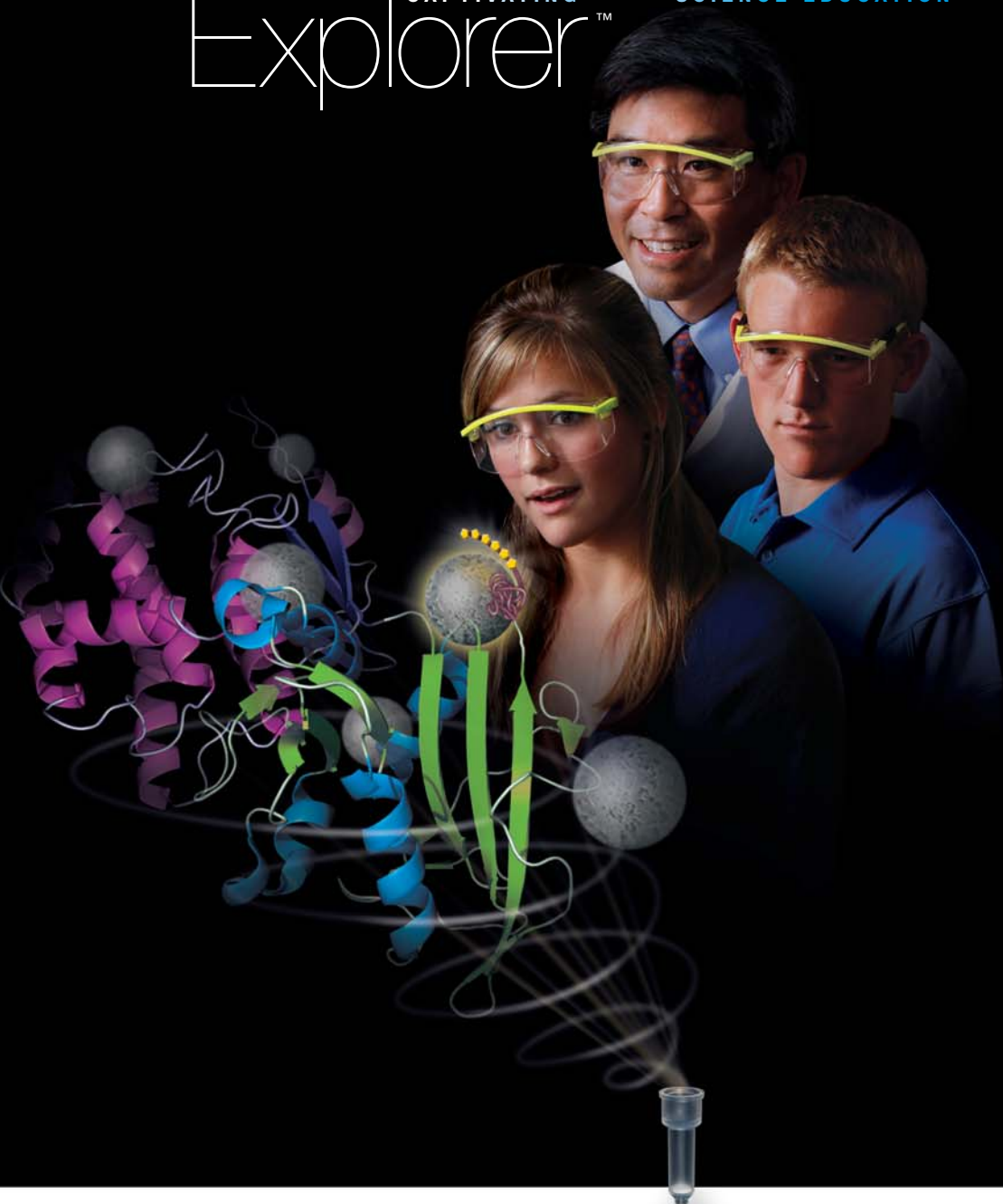


**New Dye Electrophoresis Kit** (see page 5) • **New Catalog** (see page 11)  
**Free Cuvette Racks With Kit** (see page 16) • **New Micropipets** (see page 17)

# Biotechnology Explorer™

CAPTIVATING SCIENCE EDUCATION



**It Works!** Guaranteed.

**BIO-RAD**

**CURRICULA • EQUIPMENT • KITS • PROFESSIONAL DEVELOPMENT • TECHNICAL SUPPORT**

# Bio-Rad. It Works!



**Learning** from mistakes is one of the most valuable experiences students can have. But failure due to poor quality lab materials is unacceptable. At Bio-Rad, quality and reliability are part of who we are. In the classroom, this translates into the best value for your money and the confidence that time spent in the lab will be worthwhile — because failure isn't an option for you or your students.

**Complete Solution.** The Biotechnology Explorer Program has been at the forefront of science education for over 15 years, providing students and teachers with individual lab activities, complete courses, and assessment tools. Our technical support (ranked first in 2011 by Bioinformatics Service and Support Survey), professional development, and curriculum training specialists are here to continue to support you and are second to none. Visit us at [www.bio-rad.com/ad/explorercatalog04](http://www.bio-rad.com/ad/explorercatalog04) to request your new 2012 Biotechnology Explorer catalog to see all that we have to offer!





## Free Professional Adjustable-Volume Digital Micropipet Special Offer

Get a free Professional Adjustable-Volume Digital micropipet when you purchase \$1,000 or more in Bio-Rad educational equipment or supplies — a **\$245 savings!**

Description	Catalog #	EDU Price	Special Offer
<b>Purchase \$1,000 in Bio-Rad educational equipment or supplies</b>	Varies	≥\$1,000.00 combined total	≥\$1,000.00 combined total
<b>Professional Adjustable-Volume Digital Micropipet, 0.5–10 µl</b>	166-0505EDU	<del>245.00</del>	<b>Free</b> Save \$245

*Must reference quote #12-Q10100. For the free micropipet, you must include the catalog number as a separate item on your order. Promotion cannot be combined with other offers. Limit one per customer. Offer expires August 31, 2012.*



# Biotechnology: A Laboratory Skills Course — Textbook

## New Biotechnology: A Laboratory Skills Course Textbook

### Starting a biotechnology course has never been easier!

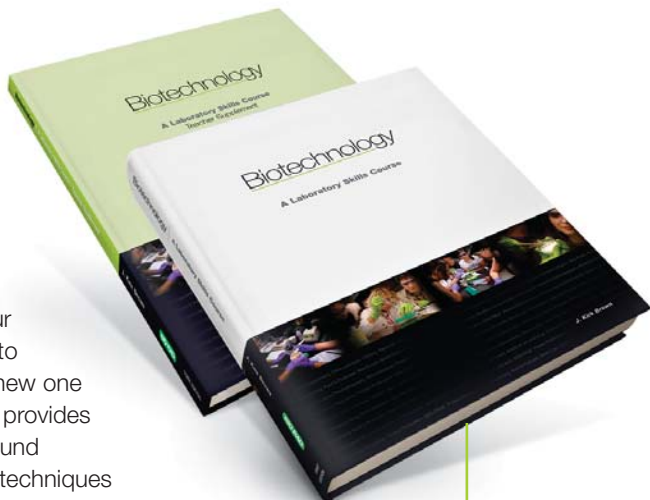
Biotechnology: A Laboratory Skills Course is a biotechnology textbook that is a ready-to-go solution for your biotechnology course, allowing you to complement your course or start a new one right away! This laboratory textbook provides you and your students with background information about the methods and techniques used in today's exciting research and manufacturing laboratory environments along with real-world activities that allow your students to understand the powerful impact science has on their everyday lives.

### 35 activities — non-kit-based and kit-based:

Activities are an essential part of engaging students to develop their skills and provide the backbone for this textbook. The non-kit-based activities, such as pipetting and solution making, address core competencies needed in all areas of a molecular biology laboratory. The kit-based activities extend these skills into real-world applications with worry-free preparation and confidence in the results.

Each student chapter includes: an introduction and background on fundamental molecular biology concepts; real-world vignettes of careers, bioethics, key skills, and case studies; and hands-on activities that progressively build science proficiency.

The teacher supplement provides step-by-step activity preparation, including information about the activity timeline, a skills assessment, answers to pre- and postlab questions, pacing guides, and shopping lists.



### Table of Contents

Chapter 1: The Biotechnology Industry
Chapter 2: Laboratory Skills
Chapter 3: Microbiology and Cell Culture
Chapter 4: DNA Structure and Analysis
Chapter 5: Bacterial Transformation and Plasmid Purification
Chapter 6: The Polymerase Chain Reaction
Chapter 7: Protein Structure and Analysis
Chapter 8: Immunological Applications
Chapter 9: Research Projects

## New Biotechnology: A Laboratory Skills Course Textbook

Description	Catalog #	List Price	EDU Price
<b>Teacher Edition</b> (includes one each 166-1025EDU and 166-1026EDU)*	166-1027EDU	<b>\$150.00</b>	<b>\$120.00</b>
<b>Student Edition</b> (ISBN 978-0-9832396-0-4)	166-1025EDU	<b>117.50</b>	<b>94.00</b>
<b>Teacher Supplement*</b> (ISBN 978-0-9832396-1-1), teacher reference guide	166-1026EDU	<b>43.75</b>	<b>35.00</b>

\* Teacher supplement contains guidance for the instructor including lab prep, activity timelines, skills assessment, and a pacing and purchasing guide. EDU price discounts are for qualified educational institutions and educators only. Items are available at list price for noneducators (must be ordered without an EDU suffix).

# New IDEA Kit

A super fun inquiry kit available June 2012!



New Free  
**Catalog!**  
(see page 11)

## New IDEA Kit



Each kit contains sufficient materials for 8 student workstations. We recommend 2-4 students per workstation.

### New IDEA Kit — Inquiry Dye Electrophoresis Activity

Catalog # . . . . .EDU Price  
**166-5075EDU . . . . . Inquire**

Kit includes 4 reference dyes, dye extraction buffer, agarose powder, TAE electrophoresis buffer, microtubes, and curriculum. Ships at room temperature.

### IDEA Kit Reagent Refill Pack

Catalog # . . . . .EDU Price  
**166-5076EDU . . . . . Inquire**

Refill includes 4 reference dyes, dye extraction buffer, and microtubes. Ships at room temperature.

### Key Kit Features

- Inquiry lab
- Complete in one 45 min lab session
- Visible results



ReadyAgarose™  
precast gel  
1.0%, 2 x 8-well, TAE,  
161-3057EDU \$8.80

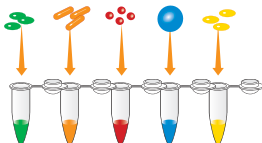
## IDEA Kit and Eight Micropipets Combo



**IDEA Kit and eight 10 µl Fixed-Volume Micropipets**  
**166-5077EDU Inquire**

**Educational discounts** apply only to items ordered with an EDU suffix. EDU price discounts are for qualified educational institutions and educators only.

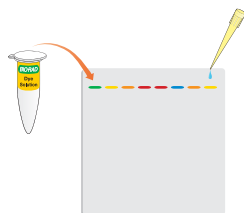
Extract dye from various candies



Incubate sample candies in glycerol solution until solution is brightly colored

Prepare extract samples

Load reference dyes and dye extracts



Electrophorese dye samples at 100 V for 20 min



Visualize and document gels

### LAB 1

**The colors of food can influence your impressions of them.** Mother nature has her way of using her color palette to bring nature to life but some of what we see in grocery stores has been enhanced to appeal to our human nature. There is as much art as science to finding the right combinations of colors to tempt the human palate. Coloring agents can be natural, such as beets, or artificial, such as red dye #40.

Electrophoresis is a fundamental skill used daily in the molecular biology laboratory. Bridging the gap between the real world and the classroom can help solidify these concepts and encourage further use of them. Combining this connection with the power of inquiry can help your students tackle questions still needing answers in the world of science. Bio-Rad's **new IDEA kit** is a dazzling way for students to learn the basics of electrophoresis using dyes that are commonly found in the foods we eat. This inquiry lab allows your students to analyze what dye combinations create particular colors in the hard-shell candies of their choice. Make this treasure hunt even more appealing by looking for other types of foods and their dyes to illustrate how they affect how the product looks. Do red and blue make purple? Is pink really pink? The colorful results may surprise you and will certainly get your students talking about their discoveries.



# Genes in a Bottle™ Kit

Can you see your DNA?

**New Free Catalog!**  
(see page 11)

## Genes in a Bottle Kit



Each kit contains sufficient materials for 36 students.

### Genes in a Bottle Kit

Catalog # .....EDU Price

**166-2300EDU\* .....\$134.00**

Ships and stores at room temperature.

\* Includes one DNA extraction module and two DNA necklace modules.

**166-2000EDU .....95.00**

DNA Extraction Module

**166-2200EDU .....33.00**

DNA Necklace Module (18 necklaces)

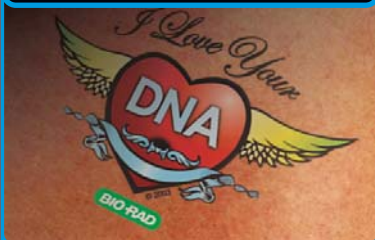
### Key Kit Features

- Use as introductory or capstone activity
- Perform real research techniques
- Extract, precipitate, and bottle your DNA
- Complete in one 45 minute lab session



DNA Necklace Extension Activity

## I Love Your DNA

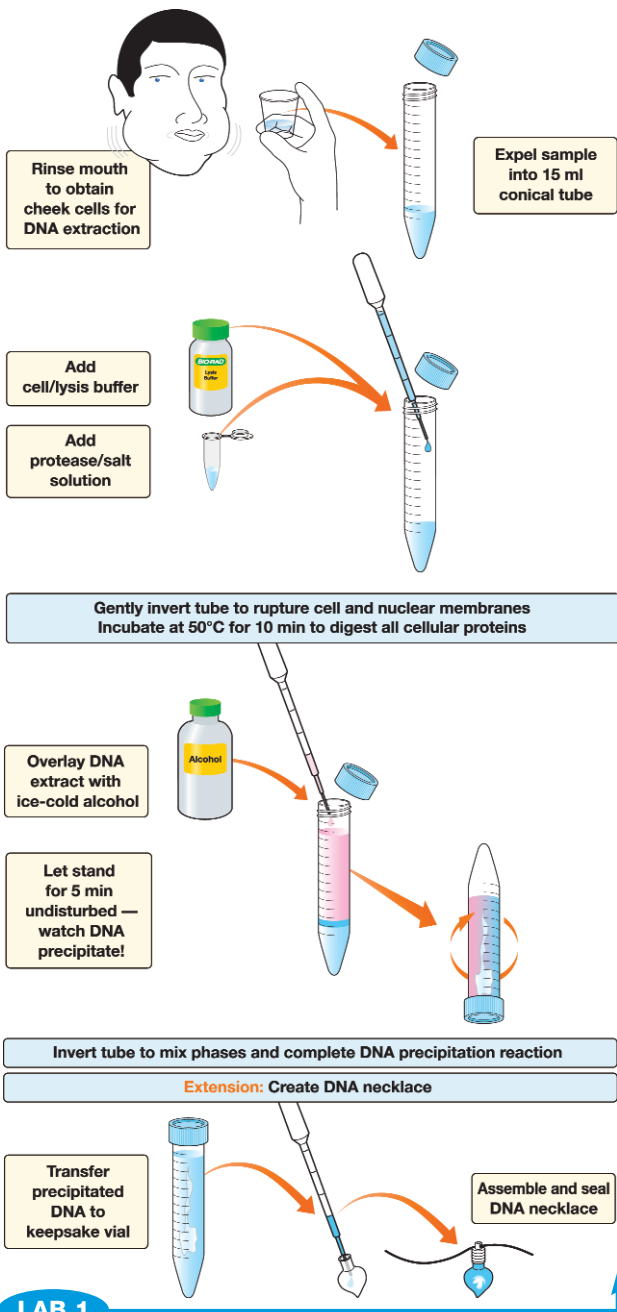


### I Love Your DNA Tattoos

Pack of 200 temporary tattoos

**166-2004EDU .....\$22.00**

**Educational discounts** apply only to items ordered with an EDU suffix. EDU price discounts are for qualified educational institutions and educators only.



## LAB 1

**Make your biology personal.** Introduce your students to molecular biology with their own DNA! Enable your students to see the normally invisible substance of life and begin to comprehend the meaning of their own genetic makeup. In this activity your students employ the same real-world laboratory procedure used to extract DNA from many different organisms for a variety of biotechnology research applications. Students extract genomic DNA from their own cheek cells, then precipitate and bottle it in a fabulously cool necklace.

From cell structure to genetics to the chemistry of life — this kit integrates multiple life science standards in a single lesson. Seeing DNA makes it real. Wearing it makes the lesson memorable!



# pGLO™ Bacterial Transformation and GFP Extension Kits

— Hands-on activities for AP Big Idea 3

## pGLO Bacterial Transformation and GFP Extension Kits



Each kit contains sufficient materials for 8 student workstations. We recommend 2–4 students per workstation.

### pGLO Bacterial Transformation Kit

Catalog # .....EDU Price  
**166-0003EDU .....\$89.00**

Includes one UV pen light.

### GFP Chromatography Kit

**166-0005EDU .....101.00**

### pGLO Kit SDS-PAGE Extension

**166-0013EDU .....87.00**

Includes curriculum, 1 g DTT, 100 µl Precision Plus Protein™ Kaleidoscope™ protein standards, 100 ml Bio-Safe™ Coomassie stain, 1 L 10x TGS, 30 ml Laemmli sample buffer. Coomassie is a trademark of BASF Aktiengesellschaft.

### Key Kit Features

- Aligns with **AP Big Idea 3**
- Transform bacteria with jellyfish gene
- Capture the glow
- Analyze the proteome



## Available Separately

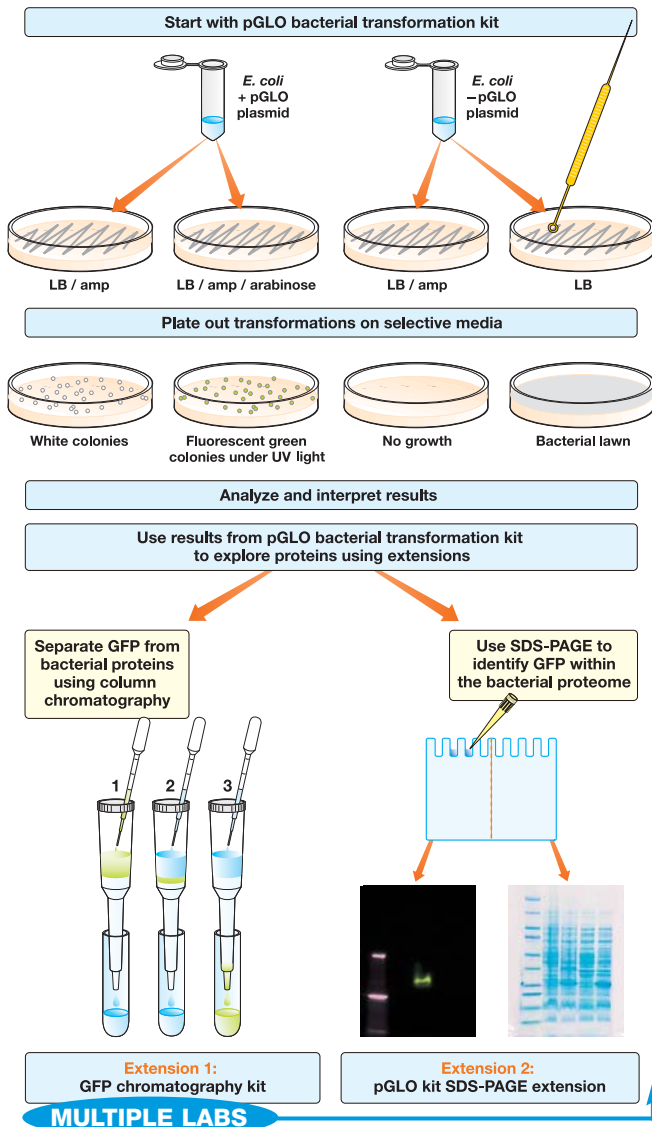


- Long-Wave UV Pen Light**  
 Small, disposable ultraviolet light  
**166-0530EDU .....\$10.00**



- Long-Wave UV Lamp**  
 Portable, mini ultraviolet lamp  
**166-0500EDU .....\$33.00**

**Educational discounts** apply only to items ordered with an EDU suffix. EDU price discounts are for qualified educational institutions and educators only.



**Using pGLO to teach inquiry.** In the pGLO bacterial transformation kit, students transform bacteria with a gene from a bioluminescent jellyfish to express a new protein, green fluorescent protein (GFP). For inquiry-based extensions, students can vary the media components, arabinose concentration, heat shock temperature, and more to help them develop critical thinking skills and design real experiments.

**The GFP chromatography kit** provides a basis to dive deeper into the proteins expressed in the pGLO bacterial transformation lab and allows students to purify GFP. The pGLO kit SDS-PAGE extension allows students to analyze the entire bacterial proteome.

Show your students the relevance of science. When students genetically engineer bacteria with the genes from a bioluminescent jellyfish, they never forget the central mantra of molecular biology:

**DNA > RNA > Protein > Trait — Green Fluorescence!**

# Forensic DNA Fingerprinting Kit

Who Done It? — Hands-on activities for AP Big Idea 3

## Forensic DNA Fingerprinting Kit



Each kit contains sufficient materials for 8 student workstations. We recommend 2–4 students per workstation.

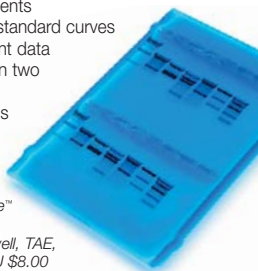
### Forensic DNA Fingerprinting Kit

Catalog # .....EDU Price  
**166-007EDU .....\$130.00**

Convenient lyophilized reagents.  
 Ships at room temperature. Immediately store temperature-sensitive reagents at  $-20^{\circ}\text{C}$ .

#### Key Kit Features

- Aligns with **AP Big Idea 3**
- Use electrophoresis to visualize DNA fragments
- Construct standard curves from student data
- Complete in two 45 minute lab sessions



ReadyAgarose™  
 precast gel  
 1.0%, 2 x 8-well, TAE,  
 161-3057EDU \$8.00

## Incubate with Ease



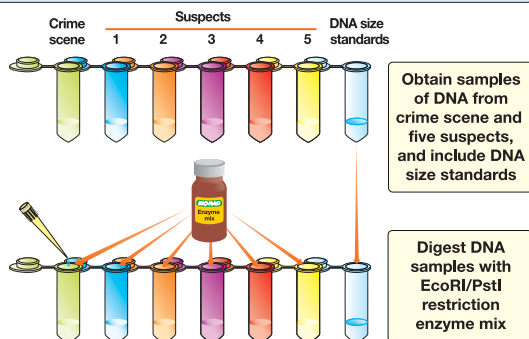
### Water Bath

- Stainless-steel tank and lid
- Temperature range up to  $100^{\circ}\text{C}$
- Over-temperature protection
- Includes thermometer

**166-0504EDU      \$590.00**

**Educational discounts** apply only to items ordered with an EDU suffix. EDU price discounts are for qualified educational institutions and educators only.

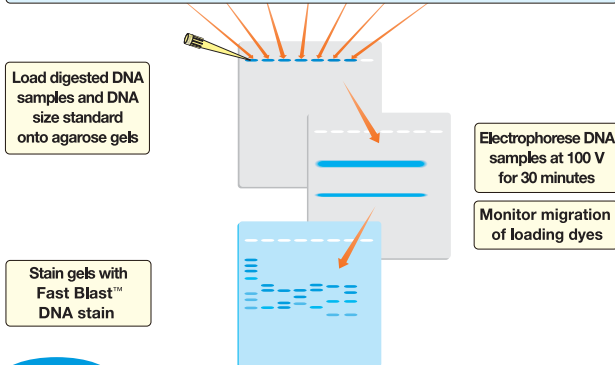
### Rehydrate DNA samples and restriction enzymes



### Incubate at $37^{\circ}\text{C}$ for 45 min or overnight at room temperature

#### LAB 1

### Add loading dye to all digested DNA samples



#### LAB 2

### Match crime scene DNA with suspects' DNA. Who done it?

### Construct a standard curve using DNA size standards, then determine size of unknown fragments in DNA samples

### Extension: Plasmid mapping using restriction enzymes

**Using real DNA as evidence.** Using real DNA as evidence, your students play the role of crime scene investigators. DNA evidence assists in criminal, missing person, mass disaster, and paternity cases. It can also be used to exonerate the innocent.

The six DNA samples in this kit are plasmids engineered to mimic the variations in DNA that exist between one human being and another. One DNA sample has been collected from a "crime scene" and five samples have been obtained from various "suspects." Each sample is digested using a mixture of two DNA restriction enzymes, generating a distinct pattern of DNA fragments. From their electrophoresis results, students construct standard curves, determine DNA fragment sizes, and place a suspect at the scene of the crime.

**From pGLO™ to Forensic DNA Fingerprinting — An Inquiry Approach.** Develop an inquiry-based activity that links pGLO to forensic DNA fingerprinting samples by asking questions such as: We have 5 different plasmids and we successfully transformed pGLO into *E. coli* K-12. Can we transform this bacteria with these plasmids? *Yes, provided the plasmid is not too large.* Will the protocol for pGLO work for all plasmids? What considerations do I have to keep in mind? *If you use the same bacteria, it is the plasmid that is variable in this experiment.* The question is — how are these plasmids different? *Size is the most obvious answer. Conformation is another consideration.* Try it. Don't worry about not knowing how the experiment will turn out — that is science!



# Free Life Sciences and AP Workshops at a Conference Near You!

## 2012 Fall Teacher Conference and Workshop Schedule

<b>March–April</b>	29–1	NSTA National	Indianapolis	Indiana
<b>April</b>	4–7	Association of Southeastern Biologists	Athens	Georgia
<b>June</b>	4–8	BioLink Summer Fellows	Berkeley	California
<b>July</b>	23–26	BIOMAN	Graham	North Carolina
<b>October</b>	18–20	NSTA Regional	Louisville	Kentucky
<b>October</b>	19–21	CSTA	San Jose	California
<b>Oct.–Nov.</b>	31–3	NABT	Dallas	Texas
<b>November</b>	1–3	NSTA Regional	Atlanta	Georgia
<b>November</b>	8–10	STAT-CAST	Corpus Christi	Texas
<b>Nov.–Dec.</b>	29–1	ACTE	Atlanta	Georgia
<b>December</b>	6–8	NSTA Regional	Phoenix	Arizona

A complete schedule can be found on the Web at [explorer.bio-rad.com/workshops](http://explorer.bio-rad.com/workshops).

## Life Sciences Core Content Standards Kit Selection Guide

Scientific inquiry	Genetics	Cell and molecular biology	Chemistry of life	Evolution	Environmental and health science	Advanced concepts and techniques		
<p><b>Scientific inquiry:</b> field and lab investigations, scientific problem solving, environmental considerations, impact of research on society, career options</p> <p><b>Genetics:</b> genes and heredity, chromosomes and alleles, mutations, variation; DNA structure, function, replication; central dogma</p> <p><b>Cell and molecular biology:</b> cell structures and processes; plant, microbe, and animal cell types; growth, development, and interaction</p> <p><b>Chemistry of life:</b> structure and function of cellular components and processes (proteins, carbohydrates, lipids, nucleic acids, etc.)</p> <p><b>Evolution:</b> change in heritable traits in populations; natural selection; allelic and species diversity, phylogeny, extinction, and fossil record</p> <p><b>Environmental and health science:</b> interactions in natural systems; biodiversity, natural resources, food webs, energy pyramid, human impact; disease and epidemiology</p> <p><b>Advanced concepts and techniques:</b> going beyond the textbook, applying the results to the real world</p>								
★	★	★			★		Biofuel enzyme kit (166-5035EDU) — AP Big Idea 4	Introductory
★	★		★				Microbes and health kit (166-5030EDU)	
★	★	★	★				Genes in a Bottle™ kit (166-2300EDU)	
★	★	★	★				pGLO™ bacterial transformation kit (166-0003EDU) — AP Big Idea 3	
★		★	★				Green fluorescent protein (GFP) chromatography kit (166-0005EDU)	
★	★	★	★		★		Secrets of the Rainforest™ kit (166-0006EDU)	
★		★					Size exclusion chromatography kit (166-0008EDU)	
★		★					Got Protein?™ kit (166-2900EDU)	
★	★	★	★		★		ELISA Immuno Explorer™ kit (166-2400EDU)	Intermediate
★	★		★	★			Forensic DNA fingerprinting kit (166-0007EDU) — AP Big Idea 3	
★	★	★	★				Analysis of precut lambda DNA kit (166-0001EDU) — AP Big Idea 3	
★	★	★	★				Restriction digestion and analysis of lambda DNA kit (166-0002EDU) — AP Big Idea 3	
★		★	★				pGLO kit SDS-PAGE extension (166-0013EDU)	
★	★			★	★		Crime Scene Investigator PCR Basics™ kit (166-2600EDU)	
★	★	★	★	★	★		Comparative proteomics kit I: protein profiler module (166-2700EDU) — AP Big Idea 1	
★	★	★	★	★	★		Comparative proteomics kit II: western blot module (166-2800EDU)	
★	★	★	★	★			PV92 PCR informatics kit (166-2100EDU) — AP Big Idea 1	Advanced
★	★	★	★	★	★		GMO Investigator™ kit (166-2500EDU)	
★	★		★	★		★	Crime Scene Investigator PCR Basics real-time PCR starter kit (166-2660EDU)	
★	★	★	★	★	★	★	GMO Investigator real-time PCR starter kit (166-2560EDU)	
★	★	★	★	★	★	★	Cloning and sequencing explorer series (166-5000EDU)	
★	★	★	★		★		Protein expression and purification series (see page 15 for more information)	

# Biotechnology Explorer™ Program

## Educational Pricing Contract Application

**BIO-RAD**

### Educational Pricing Contract Application

As an educator you are entitled to discount pricing on all Bio-Rad products. To initiate setup of a new education account, simply fax or mail this page to Bio-Rad. If you are ready to place your first order, send this page and attach a purchase order with the numbers and descriptions of the items you wish to purchase.

### Biotechnology Explorer Program

Bio-Rad Laboratories, Inc.  
2000 Alfred Nobel Drive  
Hercules, CA 94547 USA



**Fax to 1-800-879-2289 or 1-510-741-5800.**

### Re: Educational Discount

We are an educational facility interested in using Bio-Rad products to teach our students. We would like to receive a teaching lab discount and understand that the Bio-Rad education discount is available only to educators at the K-12 and undergraduate levels. This letter is our confirmation that the products we order through our educational account will be used only to educate students in a classroom or teaching lab environment and will not be used for basic scientific research. We are sending this letter in order to:

- Initiate setup of a new educational account with Bio-Rad Laboratories  
(If tax exempt, please include a copy of the school's tax certificate)
- Place a new order, with PO attached
- Confirm an order identification number (please fill in order number) \_\_\_\_\_

Name of contact: \_\_\_\_\_

Department: \_\_\_\_\_

School or institution: \_\_\_\_\_

We are a (please check one):  High school  Two-year/Community college  
 College or undergraduate teaching laboratory  Other \_\_\_\_\_

**Bill to address:** \_\_\_\_\_

City/state/ZIP code: \_\_\_\_\_

Phone number: \_\_\_\_\_ Fax number: \_\_\_\_\_

**Ship to address:** \_\_\_\_\_

City/state/ZIP code: \_\_\_\_\_

Phone number: \_\_\_\_\_ Fax number: \_\_\_\_\_

Email address: \_\_\_\_\_

Signature: \_\_\_\_\_

# Get a New 2012/13 Biotechnology Explorer™ Catalog and Full-Color PCR Poster Free

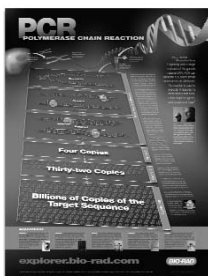
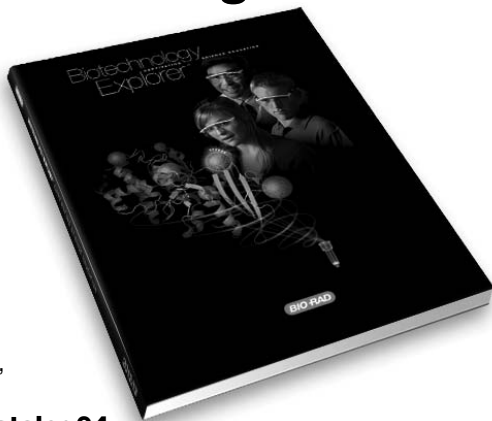
## New 2012/13 Biotechnology Explorer Catalog

**Free Catalog.** Exciting new kits will ignite your classroom with hands-on lab activities and learning experiences. Check out the new lab equipment, refresh kit components, and smart, reusable plastic supplies. And, as always, get **20–40% off** list prices for all Bio-Rad research-quality products.



Smartphone  
Information

**Three ways to get your catalog:**  
call **1-800-424-6723**, fill in and mail the attached postage-paid card, or visit us on the Web at **www.bio-rad.com/ad/explorercatalog04**.



## Free Full-Color PCR Poster

See a detailed visual explanation of the polymerase chain reaction process: how it works, why it works, and what you need it for in the scientific research world. Learn about the PCR revolution and the hot research areas using PCR now.

While supplies last — fill in and mail the attached postage-paid card to get your full-color, giant-sized **free PCR poster**.

Find out more about the  
**Biotechnology Explorer™ program**  
professional development options  
& get some free stuff!

20 to  
**40% off**  
list prices

Name \_\_\_\_\_ Title \_\_\_\_\_

Institution \_\_\_\_\_

Department \_\_\_\_\_ Bldg. \_\_\_\_\_ Room no. \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ ZIP code \_\_\_\_\_

( \_\_\_\_\_ ) \_\_\_\_\_

Phone \_\_\_\_\_

( \_\_\_\_\_ ) \_\_\_\_\_

Fax \_\_\_\_\_

Email \_\_\_\_\_ (By providing my email address I agree to receive email about Bio-Rad products and events.)

### We want to hear from you!

What are your professional development objectives? \_\_\_\_\_

\_\_\_\_\_

What challenges do you face in preparing students for biotech careers? \_\_\_\_\_

\_\_\_\_\_

Please have a Bio-Rad curriculum training specialist contact us about meeting our teaching goals and professional development needs in our own district today.

### Free stuff and more:

- Free Biotechnology Explorer catalog (bulletin 2112)
- Free PCR poster (bulletin 5886)
- Hey! Have my Bio-Rad account representative call me
- I would like to receive the Bio-Rad eFocus email newsletter

Fill in and return this card today or, for immediate information, call **1-800-424-6723**.

# Ask the Experts — Inquiry with the Biofuel Enzyme Kit



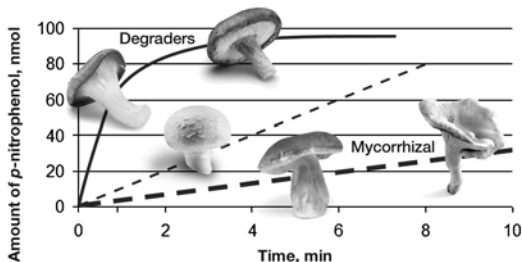
**Damon Tighe**  
Curriculum and Training Specialist and  
Biotechnology Explorer Professional  
Development Team Member

**The biofuel enzyme kit provides structure for inquiry** into the source of enzymes used in the growing biofuels industry. Most enzymes currently used in this industry are from fungi, and students can choose from a wide array of them at most supermarkets. Mushrooms have different levels of cellobiase activity, which correspond to their ecological niches. Chanterelle and porcini mushrooms are mycorrhizal and associate with tree roots. They obtain most of their nutrients from this association and have little need for enzymes that break down cellulose. Oyster and shiitake mushrooms primarily

grow on dead organic matter and need large amounts of cellulose-degrading enzymes to get their nutrients. When students compare the cellobiase of mycorrhizal mushrooms with primary degraders they'll find the level of cellobiase activity matches the mushroom's lifestyle. This is a great platform for discussing the ecological roles of fungi, carbon cycling, and even evolution as it relates to enzymes.

Check out Vernier's new "Investigating Biology through Inquiry" lab book, which has protocols to make this inquiry exceptional. The kit works with both the Vernier SpectroVis Plus and Bio-Rad SmartSpec Plus spectrophotometers. The kit can be run with or without a spectrophotometer, allowing you to decide the level of equipment engagement.

## Reaction Rate with Enzyme



Contact us at [biotechnology\\_explorer@bio-rad.com](mailto:biotechnology_explorer@bio-rad.com) for more ideas on infusing inquiry into your biofuel enzyme kit.



NO POSTAGE  
NECESSARY  
IF MAILED  
IN THE  
UNITED STATES

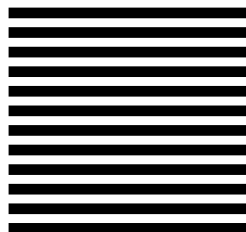
**BUSINESS REPLY MAIL**

FIRST CLASS PERMIT NO 42 RODEO, CALIF

POSTAGE WILL BE PAID BY ADDRESSEE

**BIO-RAD**

Bio-Rad Laboratories, Inc.  
2000 Alfred Nobel Drive  
Hercules, CA 94547-9980





# ELISA Immuno Explorer™ Kit

Are you positive?



## ELISA Immuno Explorer Kit



Each kit contains sufficient materials for 12 student workstations. We recommend 2–4 students per workstation.

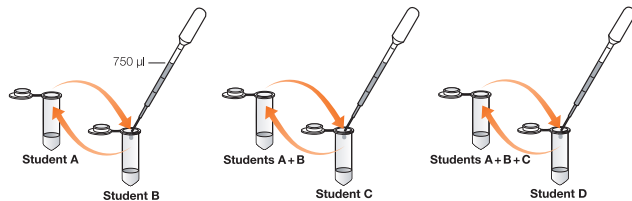
### ELISA Immuno Explorer Kit

Catalog # . . . . . EDU Price  
**166-2400EDU . . . . . \$127.00**

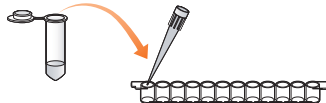
Ships at room temperature. Immediately store temperature-sensitive reagents at 4°C.

#### Key Kit Features

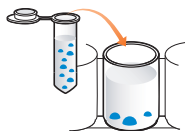
- Apply a real-world diagnostic procedure
- Simulate real-world HIV testing
- Simulate GMO, pregnancy, and drug testing
- Explore biodefense
- Complete in one 45 minute lab session



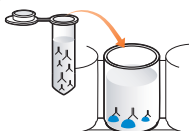
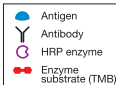
Optional outbreak activity: Students simulate spreading of a disease



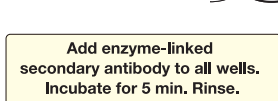
Load positive and negative controls in triplicate into wells of microplate strips



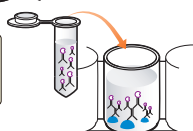
Load student samples (unknowns) in triplicate into wells of the microplate strips. Incubate for 5 min. Rinse.



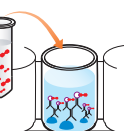
Add primary antibody to all wells. Incubate for 5 min. Rinse.



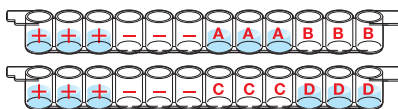
Add enzyme-linked secondary antibody to all wells. Incubate for 5 min. Rinse.



Add enzyme substrate to all wells. Incubate for 5 min.



Watch for color development



Optional: Students track the progress of the disease through the classroom

Extension\*: Perform quantitative analysis of samples using Bio-Rad® iMark™ microplate absorbance reader

## LAB 1

\* **Analysis of results:** ELISA (enzyme-linked immunosorbent assay) is a highly sensitive and powerful assay that can give qualitative (yes/no) and quantitative (how much?) information. Qualitative results can be determined visually by eye. For precise quantitative determination of concentrations, a microplate reader is required. A detailed lesson extension for quantitative ELISA is included in the kit curriculum.

**Simulate the outbreak of a disease** in your classroom and use real antibodies to track it. Teach your students how HIV, bird flu, mad cow disease, genetically modified organisms, and the molecular markers of cancer, pregnancy, or drug use are detected — in the real world. Enzyme-linked immunosorbent assay (ELISA) is a powerful antibody-based biodetection tool used in the field to hunt for pathogens in water, food, or air, whether these emerge naturally or through acts of aggression.

Explore biodefense, immunology, agriculture, and health science with this topical, hands-on classroom lab. The ability of antibodies to act like magic bullets and target viral, bacterial, and allergenic antigens in the body also makes them ideal biodetection tools in the hunt for antigens in bioscience research and medical diagnostic tests. This kit integrates multiple core content areas. It facilitates teaching about immune system functions and about the unique properties of antibodies that have revolutionized medicine, epidemiology, and life science research.

## Quick Data Analysis



### iMark™ Microplate Absorbance Reader

Includes 6 filters (415, 450, 490, 595, 655, and 750 nm), plate shaker, onboard software and thermal printer, one roll printer paper, USB, power cables, and instructions

**168-1130EDU \$4,281.60**

**Educational discounts** apply only to items ordered with an EDU suffix. EDU price discounts are for qualified educational institutions and educators only.

# Comparative Proteomics Kits I and II: Protein Profiler and Western Blot Modules

## Comparative Proteomics Kits I and II: Protein Profiler Module and Western Blot Module



Each kit contains sufficient materials for 8 student workstations. We recommend 2-4 students per workstation.

### Protein Profiler Module

Catalog # .....EDU Price  
**166-2700EDU .....\$165.00**

Convenient lyophilized reagents. Ships at room temperature. Immediately store temperature-sensitive reagents at  $-20^{\circ}\text{C}$ . Obtain fish samples locally. Mini-PROTEAN® TGX™ precast gels available separately.



### Western Blot Module

**166-2800EDU .....190.00**

Convenient lyophilized reagents. Ships at room temperature. Immediately store temperature-sensitive reagents at  $-20^{\circ}\text{C}$  as indicated.

### Protein Profiler and Western Blot Modules

**166-2850EDU .....345.00**

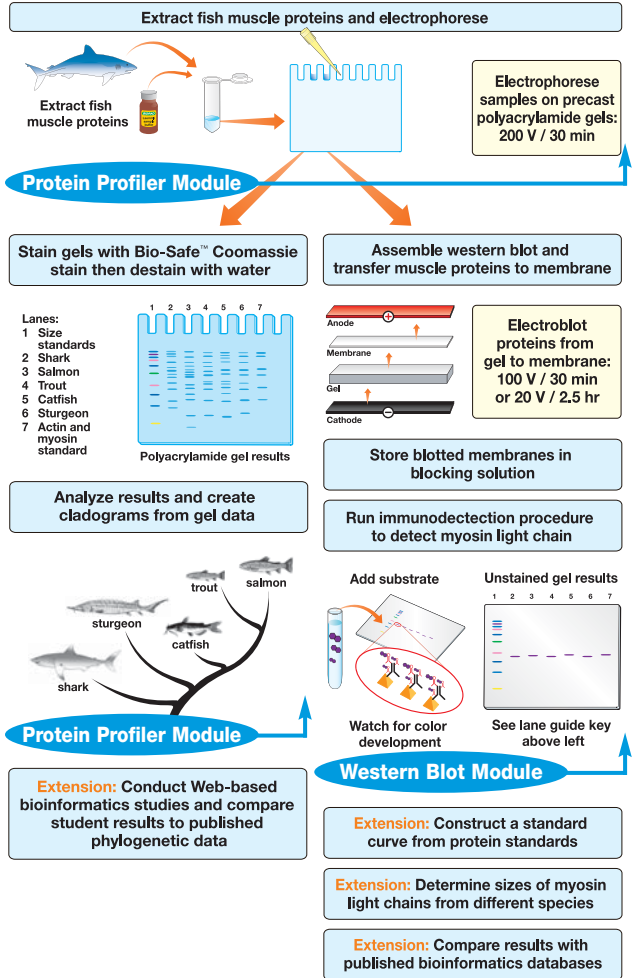
#### Key Kit Features for Both Modules

- Aligns with **AP Biology Big Idea 1**
- Explore evolution and immunodetection
- Study protein structure/function
- Apply protein electrophoresis
- Construct cladograms
- Apply immunology
- Use antibodies as tools
- Complete in seven or eight 45 minute lab sessions



Mini-PROTEAN® TGX® gel  
4-20%, 10-well, 2 gels/box,  
456-1093SEDU \$15.20

**Educational discounts** apply only to items ordered with an EDU suffix. EDU price discounts are for qualified educational institutions and educators only.



**The Protein Profiler Module moves beyond DNA** and allows your students to employ protein gel electrophoresis to explore evolution at the molecular level using the central molecular framework of biology:

### DNA > RNA > Protein > Trait — Phenotype

Students generate protein profiles from the muscle tissues of various species of fish to test the hypothesis that protein fingerprints can indicate evolutionary relatedness. Based on their own results, students can decide whether their results support biological evolution.

The western blot module takes the Bio-Rad protein profiler module to the next level by specifically identifying myosin from the hundreds of other muscle proteins in the profiles. From their protein profiler results, students make educated guesses as to the identities of the proteins in their gels. Via western blotting, antibodies confirm the presence and location of one specific protein, myosin light chain, in each species' profile. Measurable differences in the molecular weights of the myosin light chain proteins from different species lead students to hypothesize about how these variations relate to evolutionary relationships of the species.

Get our free curriculum on the Web at [explorer.bio-rad.com](http://explorer.bio-rad.com).

# 50% Off The Cloning and Sequencing Explorer Series

with purchase of the Protein Expression and Purification Series

## Cloning and Sequencing Explorer Series

Available as a complete series or as individual modules:

1. Nucleic Acid Extraction
2. GAPDH PCR
3. Electrophoresis
4. PCR Kleen™ Spin Purification
5. Ligation and Transformation
6. Microbial Culturing
7. Aurum™ Plasmid Mini Purification
8. Sequencing and Bioinformatics

## Protein Expression and Purification Series

Available as a complete series or as individual modules:

1. Growth and Expression
2. SDS-PAGE Electrophoresis
3. Purification
  - Option 1: Centrifugation Purification Process
  - Option 2: Hand-Packed Column Purification Process
  - Option 3: Prepacked Cartridge Purification Process
4. DHFR Enzymatic Assay
5. Assessment



### Integrated Molecular Biology Labs for College Level!

Looking for authentic lab experiences that carry a gene or protein of interest from isolation to analysis? Bio-Rad's modular lab series provide validated procedures, easy preparation, and reproducible success year after year. Visit the Web to learn about our advanced series for cloning, sequencing, and bioinformatics, and protein expression and purification using affinity chromatography. These flexible, modular lab series can be used as capstone projects or a complete molecular biology course.

## 50% Off Cloning and Sequencing Explorer Series Offer

Get 50% off the Cloning and Sequencing Explorer Series when you purchase the Protein Expression and Purification Series — a **\$762.50 savings**

Description	Catalog #	EDU Price	Offer Price
<b>Protein Expression and Purification Series</b> <b>For Centrifugation Process</b>	166-5040EDU	<b>\$567.00</b>	<b>\$567.00</b>
<b>Cloning and Sequencing Explorer Series</b>	166-5000EDU	<del>1,525.00</del>	<b>762.50</b>
<i>Must reference quote #12-Q10178.</i>	<b>Save \$762.50</b>	<del>2,092.00</del> ➔	<b>1,329.50</b>
<b>Protein Expression and Purification Series</b> <b>Hand-Packed Column Process</b>	166-5045EDU	<b>718.00</b>	<b>718.00</b>
<b>Cloning and Sequencing Explorer Series</b>	166-5000EDU	<del>1,525.00</del>	<b>762.50</b>
<i>Must reference quote #12-Q10180.</i>	<b>Save \$762.50</b>	<del>2,243.00</del> ➔	<b>1,480.50</b>
<b>Protein Expression and Purification Series</b> <b>For Prepacked Column Process</b>	166-5050EDU	<b>718.00</b>	<b>718.00</b>
<b>Cloning and Sequencing Explorer Series</b>	166-5000EDU	<del>1,525.00</del>	<b>762.50</b>
<i>Must reference quote #12-Q10179.</i>	<b>Save \$762.50</b>	<del>2,243.00</del> ➔	<b>1,480.50</b>

Offer cannot be combined with other promotional offers. Limit one per customer. Expires August 31, 2012.

# Free Racks with Biofuel Enzyme Kit



New Free Catalog!  
(see page 11)

Can enzymes solve global warming?

## Biofuel Enzyme Kit



Each kit contains sufficient materials for 8 student workstations for all 6 activities. We recommend 2-4 students per workstation.

### Biofuel Enzyme Kit

Catalog # .....EDU Price

**166-5035EDU ..... \$127.00**

Ships at room temperature.

Store at 4°C.

### Cuvette Racks

Rack holds 12 cuvettes, set of 5 racks

**166-0485EDU ..... 54.00**

### Key Kit Features

- Aligns with **AP Biology Big Idea 4**
- Guides instruction on enzyme kinetics and biofuel energy sources
- Contains no strong oxidizing agents
- Enables both qualitative and quantitative measurement of reactions
- Complete core activity in one 45 minute lab session
- Includes 5 additional enrichment activities



## Free Cuvette Racks Special Offer



Purchase the Biofuel Enzyme kit, and receive a free set of 5 cuvette racks – a **\$54 savings!**

### Biofuel Enzyme Kit

166-5035EDU \$127.00

### Cuvette Racks

166-0485EDU ~~54.00~~

**Save \$54.00**

**127.00**

**Must reference quote #12-Q11181.**

For the free cuvette rack set, you must include the catalog number as a separate item on your order.

Promotion cannot be combined with other offers. Limit one per customer. Offer expires August 31, 2012.

**Prepare substrate samples**

**Add enzyme and buffer (control) to substrate**

Enzyme      Buffer

**Prepare test samples for spectral analysis**

Enzyme reaction

Control reaction

**At specified times, remove aliquots and add to stop solution**

**Compare enzyme and control reaction time points to standards to determine amount of product formed**

Standards

Reaction sample

**Generate a reaction curve from the amount of product formed at each time point**

**Extension: Read standards and reaction samples in spectrophotometer**

**Generate standard curve from standards' absorbance data**

**Determine the amount of product formed at each reaction time point. Generate a reaction curve**

## LAB 1

**Enzymes and energy.** Reveal the power of enzyme kinetics by illustrating the theory through the real-world application of biofuel production. The biofuel enzyme kit tests the ability of an enzyme to increase the rate of conversion of a clear substrate to a colored product. Students will test and calculate the rate of conversion of a sugar substrate (*p*-nitrophenyl glucopyranoside) to *p*-nitrophenol and glucose in the presence or absence of the enzyme cellobiase (part of the cellulase family). After establishing the rate of reaction in the presence of the enzyme, various conditions influencing the reaction rate can be tested. In addition, students can perform independent inquiry with mushroom extracts.

- Activity 1:** Reaction rate in the presence or absence of an enzyme
- Activity 2:** Effect of temperature on the reaction rate
- Activity 3:** Effect of pH on the reaction rate
- Activity 4:** Effect of enzyme concentration on the reaction rate
- Activity 5:** Effect of substrate concentration on the reaction rate
- Activity 6:** Ability of mushroom extracts to increase the reaction rate

**Can enzymes solve global warming?**  
Let your students decide whether this is possible!



# Biotechnology Explorer™ Program

## Complete Line of Micropipets and Supplies

**New**



**New and Improved Professional Adjustable-Volume Digital Micropipets**

- Three-year warranty
- Fully autoclavable micropipet that accommodates standard pipet tips
- Adjustable digital dial with locking mechanism, slender contoured grip, and ergonomic tip ejector

**166-0499EDU** (0.1–2 µl)  
**166-0505EDU** (0.5–10 µl)  
**166-0506EDU** (2–20 µl)  
**166-0507EDU** (20–200 µl)  
**166-0508EDU** (100–1,000 µl)

Each pipet only **\$245.00**

**New 8-Channel Micropipet**



- Standard 96-well format
- Continuously adjustable volume selection (20–200 µl) with thumbwheel or push button
- Volume lock
- Rotating manifold
- Curved ejector bar reduces ejection force
- Fully autoclavable

**166-0495EDU** **\$552.00**

**New Pipet Controller**



- Volume range: 1–100 ml
- 120 V Cordless
- Single-hand operation

**166-0490EDU** **\$277.44**

**New Carousel Pipet Rack**



Six-place carousel rack conveniently rotates for easy access to all your micropipets. (Micropipets not included)

**166-0487EDU** **\$120.00**



**New Professional Pipet Backpack Set**

- Four professional adjustable-volume digital micropipets (0.5–10, 2–20, 20–200, 100–1,000 µl)
- TBR-14, -35, -40, and Prot/Elec™ pipet tips racks
- Six-place carousel pipet rack
- Bio-Rad backpack

**166-0486EDU** **\$875.00**

**Micropipet Rack**



Designed for the lab benchtop with wipe-and-clean surface and a non-skid base.

- Holds 9 single micropipets

**166-0554EDU** **\$31.00**

**Fixed-Volume Micropipets**



Get all the accuracy of standard adjustable-volume micropipets — but at a fraction of the price!

**166-0511EDU** (5 µl)  
**166-0512EDU** (10 µl)  
**166-0513EDU** (20 µl)  
**166-0515EDU** (50 µl)

Each pipet only **\$24.00**

**Classroom Adjustable-Volume Digital Micropipets**





These adjustable pipets deliver exceptional classroom performance.

- Two-year warranty
- Adjustable digital dial with convenient tip ejector
- Accommodates standard pipet tips

**166-0550EDU** (0.5–10 µl)  
**166-0551EDU** (2–20 µl)  
**166-0552EDU** (20–200 µl)  
**166-0553EDU** (100–1,000 µl)

Each pipet only **\$120.00**

## Pipet Tip Fit Chart and Ordering Information

Tip Type, Quantity	Catalog #	Bio-Rad Micropipet Fit		EDU Price	
		Adjustable	Fixed-Volume		
 <b>BR/TBR-14</b>					
<b>Bulk Pipet Tips</b>					
 <b>BR/TBR-35</b>					
<b>BR/TBR-35</b>	BR-14 Tips, 1,000/bag	223-9014EDU	0.1–2, 0.5–10 µl	Not available	\$28.80
<b>BR/TBR-40</b>	BR-35 Tips, 1,000/bag	223-9035EDU	2–20, 20–200 µl	5, 10, 20, 50 µl	28.80
<b>Prot/Elec</b>	BR-40 Tips, 500/bag	223-9040EDU	100–1,000 µl	Not available	15.20
	Prot/Elec Tips, 1,000/bag	223-9915EDU	0.5–10, 2–20, 20–200 µl	5, 10, 20 µl	44.00

Visit us at [explorer.bio-rad.com](http://explorer.bio-rad.com) for more pipet tip options.

### New Storage Racks



- New 15 ml Tube Rack**
    - Can be frozen or autoclaved
    - Holds 60 x 15 ml tubes
    - 10.5 x 25 x 7.2 cm (W x D x H)
    - Set of 5 racks
- 166-0483EDU \$69.00**



- New 50 ml Tube Racks**
    - Can be frozen or autoclaved
    - Holds 24 x 50 ml tubes
    - 11 x 30 x 8.5 cm (W x D x H)
    - Set of 5 racks
- 166-0484EDU \$69.00**



- New Cuvette Racks**

These cuvette racks are essential for organizing cuvette samples and avoiding accidental spills.

    - Holds 12 standard size cuvettes
    - 5 x 17.2 x 1.5 cm (W x D x H)
    - Set of 5 racks
- 166-0485EDU \$54.00**



- Green Racks**

Durable polypropylene construction.

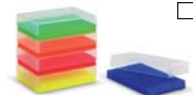
    - Holds 80 x 1.5/2.0 ml tubes
    - 6.1 x 23.1 x 2.7 cm (W x D x H)
    - Set of 5 racks
- 166-0481EDU \$46.00**



- Storage Boxes**

Durable polypropylene construction with alphanumerically labeled translucent lid.

    - Holds 100 x 1.5/2.0 ml tubes
    - 14.2 x 14.2 x 5.5 cm (W x D x H)
    - Set of 5 multicolored racks
- 166-0482EDU \$72.00**



- 96-Place PCR-Tube Rack and Cover**
    - Holds 96 tubes
    - Set of 5 multicolored racks
- TRC-0501EDU \$30.40**

### New Heating Blocks



- Optional heating blocks for 0.5, 2.0, and 15 ml tubes
- 166-0565EDU \$92.00**  
(fits 24 x 0.5 ml tubes)
  - 166-0566EDU 92.00**  
(fits 24 x 2.0 ml tubes)
  - 166-0567EDU 92.00**  
(fits 12 x 15 ml tubes)



- Digital Dry Bath**

This digitally controlled dry bath is perfect for a multitude of laboratory procedures where incubation of samples is needed.

    - Accurate microprocessor control with digital display
    - Easy user calibration
    - Includes 24 x 1.5 ml heating block
- 166-0562EDU \$438.00**

### Three Blocks for \$184 Offer



- Purchase all three heating blocks for 0.5, 2.0, and 15 ml tubes for the price of two — **a \$92 value!**
- Promotional Price  
**166-0570EDU \$184**
- Must reference quote #12-Q10842. Limit one per customer. Offer cannot be combined with other promotional offers. Promotional offer expires August 31, 2012.*



- Digital Dry Bath with All Four Heating Blocks**

Includes digital dry bath and 0.5, 1.5, 2.0, and 15 ml heating blocks.
- 166-0571EDU \$675.00**



- T100™ Thermal Cycler**

Touch screen with graphical programming features USB compatibility and convenient 96-well x 0.2 ml capacity.

    - Thermal gradient function
    - Fast ramping rate
    - 15–100 µl reaction volumes
- 186-1096EDU \$3,750.00**



- MiniOpticon™ Two-Color Real-Time PCR Detection System**

Compact system, precise thermal control, temperature gradient capability, performs applications including quantitative real-time PCR, relative gene expression analysis, and allelic discrimination.

    - 48-well plate or 6 x 8-tube strips
    - 10–100 µl sample volumes
- CFB-3120EDU \$15,196.00**

Coomassie is a trademark of BASF Aktiengesellschaft.

Notice regarding Bio-Rad thermal cyclers and real-time systems: Purchase of this instrument conveys a limited non-transferable immunity from suit for the purchaser's own internal research and development and for use in human in vitro diagnostics and all other applied fields under U.S. Patent Number 5,475,610 (Claims 1, 44, 158, 160–163, and 167 only), or corresponding claims in its non-U.S. counterpart, owned by Applera Corporation. No right is conveyed expressly, by implication, or by estoppel under any other patent claim, such as claims to apparatus, reagents, kits, or methods such as 5' nuclease methods. Further information on purchasing licenses may be obtained by contacting the Director of Licensing, Applied Biosystems, 850 Lincoln Centre Drive, Foster City, California 94404, USA.

Bio-Rad's real-time thermal cyclers are licensed real-time thermal cyclers under Applera's U.S. Patent Number 6,814,934 B1 for use in research, human in vitro diagnostics, and all other fields except veterinary diagnostics.

Bio-Rad's thermal cyclers and real-time thermal cyclers are covered by one or more of the following U.S. patents or their foreign counterparts owned by Eppendorf AG: U.S. Patent Numbers 6,767,512 and 7,074,367.

# 20-40% Off



New Free  
Catalog!  
(see page 11)



- Mini Centrifuge** (2,000 x g)  
Includes microtube and PCR strip tube rotors and 0.4 ml and 0.5 ml tube adaptors; max. speed 6,000 rpm.

**166-0603EDU \$299.00**



- Mini Incubation Oven** (0.5 cu ft)  
Compact oven is thermostatically controlled with access port for running temperature controlled experiments with mixing devices.

**166-0501EDU \$375.00**



- Model 16K** (16,000 x g)  
**Microcentrifuge**

- 1.5 ml or 2.0 ml tubes
- Max. speed 14,000 rpm

**166-0602EDU \$1,900.00**



- Mini Rocker**  
Compact design allows it to fit inside our mini incubation oven.

- Designed for processing blots and staining gels
- Optimal fixed speed and tilt
- 3-D motion

**166-0710EDU \$399.00**

Adaptor sold separately

- PCR Tube Adaptor**  
(for #166-0602EDU)  
Holds 16 individual 0.2 ml tubes.

**166-0620EDU \$105.00**



- BR-2000 Vortexer**  
General-purpose vortex mixer.

**166-0610EDU \$275.00**



- Tube Roller**  
Compact design allows it to fit inside our mini incubation oven.

- Horizontal and vertical motions
- Noiseless operation
- Coldroom compatible
- Dual format rotisseries
- 3 interchangeable rotisseries

**166-0711EDU \$465.00**

Adaptor sold separately

- Flathead Dimpled Adaptor**  
(for #166-0610EDU)

**166-0622EDU \$45.00**

## Discount EDU prices. Get free quotes.

Or, set up a  
Bio-Rad account today!

Use your Visa, MasterCard,  
or American Express card.



Prices shown reflect our education discount and are limited to qualified educational institutions and educators only and are subject to change. All promotional items must be included on your order form with special pricing indicated. Offers cannot be combined with other offers. Promotional offers expire August 31, 2012.

Email: Send your request for a price quote to [lsg.quotes.us@bio-rad.com](mailto:lsg.quotes.us@bio-rad.com).

Phone: 1-800-424-6723 x6757. Always include catalog numbers, your name, address, and phone and fax numbers. (Quote requests may also be left on voice mail.)

# explorer.bio-rad.com

For more laboratory equipment or for immediate information, call 1-800-424-6723.



EN-61010 safety  
compliant

- PowerPac™ Basic Power Supply**

Constant voltage or current output, real-time monitoring, and pause/resume features.

- Runs 4 cells simultaneously
- 400 mA maximum current
- 10-300 V in 1 V steps
- Timer controlled
- Fully programmable

**164-5050EDU \$316.00**



- Mini-PROTEAN® Tetra Cell**

For 1-D vertical gel electrophoresis.

- Runs 1-4 mini gels
- Easy assembly
- Leak-free electrophoresis
- Run precast or handcast gels

**165-8004EDU \$437.60**

(4-gel system, for Bio-Rad precast gels)

**165-8005EDU 334.40**

(2-gel system, for Bio-Rad precast gels)



- DNA Electrophoresis Systems**

**Mini-Sub® Cell GT Cell**

Includes 7 x 10 cm gel tray and two 8-well combs.

**166-4000EDU \$235.00**

**Mini ReadySub-Cell™ GT Cell**

For ReadyAgarose precast gels.

**170-4487EDU 216.80**



- Mini Trans-Blot® Module**

Includes 2 gel holder cassettes, 4 fiber pads, modular electrode assembly, blue cooling unit only (no tank or lid).

**170-3935EDU \$339.20**

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Permit No. 365



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Hercules, CA 94547

**Address service requested**



**SmartSpec Plus Spectrophotometer**



**Biofuel Enzyme Kit**

**Purchase a SmartSpec™ Plus Spectrophotometer and Get a Free Biofuel Enzyme Kit — a \$127 Savings**

The **SmartSpec Plus spectrophotometer** has more features and functionality than many other benchtop spectrophotometers. Combining performance and stability at an affordable price, it is perfect for running protein assays, quantitating DNA, and monitoring cell culture growth.

**Features**

- Built-in printer
- Long-life xenon flash lamp
- User interface with six different languages
- Easy-to-use, menu-driven operation
- Compact, space-saving design
- Performs assays from 200 to 800 nm
- Scans wavelengths for spectral analysis
- Constructs and saves standard curves
- Performs simple kinetic assays

Description	Catalog #	EDU Price
<b>SmartSpec Plus Spectrophotometer</b>	170-2525EDU	\$4,508.00
<b>Biofuel Enzyme Kit</b> (see page 16 for kit information)	166-5035EDU	127.00
	<b>Save \$127.00</b>	<del><b>4,635.00</b></del>
		<b>4,508.00</b>

**Must reference quote #12-Q10181. For the free Biofuel Enzyme Kit, you must include the catalog number as a separate item on your order. Promotion cannot be combined with other offers. Limit one per customer. Offer expires August 31, 2012.**



**For a free catalog or to order, call 1-800-424-6723.** Use your Visa, MasterCard, or American Express card. Discounts and specials may not be combined with other promotional offers. Limited-time offers expire August 31, 2012.