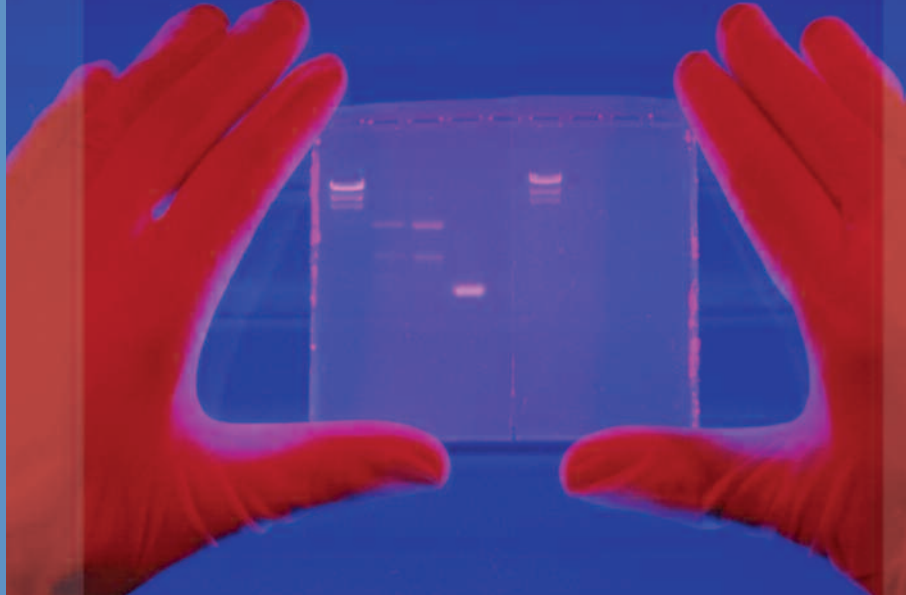


BIOESSENTIALS™

Your guide to vital reagents and equipment for life science applications.



CELL CULTURE

EXTRACTION & PURIFICATION
OF BIOMOLECULES

PCR & RT-PCR

**Separation of Nucleic Acids by
Agarose Gel Electrophoresis**

PROTEIN
ELECTROPHORESIS

Thermo Scientific and Fisher Scientific products deliver an end-to-end solution that can meet your most demanding electrophoresis requirements.

You can depend on our expertise in electrophoresis instruments along with ultra-pure reagents that are pre-qualified for your applications. This guide is designed to help you select the right products from our best-in-class array of laboratory equipment and bioreagents.

3-STEP Selection Process

Separation of Nucleic Acids by AGAROSE GEL ELECTROPHORESIS

1 Choose Your Reagents

- Agarose
- Buffer
- Ladders

2 Choose Your Equipment

- Power Supply
- Gel Box

3 Downstream Application Essentials

- Gel Staining
- Hybridization
- DNA Gel Extraction

Choosing your agarose

Fisher BioReagents® offers three different grades of agarose that are functionally tested and pre-qualified for specific applications.

Agarose grades used in electrophoresis of nucleic acids

Genetic Analysis Grade – agarose that yields biologically active DNA or RNA. Testing includes enzymatic performance measurements.

Molecular Biology Grade – suitable for analytical separation of DNA or RNA.

PCR Grade – the original agarose for analytical separation of PCR amplicons (<1kb).

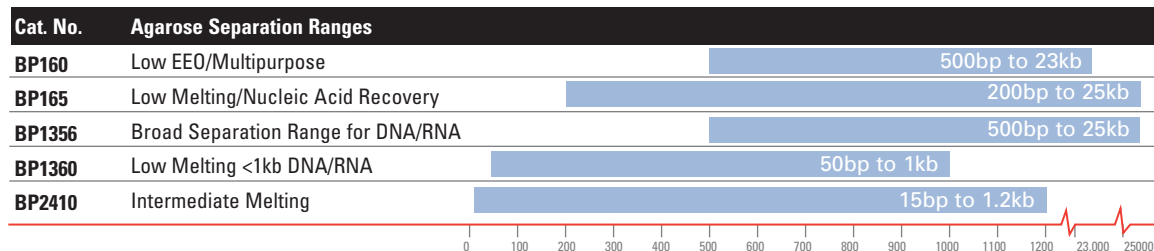
Agarose is a linear polysaccharide composed of alternating residues of D- and L-galactose joined by glycosidic linkages. Agarose forms gels that are both porous and resilient. These gel properties provide a sieving matrix which allows the electrophoretic separation of charged macromolecules such as DNA or RNA according to size. Compared to polyacrylamide gel, agarose has a lower resolution but wider range of separation.

Lower grades of agarose can be contaminated with other polysaccharides, salts, and proteins. Such impurities can alter the gelling/ melting temperature of agarose solutions or affect the ability to use the recovered nucleic acid sample in a post-electrophoresis application.

AGAROSE

Two Factors for Selecting an Agarose

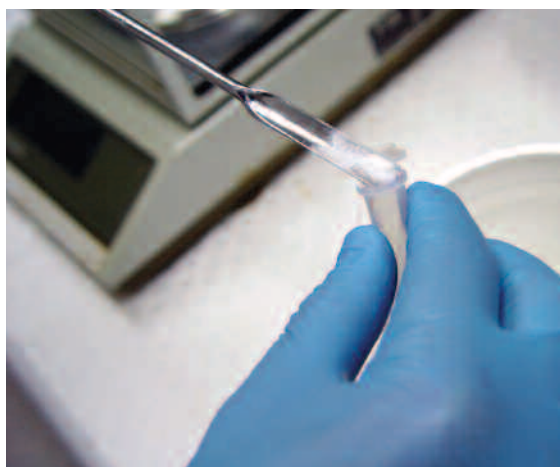
1. The size of DNA or RNA fragments to be analyzed (see graph below).



2. The type of downstream application that will follow electrophoretic separation (e.g., cloning procedures directly from remelted agarose or in-gel reaction).

Agarose Selection Guide

Type of Agarose	Low EEO	Low Melting >200bp	Low Melting <1000bp	Wide Separation Range	PCR Grade
Cat. No.	BP160	BP165	BP1360	BP1356	BP2410
Recovery of DNA and RNA	x	x	x	x	x
Southern and Northern Blots	x				
DNA/RNA separation 50bp to 1kb			x		x
DNA/RNA separation >1kb	x	x		x	
PCR fragment analysis	x	x	x	x	x
In-gel reactions (ligation, transformations, PCR)			x		
Colony lifts	x				
Available pack sizes	100g and 500g	25g	100g	100g and 500g	100g
Agarose grade	Molecular biology	Molecular biology	Genetic analysis	Genetic analysis	PCR



Choosing your buffers

Our Fisher BioReagents line of electrophoresis buffers is available in various package configurations to suit all budgets. Choose from the most economical powder components, through concentrated stock solutions, to ready-to-use concentrations in specially designed containers featuring faucets for easy dispensing.

Two buffers commonly used for DNA agarose electrophoresis are Tris-acetate with EDTA (TAE; 40mM Tris-acetate, 1mM EDTA) and Tris-borate with EDTA (TBE, 89mM Tris-borate, 2mM EDTA). Because the pH of these buffers is neutral, the phosphate backbone of DNA has a net negative charge and migrates toward the anode. TAE and TBE have different properties which makes one more suitable than the other for a specific purpose.

MOPS is a commonly-used buffer system for RNA electrophoresis using formaldehyde or formamide denatured RNA. It is important to use RNase-free chemicals, water, and containers when preparing the buffer solution. The typical formulation of a 10X MOPS running buffer is 0.4M MOPS (pH 7.0), 0.1M sodium acetate, and 0.01M EDTA.

The denaturing system chosen depends on the purpose of the RNA experiment and the size of the RNA fragment being separated. Formaldehyde denaturation is suitable if RNA samples are to be recovered. Formamide denaturation is suitable if the RNA needs to retain its biological activity.

Buffer	Suggest Uses	Properties
TAE	DNA recovery. Electrophoresis of large DNA (>12 kb).	Low buffering capacity. Recirculation may be necessary for extended run times (>6 hr).
TBE	Electrophoresis of small DNA (< 1kb). Increased resolution of small DNA (< 1kb).	Decreased DNA mobility. High buffering capacity – no recirculation required for extended run times.
MOPS	Electrophoresis of formaldehyde denatured RNA.	Buffer is low in ionic strength. Recirculation of buffer may be necessary.



BUFFERS

Buffers for Nucleic Acid Applications

Cat. No.	Concentration	Tris-Borate-EDTA
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TBE

BP2430-1	1X	1L
BP2430-4	1X	4L
BP2430-20	1X	20L
BP1396-86	5X	1L*
BP1333-1	10X	1L
BP1333-4	10X	4L
BP1333-20	10X	20L
BP1334-1	10X	1L**

Cat. No.	Concentration	Tris-Borate-EDTA
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TAE

BP2434-4	1X	4L
BP2434-20	1X	20L
BP1335-500	10X	500mL
BP1335-1	10X	1L
BP1335-4	10X	4L
BP1335-20	10X	20L
BP1330-1	25X	1L
BP1332-500	50X	500mL
BP1332-1	50X	1L
BP1332-4	50X	4L
BP1332-20	50X	20L
BP1331-1	25X	1L**

Cat. No.	Description	Size
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MOPS

BP308-100	Powder	100g
BP308-500	Powder	500g

Water

BP2484-50	Nuclease-Free	50mL
BP2484-100	Nuclease-Free	100mL
BP2470-1	DNA-Grade	1L
BP561-1	RNA-Grade	1L

Formaldehyde

BP531-25	37% by weight	25mL
BP531-500	37% by weight	500mL

*Pre-weighed powder in poly bottle. Dissolve in water.

** Pre-weighed powder in foil pack. Dissolve in water.

Suggested Agarose Concentrations

The optimal gel concentration depends on the size of the DNA fragments to be resolved.

Cat. No.	Main Application	DNA Size Range in Base Pairs	Finale Agarose Concentration % (W/V)	
			1x TAE buffer	1x TBE buffer
BP1360	Low melting temperature agarose. Certified recovery of small nucleic acid fragments. Outstanding resolution.	500-1,000	2.5	2.0
		150-700	3.0	2.5
		100-450	3.5	3.0
		70-300	4.0	3.5
		10-100	4.5	4.0
		8-50	5.0	4.5
BP165	Low melting temperature agarose. Broad separation range. Ideal for DNA and RNA recovery after electrophoretic separation.	500-25,000	0.75	0.70
		300-20,000	1.00	0.85
		200-12,000	1.25	1.00
		150-6,000	1.50	1.25
		100-3,000	1.75	1.50
BP1356 BP160	Suitable for routine nucleic acid electrophoresis applications with broad separation range.	1,000-23,000	0.60	0.50
		800-10,000	0.80	0.70
		400-8,000	1.00	0.85
		300-7,000	1.20	1.00
		200-4,000	1.50	1.25
		100-3,000	2.00	1.75

Choosing your ladders

To achieve the most accurate qualitative and quantitative analysis via agarose gel electrophoresis, the appropriate DNA or RNA standard is required. Fisher BioReagents provides a wide range of

standards, including routine DNA ladders for quick size and quality assessment as well as exACTGene DNA ladders that allow for quantitative analysis.

exACTGene® and Routine DNA Ladders

Ready-to-use (pre-mixed with the loading dye), room temperature, stable DNA ladders are available for all common electrophoresis applications.

Cat. No.	Application	Size Range	Number of Bands	Number of Loadings
	exACTGene® DNA ladders are ideal for qualitative analysis, quantitative estimation, and size assessment			
BP2570-100	PCR fragment analysis	25-650bp	14	100/10uL
BP2571-100	PCR fragment analysis, small DNA digests	25-1000bp	12	100/10uL
BP2572-100	Quick check of PCR or enzyme digestion results	50-2000bp	8	100/10uL
BP2573-100	General purpose, small DNA fragments	100-1000bp	10	100/10uL
BP2574-100	Fast run times, small DNA fragments	100-2000bp	11	100/10uL
BP2575-100	Clone identification	100-2686bp	14	100/10uL
BP2576-100	Large size PCR or cloning	300-5000bp	10	100/10uL
BP2577-100	Small and large cloning application	100-5000bp	16	100/10uL
BP2578-100	General purpose, large digested DNA	300-10,000bp	13	100/10uL
BP2579-100	General purpose, wide size range	100-10,000bp	19	100/10uL
BP2580-100	General purpose, extra-large fragments	300-24,000bp	15	100/10uL
	Routine DNA ladders are designed for qualitative analysis and size assessment			
BP2581-200	Small fragments, quick size assessment	50-2000bp	11	200/5uL
BP2582-200	Quick size assessment of broad size range	50-10,000bp	16	200/5uL

For Lambda DNA digests or other DNA markers and ladders not containing loading dye, please visit www.fishersci.com and type: BP2553-100 in the search box.

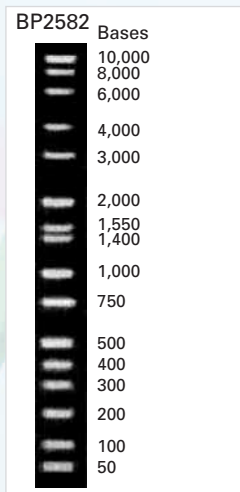
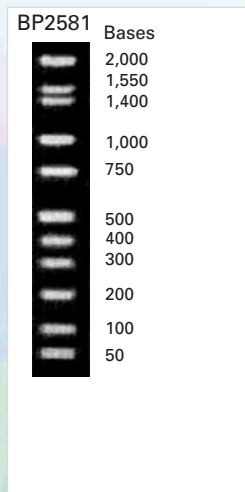
LADDERS

RiboLadders™ RNA Standards

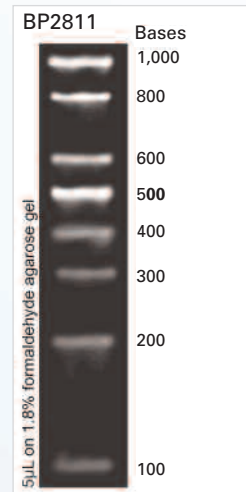
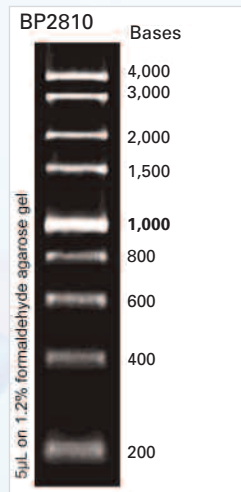
These standards can be used to assess single-stranded RNA molecules on both native and denaturing agarose gels. These unique RNA standards are lyophilized to reduce thawing-related degradation, to prolong shelf life and to ensure consistent performance.

Cat. No.	Application	Size Range	Number of Bands	Number of Loadings
	Sizing unknown RNA fragments			
BP2810-50	Small RNA fragments	0.1 – 1kb	8	50
BP2811-50	Large RNA fragments	0.2 – 4kb	9	50

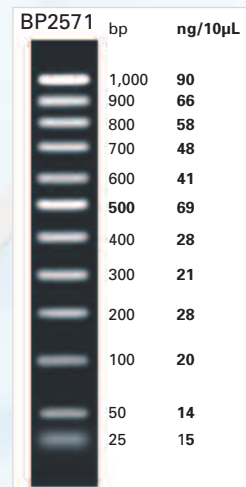
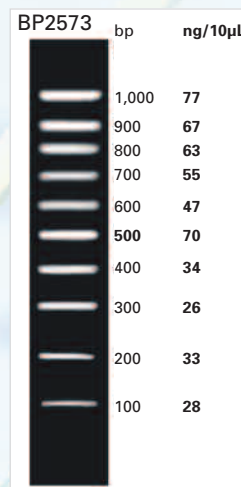
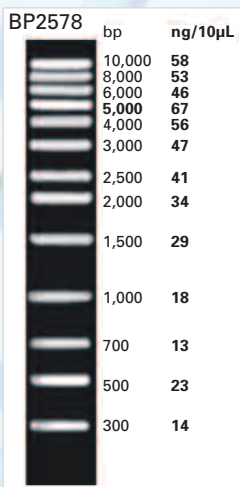
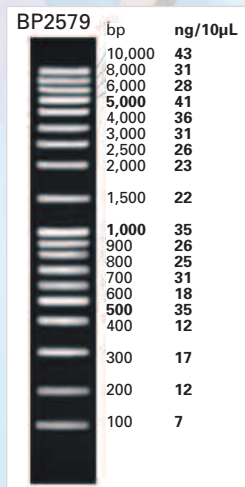
Routine DNA Ladders



RiboLadders™ RNA Standards



exACTGene® DNA Ladders



Choosing your gel box and power supply

Submarine Electrophoresis Gel Boxes

Thermo Scientific submarine electrophoresis gel boxes are available in three sizes and sample quantities. This gel size flexibility is important in order to provide sufficient separation of closely-spaced DNA fragments as well as small and large nucleic acid fragments on the same gel.

Cat. No.	Model	Cooling Option	Max Number of Samples	Gel Size (W x L) in cm	Running Buffer Volume in mL
09-528-178	EasyCast B1	no	34	9 x 11	600
OWB1BP	EasyCast B1	yes	34	9 x 11	600
09-528-110B	EasyCast B2	no	108 with rapid load tray	12 x 14	800
09-528-118	EasyCast B2	yes	108 with rapid load tray	12 x 14	800
09-528-124	EasyCast B3	yes	300 with rapid load tray	12 x 14	1000
OWA6	Millipede A6	no	500	23 x 25	3000

EasyCast® Systems:

- Compact footprint
- EasyCast® gasket UVT gel tray
- SuperSafe® lid with attached power supply leads
- Optional cooling system

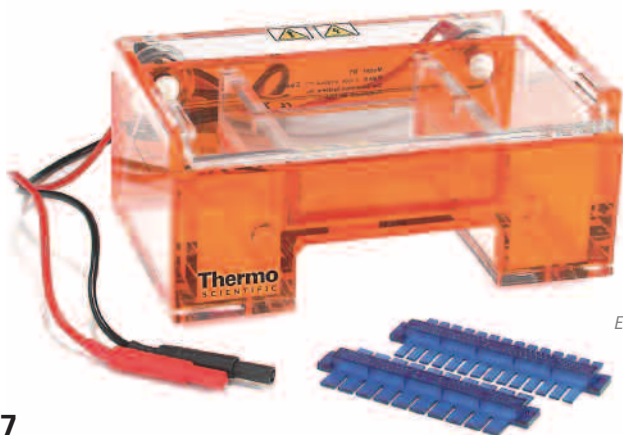
Millipede® System:

- Buffer chamber with 3-point leveling base
- SuperSafe® lid with attached power supply leads
- UV transparent gel tray with gasket end gates
- Leveling bubble

Voltage Table

The table below provides recommended voltages and buffers according to DNA size and application. The distance used to determine the voltage gradients is the distance between electrodes, not the gel length. If the voltage is too high, band streaking may occur for large DNA sizes (>12kb). When the voltage is too low, the mobility of small (< 1kb) DNA is reduced, and band broadening will occur due to dispersion and diffusion.

Gel Size	Voltage	Recovery Buffer	Analytical Buffer
<1kb	5 V/cm	TAE	TBE
<1 kb to >12 kb	4-10 V/cm	TAE	TBE
>12 kb	1-2 V/cm	TAE	TAE



EasyCast B1 Gel Box

EQUIPMENT

Low Voltage Power Supplies

105 Power Supply

- Suitable for DNA/RNA submarine gel electrophoresis and mini-SDS PAGE.

250-90 Power Supply

- Designed to operate in constant voltage or constant current with a continuously variable output in either mode.
- Appropriate for DNA/RNA submarine gels, electroblotting mini gels, and mini protein and mini SDS PAGE.

105 and 250-90 Power Supplies

- Each unit is capable of automatically crossing over from one mode of operation to the other when the preset limit is reached.

135-90 Power Supply

- Capable of producing up to 500 volts and 500 milliamps, this power supply is ideal for PAGE, SDS-PAGE, DNA or RNA submarine gels, as well as all types of small-format transfer apparatus.

570-90 Power Supply

- This unit is capable of producing up to 500 volts or 2,500 milliamps and is an excellent choice for running all types of electroblotting applications. It is also ideal for PAGE, SDS-PAGE, and DNA or RNA submarine gels.

135-90 and 570-90 Power Supplies

- Both models prevent sample diffusion with a unique holding voltage feature.
- Samples and systems are protected by an automatic crossover function that automatically switches over from one mode of operation to the other when the preset limit is reached.
- Enables efficient time management with dual-function, 100-hour timer.
- Simple operation – a single knob controls the output, and a single push-button selects the mode to be adjusted.



105 Power Supply



250-90 Power Supply



570-90 Power Supply

Specifications	105	250-90	135-90	570-90
Operating Voltage	Low range 20-130 (10 V steps) High range 140-250 (10 V steps)	10-250 Volts	500 Volts	500 Volts
Maximum Voltage	250 Volts			
Operating Current Range			500 mA	2500 mA
Maximum Output Power		125 Watts	250 watts	325 watts
Maximum Current	300 milliamps @ 150-250 V 500 milliamps below 150 V	5 - 500 milliamps		
No. of Output Terminals (female)	2 sets of connectors 4 mm connectors	4 sets of recessed 4 mm connectors	4 sets of recessed 4 mm connectors	4 sets of recessed 4 mm connectors
Mode of Operation		Constant voltage or constant current with automatic crossover		
Safety Interlock		Load sensing shut down disconnect. Automatic restart provided in case of power failure.	Load sensing shut down disconnect. Automatic restart provided in case of power failure. Key actuation necessary to activate high voltage.	
Timer		Dual function up/down timer which deactivates high voltage upon reaching zero time remaining in count down mode.		
		0.00 - 24 hour.	99 hr 59 min	99 hr 59 min
Dimensions (w x d x h)	213 x 133 x 114 mm	220 x 190 x 140 mm	225 x 303 x 145 mm	225 x 303 x 145 mm
Weight	2.3 kg net, 3.2 kg shipping	2.3 kg net, 6 kg shipping	8.4 kg	8.4 kg
Voltage	Cat. No.	Cat. No.	Cat. No.	Cat. No.
115 V	105ECA-115	25090ECA-115	13590ECA-115	57090ECA-115
230 V	105ECA-LVD	25090ECA-LVD	13590ECA-LVD	57090ECA-LVD

Choosing your application

Post-Electrophoresis Applications and Related Supplies

There are multiple applications that follow nucleic acid electrophoresis. Thermo Scientific offers a broad selection of equipment along with essential Fisher BioReagents for these protocols.

Gel Staining

This process can be done during electrophoresis by adding stains such as ethidium bromide into the gel. Alternatively the gel is stained after the separation is completed. **Fisher BioReagents** offers **ethidium bromide** in a solution that saves time and limits manipulation of the carcinogenic chemical. To accelerate the staining and destaining of gel, the gel tray can be shaken using a multi-purpose shaker.

Hybridization

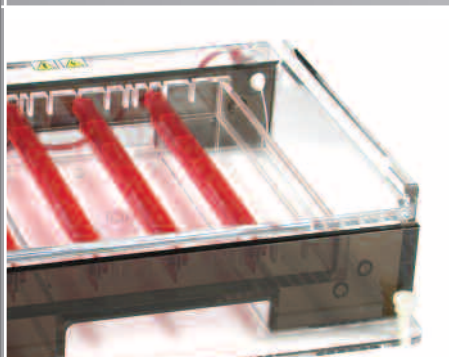
DNA or RNA is transferred from the agarose gel to a membrane for Southern or Northern hybridization. The hybridization process is carried out in a temperature-controlled chamber such as the **Thermo Scientific Hybaid Shake & Stack**. This oven provides unmatched reliability, accuracy and uniformity to ensure reproducible results. **Fisher BioReagents** offers functionally tested **reagents and buffers** for the hybridization process.

DNA Gel Extraction

In certain cases there is a need to extract the specific size DNA fragment from the gel. The piece of agarose that contains the DNA is melted at a higher temperature in the presence of high salt buffer and then binds to the spin column. The liquid is passed through the column by centrifugation, which is the fastest and most efficient method to extract the DNA. Our **Thermo Scientific Sorvall® Legend® Micro 17 & 21** microcentrifuge series provides fast and efficient processing of your micro-volume samples.

Thermo Scientific and Fisher Scientific offer a complete LABORATORY SOLUTION

**Thermo Scientific Millipede
Horizontal Electrophoresis System**



**Thermo Scientific
Hybaid Shake & Stack**



Fisher BioReagents Buffers



**Thermo Scientific
Sorvall Legend Micro 17 & 21
Microcentrifuge Series**



For more information on Fisher BioReagents — go to www.fishersci.com
For Thermo Scientific equipment visit www.thermo.com

FREE Fisher BioReagents

Buy any electrophoresis equipment listed below and receive FREE Reagents worth up to 50% of your purchase price.

act now!

- 1** Purchase any of the electrophoresis instruments listed below through Fisher Scientific by 9/30/2007.
- 2** Visit www.thermo.com/bioessentials and choose your **FREE Fisher BioReagents** from a list of over 500 products.

Product	Cat. No.	FREE Fisher BioReagents Value
Thermo Scientific Power Supplies		
Model 105	FB105	\$300
Model 135-90	FBEC13590	\$500
Model 250-90	FBEC25090	\$300
Model 570-90	FBEC57090	\$500
Model 3000P	FBEC3000P	\$600
Thermo Scientific Gel Boxes		
Easy Cast B1	09-528-178	\$150
Easy Cast B1 with cooling option	OWB1BP	\$160
Easy Cast B2	09-528-110B	\$200
Easy Cast B2 with cooling option	09-528-118	\$220
Easy Cast B3	09-528-124	\$225
Millipede A6	OWA6	\$250
Related Thermo Scientific Equipment		
Sorvall Legend Micro 17	75002431	\$300
Sorvall Legend Micro 21	75002436	\$300
Sorvall Legend Micro 17R	75002441	\$400
Sorvall Legend Micro 21R	75002446	\$400
Legend 14 Microcentrifuge	11210807	\$400
Hybaid Shake & Stack	HBSNSR	\$500
Hybaid Shake & Stack (+platform)	HBSNSRS	\$550
Reagents		
Agarose - 500g size	BP160-500	\$150
	BP1356-500	\$150
	BP164-500	\$150
DNA or RNA Ladder (listed in this brochure)		\$50

Offer expires on 09/30/2007. Free BioReagents must be redeemed by 10/31/2007. Valid in the U.S. only. Not valid with any other offers, contracts or agreements. Void where prohibited. Free Fisher BioReagents value based on US listed prices.

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