Biotechnology

DNA Extraction & Quantitation

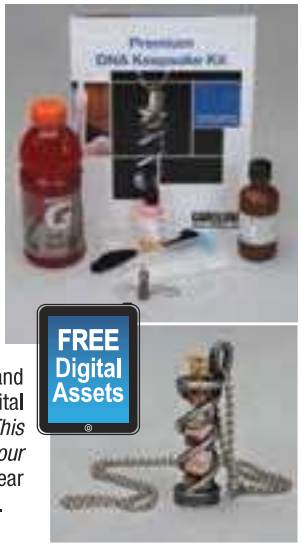
Introduce students to DNA as more than an abstract concept!

- Simple procedure can be completed in 1 class period
- Students make a necklace using their own DNA
- Middle school through college level
- Engaging and economical

DNA Keepsake Kit

The DNA Keepsake, an expression of life's eternal molecule

211762 DNA Keepsake 1-Station Kit



Beginning—Easy to perform; requires little or no prior knowledge.

How often do you engage your students by helping them create something truly unique and personal? Take them on a journey of self-discovery in the molecular world with this kit. It uses safe, simple materials that enable students to extract their own DNA—and have it appear right before their eyes! Transfer the DNA to the glass vial, and together with the beautiful pewter double helix pendant, it becomes a piece of jewelry—and more. It's also an expression of an individual's personal genetic makeup for all to appreciate. Foster your students' curiosity and wonder with this one-of-a-kind experience. The **1-Station Kit** includes enough materials to create 1 DNA Keepsake; the **12-Station Kit**, 12 DNA Keepsakes; and the **24-Station Kit**, 24 DNA Keepsakes. All kits provide 1-yr access to digital resources; visit Carolina.com for complete lists of kit materials. **Note:** *This kit requires students to use samples of their own saliva. Please check your school's policy regarding the use of bodily fluids in the classroom.* FREE 1-year access to digital resources that support 3-dimensional instruction included.

⚠²	**211762**	1-Station Kit	Each	**$27.00**
⚠²	**211763**	12-Station Kit	Each	**$128.00**
⚠²	**211764**	24-Station Kit	Each	**$175.00**

DNA Necklace Kit

Beginning—Easy to perform; requires little or no prior knowledge.

This fun and fascinating lab activity not only shows students how to isolate human genomic DNA, it lets them create DNA necklaces they can actually wear. Students extract their DNA by lysing their cheek cell sample, then watch as wispy white strands of their own DNA precipitate out of a solution containing ethanol. After transferring their DNA to plastic microcentrifuge tubes, students fashion the tubes into DNA pendant necklaces using colorful string. This is one easy lab activity that really gets your students talking about DNA and science! **Demonstration Kit** includes enough materials for 1 student. **Classroom Kit** includes enough materials for 32 students. Visit Carolina.com for complete lists of kit materials. **Note:** *This kit requires students to use samples of their own saliva. Please check your school's policy regarding the use of bodily fluids in the classroom.* FREE 1-year access to digital resources that support 3-dimensional instruction included.

211138 DNA Necklace Classroom Kit

⚠²	**211138**	Classroom Kit	Each	**$59.99**
⚠²	**211134**	Demonstration Kit	Each	**$23.99**

Teacher Testimonial

"I like the DNA Necklace Kit because it gets my students to understand DNA. The kit changes the perception of my students about DNA, in that it shows them that DNA is not an abstract model, but something tangible and something they can actually collect and separate from other parts of the cell. Besides, they think it's cool that they get to extract their own DNA."

Andrew Uy
Science Teacher
Loyola High School
Los Angeles, CA

Customer Review

"I do this lab with my 7th graders each year, and it's their favorite. It's best if you have 90 minutes or longer so that the students can thoroughly observe each step. It's also good for them to have something else to work on during the waiting."

Middle School Science Teacher

DNA extraction using cheek cells from 211134 DNA Necklace Demonstration Kit

Teacher's Choice | Carolina Exclusive | More Information Available Online

⚠² California Proposition 65
⚠ WARNING: Reproductive Harm – www.P65Warnings.ca.gov

171093 Biotechnology Kit: DNA Extraction of *E. coli*

Biotechnology Kit: DNA Extraction of E. coli

Excellent for all levels of teaching. Demonstrates the DNA extraction process with freeze-dried *E. coli* cells. Cell walls are broken with a detergent, and the DNA is extracted onto a spooling rod. Allows students to visualize DNA and understand some of its properties. Also illustrates the enormous length and acidic nature of the DNA molecule. **Kit** is for a class of 30 students or 6 separate teacher demonstrations. **Kit Refill** contains the perishable materials needed to rerun the kit. A hot water bath, test tubes, and 95% alcohol are needed but not included. Requires 1 to 2 class periods to complete. With instructions.

Kit includes:
- Freeze-Dried *E. coli* in Spooling Tubes
- Bacterial Suspension Solution
- Alkaline pH Indicator (concentrated)
- Measuring Cups
- Pipets
- Detergent Solution
- Spooling Rods
- DNA Suspension Solution

171093 Kit Each **$154.45**
171094 Kit Refill Each **$105.00**

Universal DNA Extraction Reagent System

- No hazardous solvents used
- Instructions included
- Reagents are stable for 1 year when stored as directed

Complete reagent system for extracting DNA from *E. coli*, Wisconsin Fast Plants® specimens, or *Drosophila*. Supplies enough reagents for 20 *E. coli* DNA extractions, 10 four-cotyledon plant DNA extractions, or 60 single-fly DNA preps. **Note:** *Order organisms separately.*

System includes:
- Cell Lysis Solution
- Protein Precipitation Solution
- DNA Hydration Solution and RNase
- Instructions

Needed but not included:
- Micropipettors
- Water Bath (80° C)
- Microcentrifuge
- Pellet Pestles (item #215828; for plant or *Drosophila* preparations)

211315 Per system **$36.00**

Use your own DNA to study population genetics and evolution with our PCR kits! See them on pages 268–272.

154704 Carolina Plant Biotechnology: DNA Extraction Kit

Carolina® Plant Biotechnology: DNA Extraction Kit

Intermediate—Easy to perform; requires some basic training in microbiology.

Extract DNA from wheat germ! No waiting or taking turns! Designed so a class of 30 students can perform the experiment simultaneously. Wheat germ is ground, the cells are lysed, and cellular contents are released. Extracellular protein is digested by enzyme treatment and heating. The DNA is then spooled on a stirring rod. A hot plate and 70 to 95% alcohol are needed but not included. The **Refill** contains the perishable materials needed to rerun the experiment.

154704 Kit Each **$105.00**
154692 Refill Each **$48.65**

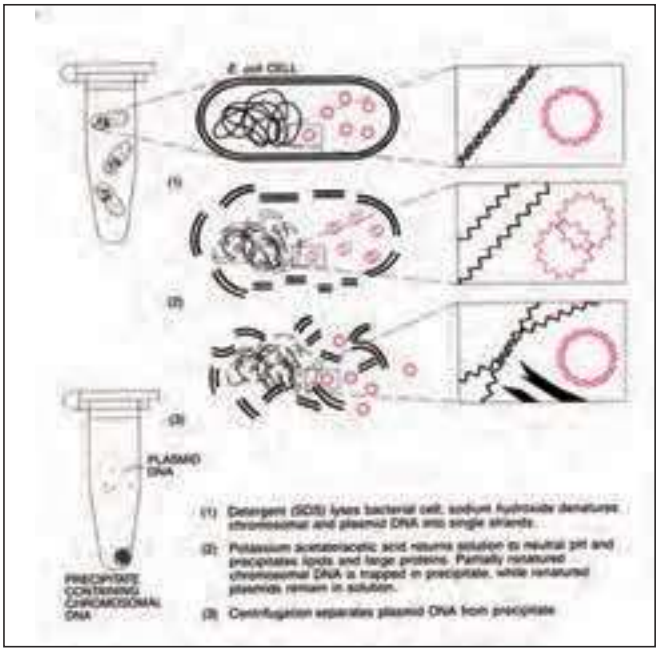


Illustration demonstrating the 211310 Plasmid DNA Isolation Reagent System

Plasmid DNA Isolation Reagent System ⚠²

Contains all reagents needed to purify plasmid DNA from *E. coli* cells using the "mini prep" procedure. Sufficient for at least 40 individual preparations.

System includes:
- 5 mL Tris-EDTA (TE) Solution
- 25 mL Potassium Acetate Solution
- 25 mL Glucose-Tris-EDTA (GTE) Solution
- 5 mL Sodium Hydroxide Solution (4 N)
- 10 mL Sodium Dodecyl Sulfate (10%)
- 50 mL Isopropanol
- 25 mL Ethanol (95%)
- Instructions

211310 Per system **$72.00**

DNA Extraction & Quantitation

Strawberry DNA Extraction Kit ⚠²

Beginning—Easy to perform; requires little or no prior knowledge.

- Transforms the abstract concept of DNA into something concrete
- Easy to use and safe enough for young students; interesting and informative enough for older students
- Comprehensive manual makes lesson planning easy

Grade 5 and up. This kit meets many of the National Science Education Standards in life science. Students may never look at strawberries the same again! This exciting activity is ideal for introducing students to the fascinating world of DNA. Using a technique similar to the one used by scientists, students work in pairs to extract DNA from strawberry fruit and examine it. They also review plant cell structure, and learn cell wall and cell membrane composition. Kit includes plastic tubes, plastic bags, funnels, ethanol, detergent, pipets, cheesecloth, sodium chloride, and wooden sticks. Also includes a comprehensive teacher's manual with reproducible student worksheets, background information, lesson instructions, follow-up activities, and a glossary. Strawberries are not included. Designed for 32 students.

211338 Per kit **$69.95**

211133 Onion DNA Extraction Kit

Onion DNA Extraction Kit

Beginning—Easy to perform; requires little or no prior knowledge.

- Makes the abstract concept of DNA concrete
- Simple procedure
- DVD demonstrating procedure and setup is helpful for the first-time user

A simple procedure for extracting DNA from onions. Kit contains instructions and materials for 15 extractions.

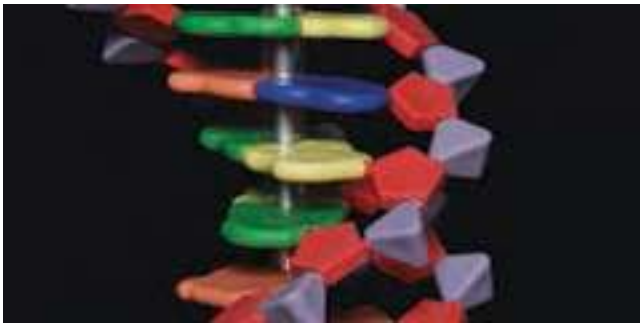
211133 Per kit **$50.00**

Developed in cooperation with the DNA Learning Center of Cold Spring Harbor Laboratory.

Experience the Carolina Digital Advantage

Many Carolina kits now include FREE 1-year access to digital resources on CarolinaScienceOnline.com:

- Teacher's manuals
- Downloadable, printable student materials
- Interactive lessons, videos, simulations, and animations



Make your DNA lessons more visual. See our collection of DNA models starting on page 288.

⚠² California Proposition 65
⚠ **WARNING:** Reproductive Harm – www.P65Warnings.ca.gov

Transformation

211082 Green Gene Colony Transformation 8-Station Kit (in use)

Gene to Protein: Green Fluorescent Protein Necklace Kit

Illuminate the dark corners of your students' curiosity by teaching them about proteins. This simple classroom exercise enables students to isolate the green fluorescent protein (GFP) found in jellyfish, while teaching them about recombinant proteins and genetic engineering. After students isolate the GFP, they expose their samples to ultraviolet (UV) or blue LED light and watch them glow. Students then create necklaces with their glowing GFP and wear them proudly. With this beginner's activity, you can show your students that protein science can be approachable and engaging, but not overwhelming. Kit materials equip 32 students and include teacher's manual, student guide, and digital resources. Visit Carolina.com for complete lists of kit materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials.* FREE 1-year access to digital resources that support 3-dimensional instruction included.

211555P Gene to Protein: Green Fluorescent Protein Necklace Kit (with perishables)

	211555	Kit (with prepaid coupon)	Each	**$69.95**
	211555P	Kit (with perishables)	Each	**$69.95**
New!	**211902**	Carolina UV LED Flashlight	Each	**$25.00**

Green Gene Colony Transformation Kit

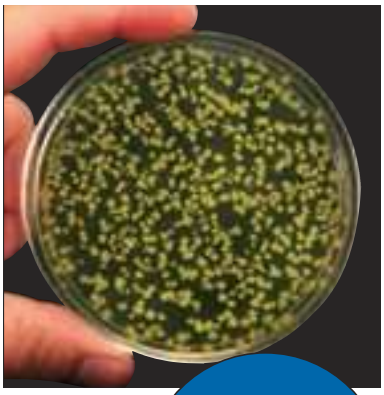
An eye-catching example of the genetic basis of inheritance

DNA KITS LEARNING CENTER

Intermediate—Easy to perform; requires some background knowledge.

- Green color is clearly visible in normal classroom light
- No UV lighting needed
- Pre-aliquoted and prepared reagents minimize teacher prep time

Open your students' eyes to the genetic basis of inheritance with this simple lab. Developed in cooperation with the DNA Learning Center, this kit clearly demonstrates the induced uptake of a jellyfish gene by *E. coli*. Students observe the phenotypic effect of adding the gene for GFP (green fluorescent protein). GFP is expressed on plain LB—no color development substrate or induction reagent is needed. Your students can easily view the "green" effects in normal classroom lighting. Colonies will fluoresce under UV light. The plasmid containing the GFP gene also contains an ampicillin resistance gene, so ampicillin can be used to select for transformants. Lab procedure is easy to follow. Visit Carolina.com for complete lists of kit materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials.*



Revised! Now with more transformed colonies!

	211080	Teacher Demonstration Kit (with prepaid coupon)	Each	**$66.00**
	211080P	Teacher Demonstration Kit (with perishables)	Each	**$66.00**
	211080C	Teacher Demonstration Kit Perishables Refill	Each	**$29.00**
	211081	4-Station Kit (with prepaid coupon)	Each	**$84.50**
	211081P	4-Station Kit (with perishables)	Each	**$84.50**
	211082	8-Station Kit (with prepaid coupon)	Each	**$134.00**
	211082P	8-Station Kit (with perishables)	Each	**$134.00**
	211082C	4- and 8-Station Kit Perishables Refill	Each	**$31.50**
	211085	How-To DVD	Each	**$20.00**
New!	**211902**	Carolina UV LED Flashlight	Each	**$25.00**

211902 Carolina UV LED Flashlight

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Customer Review

"Doing research, I have run many transformation experiments—used many kits—had many failures. The kit provided by Carolina is easy for students to follow and they always obtain appropriate results. The kit is sensitive enough that they need to complete the steps in order; however, it allows for small errors that produce usable results. I have been very pleased with the Carolina kit!"

High School Biology Teacher

To purchase glass beads separately, see page 320.

Transformation • Carolina Exclusive

Purification of Green Fluorescent Protein Kits

Teach your students how to purify a green fluorescent jellyfish protein produced in *E. coli!*

Intermediate/Advanced—Modules 1 and 2 require some background knowledge. Module 3 is for more experienced classes and requires some technical skill.

These kits are great for teaching:

- The molecular basis of heredity
- The relationship between genes and proteins
- How *E. coli* is used to engineer proteins useful in medicine and manufacturing
- Three techniques—transformation, protein purification, and protein gel electrophoresis—commonly used in biological research and its areas of application

The lab is set up in 3 modules that can be purchased separately and used in conjunction with one another.

Module 1, the Green Gene Colony Transformation Kit, is necessary for creating the GFP-expressing bacteria used in the protein purification exercise in Module 2.

Module 2 contains all the reagents and instructions necessary for purifying GFP from *E. coli*.

Module 3 contains the acrylamide gels and other electrophoresis reagents necessary for electrophoretic analysis of the purified GFP. The 3rd module is optional but greatly enhances the teaching value of the lab.

Visit Carolina.com for complete lists of kit materials. **Note:** *Order each module with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return each coupon to request delivery of perishable materials. Refrigerate Module 3's polyacrylamide gels and protein marker until use.*

Microcentrifuge tubes containing purified green fluorescent protein (GFP)

211080	Module 1 (transformation) Teacher Demonstration Kit (with prepaid coupon)	Each	**$66.00**
211080P	Module 1 (transformation) Teacher Demonstration Kit (with perishables)	Each	**$66.00**
211082	Module 1 (transformation) 8-Station Kit (with prepaid coupon)	Each	**$134.00**
211082P	Module 1 (transformation) 8-Station Kit (with perishables)	Each	**$134.00**
211072	Module 2 (purification) 8-Station Kit (with prepaid coupon)	Each	**$58.00**
211072P	Module 2 (purification) 8-Station Kit (with perishables)	Each	**$58.00**
211073	Module 3 (electrophoresis) 8-Station Kit (with prepaid coupon)	Each	**$112.00**
211073P	Module 3 (electrophoresis) 8-Station Kit (with perishables)	Each	**$112.00**
New! **211902**	Carolina UV LED Flashlight	Each	**$25.00**

211082 Purification of Green Fluorescent Protein 8-Station Kit (in use)

211082 Purification of Green Fluorescent Protein 8-Station Kit

Carolina Teacher Tips

Cold Storage Recommendations

- **Ampicillin** will remain active for 1 month if refrigerated and for 6 to 12 months if frozen.
- ***E. coli*** should be refrigerated and used within 2 to 4 weeks of receipt.
- **Plasmid** can be refrigerated for 1 year and frozen for even longer.
- **Polyacrylamide gels** and **protein marker** should be refrigerated.

Developed in cooperation with the DNA Learning Center of Cold Spring Harbor Laboratory.

Colony Transformation Kit

Intermediate—Easy to perform; requires some background knowledge.

- No liquid culturing
- Minimal teacher preparation

These kits demonstrate the induced uptake and expression of foreign DNA by a living cell. Students observe the phenotypic effect of adding new DNA sequences to living bacteria. *E. coli* cells that take up an antibiotic-resistance gene gain the ability to grow in the presence of ampicillin. Requires preparation 2 days prior to lab. **Note:** *Order the kit with the perishable materials (all ◊ items) included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials.*

Teacher Demonstration Kit and 4- and 8-Station Kits include:
E. coli◊
Plasmid DNA Solution◊
Transformation Buffer and Luria Broth
Ready-to-Pour Plates
(Demonstration Kit contains prepoured plates◊)
Ampicillin◊
Spreading Beads and Sterile Tubes
Pipets and Transfer Loops
Teacher's Manual with Student Masters

Teacher Demonstration Kit Perishables Refill includes:
E. coli◊
Plasmid DNA Solution◊
Prepoured Plates◊

4- and 8-Station Kit Perishables Refills include:
E. coli◊
Plasmid DNA Solution◊
Ampicillin◊

211140	Teacher Demonstration Kit (with prepaid coupon)	Each	**$68.00**
211140P	Teacher Demonstration Kit (with perishables)	Each	**$68.00**
211140C	Teacher Demonstration Kit Perishables Refill	Each	**$31.00**
211141	4-Station Kit (with prepaid coupon)	Each	**$87.00**
211141P	4-Station Kit (with perishables)	Each	**$87.00**
211142	8-Station Kit (with prepaid coupon)	Each	**$128.00**
211142P	8-Station Kit (with perishables)	Each	**$128.00**
211142B	4- and 8-Station Kit Perishables Refill	Each	**$32.00**

211142P Colony Transformation 8-Station Kit (with perishables)

Our melt-and-pour agarose and pre-aliquoted reagents save you time!

pBLU® Colony Transformation Kit

Thanks to the dramatic color change and ampicillin, students clearly see the results of introducing new genes into live bacteria

Intermediate—Easy to perform; requires some background knowledge.

- Suitable for use in freshman biotechnology
- Great for teaching the molecular basis of inheritance
- Simple, straightforward procedure
- Pre-aliquoted and prepared reagents minimize teacher prep time

Transformation is a great way to demonstrate to students the genetic basis of phenotype and inheritance!

Students use specially developed pBLU® plasmid in a colony transformation procedure to observe the phenotypic effect of inserting new genes into living bacteria. An ampicillin-sensitive strain of *E. coli*, incapable of producing β-galactosidase for lactose breakdown, is induced to take up pBLU® plasmid DNA. This plasmid contains genes for both ampicillin resistance and β-galactosidase production. The transformed cells are plated on (1) medium containing ampicillin, and (2) medium containing ampicillin and X-gal. (X-gal is a histochemical substrate that, when cleaved by β-galactosidase, forms a blue product.) Transformants appear as white colonies on the ampicillin medium and as blue colonies on the ampicillin/X-gal medium. The transformed colonies' phenotype is *lac*$^+$ and amp^r. **Note:** *Order the kit with the perishable materials included (all ◊ items) or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials.*

Teacher Demonstration Kit and 4- and 8-Station Kits include:
E. coli◊
pBLU® Plasmid◊
Transformation Buffer and Luria Broth
Ready-to-Pour Plates (Demonstration Kit contains prepoured plates◊)
Ampicillin◊
Prepared Ampicillin/X-gal Solution◊
Spreading Beads and Sterile Tubes
Pipets and Transfer Loops
Teacher's Manual with Student Masters

4- and 8-Station Perishables Refills include:
E. coli◊
Plasmid DNA Solution◊
Ampicillin◊
Prepared Ampicillin/X-gal Solution◊

211145X	Teacher Demonstration Kit (with prepaid coupon)	Each	**$79.00**
211145XP	Teacher Demonstration Kit (with perishables)	Each	**$79.00**
211145Y	4-Station Kit (with prepaid coupon)	Each	**$102.00**
211145YP	4-Station Kit (with perishables)	Each	**$102.00**
211146	8-Station Kit (with prepaid coupon)	Each	**$137.00**
211146P	8-Station Kit (with perishables)	Each	**$137.00**
211146A	4- and 8-Station Kit Perishables Refill	Each	**$56.00**

211146P pBLU Colony Transformation 8-Station Kit (with perishables)

Customer Review

"I strongly recommend that you use the pBLU® transformation for AP® Bio Lab 6A, as students are immediately able to determine which colonies have expressed the new genes (the blue color is quite visible). Even with less than perfect lab technique, over the last 7 years at least 85% of my lab groups have achieved expression of both new genes for ampicillin resistance and β-galactosidase."

High School Biology Teacher

Assorted GloFish Fluorescent Zebra Fish

GloFish® Fluorescent Zebra Fish

Bring a living example of genetic engineering into your classroom

With their illuminating appearance (from a borrowed sea coral gene), fluorescent zebra fish bring wonder and excitement to your classroom, office, or home freshwater aquarium. Originally bred for detecting environmental pollutants in waterways, GloFish® fluorescent fish are completely safe. The fun, attractive, brightly colored fish are also excellent classroom organisms for introducing topics such as genetic modification, fitness effects, ethics, environmental science, and many others. GloFish® Assortments come in sets of 4 or 6. Colors as available. **Note:** *GloFish® fluorescent fish are licensed under 1 or more United States patents. Reproduction (breeding) of GloFish® is permitted only for educational use by teachers and students in bona fide educational institutions; however, any sale, barter, or trade of the offspring from such reproduction is strictly prohibited.*

145251	Starfire Red®	Pack of 4	**$29.95**
145253	Sunburst Orange®	Pack of 4	**$29.95**
145255	Electric Green®	Pack of 4	**$29.95**
145264	Cosmic Blue®	Pack of 4	**$29.95**
145265	Galactic Purple®	Pack of 4	**$29.95**
145266	GloFish® Assortment	Set of 4	**$29.95**
145257	GloFish® Assortment	Set of 6	**$43.50**

See our full line of GloFish® products beginning on page 171.

Bacterial Strains

Cultures should be used within 1 month, but are best used within 2 weeks of delivery. Store at +4° C.

MM294

An *E. coli* strain isolated in the laboratory of Matthew Meselson. MM294 gives superior yields of plasmid DNA in mini-preparations. Wild-type phenotype. Contains no plasmids.

211530	Slant Culture	Each	**$13.50**
211531	Streaked Plate	Each	**$15.50**

MM294/pAMP

Ampicillin-resistant phenotype. Contains plasmid pAMP. Slant culture.

211540 Each **$13.50**

β-galactosidase-deficient E. coli

For use in pBLU® transformation experiments. This is a mutant *E. coli* strain incapable of producing β-galactosidase, which is necessary for the breakdown of lactose or X-gal, a lactose analog. When these bacteria are transformed with pBLU®, they will break down X-gal (and lactose) and this results in blue colonies. Slant culture.

211561 Each **$13.50**

211561 β-galactosidase-deficient *E. coli*

Competent E. coli Cells

Invitrogen. Add plasmid using simple heat-shock protocol and plate on Luria broth agar plus appropriate selection antibiotic. Plan to use cells within 2 weeks of their arrival. Order at least 2 weeks before needed. 1 mL. **Note:** ***Should not be shipped over a weekend.*** *Carolina recommends that you request your order to arrive on a Wednesday, Thursday, or Friday (or even a Saturday) to avoid weekend shipping. Competent cells must be stored at –70° C for any prolonged period of time.*

211600 Each **$95.00**

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DNA KITS LEARNING CENTER Glow-in-the-Dark Transformation Kit

Intermediate—Easy to perform; requires some background knowledge.

- No special equipment is needed to view the bioluminescence
- Requires no liquid culturing
- Minimal teacher preparation

Bacteria that produce light are very common in the ocean. One luminescent bacterium is *Vibrio fischeri*. The group of genes involved in the production of light (also known as the *lux* genes) has been removed from *V. fischeri* and placed in a plasmid, pVIB. Bacterial transformation is used to transfer the pVIB plasmid into *E. coli*. After *E. coli* takes up the plasmid, it glows in the dark. The transformed colonies are also ampicillin resistant. **Note:** *Bacteria transformed with the pVIB plasmid must be grown at 30° C or less for the glowing to be seen. Order the kit with the perishable materials (all ◊ items) included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials. Cannot be shipped via USPS.*

Teacher Demonstration Kit and 4- and 8-Station Kits include:

- *E. coli*◊
- Plasmid DNA Solution◊
- Ampicillin◊ (not in Demonstration Kit)
- Ready-to-Pour Plates (Demonstration Kit contains prepoured plates◊)
- Transformation Buffer and Luria Broth
- Spreading Beads and Sterile Tubes
- Pipets and Transfer Loops
- Teacher's Manual with Student Masters

Teacher Demonstration Kit Perishables Refill includes:

- *E. coli*◊
- Plasmid DNA Solution◊
- Prepoured Plates◊

4- and 8-Station Perishables Refills include:

- *E. coli*◊
- Plasmid DNA Solution◊
- Ampicillin◊

211086	Teacher Demonstration Kit (with prepaid coupon)	Each	**$66.00**
211086P	Teacher Demonstration Kit (with perishables)	Each	**$66.00**
211086C	Teacher Demonstration Kit Perishables Refill	Each	**$29.00**
211087	4-Station Kit (with prepaid coupon)	Each	**$84.50**
211087P	4-Station Kit (with perishables)	Each	**$84.50**
211088	8-Station Kit (with prepaid coupon)	Each	**$133.00**
211088P	8-Station Kit (with perishables)	Each	**$133.00**
211088C	4- and 8-Station Kit Perishables Refill	Each	**$31.50**

Customer Review

"A great kit! This is the 4th time I have used it. The directions are clear, it is easy to use, and it always works. And students have something really interesting to look forward to. When the incubation period is over and the petri dish is taken to a dark room, they always exclaim 'wow!' when they see the E. coli *colonies glowing in the dark. Helps motivate them to understand the biological concepts behind transformation."*

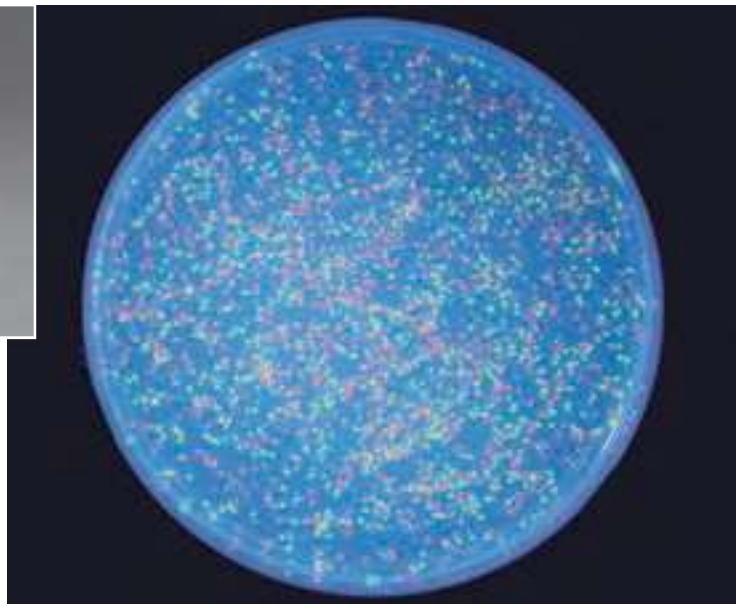
High School Biology Teacher

Experience the Carolina Digital Advantage

Many Carolina kits now include FREE 1-year access to digital resources on CarolinaScienceOnline.com:

- Teacher's manuals
- Downloadable, printable student materials
- Interactive lessons, videos, simulations, and animations

Beyond Transformation



211150P pClone: Exploring Promoters with Synthetic Biology Kit (with perishables) *(above)* and in use *(right)*

pClone: Exploring Promoters with Synthetic Biology Kit

Advanced—For experienced high school and college classes; requires some technical skill.

- Unique introduction to synthetic biology
- Hands-on exploration of the role of promoters in gene regulation
- Takes a traditional transformation lab to the next level

Bring the unique area of synthetic biology into your classroom with this one-of-a-kind kit activity. Your students get the opportunity to take on the role of genetic engineers as they clone promoters into 2 different plasmids. This hands-on approach to transcription regulation exposes your class to a wide array of biological disciplines including biotechnology, molecular biology, and evolutionary biology.

Students clone the promoters into the plasmids, pClone Red and pClone Blue, which are then transformed into *E. coli* cells. Based on the orientation of the promoter, students will observe colonies that appear green (produce GFP), red (produce RFP), or blue (produce AmilCP blue) on their culture plates. The lab becomes quantitative as students use freely available software to determine the level of protein expression in their colonies. Requires thermal cycler that can maintain a temperature of 16° C. Kit includes enough materials for 8 groups of 2 to 4 students. The activities typically take 3 to 6 class periods for completion. Visit **Carolina.com** for a complete list of kit materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of the perishable materials.* FREE 1-year access to digital resources that support 3-dimensional instruction included.

211150	Kit (with prepaid coupon)	Each	**$232.00**
211150P	Kit (with perishables)	Each	**$232.00**

211162P E-Z Gene Splicer DNA Recombination and Transformation Kit (with perishables)

E-Z Gene Splicer DNA Recombination and Transformation Kit

An introduction to cloning

Advanced—For experienced high school and college classes; requires some technical skill.

Developed in cooperation with the DNA Learning Center, this lab features a deceptively simple experiment that shows the key elements of constructing recombinant DNA. Students ligate (join) DNA fragments containing 2 types of antibiotic-resistant genes and insert the recombined DNA into *E. coli* cells using rapid colony transformation. Cells containing recombined DNA molecules are detected by their dual antibiotic resistance. Visit **Carolina.com** for complete lists of kit materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials. Perishables are shipped on gel cold packs. Foreign orders require special handling.*

211162	6-Station Kit (with prepaid coupon)	Each	**$220.00**
211162P	6-Station Kit (with perishables)	Each	**$220.00**
211162C	6-Station Kit Perishables Refill	Each	**$127.00**

See our selection of BioBuilder® kits at Carolina.com for further synthetic biology studies.

Check out our Carolina Investigations® for AP® Biology: Transformation Kit (item #747730) on page 329.

Biotechnology

DNA Transfer & Working with E. coli

211128P Transduction of an Antibiotic-Resistance Gene Kit (with perishables)

Transduction of an Antibiotic-Resistance Gene Kit

Genetic engineering as it occurs in nature!

Intermediate—Easy to perform; requires some background knowledge.

In this easy exercise, students observe a natural method of gene transfer. The harmless bacterial virus T4 transmits an ampicillin-resistance gene to *E. coli*. Students also observe the killing of *E. coli* by the bacteriophage. For more advanced students, a discussion of nonsense mutations and nonsense suppressing mutations is included with the teacher background information. Kit is designed for 16 to 32 students working in groups of 2 or 4 (8 stations). Visit Carolina.com for a complete list of kit materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials.*

211128	Kit (with prepaid coupon)	Each	**$179.00**
211128P	Kit (with perishables)	Each	**$179.00**
211128C	Kit Perishables Refill	Each	**$32.00**

211125P Introductory Bacterial Conjugation Kit (with perishables)

Introductory Bacterial Conjugation Kit

Intermediate—Easy to perform; requires some background knowledge.

Developed in cooperation with Dr. Robert Thomson, formerly of Marquette University. Useful for teaching bacterial identification and the intercellular transfer of genes for antibiotic resistance between microorganisms. Students identify and confirm the identity of bacteria with different antibiotic resistance by streaking on different antibiotic selective media. Strains are then combined on a "mating" plate to allow conjugation. Results are tested on various media for growth response to demonstrate that DNA can be transferred between 2 genetically different cells. Requires an overnight culture and minimal teacher preparation. Kit is designed for 16 to 32 students working in groups of 2 or 4 (8 stations). Visit Carolina.com for a complete list of kit materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials. Antibiotic solutions and cultures last 1 month when refrigerated.*

⚠²	**211125**	Kit (with prepaid coupon)	Each	**$114.95**
⚠²	**211125P**	Kit (with perishables)	Each	**$114.95**
⚠²	**211125A**	Kit Perishables Refill	Each	**$39.00**

211127P Advanced Bacterial Conjugation Kit (with perishables)

Advanced Bacterial Conjugation Kit

Intermediate—Easy to perform; requires some background knowledge.

- Designed for 16 to 32 students (8 stations)
- Requires overnight bacterial culture
- Minimal teacher preparation
- Inquiry-based learning

Teach your students about gene transfer between bacterial strains. In 1 of the included strains of *E. coli*, the gene for antibiotic resistance for streptomycin is located on the chromosome. In the other, the gene for antibiotic resistance for ampicillin occurs as extrachromosomal plasmid DNA. Through the process of streaking the conjugated bacteria on 4 different types of antibiotic selective media, students determine which bacterial strain is the donor strain. Visit Carolina.com for a complete list of kit materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials. Antibiotic solutions and cultures last 1 month when refrigerated.*

⚠²	**211127**	Kit (with prepaid coupon)	Each	**$127.00**
⚠²	**211127P**	Kit (with perishables)	Each	**$127.00**
⚠²	**211127C**	Kit Perishables Refill	Each	**$39.00**

⚠² California Proposition 65
⚠ **WARNING:** Reproductive Harm – www.P65Warnings.ca.gov

171015P Genetic Construction Kit (with perishables)

Genetic Construction Kit

A safe classroom exercise in which students produce a new strain of viable bacteria. The genetic manipulation conducted is similar to more complex procedures common in modern genetic engineering. Through bacterial conjugation, substituted sex factors (F plasmids bearing *lac* operon genes) are transferred to a background genome expressing antibiotic resistance. Indicator and selective agar media are used to identify and isolate the hybrid cells. As part of the lab, cultures will require incubation. Heterogenotic bacteria constructed in this exercise can be tested by the procedure outlined in item #171027 Carolina BioKits®: Introduction to Gene Regulation: The *lac* Operon. Designed for 6 teams of students. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials. Prior to lab, keep bacteria cultures at room temperature; do not incubate or refrigerate.*

171015 Kit (with prepaid coupon) Each **$150.65**
171015P Kit (with perishables) Each **$150.65**

821042 Introduction to Sterile Technique Kit

Introduction to Sterile Technique Kit

Allow your students to practice important sterile lab skills for studying microorganisms. Students perform 2 sterile exercises: the transfer of sterile nutrient broth to a culture tube and the transfer of sterile nutrient broth from a culture tube onto a nutrient agar plate. Students must be able to perform both of these exercises without introducing unwanted microorganisms and understand the use of a positive control. Kit includes materials sufficient for 10 groups of 3 students. Visit Carolina.com for complete lists of kit materials.

821042 Per kit **$78.80**

821042 Introduction to Sterile Technique Kit (in use)

Design your own lab experiment using organisms from our selection of over 100 bacterial cultures, which begins on page 34.

Experience the Carolina Digital Advantage

Many Carolina kits now include FREE 1-year access to digital resources on CarolinaScienceOnline.com:

- Teacher's manuals
- Downloadable, printable student materials
- Interactive lessons, videos, simulations, and animations

Electrophoresis

Exploring Electrophoresis Series—an economical way to do electrophoresis!

Economical

Kits in this series contain everything needed to run a gel electrophoresis lab for a whole class—just add water and batteries.* Kits and reagents can be shipped and stored for short periods at room temperature.**

Durable and Reusable

Gel electrophoresis apparatus can be reused with the refill for the same kit or with one of the other refill kits in the series. Replacement parts are also available.

Simple

Clear, beautifully illustrated instructions make electrophoresis fun and easy.

Safe

Electrophoresis chambers are run at low voltage. Carbon fiber electrodes are biodegradable.

Each classroom kit in the series contains:

- Five battery-powered gel chambers
- Combs (4 or 6 well), carbon-fiber electrodes, and leads
- Pipetting devices
- Agarose and buffer
- DNA or dye samples
- Enzymes where necessary
- Easy-to-follow instructions

*Carolina® Electrophoresis Power Supply (item #213674), specifically designed for use with these gel chambers, is also available.
**The DNA in Nature's Dice—A Genetic Screening Simulation Kit has some items that are shipped on ice packs.

Students working with 211014 Exploring Electrophoresis and Forensics Classroom Kit

Room Temp. DNA Storage

Room Temperature Storage DNA

Kits displaying this icon include DNA formulated to be stable at room temperature for a limited period of time. RTS DNA saves you money since the kit does not include heavy ice packs or require overnight shipping. If you plan on using the RTS DNA in less than 6 weeks, you can store it at room temperature. However, for storage longer than 6 weeks, RTS DNA should be refrigerated or frozen.

Gel from 211000 Exploring Electrophoresis of Dyes Demonstration Kit

Exploring Electrophoresis of Dyes Kit

Intermediate—Easy to perform; requires some background knowledge.

Students separate mixtures of colorful dyes and identify the components by comparing them to standards. Effectively demonstrates the principles of electrophoresis. Gels can be run in 35 minutes with five 9-V batteries or in 50 minutes with 3 batteries.

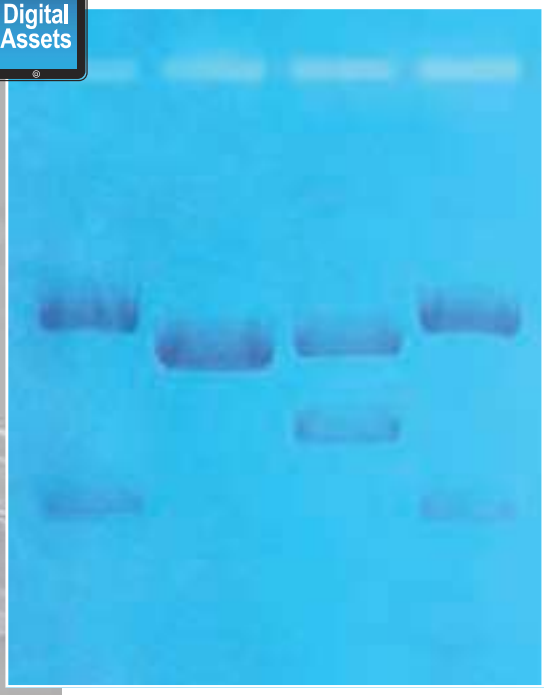
The **Demonstration Kit** contains instructions, 1 set of apparatus (with 6-well comb), and sufficient supplies for 3 demonstrations. The **Classroom Kit** contains instructions, 5 sets of apparatus (with 6-well comb), and sufficient supplies for 15 experiments. The **Replacement Kit** contains enough of the following for 15 experiments:

Agarose Powder and TBE Buffer
Carbon-Fiber Electrodes
Pipet Tips and Dye Samples

⚠[1]	**211000**	Demonstration Kit	Each	**$68.00**
⚠[1]	**211002**	Classroom Kit	Each	**$230.00**
⚠[1]	**211003**	Replacement Kit	Each	**$40.00**

⚠[1] California Proposition 65
⚠ WARNING: Cancer – www.P65Warnings.ca.gov

211014 Exploring Electrophoresis and Forensics Classroom Kit



Gel from 211014 Exploring Electrophoresis and Forensics Classroom Kit

Exploring Electrophoresis and Forensics Kit

Intermediate—Easy to perform; requires some background knowledge.

- Introduces advanced concepts of PCR and DNA fingerprinting
- Gels can be run in 45 minutes with five 9-V batteries or overnight with 1 battery
- Introduces forensic techniques

This technically simple experiment simulates the use of DNA in forensic investigations. Students cast agarose gels, load predigested DNA, and perform electrophoresis. They use the banding patterns of the DNA in the gel to compare the DNA fingerprints of 2 suspects with evidence and victim DNA. The kit's predigested DNA can also be bought in bulk by the mL; minimum order is 1 mL. **Note:** *Distilled or deionized water is needed but not included. Order bulk DNA 2 weeks prior to desired ship date.* FREE 1-year access to digital resources that support 3-dimensional instruction included.

Kits include:	Classroom Kit	Demonstration Kit	Replacement Kit
Pipetting Devices	5	1	-
Electrophoresis Chamber	5	1	-
4-Well Comb	5	1	-
Pairs of Leads	5	1	-
Carbon-Fiber Sheets (11 × 10 cm)	3	1	-
Agarose	1.2 g	30 mL (0.8%)	1.2 g
75 mL 20× TBE	1	1	1
50 mL *Carolina*BLU™ Stain (concentrate)	1	1	1
Suspect 1 DNA (20-µL tubes)	10	2	10
Suspect 2 DNA (20-µL tubes)	10	2	10
Victim DNA (20-µL tubes)	10	2	10
Evidence DNA (20-µL tubes)	10	2	10
How-To DVD	1	-	-
Tips	30	6	30
Teacher Instructions	1	1	-
Student Instructions	5	1	-

211012	Demonstration Kit	Each	**$87.00**
211014	Classroom Kit	Each	**$330.00**
211016	Replacement Kit	Each	**$185.00**
212245	How-To DVD	Each	**$18.50**
211014V	Victim DNA	Per mL	**$77.00**
211014E	Evidence DNA	Per mL	**$77.00**
211014S1	Suspect 1 DNA	Per mL	**$77.00**
211014S2	Suspect 2 DNA	Per mL	**$92.00**

Customer Review

"Very effective learning tool, but it does take a bit of prep time on the instructor's part . . . It helps to prep most of it in advance and just have the students load the DNA. I consistently receive positive feedback from the students after they've completed this activity. It's one of their favorite labs!"

University Biology Professor

Customer Review

"We used five 9-V batteries, ran the gel for 55 min, and got excellent results. On end-of-unit surveys, students often remark that this was their favorite lab because they felt that they were 'doing stuff real scientists do.' Students are always engaged in this lab and love to compare to see which group got the best results."

Middle School Science Teacher

Teacher's Choice | Carolina Exclusive | More Information Available Online

Exploring Electrophoresis of DNA Kit

Intermediate—Easy to perform; requires some background knowledge.

Students separate mixtures of precut DNA fragments using samples of lambda DNA—uncut, cut with *Eco*RI, and cut with *Hin*dIII—to effectively demonstrate the action of restriction enzymes and the principles of electrophoresis. Gels can be run in 3½ hours using three 9-V batteries or overnight with 1 battery.

The **Demonstration Kit** contains instructions, 1 set of apparatus (with 4-well comb), and sufficient materials for 2 demonstrations. The **Classroom Kit** contains instructions, 5 sets of apparatus (with 4-well comb), and sufficient materials for 10 experiments. The **Replacement Kit** contains enough of the following for 10 experiments:

- Agarose Powder and TBE Buffer
- Carbon-Fiber Electrodes
- Pipet Tips
- *Carolina*BLU™ DNA Stain
- Predigested DNA Samples

Note: *Distilled or deionized water and batteries are needed but not included.*

211004	Demonstration Kit	Each	**$77.00**
211006	Classroom Kit	Each	**$317.50**
211007	Replacement Kit	Each	**$115.50**

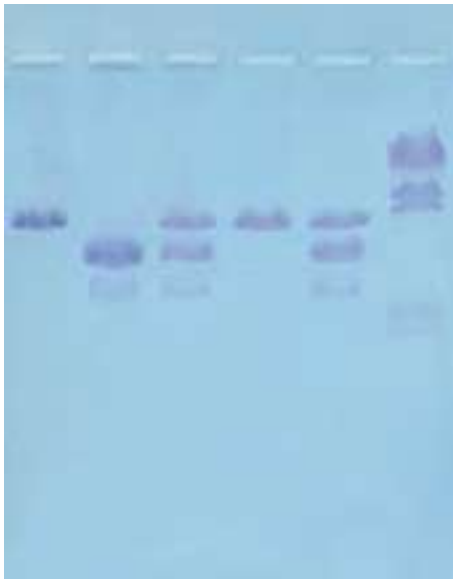
Room Temp. DNA Storage

Gel from 211004 Exploring Electrophoresis of DNA Demonstration Kit

Customer Review

"This kit contains everything you need to run 2 electrophoresis gels with DNA (except batteries). Instruction pamphlet is informative and easy to follow. Loading the gel takes some skill, however. I found it helpful to order additional agarose and practice using food dyes. This saved me from wasting the expensive DNA samples with an improperly loaded gel. Kit contains enough buffer for the practice food dye runs, especially if you reuse the buffer."

Middle School Science Teacher



Gel from 211018 Nature's Dice—A Genetic Screening Simulation Classroom Kit

Nature's Dice—A Genetic Screening Simulation Kit

Great for merging classical Mendelian genetics and modern molecular biology!

Intermediate—Easy to perform; requires some background knowledge.

This lab is designed to help your students understand:

- Genetic screening of an extended family
- Classical Mendelian genetics
- Modern molecular biology
- Molecular basis of heredity
- Ethical and social implications of genetic testing

Students receive a 24-member family tree and DNA samples presumably taken from each family member. They determine the genotype of each of the relatives by cutting the DNA samples with a restriction enzyme and separating the fragments by gel electrophoresis. The genotypes revealed by the class are used to determine the pattern of inheritance of the "gene" being analyzed and to predict each person's phenotype. In this simulation, the teacher and students choose a fictitious phenotype to link to the gene, although the principles and issues raised would apply to real situations. The **Classroom Kit** contains instructions and enough of the following to run 5 gels:

- DNA Samples◊
- DNA Markers◊
- Restriction Enzymes
- Agarose and TBE Buffer
- Carbon Fiber Electrodes
- Pipet Tips
- *Carolina*BLU™ DNA Stain
- Gel Loading Apparatus and Gel Apparatus

The **Refill Kit** contains everything in the Classroom Kit except gel apparatus and gel loading apparatus. **Note:** *Order the kit with the perishable materials (all ◊ items) included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials.*

211018	Autosomal Recessive Trait Classroom Kit (with prepaid coupon)	Each	**$353.50**
211018P	Autosomal Recessive Trait Classroom Kit (with perishables)	Each	**$353.50**
211018A	Autosomal Recessive Trait Refill Kit (with prepaid coupon)	Each	**$168.50**
211018AP	Autosomal Recessive Trait Refill Kit (with perishables)	Each	**$168.50**
211018C	DNA and Marker Only (from item #211018)	Each	**$127.00**
211019	Sex-Linked Trait Classroom Kit (with prepaid coupon)	Each	**$352.00**
211019P	Sex-Linked Trait Classroom Kit (with perishables)	Each	**$352.00**
211019A	Sex-Linked Trait Refill Kit (with prepaid coupon)	Each	**$173.50**
211019AP	Sex-Linked Trait Refill Kit (with perishables)	Each	**$173.50**
211019C	DNA and Marker Only (from item #211019)	Each	**$127.00**

Room Temp. DNA Storage

Room Temperature Storage DNA

Kits displaying this icon include DNA formulated to be stable at room temperature for a limited period of time. RTS DNA saves you money since the kit does not include heavy ice packs or require overnight shipping. If you plan on using the RTS DNA in less than 6 weeks, you can store it at room temperature. However, for storage longer than 6 weeks, RTS DNA should be refrigerated or frozen.

Teacher's Choice | Carolina Exclusive | More Information Available Online

New! Exploring Electrophoresis Using Forensic DNA Evidence Kit

Intermediate—Easy to perform; requires some background knowledge.

- Introduces students to the use of DNA analysis in forensic investigations
- Perform a technically simple, hands-on experiment in 45 minutes with 9-V batteries
- Discuss advanced topics of PCR and DNA fingerprinting

Solve a forensic mystery using the tools of biotechnology and the concept of DNA fingerprinting. Students cast agarose gels, load predigested DNA samples, and perform electrophoresis. They stain the gels and analyze the banding patterns of DNA collected from the suspects and the crime scene. Includes beautifully illustrated instructions as well as needed materials and equipment. **Demonstration Kit** contains 1 set of apparatus and sufficient supplies for 1 instructor to demonstrate the lab twice to a classroom. **Classroom Kit** contains 5 sets of apparatus and sufficient supplies for 5 groups to perform the lab twice. Materials are durable and reusable with replacement parts available. **Note:** *Distilled or deionized water, batteries or power supply, and hot water bath are needed but not supplied.*

211033 Demonstration Kit Each **$69.00**
211034 Classroom Kit Each **$265.00**

211034 Exploring Electrophoresis Using Forensic DNA Evidence Classroom Kit

Exploring Restriction Analysis and Electrophoresis of DNA Kit

Intermediate—Easy to perform; requires some background knowledge.

Students set up their own restriction digests of lambda DNA with *Bam*HI, *Eco*RI, and *Hind*III using *Instant DNA* and *Instant Enzymes*. They then separate the resulting DNA fragments by electrophoresis. Gels can be run in 3½ hours using three 9-V batteries or overnight with 1 battery.

The **Demonstration Kit** contains instructions and 1 set of apparatus with materials for 2 separate experiments. The **Classroom Kit** contains instructions and 5 sets of apparatus (with 4-well comb) with materials for 10 separate experiments. The **Replacement Kit** contains enough of the following for 10 experiments:

Agarose Powder and TBE Buffer
Carbon-Fiber Electrodes
Pipet Tips
*Carolina*BLU™ DNA Stain
Lambda DNA and Restriction Enzymes

Note: *Distilled or deionized water, batteries, and a 37° C water bath are needed but not included.*

211008 Demonstration Kit Each **$91.50**
211010 Classroom Kit Each **$363.00**
211011 Replacement Kit Each **$183.00**

Exploring Electrophoresis Series Accessories

Carolina® Electrophoresis Power Supply

Designed for use with the Exploring Electrophoresis Series

A low-voltage power supply designed to run low-voltage applications. Two-channel design allows for running 2 gel boxes simultaneously. Five voltage settings from 10 to 60 V in 10-V increments.

213674 Each **$129.00**

211022 Pipetting Devices

Exploring Electrophoresis Series Replacement Parts

211022 Pipetting Devices (five 1-mL syringes with 150 tips)
Per set **$43.50**

211015 Replacement Gel Chamber (for the Exploring Electrophoresis Series; comb, leads, and carbon-fiber electrodes not included)
Each **$21.00**

211026 Replacement Gel Chamber Assembly (includes chamber, 4- and 6-well combs, 1 pair of electrical leads, and a 10 × 10-cm sheet of replacement carbon filter)
Per set **$39.50**

211026 Replacement Gel Chamber Assembly

213626 Triple-Row Comb

Triple-Row Comb

This unique comb is designed for making your own practice pipetting station plates (petri plate and agar not included).

213626 Each **$15.50**

Energizer® Industrial Alkaline Batteries

High-energy, long-lasting Energizer® alkaline batteries.

756313 C Battery Each **$2.60**
756315 AAA Battery Each **$1.99**
756316 AA Battery Each **$2.45**
756317 D Battery Each **$3.45**
756318 9-V Battery Each **$5.35**

Introductory Kits

Introductory Gel Electrophoresis Kit

Beginning—Easy to perform; requires little or no prior knowledge.

Excellent for teaching basic electrophoresis principles. Students become familiar with general techniques used in molecular biology, such as preparing agarose gels, loading samples into sample wells, using gel chambers and power supplies, observing results, and measuring migration distances. This kit utilizes 5 unique dyes to demonstrate differences in migration rates and charges. Both the **Teacher Demonstration Kit** (1 station) and the **8-Station Kit** contain agarose, TBE buffer, disposable pipetting devices, rulers, plastic trays, 5 known dye samples, 3 unknown dye samples, and instructions. Equipment needed but not supplied includes a gel electrophoresis chamber and a power supply with at least a 50-V capability.

⚠[1]	**211147**	Teacher Demonstration Kit	Each	**$26.00**
⚠[1]	**211148**	8-Station Kit	Each	**$67.00**
⚠[1]	**211144**	Dye for 8 Stations	Each	**$20.00**

211148 Introductory Gel Electrophoresis 8-Station Kit (detail shown above)

211145 Practice Pipetting Stations Kit

Practice Pipetting Stations Kit

Reusable!

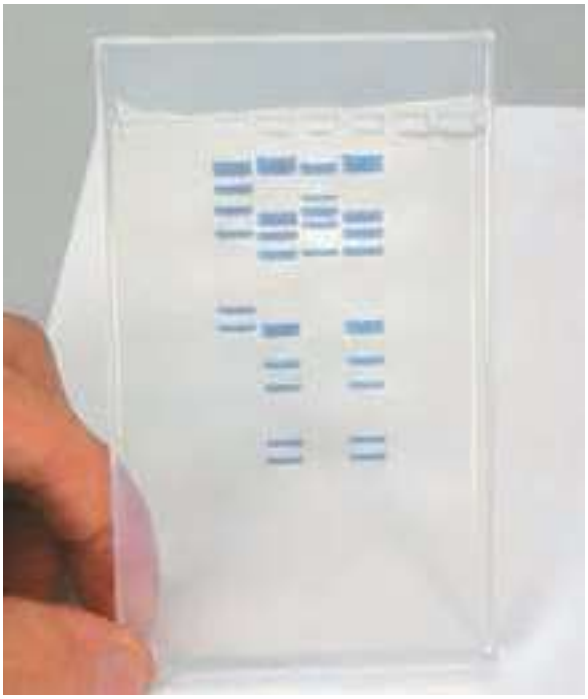
Beginning—Easy to perform; requires little or no prior knowledge.

Pipetting errors and inexperience can waste DNA and reagents. Take advantage of the convenience these practice stations provide. Students practice their pipetting techniques to ensure that they can accurately dispense samples. There are instructions and materials for 10 stations.

Each station contains:
24 Preformed Wells (for practice loading of agarose gels)
Microcentrifuge Tubes
Practice Loading Dye

Needed but not included:
Container (to hold gel while loading)

211145 Per kit **$49.00**



211152 Gel Electrophoresis Model

Gel Electrophoresis Model

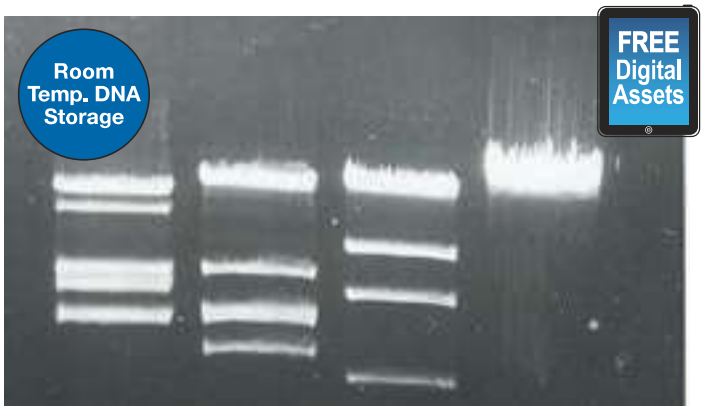
Want to teach your students about gel electrophoresis but don't have the time or resources? Why not use this durable simulated gel? It closely imitates the look and feel of a real gel and can be used over and over again. Use it to teach how to create standard curves and calculate the molecular weight of DNA fragments or to practice gel loading. Simply wash the gel when you are finished. The model has 8 lanes total, 4 of them simulating the following digests: lambda cut with *Hin*dIII, lambda cut with *Eco*RI, and lambda cut with both *Eco*RI and *Hin*dIII (there are 2 lanes of this digest).

211152 Each **$37.00**

⚠[1] California Proposition 65
⚠ **WARNING:** Cancer – www.P65Warnings.ca.gov

Teacher's Choice | Carolina Exclusive | More Information Available Online

Intermediate/Advanced Kits



Restriction digest of DNA from bacteriophage lambda using 3 different enzymes *(right to left:* uncut, *Hin*dIII, *Eco*RI, and *Bam*HI*)*

Restriction Enzyme and DNA Kit

Similar to the DNA Restriction Analysis Kits (items #211103, #211103P, #211104, #211106, #211106P, and #211107) except this kit comes with dried enzymes and dried DNA

Advanced—For experienced high school and college classes; requires some technical skill.

This kit features our *Instant Enzymes* and *Instant DNA*. No more pipetting errors when adding enzyme to DNA; no more freezer storage or frozen samples; no more next-day and ice pack shipping charges. The stable *Instant DNA* is simply rehydrated with distilled or deionized water. After hydration, DNA is added to the tubes containing the *Instant Enzymes* (*Bam*HI, *Eco*RI, and *Hin*dIII) and incubated at 37° C. After incubation, the DNA samples are electrophoresed on an agarose gel and stained. The kit contains sufficient materials for 8 teams of students. **DNA and Enzyme Refills** include consumable items. Visit **Carolina.com** for complete lists of kit materials. Materials are shipped via ground service. FREE 1-year access to digital resources that support 3-dimensional instruction included.

211185	*Carolina*BLU Kit	Each	**$128.95**
211186	*Carolina*BLU Kit DNA and Enzyme Refill	Each	**$66.95**
211193	GelGreen Kit	Each	**$142.95**
211194	GelGreen Kit DNA and Enzyme Refill	Each	**$76.95**

DNA KITS LEARNING CENTER — Developed in cooperation with the DNA Learning Center of Cold Spring Harbor Laboratory.

Restriction Mapping of Plasmid DNA Kit

Advanced—For experienced high school and college classes; requires some technical skill.

- Includes step-by-step instructions and practice problems
- 4- and 8-station kits to match your needs and budget

Electrophoresis of precut DNA with an analytical application. Students cast gels and perform electrophoresis of ready-to-load samples of predigested plasmid DNA. After staining with *Carolina*BLU™ stain, students determine the sizes of the plasmid DNA fragments in each sample and use the data to deduce a restriction map of the plasmid. Kits contain sufficient materials for either 4 or 8 teams of students to perform the exercise.

211174	4-Station Kit	Each	**$97.95**
211175	8-Station Kit	Each	**$159.95**
211176	DNA Only (from 8-Station Kit)	Each	**$108.95**

211103P DNA Restriction Analysis Ethidium Bromide Kit (with perishables)

DNA Restriction Analysis Kit

Students perform restriction digests using wet enzymes and analyze the fragments by electrophoresis

Advanced—For experienced high school and college classes; requires some technical skill.

This classic lab was developed in cooperation with the DNA Learning Center. Students perform restriction digests on bacteriophage lambda DNA, conduct electrophoretic analysis of the reactions, and stain the resulting gel. They then observe and analyze the stained patterns of fragments separated by size during gel electrophoresis. Materials are sufficient for 6 teams of students or 6 separate instructor demonstrations. **Refills** include lambda DNA, 2× restriction buffer, and 15 µL of restriction enzymes (*Bam*HI, *Eco*RI, and *Hin*dIII). Visit **Carolina.com** for complete lists of kit materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials.* ***Kits with perishable materials included should not be shipped over a weekend.*** *Carolina recommends that you request these items to arrive on a Wednesday, Thursday, or Friday (or even a Saturday) to avoid weekend shipping. Foreign orders require special handling. Items #211103, #211103P, and #211104 are sold only to schools and businesses.*

211103	Ethidium Bromide Kit (with prepaid coupon)	Each	**$135.95**
211103P	Ethidium Bromide Kit (with perishables)	Each	**$135.95**
211104	Ethidium Bromide Kit Perishables Refill	Each	**$65.95**
211106	*Carolina*BLU Kit (with prepaid coupon)	Each	**$132.95**
211106P	*Carolina*BLU Kit (with perishables)	Each	**$132.95**
211107	*Carolina*BLU Kit Perishables Refill	Each	**$59.95**

Gel from 211175 Restriction Mapping of Plasmid DNA Kit

DNA Fingerprinting Kits

PCR Forensics Simulation Kit

Intermediate—Easy to perform; requires some background knowledge.

This intermediate-level kit introduces the concepts of PCR and DNA fingerprinting and simulates the use of DNA in forensic investigations. The "DNA fingerprints" of 2 suspects are compared at 2 loci for a match with evidence DNA after being electrophoresed in agarose gels and stained with *Carolina*BLU™ stain. The kit's predigested DNA can also be bought in bulk by the mL; minimum order is 1 mL. **Note:** *Order bulk DNA 2 weeks prior to desired ship date.*

Kits include:	**4-Station Kit**	**8-Station Kit**
Sets of DNA Sample (for 1 experiment)	4	8
Agarose	3.2 g	6 g
20× TBE Buffer	150 mL	200 mL
Gloves	8	16
*Carolina*BLU™ Final Stain	250 mL	250 mL
*Carolina*BLU™ Gel and Buffer Stain	7 mL	7 mL
Staining Tray	4	8
Disposable Needle-Nosed Bulbs for Loading Gels	28	56
Teacher's Manual with Reproducible Student Guide	1	1

Needed but not included:
Gel Electrophoresis Chamber and Power Supply
White Light Box (optional)

211213	4-Station Kit	Each	**$103.95**
211214	8-Station Kit	Each	**$177.00**
211212	DNA for 8-Station Kit	Each	**$120.00**
211210E1	Evidence 1 DNA	Per mL	**$60.50**
211210E2	Evidence 2 DNA	Per mL	**$60.50**
211210SX1	Suspect X1 DNA	Per mL	**$74.95**
211210SX2	Suspect X2 DNA	Per mL	**$74.95**
211210SY1	Suspect Y1 DNA	Per mL	**$74.95**
211210SY2	Suspect Y2 DNA	Per mL	**$66.95**

211214 PCR Forensics Simulation 8-Station Kit

Teacher Testimonial

"I have used Carolina's PCR forensics simulation DNA fingerprinting kit at a local biotechnology symposium [I have hosted] each year since 1994. Literally thousands of students have benefited from using this kit to foster their understanding of gel electrophoresis, PCR, restriction endonucleases, and the reading of a DNA fingerprint . . ."

Myron Blosser
High School Biology Teacher
Recipient of a National Association of Biology Teachers Outstanding Biology Teacher of the Year Award for Virginia

Customer Review

"Outbreak! [Fingerprinting Virus DNA Kit] provides an introduction to gel electrophoresis that is plenty easy for my regular 9th–10th graders to understand, yet relevant to what's going on in molecular biology in the real world."

High School Biology Teacher

211206 Outbreak! Fingerprinting Virus DNA 4-Station Kit

Outbreak! Fingerprinting Virus DNA Kit

Intermediate—Easy to perform; requires some background knowledge.

Students become virus hunters with this easy-to-use kit. They interpret DNA fingerprints to identify the viral strain responsible for a potentially deadly fictitious-disease outbreak. Students load harmless predigested DNA samples onto agarose gels and separate the fragments to produce DNA fingerprints. Included references to articles about emerging diseases can help students learn more.

Kits include:	**4-Station Kit**	**8-Station Kit**
Sets of DNA Samples (for 1 experiment)	4	8
Agarose	2.4 g	5 g
50× TAE buffer	50 mL	100 mL
Gloves	8	16
*Carolina*BLU™ Final Stain	250 mL	250 mL
*Carolina*BLU™ Gel and Buffer Stain	7 mL	7 mL
Staining Tray	4	8
Disposable Needle-Nosed Bulbs for Loading Gels	16	32
Teacher's Manual with Reproducible Student Guide	1	1

Needed but not included:
Gel Electrophoresis Chamber and Power Supply
White Light Box (optional)

211206	4-Station Kit	Each	**$69.95**
211207	8-Station Kit	Each	**$134.00**
211204	DNA for 8-Station Kit	Each	**$93.00**

Teacher's Choice | Carolina Exclusive | More Information Available Online

Restriction digest of DNA from bacteriophage lambda using 3 different enzymes *(left to right:* uncut, *Eco*RI, *Hin*dIII)

211149 Restriction Enzyme Cleavage of DNA 8-Station Kit

Restriction Enzyme Cleavage of DNA Kit

Students electrophorese pre-cut DNA fragments—a classic lab

Intermediate—Easy to perform; requires some background knowledge.

- Complete kit (just supply distilled or deionized water and equipment)
- Load and go with aliquoted, ready-to-use DNA samples
- Easy-to-use teacher's manual and student guide
- Contains 2 bonus dry labs: "DNA Goes to the Races" and "DNA Scissors"

It's easy to teach students the basics of DNA gel electrophoresis and analysis with this classic lab. Using convenient pre-cut DNA fragments, students electrophorese, stain, and visualize uncut lambda DNA (control) and DNA predigested with *Eco*RI and *Hin*dIII (standard molecular weight marker). They then determine the sizes of the DNA fragments. Enough materials for 4 or 8 teams of students. **Note:** *Cannot be shipped via USPS.*

Kits include:	**4-Station Kit**	**8-Station Kit**
*Hin*dIII-Cut Lambda (20-µL tubes)	4	8
*Eco*RI-Cut Lambda (20-µL tubes)	4	8
Undigested DNA (20-µL tubes)	4	8
Disposable Needle-Nosed Bulb Pipets for Loading Gels	16	32
Agarose	2.4 g	5 g
*Carolina*BLU™ Final Stain (250-mL bottle)	1	1
*Carolina*BLU™ Gel and Buffer Stain (7-mL bottle)	1	1
Staining Trays	4	8
Disposable Gloves	4	4
TAE Buffer 50× (50-mL bottle)	1	-
TAE Buffer 50× (100-mL bottle)	-	1
Semi-Log Graph Paper	4	8
Rulers	4	8
Teacher's Manual	1	1
Student Guide	4	8
2 Bonus Dry Labs	1	1

Needed but not included:
Gel Electrophoresis Chambers
Power Supplies
White Light Source (optional)

211148Y	4-Station Kit	Each	**$76.95**
211149	8-Station Kit	Each	**$107.00**
211149A	8-Station Refill (DNA only)	Each	**$59.95**

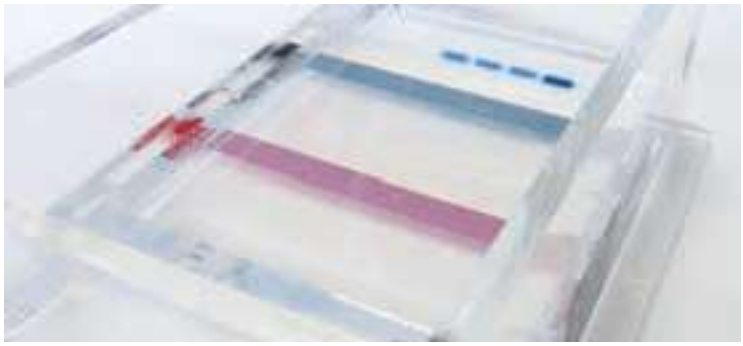
Room Temperature Storage DNA

Room Temp. DNA Storage

Kits displaying this icon include DNA formulated to be stable at room temperature for a limited period of time. RTS DNA saves you money since the kit does not include heavy ice packs or require overnight shipping. If you plan on using the RTS DNA in less than 6 weeks, you can store it at room temperature. However, for storage longer than 6 weeks, RTS DNA should be refrigerated or frozen.

DNA KITS LEARNING CENTER

Developed in cooperation with the DNA Learning Center of Cold Spring Harbor Laboratory.



Fast Gels Kit

Intermediate—Easy to perform; requires some background knowledge.

- Run gels in as little as 15–18 minutes!
- Introduce your students to genetic screening or environmental forensics

This kit is a great way to do an electrophoresis lab in short class periods. The patented buffer allows gels to be run at high voltages (high speed) without the loss of resolution usually seen in gels run at high speed. The lab manual includes 2 different investigative scenarios to choose from. In the first, students determine whether a father has passed his cancer-associated mutation on to his children. In the second, students determine whether a fisherman illegally fished from a river on protected land. Both scenarios include positive and negative controls to demonstrate the importance of controls in experimentation. Manual includes basic and more advanced background material for each scenario to aid in teaching at multiple levels. Gels require a 290-V power supply (not included) to run at full speed. A lower-voltage power supply can be used, but gels will run more slowly. **Note:** *Order the kit with the perishable materials (all ◊ items) included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials.*

Kits include:	**4-Station Kit**	**8-Station Kit**
Agarose Powder	4 g	8 g
20× Electrophoresis Buffer	100 mL	200 mL
DNA Sample A (20-µL tube)◊	4	8
DNA Sample B (20-µL tube)◊	4	8
DNA Sample C (20-µL tube)◊	4	8
DNA Sample D (20-µL tube)◊	4	8
DNA Sample E (20-µL tube)◊	4	8
DNA Sample F (20-µL tube)◊	4	8
*Carolina*BLU™ Gel and Buffer Stain	7 mL	7 mL
*Carolina*BLU™ Final Stain	250 mL	250 mL
Gel Staining Trays	4	8
1-mL Syringes for Loading Gels	4	8
Pipet Tips for Syringes	34	68
Teacher's Manual with Student Masters	1	1

Needed but not included:
Electrophoresis Chambers
Power Supply (290 V for best performance)
Distilled Water

211036 4-Station Kit (with prepaid coupon) Each **$120.50**
211036P 4-Station Kit (with perishables) Each **$120.50**
211035 8-Station Kit (with prepaid coupon) Each **$192.00**
211035P 8-Station Kit (with perishables) Each **$192.00**

211036P Fast Gels 4-Station Kit (with perishables)

211202P Forensic DNA Fingerprinting GelGreen Kit (with perishables)

Forensic DNA Fingerprinting Kit

DNA KITS LEARNING CENTER

Advanced—For experienced high school and college classes; requires some technical skill.

Developed in cooperation with the DNA Learning Center, this advanced lab uses plasmid isolation and restriction analysis to illustrate forensic DNA typing. Students are provided with 2 samples of *E. coli* cells to represent blood samples from 2 suspects. Plasmid DNA is extracted using a miniprep procedure and cut with restriction enzymes, along with a DNA sample representing the evidence from a crime scene. The resulting "DNA fingerprints" of the suspects are compared for a match with the evidence. Materials are sufficient for 8 teams of students or 8 teacher demonstrations. Visit Carolina.com for complete lists of kit materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials. Foreign orders require special handling.* FREE 1-year access to digital resources that support 3-dimensional instruction included.

Results of 211205 Forensic DNA Fingerprinting *Carolina*BLU Kit

⚠²**211205** *Carolina*BLU Kit (with prepaid coupon) Each **$151.50**
⚠²**211205P** *Carolina*BLU Kit (with perishables) Each **$151.50**
211205C *Carolina*BLU Kit Perishables Refill Each **$92.50**
⚠²**211202** GelGreen Kit (with prepaid coupon) Each **$174.00**
⚠²**211202P** GelGreen Kit (with perishables) Each **$174.00**
211202C GelGreen Kit Perishables Refill Each **$113.00**

⚠² California Proposition 65
⚠ **WARNING:** Reproductive Harm – www.P65Warnings.ca.gov

Restriction Mapping

Restriction Mapping of Lambda DNA Kit

Advanced—For experienced high school and college classes; requires some technical skill.

Developed in cooperation with the DNA Learning Center of Cold Spring Harbor Laboratory, this kit provides data that allow students to assemble a map of cutting sites for *Apa*I, *Eco*0109I, and *Hin*dIII on the genome of the lambda virus. This is accomplished by digesting lambda DNA with the 3 restriction enzymes alone and in combination. A restriction map can be generated by using information gained from the electrophoresis of the lambda restriction fragments. Materials are sufficient for 6 teams of students or 6 separate instructor demonstrations. **Note:** *Order the kit with the perishable materials (all ◊ items) included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials.* ***Kits with perishable materials included should not be shipped over a weekend.*** *Carolina recommends that you request these items to arrive on a Wednesday, Thursday, or Friday (or even a Saturday) to avoid weekend shipping. Foreign orders require special handling.*

Kit includes:
Lambda DNA◊
Restriction Enzymes◊
Restriction Buffer◊
Loading Dye
Electrophoresis Buffer
*Carolina*BLU™ Stain
Agarose
Microcentrifuge Tubes
Staining Trays
Gloves
Semi-Log Graph Paper
Rulers
Teacher and Student Instructions

Kit Perishables Refill includes:
Lambda DNA◊
Restriction Enzymes◊
Restriction Buffer◊

Needed but not included:
Gel Electrophoresis Chambers and Power Supplies
Gel Visualization Equipment (white light)
37° C and 65° C Water Baths
Micropipettor

211173	Kit (with prepaid coupon)	Each	**$180.25**
211173P	Kit (with perishables)	Each	**$180.25**
211173C	Kit Perishables Refill	Each	**$136.99**

211173P Restriction Mapping of Lambda DNA Kit (with perishables)

Developed in cooperation with the DNA Learning Center of Cold Spring Harbor Laboratory.

Southern Hybridization

Southern Hybridization Experiment Kit

Advanced—For experienced high school and college classes; requires some technical skill.

A complete kit for conducting 6 Southern hybridization experiments using 7.5 × 10-cm membranes. Students map the location of a sequence within the bacteriophage lambda chromosome. Requires extended lab periods (call our Biotechnology Department for specifics). **Note:** *Order the kit with the perishable materials (all ◊ items) included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials. Foreign orders require special handling.*

Kit includes:
NBT/BCIP Color Development Solution◊
Biotinylated Probe◊
Streptavidin-Alkaline Phosphatase Conjugate◊
Precut DNA◊
2× Denaturation Buffer
2× Neutralization Buffer
20× SSC w/SDS
Prehybridization/Hybridization Buffer
Blocking Agent
Buffer for Detection Steps
Staining Trays
Gloves
Nylon Membrane
3mm Whatman Paper
Hybridization Bags
Instructions

Kit Perishables Refill includes:
NBT/BCIP Color Development Solution◊
Biotinylated Probe◊
Streptavidin-Alkaline Phosphatase Conjugate◊
Precut DNA◊

Needed but not included:
Agarose and TBE Buffer
Electrophoresis Equipment
Gel Photography Equipment
Oven (70–80° C)
Water Bath (50° C)
Containers (for wash steps and transfer)
Transparent Rulers

211215	Kit (with prepaid coupon)	Each	**$369.75**
211215P	Kit (with perishables)	Each	**$369.75**
211215C	Kit Perishables Refill	Each	**$218.50**

Agarose Gel

Nylon Membrane

211215P Southern Hybridization Experiment Kit (with perishables)

Polymerase Chain Reaction

Human DNA PCR Kits

- Each kit uses a 30-minute method that requires no specialized equipment to isolate template DNA from hair sheaths or cheek (buccal) cells.†
- Simply add student DNA template and primer mix to the Ready-to-Go Beads™, which incorporate the needed components and are stable at room temperature. Saves time and ensures accuracy.
- To save additional time, loading dye is incorporated into the primer mix—amplified reactions can be taken from the thermal cycler and immediately loaded for gel electrophoresis.
- PCR products can be readily analyzed on agarose and can be stained with either ethidium bromide or *Carolina*BLU™.

Oligos supplied by Operon Biotechnologies.
†The protocol for kit items #211377 through #211381P (page 271) utilizes only cheek cells.

Carolina's human DNA PCR kits allow students to use PCR to amplify their own DNA.

Why Carolina® PCR Kits?

Highest quality—Carolina's staff works with the experts at the DNA Learning Center (DNALC) of Cold Spring Harbor Laboratory and other collaborators to develop the very best kits available.

Teacher and student friendly—We've taken measures to save you prep time and make the labs convenient.

Carolina® service and guarantee—The best assurance you can have. We offer free online and telephone support. If you have a question, we'll answer it promptly. If you have a problem with any of our materials, we'll do whatever it takes to fix it—guaranteed!

DNA Kits

Opening up a new world of DNA

Developed by a world leader in biotechnology instruction, these kits are backed by the reputation of the DNA Learning Center (DNALC) of Cold Spring Harbor Laboratory (CSHL). Each kit incorporates insights from years of teacher and student testing at the DNALC; several kits are based on pioneering research from CSHL.

Updated DNA kits stress the merging of molecular biology and computer computation, a hallmark of modern biology. The companion CD-ROMs and Internet site provide electronic learning tools that can be used at home or in class, plus animations of key techniques.

For more about these kits and materials, see the pages listed below.

Using an *Alu* Insertion Polymorphism to Study Human Populations
(items #211230A to #211232AP; page 270)

***Recovering the Romanovs* CD-ROM**
(item #212205; page 296)

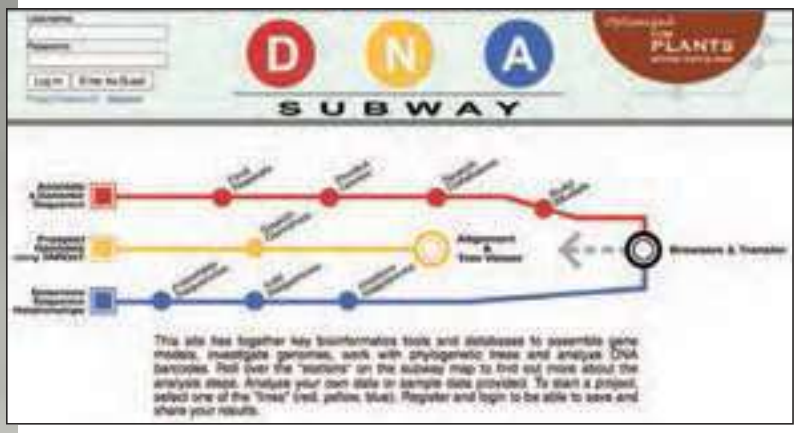
Using a Single Nucleotide Polymorphism (SNP) to Predict Bitter Tasting Ability
(items #211377 to #211381P; page 271)

Detecting Genetically Modified Food by PCR
(items #211367 to #211372P; page 274)

216298
Carolina Compact Thermal Cycler

214539
Carolina Research Pipettor

Carolina's recommended biotechnology equipment and supplies begin on page 298.



DNA Subway is a unique bioinformatics tool offering robust analysis and user-friendly interface. Optimized for usage with the Using DNA Barcodes to Identify and Classify Living Things kits, it makes bioinformatics more accessible in your classroom.

211385P Using DNA Barcodes to Identify and Classify Living Things Amplification Kit (with perishables)

Using DNA Barcodes to Identify and Classify Living Things

DNA KITS LEARNING CENTER

Advanced—For experienced high school and college classes; requires some technical skill.

- Revised protocol saves you time and delivers robust results
- Use DNA barcodes to identify student-collected samples of plants or animals
- Designed, tested, and updated with the classroom in mind
- Connect students to real-world bioinformatics
- Identify diversity by taking taxonomy to the next level

This kit explores an emerging trend in molecular biology and brings bioinformatics to the classroom in an accessible manner. Students take a new approach to taxonomy using "DNA barcodes"—short, unique DNA sequences—to learn about the biodiversity of plants, mammals, fish, or insects. Unlock the barcodes of even more organisms by purchasing the Fungal Primer Set (item #211388, sold separately) to give students the opportunity to explore the diverse world of fungi. Using polymerase chain reaction (PCR) on specific regions of the *rbcL* or *COI* gene, students amplify their extracted DNA to create unique barcodes. These amplified sequences (amplicons) are then submitted for sequencing and can be analyzed using our custom-designed online tool, DNA Subway. Our partner, GENEWIZ, Inc., offers an educational discount for sequencing services. Each kit contains materials for 25 DNA extractions and PCR reactions. Visit Carolina.com for a complete list of materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishable materials later at your convenience. Contact us or return the coupon to request delivery of perishable materials.*

⚠2	**211385**	DNA Barcode Amplification Kit (with prepaid coupon)	Each	**$232.00**
⚠2	**211385P**	DNA Barcode Amplification Kit (with perishables)	Each	**$232.00**
⚠2	**211386**	DNA Barcode Amplification and Electrophoresis Kit with *Carolina*BLU Stain (with prepaid coupon)	Each	**$241.00**
⚠2	**211386P**	DNA Barcode Amplification and Electrophoresis Kit with *Carolina*BLU Stain (with perishables)	Each	**$241.00**
⚠2	**211387**	DNA Barcode Amplification and Electrophoresis Kit with GelGreen Stain (with prepaid coupon)	Each	**$251.00**
⚠2	**211387P**	DNA Barcode Amplification and Electrophoresis Kit with GelGreen Stain (with perishables)	Each	**$251.00**

Illustra™ PuReTaq™ Ready-to-Go™ PCR Beads

Save time in your classroom and lab with PCR beads that are preformulated, predispensed, and include all reagents required for PCR reactions. Simply add your DNA template, water, and primers. Less pipetting means less contamination and fewer errors, yielding robust, reproducible results. Use these beads with confidence to replenish your Carolina PCR kits or for other PCR reactions. **Note:** *Store at ambient temperature.*

211470	25-Reaction Pack	Each	**$75.00**
211471	96-Reaction Pack	Each	**$240.00**

211470 Illustra PuReTaq Ready-to-Go PCR Beads

DNA Barcoding Primers

For use with Using DNA Barcodes to Identify and Classify Living Things (items #211385, #211385P, #211386, #211386P, #211387, and #211387P). Primers are in cresol red loading solution for PCR amplification of genes needed for conducting DNA barcoding. Each primer set provides sufficient materials for 25 student reactions. 700 µL. **Note:** *The fungal primer is not recommended for use with* Carolina*BLU*™ *stain.*

211511	Plant *rbcL* Primer Set	Each	**$34.50**
211512	Fish *COI* Primer Set	Each	**$34.50**
211513	Insect/Mammal Primer Set	Each	**$34.50**
211388	Fungal Primer Set	Each	**$34.50**

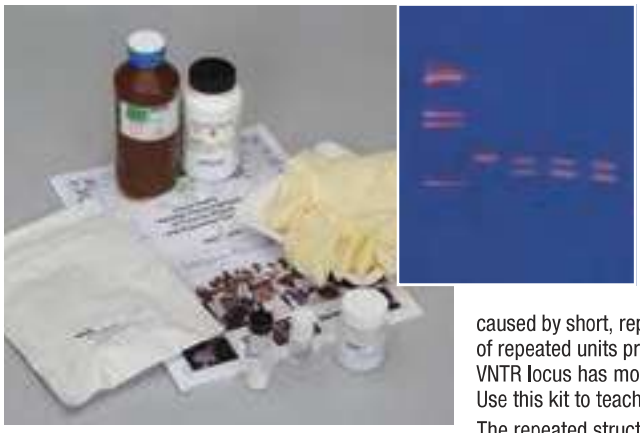
211511 DNA Barcoding Primer, Plant *rbcL* Primer Set

DNA KITS LEARNING CENTER Developed in cooperation with the DNA Learning Center of Cold Spring Harbor Laboratory.

⚠2 California Proposition 65

⚠ WARNING: Reproductive Harm – www.P65Warnings.ca.gov

Polymerase Chain Reaction (PCR)



211234A Using Highly Variable Polymorphisms in Forensic Biology and Population Genetics Extraction, Amplification, and Electrophoresis Kit with Ethidium Bromide Stain

Using Highly Variable Polymorphisms in Forensic Biology and Population Genetics Kit

Introduce students to Hardy-Weinberg equilibrium and the concept of allele frequencies in populations

Advanced—For experienced high school and college classes; requires some technical skill.

- Provides an introduction to the use of PCR in forensics
- Helps demonstrate real-world applications of PCR

This lab illustrates the use of DNA typing to identify individuals in court cases and disasters. It assays for variable numbers of tandem repeats (VNTR) polymorphisms, which are caused by short, repeated copies of a 16-nucleotide sequence at the pMCT118 locus. Differences in the number of repeated units produce longer and shorter alleles, which can be resolved by gel electrophoresis. Because the VNTR locus has more than 29 different alleles, a panel of student types shows a variety of different genotypes. Use this kit to teach population genetics, Hardy-Weinberg equilibrium, and forensics techniques.

The repeated structure of the VNTR polymorphism makes it more difficult to amplify, so this experiment greatly benefits from a "hot start," in which 1 of the reagents is added during the first denaturing cycle. Each kit contains instructions and materials for 25 students. Visit Carolina.com for a complete list of kit materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials.*

211233A	Using Highly Variable Polymorphisms Extraction and Amplification Kit with 0.2-mL Tubes (with prepaid coupon)	Each	**$217.50**
211233AP	Using Highly Variable Polymorphisms Extraction and Amplification Kit with 0.2-mL Tubes (with perishables)	Each	**$217.50**
211234A	Using Highly Variable Polymorphisms Extraction, Amplification, and Electrophoresis Kit with Ethidium Bromide Stain and 0.2-mL Tubes (with prepaid coupon)	Each	**$239.00**
211234AP	Using Highly Variable Polymorphisms Extraction, Amplification, and Electrophoresis Kit with Ethidium Bromide Stain and 0.2-mL Tubes (with perishables)	Each	**$239.00**
211235A	Using Highly Variable Polymorphisms Extraction, Amplification, and Electrophoresis Kit with *Carolina*BLU Stain and 0.2-mL Tubes (with prepaid coupon)	Each	**$227.50**
211235AP	Using Highly Variable Polymorphisms Extraction, Amplification, and Electrophoresis Kit with *Carolina*BLU Stain and 0.2-mL Tubes (with perishables)	Each	**$227.50**
211506	pMCT118 Primer Set	Each	**$34.50**

Mitochondrial DNA Polymorphisms in Human Evolution Kit

Generate excitement by having your students amplify their own mitochondrial DNA for sequencing!

Advanced—For experienced high school and college classes; requires some technical skill.

- Uses a simple, robust protocol ideal for the classroom
- Enlivens discussions on the molecular basis of heredity and evolution
- Provides a basic version of the lab that is used in forensics and the analysis of ancient DNA samples
- Teaches real-world applications of PCR
- Includes online resources to enhance the learning experience

Students use safe saline mouthwash or hair and Chelex® extraction to obtain a sample of their own DNA. Then they amplify a 440-nucleotide segment of a hypervariable region of the mitochondrial chromosome, which contains numerous single nucleotide polymorphisms (SNPs). After gel electrophoresis confirms amplification, the student samples may be sent for sequencing (the cost of sequencing is not included in the price of the kit). Students then compare their SNPs to ancient hominids and to people from different world populations to discover patterns of DNA variation and to analyze theories of human evolution.

Each kit contains instructions and materials for 25 students. Visit Carolina.com for a complete list of kit materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials. Items #211237A and #211237AP are sold only to schools and businesses.*

211237A Mitochondrial DNA Polymorphisms in Human Evolution Extraction, Amplification, and Electrophoresis Kit with Ethidium Bromide Stain

Gel from Mitochondrial DNA Polymorphisms in Human Evolution Kit

211236A	Mitochondrial DNA Extraction and Amplification Kit with 0.2-mL Tubes (with prepaid coupon)	Each	**$217.50**
211236AP	Mitochondrial DNA Extraction and Amplification Kit with 0.2-mL Tubes (with perishables)	Each	**$217.50**
211237A	Mitochondrial DNA Extraction, Amplification, and Electrophoresis Kit with Ethidium Bromide Stain and 0.2-mL Tubes (with prepaid coupon)	Each	**$239.00**
211237AP	Mitochondrial DNA Extraction, Amplification, and Electrophoresis Kit with Ethidium Bromide Stain and 0.2-mL Tubes (with perishables)	Each	**$239.00**
211238A	Mitochondrial DNA Extraction, Amplification, and Electrophoresis Kit with *Carolina*BLU Stain and 0.2-mL Tubes (with prepaid coupon)	Each	**$227.50**
211238AP	Mitochondrial DNA Extraction, Amplification, and Electrophoresis Kit with *Carolina*BLU Stain and 0.2-mL Tubes (with perishables)	Each	**$227.50**
211504	mtDNA Primer Set	Each	**$34.50**

DNA KITS LEARNING CENTER — Developed in cooperation with the DNA Learning Center of Cold Spring Harbor Laboratory.

Teacher's Choice | Carolina Exclusive | More Information Available Online

New! Identifying the Mutation in Non-Purple Stem Wisconsin Fast Plants® Kit

Making a genotype-to-phenotype connection using Wisconsin Fast Plants®

Advanced—For experienced high school and college classes; requires some technical skill.

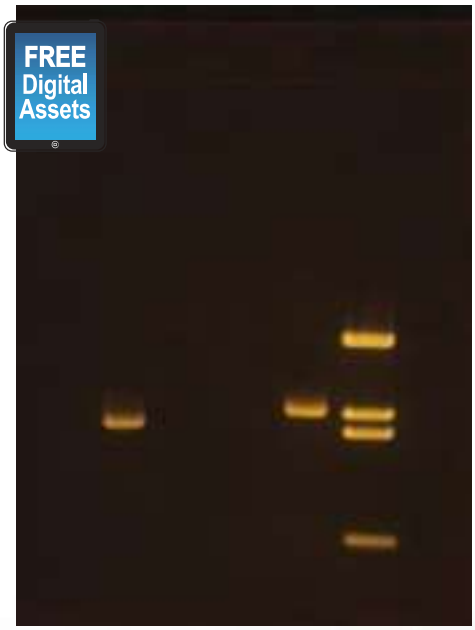
This lab explores the connection between Mendelian genetics and molecular biology through the analysis of the mutation responsible for the non-purple stem trait in Wisconsin Fast Plants®. Students predict the phenotype and genotype for stem color in the F_2 generation of a monohybrid cross and propose an explanation as to why the *anl* allele leads to a non-purple stem phenotype, whereas the *ANL* allele leads to the purple stem phenotype. Students finally plant F_2 seeds on a monohybrid cross that will be used for phenotypic and molecular analysis. This lab also requires students to familiarize themselves with bioinformatics programs in which they practice analyzing sequence data of purple stem and non-purple stem alleles of the anthocyaninless genes. They then translate the sequences and discuss how the mutations found in non-purple stem alleles impact gene function. Each kit equips 24 students working in groups of 4 and includes free 1-year access to digital resources that support 3-dimensional instruction. **Note:** *Kit includes a prepaid coupon to request perishable materials (all ◊ items) later at your convenience. Contact us or return the coupon to request delivery of perishable materials.*

Kits include:	Kit without Stain (item #211161)	Kit with *Carolina*BLU™ (item #211463)	Kit with GelGreen™ (item #211465)
Primer/Loading Dye Mix◊	1	1	1
W Primer/Loading Dye Mix◊	1	1	1
pBR322/BstN1 Marker◊	1	1	1
TE (Tris/EDTA) Buffer with RNase, 3 mL◊	1	1	1
Wisconsin Fast Plants® Seed, P_1, Non-Purple Stem Hairless	30	30	30
Wisconsin Fast Plants® Seed, P_2, Purple Stem Hairy	30	30	30
Wisconsin Fast Plants® Seed, F_2, Non-Purple Stem Hairless × Purple Stem Hairy	50	50	50
Petri Dishes	25	25	25
Filter Paper, 9 cm	100	100	100
Edwards Buffer, 20 mL	1	1	1
Pellet Pestles	15	15	15
PCR Beads in 0.2-mL PCR Tubes	25	25	25
Isopropanol, 10 mL	1	1	1
Agarose, 4 g	-	1	1
*Carolina*BLU™ Gel and Buffer Stain, 7 mL	-	1	-
*Carolina*BLU™ Final Stain, 400 mL	-	1	-
GelGreen™ Stain, 100 mL	-	-	1
5 M NaCl, 8 mL	-	-	1
TBE Buffer, 20×, 200 mL	-	1	1
Staining Trays	-	6	6
Gloves	-	12	12

211461 Identifying the Mutation in Non-Purple Stem Wisconsin Fast Plants Amplification Kit with 0.2-mL Tubes (with prepaid coupon) Each **$200.00**

211463 Identifying the Mutation in Non-Purple Stem Wisconsin Fast Plants Extraction, Amplification, and Electrophoresis Kit with *Carolina*BLU Stain and 0.2-mL Tubes (with prepaid coupon) Each **$212.00**

211465 Identifying the Mutation in Non-Purple Stem Wisconsin Fast Plants Extraction, Amplification, and Electrophoresis Kit with GelGreen Stain and 0.2-mL Tubes (with prepaid coupon) Each **$232.00**



Gel from Identifying the Mutation in Non-Purple Stem Wisconsin Fast Plants Kit

Want your kit shipped with the perishables included? Order it from Carolina.com (item #211461P, #211463P, or #211465P).

Purple Stem

Non-Purple Stem

Polymerase Chain Reaction (PCR)

Gel from Using an *Alu* Insertion Polymorphism to Study Human Populations Kit

211231AP Using an *Alu* Insertion Polymorphism to Study Human Populations Extraction, Amplification, and Electrophoresis Kit with Ethidium Bromide

Using an Alu Insertion Polymorphism to Study Human Populations

Introduce your students to human population genetics through PCR analysis of their own genotypes

Advanced—For experienced high school and college classes; requires some technical skill.

- Simple, robust protocol is ideal for classroom use
- Incorporates Hardy-Weinberg equilibrium and chi-square analysis
- Helps demonstrate real-world applications of PCR
- Discover how *Alu* insertions are used to track world population migrations
- CD-ROM contains animations and video clips for classroom instruction

Students use safe saline mouthwash or hair and Chelex® extraction to obtain a sample of their own DNA. Then they use polymerase chain reaction (PCR) to amplify a 300-nucleotide *Alu* insertion in an intron of the H-cadherin gene. Gel electrophoresis separates the 2 alleles, and each student determines his/her own genotype. The experiment provides an introduction to human population genetics as participants learn to score genotypes and to calculate genotype and allele frequencies. Teaching themes include:

- Evolution
- Population genetics
- Chi-square analysis
- Hardy-Weinberg equilibrium
- Real-world applications of PCR technology

Each kit contains instructions, a CD-ROM, and materials for 25 students and is available in 2 versions. The first version, for DNA extraction and amplification only, includes Chelex®, proteinase K, Ready-to-Go Beads™ (in 0.2-mL reaction tubes), primer/loading dye mix, mineral oil, and DNA markers. The second version includes all of the above plus agarose, electrophoresis buffer, staining trays, gloves, and either ethidium bromide or *Carolina*BLU™ stain. Visit **Carolina.com** for a complete list of kit materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials. Items #211231A and #211231AP are sold only to schools and businesses.*

211230A	*Alu* DNA Extraction and Amplification Kit with 0.2-mL Tubes (with prepaid coupon)	Each	**$217.50**
211230AP	*Alu* DNA Extraction and Amplification Kit with 0.2-mL Tubes (with perishables)	Each	**$217.50**
211231A	*Alu* DNA Extraction, Amplification, and Electrophoresis Kit with Ethidium Bromide and 0.2-mL Tubes (with prepaid coupon)	Each	**$237.50**
211231AP	*Alu* DNA Extraction, Amplification, and Electrophoresis Kit with Ethidium Bromide and 0.2-mL Tubes (with perishables)	Each	**$237.50**
211232A	*Alu* DNA Extraction, Amplification, and Electrophoresis Kit with *Carolina*BLU Stain and 0.2-mL Tubes (with prepaid coupon)	Each	**$227.50**
211232AP	*Alu* DNA Extraction, Amplification, and Electrophoresis Kit with *Carolina*BLU Stain and 0.2-mL Tubes (with perishables)	Each	**$227.50**
211502	*Alu* PV92 Primer Set	Each	**$34.50**

Gel from Using a Single Nucleotide Polymorphism (SNP) to Predict Bitter Tasting Ability Kit

211379P Using a Single Nucleotide Polymorphism (SNP) to Predict Bitter Tasting Ability Extraction, Amplification, and Electrophoresis Kit with Ethidium Bromide (with perishables)

Using a Single Nucleotide Polymorphism (SNP) to Predict Bitter Tasting Ability Kit

This unique kit allows you to teach many different concepts, techniques, and skills in 1 lab!

Advanced—For experienced high school and college classes; requires some technical skill.

- DNA isolation
- PCR
- Restriction digestion
- Electrophoresis
- Relationship between genotype and phenotype
- Importance of SNPs in understanding modern molecular biology and its applications
- Bioinformatics

This kit explores the molecular basis of the inherited ability to taste the bitter chemical phenylthiocarbamide (PTC), which was first described in the 1930s by Cold Spring Harbor Laboratory scientist Albert Blakeslee. Students determine their ability to taste PTC using taste paper. They then use safe saline mouthwash and Chelex® extraction to obtain a sample of their own DNA and amplify a 221-nucleotide region of the PTC taste receptor gene. The 2 alleles differ by a single nucleotide, so restriction digestion of the amplified product followed by gel electrophoresis effectively differentiates the 2 alleles. One allele strongly correlates to the ability to taste PTC. After scoring their SNP genotypes, students determine how well the SNP genotypes actually correlate to tasting. Each kit includes materials for 25 PCR reactions and restriction digests, and a PTC CD-ROM. CD-ROM includes animations and additional resources. Visit **Carolina.com** for complete lists of kit materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials.* ***Kits with perishable materials included should not be shipped over a weekend.*** *Carolina recommends that you request these items to arrive on a Wednesday, Thursday, or Friday (or even a Saturday) to avoid weekend shipping. Items #211379 and #211379P are sold only to schools and businesses.*

211377	PTC Extraction and Amplification Kit with 0.2-mL Tubes (with prepaid coupon)	Each	**$240.00**
211377P	PTC Extraction and Amplification Kit with 0.2-mL Tubes (with perishables)	Each	**$240.00**
211379	PTC Extraction, Amplification, and Electrophoresis Kit with Ethidium Bromide and 0.2-mL Tubes (with prepaid coupon)	Each	**$260.00**
211379P	PTC Extraction, Amplification, and Electrophoresis Kit with Ethidium Bromide and 0.2-mL Tubes (with perishables)	Each	**$260.00**
211381	PTC Extraction, Amplification, and Electrophoresis Kit with *Carolina*BLU and 0.2-mL Tubes (with prepaid coupon)	Each	**$250.00**
211381P	PTC Extraction, Amplification, and Electrophoresis Kit with *Carolina*BLU and 0.2-mL Tubes (with perishables)	Each	**$250.00**
211376C	PTC Perishables Set (primer/loading dye mix, marker, *Hae*III enzyme)	Each	**$127.50**
211508	PTC Tasting Primers Set	Each	**$34.50**

Developed in cooperation with the DNA Learning Center of Cold Spring Harbor Laboratory.

Polymerase Chain Reaction (PCR)

211345P Human Mitochondrial DNA Haplotyping Extraction, Amplification, and Electrophoresis Kit (AT) (with perishables)

Gel from Human Mitochondrial DNA Haplotyping Kit (AT)

Human Mitochondrial DNA Haplotyping Kit (AT)

Students use PCR and restriction enzyme analysis to determine their own mitochondrial haplotype

Advanced—For experienced high school and college classes; requires some technical skill.

Using mitochondrial DNA isolated from their cheek cells or hair, students perform PCR and a restriction enzyme digest to determine their haplotypes with respect to a locus in the mitochondrial genome. Concepts explored in this kit include haplotyping, evolution, and the application of PCR technology. Includes materials for 25 PCR reactions and restriction enzyme digests. Visit Carolina.com for complete lists of kit materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials.*

211341	Haplotyping DNA Extraction and Amplification Kit with 0.2-mL Tubes (with prepaid coupon)	Each	**$229.50**
211341P	Haplotyping DNA Extraction and Amplification Kit with 0.2-mL Tubes (with perishables)	Each	**$229.50**
211345	Haplotyping DNA Extraction, Amplification, and Electrophoresis Kit with 0.2-mL Tubes (with prepaid coupon)	Each	**$270.50**
211345P	Haplotyping DNA Extraction, Amplification, and Electrophoresis Kit with 0.2-mL Tubes (with perishables)	Each	**$270.50**

Amplification of Lambda DNA by PCR Kit

Can be performed with hand cycling!

Intermediate—Easy to perform; requires some background knowledge.

Good for beginning PCR study. Students amplify a 1,106-bp sequence from the bacteriophage lambda genome using a sample of dilute lambda DNA mixed with PCR Ready-to-Go Beads™ and lambda PCR primers. The mixture can be amplified using 2 water baths (55° C and 100° C) or by using a DNA thermal cycler. Students load the PCR samples onto a 1% agarose gel, electrophorese, and stain. They then verify the size of the amplified product by comparing it to DNA size markers. This kit also can be used to do time-course studies in which the number of amplification cycles is varied. Students can then observe a qualitative difference in the intensity of the bands on the gel in response to the number of amplification cycles performed. Materials are sufficient for 25 reactions or 6 to 8 time-course experiments. Visit Carolina.com for a complete list of kit materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials.*

211222	Lambda Amplification Kit with 0.2-mL Tubes (with prepaid coupon)	Each	**$200.00**
211222P	Lambda Amplification Kit with 0.2-mL Tubes (with perishables)	Each	**$200.00**
211227	Lambda Amplification and Electrophoresis Kit with *Carolina*BLU Stain and 0.2-mL Tubes (with prepaid coupon)	Each	**$227.50**
211227P	Lambda Amplification and Electrophoresis Kit with *Carolina*BLU Stain and 0.2-mL Tubes (with perishables)	Each	**$227.50**

Gel from time-course experiment using Amplification of Lambda DNA by PCR Kit

Developed in cooperation with the DNA Learning Center of Cold Spring Harbor Laboratory.

Detecting Epigenetic DNA Methylation in Arabidopsis Kit

Advanced—For experienced high school and college classes; requires some technical skill.

- Introduce students to the growing field of epigenetics
- Use a protocol designed especially for the classroom
- Gain experience working with the model plant *Arabidopsis thaliana*
- Investigate the role of DNA methylation in gene regulation

Utilize methylation-sensitive enzymes to explore epigenetics—heritable changes in gene expression—that affect flowering in *Arabidopsis*. By growing wild-type *Ler* and mutant *fwa-1* plants, students are able to observe phenotypic differences in flowering and then investigate this difference using multiple molecular techniques. Students conduct DNA extraction, restriction enzyme digest, PCR, gel electrophoresis, and bioinformatics to investigate the pivotal role DNA methylation plays in gene regulation.

Each kit contains materials for 25 DNA extractions and PCR reactions. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials.* ***Kit must be used within 4 weeks of receiving it.***

211404P Detecting Epigenetic DNA Methylation in *Arabidopsis* Kit (with perishables)

211403	Detecting Epigenetics Amplification Kit (with prepaid coupon)	Each	$298.50
211403P	Detecting Epigenetics Amplification Kit (with perishables)	Each	$298.50
211404	Detecting Epigenetics Amplification and Electrophoresis Kit with *Carolina*BLU Stain (with prepaid coupon)	Each	$321.50
211404P	Detecting Epigenetics Amplification and Electrophoresis Kit with *Carolina*BLU Stain (with perishables)	Each	$321.50
211405	Detecting Epigenetics Amplification and Electrophoresis Kit with GelGreen Stain (with prepaid coupon)	Each	$369.50
211405P	Detecting Epigenetics Amplification and Electrophoresis Kit with GelGreen Stain (with perishables)	Each	$369.50

Genotype-Phenotype Connection Kit

A unique kit using a colorful model microbe to help students understand the connection between genotypes and phenotypes

Advanced—For experienced high school and college classes; requires some technical skill.

- Robust yet simple protocol designed with the classroom in mind
- Connects students to real-world bioinformatics
- Includes a unique model organism ideal for classroom study

Looking for a great way to introduce your students to a new model organism while building their inquiry skills and advanced molecular techniques? In this activity, students use the model microbe *Halobacterium* sp. NRC-1 to perform deoxyribonucleic acid (DNA) extractions, polymerase chain reactions (PCR), and gel electrophoresis. The activity is designed in inquiry format to allow students to observe and experience the Archaeon and extreme halophile (salt-loving) microorganism, *Halobacterium* sp. NRC-1, along with a stable mutant derivative, *Halobacterium* sp. KBT-1. Students identify the phenotypic differences between these colonies and use PCR to analyze DNA from either a mutant (KBT-1), a wild type (NRC-1), or a sectored colony, further cementing the genotype-phenotype connection. Each kit contains materials for 25 DNA extractions and PCR reactions. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials.*

211217P Genotype-Phenotype Connection Extraction and Amplification Kit (with perishables)

211217	Extraction and Amplification Kit (with prepaid coupon)	Each	$227.50
211217P	Extraction and Amplification Kit (with perishables)	Each	$227.50
211218	Extraction, Amplification, and Electrophoresis Kit with *Carolina*BLU Stain (with prepaid coupon)	Each	$248.00
211218P	Extraction, Amplification, and Electrophoresis Kit with *Carolina*BLU Stain (with perishables)	Each	$248.00
211219	Extraction, Amplification, and Electrophoresis Kit with GelGreen Stain (with prepaid coupon)	Each	$260.00
211219P	Extraction, Amplification, and Electrophoresis Kit with GelGreen Stain (with perishables)	Each	$260.00

Forensic PCR Investigation Kit

Advanced—For experienced high school and college classes; requires some technical skill.

- Features robust yet simple protocol designed with the classroom in mind
- Connects students to real-world forensic techniques
- Introduces and reinforces techniques such as gel electrophoresis and PCR

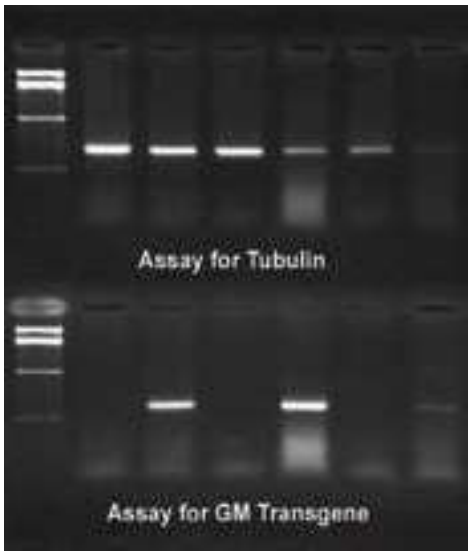
Looking to build on your students' classroom knowledge of DNA fingerprinting with a hands-on activity? This kit takes your forensics class to the next level by giving students the opportunity to analyze DNA samples from a (fictitious) crime scene. Students immerse themselves in attempting to identify the culprit, learning more about DNA profiling and the role of tandem repeats in the analysis. They build on that knowledge with a hands-on investigation of the samples using PCR amplification and gel electrophoresis to help close the case. This kit is a great next step for bringing molecular techniques into your forensics classroom or an ideal investigation for engaging your biology classroom in a new way. Each kit contains materials for 28 PCR reactions with students working in 6 groups of 4. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials. Items #211401 and #211401P are sold only to schools and businesses.*

211400P Forensic PCR Investigation Amplification Kit (with perishables)

211400	Amplification Kit (with prepaid coupon)	Each	$223.00
211400P	Amplification Kit (with perishables)	Each	$223.00
211401	Amplification and Electrophoresis Kit with Ethidium Bromide (with prepaid coupon)	Each	$254.00
211401P	Amplification and Electrophoresis Kit with Ethidium Bromide (with perishables)	Each	$254.00
211402	Amplification and Electrophoresis Kit with *Carolina*BLU (with prepaid coupon)	Each	$242.00
211402P	Amplification and Electrophoresis Kit with *Carolina*BLU (with perishables)	Each	$242.00

Polymerase Chain Reaction (PCR)

211371P Detecting Genetically Modified Food by PCR Extraction, Amplification, and Electrophoresis Kit (with perishables)



Gel from Detecting Genetically Modified Food by PCR Kit

DNA KITS LEARNING CENTER

Developed in cooperation with the DNA Learning Center of Cold Spring Harbor Laboratory.

Detecting Genetically Modified Food by PCR

DNA KITS LEARNING CENTER *Advanced—For experienced high school and college classes; requires some technical skill.*

Explore a modern application of genetic engineering through this exciting laboratory activity. Many commercial crops are genetically modified (GM) to include a transferred gene (transgene) for herbicide resistance. This activity investigates whether the soy or corn ingredients in various processed foods contain a genetic modification. Students isolate DNA from wild-type and GM plant material (provided controls), and from food products of their choice. They use the extracted DNA as a template in 2 separate PCR reactions run under the same conditions. One reaction serves as a positive control to amplify a portion of the tubulin gene found in all plants, and the other assays for genetic modification. Each group works with a plant control and a food product. Each kit includes materials for 25 PCR reactions. Order kit to arrive 1 month before performing lab. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials.* FREE 1-year access to digital resources that support 3-dimensional instruction included.

211367	GM Food Extraction and Amplification Kit with 0.2-mL Tubes (with prepaid coupon)	Each	**$212.50**
211367P	GM Food Extraction and Amplification Kit with 0.2-mL Tubes (with perishables)	Each	**$212.50**
211371	GM Food Extraction, Amplification, and Electrophoresis Kit with *Carolina*BLU and 0.2-mL Tubes (with prepaid coupon)	Each	**$222.50**
211371P	GM Food Extraction, Amplification, and Electrophoresis Kit with *Carolina*BLU and 0.2-mL Tubes (with perishables)	Each	**$222.50**
211372	GM Food Extraction, Amplification, and Electrophoresis Kit with GelGreen and 0.2-mL Tubes (with prepaid coupon)	Each	**$289.00**
211372P	GM Food Extraction, Amplification, and Electrophoresis Kit with GelGreen and 0.2-mL Tubes (with perishables)	Each	**$289.00**

PCR Primers

PTC Tasting Primers

For use with Using a Single Nucleotide Polymorphism (SNP) to Predict Bitter Tasting Ability Kit (items #211377 through #211381P). One set of primers in cresol red loading solution for PCR amplification of the locus associated with the ability to taste phenylthiocarbamide (PTC). Sufficient materials for 25 student reactions. 700 µL.

211508 Each **$34.50**

pMCT118 Primers

For use with Using Highly Variable Polymorphisms in Forensic Biology and Population Genetics Kit (items #211233A through #211235AP). One set of primers in cresol red loading solution for PCR amplification of the pMCT118 locus. Sufficient materials for 25 student reactions. 700 µL.

211506 Each **$34.50**

Alu TPA Primers

One set of primers for PCR amplification of TPA-25 *Alu* insertion. Materials (165 µL of each primer) are sufficient for 30 reactions. **Note:** *Not for use with Using an* Alu *Insertion Polymorphism to Study Human Populations Kit (items #211230A through #211232AP).*

211496 Per set **$34.50**

mtDNA Primers

For use with Mitochondrial DNA Polymorphisms in Human Evolution Kit (items #211236A through #211238AP). One set of primers in cresol red loading solution for PCR amplification of a 440-bp sequence within the control region of the mitochondrial DNA. Sufficient materials for 25 student reactions. 700 µL.

211504 Each **$34.50**

Alu PV92 Primers

For use with Using an *Alu* Insertion Polymorphism to Study Human Populations kits (items #211230A through #211232AP). One set of primers in cresol red loading solution for PCR amplification of the PV92 locus. Sufficient materials for 25 student reactions. 700 µL.

211502 Each **$34.50**

See our DNA Barcoding Primers on page 267.

Electrophoresis Reagents

Electrophoresis Reagent Refill

DNA refills for our 6-station biotechnology kits help you save on costs by allowing you to reuse instructions and use your own electrophoresis supplies. The Electrophoresis Reagent Refill complements these DNA refills by supplying materials needed to conduct electrophoresis of DNA for *any* of our 6-Station Refill Kits. The Electrophoresis Reagent Refill contains 4 g of agarose, 150 mL of 20× TBE buffer concentrate, *Carolina*BLU™ concentrate, and 6 staining trays. All you need to provide is the electrophoresis equipment, instructions, and DNA samples from your favorite kit.

211303 Each **$44.00**

211303 Electrophoresis Reagent Refill

DNA Gel Electrophoresis Reagent Set

Contains all reagents needed for separating DNA restriction fragments using agarose gel electrophoresis. Includes tris-borate-EDTA (TBE) electrophoresis buffer concentrate for 10 L 1× buffer; electrophoresis-grade agarose, 25 g; loading dye, 1 mL; and either ethidium bromide (5 mg/mL, 1 mL) or *Carolina*BLU™. **Note:** *Item #211300 is sold only to schools and businesses.*

211300 Ethidium Bromide Set Each **$134.00**
211301 *Carolina*BLU Set Each **$109.00**

Fast Gels Electrophoresis Pack

- Electrophoresis at warp speed
- As simple as changing your buffer
- Run gels in 10 to 20 minutes

Looking for a great way to save time in your classroom without making big changes to your protocols? Carolina is proud to exclusively offer the Fast Gels buffer system designed to take your electrophoresis experiments to the next level. On average, our Fast Gels products decrease DNA electrophoresis run-time from 45 minutes to 10–20 minutes, allowing you to accomplish more during valuable class time. The Fast Gels system typically works best with DNA fragments that are less than 1 kb in length, making it an effective option for many of our PCR kits. Each pack contains enough materials to run and stain 8 gels (2% or lower) using the specified stain. For optimum results your power supply must be capable of running at 250 to 290 V, but any increase in voltage will help reduce the running time of your gel. Visit Carolina.com for a complete list of materials. **Note:** *Item #217308 is sold only to schools and businesses.*

217307 Fast Gels Electrophoresis Pack: *Carolina*BLU Each **$22.50**
217308 Fast Gels Electrophoresis Pack: Ethidium Bromide Each **$55.50**
217309 Fast Gels Electrophoresis Pack: GelGreen Each **$72.50**

217307 Fast Gels Electrophoresis Pack: *Carolina*BLU

For individual electrophoresis reagents, see Chemicals on pages 285–286.

CarolinaBLU™ DNA Stain

An ultra-safe, 2-step staining system in which a small amount of stain is added to the agarose and buffer prior to running the gel. This causes DNA bands to become faintly visible during electrophoresis. After electrophoresis, simply stain as usual to enhance visualization of bands. *Carolina*BLU™ stain gives better results than methylene blue because of increased sensitivity, reduced background, and reduced staining time. Includes 30 mL of stain to be added to the agarose and buffer solutions and 250 mL of the final staining solution.

217300 Each **$11.50**

Gel run with *Carolina*BLU in the gel and buffer, and before final staining with *Carolina*BLU final stain

After staining with *Carolina*BLU final stain

GelGreen™

A safer alternative to ethidium bromide

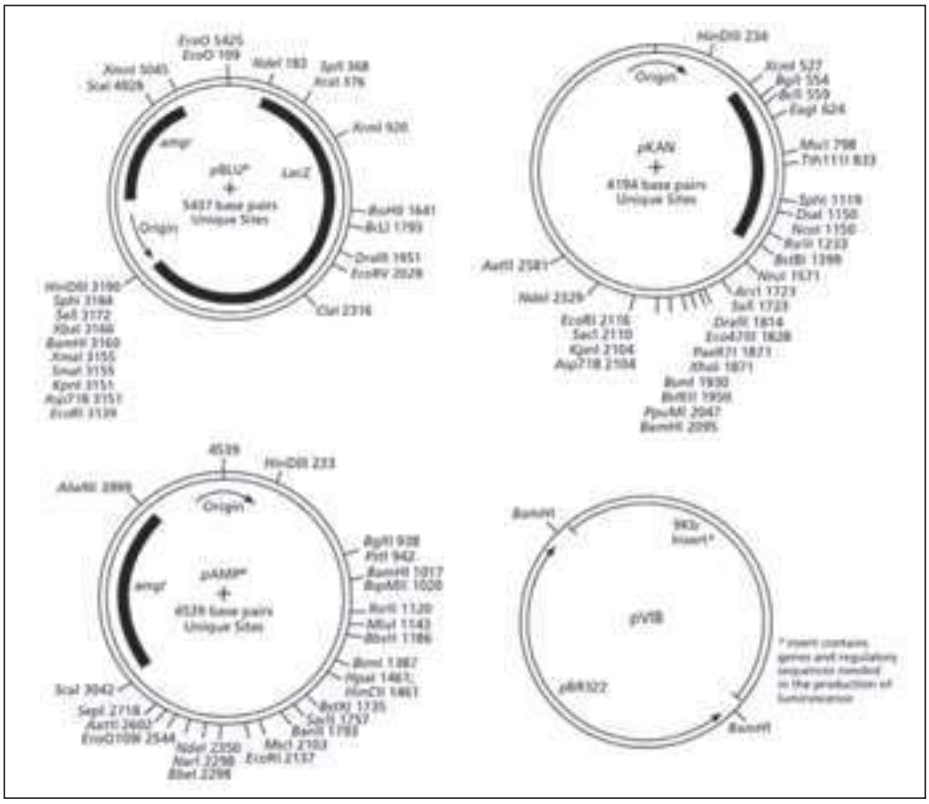
GelGreen™ is a stable, low toxicity stain with sensitivity comparable to ethidium bromide and is non-mutagenic by Ames test. GelGreen's main UV absorption peak is between 250 nm and 300 nm, but it also absorbs well at 500 nm. Thus, DNA stained with GelGreen™ can be visualized using a 254-nm UV transilluminator or equipment such as a Dark Reader™, Visi-Blue™, or a 488-nm laser-based scanner. Stain comes in a 150-µL tube of 10,000× solution. Suggested use is as a 3× solution for post-electrophoresis staining of double- or single-stranded DNA and RNA in agarose gels. The stain can also be used at 1× concentration incorporated into the gel, but this may affect DNA band mobility. Not recommended for use with acrylamide gels.

217305 Per tube **$68.95**

217305 GelGreen

Biotechnology

Plasmid & Lambda DNA



Restriction maps: *(top left)* pBLU Plasmid (211420 to 211427); *(bottom left)* Plasmid pAMP (211429 to 211438); *(top right)* Plasmid pKAN (211439 to 211443); *(bottom right)* Plasmid pVIB (211447)

Lambda DNA

Supplied with TE buffer.

211408 10 µg (100 µL; 0.1 µg/µL)
Each **$18.00**

211410 40 µg (200 µL; 0.2 µg/µL)
Each **$37.25**

211414 80 µg (200 µL; 0.4 µg/µL)
Each **$74.25**

Customer Review

"The prepackaged Lambda DNA is purchased by our campus biology department because of its ease to use by students, and we get good results every time."

University Lab Manager

Bulk quantities and special orders are available on request. Contact Carolina's Biotechnology Department at 800.334.5551 for details.

211419 Instant Lambda DNA

Instant Lambda DNA

Lambda DNA dried in tris-EDTA buffer; stable for years at room temperature. Simply reconstitute with distilled water prior to use; refrigerate after reconstitution. 10 × 10 µg.

211419 Each **$59.75**

Plasmid pGREEN

Green phenotype; will also glow under UV light; transformation concentration only. 1 µg (200 µL; 0.005 µg/µL).*

211449 Each **$14.50**

pBLU® Plasmid

Developed by Dr. Greg Freyer (coauthor of *DNA Science: A First Course—2nd Edition*, item #212209) exclusively for Carolina. This plasmid contains the gene for ampicillin resistance as well as the entire β-galactosidase gene. It does not depend on complementing a partial β-galactosidase gene product as does pUC. In addition, the host, *E. coli* DH5α, does not need to be maintained on minimal medium for pBLU® transformation. The *lac* suppressor gene is inactivated, eliminating the need for IPTG in the medium.

211420 10 µg (50 µL; 0.2 µg/µL)
Each **$86.75**

211421 20 µg (100 µL; 0.2 µg/µL)
Each **$133.00**

211424 20 µg (50 µL; 0.4 µg/µL)
Each **$133.00**

211427 1 µg (200 µL; 0.005 µg/µL)*
Each **$13.00**

Plasmid pAMP

Ampicillin-resistant phenotype.

211429 10 µg (50 µL; 0.2 µg/µL)
Each **$80.50**

211430 20 µg (100 µL; 0.2 µg/µL)
Each **$120.75**

211431 40 µg (200 µL; 0.2 µg/µL)
Each **$180.50**

211433 40 µg (100 µL; 0.4 µg/µL)
Each **$180.50**

211438 1 µg (200 µL; 0.005 µg/µL)*
Each **$10.75**

Plasmid pKAN

Kanamycin-resistant phenotype.

211439 10 µg (50 µL; 0.2 µg/µL)
Each **$80.00**

211440 20 µg (100 µL; 0.2 µg/µL)
Each **$120.75**

211441 40 µg (200 µL; 0.2 µg/µL)
Each **$180.50**

211443 40 µg (100 µL; 0.4 µg/µL)
Each **$180.50**

Plasmid pVIB

Transformation concentration. 1 µg (200 µL; 0.005 µg/µL).* Bacteria containing pVIB should be grown at 30° C or cooler for glowing to be seen.

211447 Each **$10.75**

Plasmid pUC18

Ampicillin-resistant phenotype. Contains the α-peptide of the *lacZ* (β-galactosidase) gene. 10 µg.

211462 Each **$68.00**

Plasmid pBR322

Ampicillin and tetracycline-resistant phenotype. 10 µg (100 µL; 0.1 µg/µL).

211450 Each **$61.75**

*Transformation concentration; use 10 µL/transformation.

DNA Markers & Enzymes

Molecular Weight Marker

Lambda DNA/*Hin*dIII. Contains bands of the following sizes: 23,123 bp; 9,416 bp; 6,557 bp; 4,361 bp; 2,322 bp; 2,027 bp; and 564 bp.

211473 50 µg (200 µL; 0.25 µg/µL) Each **$71.25**
211473A 25 µg (100 µL; 0.25 µg/µL) Each **$44.50**

Molecular Weight Marker

Lambda DNA/*Eco*RI. Contains bands of the following sizes: 21,226 bp; 7,421 bp; 5,804 bp; 5,643 bp; 4,878 bp; and 3,530 bp. 50 µg (200 µL; 0.25 µg/µL).

211474 Each **$71.25**

Molecular Weight Marker

Lambda DNA/Bst EII. Contains bands of the following sizes: 8,454 bp; 7,242 bp; 6,369 bp; 5,686 bp; 4,822 bp; 4,324 bp; 3,675 bp; 2,323 bp; 1,929 bp; 1,371 bp; 1,264 bp; 702 bp; 224 bp; and 117 bp. 50 µg (200 µL; 0.25 µg/µL).

211475 Each **$85.50**

Molecular Weight Marker

pBR322/BstNI. This plasmid-based DNA ladder has fragments of 1,857; 1,058; 929; 383; and 121 bp. Supplied at a concentration of 0.075 µg/µL; 130 µL (enough for 6 gels) is provided. This is an excellent ladder for comparing with other plasmid restriction digests or PCR reactions. 9.75 µg.

211479 Each **$46.50**

211473 Molecular Weight Marker

211474 Molecular Weight Marker

211475 Molecular Weight Marker

211479 Molecular Weight Marker

New! Molecular Weight Marker

100 bp. Reference bands with increased intensity for easy size determination. Plasmids digested to completion and purified using a multi-step chromatography process. Simply load 5 µL per lane for green nucleic. DNA ladder has fragments of 1,000; 900; 800; 700; 600; 500; 400; 300; 200; and 100 bp. Supplied at a concentration of 0.1 µg/µL; 50 µL (enough for 10 gels).

211480 Each **$20.00**

New! Molecular Weight Marker

1 kb. Reference bands with increased intensity for easy size determination. Plasmids digested to completion and purified using a multi-step chromatography process. Simply load 5 µL per lane for green nucleic. DNA ladder has fragments of 10,000; 8,000; 6,000; 5,000; 4,000; 3,000; 2,500; 2,000; 1,500; 1,000; 750; 500; and 250 bp. Supplied at a concentration of 0.1 µg/µL; 50 µL (enough for 10 gels). **Note:** *DNA ladders are shipped at ambient temperature. On arrival, store at –20° C for optimum stability and long-term storage for up to 15 months.*

211481 Each **$20.00**

Instant Restriction Enzymes

No more worry about enzymes losing activity! No more waste from pipetting errors! These enzymes are freeze-dried in reaction buffer in individual reaction tubes and are stored at room temperature. Each tube contains sufficient activity to digest 1.5 µg DNA in 20 minutes. Simply add DNA to the enzyme tube and incubate at 37° C for 20 minutes or at room temperature overnight. Packaged in 16 reaction tubes.

211721 *Bam*HI Pack of 16 **$55.75**
211723 *Eco*RI Pack of 16 **$55.75**
211725 *Hin*dIII Pack of 16 **$55.75**

Instant Restriction Enzymes

Restriction Enzymes

Liquid enzymes are shipped next day on gel cold packs. Foreign orders may require special handling. Liquid enzymes should be stored at –20° C. All enzymes are sent with 10× restriction enzyme buffer.

*Bam*HI

211660 200 µL (2,000 units) Each **$55.75**

*Hin*dIII

211690 200 µL (2,000 units) Each **$55.75**

*Eco*RI

211670 200 µL (2,000 units) Each **$55.75**

*Hae*III

211712 40 µL (400 units) Each **$42.00**

Modifying Enzymes

T4 DNA Ligase

With 10× ligation buffer/ATP.

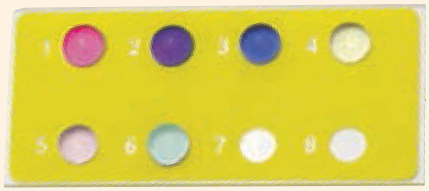
211740 50 µL (10,000 units) Each **$118.75**
211741 100 µL (20,000 units) Each **$218.75**

RNase A

5 mg/mL.

211745 500 µL Each **$16.00**

Microarray



From 211520 DNA Chips: Genes to Disease

Teacher Testimonial

"We ran this simulation in a 300-level genetics lab (college, not high school) last semester along with the supplementary math analysis that Dr. Laurie Heyer and Dr. Malcolm Campbell (Davidson College) developed. It was a great success! Not only did the students enjoy the lab . . . they [also] had significant gains in understanding. I really like this simulation!"

Pamela A. Marshall, PhD
Assistant Professor of Integrated Natural Sciences
Arizona State University, West Campus
Glendale, AZ

211520 DNA Chips: Genes to Disease

DNA Chips: Genes to Disease

Advanced—For experienced high school and college classes; requires some technical skill.

- Simple microarray simulation
- Comprehensive 2- to 4-day lesson plan
- Affordable lab option
- No special equipment
- 45-minute experiment

This microarray simulation provides an inexpensive, hands-on lab to introduce students to microarrays, the complexities of gene expression, and the role of gene expression in cancer. Using simulated microarray technology, students compare the relative expression levels of 6 different genes in healthy lung cells and lung cancer cells. They then discuss the significance of the relative expression levels with respect to the genes' roles in causing cancer. Kit contains enough material for 10 groups to perform the experiment twice. Teacher's manual includes instructions for a bonus dry lab.

Kit includes:
Glass Slides
Simulated Hybridization Solution
6 Simulated cDNA Solutions
Instructions with Student Masters
Pack of 30 Student Worksheets

Needed but not included:
Hot Water Bath

Refill Kit includes:
Simulated Hybridization Solution
6 Simulated cDNA Solutions
Pack of 30 Student Worksheets

211520	Kit	Each	**$106.00**
211521	Refill Kit	Each	**$62.00**

Alternative Energy

210000 Microbial Fuel Cell Kit

Microbial Fuel Cell Kit

Advanced—For experienced high school and college classes; requires some technical skill.

- Investigate cellular respiration
- Explore an alternative fuel source
- See microbes in a new light

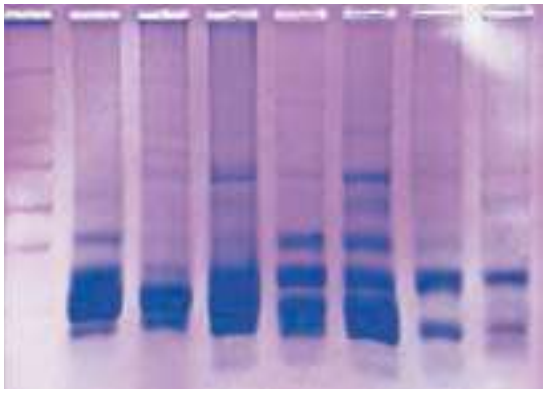
Use this high-quality fuel cell in an exciting cross-curricular lab that explores cellular respiration, electrical currents, microbiology, and the need for alternative fuels. The fuel cell uses the metabolic activity of ordinary baker's yeast to create a small electric current; its design is based on original research done by Dr. Peter Bennetto, formerly of King's College, London. Chemicals arrive dry, in premeasured amounts. The **Microbial Fuel Cell** is also sold separately and includes 2 sets of neoprene gaskets, a cation-exchange membrane, and carbon fiber for electrodes. The cation-exchange membrane can be reused many times.

Kit includes:
Fuel Cell with 2 Sets of Neoprene Gaskets
Cation-Exchange Membrane
Sodium Phosphate*
Glucose*
Methylene Blue*
Potassium Hexacyanoferrate*
Carbon Fiber for Electrodes*
Set of Leads
Whiz-Away™ Wipe Cloth*
Manual

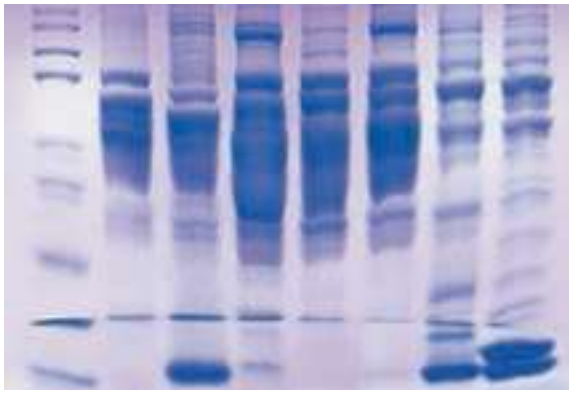
Needed but not included:
Distilled Water
Active Dry Yeast
5- or 10-mL Serological Pipets or Syringes
(for measuring fluid and loading the cell)
Digital Voltmeter (that measures 0.4–0.6 V and 1–50 mA)

210000	Kit	Each	**$305.00**
210001	Refill Kit (all * items)	Each	**$35.25**
214320	Microbial Fuel Cell	Each	**$232.00**
210002	Replacement Cation-Exchange Membrane	Each	**$66.25**

Protein Analysis & Protein Gel Electrophoresis



Gel from 211255 Fish Protein Fingerprinting on Agarose Gels Kit



Gel from 211260 Fish Protein Fingerprinting on Polyacrylamide Gels Kit

Customer Review

"These fish proteins gave us great results on acrylamide gels. The different species were easy to distinguish and the samples were of great quality. This product allowed me to design a lab activity in which I tied in molecular biology, proteins, evolution, and taxonomy. I highly recommend it!"

University Professor

Fish Protein Fingerprinting Kits

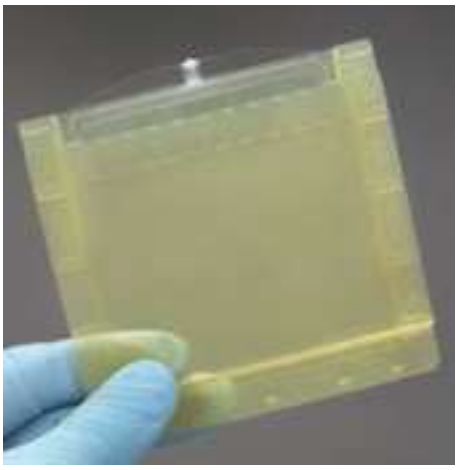
Good for inquiry-based learning; both kits come with prepared fish protein samples, and all electrophoresis materials are included—no need to purchase acrylamide gels or agarose

Advanced—For experienced high school and college classes; requires some technical skill.

Explore the evolution of fish species through protein analysis. Students perform gel electrophoresis on extracted muscle protein mixtures from 7 different types of fish. The fish protein extracts are provided ready for use. Electrophoresis of the protein extracts creates a unique pattern of bands, called a protein fingerprint, for each fish species. Students compare the protein fingerprints from the 7 different types of fish, hypothesize on the degree of relatedness of the fish, and compare their ideas to a standard evolutionary tree of fish. The **Fish Protein Fingerprinting on Agarose Gels Kit** uses fine-sieving agarose gels for separation of protein bands and contains sufficient materials for running 6 gels. The **Fish Protein Fingerprinting on Polyacrylamide Gels Kit** uses precast polyacrylamide gels for separation of protein bands and contains sufficient materials for running 4 gels (6 gels if additional marker and gels are purchased). Polyacrylamide gels provide greater protein resolution than fine-sieving agarose gels do but require vertical electrophoresis chambers. Additional polyacrylamide gels and other reagents can be purchased separately. Visit Carolina.com for a complete list of kit materials. **Note:** *Order the kits with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials.* ***Kits with perishable materials included should not be shipped over a weekend.*** *Carolina recommends that you request these items to arrive on a Wednesday, Thursday, or Friday (or even a Saturday) to avoid weekend shipping. Protein samples require freezer storage. Avoid repeated freezing and thawing of samples.*

211255	Fish Protein Fingerprinting on Agarose Gels Kit (with prepaid coupon)	Each	**$222.50**
211255P	Fish Protein Fingerprinting on Agarose Gels Kit (with perishables)	Each	**$222.50**
211255C	Perishables Refill Kit A	Each	**$164.50**
211260	Fish Protein Fingerprinting on Polyacrylamide Gels Kit (with prepaid coupon)	Each	**$250.25**
211260P	Fish Protein Fingerprinting on Polyacrylamide Gels Kit (with perishables)	Each	**$250.25**
211260C	Perishables Refill Kit B	Each	**$164.50**

Expand your kit to serve more students by ordering extra electrophoresis materials.			
211375	Precast Polyacrylamide Gel	Each	**$24.25**
217088	Protein Gel Agarose (10 g)	Each	**$81.75**
211510	Protein Size Standard (50 µL)	Each	**$36.25**
219030	Tris-Glycine SDS Buffer	Each	**$22.00**
219784	COOMASSIE Protein Stain Solution, 1×	500 mL	**$10.50**
219785	COOMASSIE Destain Solution, 5×	500 mL	**$11.75**



211375 Precast Polyacrylamide Gel

ELISA Simulation Kit

Intermediate—Easy to perform; requires some background knowledge.

Explore infectious diseases using a hands-on simulated ELISA assay. ELISA (Enzyme-Linked Immunosorbent Assay) is a common laboratory technique used to test blood serum for antibodies against disease-causing agents. Using the ELISA Simulation Kit, students work in pairs to diagnose 6 fictitious patients for HIV, Lyme disease, avian influenza (bird flu), or West Nile virus. Hypothetical scenarios are provided for each patient being tested for each disease. This kit poses no risk of infection because it does not contain actual serum samples, antibodies, antigens, or disease-causing agents. **Kit** includes enough materials for 32 students. **Refill Kit** contains all kit materials except microtiter plates and teacher's manual. Visit Carolina.com for complete lists of kit materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials. Freeze perishable samples upon arrival.*

211248	Kit (with prepaid coupon)	Each	**$125.00**
211248P	Kit (with perishables)	Each	**$125.00**
211249	Refill Kit (with prepaid coupon)	Each	**$62.00**
211249P	Refill Kit (with perishables)	Each	**$62.00**

211248P ELISA Simulation Kit (with perishables)

Protein Assay Kit

Intermediate—Easy to perform; requires some background knowledge.

Students use a standard curve to analyze data in this experiment. They gather data by performing a BCA assay to determine the amount of protein in a standard versus 3 different food samples (included). Optionally, they can supply and test a fourth liquid food sample of their choosing. A spectrophotometer is used to obtain numerical values for the absorbances of dilutions of the standard and the samples. Students graph absorbance versus protein concentration for the standard and use the resulting curve to interpolate the concentration of protein in the samples. Kit includes enough materials for 8 stations. Visit Carolina.com for a complete list of kit materials.

211285 Per kit **$278.25**

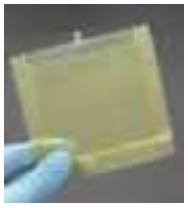
Results from 211285 Protein Assay Kit

Protein Sets, Reagents, & Markers for Protein Analysis

Precast Polyacrylamide Gel

12% polyacrylamide gel in tris-glycine-SDS buffer for separation of proteins. Gel cassette is 9.5 × 10 cm, 1-mm thick, with 10 sample wells. Fits Carolina's vertical gel box as well as many others. On precast gels we guarantee a minimum 30-day shelf life from date of shipment when gels are kept refrigerated.

211375 Each **$24.25**



211375 Precast Polyacrylamide Gel

Protein Size Standards

Invitrogen. A mixture of 12 proteins ranging in size from 2.5 kD to 200 kD (200, 116.3, 97.4, 66.3, 55.4, 36.5, 31, 21.5, 14.4, 6, 3.5, and 2.5 kD). Approximately 0.5 mg/mL of each protein. Load 5 µL per lane. Store in refrigerator. Unit of 50 µL. **Note:** *Shipped on gel cold packs.* ***Should not be shipped over a weekend.*** *Carolina recommends that you request your order to arrive on a Wednesday, Thursday, or Friday (or even a Saturday) to avoid weekend shipping.*

211510 Each **$36.25**

Fish Protein Sample Set

Examine the relatedness of different types of fish by comparing their protein profiles. Set contains extracts of 7 different species of fish. Extracts are ready to load onto acrylamide or agarose gels. Use 10 µL per gel lane on our precast acrylamide gels. Each sample is 150 µL. Store in freezer. See item #211255 on page 279 for picture. **Note:** *Shipped 2nd day on gel cold packs.* ***Should not be shipped over a weekend.*** *Carolina recommends that you request your order to arrive on a Wednesday, Thursday, or Friday (or even a Saturday) to avoid weekend shipping.*

211515 Each **$64.00**

Carolina Teacher Tips

- Store fish protein sets in the freezer.
- Repeated freezing and thawing can degrade protein. To prevent loss of useable protein, aliquot it into smaller volumes before freezing.

Agarose, Protein Gel

This special fine-sieving agarose is preferable to standard agarose for separation of proteins. Use at 4% concentration for most applications.

217088 Each **$81.75**

Tris-Glycine-SDS Buffer

5× concentrate. For electrophoresis of proteins. 500 mL.

219030 Each **$22.00**

Gene Expression

171206P Evolution in Real Time: Bacteria and Antibiotic Resistance 8-Station Kit (with perishables)

Evolution in Real Time: Bacteria and Antibiotic Resistance

Looking for an engaging activity that blends the topic of evolution with the real-world issue of antibiotic resistance? In this experiment, students observe firsthand the evolution of a bacterial population's resistance to antibiotics over generations. It gives students the opportunity to use sterile technique, perform serial dilutions, plate bacteria, and understand the process of natural selection. The **8-Station Kit** is designed for 8 groups of 2 to 4 students each. The **1-Station Kit** is designed for 1 group of 2 to 4 students. All kits include 1-year access to digital resources that support 3-dimensional instruction. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials.*

171205	1-Station Kit (with prepaid coupon)	Each	**$61.00**
171205P	1-Station Kit (with perishables)	Each	**$61.00**
171206	8-Station Kit (with prepaid coupon)	Each	**$126.00**
171206P	8-Station Kit (with perishables)	Each	**$126.00**

171027P Carolina BioKits: Introduction to Gene Regulation: The *lac* Operon (with perishables)

Carolina BioKits®: Introduction to Gene Regulation: The *lac* Operon

Introduce your students to gene regulation with this lab activity focused on the *lac* operon. During the lab, students test the β-galactosidase levels of 3 cultures grown in the presence of glucose, lactose, or glucose and lactose. You have the option of allowing students to perform the activity as a quantitative lab (with spectrophotometer) or as a qualitative lab (without spectrophotometer). This kit is designed for students working in 8 groups of 2 to 4. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request the perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials. The o-nitrophenyl-β-D-galactopyranoside must be kept frozen.*

171027	Kit (with prepaid coupon)	Each	**$102.95**
171027P	Kit (with perishables)	Each	**$102.95**

214805 Genes and ConSEQUENCES Kit

Genes and ConSEQUENCES Kit

- Use specific examples to explain central dogma
- Introduce students to the NCBI database and related tools
- Provide real-world examples of complex genetic interactions
- Use and interpret electropherogram diagrams
- Understand the role of protein products in diseases

In today's fast-paced world of genetics, there are a tremendous amount of DNA sequences being generated by scientists around the world. Unlocking the power of these sequences requires a specific skill set and a keen understanding of using databases and conducting sequence comparisons. Accessing the National Center for Biotechnology Information (NCBI) database, students use the Basic Local Alignment Search Tool (BLAST) to compare their sequences to gene segments published in the database. Using a case study approach, students continue to explore their sequences as they work to determine the location and role of their gene in a disease. Kit is designed to continually reinforce the central dogma of biology and give students basic knowledge of these database tools. Designed for 30 students working in pairs.

214805 Per kit **$54.00**

Nematode Genetics

C. elegans as a Model Organism

These worms grow quickly—from embryo to adult in 3 days—are easy to culture, and can be stored in a freezer. The embryos, larvae, and adults are transparent, making observations of morphology and development in living worms easy. *C. elegans* can be grown at room temperature on small petri dishes seeded with the bacterium *E. coli*. To observe *C. elegans*, all that is required is a dissecting microscope. With these minimal requirements and a few simple tools, students can observe *C. elegans* behavior, development, and mutant phenotypes.

Caenorhabditis elegans N2

Wild-type strain. Extensively used for genetic studies. *Caenorhabditis elegans* completes its life cycle in 3 days, developing from egg through 4 larval stages to adult. The worms can be aseptically maintained in the laboratory at 20° C on Nematode Growth Agar (item #173520) using *Escherichia coli* (item #155068) as the feeder host.

173500 Each **$14.70**

173500 *Caenorhabditis elegans* N2

Nematode Growth Agar

Required for the successful subculturing of *Caenorhabditis elegans* N2 (item #173500). Each bottle contains 135 mL of medium, enough to pour about 5 petri dishes. Order *Escherichia coli* (item #155068) as the feeder host.

173520 Per bottle **$8.75**
10+ Bottles Each **$8.00**

211390 Culturing and Observing *C. elegans* Kit

Culturing and Observing C. elegans Kit

Intermediate—Easy to perform; requires some background knowledege.

Students will:

- Observe the powerful effect of mutations on phenotype
- Practice their microscope skills
- Get hands-on experience with an important model organism

This simple kit makes it easy to introduce students to the model organism *C. elegans*, a microscopic nematode worm used in Nobel Prize-winning studies on development, programmed cell death (apoptosis), and RNA interference. *C. elegans* is also widely used in studies to gain insight into the function of many human genes. In this lab, students perform "chunking," a simple way to move worms from 1 plate to another. They then observe the morphology, life cycle, and behavior of both wild-type and mutant worms. The observation that different mutants have different phenotypes emphasizes the relationship of genotype to different phenotype. Visit Carolina.com for a complete list of kit materials. **Note:** *Because of the time-sensitive preparation and limited shelf life of the kit's living materials, please order a minimum of 2 weeks prior to the desired ship date. Plan on using the materials within a week of receiving them. Kit ships only on Mondays, Tuesdays, and Wednesdays and is shipped standard overnight delivery.*

211390 Per kit **$88.00**

173525P *Caenorhabditis elegans* Culture Kit (with perishables)

Caenorhabditis elegans Culture Kit

For teacher demonstration or individual use. This kit contains enough materials for maintaining *C. elegans* over a period of 6 subcultures. Visit Carolina.com for complete lists of kit materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials. For kit with perishables included, order 2 weeks prior to the requested delivery date. Keep* C. elegans *and bacteria cultures at room temperature; do not incubate or refrigerate.*

173525 Kit (with prepaid coupon) Each **$105.00**
173525P Kit (with perishables) Each **$105.00**

See our Worms in a Changing Environment Kit on page 133.

Teacher's Choice | Carolina Exclusive | More Information Available Online

RNA Interference: Turning Genes Off at Will

Looking for a new way to vividly demonstrate the relationship between genes, their function, and phenotypes using Nobel Prize-winning technology? Pairing RNAi with the model organism *C. elegans* will give you that opportunity. RNAi is routinely employed to silence targeted genes in a sequence-specific way, granting researchers the ability to study gene function. These activities produce great results in just a matter of days and allow you to bring breakthrough research into your classroom.

Inducing RNAi by Feeding

Students silence genes and then observe the results!

Advanced—For experienced high school and college classes; requires some technical skill.

- Demonstrate to your students the power of silencing a single gene.
- Teach about a powerful method for determining gene function.
- Introduce your students to a model organism used for studying many aspects of biology, including development and gene function.
- Engage in bioinformatics exercises exploring protein function and *C. elegans* and human gene relatedness.

FREE Digital Assets

211391P Inducing RNAi by Feeding Kit (with perishables)

RNA interference (RNAi) is a technique that allows you to silence the expression of a chosen gene by specifically degrading the gene's mRNA. Students use the Nobel Prize-winning technique to silence 2 different genes in the nonparasitic roundworm, *C. elegans*. *C. elegans* is a model organism used for studying many aspects of biology, including development and gene function. In this lab, wild-type worms are fed lab strains of *E. coli* that express double-stranded RNA (dsRNA) corresponding to either of 2 target genes: *BLIstered cuticle (bli-1)* or *DumPY (dpy-11)*. The ingestion of the dsRNA initiates the destruction of mRNA expressed from the target genes. Students then examine the phenotypes induced by silencing these genes. Silencing *bli-1* leads to the formation of clear blisters in a worm's outer cuticle; silencing *dpy-11* leads to a worm developing a short, fat body. In accompanying bioinformatics exercises, students explore the function of the protein encoded by the silenced gene and the relatedness of worm and human genes. Kit includes FREE 1-year access to digital resources that support 3-dimensional instruction; visit Carolina.com for complete lists of kit materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials. For kit with perishables included, order 2 weeks prior to the requested delivery date. Perishables are only shipped on Mondays, Tuesdays, and Wednesdays. Plan to use the perishable materials within 1 week of receiving them.*

⚠² **211391**	Kit (with prepaid coupon)	Each	**$188.00**
⚠² **211391P**	Kit (with perishables)	Each	**$188.00**
702700	Micro Spatula, Both Ends Flat	Each	**$5.30**

Caenorhabditis elegans N2

Customer Review

"Such a simple lab to perform to teach a relatively new concept! I highly recommend it!"

College Biology Professor

Developed in cooperation with the DNA Learning Center of Cold Spring Harbor Laboratory.

⚠² California Proposition 65

⚠ **WARNING:** Reproductive Harm – www.P65Warnings.ca.gov

Gene Expression

Examining the RNAi Mechanism

Advanced—For experienced high school and college classes; requires some technical skill.

- Demonstrate to your students the power of silencing a single gene.
- Teach about a powerful method for determining gene function.
- Explore the relationship between phenotype, genotype, and RNAi-induced phenotype.
- Perform bioinformatics exercises exploring protein function in *C. elegans*, and human relatedness.

FREE Digital Assets

211392P Examining the RNAi Mechanism Kit (with perishables)

RNA interference (RNAi) is a technique that allows you to silence the expression of a chosen gene by specifically degrading the gene's mRNA. The Examining the RNAi Mechanism kit allows students to use this Nobel Prize-winning technique to silence the *dpy-13* gene in the non-parasitic roundworm, *C. elegans*. They observe wild-type worms eat a lab strain of *E. coli* that expresses double-stranded RNA (dsRNA) corresponding to the targeted gene, *DumPY 13 (dpy-13)*. The ingestion of the dsRNA from the bacteria initiates the destruction of mRNA expressed from the targeted *dpy-13* gene. Students examine the short, fat phenotype induced by silencing the *dpy-13* gene, and then isolate DNA from the RNAi-induced *dpy-13* worms, wild-type worms, and from *dpy-13* worms with a deletion in the *dpy-13* gene. They then amplify the region of the *dpy-13* gene containing the mutation to determine if the corresponding region in the wild-type worms and the RNAi-induced *dpy-13* worms has the same mutation. The deletion mutation creates a size difference in the amplified DNA fragment that can be easily observed by gel electrophoresis. In accompanying bioinformatics exercises, students explore the function of the protein encoded by the silenced gene and the relatedness of the human and worm genes. Visit **Carolina.com** for complete lists of kit materials. **Note:** *Order the kit with the perishable materials included or with a prepaid coupon to request perishables later at your convenience. Contact us or return the coupon to request delivery of perishable materials. For all kits with the perishables included, order 2 weeks prior to the requested delivery date. Perishables are only shipped on Mondays, Tuesdays, and Wednesdays. Plan to use the perishable materials within 1 week of receiving them. Items #211394 and #211394P are sold only to schools and businesses.* FREE 1-year access to digital resources that support 3-dimensional instruction included.

Caenorhabditis elegans N2

⚠2	**211392**	RNAi and Amplification Kit (with prepaid coupon)	Each	**$329.00**
⚠2	**211392P**	RNAi and Amplification Kit (with perishables)	Each	**$329.00**
⚠2	**211393**	RNAi, Amplification, and Electrophoresis Kit with *Carolina*BLU (with prepaid coupon)	Each	**$339.00**
⚠2	**211393P**	RNAi, Amplification, and Electrophoresis Kit with *Carolina*BLU (with perishables)	Each	**$339.00**
⚠2	**211394**	RNAi, Amplification, and Electrophoresis Kit with Ethidium Bromide (with prepaid coupon)	Each	**$379.00**
⚠2	**211394P**	RNAi, Amplification, and Electrophoresis Kit with Ethidium Bromide (with perishables)	Each	**$379.00**

Developed in cooperation with the DNA Learning Center of Cold Spring Harbor Laboratory.

⚠2 California Proposition 65
⚠ WARNING: Reproductive Harm – www.P65Warnings.ca.gov

Chemicals

We supply premium-quality chemicals and stains. The following chemical list includes those materials which we routinely maintain in stock. Special orders can be quoted and are usually shipped in 2 weeks.

Safety

Carolina is concerned with safety. Our safety communications are under continual update and improvement. In the event of a serious spill, contamination, ingestion, or other emergency situation, information is available from Carolina by calling product information at 800.227.1150 or 336.584.0381 and explaining your emergency. This service is available 8 AM to 5 PM (ET) Monday through Friday. For chemical emergencies during all other hours, contact your local poison control center at 800.222.1222 within the US.

It is recommended that each person in the laboratory be required to wear eye protection at all times. Contact lenses should not be worn in a chemical laboratory. Laboratory coats and laboratory aprons should be used to prevent chemical contamination. It is advised that appropriate gloves be worn when handling any chemical. When pouring volatile chemicals, always use a fume hood.

Carolina provides a safety data sheet (SDS) with each hazardous chemical (as defined by OSHA) shipped to you. For your protection, the safety requirements listed on the data sheet should be followed.

For an explanation of chemical grades and details on shipping, go to page 932.

Stains & Dyes

GelGreen™

A safer alternative to ethidium bromide

GelGreen™ is a stable, low toxicity stain with sensitivity comparable to ethidium bromide and is non-mutagenic by Ames test. GelGreen's main UV absorption peak is between 250 nm and 300 nm, but it also absorbs well at 500 nm. Thus, DNA stained with GelGreen™ can be visualized using a 254-nm UV transilluminator or equipment such as a Dark Reader™, Visi-Blue™, or a 488-nm laser-based scanner. Stain comes in a 150-µL tube of 10,000× solution. Suggested use is as a 3× solution for post-electrophoresis staining of double- or single-stranded DNA and RNA in agarose gels. The stain can also be used at 1× concentration incorporated into the gel, but this may affect DNA band mobility. Not recommended for use with acrylamide gels.

217305 Per tube **$68.95**

Ethidium Bromide DNA Stain

Note: *Sold only to schools and businesses.*

217422 250 mL at 1 µg/mL (no dilution required) Each **$41.50**

Loading Dye

For gel electrophoresis of DNA, 10× concentration.

218200 1 mL Each **$7.50**

Gel run with *Carolina*BLU in the gel and buffer, and before final staining with *Carolina*BLU final stain

After staining with *Carolina*BLU final stain

CarolinaBLU™ DNA Stain

An ultra-safe, 2-step staining system in which a small amount of stain is added to the agarose and buffer prior to running the gel. This causes DNA bands to become faintly visible during electrophoresis. After electrophoresis, simply stain as usual to enhance visualization of bands. *Carolina*BLU™ stain gives better results than methylene blue because of increased sensitivity, reduced background, and reduced staining time. Includes 30 mL of stain to be added to the agarose and buffer solutions and 250 mL of the final staining solution.

217300 Each **$11.50**

Buffers

Tris-Borate-EDTA (TBE)

20× electrophoresis buffer concentrate. **Note:** *Cannot be shipped via USPS. Sold only to schools and businesses.*

219025 150 mL for 3 L of 1× Buffer Each **$17.00**
219027 500 mL for 10 L of 1× Buffer Each **$38.00**

Tris-Acetate-EDTA (TAE)

Buffer used for electrophoresis. Comes as a 50× concentrate.

219032 50 mL for 2.5 L of 1× Buffer Each **$15.00**
219033 100 mL for 5 L of 1× Buffer Each **$22.00**

Tris-Glycine-SDS Buffer

5× concentrate. For electrophoresis of proteins.

219030 Each **$22.00**

Biotechnology

General Chemicals

Agarose
Electrophoresis grade; low EEO.
217075 5 g Each **$17.50**
217080 25 g Each **$68.50**

Agarose, Protein Gel
This special fine-sieving agarose is preferable to standard agarose for separation of proteins. Use at 4% concentration for most applications.
217088 10 g Each **$81.75**

Chelex®
100 to 200 mesh, sodium form.
217310 25 g Each **$89.00**

Sodium Dodecyl Sulfate (SDS), Solid
218820 50 g Each **$39.00**

211320 Calcium Chloride, 50 mM

Calcium Chloride, 50 mM
For the preparation of competent *E. coli* cells. The 5 × 100-mL quantity is sufficient for at least 40 individual preparations.
211320 5 × 100 mL Each **$48.50**
211322 8 × 3 mL Each **$14.50**

217085 Melt-n-Pour Agarose, 400 mL, 1%

Melt-n-Pour Agarose, 400 mL
Made with TBE buffer. Just melt in microwave or boiling water bath.
217084 0.8% Each **$28.50**
217085 1% Each **$29.50**
217086 2.0% Each **$34.50**

Antibiotics

Solutions

Antibiotics are added to culture media (after autoclaving and cooling to 50˚ C) at a rate of 1 mL of antibiotic solution per 100 mL of media. Antibiotic solutions are stable for 1 month refrigerated or longer if frozen. Please specify delivery date to ensure fresh materials.

Ampicillin
10 mg/mL.
216858 4 mL Each **$6.25**
216860 100 mL Each **$46.50**

Ampicillin/X-gal
7.5 mg/mL. Add 1 mL of antibiotic per 75 mL of medium.
216874 5.4 mL Each **$29.00**

Kanamycin
10 mg/mL.
216861 100 mL Each **$49.00**

216874
Ampicillin/X-gal

216860 Ampicillin

Media Ingredients

Tryptone
216741 500 g Each **$108.00**

Yeast Extract
216746 500 g Each **$115.00**

216746 Yeast Extract

Dry Powder

Ampicillin
216880 5 g Each **$52.50**

Kanamycin
216881 5 g Each **$62.00**

216880 Ampicillin

Culture Media

Media are formulated with LB or LB agar base. Please give use date on your order. When you receive your material, refrigerate it immediately at 2 to 8° C. Antibiotics should be frozen unless the media they are added to is used within 2 months of receiving the antibiotic. Media with antibiotics last for approximately 2 months from the date the antibiotic is added.

Media Plates

Ready-to-use prepoured plates (100 × 13 mm or 100 × 15 mm).

216600 Luria Broth Agar Plates

Luria Broth Agar

Rich nutrient agar for the growth of *E. coli* colonies.

216600 Pack of 10 **$22.50**

Luria Broth Agar + Ampicillin

Selects for ampicillin resistance.

216601 Pack of 10 **$25.00**

Luria Broth Agar + Ampicillin + X-gal

Selects for ampicillin resistance and gives blue colonies if bacteria contains gene for β-galactosidase.

216604 Pack of 10 **$43.75**

Ready-to-Pour Media

Each set contains premixed, sterile agar sufficient for pouring 25 plates. Simply melt in a microwave oven, water bath, or autoclave; cool; add antibiotic; and pour into the sterile plates provided. Each bottle is sealed to prevent contamination and drying. Antibiotic solutions are provided separately in sterile aliquots to be added after the agar has been melted and cooled to 50° C. Antibiotics should be frozen unless the media they are added to is used within 2 months of receiving the antibiotic.

216620 Luria Broth Agar

Luria Broth Agar

Rich nutrient agar for the growth of *E. coli* colonies.

216620 Per set **$30.25**

Luria Broth Agar + Ampicillin

Selects for ampicillin resistance.

216621 Per set **$34.50**

Luria Broth Agar + Kanamycin

Selects for kanamycin resistance. **Note:** *Sold only to schools and businesses.*

216622 Per set **$34.25**

Media Solutions

Luria Broth Vials

Sterile, in 3.0-mL vials.

216655 Pack of 8 **$14.00**

Luria Broth Bottles

These sterile 50-mL aliquots of Luria broth are ready to use for small overnight suspension cultures of *E. coli* for isolating plasmid DNA or for aiding in spreading small volumes of cells. In 50-mL bottles.

216650
Pack of 5 **$26.50**

216650 Luria Broth Bottles

Dehydrated Media (Premixed)

Our dehydrated media are the finest quality available. They are convenient to use and uniform in composition.

Luria Broth Base

Rich nutrient broth for suspension cultures of *E. coli*. Mix contains correct proportions of tryptone, yeast extract, and sodium chloride. Suspend in distilled water, adjust pH, and autoclave.

216710 500 g Each **$92.00**

Luria Broth Agar Base

Rich nutrient agar for isolating *E. coli* colonies. Mix contains correct proportions of tryptone, yeast extract, sodium chloride, and agar. Suspend in distilled water, adjust pH, autoclave, and pour.

216700 500 g Each **$125.00**
216701 1 kg Each **$220.50**

216710 Luria Broth Base

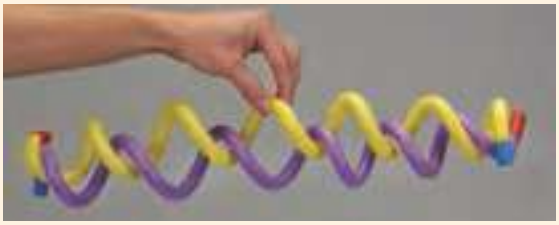
Models & Simulations

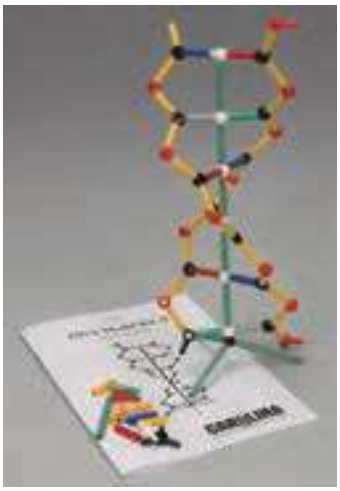
DNA Discovery Kit© ⚠3

For teaching at multiple levels. 3D Molecular Designs. Let your students discover the structure of DNA just as Watson and Crick did. This kit incorporates powerful magnets into accurate, 3-D nucleotide representations to make a fun, self-instructive model. As your students correctly join the nucleotides and connect base pairs, they will "feel" hydrogen bonding between the nucleotides and observe the helical structure of DNA develop. Teacher-developed and field-tested, the classroom kit contains 12 base pairs (6 of each nucleotide).

211120 Per kit **$349.00**

Did you know?
Project Lead the Way® selected The DNA Discovery Kit© for its Biomedical Sciences Program.





171055 DNA Model Kit A (in use)

DNA Model Kit A

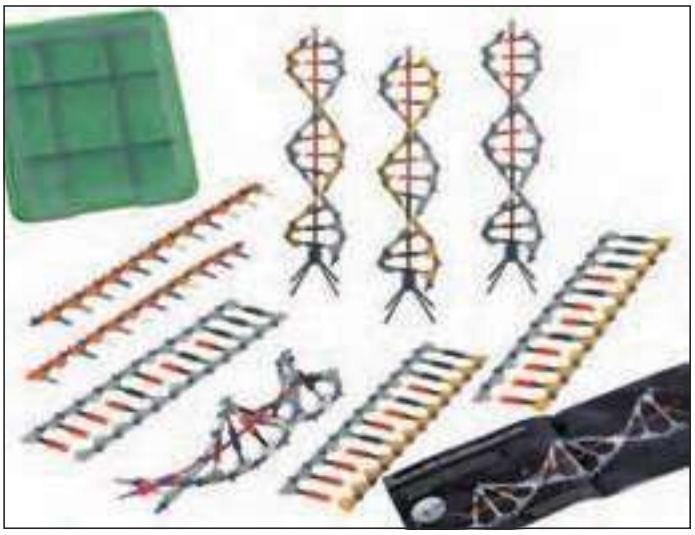
For building a simplified representation of a short segment of double-stranded DNA. All pieces are plastic and identified by color. Completed model is in the shape of a double helix about 25 cm H containing 6 paired nucleotides. Recommended for use with our item #171050D Original DNA Puzzle Kit. With instructions.

Kit includes:
12 Deoxyribose Units
12 Phosphoric Acid Units
3 Adenine Units
3 Guanine Units
3 Cytosine Units
3 Thymine Units
6 Hydrogen Bond Centers
24 Nucleotide Connectors
Support Stand

171055 Per kit **$16.75**

Carolina Cares About Safety

These products are educational materials, not toys or games. They are to be used only under adult supervision and for instructional purposes by middle school and older students. Not for use by children less than 8 years old.



211119 DNA Replication and Transcription Set

DNA Replication and Transcription Set

Beginning—Easy to perform; requires little or no prior knowledge.

An engaging, simple manipulative set for studying DNA, including structure, replication, and transcription. This wonderfully flexible set allows students to build and learn using models that demonstrate phosphate groups, deoxyribose and ribose sugars, hydrogen bonds, 4 codons, and nucleotides. It includes 521 K'NEX® rods and connectors, providing materials for a group of 2 to 3 students working together to build a 12-base pair parent molecule and then to replicate it to create two 12-base pair daughter molecules. Students can also create the mRNA for each strand in the parent molecule. Set features a 20-page full-color student booklet and CD-ROM with a teacher's guide that includes lesson plans and background information covering DNA structure, replication, transcription, coding, translation, and mutation. Packed in a strong, stackable storage case with movable dividers and a transparent, lockable lid.

211119 Per set **$75.00**
8+ Sets Each **$65.00**

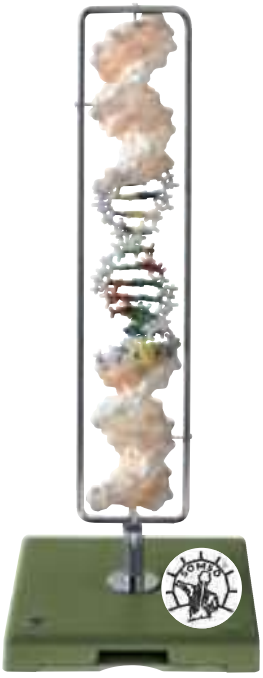
171056 Individual DNA and Molecular Model Kit

Individual DNA and Molecular Model Kit

Lab-Aids®. For 1 student. Kit contains over 150 plastic, color-coded pieces representing nitrogenous bases (A, T, G, C), hydrogen bonds (flexible), phosphates, and sugars needed to construct a model of a short DNA segment with 8 base pairs. Also included are atoms of carbon, oxygen, nitrogen, hydrogen, and phosphorus, with the covalent bonding pieces needed to construct a DNA or RNA nucleotide. Models are easy to assemble and disassemble; all components are reusable. Includes a student instruction manual.

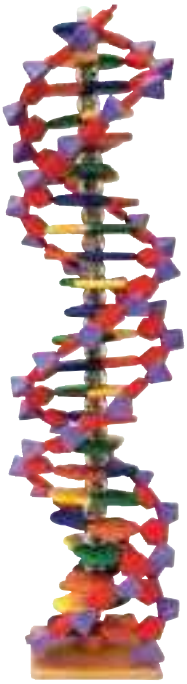
171056 Per kit **$31.75**

⚠3 California Proposition 65
⚠ WARNING: Cancer and Reproductive Harm – www.P65Warnings.ca.gov



561700 Somso DNA Double Helix

561705 Somso Chromosome



840203 Molymod DNA Model Set

Somso® DNA Double Helix

Scale: 30×106:1. Section of B-DNA double helix is based on data gained from X-ray diffraction studies. Clockwise double helix has 10.5 base pairs per coil, equivalent to a passage height of about 3.4 nm. Structure correlates closely with the model of DNA developed by Watson and Crick in 1953. In 1 piece; mounted on a rotating stand with green base.

561700 Each **$1,655.00**

Somso® Chromosome

About 50,000× life size. Model shows a submetacentric metaphase chromosome in exquisite detail. The 2 chromatids are connected in the region of the centromere. The lower arm of the right chromatid is shown with supportive proteins removed to reveal loop domains of the fundamental fibril. Mounted on a stand with green base. Overall size, 46 × 18 × 18 cm.

561705 Each **$655.00**

Molymod® DNA Model Set

Teach the primary and secondary structure of DNA with this durable, attractive model. Colorful pieces reveal the polymeric nature of DNA, including base pairs, phosphate ester linkages, and ribose units. Adenine and thymine bases are attached by 2 pegs to model their 2 hydrogen bonds and 3 pegs link cytosine and guanine base pairs. Model even shows major and minor grooves. Size, 18" H.

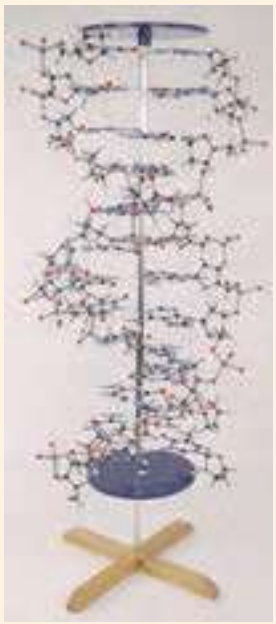
840203 Per set **$85.65**

171058 DNA Model Kit B

DNA Model Kit B

Kemtec®. For building a scale model (1 cm = 1Å) of the double stranded deoxyribonucleic acid molecule. Students learn the detailed chemical structure and sequence of polynucleotides and observe the basis for polarity within the phosphate-sugar backbone, features relevant to the genetic function of the molecule. Sixteen base pairs provide numerous coding triplet (codon) possibilities. The completed model, in the shape of a double helix about 55 cm H, demonstrates the spatial relationships in DNA revealed by Watson and Crick. It is held together by a metal shaft on a wooden base. All molecular components are flexible plastic, white in color, with Pop-It Bead connections. Individual atoms can be painted using the included paint set. With instructions.

171058 Per kit **$179.00**



840225 Orbit Proview DNA Model and 840227 Model Stand

Orbit™ Proview DNA Model

Large-scale 3-D model helps students visualize and understand the base pairs, sugar rings, and phosphate groups of the DNA structure. Students construct the subassemblies then join them together to make the complete DNA model. **Model** includes 750 atoms and 850 bonds, a suspension framework of pre-strung wooden plates, assembly instructions, and a student worksheet. Size, 85 cm H × 40 cm W. **Model Stand** can be purchased separately, or you can suspend the model from a hook or display it on a laboratory ring stand.

840225 Model Each **$193.00**
840227 Model Stand Each **$82.00**

Teacher's Choice | Carolina Exclusive | More Information Available Online

Original DNA Puzzle Kit

Change is good, but nothing beats an original

- Includes improved extra-thick, durable cardboard pieces
- Covers DNA replication, transcription, and translation
- Reinforces science practices through hands-on learning

Based on customer feedback, we've learned that nothing beats the original. So we are proud to introduce the Original DNA Puzzle Kit, which features extra-durable cardboard pieces that fit together snugly and are designed to withstand years of classroom abuse. Of course, we've also updated the teacher instructions and activities to give you the same great product with useful improvements. With this kit, students study the structure of DNA and RNA, and the processes of replication, transcription, and translation (protein chain formation). Fully reusable. With teacher instructions.

171050D Per kit **$65.95**

From 211109 DNA Synthesis Set

From 211110 Gene Expression Set

DNA Synthesis Set

This high-quality, colorful, and innovative model set is great for teaching high school and college students about DNA structure and replication. Students build a double-stranded DNA molecule and simulate its replication. Magnets embedded in the model parts guide students in assembling the model in the correct molecular orientation. The result is a representation that shows more molecular detail than most other classroom DNA models. The accompanying manual is clearly written and takes students step by step through important concepts about nucleotide and DNA structure, including hydrogen bonding, antiparallelism, deoxyribose structure, cyclic base structure, and the process of DNA replication. The teacher's manual and answer key booklet contains a student worksheet master. Also includes a student instruction booklet.

8 Adenines
8 Guanines
8 Thymines
8 Cytosines
Teacher's Manual with Answer Key Booklet and Student Instruction Booklet

211109 Per set **$365.00**

Gene Expression Set

This high-quality, colorful model set provides an engaging way to teach high school and college students the structure of RNA and proteins, and the processes of transcription and translation. Students use the included DNA template to construct the corresponding mRNA. With this mRNA, the model pieces, and the genetic code in the instructions, students then assemble the protein sequence coded for by the mRNA. Magnets imbedded in the pieces guide students in assembling the model in the correct molecular orientation. Model includes more detail than most teaching models covering the same subjects. Step-by-step instructions are clearly written and easy to follow. The teacher's manual and answer key booklet contains a student worksheet master. Also includes a student instruction booklet.

3 Adenines
3 Guanines
5 Uracils
4 Cytosines
4 Amino Acids (serine, leucine, methionine, phenylalanine)
4 tRNAs
Release Factor
DNA Template
Teacher's Manual with Answer Key Booklet and Student Instruction Booklet

211110 Per set **$350.00**

Super DNA Models: Molecular Model Kits

Beginning—Easy to perform; requires little or no prior knowledge.

From Ryler Enterprises. The difficult task of teaching abstract, complicated biotechnology concepts becomes easier with these colorful, easy-to-assemble, plastic model kits. Each durable kit includes background information, Web resources, instructions, teaching ideas, and assessments.

- Proven in the classroom—designed and developed by science teachers
- Flexible—can be used for stand-alone lessons or can be coordinated for a series of lessons
- Hands-on/minds-on activities—by creating and manipulating their own molecules, students learn more about DNA structure and function, transcription and translation, and recombinant DNA technology
- Helps meet National Science Education Standards
- Ideal for introducing and reinforcing concepts before or after labs

211113 DNA Structure and Function Kit

211113 DNA Structure and Function Kit (in use)

DNA Structure and Function Kit

Kit provides enough parts to create a 15-nucleotide base pair DNA model to demonstrate DNA structure and replication.

211113 Per kit **$47.50**

211116 Translation Kit

Translation Kit

Kit contains enough parts to create a 15-nucleotide model of mRNA (including a stop codon) and 4 tRNAs with their specific amino acids. Also includes a ribosome illustration to use to simulate polypeptide formation.

211116 Per kit **$61.50**

211114 Transcription Kit

Transcription Kit

Kit contains enough parts to create a 15-nucleotide mRNA model that corresponds to the DNA from the DNA Structure and Function Kit (item #211113). Also includes a methyl guanosine cap and a short poly A tail.

211114 Per kit **$46.00**

Simulations of Heredity Kit Series

Create Models of the Building Blocks of Life

- Hands-on kit series that simulates the basics of DNA, RNA, and chromosomal behavior
- Color-coded beads unlock the enigmas of molecular genetics
- Enough kit elements for 30 students
- Excellent tool for reinforcing base-pairing rules

The biochemical intricacies of molecular genetics are enough to overwhelm just about any biology student. This series of study kits simplifies the complexities of genetics by allowing students to use plastic color-coded beads to:

- Build and visualize the nucleotide base pair bonds of DNA
- Examine intrinsic DNA structure and execute the basics of DNA replication
- Demonstrate the processes of RNA synthesis (transcription) and protein synthesis (translation) using the same durable bead system
- Study chromosomal behavior during mitosis and meiosis
- Simulate crossing-over and several chromosome aberrations for easier understanding

DNA Simulation

Carolina BioKits®: DNA Simulation

Looking for an easier way to visualize deoxyribonucleic acid (DNA) and molecular events in your classroom? Give students an opportunity to go hands-on with these DNA manipulatives and help them grasp key molecular processes. The easy-to-use, colorful beads make teaching the structure and function of DNA a simple and engaging process. Both kits include teacher's manual and reproducible full-color student guide. The **10-Station Kit** is designed for a class of 30 students working in groups of 3; the **1-Station Kit** equips 1 to 3 students. Visit Carolina.com for a complete list of materials.

171030 10-Station Kit Each **$145.00**
171033 1-Station Kit Each **$44.50**

171030 Carolina BioKits: DNA Simulation 10-Station Kit

RNA Simulation

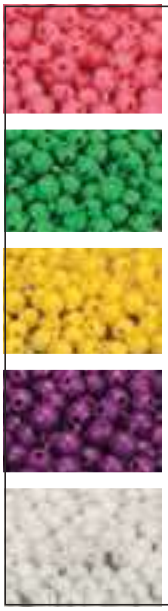
RNA Simulation BioKit®

For a class of 30. Using color-coded beads, students transcribe the code of heredity held in the nucleotide order of a DNA sense strand to a messenger RNA (mRNA) molecule. After migrating to the ribosome, the mRNA sequence is translated into an amino acid chain via protein synthesis. This kit is recommended for use with our item #171030 Carolina BioKits®: DNA Simulation. Visit Carolina.com for a complete list of kit materials.

171035 Per kit **$133.00**

Carolina Cares About Safety

These products are educational materials, not toys or games. They are to be used only under adult supervision and for instructional purposes by middle school and older students. Not for use by children less than 8 years old.



Simulation Components

Bulk Beads and Connectors

Clear connectors and 4-way beads from Carolina BioKits®: DNA Simulation (item #171030), RNA Simulation BioKit® (item #171035), and Carolina BioKits®: Chromosome Simulation Kit (item #171100). Beads are 12 mm W.

Catalog No.	Description	Quantity	Each
171041	White 4-Way Beads	Pack of 300	$15.00
171042	Pink 4-Way Beads	Pack of 300	$15.00
171043	Red 4-Way Beads	Pack of 300	$15.00
171044	Green 4-Way Beads	Pack of 300	$15.00
171046	Yellow 4-Way Beads	Pack of 300	$15.00
171047	Orange 4-Way Beads	Pack of 300	$15.00
171048	Purple 4-Way Beads	Pack of 300	$15.00
171049	Clear Connectors	Pack of 300	$22.25

211040 Criminal DNA Fingerprinting Simulation Kit

211161 DNA Manipulatives Kit

Criminal DNA Fingerprinting Simulation Kit

Intermediate—Easy to perform; requires some background knowledge.

Students act as forensic scientists in this hands-on activity that explores the theory, process, and applications of VNTR-based DNA fingerprinting. Using color-coded pop-bead models, students simulate molecular biology procedures to create a simplified DNA fingerprint for a murder suspect. In groups, students use the materials in this kit to simulate restriction enzyme digestion, gel electrophoresis, Southern transfer, probe hybridization, and autoradiography. Finally, students compare the DNA fingerprint they create to the DNA fingerprints provided and determine if the murder suspect is guilty or innocent. **Kit** includes teacher's manual with reproducible student guide and enough materials for a class of 32 students. **Paper Refill Kit** replenishes consumed materials. Visit Carolina.com for complete lists of kit materials. Replacement beads and connectors can be purchased separately (items #171041 through #171049).

211040 Kit Each **$158.00**
211042 Paper Refill Kit Each **$26.95**

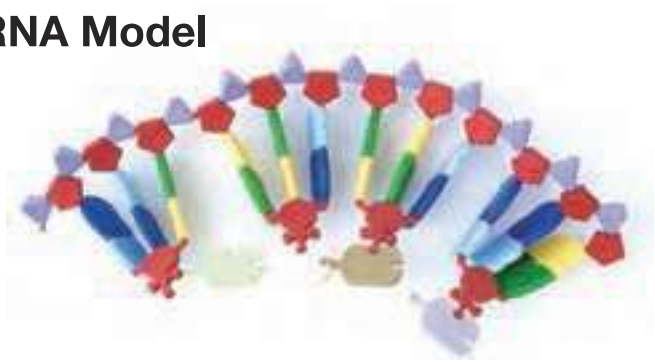
New! DNA Manipulatives Kit

Intermediate—Easy to perform; requires some background knowledge.

Explore the concept of recombinant DNA technology with this easy-to-use kit. Use manipulatives to demonstrate plasmid DNA cut with restriction enzymes. Fragments are labeled with base pair overhangs, fragment size, and antibiotic resistance. Kit is sufficient for 30 students. Includes both teacher demonstration and student manipulatives, instructional CD-ROM, and teacher's manual. All components are reusable.

211161 Per kit **$275.00**

RNA Model



840175 Molymod Advanced RNA Model Set

Molymod® Advanced RNA Model Set

Perfect complement to the Molymod® DNA Model Set (item #840203)

Use this RNA model to show your students the structural differences between RNA and DNA and demonstrate transcription and translation, the crucial events of protein synthesis. Includes 4 tRNA pieces and 4 amino acid pieces to show the synthesis of a tetrapeptide from beginning to end.

840175 Per set **$53.50**

Teacher's Choice | Carolina Exclusive | More Information Available Online

211108 Genetic Kinship: Following the Globin Gene Through Time 1-Station Kit

Genetic Kinship: Following the Globin Gene Through Time

Intermediate—Easy to perform; requires some background knowledge.

This kit introduces genetic similarity and variation by evolutionary processes. Students can examine the evolution of the globin gene family with 3 dynamic activities. In the first activity, students use magnetic nucleotide bases to model DNA and RNA structure. They generate a mutation in the sequence and investigate subsequent changes in the amino acid sequence. In the second activity, students focus on gene duplication by making cladograms. In the final activity, students model biotechnology techniques including restriction enzyme digestion, polymerase chain reaction, and gel electrophoresis to diagnose an individual with sickle-cell anemia. The **1-Station Kit** equips up to 4 students; the **8-Station Kit** equips up to 32 students. Both kits include FREE 1-year access to digital resources that support 3-dimensional instruction.

Kit includes:
Nucleotide Magnet Set(s)
Magnet-Receptive Whiteboard
Container(s) with Lids
Teacher's Manual and Student Guide

211105 8-Station Kit Each **$149.75**
211108 1-Station Kit Each **$26.75**

New! Modeling DNA to Protein Kit

Students follow a hypothetical scenario of an infant, "Baby Terra," diagnosed with sickle cell disease. As they do, they are introduced to the process of translation by modeling the flow of genetic information on a region of the beta hemoglobin gene. The kit investigations allow students to model transcription and translation using unique magnetic nucleotide bases, develop their own protein translation model, and use clay to demonstrate the physiological effects of the sickle cell mutation. Have your students explore the question "Why did Baby Terra get sick?" through Mendelian and molecular modeling. The **1-Station Kit** equips 1 group of 4 students; the **8-Station Kit** equips 32 students working in groups of 4. Visit **Carolina.com** for complete lists of kit materials. Both kits include 1-year access to digital resources that support 3-dimensional instruction.

211181 1-Station Kit Each **$38.00**
211183 8-Station Kit Each **$162.00**

211181 Modeling DNA to Protein 1-Station Kit

From 211129 Amino Acid Starter Kit, Set of 3 Kits

Amino Acid Starter Kit©

Dynamic, durable side chain models feature embedded magnets and embedded plastic balls to graphically indicate atomic structure

Intermediate—Easy to perform; requires some background knowledge.

3-D Molecular Designs. Using these captivating models and tools, students explore proteins' primary, secondary, and tertiary structures. They learn the chemical properties of the 20 amino acid side chains using dynamic side chain models. These models feature dual-coloring schemes—a colored band at the base indicates chemical properties—and embedded plastic balls show atomic structure. Since understanding the structural and chemical properties of the amino acid side chains is essential to grasping the basics of protein structure, working with the side chain models helps students comprehend protein structure. An additional protein-folding activity further deepens students' understanding as they explore the role of the side chains' properties in creating secondary structure.

Kit includes:

- Chemical Properties Circle
- Amino Acid Side Chain Chart
- 4-ft Mini-Toober®
- Set of Red and Blue Endcaps
- 22 Clear Bumpers
- 22 Amino Acid Side Chains
- 22 Plastic Clips
- 6 Hydrogen Bond Connectors

⚠3 **211126** Kit Each **$87.25**
⚠3 **211129** Set of 3 Kits Each **$215.25**

Did you know? Project Lead the Way® selected the Amino Acid Starter Kit© and the Bioinformatics Map of the Human β-Globin Gene© Set for its Biomedical Sciences Program.

From 211124 Bioinformatics Map of the Human β-Globin Gene Set

Bioinformatics Map of the Human β-Globin Gene© Set ⚠3

Intermediate/Advanced—For experienced high school and college classes; less experienced classes may require more instructor guidance.

- Recommended for teaching mRNA processing
- Reusable and easy to use

3-D Molecular Designs. Don't just tell your students about triplet codons, reading frames, and introns and exons—let them explore these elegant features of eukaryotic genes as they examine the map of the human β-globin gene. Searching through the sequence to find the β-globin gene reinforces students' knowledge of the genetic code and their understanding of the role of bioinformatics software in automating DNA sequence analysis. The maps are laminated so students can use highlighters or dry-erase pens to mark the exons on the DNA sequence; afterward the markings can be erased easily and the maps reused. For use with individual students or small student teams. Set includes 12 student maps, 1 teacher's map, and online access to teacher's notes, student activities, background information, and a list of additional resources.

211124 Each **$120.00**

Teacher's Choice | Carolina Exclusive | More Information Available Online

⚠3 California Proposition 65
⚠ WARNING: Cancer and Reproductive Harm – www.P65Warnings.ca.gov

New! Synapse Construction Kit©

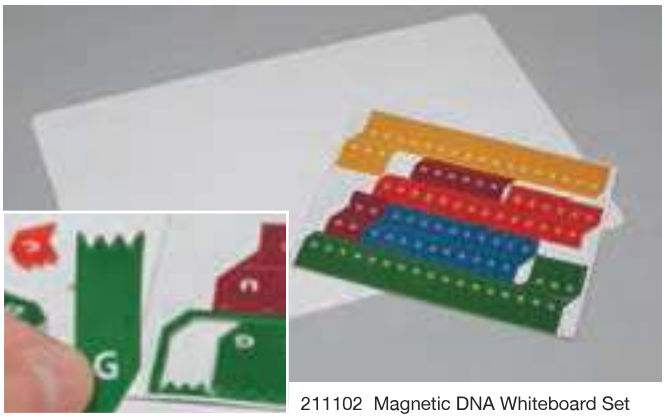
211153 Synapse Construction Kit

3D Molecular Designs. Engage your classroom with hands-on modeling of neuronal communication. Students can use this kit's colorful foam pieces to:

- Discover how the resting potential of a neuron is established
- Demonstrate the propagation of an action potential down an axon
- Simulate the action of the sodium-potassium pump in resetting the resting potential
- Explore the effects of neurotransmitters acetylcholine, dopamine, and GABA on a postsynaptic neuron
- Model cholinergic, dopaminergic, and GABAergic synapses
- Compare and contrast metabotropic and ionotropic receptors
- Analyze the impact of various substances such as nicotine, cocaine, sarin gas, and propofol on neuronal signaling
- And much more

Visit Carolina.com for a complete list of kit materials. Go to the 3D Molecular Designs website for additional resources: PDFs of Teacher Notes (an activity guide) to help you consider different ways to use the kit materials and additional guides to supplement or reinforce concepts presented in the classroom.

211153 Kit Each **$120.00**
211154 Set of 3 Kits Each **$365.00**



211102 Magnetic DNA Whiteboard Set

Magnetic DNA Whiteboard Set

- Replaces paper cutout DNA activities—permanently!
- Features attention to detail, including whiteboard mat, accurate bonding, and 3' to 5' orientation
- Offers economical price with durable classroom design

Looking for a truly unique way to brighten up your DNA lessons and make sure they stick with your students? Never again worry about losing valuable class time to students cutting out paper nucleotides for your DNA activities. This fully reusable set comes with color-coded nucleotides (A, T, G, C, U) for students to model strands of DNA and RNA. Each nucleotide features notches to represent bonding, and pieces are designed to allow students to accurately represent 3' to 5' orientation. The magnetic board doubles as a whiteboard, providing endless possible classroom activities. Purchase this magnetic DNA set and say goodbye to those paper nucleotide labs forever. Size, 18 × 12".

211102 Per set **$19.95**

Teacher Resources

441206 Carolina Messenger: The RNA Game

Carolina® Messenger: The RNA Game™

A fun, meaningful way to teach and learn about genes, messenger RNA, and proteins!

Age 13 and up. Without messenger RNA (mRNA), your genes are useless. Messenger RNA transfers genetic information from a cell's nucleus to its cytoplasm to direct protein synthesis. Rolling the DNA Dice™, students have fun as they learn how an mRNA copy of genetic DNA information is made. Using simple charts, they discover how to convert DNA codon sequences into mRNA codons. These charts also show students how mRNA codons specify amino acids during protein synthesis on ribosomes. In the end, seemingly complex events are all made easy to understand through the game's DNA Dice™, simple charts, and illustrated educational game book. For 2 to 5 players.

441206 Each **$42.00**

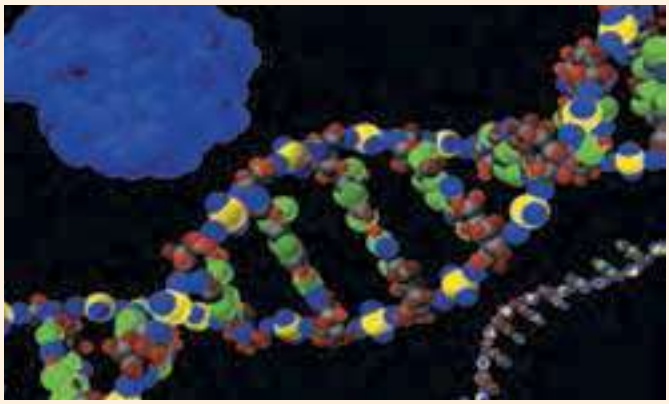
441202 Carolina Codon: The DNA Game

Carolina® Codon™: The DNA Game™

A fun, dice-based matching game for teaching about DNA, amino acids, proteins, and their relation to human diseases

Age 13 and up. Student "scientists" identify amino acid sequences for key proteins in 5 common human diseases: cancer, AIDS, cystic fibrosis, muscular dystrophy, and diabetes. The game is played by rolling dice and associating codons with the appropriate amino acids. It includes a Genetic Code Dictionary and an informative booklet containing facts about DNA, genes, and human genetic diseases, along with the benefits and social implications of genetic engineering. For 2 to 5 players.

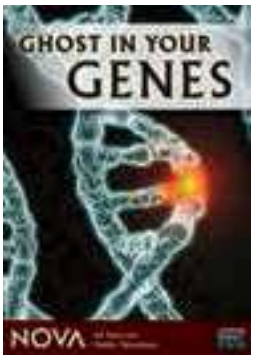
441202 Each **$43.00**



DNA, RNA, and Protein Synthesis: Information to Structure

This program looks first at the structure of DNA before going on to describe how DNA carries out its 4 major functions: storing information; replicating information; creating slight changes in the information through mutations that forces of natural selection act upon; and translating information into the proteins that define an individual. During this discussion students are introduced to point mutations; insertions and deletions; the genetic code; transfer, messenger, and ribosomal RNA; and the process of replication and translation. 2005.

496507 DVD Each **$95.00**



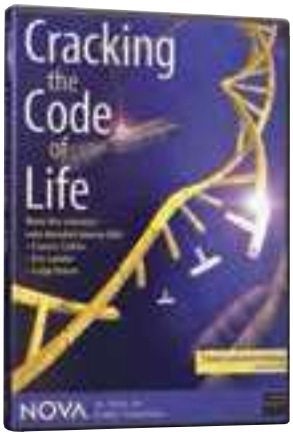
NOVA® Ghost in Your Genes

Grade 7 and up. NOVA® explores new findings that call into question the long-held belief that all of our inherited traits are passed on by our genes. The fast-growing field of epigenetics investigates hidden influences that could affect not only our health today but our descendants' health far into the future.

Ghost in Your Genes explores this new idea, interviewing scientists in the field and following what could be a paradigm shift in the way we think about inheritance and genes. Close-captioned. 56 minutes. 2007.

492200 DVD Each **$26.50**

NOVA® Cracking the Code of Life



Grade 7–College. NOVA® follows scientists as they race to capture one of the biggest prizes in history—the human genome. Participants in *Cracking the Code* include Francis Collins, director of the National Human Genome Research Institute and head of the Human Genome Project; J. Craig Venter, CEO of Celera Genomics; Eric Lander, director of the Whitehead Center for Genome Research; and clinicians, ethicists, and other experts at the forefront of genetics. This program explains:

- The structure and function of DNA
- What a gene is and what it does
- How proteins govern the body's processes
- The debate and struggle over patenting genes
- Related legal and ethical questions

The Human Genome Project provided the infrastructure for years of future work in detecting, treating, and possibly curing human illnesses. Close-captioned. 120 minutes. 2001.

492213 DVD Each **$21.00**

From 212205 *Recovering the Romanovs* CD-ROM

Recovering the Romanovs

DNA KITS LEARNING CENTER

Students learn how DNA and other forensic evidence can be used to solve an intriguing historical mystery. This CD-ROM is an interactive exploration adapted from the DNA Learning Center's award-winning Internet site, *DNA Interactive*. First, students learn about the privileged lives and untimely deaths of Tsar Nicholas and the Romanov family during the Russian Revolution. Then they use computer forensics and DNA comparisons to determine if bones found in an unmarked grave in Siberia belong to the murdered members of the Romanov family. Finally, students use DNA sequence evidence to solve the mystery of Princess Anastasia Romanov: Did she survive the massacre? Was she the woman named Anna Anderson? The CD-ROM contains a printable teacher's guide and reproducible student workbook.

212205 Each **$21.00**

DNA KITS LEARNING CENTER

Developed in cooperation with the DNA Learning Center of Cold Spring Harbor Laboratory.

DNA Interactive DVD

High School–College. This DNA Learning Center presentation uses a variety of visual materials to make DNA research more accessible to students. The over 200 multimedia clips include:

- Vivid 3-D animations illustrating: DNA structure, transcription, translation, DNA recombination, tumor growth and spread, the polymerase chain reaction, human genome sequencing, and more. The animations have narration options for different instruction levels.
- Video interviews with 11 Nobel Laureates and more than 50 scientists, clinicians, and patients. The discussions cover subjects from major scientific discoveries, to science and experimentation, to the effects of a specific genetic disease.

Close-captioned. 4 hours. 2003. International customers: NTSC version, unencoded.

212239 DVD Each **$40.00**

Equipment & Labware

Outfit Your Lab with Carolina Quality

- Wide product selection
- Designed for durability and ease of use
- Selected with the classroom in mind
- 100% satisfaction guarantee

The CAROLINA® Brand

Innovation, Quality, and Value

We reserve the Carolina brand for products of exceptional quality and value. In the laboratory and classroom, count on these products for excellent performance at a reasonable cost.

- **Carolina® Laboratory Equipment**
  Ideal for high school and college labs, this line offers innovative features, great performance, and easy operation.
- **Carolina® Glassware**
  Meeting rigorous ASTM specifications, our standard-grade borosilicate glassware is a quality alternative that's kind to your budget.

Browse this catalog or visit Carolina.com to learn more.

Biotechnology

Equipment

miniPCR®

216300 miniPCR Thermal Cycler, Clear

216300B miniPCR Thermal Cycler, Blue

216300A miniPCR Thermal Cycler, Sunrise Amber

216300G miniPCR Thermal Cycler, Green

216300P miniPCR Thermal Cycler, Pink

miniPCR® Thermal Cycler

With the philosophy that PCR is for everyone, everywhere, the miniPCR® Thermal Cycler is a practical unit that can be used in a classroom, laboratory, or in the field. Its sleek, sturdy design and small footprint make it portable and user friendly. The PCR software downloads to any smart device running Macintosh® OS, Windows®, or Android™ operating system. The fully intuitive program allows also you to monitor and analyze the process in real time. Your students can easily connect with this hands-on device as a tool to understanding DNA amplification. The miniPCR® makes biotechnology affordable, approachable, and gratifying. Each miniPCR® Thermal Cycler includes a miniPCR® unit, AC adapter, USB cable, and miniPCR® carry bag. Available in your choice of 5 colors and as a pack of 4 (clear only).

Specifications:

Power Supply:	100- to 240-V AC; 50 to 60 Hz; 70 W
Sample Capacity:	8 × 0.2-mL PCR tubes (strip compatible); use flat or domed caps with adjustable lid
Ramp Rate:	Max heating, 3.2° C/sec; max cooling, 2.2° C/sec
Program Storage Capacity:	Unlimited libraries, PDF file
Temperature Range:	Ambient to 99° C
Temperature Control:	Resistive heating; forced-air cooling; embedded thermistors and PID algorithm
Memory:	Runs last-stored program at power ON
Heated Lid Temperature:	Independent lid heater up to 120° C; PID control
Dimensions:	About 2 × 5 × 4" (5.1 × 12.7 × 10.2 cm)
Weight:	About 1 lb (450 g)

216300	Clear	Each	**$750.00**
216310	Clear, Pack of 4	Each	**$2,800.00**
New! 216300A	Sunrise Amber	Each	**$750.00**
New! 216300B	Blue	Each	**$750.00**
New! 216300G	Green	Each	**$750.00**
New! 216300P	Pink	Each	**$750.00**

New! miniPCR® Thermal Cycler and blueGel™ Combo

Amplify, digest, electrophorese, visualize, and document using a single package! This combo includes the miniPCR® Thermal Cycler, Clear (item #216300) and the blueGel™ Integrated Electrophoresis and Visualization System (item #213900) for 1 low price.

216320 Each **$995.00**

blueGel™ Integrated Electrophoresis and Visualization System

- Gel electrophoresis unit with built-in transilluminator
- Casting system with integrated comb holder
- Seamless polycarbonate ABS injection-molded parts
- Platinum and stainless-steel electrodes
- High-intensity blue LED illuminator panel
- Two-button operation: one for Run, one for Light

213900 blueGel Integrated Electrophoresis and Visualization System

This innovative unit integrates electrophoresis and DNA visualization into 1 convenient system. The blueGel™ produces rapid results, allowing you to visualize DNA instantly by turning on the safe blue LED light. Other unique safety features include the use of safe green DNA dyes, low-voltage power supply, and automatic current shut-off when cover is removed. The error-proof load feature allows the electrodes to fit only in the correct orientation—never run a gel backwards again! The user-friendly casting system eliminates leaks and uses up to 10× less reagent. The combs stow away for easy storage, and their configuration accommodates 9 to 26 wells per gel. Document results using any smart device or camera. The **blueGel™ Bundle** includes 4 complete blueGel™ systems.

Specifications:

Capacity:	1 or 2 rows of combs; 9 or 13 wells in each row
Power Supply:	100- to 240-V AC, 50/60 Hz, 48 V
Volume:	Gel, 20 mL; buffer, 25 mL
Dimensions:	Unit, 3 × 9 × 4" H (8 × 23 × 10 cm); gel, 60 × 60 mm
Weight:	3/4 lb (350 g)

213900	blueGel System	Each	**$440.00**
213910	blueGel Bundle	Each	**$1,650.00**

Equipment Packages

Discover DNA

Electrophoresis packages designed to fit a variety of lab needs

- Simplify ordering
- Save you time and money
- Provide easy-to-use equipment

Want to build your own custom equipment package? Call our Quotations Department and they'll do it for you! Call 800.334.5551.

Carolina® Electrophoresis Equipment Package I

- Materials preselected for your class to save you time
- Equipment for running 12 gels simultaneously

Perfect for use in AP® Biology. Package I contains enough quality equipment to run 12 gels at 1 time. Not an expert in molecular biology? Not a problem. The package also includes *DNA Science: A First Course*, with complete instructions on basic molecular techniques for educators trained in science. **Note:** *Transilluminator may look different from picture.*

Package includes:
3 Carolina® NG Electrophoresis Power Supplies (item #213704)
6 Carolina® NG Electrophoresis Chambers (item #213641)
Disposable Wiretrol® II Micropipet Set (item #211156)
White Light Transilluminator
DNA Science: A First Course (item #212209)

213620 Each **$2,450.00**

AP® is a trademark registered and/or owned by the College Board®, which was not involved in the production of, and does not endorse, these products.

213620 Carolina Electrophoresis Equipment Package I

213600 Carolina Separation Station I

Carolina® Separation Station I

Pour gels without masking tape when using Carolina® Deluxe Gel Electrophoresis Chambers

The essentials for conducting electrophoresis experiments. Station I runs 2 gels at 1 time.

Package includes:
Carolina® NG Electrophoresis Power Supply (item #213704)
2 Carolina® Deluxe Gel Electrophoresis Chambers (item #213710)

213600 Each **$785.00**

213602 Carolina Separation Station II

Carolina® Separation Station II

The essentials for conducting electrophoresis experiments. Station II runs 4 gels at 1 time.

Package includes:
Carolina® NG Electrophoresis Power Supply (item #213704)
2 Carolina® NG Electrophoresis Chambers (item #213641)

213602 Each **$765.00**

Carolina® White-Light Equipment Package

You can load 6 gels at a time with the micropipettors, run 12 gels simultaneously with the gel electrophoresis equipment, view *Carolina*BLU™-stained gels on the white light box, and record the lab data with the Carolina® Digital Camera.

Package includes:
3 Carolina® NG Electrophoresis Power Supplies (item #213704)
6 Carolina® NG Gel Electrophoresis Chambers (item #213641)
White Light Transilluminator
Carolina® Digital Camera (item #213688)
6 Carolina® Research Pipettors, 2.0 to 20 µL (item #214540)

213630 Each **$4,200.00**

213630 Carolina White-Light Equipment Package

Equipment

Power Supplies

213712 Carolina QuadTouch300 Power Supply

Carolina® QuadTouch300 Power Supply

Power meets versatility

At home in both classroom and research settings, this exceptional power supply features intuitive timer and voltage control via a backlit LCD touchscreen. Four-channel output makes running samples for a large classroom less hassle. The QuadTouch300 can be set up vertically or horizontally to fit tight spaces and its LCD automatically selects the correct orientation. Separate nucleic acids or proteins confidently with 5 V or 5 mA increments using constant voltage or constant current settings on a timer (up to 99 hr, 59 min). Warranted by the manufacturer for 2 years.

Specifications:

Current:	5 to 400 mA (in 5-mA increments)
Max Power:	80 W
Output Jack Sets:	4
Voltage Output:	10 to 300 V (in 5-V increments)
Dimensions:	21.5 × 15.5 × 9.75 cm
Weight:	1.6 kg

213712 Each **$539.00**

213677 Carolina Dual200 Power Supply

Carolina® Dual200 Power Supply

The standard in affordable classroom electrophoresis power supplies

Compact yet powerful, the Dual200 offers a maximum output of 200 V. It can run 2 gels simultaneously, and its sleek, stackable design conserves space in your laboratory or classroom.

Specifications:

Output Jack Sets:	2
Max Current:	200 mA
Max Power:	40 W
Output Voltages:	100 V, or 200 V constant
Dimensions:	6 × 11.5 × 5.7 cm
Weight:	0.4 kg
Warranty:	2 yr

213677 Each **$212.00**

213708
Carolina Deluxe
NG Electrophoresis
Power Supply

Carolina® Deluxe NG Electrophoresis Power Supply

This sturdy, high-quality, metal-encased power supply is the deluxe model in the Carolina® NG Electrophoresis Power Supply line. It has all the features of the Carolina® NG Electrophoresis Power Supply (item #213704), plus a 4-digit LED display that allows you to precisely adjust and monitor output voltage. The 2 independently operating channels are continuously adjustable to supply 25- to 150-V DC. Each channel is protected by its own type 3AG fuse (250 V, 300 mA; size, $1^{1}/_{4} \times {}^{1}/_{4}$"). Great for running 2 gels at the same voltage or at different voltages.

Specifications:

Input:	120 V AC, 60 Hz
Voltage Output:	25- to 150-V DC per channel, continuously adjustable
Current:	0 to 300 mA per channel
Dimensions:	$5^{2}/_{5}$" W × $7^{1}/_{10}$" D × $3^{3}/_{10}$" H
Weight:	$4^{1}/_{2}$ lb

213708 Each **$520.00**

213704
Carolina NG
Electrophoresis
Power Supply

Carolina® NG Electrophoresis Power Supply

- Simultaneously run 2 gel boxes
- Sturdy metal construction

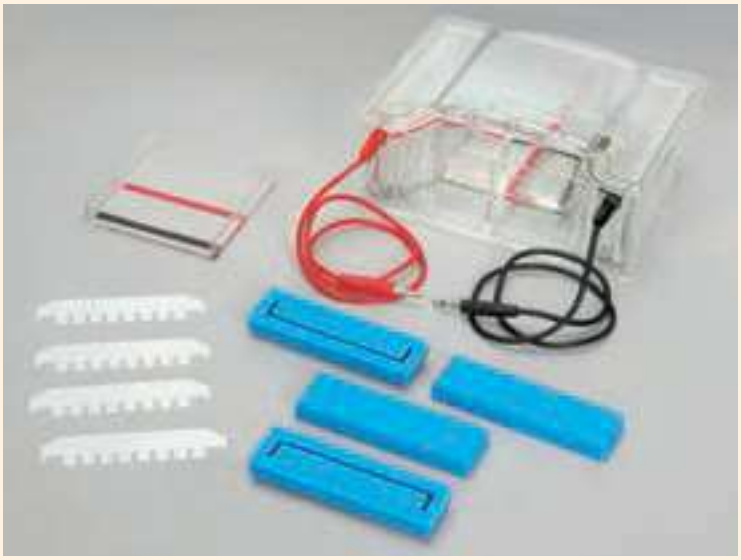
This sturdy, high-quality, metal-encased power supply is the next generation in the Carolina® Electrophoresis Power Supply line. The 2 independently operating channels are continuously adjustable to supply from 25- to 150-V DC. Settings for 25, 50, 75, and 145 V are marked. Each channel is protected by its own type 3AG fuse (250 V, 300 mA; size, $1^{1}/_{4} \times {}^{1}/_{4}$"). Great for running 2 gels at the same voltage or at different voltages.

Specifications:

Input:	120-V AC, 60 Hz
Voltage Output:	25- to 150-V DC per channel, continuously adjustable with 25-, 50-, 75-, and 145-V settings marked
Current:	0 to 300 mA per channel
Dimensions:	$5^{2}/_{5}$" W × $7^{1}/_{10}$" D × $3^{3}/_{10}$" H
Weight:	$4^{1}/_{2}$ lb

213704 Each **$410.00**

Electrophoresis Chambers



Carolina® NG Electrophoresis Chamber

- Easy to use and store
- Safe—unit will not operate unless lid is in place
- Stackable gel trays run 32 samples at 1 time
- Tray makes a gel 3 1/2 × 3 1/4"

The 2 gel trays in this unit have notches in the center to accommodate a second comb, four 8-well combs, and 4 flexible dams for use when pouring gels. An easily removable lid includes 2 compartments for storing leads when chamber is not in use. Unique design encloses and protects the platinum wire to prevent accidental breakage, but still allows access for repairs. Outside dimensions, 8" L × 6" W × 3 1/5" H. Wt, 1 1/10 lb.

213641 Each **$283.00**

213654 Carolina Gel Electrophoresis Chamber Set

Carolina® Gel Electrophoresis Chamber Set

Two gels; one chamber

- Run 2 gels in 1 chamber and use half the number of gel boxes
- Four 8-well combs, notches in the center of each tray, and stackable gel trays offer the option of running 32 samples at 1 time
- Durable 1/4" acrylic construction
- Safe—unit will not operate without lid securely in place

This **Chamber Set** is the same as our Carolina® Gel Electrophoresis Chamber (item #213668), except the set includes 4 combs and 2 stackable gel trays. This gives you the option of running 2 gels at once in the same chamber. Simply load the first gel as usual, place the second casting tray on top of it, add additional buffer, then load the second gel. The trays make gels 3 1/4" W × 3 3/4" L. **Stackable Casting Trays Set** provides 2 more stackable casting trays and four more 8-well combs.

213654	Chamber Set	Each	**$315.00**
213655	Stackable Casting Trays Set	Each	**$54.00**

213668 Carolina Gel Electrophoresis Chamber

Carolina® Gel Electrophoresis Chamber

- Durable 1/4" acrylic construction
- Safe—unit will not operate without lid securely in place
- Easy to use—heavy, nonwarping gel-casting tray is marked for easy loading
- Notches in the center of the tray and two 8-well combs offer the option of running 16 samples per gel
- Run 32 samples at 1 time using Carolina® Stackable Casting Trays (item #213655)
- Tray makes a gel 3 1/4" W × 3 3/4" L
- Comes with instructions

213668	Chamber	Each	**$292.00**
213667	Extra 8-Well Comb	Each	**$14.00**

For replacement parts for our Carolina® gel chambers, go to Carolina.com and type "chamber replacement parts" in the search field.

Teacher's Choice **Carolina Exclusive** **More Information Available Online**

Carolina® SmartGel Combo

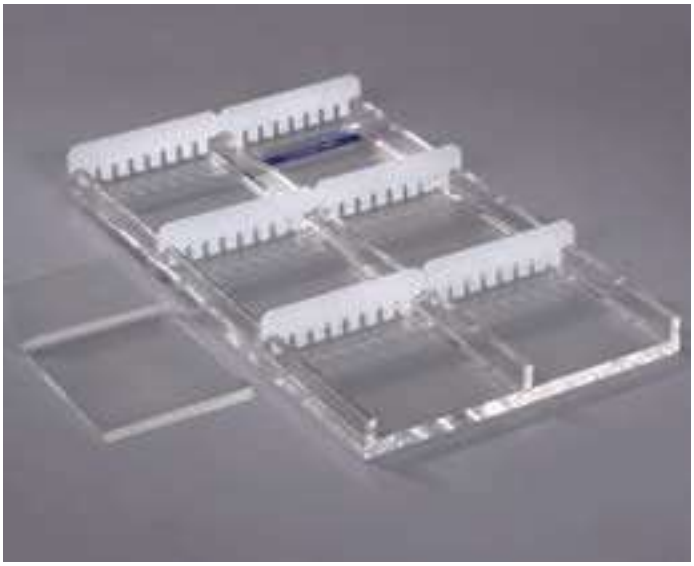
Complete electrophoresis system!

Streamline your lab with this clever, integrated, 2-in-1 system that combines power supply and electrophoresis chamber in 1 unit. Choose from 3 voltage settings and a timed mode (up to 99 min) to run up to 44 samples at once—a whole class's worth! Safety features include a magnetic interlocking lid and vented safety lid. Included gel trays, casting stand, and double-sided combs make gel casting quick and simple. Just choose a gel tray, place it in the casting stand, pick your combs, and you are set to pour.

Specifications:

Input:	115- to 230-V AC, 50/60 Hz
Output Voltages:	35, 50, or 100 V
Dimensions:	19 × 13 × 5.5 cm
Weight:	0.45 kg

213642 Per system **$510.00**



213669 Multi-Gel Precasting System

Multi-Gel Precasting System

Enables prelab preparation of 6 agarose gels. Reduces class time for pouring individual gels and ensures consistent standards for students. Gel size designed to fit casting tray of our item #213668 Carolina® Gel Electrophoresis Chamber. Gels can be cast, stored in TBE buffer, and refrigerated for later use. A gel scoop for easy removal and six 8-tooth combs are included. Dimensions: unit, $15\frac{3}{4} \times 7\frac{1}{2}$"; gel compartment, $3\frac{3}{4} \times 3\frac{1}{4}$". Center cross bars lift out for easier removal of gels.

213669 Per system **$174.00**

213710 Carolina Deluxe Gel Electrophoresis Chamber

Carolina® Deluxe Gel Electrophoresis Chamber

Easy-to-use design allows you to cast gels without using tape or gates!

- Durable $\frac{1}{4}$" acrylic construction
- Safe—unit will not operate without lid securely in place
- Heavy, nonwarping gel-casting tray is marked for easy loading
- Notches in the center of the tray and two 8-well combs offer the option of running 16 samples per gel
- Tray makes a gel $3\frac{1}{4}$" W × $3\frac{3}{4}$" L

This unit is the same as our Carolina® Gel Electrophoresis Chamber (item #213668), except gaskets in the ends of the gel tray eliminate the need for tape. Simply turn the gel sideways in the gel chamber (see picture) to cast the gel.

213710 Each **$298.00**

213713 Carolina Vertical Dual Gel Electrophoresis Chamber

213810 E-Gel Simple Runner Electrophoresis Device

New! Carolina® Vertical Dual Gel Electrophoresis Chamber

This high quality, leak-proof gel box is designed for teaching and research labs. Its sleek, safe design is reliable and easy to use. Use with Precast Polyacrylamide Gels (item #211375) or standard 8 × 10-cm gel cassettes or slightly taller. **Electrophoresis Chamber** comes with 2 replacement gaskets. Purchase the transfer apparatus separately for a complete western blotting transfer system; it includes transfer-blot core, 2 gel holder cassettes, and 4 foam pads.

213713	Electrophoresis Chamber	Each	**$389.00**
213714	Western Blot/Nucleic Acid Transfer Apparatus	Each	**$650.00**

Teacher's Choice | Carolina Exclusive | More Information Available Online

E-Gel® Simple Runner Electrophoresis Device

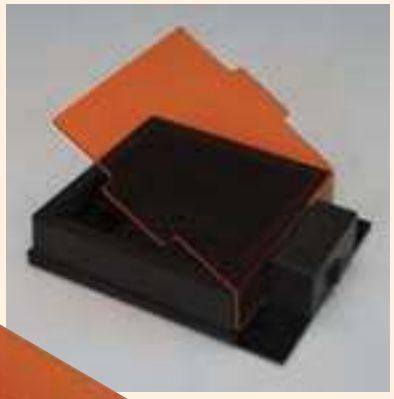
- Fast DNA separation—sample separation in minutes
- Convenient—small footprint and light weight
- Easy to use—intuitive interface and pre-programmed protocols

The Invitrogen E-Gel® Simple Runner Electrophoresis Device is an easy-to-use automated system designed for use with E-Gel® precast agarose gels. E-Gel® technology saves time and provides convenience by eliminating any need for gel preparation or staining. Run DNA samples in 15–30 minutes; device comes preprogrammed with 15- and 30-minute protocols for fast and simple operation. Compatible with E-Gel® single- and double-comb dry, precast, pre-stained agarose gels with either ethidium bromide or *SYBR Safe™ stains (items #213802, #213805, and #213809). Gels have 20-µL well capacity, are single-combed, and have 12 wells. **Note:** *E-Gel® gels have a limited shelf life. Order them within 2 weeks of use. E-Gel® with Ethidium Bromide sold only to schools and businesses.*

New!	**213810**	E-Gel Electrophoresis Device	Each	**$295.95**
	213802	6-Pack of E-Gels, 0.8% with Ethidium Bromide	Each	**$102.00**
	213805	6-Pack of E-Gels, 2% with Ethidium Bromide	Each	**$105.00**
	213809	6-Pack of E-Gels, 2% with SYBR Safe	Each	**$99.00**

Save with our exclusive electrophoresis equipment packages on page 299.

*SYBR Safe™ is a safe stain with the same sensitivity as ethidium bromide. The light source used to visualize EthBr, as well as other light sources, can be used to visualize SYBR Safe™, but different filters may be required for photography. For SYBR Safe™ gels, we guarantee a minimum 2-week shelf life from date of shipment. Call Carolina at 800.334.5551 for more information.



Carolina® GelView System

Looking for an easy way for students to visualize electrophoresis results, digitally capture and share them, and drop them into their electronic lab notebooks? This 1-stop imaging system allows students to do all that with a camera-equipped smart device such as a phone or tablet. They simply place GelView over the stained gel, place the smart device camera on the stage over the optical filter, align, and snap an image. Students can share the images via e-mail, text, or cloud-sharing apps. GelView is an innovative, cost-effective way to document results without making compromises. Includes a 535-nm band-pass filter for green dyes.

213742 Per system **$854.95**

Carolina® Digital Camera

Get quality digital pictures and flexibility in 1 device. The camera's minimum 10-megapixel imager provides large, detailed photos. Use the camera with the detachable hood to photograph gels stained with *Carolina*BLU™, or remove the hood and use the camera by itself. Minimal internal memory; memory card not included. Connects directly to your computer with included USB cable. Compatible with our Carolina® LED Light Box (item #213694). **Note:** *Due to the rapidly changing nature of digital camera technology, camera specifications may vary from those described.*

213688 Each **$710.00**

213725 PhotoDoc-It Imaging System

PhotoDoc-It™ Imaging System ⚠²

- Printer (17.8 × 12.7 × 6.4 cm) has USB connectivity and creates high-quality 4 × 6" prints.
- UV transilluminator emits light at 302 nm and has a $7^{8}/_{10} \times 7^{8}/_{10}$" viewing area.
- Lightweight, durable metal hood has an 11 × 10" opening.
- Filter in hood can be easily exchanged for other filter types.
- Unique view port window allows observation of UV-illuminated gels.

Capture and print images with this easy-to-use system for basic gel documentation. Users can also observe UV-illuminated gels via the unique UV-blocking view port window. The stand-alone package does not require a computer, but images can be downloaded to a PC via USB cable (not included). Images may also be stored on the camera's minimum 128-MB memory card. Camera can operate on batteries or power cord. Package includes: UV transilluminator, 10-megapixel digital camera with zoom lens and power adapter, lightweight hood with handles, color printer, paper and ink cartridges for 108 prints, filter for viewing gels with ethidium bromide, cable, and lock. **Note:** *Due to the rapidly changing nature of digital camera technology, camera specifications may vary from those described.*

213725 Per system **$4,795.00**

Teacher's Choice | Carolina Exclusive | More Information Available Online

⚠² California Proposition 65
⚠ **WARNING:** Reproductive Harm – www.P65Warnings.ca.gov

Carolina® LED Light Box
Perfect for use with *Carolina*BLU™ or GelGreen™ DNA stains

Analyze gels under white or blue light. With powerful long-lasting dual LEDs, the light box emits either white or blue light, giving you increased options during gel staining and viewing. In the white light mode the box emits safe light ideal for visualizing gels stained with *Carolina*BLU™. Using the blue light setting with the included filter provides a safer alternative to UV light for observing gels stained with GelGreen™. Designed for the classroom with a durable molded polymer casing and compact footprint for easy storage; optimized to be used with the Carolina® Digital Camera system (item #213688).

213694 Each **$210.00**

Ultra-Spec 2000 Safety Glasses

Uvex™. Exclusive 4C coating provides antistatic, antifog, and anti-scratch protection. Offers UV eye protection up to 385 nm. Extremely lightweight for additional comfort. Has free-flow ventilation and fits over most prescription glasses. Meets performance criteria for ANSI Z87.1-2003 and CSA Z94.3 standards. **Note:** *Not intended for chemical-splash protection.*

213695 Each **$9.05**

213695 Ultra-Spec 2000 Safety Glasses

Orange Viewing Goggles

Proper eye protection is essential when using forensic light sources or fingerprint powder. View fluorescing evidence without exposure to UV rays. These goggles completely wrap around and fit over prescription glasses.

212142 Each **$35.00**

212142 Orange Viewing Goggles

Stirrers

Carolina® Mini Vortex Mixer

- Fixed 2,800-rpm speed
- Small 4 × 4" footprint
- Fully enclosed mixing cup
- Flexible, durable, easy-to-clean contact surface that resists stains
- Sturdy, stable metal base
- Handles 30-mm tubes
- Automatic on/off—just push down
- One-year warranty

With a brand-new design that is functional, durable, and attractive, the Carolina® Mini Vortex Mixer meets all of your basic vortexing, agitation, and mixing needs at an affordable price. The fixed 2,800-rpm speed provides great mixing power, and the fully enclosed cup provides a becoming, sturdy surface. To use, simply push down on the cup head and start mixing. The small 4 × 4" footprint saves valuable work space but remains stable. One-year warranty. 115 V; wt, 2 lb.

701076 Each **$205.00**