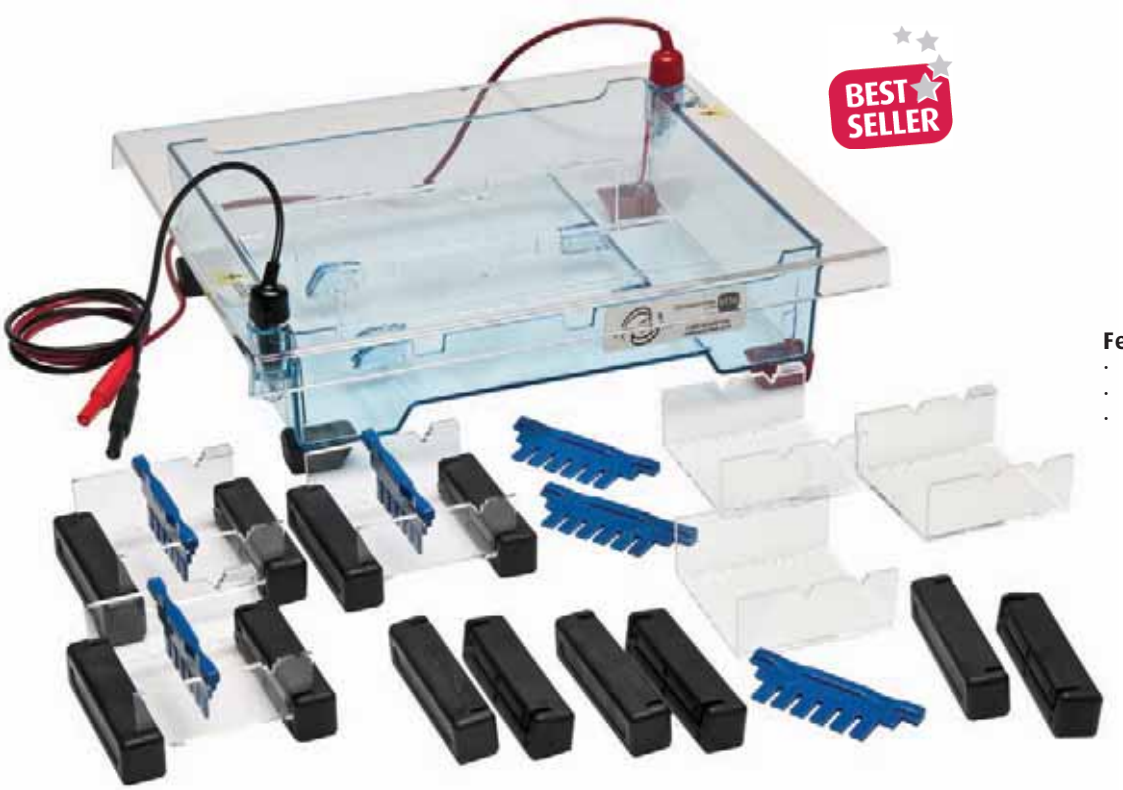
LabStations™ are pre-selected packages that offer maximum value!

EDVOTEK® offers a variety of LabStations™ for all classroom sizes and budgets.

We also offer CUSTOM LabStations™ to suit your individual needs.

See pages 119-122 for more information or contact a BioEducation specialist at 1.800.EDVOTEK.

DNA Electrophoresis



Features:
- Six 7 x 7 cm Trays
- Six 6-tooth combs
- Twelve rubber end caps

M36 HexaGel™ Electrophoresis Apparatus

DNA electrophoresis for your whole class with just a single gel tank! Six groups of students can load their own individual gels and the six gels are run together in 30-40 minutes giving excellent results! Eliminate cumbersome gel tray taping and pour gels quickly and easily with our innovative gel tray sealing rubber end caps. The M36 is backed by a lifetime warranty and free technical support.

For 6 Lab Groups

Cat. #515

MADE IN THE USA

Lifetime Warranty & Tech support!

M6Plus Electrophoresis Apparatus

BEST SELLER

Runs one group of student samples (or a classroom demonstration) in 30-40 minutes. Durable and easy to use! Excellent results every time!

M6Plus Features:
- One 7 x 10 cm Tray
- One 6 tooth comb
- One 8/10 tooth comb
- Two rubber end caps

Now Includes 7 x 10 cm tray!

For 1 Lab Group

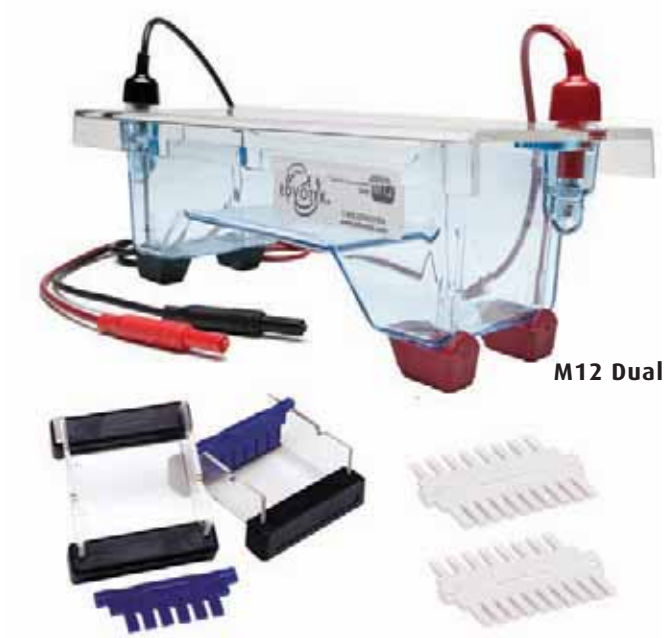
Cat. #500

Lifetime Warranty & Tech support!

MADE IN THE USA

BEST SELLER

M12



M12 Dual

M12 or M12 Dual Electrophoresis Apparatus

Run up to two groups of student samples at the same time. Choose either two 7 x 7 cm gel trays or one 7 x 14 cm gel tray. Gives excellent results in 30-40 minutes.

M12 Features:
- One 7 x 14 cm Tray
- Two 6 tooth combs
- One 8/10 tooth comb
- Two rubber end caps

For 2 Lab Groups

Cat. #502

M12 Dual Features:
- Two 7 x 7 cm Trays
- Two 6 tooth combs
- Two 8/10 tooth combs
- Four rubber end caps

For 2 Lab Groups

Cat. #504

Electrophoresis Accessories

E-Z Align™ Tray
7x7 cm tray with end caps
Cat. # 684

E-Z Align™ Tray
7x10 cm tray with end caps
Cat. # 686

E-Z Align™ Tray
7x14 cm tray with end caps
Cat. # 685

6 Tooth Comb
Cat. # 680

Double Comb 8/10
Cat. # 683

Gemini Split Tray™
Two 7x7 cm trays with end caps and two 6 tooth combs
Cat. # 535

Rubber End Caps
Cat. # 687

MV10 Vertical Protein Electrophoresis Apparatus

Designed for separation of proteins on polyacrylamide gels. The MV10 runs one vertical polyacrylamide gel. All parts are color coded to ensure proper orientation.

Precast Polyacrylamide Gels

Cat. # 651
Three 12% precast gels
Requires refrigeration

Cat. # 652
Six 12% precast gels
Requires refrigeration

MADE IN THE USA

MV10 Features:
- Holds one gel cassette
- All platinum electrodes
- Safety interlock cover
- Safety electrical leads

For 1 Group

Cat. #581

Power Supplies

DuoSource™ 75

75 V Power Supply

The DuoSource™ 75 power supply runs gels quickly in only 40-50 minutes! Can operate two M6Plus units, two M12 units or two HexaGels (at 75 V).

75 V for 1 or 2 units

Cat. #507

DuoSource™ 150

BEST SELLER

75/150 V Power Supply

The DuoSource™ 150 is a great value and runs gels quickly in only 20-30 minutes (at 150 V)! Can operate two M6Plus units, two M12 units or two HexaGels.

75 /150 V for 1 or 2 units

Cat. #509

TetraSource™ 300

NEW

30-300 V Power Supply

Power any combination of EDVOTEK electrophoresis units with this mighty 650 mA power supply! Features an easy-to-use, fully programmable interface for setting voltage, current or timer control with each parameter displayed in real-time. Programs may be paused or resumed at any point. Run experiments in the least time possible with this powerful and versatile unit!

30-300 V for 1 to 4 units

Cat. #5010

MADE IN THE USA

Our power supplies are made in the USA!

Pipets & Liquid Handling

Edvotek® Variable Micropipets

Our sturdy Variable Micropipets are designed with volumes ranging from 0.1 to 5000 µl. They are easy to use, highly accurate and use standard micropipet tips. The volume is easily selected by twisting the top. The lightweight design and tip ejector makes operation fast & easy. A tool and instructions are included for self-calibration.

Cat. # 589-2	0.1 - 2.5 µl Micropipet
Cat. # 589	0.5 - 10 µl Micropipet
Cat. # 589-1	2 - 20 µl Micropipet
Cat. # 590	5 - 50 µl Micropipet
Cat. # 591	10 - 100 µl Micropipet
Cat. # 591-1	20 - 200 µl Micropipet
Cat. # 592-1	100 - 1000 µl Micropipet
Cat. # 593-1	1000 - 5000 µl Micropipet

BEST SELLER

Lifetime Warranty

Pipet Stand

For 6 Micropipets
Cat. # 796

Micropipet Tips

Ultra Micropipet Tips
0.5-10 µl, 2 racks of 96 each
Cat. # 635

0.5-10 µl, Bag of 1000 tips
Cat. # 635-B

Micropipet Tips
200-1000 µl, 2 racks of 100 ea.
Cat. # 637

200-1000 µl, Bag of 1000 tips
Cat. # 637-B

Yellow Micropipet Tips
1-200 µl, 2 racks of 96 ea.
Cat. # 636

1-200 µl, **Bag of 1000 tips**
Cat. # 636-B

Fine Tip Micropipet Tips
1-200 µl, 1 rack of 204
Cat. # 638

Jumbo Micropipet Tips
1000-5000 µl, Bag of 100 tips
Cat. # 637-2

Pipets & Liquid Handling

Fixed Volume MiniPipets™

Robust, accurate, easy to use, color coded, fun & cost effective micropipets which use standard micropipet tips. No need to calibrate and impossible to measure the wrong volume!

Cat. # 585	5 µl	MiniPipet
Cat. # 586	10 µl	MiniPipet
Cat. # 586-1	20 µl	MiniPipet
Cat. # 587	25 µl	MiniPipet
Cat. # 587-1	30 µl	MiniPipet
Cat. # 587-2	35 µl	MiniPipet
Cat. # 588	40 µl	MiniPipet
Cat. # 588-1	50 µl	MiniPipet
Cat. # 588-2	75 µl	MiniPipet
Cat. # 588-3	100 µl	MiniPipet
Cat. # 588-4	200 µl	MiniPipet

BEST SELLER

Uses Standard 1-200 µl tips.

EdvoPette™ Pipet Controller

The all-new EdvoPette™ Pipet Controller is a lightweight cordless pipetting controller ideally suited as an aliquoting tool for instructors and teaching assistants. It utilizes all standard serological pipets. The speed can be fine-tuned by applying varying finger pressure to the operating buttons.

Cat. # 594

Transfer Pipets

Micro Transfer Pipets, Disposable
Cat. # 632 400/pkg

Graduated 1 ml Transfer Pipets
Cat. # 647 200/pkg

Pumps & Pipets

Green Pipetting Pump (For pipets 5-10 ml)
Cat. # 640

Blue Pipetting Pump (For pipets up to 2 ml)
Cat. # 641

1 ml Pipets, Disposable
Cat. # 644 200/pkg

5 ml Pipets, Disposable
Cat. # 645 50/pkg

10 ml Pipets, Disposable
Cat. # 646 50/pkg

PCR Equipment

EdvoCycler™

Finally, a PCR machine at an affordable price!

EdvoCycler™ has a 25 place block!

MegaCycler™

Classroom PCR Amplified!

MegaCycler™ has a 49 place block!

The EdvoCycler™ and the MegaCycler™ are stand alone classroom PCR machines that are easy to use! The EdvoCycler™ features a 0.2 ml tube block for up to 25 student samples and the MegaCycler™ has nearly twice that capacity with its 49-place block! Both come pre-programmed with all Edvotek PCR protocols. These programs may be modified or deleted, plus there's extra memory slots for more! The vivid 7-line LCD displays all program parameters on a single screen. A heated lid makes operation a snap. No oil is required. Proudly made in the USA and backed by a 2 year warranty!

Features:

- EdvoCycler™ holds 25 x 0.2 ml PCR tubes
- MegaCycler™ holds 49 x 0.2 ml PCR tubes
- Heated lid with magnetic latch
- No oil required
- Pre-programmed Edvotek PCR protocols
- Vivid 7-line LCD display with live program information
- Standalone machine - no PC required!
- Temperature Range: 4 to 99° C
- Maximum Ramp Rate: 3° C/sec.
- Dimensions: 16 x 8.5 x 7"

NIH

Research supported in part by NIH SBIR NCRR Grant #R44RR18670

EdvoCycler™
Holds 25 x 0.2 ml sample tubes.
Cat. #541

MegaCycler™
Holds 49 x 0.2 ml sample tubes.
Cat. #542

PCR reagents (tubes and PCR EdvoBeads™) are available on page 124.

Spectrophotometers

UNICO® S1000 Educational Spectrophotometer

The UNICO Model S1000 Educational Spectrophotometer is an economical visible light unit designed for educational laboratories. Featuring a wavelength range of 400-1000 nm, 20 nm bandpass, analog interface, digital display, transmittance and absorbance modes and a sample compartment that accepts round tube or square cuvettes (with included cuvette adapter). The S1000 also features built-in second order filters that can be manually changed to help students better understand spectroscopy. Includes a box of 12 round optical glass cuvettes, a square cuvette adapter, user's manual with experiments and dust cover. Now includes a USB port for data transfer to PC's.

Cat. #566

UNICO® S1200 Visible Spectrophotometer

The UNICO® Model S1200 Visible Spectrophotometer is the best value in a precise, accurate 5 nm design. Featuring a large, easy to read digital display, visible wavelength range of 335-1000 nm, 5 nm bandpass, an USB & RS-232C interface, Four modes: T = transmittance, A = absorbance, C =concentration & F = factor, auto-zero function and a sample compartment that accepts round tube or square cuvettes. The S1200 also features built-in automatic second order filters for quick and easy operation, and bulb changes require no tools or alignment. Includes a box of 12 round optical glass cuvettes, a set of two optical square glass cuvettes, user's manual and dust cover.

Cat. #567

UNICO® S2100UV+ UV/Vis Spectrophotometer

The redesigned UNICO® S2100UV+ UV/Vis Spectrophotometer offers an exceptional value with a wavelength range from 200-1000 nm, 4 nm bandpass, Ultraviolet (UV) light and the full visible wavelength range all in one machine. Featuring a large, 4-line LCD display which can be read from any angle, an USB & RS-232C interface and four modes: T = transmittance, A=absorbance, C = concentration & F = factor, auto-zero function and a sample compartment that accepts round tube or square cuvettes. The compartment can accept cuvettes up to 100 mm in path length. Optional software expands the capabilities to Abs, %T, DNA/Protein ratio and wavelength scanning. Includes a set of four 10 mm square optical glass cuvettes, a set of two 10 mm UV transparent quartz cuvettes, user's manual and dust cover.

Cat. #568

Gel Visualization

White Light Box

The White Light Box features a spacious 21.5 x 29 cm viewing area and is designed to visualize DNA stained with FlashBlue™ or proteins stained with Coomassie Blue. The White Light Box may also be used to view autoradiograms.

Cat. #552

Long Wave UV Mini-Light

A hand-held UV light that is used to detect hydrolysis of the fluorescent substrate and fluorescent *Artemia* and *Daphnia* after their ingestion. Also useful for observing fluorescence in Green (GFP) and Blue (BFP) fluorescent proteins.

Cat. #969

Midrange UV Transilluminator

The all-new Midrange UV Transilluminator is compact and designed to visualize DNA stained with Ethidium Bromide, Sybr® Safe, and other fluorescent stains. The UV filter size is 7 x 14 cm and is optimal for visualizing all of our gel sizes. Safety features include a UV-blocking cover and a power cut-off switch when the cover is opened.

Cat. #558 7 x 14 cm UV Filter

MADE IN THE USA

Short Wave UV	100 nm – 279 nm	Degradation of DNA
Mid Wave UV	280 nm – 314 nm	Visualization of DNA
Long Wave UV	315 nm – 400 nm	Visualization of GFP/BFP and Forensics

Gel Photodocumentation

NEW

EdvoFoto™ Digital GelCam

EDVOTEK has integrated an easy-to-use digital camera and specially designed hood to provide a low cost alternative for gel photos. Will accommodate gels up to 9.5 x 11 cm. Photos may be downloaded to a computer.

Cat. #551

NEW

UV Digital Photodocumentation System

Save money by purchasing both our Midrange UV transilluminator and our Photodocumentation System together! Comes with both Cat. #558 and #551.

Cat. #555

Visit Us Online!

www.edvotek.com

Download Edvotek kits with Protocols!	**Browse** our online catalog!	**Order Products** online!	**Receive** Technical Support!

Waterbaths

Edvotek® 1.8 L Digital Waterbath

BEST SELLER

This classic Edvotek® waterbath has been improved to now include digital temperature control! We've also added a low-water sensor to prevent burn-outs and deepened the chamber to hold more bottles and flasks. The stainless steel chamber is corrosion resistant and temperature controlled from ambient to 95°C with cover (now included).

Cat. #539 1.8 L Waterbath
5.5 x 6 x 4" chamber
Includes one cover

Edvotek® 10 L Digital Waterbath

The all-new Edvotek® 10 L waterbath incorporates digital temperature control and an optional shaking capability! We've also added a low-water sensor to prevent burn-outs and the deep chamber holds virtually any bottle or flask. The stainless steel chamber is corrosion resistant and temperature controlled from ambient to 95°C with cover (now included).

Cat. #538 10 L Waterbath
8.5 x 15 x 6" chamber
Includes one cover

Edvotek® PCR Bath™

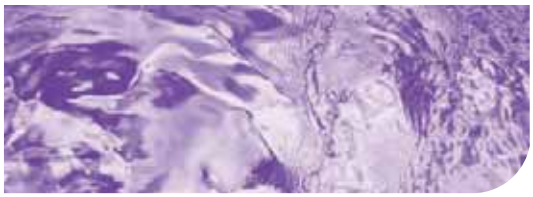
Our unique three-chambered PCR waterbath is ideal for both PCR experiments and for general lab use. Three individual chambers (3 x 1.8 L) are built into one casing, allowing multiple temperature settings. Temperature control is from ambient to 99°C with covers. Includes three chamber covers and a test tube rack to easily transport samples between baths. All waterbaths feature stainless steel chambers that are corrosion resistant and temperature controlled with an accuracy of ±0.5°C. Chamber dimensions: 5.5 x 6 x 3.5"

Cat. #544 PCR Bath™
Three 1.8 L chambers
Includes three covers

MADE IN THE USA

All our waterbaths and shaking waterbaths are made in the USA!

Waterbaths



Edvotek® 10 L Digital Shaking Waterbath

Our 10 L Shaking Waterbath is designed for the most precise sample incubation when aeration and agitation are required. Features a 12 x 9 x 6″ stainless steel chamber. Offers exceptional temperature control from ambient to 99°C with an accuracy of ±0.5°C (with cover).

Cat. #5027 Digital 10 L Shaking Waterbath
Cat. #5027-C 10 L Shaking Waterbath cover

Edvotek® 20 L Digital Shaking Waterbath

Our 20 L Shaking Waterbath is designed for the most precise sample incubation when aeration and agitation are required. Features a 19.5 x 11.5 x 6″ stainless steel chamber. Offers exceptional temperature control from ambient to 99°C with an accuracy of ±0.5°C (with cover).

Cat. #5028 Digital 20 L Shaking Waterbath
Cat. #5028-C 20 L Shaking Waterbath cover

Waterbath Floats

Set of 2, 4.5″L x 3″W

Cat. # 689

Shakers & Centrifuges

Piccolo® Microcentrifuge

EDVOTEK®'s newly updated Piccolo® Microcentrifuge is easy-to-use, economical and handles most teaching lab applications including sample spin-downs and cell pelleting. Speed is variable from 0 to 6,400 rpm (2046 x g maximum). Includes a 6-place rotor for 1.5/2.0 ml tubes, and a second rotor for two 8 x 0.2 ml strip tubes.

Cat. #534

Mezzo™ Microcentrifuge NEW

Compact and easy to use, yet powerful enough to enable each workstation to be equipped with a centrifuge for a wide range of molecular biology separations and quick spins. Speed is variable from 0 to 12,500 rpm. The Mezzo™ Microcentrifuge includes a 12-place rotor for 1.5 ml to 2.0 ml tubes (adapters available for smaller tubes). A digital timer allows programs running from 15 seconds to 30 minutes. The unit is 8.0 x 6.7 x 4.5".

Cat. #533

Eppendorf® Microcentrifuge 5418

The ultra-compact 18-place Microcentrifuge 5418 fits on even the smallest lab bench. About the size of a standard sheet of paper, it offers a broad range of features that make your lab work easier. It provides up to 16,873 x g (14,000 rpm) and is extremely quiet, even when running without the rotor lid.

Cat. #530

Shakers & Centrifuges

Mini EdvoRokr™

The Mini EdvoRokr™ features a tilt angle and optimizeds speed for gel blotting, washing and staining. With the tri-directional motion, the rocker provide thorough and gentle mixing ability. The 10.5" X 7.5" autoclavable plat mat can accept stakable platforms and are safe to use in cold rooms and incubators (4°C to 65°C) . The unit is 4.4 lb.

- Optimized speed & tilt for gel blotting, washing & staining
- Tri-Directional motion for thorough, gentle mixing
- Accepts stacking platforms
- Incubator & Cold Room Safe

Cat. #5019

Tornado Vortexer™

The Tornado Vortexer™ is a general purpose mixer for applications that demand vigorous and uniform vortexing. Variable analog speed control of 100 to 3200 rpm (±25 rpm) with low rpm start-up allows gradual, gentle shaking of samples. The unit may alternatively be operated in "touch" (AUTO) mode. Rubber feet and a heavy base ensure that the unit won't "walk-away" during use. A cup head and a 3" dimpled platform are included with each unit.

Cat. #5023

Balances, Timer, Incubator

Electronic Balance NEW

This Electronic Balance was developed especially for ambitious first-time users in the laboratory and academic sector. This balance has a readability of 0.1 g and a capacity of 600 g.

Features:
- Capacity - 600g
- Readability - 0.1g
- Backlit LCD display
- 0-40°C operating temperature
- Stackable storage
- Automatic external calibration
- AC adapter supplied, 6 AA batteries optional

Cat. #562

Incubation Oven NEW

This economical bacterial incubator features a digital temperature control with a range from Ambient +1° C to 60° C. Ideal for growing bacteria on agar plates at 37° C or for Southern and Western Blot analysis at 60° C. Includes two adjustable/removable shelves for increased capacity. Accepts bottles and flasks up to 2 L.
Internal dimensions are: 10.3 x 9.3 x 12.8".
External dimensions are: 13.2 x 14.5 x 18.7".

Cat. #546

4 Channel Timer

Cat. # 763

LabStations™

Classroom DNA Electrophoresis LabStation™

BEST SELLER

Includes:

1	Cat. #515	M36 HexaGel™ Electrophoresis Apparatus (Six 7 x 7 cm Trays)
1	Cat. #509	DuoSource™ 150 (75/150 V for 1 or 2 units)
2	Cat. #588	Fixed Volume MiniPipet (40 µl)
1	Cat. #636	Yellow Micropipet Tips (1 - 200 µl / 2 Racks of 96)
1	Cat. #130	DNA Fingerprinting Classroom Kit

Supports up to 24 Students

Cat. # 5062

Demonstration DNA Electrophoresis LabStation™

Includes:

1	Cat. #500	M6Plus Electrophoresis Apparatus (7 x 10 cm Tray)
1	Cat. #509	DuoSource™ 150 (75/150 V for 1 or 2 units)
1	Cat. #588	Fixed Volume MiniPipet (40 µl)
1	Cat. #636	Yellow Micropipet Tips (1 - 200 µl /2 Racks of 96)
1	Cat. #S-51	Whose DNA Was Left Behind?

Supports up to 4 Students

Cat. # 5061

Contact an EDVOTEK® BioEducation Specialist at

1.800.EDVOTEK

to customize a LabStation for your classroom!

Dual DNA Electrophoresis LabStation™

Includes:

2	Cat. #502	M12 Electrophoresis Apparatus (7 x 14 cm Tray)
1	Cat. #509	DuoSource™ 150 (75/150 V for 1 or 2 units)
2	Cat. #590	Variable MicroPipet (5 - 50 µl)

Supports up to 16 Students

Cat. # 5063

Dual Protein Electrophoresis LabStation™

Includes:

2	Cat. #581	MV10 Protein Electrophoresis Apparatus
1	Cat. #509	DuoSource™ 150 (75/150 V for 1 or 2 units)
4	Cat. #590	Variable MicroPipets (5 - 50 µl)

Supports up to 16 Students

Cat. # 5064

EDVOTEK® offers an extensive selection of Experiment kits for use with LabStations™. Experiments include all critical reagents and detailed instructions to ensure success in the classroom laboratory.

Classroom Protein Electrophoresis LabStation™

Includes:

4	Cat. #581	MV10 Protein Electrophoresis Apparatus
1	Cat. #5010	TetraSource™ 300 Power Supply (30-300 V for 1 to 4 units)
8	Cat. #590	Variable MicroPipet (5 - 50 µl)
1	Cat. # 552	White Light Box (21.5 x 29 cm viewing surface)

Supports up to 32 Students

Cat. # 5065

Classroom PCR LabStation™

Includes:

6	Cat. #502	M12 Electrophoresis Apparatus (7 x 14 cm Tray)
3	Cat. #509	DuoSource™ 150 (75/150 V, for 1 or 2 units)
6	Cat. #590	Variable MicroPipet (5 - 50 µl)
2	Cat. #534	Piccolo® Microcentrifuge
1	Cat. #541	EdvoCycler™ (25 x 0.2 ml)
1	Cat. #558	Midrange UV Transilluminator (7.5 x 7.5 cm filter)
1	Cat. #539	Edvotek® 1.8 L Waterbath

Supports up to 25 Students

Cat. # 5067

Comprehensive Biotechnology LabStation™

Supports up to 48 students

Cat. # 5068

NEW & improved!

6	Cat. #502	M12 Electrophoresis Apparatus (7 x 14 cm Tray)
3	Cat. #581	MV10 Protein Electrophoresis Apparatus
3	Cat. #5010	TetraSource™ 300 Power Supply (30-300 V for 1 to 4 units)
1	Cat. #542	MegaCycler™ (49 x 0.2 ml)
1	Cat. #5023	Tornado Vortexer™
3	Cat. #534	Piccolo® Microcentrifuge
1	Cat. #546	Incubation Oven
1	Cat. #538	EDVOTEK® 10 L Digital Waterbath
1	Cat. #551	EdvoFoto™ Digital GelCam
1	Cat. #552	White Light Box
1	Cat. #558	Midrange UV Transilluminator
10	Cat. #969	Long Wave UV Mini-Light
6	Cat. #589	Variable Micropipet (0.5 - 10 µl)
6	Cat. #591	Variable Micropipet (10 - 100 µl)
6	Cat. #592-1	Variable Micropipet (100 - 1000 µl)
5	Cat. #635	Ultra Micropipet Tips (0.1 - 10 µl/2 Racks of 96)
10	Cat. #636	Yellow Micropipet Tips (1 - 200 µl/2 Racks of 96)
5	Cat. #637	Micropipet Tips (200 - 1000 µl/2 Racks of 100)
5	Cat. #638	Fine Tip Micropipet Tips (1 - 200 µl/1 Rack of 204)

SECTION SIXTEEN

16 Reagents, Biologicals & Supplies

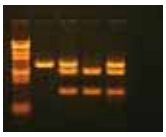
Reagents for DNA Electrophoresis

InstaStain® Ethidium Bromide

Rapid, sensitive and contains only a few micrograms of ethidium bromide. In 2 minutes, an agarose gel is ready for visualization. Disposal is minimal compared to the volume of liquid waste generated from the standard ethidium bromide staining procedure.

For 40 gels, 7 x 7 cm
Cat. # 2001

For 100 gels, 7 x 7 cm
Cat. # 2002



InstaStain® Blue

InstaStain® Blue sheets stain gels in minutes and give high quality and uniform gel staining with excellent results for photography. They are environmentally friendly, avoiding large amounts of liquid stain and waste disposal.

For 40 gels, 7 x 7 cm
Cat. # 2003

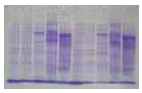
For 100 gels, 7 x 7 cm
Cat. # 2004

Protein InstaStain®

Protein InstaStain® sheets stain gels faster than conventional methods. Protein InstaStain® gives high quality and uniform gel staining with excellent results for photography. They are also environmentally friendly because they use a solid matrix, avoiding large amounts of liquid stain and waste disposal.

For 15 gels, 10 x 10 cm
Cat. # 2016

For 30 gels, 10 x 10 cm
Cat. # 2017



SYBR® Safe Stain

- SAFE for the Biotechnology Classroom!
- More sensitive than ethidium bromide
- Non-mutagenic

Save time, money, the environment...and get better gel results!

Concentrate-
for 750 ml
Cat. # 608

SYBR® Safe is a registered trademark of Life Technologies Corporation.

Melt and Pour UltraSpec-Agarose™

0.8% UltraSpec-Agarose™ prepared with TAE buffer.
Cat. # 601 400 ml
Cat. # 601-B 5 x 400 ml

UltraSpec-Agarose™

NEW

DNA Electrophoresis Grade
Cat. # 605-3g
Cat. # 605-20g
Cat. # 605-100g
Cat. # 605-500g

Electrophoresis Reagent Package with FlashBlue™ Stain

Package Contains:
- UltraSpec-Agarose™ (10 grams)
- 100 ml Electrophoresis Buffer (50x)
- 1ml Gel Loading (10x) Solution with tracking dye
- FlashBlue™ stain (for 1.2 L)

Cat. # 604

Electrophoresis Reagent Package with InstaStain® Blue

Package Contains:
- UltraSpec-Agarose™ (10 grams)
- 100 ml Electrophoresis Buffer (50x concentrated)
- 1ml Gel Loading Solution (10x) with tracking dye
- InstaStain® Blue (Cat. #2003)

Cat. # 624

10X Gel Loading Solution

Yields 6 ml final volume of DNA sample. Recommended usage: Add 1 volume solution to 9 volumes of sample and mix well.
Cat. # 606

Electrophoresis Buffer 50x TAE

This 50-fold concentrated solution (Tris-acetate, EDTA, pH 7.8) is sufficient for making 5 liters of diluted working buffer.
Cat. # 607 100 ml
Cat. # 607-XL 500 ml

Electrophoresis Buffer 10x TBE

To prepare, dissolve in distilled or deionized water.
Cat. # 607-1

FlashBlue™ DNA Staining System

FlashBlue™ is a proprietary visible light DNA stain that has been optimized to shorten the time required for both staining and destaining steps.

10X Concetrate, For 3 L
Cat. # 609

Restriction Enzyme Reaction Buffer

Concentrated reaction buffer (2 ml) for restriction enzymes. Sufficient for 200 reactions.
Store at room temperature.
Cat. # 610

DNA Gel Markers

The sizes of the DNA fragments, in the base pairs, are 23130, 9416, 6557, 4361, 3000, 2322, 2027, 725, and 570. The 3000 and 725 base pair fragments have been added to facilitate staining.

For 20 gels, 20 µg
Cat. # 750

Ready-to-Load Digested DNAs

Due to their stable nature, most EDVOTEK® reagents are shipped ambient. Upon receipt, however, the materials should be stored according to the accompanying instructions.

READY TO LOAD

Lambda DNA digested with Eco RI
Cat. # 709 20 µg for 20 gels

Lambda DNA digested with Eco RI & Hind III
Cat. # 710 20 µg for 20 gels

Lambda DNA digested with Hind III
Cat. # 711 20 µg for 20 gels

Plasmid pUC8 DNA digested with Eco RI
Cat. # 712 20 µg for 20 gels

Restriction Enzymes

The three most frequently used restriction enzymes are Eco RI, Bam HI, and Hind III. Each enzyme catalyzes cleavage at or near the defined base sequence. Because of this property, they are important reagents for biotechnology. They are utilized in cloning procedures. EDVOTEK® restriction endonucleases are purified by procedures developed in our laboratories. Each lot produced must meet quality control specifications.

Dryzyme® - *Eco RI*
The enzyme is isolated from E. coli RY13 carrying RI (fi+ plasmid) genes for restriction and modification as well as genes for resistance to the drugs sulfathiazole and streptomycin. The recognition specificity of Eco RI is sensitive to ionic environment. Product is lyophilized and contains 1500 units.
Cat. # 715

Dryzyme® - *Hind III*
The first type restriction endonuclease activity was isolated from Haemophilus influenzae Rd cells by H. O. Smith and associates. Subsequently the presence of two enzymes (Hind II and Hind III) in this cell strain was established. Product is lyophilized and contains 1500 units.
Cat. # 716

Dryzyme® - *Bam HI*
The restriction endonuclease Bam HI is isolated from Bacillus amyloliquefaciens H cells. Under certain conditions, the enzyme will recognize variations of the palindrome sequence to include GGNNCC. Product is lyophilized and contains 1500 units.
Cat. # 717

DNA
DNAs require freezer storage

Bacteriophage Lambda DNA
Cat. # 701 50 micrograms

Plasmid pBR322
Cat. # 702 10 micrograms

Plasmid pUC8
Cat. # 703 10 micrograms

Plasmid pUC18
Cat. # 704 10 micrograms

Restriction Enzyme Reaction Buffer
Concentrated reaction buffer (2 ml) for restriction enzymes. Sufficient for 200 reactions. Store at room temperature.
Cat. # 610

"Universal" DNA Extraction Buffer
For 50 extractions. This solution is recommended for the extraction of DNA from various fruit and vegetable tissues. The composition is safe for classroom use and is ideal for use in developing independent inquiry-based experiments.
Cat. #627

Nylon Membranes for Southern Blots
Set of 5 blots. 7 x 14 cm. Use nylon membranes to perform Southern blots on any of your favorite DNA electrophoresis experiments.
Cat. # 665

Catalase Powder
200,000 units.
Cat. # 628

Dryzymes® No Ice Shipment

SAVE MONEY! No overnight ice shipment. Shipped at room temperature.

Polymerase Chain Reaction

PCR EdvoBeads™
Each PCR EdvoBead™ contains:
- Taq DNA Polymerase
- Taq DNA Polymerase Buffer
- dNTP Mixture
- $MgCl_2$

Cat. # 625 30 Beads

Thin-walled PCR Microtest Tubes
(0.2 ml for PCR) 100/pkg
Cat. # 642.2

(0.5 ml for PCR) 100/pkg
Cat. # 642.5

Chelating Agent
Chelating agent used for extraction of DNA in PCR. Includes 0.2 grams of chelating resin and buffer for resuspension.
Cat. # 629

Proteinase K
Proteinase K is required to prepare the lysis solution for isolation of DNA from hair.
Cat. # 626

Bacterial Transformation Reagents

Luria Broth Media
Cat. # 611 100 g

Bacterial Plating Agar
Cat. # 612 30 g

IPTG
Cat. # 613 100 mg

X-Gal
Cat. # 614 250 mg

ReadyPour™ Luria Broth
Agar Base (170 ml)
Cat. # 615

Agar Base with Ampicillin (170 ml)
Cat. # 616

Transformation Reagents
For 10 Lab Groups
Amp, X-Gal, pGal™
(does not include media and plasticware)
Cat. # 617

Unit Definition:
One EDVOTEK® restriction enzyme unit is defined as the amount of enzyme required to digest 1.0 µg of lambda phage DNA in 60 min. at 37°C in a total reaction mixture of 50 µl.

Reaction Buffer for Restriction Enzymes:
All enzyme shipments contain the appropriate reaction buffer for optimal reactions. A general reaction buffer can be purchases separately (Cat. # 610).

BactoBeads™

Place one BactoBead™ on the agar plate, watch it dissolve, and streak for isolated colonies.

E. coli **JM109 BactoBeads™**
Cat. # 726 5 beads

E. coli **Fluorescent Protein Host BactoBeads™**
Cat. #728 5 beads

E. coli **OP50 BactoBeads™** *(for C.elegans)*
Cat. #729 5 beads

Citrobacter freundii **Chromogenic Host BactoBeads™**
Cat. #740 5 beads

Serratia marcescens **BactoBeads™**
Cat. #741 5 beads

Micrococcus luteus **BactoBeads™**
Cat. #742 5 beads

Bacillus subtilis **BactoBeads™**
Cat. #743 5 beads

Lyophilized Bacterial Cultures and Cells

These freeze-dried cultures contain lyophilized viable strains of common classroom microbes. These non-pathogenic strains are simple to reestablish by the addition of nutrient broth and incubation at the appropriate growth temperature. Shipped ambient and should be stored in the refrigerator at 4°C.

LyphoCells™ for DNA Extraction
Same as in Cat. #203. Incl. buffer for cell resuspension.
Cat. # 621

Protein Electrophoresis Reagents

Some components require -20°C Freezer Storage.

Precast Polyacrylamide Gels
Cat. # 651 3 gels (12%)
Cat. # 652 6 gels (12%)

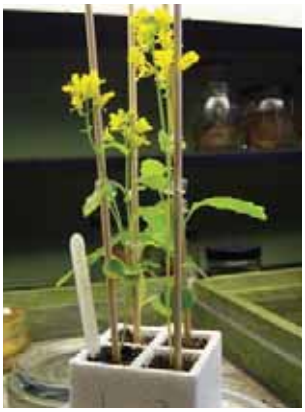
Tris-glycine-SDS Powdered Buffer
For protein gel electrophoresis.
Enough powder to make 5L of 1X buffer.
Cat. # 655

Tris-glycine Powdered Buffer
For protein gel electrophoresis.
Enough powder to make 5L of 1X buffer.
Cat. # 656

Tris-HCl-SDS-2-Mercaptoethanol
Contains mercaptoethanol to break disulfide bonds in proteins. This buffer solution can be used for molecular weight determination. Requires -20°C Freezer Storage.
Cat. # 658 10 ml

Prestained Lyophilized Protein Standard Marker
Molecular Weight Standards.
Cat. # 752 For 6 gels

Quick Plant™ Seeds



Quick Plant™ Seeds - *Brassica*
Cat. # 1225 50 seeds
Cat. # 1226 200 seeds

Wild Type Seeds - *Arabidopis Thaliana*
Cat. # 1251 150 seeds
Cat. # 1252 300 seeds

Dwarf Type Seeds - *Arabidopis Thaliana*
Smaller, more compact
Cat. # 1255 150 seeds
Cat. # 1256 300 seeds

Variegated - *Arabidopis Thaliana*
Variegated Leaf Coloring
Cat. # 1257 150 seeds
Cat. # 1258 300 seeds

Lab Supplies

Microtest Tube Rack
(Single rack)
Cat. # 639

Microtest Tubes
(500 snap-top tubes - 1.5 ml)
Cat. # 630

Thin-walled PCR Microtest Tubes
(0.2 ml for PCR) 100/pkg
Cat. # 642.2

(0.5 ml for PCR) 100/pkg
Cat. # 642.5

Microtiter Plates
Set of 6 plates.
96-well plastic microtiter plates. Opaque white color facilitates easy viewing of color reactions.
Cat. # 666

Small Petri Plates
60 x 15 mm, 1 shelf pack
Cat. # 633

Large Petri Plates
100 x 15 mm, 1 shelf pack
Cat. # 643

Waterbath Floats
Set of 2, 4.5"L x 3"W
Cat. # 689

Nonmercury Thermometer
Graduated in 1°C divisions.
Range of -20° - 110° C.
Cat. # 765

Safety Supplies

Disposable Nitrile Gloves
For latex sensitive allergy. 100/pkg
Cat. #774-1 Small
Cat. #774-2 Medium
Cat. #774-3 Large
Cat. #774-4 XLarge

Goggles, Laboratory UV Light Safety
Laboratory safety goggles with UV light protection.
Cat. # 631

Ordering Information

5 Easy Ways to Order

Simply place your order one of the following ways:

web	**www.edvotek.com**
email	**orders@edvotek.com**
phone	**1.800.EDVOTEK (1.800.338.6835)**
fax	**202.370.1501**
mail	**1121 5th Street NW, Washington, DC 20001**

Shipping

USA All orders are shipped from Washington, DC via EDVOTEK preferred carriers. A shipping, handling and insurance charge is applied to all shipments. Normal delivery time within the US and Puerto Rico is 2-7 business days by ground delivery. Additional fees or surcharges may apply for expedited shipping methods, or for shipments requiring wet or dry ice. International orders are shipped by preferred air services, unless instructed otherwise.

International All orders are shipped from Washington, DC via EDVOTEK preferred carriers. An international shipping, handling and insurance charge is applied to all orders.

Acknowledgments

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Prof. Dr. Christiane Nüsslein-Volhard, Max Planck Institute for Developmental Biology, Germany
iStockphoto
Mark Robert Halper
Aydan Stuart & biology students at Strode College
Melanie Fields & the Sidwell Friends School

Terms and Conditions

Terms

No minimum order required.

Terms: Net 30 Days

Purchase Orders, Visa, MasterCard and American Express are accepted as forms of payment.

FOB: Washington, DC, USA

All prices are in US dollars and payments must draw on American banks.

Prices are subject to change without notice.

Instructions are provided with each product, and MSDS are available.

Claims for missing items, shipping damages or losses must be made within 15 days of receipt. Noticeable damage must be noted on waybill at time of receipt.

Perishables

Perishable and live materials require two weeks notice to ensure timely arrival. Perishables are shipped upon written receipt, which may be sent via email, fax or mail. For perishable items requiring overnight wet ice shipment a surcharge applies. Live materials generally require 2nd day delivery and may only be shipped within the Continental US. All perishable and live materials are shipped Monday through Wednesday to arrive by 3 pm in most areas.

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