

Sci-On[®] Biology

S-49
EDVO-Kit #

In Search of My Father

Storage:
Store this experiment at room temperature

EXPERIMENT OBJECTIVES:

Students will learn how agarose gel electrophoresis separates different sizes of dye molecules that represent DNA fragments. They will learn how these fragments form unique DNA patterns for each person, which is the basis for solving maternity and paternity identity.

All components are intended for educational research only. They are not to be used for diagnostic or drug purposes, nor administered to or consumed by humans or animals.

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EVT 003195AM

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Experiment Components

ELECTROPHORESIS SAMPLES

- Ready-to-Load™ Dye samples
 - A Standard dyes with assigned base pair equivalents
 - B Mother 1 DNA
 - C Mother 2 DNA
 - D Boy 1 DNA
 - E Boy 2 DNA
 - F Father (surviving, married to Mother 1)

Storage:
Store entire experiment
at room temperature.

REAGENTS & SUPPLIES:

- Practice Gel Loading Solution
- UltraSpec-Agarose™ powder
- Concentrated electrophoresis buffer
- 1 ml pipet
- 100 ml graduated cylinder (packaging for samples)
- Microtipped Transfer Pipets

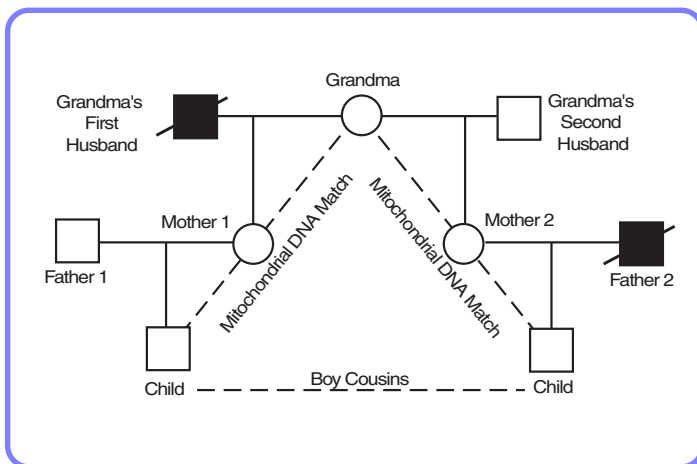
Requirements

- Horizontal gel electrophoresis apparatus
- D.C. power supply
- Automatic micropipets with tips
- Balance
- Microwave, hot plate or burner
- Pipet pump
- 250 ml flasks or beakers
- Hot gloves
- DNA visualization system (white light)
- Distilled or deionized water

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Using DNA Fingerprinting for Determining Familial Relationships

Experiment Procedures



In a war torn country, two young boys were separated from their respective parents who had been imprisoned by the regime. The children were cousins who were born two months apart and looked strikingly similar. Their mothers were half sisters who shared a common mother. After several years, the regime was overthrown and replaced by a new government that released all political prisoners from prison. The prisoners were reinstated in their respective communities and all charges against them were dropped.

During this period, the two boys had not been separated from each other, and had been adopted by a high ranking military officer who had no children of his own. Both the officer and his wife died in a liberation uprising and for a short period of time the boys were placed in an orphanage. On their 18th birthday, the boys were released from the orphanage and they immediately began to search for information regarding their lost parents.

The brothers contacted a number of elders from their village. The elders informed them that after their biological parents were released from prison, one of the fathers was assassinated by individuals who were sympathetic to the fallen regime. The second biological father was suffering from amnesia. Two women, who were thought to be their biological mothers, were in a rehabilitation facility which housed approximately 200 women.

Upon arrival to the center it was very obvious that the patients had not received proper medical attention. Based on age and appearance, about 10 women fit the profile of the two mothers.

Since the boys were cousins and their mothers were sisters who shared the same mother (who was the grandmother of the boys), the first identification screening test performed was a mitochondrial DNA fingerprinting. Mitochondrial information is inherited only through the female (mother). It was expected that the mitochondrial testing results would be identical for the two boys. Mitochon-



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Using DNA Fingerprinting for Determining Familial Relationships

drial DNA fingerprinting tests are also less expensive than chromosomal DNA testing and results are available in a shorter period of time. Results showed that two women did have the same matching mitochondrial DNA fingerprinting pattern which also matched that of the two boys.

In order to match the boys with the correct mothers and the surviving father, chromosomal DNA fingerprinting tests were ordered for the boys, the mothers and the surviving father. The DNA fingerprint of one of the boys matched with the surviving father and one of the mothers. The DNA fingerprint of a child is a composite of elements (matching visible DNA bands on the gel) from both parents. The pattern is easily recognizable and can be experimentally demonstrated in this simulation experiment.

Chromosomal deoxyribonucleic acid (DNA), present in the nucleus of every living cell, is the genetic material that acts as a blueprint for all of the proteins synthesized by that cell. In mammals, however, a large fraction of the total DNA does not encode protein and serves no obvious function. Polymorphic DNA refers to chromosomal regions that vary widely from individual to individual. By examining several of these regions within the genomic DNA obtained from an individual, one may determine a "DNA Fingerprint" for that individual. DNA polymorphisms are now widely used for determining paternity/ maternity, kinship.

Mitochondrial DNA is inherited from the mother. A human egg contains a large number of mitochondria. Unlike that, human sperm contains a small number of mitochondria. Upon fertilization of the human egg by a sperm, the zygote contains the majority of mitochondria obtained by maternal genetic inheritance. Unlike mitochondrial DNA, nuclear cell DNA is an equal composite of both parents. In each chromosome pair, one is inherited from the father and the second from the mother.

Experiment Overview

Experiment Procedures

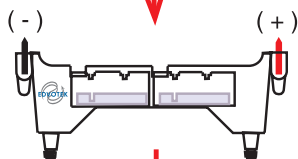
BEFORE YOU START THE EXPERIMENT

1. Read all instructions before starting the experiment.
2. Write a hypothesis that reflects the experiment and predict experimental outcomes.

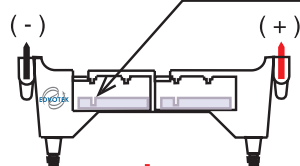
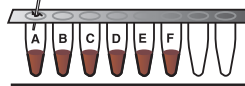


Prepare agarose gel in casting tray

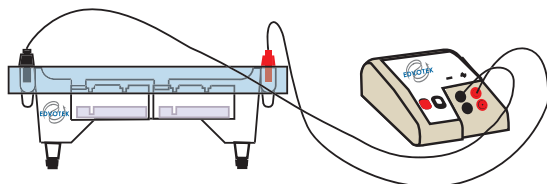
Remove end blocks, comb and submerge gel under buffer in electrophoresis chamber



Load each dye sample in consecutive wells.



Attach safety cover, connect leads to power source and conduct electrophoresis



EXPERIMENT CONTENT OBJECTIVE

Students will learn how agarose gel electrophoresis separates different sizes of dye molecules that represent DNA fragments. They will learn how these fragments form unique DNA patterns for each person, which is the basis for solving maternity and paternity identity.

WORKING HYPOTHESIS

If DNA samples collected from different mothers and fathers are examined at variable polymorphic sites, then one should be able to match the children with their real mother and father by the DNA fingerprinting method.



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Activity One - Agarose Gel Preparation and Practice Gel Loading

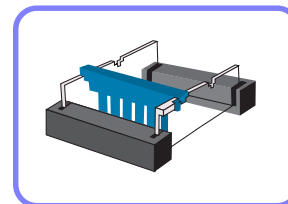
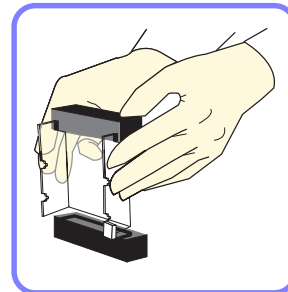


LABORATORY SAFETY

1. Gloves and goggles should be worn routinely as good laboratory practice.
2. Exercise extreme caution when working with equipment that is used in conjunction with the heating and/or melting of reagents.
3. DO NOT MOUTH PIPET REAGENTS - USE PIPET PUMPS.
4. Exercise caution when using any electrical equipment in the laboratory.
5. Always wash hands thoroughly with soap and water after handling reagents or biological materials in the laboratory.

PREPARING THE GEL BED

1. Close off the open ends of a clean and dry gel bed (casting tray) by using rubber dams or tape.
 - A. Using Rubber dams:
 - Place a rubber dam on each end of the bed. Make sure the rubber dam fits firmly in contact with the sides and bottom of the bed.
 - B. Taping with labeling or masking tape:
 - With 3/4 inch wide tape, extend the tape over the sides and bottom edge of the bed.
 - Fold the extended edges of the tape back onto the sides and bottom. Press contact points firmly to form a good seal.
2. Place a well-former template (comb) in the first set of notches at the end of the bed. Make sure the comb sits firmly and evenly across the bed.



Activity One - Agarose Gel Preparation and Practice Gel Loading

Experiment Procedures

CASTING AGAROSE GELS

- Use a 250 ml flask to prepare the gel solution. Add the following components to the flask as specified for your experiment (refer to Table A).
 - Buffer concentrate
 - Distilled water
 - Agarose powder

Table A Individual 0.8% UltraSpec-Agarose™ Gel Electrophoresis of Dyes

Size of EDVOTEK Casting Tray (cm)	Amt of Agarose (g)	+ Concentrated Buffer (50x) (ml)	+ Distilled Water (ml)	= Total Volume (ml)
7 × 7	0.24	0.6	29.4	30
7 × 15	0.48	1.2	58.8	60

- Swirl the mixture to disperse clumps of agarose powder.
- With a marking pen, indicate the level of the solution volume on the outside of the flask.
- Heat the mixture to dissolve the agarose powder. The final solution should appear clear (like water) without any undissolved particles.
 - Microwave method:
 - Cover the flask with plastic wrap to minimize evaporation.
 - Heat the mixture on High for 1 minute.
 - Swirl the mixture and heat on High in bursts of 25 seconds until all the agarose is completely dissolved.
 - Hot plate method:
 - Cover the flask with aluminum foil to prevent excess evaporation.
 - Heat the mixture to boiling over a burner with occasional swirling. Boil until all the agarose is completely dissolved.

Check the solution carefully. If you see "crystal" particles, the agarose is not completely dissolved.

At high altitudes, it is recommended to use a microwave oven to reach boiling temperatures.

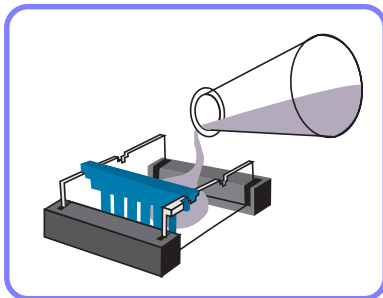


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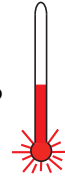
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Activity One - Agarose Gel Preparation and Practice Gel Loading

7. Cool the agarose solution to 55°C with careful swirling to promote even dissipation of heat. If detectable evaporation has occurred, add distilled water to bring the solution up to the original volume as marked on the flask in step 5.



Cool the agarose to 55°C



DO NOT POUR BOILING HOT AGAROSE INTO THE GEL BED.

Hot agarose solution may irreversibly warp the bed.

After the gel is cooled to 55°C:

**If you are using rubber dams, go to step 9.
If you are using tape, continue with step 8.**

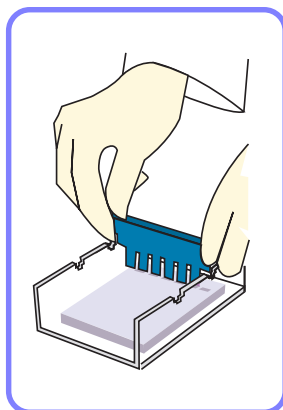
8. Seal the interface of the gel bed and tape to prevent the agarose solution from leaking.
- Use a transfer pipet to deposit a small amount of cooled agarose to both inside ends of the bed.
 - Wait approximately 1 minute for the agarose to solidify.
9. Pour the cooled agarose solution into the bed. Make sure the bed is on a level surface.
10. Allow the gel to completely solidify. It will become firm and cool to the touch after approximately 20 minutes.

Experiment Procedures

Activity One - Agarose Gel Preparation and Practice Gel Loading**PREPARING THE GEL FOR ELECTROPHORESIS**

11. After the gel is completely solidified, carefully and slowly remove the rubber dams or tape from the gel bed.

Be especially careful not to damage or tear the gel wells when removing the rubber dams. A thin plastic knife, spatula or pipet tip can be inserted between the gel and the dams to break possible surface tension.



12. Remove the comb by slowly pulling straight up. Do this carefully and evenly to prevent tearing the sample wells.
13. Place the gel (on its bed) into the electrophoresis chamber, properly oriented, centered and level on the platform.
14. Fill the electrophoresis apparatus chamber with the required volume of diluted buffer for the specific unit you are using (see guidelines in Table B).

For DNA analysis, the same EDVOTEK 50x Electrophoresis Buffer is used for preparing both the agarose gel buffer and the chamber buffer. The formula for diluting EDVOTEK (50x) concentrated buffer is 1 volume of buffer concentrate to every 49 volumes of distilled or deionized water.

The electrophoresis (chamber) buffer recommended is Tris-acetate-EDTA (20 mM tris, 6 mM sodium acetate, 1 mM disodium ethylenediamine tetraacetic acid) pH 7.8. Prepare the buffer as required for your electrophoresis apparatus.

Table B Dilution of Electrophoresis (Chamber) Buffer

EDVOTEK Model #	Concentrated Buffer (50x) (ml)	+ Distilled Water (ml)	= Total Volume (ml)
M6+	6	294	300
M12	8	392	400
M36 (blue)	10	490	500
M36 (clear)	20	980	1000

15. Make sure the gel is completely covered with buffer.
16. Proceed to loading the samples and conducting electrophoresis.

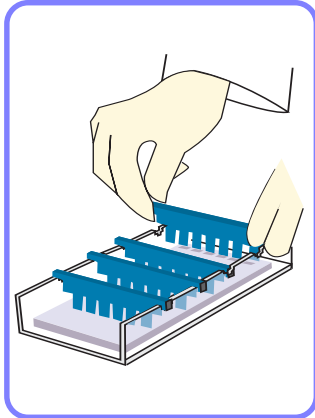


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Activity One - Agarose Gel Preparation and Practice Gel Loading

PRACTICE GEL LOADING



Accurate sample delivery technique ensures the best possible gel results. Pipeting mistakes can cause the sample to become diluted with buffer, or cause damage to the wells with the pipet tip while loading the gel.

If you are unfamiliar with loading samples in agarose gels, it is recommended that you practice sample delivery techniques before conducting the actual experiment. EDVOTEK® electrophoresis experiments contain a tube of practice gel loading solution for this purpose. Casting of a separate practice gel is highly recommended. One suggested activity is outlined below:

1. Cast a gel with the maximum number of wells possible.
2. After the gel solidifies, place it under buffer in an electrophoresis apparatus chamber.

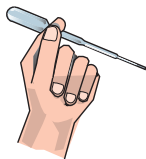
Alternatively, your teacher may have cut the gel in sections between the rows of wells. Place a gel section with wells into a small, shallow tray and submerge it under buffer or water.

Note: The agarose gel is sometimes called a "submarine gel" because it is submerged under buffer for sample loading and electrophoretic separation.

3. Practice delivering the practice gel loading solution to the sample wells. Take care not to damage or puncture the wells with the pipet tip.
 - For electrophoresis of dyes, load the sample well with 35-38 microliters of sample.
 - If using transfer pipets for sample delivery, load each sample well until it is full.
4. If you need more practice, remove the practice gel loading solution by squirting buffer into the wells with a transfer pipet.
5. Replace the practice gel with a fresh gel for the actual experiment.

Note: If practice gel loading is performed in the electrophoresis chamber, the practice gel loading solution will become diluted in the buffer in the apparatus. A small amount of practice gel loading solution (filling up to 12 wells) will not interfere with the experiment, so it is not necessary to prepare fresh buffer.

If you are using transfer pipets, gently squeeze the pipet stem, instead of the bulb to help control the delivery of small sample volumes.



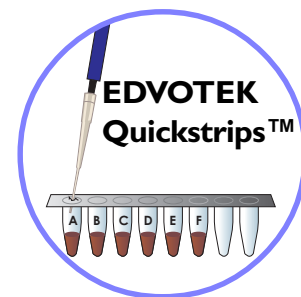
Activity Two - Conducting Agarose Gel Electrophoresis

Experiment Procedures

ELECTROPHORESIS SAMPLES

Samples in this electrophoresis experiment are packaged in pre-aliquoted Quickstrip™ connected tubes.

To remove samples from the Quickstrip™ tubes, simply pierce the foil top with the micropipet tip and withdraw the sample.



Quickstrips
patent pending

LOADING THE SAMPLES

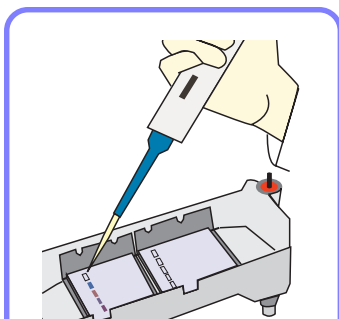
1. Check the Sample Volumes

Sometimes a small amount of sample will cling to the walls of the tubes. Make sure the entire volume of sample is at the bottom of the tubes before starting to load the gel.

- If your samples are in Quickstrip™ connected tubes, tap the foil top of the strip so samples fall to the bottom of the tubes.
- If your samples are in individual 1.5 ml or 0.5 ml microtest tubes, briefly centrifuge the sample tubes, or tap each tube on the tabletop to get all the sample to the bottom of the tube.

2. Load Samples

Load each of the dye samples in tubes A - F into the wells in consecutive order. The amount of sample that should be loaded is 35-38 μ l.



Lane	Label	Sample
1	A	Markers
2	B	Mother 1
3	C	Mother 2
4	D	Boy 1
5	E	Boy 2
6	F	Father



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Activity Two - Conducting Agarose Gel Electrophoresis

RUNNING THE GEL

- After the samples are loaded, carefully snap the cover down onto the electrode terminals.

Make sure that the negative and positive color-coded indicators on the cover and apparatus chamber are properly oriented.

- Insert the plug of the black wire into the black input of the power source (negative input). Insert the plug of the red wire into the red input of the power source (positive input).
- Set the power source at the required voltage and conduct electrophoresis for the length of time determined by your instructor. General guidelines are presented in Table C.
- Check to see that current is flowing properly - you should see bubbles forming on the two platinum electrodes.

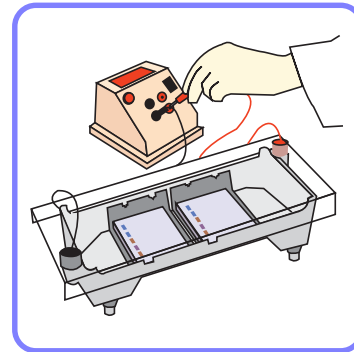


Table C Time and Voltage

Electrophoresis of Dyes

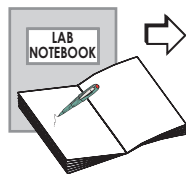
Volts	Recommended Time
125	20 min
70	40 min
50	60 min

Staining is not required for Experiment # S-49, but results must be analyzed upon completion of the electrophoretic separation. Because dye molecules are extremely small they will diffuse out of the gel. Thus, the gel cannot be saved.

- After approximately 10 minutes, you will begin to see separation of the colored dyes.
- After the electrophoresis is completed, turn off the power, unplug the power source, disconnect the leads and remove the cover.
- Document the gel results.

A variety of documentation methods can be used, including drawing a picture of the gel, taking a photograph, or scanning an image of the gel on a flatbed scanner.

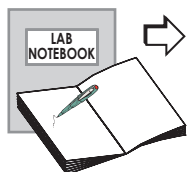
Critical Thinking and Hypothesis Development



Record the following in your Laboratory Notebook or as instructed by your teacher.

1. What is the variable in this experiment?
2. What is the control in this experiment?
3. What could one change in the experiment if this experiment was repeated?
4. Write a hypothesis that would reflect a change.
5. Based on the evidence obtained from the analysis of the gel, which child, mother and father are reunited? Explain.

Study Questions




Record the answers to the following Study Questions in your Laboratory Notebook or as instructed by your teacher.

1. What do the different dye bands that were separated by electrophoresis represent?
2. Why do different individuals, such as siblings, have different fingerprints?
3. What is the basis of mitochondrial DNA fingerprint analysis?
4. What is the difference between mitochondrial and cell DNA-based fingerprinting analysis.




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 Material Safety Data Sheet May be used to comply with OSHA's Hazard Communication Standard. 29 CFR 1910.1200 Standard must be consulted for specific requirements.			
IDENTITY (As Used on Label and List) Agarose			
Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.			
Section I			
Manufacturer's Name EDVOTEK, Inc. Address (Number, Street, City, State, Zip Code) 14676 Rothgeb Drive Rockville, MD 20850	Emergency Telephone Number (301) 251-5990 Telephone Number for information (301) 251-5990 Date Prepared 09-15-2002 Signature of Preparer (optional)		
Section II - Hazardous Ingredients/Identify Information			
Hazardous Components [Specific Chemical Identity: Common Name(s)] OSHA PEL ACGIH TLV Other Limits Recommended % (Optional)			
This product contains no hazardous materials as defined by the OSHA Hazard Communication Standard. CAS #9012-36-6			
Section III - Physical/Chemical Characteristics			
Boiling Point For 1% solution	194° F	Specific Gravity (H ₂ O = 1)	No data
Vapor Pressure (mm Hg.)	No data	Melting Point	No data
Vapor Density (AIR = 1)	No data	Evaporation Rate (Butyl Acetate = 1)	No data
Solubility in Water Insoluble - cold		Appearance and Odor White powder, no odor	
Section IV - Physical/Chemical Characteristics N.D. = No data			
Flash Point (Method Used)	No data	Flammable Limits	LEL N.D. UEL N.D.
Extinguishing Media Water spray, dry chemical, carbon dioxide, halon or standard foam			
Special Fire Fighting Procedures Possible fire hazard when exposed to heat or flame			
Unusual Fire and Explosion Hazards None			


Section V - Reactivity Data			
Stability	Unstable		Conditions to Avoid
	Stable	X	None
Incompatibility No data available			
Hazardous Decomposition or Byproducts			
Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	None
Section VI - Health Hazard Data			
Route(s) of Entry: Inhalation? Yes Skin? Yes Ingestion? Yes			
Health Hazards (Acute and Chronic) Inhalation: No data available Ingestion: Large amounts may cause diarrhea			
Carcinogenicity: NTP? IARC Monographs? OSHA Regulation?			
Signs and Symptoms of Exposure No data available			
Medical Conditions Generally Aggravated by Exposure No data available			
Emergency First Aid Procedures Treat symptomatically and supportively			
Section VII - Precautions for Safe Handling and Use			
Steps to be Taken in case Material is Released for Spilled Sweep up and place in suitable container for disposal			
Waste Disposal Method Normal solid waste disposal			
Precautions to be Taken in Handling and Storing None			
Other Precautions None			
Section VIII - Control Measures			
Respiratory Protection (Specify Type) Chemical cartridge respirator with full facepiece.			
Ventilation	Local Exhaust	Special	
	Mechanical (General) Gen. dilution ventilation	Other	
Protective Gloves	Yes	Eye Protection	Splash proof goggles
Other Protective Clothing or Equipment Impervious clothing to prevent skin contact			
Work/Hygienic Practices None			

 Material Safety Data Sheet May be used to comply with OSHA's Hazard Communication Standard. 29 CFR 1910.1200 Standard must be consulted for specific requirements.			
IDENTITY (As Used on Label and List) 50x Electrophoresis Buffer			
Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.			
Section I			
Manufacturer's Name EDVOTEK, Inc. Address (Number, Street, City, State, Zip Code) 14676 Rothgeb Drive Rockville, MD 20850	Emergency Telephone Number (301) 251-5990 Telephone Number for information (301) 251-5990 Date Prepared 09-17-2002 Signature of Preparer (optional)		
Section II - Hazardous Ingredients/Identify Information			
Hazardous Components [Specific Chemical Identity: Common Name(s)] OSHA PEL ACGIH TLV Other Limits Recommended % (Optional)			
This product contains no hazardous materials as defined by the OSHA Hazard Communication Standard.			
Section III - Physical/Chemical Characteristics			
Boiling Point	No data	Specific Gravity (H ₂ O = 1)	No data
Vapor Pressure (mm Hg.)	No data	Melting Point	No data
Vapor Density (AIR = 1)	No data	Evaporation Rate (Butyl Acetate = 1)	No data
Solubility in Water Appreciable, (greater than 10%)		Appearance and Odor Clear, liquid, slight vinegar odor	
Section IV - Physical/Chemical Characteristics N.D. = No data			
Flash Point (Method Used)	No data	Flammable Limits	LEL N.D. UEL N.D.
Extinguishing Media Use extinguishing media appropriate for surrounding fire.			
Special Fire Fighting Procedures Wear protective equipment and SCBA with full facepiece operated in positive pressure mode.			
Unusual Fire and Explosion Hazards None identified			

Section V - Reactivity Data			
Stability	Unstable		Conditions to Avoid
	Stable	X	None
Incompatibility Strong oxidizing agents			
Hazardous Decomposition or Byproducts Carbon monoxide, Carbon dioxide			
Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	None
Section VI - Health Hazard Data			
Route(s) of Entry: Inhalation? Yes Skin? Yes Ingestion?			
Health Hazards (Acute and Chronic) None			
Carcinogenicity: None identified NTP? IARC Monographs? OSHA Regulation?			
Signs and Symptoms of Exposure Irritation to upper respiratory tract, skin, eyes			
Medical Conditions Generally Aggravated by Exposure None			
Emergency First Aid Procedures Ingestion: If conscious, give large amounts of water Eyes: Flush with water Inhalation: Move to fresh air Skin: Wash with soap and water			
Section VII - Precautions for Safe Handling and Use			
Steps to be Taken in case Material is Released for Spilled Wear suitable protective clothing. Mop up spill and rinse with water, or collect in absorptive material and dispose of the absorptive material.			
Waste Disposal Method Dispose in accordance with all applicable federal, state, and local environmental regulations.			
Precautions to be Taken in Handling and Storing Avoid eye and skin contact.			
Other Precautions None			
Section VIII - Control Measures			
Respiratory Protection (Specify Type)			
Ventilation	Local Exhaust	Yes	Special None
	Mechanical (General)	Yes	Other None
Protective Gloves	Yes	Eye Protection	Splash proof goggles
Other Protective Clothing or Equipment None			
Work/Hygienic Practices None			

 <p align="center">Material Safety Data Sheet May be used to comply with OSHA's Hazard Communication Standard. 29 CFR 1910.1200 Standard must be consulted for specific requirements.</p>			
IDENTITY (As Used on Label and List) Practice Gel Loading Solution		Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.	
Section I		Emergency Telephone Number (301) 251-5990	
Manufacturer's Name EDVOTEK, Inc.		Telephone Number for information (301) 251-5990	
Address (Number, Street, City, State, Zip Code) 14676 Rothgeb Drive Rockville, MD 20850		Date Prepared 09-19-2002	
		Signature of Preparer (optional)	
Section II - Hazardous Ingredients/Identify Information			
Hazardous Components [Specific Chemical Identity; Common Name(s)] OSHA PEL ACGIH TLV Other Limits Recommended % (Optional)			
This product contains no hazardous materials as defined by the OSHA Hazard Communication Standard.			
Section III - Physical/Chemical Characteristics			
Boiling Point	No data	Specific Gravity (H ₂ O = 1)	No data
Vapor Pressure (mm Hg.)	No data	Melting Point	No data
Vapor Density (AIR = 1)	No data	Evaporation Rate (Butyl Acetate = 1)	No data
Solubility in Water Soluble			
Appearance and Odor Blue liquid, no odor			
Section IV - Physical/Chemical Characteristics			
Flash Point (Method Used)	No data	Flammable Limits	LEL No data UEL No data
Extinguishing Media Dry chemical, carbon dioxide, water spray or foam			
Special Fire Fighting Procedures Use agents suitable for type of surrounding fire. Keep upwind, avoid breathing hazardous sulfur oxides and bromides. Wear SCBA.			
Unusual Fire and Explosion Hazards Unknown			

Section V - Reactivity Data			
Stability	Unstable		Conditions to Avoid
	Stable	X	None
Incompatibility None			
Hazardous Decomposition or Byproducts Sulfur oxides, and bromides			
Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	None
Section VI - Health Hazard Data			
Route(s) of Entry: Inhalation? Yes Skin? Yes Ingestion? Yes			
Health Hazards (Acute and Chronic) Acute eye contact: May cause irritation. No data available for other routes.			
Carcinogenicity: No data available NTP? IARC Monographs? OSHA Regulation?			
Signs and Symptoms of Exposure May cause skin or eye irritation			
Medical Conditions Generally Aggravated by Exposure None reported			
Emergency First Aid Procedures Treat symptomatically and supportively. Rinse contacted area with copious amounts of water.			
Section VII - Precautions for Safe Handling and Use			
Steps to be Taken in case Material is Released for Spilled Wear eye and skin protection and mop spill area. Rinse with water.			
Waste Disposal Method Observe all federal, state, and local regulations.			
Precautions to be Taken in Handling and Storing Avoid eye and skin contact.			
Other Precautions None			
Section VIII - Control Measures			
Respiratory Protection (Specify Type)			
Ventilation	Local Exhaust	Yes	Special None
	Mechanical (General)	Yes	Other None
Protective Gloves	Yes	Eye Protection	Splash proof goggles
Other Protective Clothing or Equipment None required			
Work/Hygienic Practices Avoid eye and skin contact			

 <p align="center">Material Safety Data Sheet May be used to comply with OSHA's Hazard Communication Standard. 29 CFR 1910.1200 Standard must be consulted for specific requirements.</p>			
IDENTITY (As Used on Label and List) B-1: Food Dye		Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.	
Section I		Emergency Telephone Number (301) 251-5990	
Manufacturer's Name EDVOTEK, Inc.		Telephone Number for information (301) 251-5990	
Address (Number, Street, City, State, Zip Code) 14676 Rothgeb Drive Rockville, MD 20850		Date Prepared 07/01/03	
		Signature of Preparer (optional)	
Section II - Hazardous Ingredients/Identify Information			
Hazardous Components [Specific Chemical Identity; Common Name(s)] OSHA PEL ACGIH TLV Other Limits Recommended % (Optional)			
This product contains no hazardous materials as defined by the OSHA Hazard Communication Standard.			
Section III - Physical/Chemical Characteristics			
Boiling Point	No data	Specific Gravity (H ₂ O = 1)	No data
Vapor Pressure (mm Hg.)	No data	Melting Point	N/A
Vapor Density (AIR = 1)	No data	Evaporation Rate (Butyl Acetate = 1)	No data
Solubility in Water Soluble			
Appearance and Odor Blue color, liquid, no odor			
Section IV - Physical/Chemical Characteristics			
Flash Point (Method Used)	No data	Flammable Limits	LEL No data UEL No data
Extinguishing Media N/A			
Special Fire Fighting Procedures N/A			
Unusual Fire and Explosion Hazards None			

Section V - Reactivity Data			
Stability	Unstable		Conditions to Avoid
	Stable	X	Unknown
Incompatibility None			
Hazardous Decomposition or Byproducts Sulfur oxides and bromides			
Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	None
Section VI - Health Hazard Data			
Route(s) of Entry: Inhalation? No Skin? Yes Ingestion? Yes			
Health Hazards (Acute and Chronic) Acute eye contact: may cause irritation			
Carcinogenicity: None No data IARC Monographs? No data OSHA Regulation? No			
Signs and Symptoms of Exposure May cause skin or eye irritation			
Medical Conditions Generally Aggravated by Exposure None reported			
Emergency First Aid Procedures Rinse contacted areas with copious amounts of water			
Section VII - Precautions for Safe Handling and Use			
Steps to be Taken in case Material is Released for Spilled Wear eye and skin protection and mop/wipe spill area. Rinse with water.			
Waste Disposal Method Can be disposed in the trash or down the sink			
Precautions to be Taken in Handling and Storing Avoid eye and skin contact			
Other Precautions None			
Section VIII - Control Measures			
Respiratory Protection (Specify Type) NIOSH/MSHA - approved respirator			
Ventilation	Local Exhaust	No	Special None
	Mechanical (General)	No	Other None
Protective Gloves	Yes	Eye Protection	Splash proof goggles
Other Protective Clothing or Equipment None required			
Work/Hygienic Practices Avoid eye and skin contact			



Material Safety Data Sheet
 May be used to comply with OSHA's Hazard Communication Standard. 29 CFR 1910.1200. Standard must be consulted for specific requirements.

IDENTITY (As Used on Label and List) B-2: Food Dye		Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.	
Section I		Emergency Telephone Number (301) 251-5990	
Manufacturer's Name EDVOTEK, Inc.		Telephone Number for information (301) 251-5990	
Address (Number, Street, City, State, Zip Code) 14676 Rothgeb Drive Rockville, MD 20850		Date Prepared 07/01/03	
		Signature of Preparer (optional)	

Section II - Hazardous Ingredients/Identify Information

Hazardous Components [Specific Chemical Identity; Common Name(s)]	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (Optional)
This product contains no hazardous materials as defined by the OSHA Hazard Communication Standard.				

Section III - Physical/Chemical Characteristics

Boiling Point	No data	Specific Gravity (H ₂ O = 1)	No data
Vapor Pressure (mm Hg.)	No data	Melting Point	N/A
Vapor Density (AIR = 1)	No data	Evaporation Rate (Butyl Acetate = 1)	No data
Solubility in Water Soluble			
Appearance and Odor Blue color, liquid, no odor			

Section IV - Physical/Chemical Characteristics

Flash Point (Method Used)	No data	Flammable Limits	LEL No data	UEL No data
Extinguishing Media	N/A			
Special Fire Fighting Procedures	N/A			
Unusual Fire and Explosion Hazards	None			

Section V - Reactivity Data

Stability	Unstable		Conditions to Avoid
	Stable	X	Unknown
Incompatibility	None		
Hazardous Decomposition or Byproducts	Sulfur oxides and bromides		
Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	None
Section VI - Health Hazard Data			
Route(s) of Entry: Inhalation? No Skin? Yes Ingestion? Yes			
Health Hazards (Acute and Chronic) Acute eye contact: may cause irritation			
Carcinogenicity:	NTP?	IARC Monographs?	OSHA Regulation?
None	No data	No data	No
Signs and Symptoms of Exposure May cause skin or eye irritation			
Medical Conditions Generally Aggravated by Exposure None reported			
Emergency First Aid Procedures Rinse contacted areas with copious amounts of water			

Section VII - Precautions for Safe Handling and Use

Steps to be Taken in case Material is Released for Spilled
Wear eye and skin protection and mop/wipe spill area. Rinse with water.

Waste Disposal Method
Can be disposed in the trash or down the sink

Precautions to be Taken in Handling and Storing
Avoid eye and skin contact

Other Precautions
None

Section VIII - Control Measures

Respiratory Protection (Specify Type) NIOSH/MSHA - approved respirator

Ventilation	Local Exhaust	No	Special	None
	Mechanical (General)	No	Other	None

Protective Gloves Yes Eye Protection Splash proof goggles

Other Protective Clothing or Equipment None required

Work/Hygienic Practices Avoid eye and skin contact



Material Safety Data Sheet
 May be used to comply with OSHA's Hazard Communication Standard. 29 CFR 1910.1200. Standard must be consulted for specific requirements.

IDENTITY (As Used on Label and List) B/101 Purple		Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.	
Section I		Emergency Telephone Number (301) 251-5990	
Manufacturer's Name EDVOTEK, Inc.		Telephone Number for information (301) 251-5990	
Address (Number, Street, City, State, Zip Code) 14676 Rothgeb Drive Rockville, MD 20850		Date Prepared 09-16-2002	
		Signature of Preparer (optional)	

Section II - Hazardous Ingredients/Identify Information

Hazardous Components [Specific Chemical Identity; Common Name(s)]	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (Optional)
This product contains no hazardous materials as defined by the OSHA Hazard Communication Standard.				

Section III - Physical/Chemical Characteristics

Boiling Point	No data	Specific Gravity (H ₂ O = 1)	No data
Vapor Pressure (mm Hg.)	No data	Melting Point	N/A
Vapor Density (AIR = 1)	No data	Evaporation Rate (Butyl Acetate = 1)	No data
Solubility in Water Soluble			
Appearance and Odor Blue liquid, no odor			

Section IV - Physical/Chemical Characteristics

Flash Point (Method Used)	No data	Flammable Limits	LEL No data	UEL No data
Extinguishing Media	Dry chemical, carbon dioxide, water spray or foam.			
Special Fire Fighting Procedures	Use agents suitable for type of surrounding fire. Keep upwind, avoid breathing hazardous sulfur oxides and bromides. Wear SCBA.			
Unusual Fire and Explosion Hazards	Unknown			

Section V - Reactivity Data

Stability	Unstable		Conditions to Avoid
	Stable	X	None
Incompatibility	None		
Hazardous Decomposition or Byproducts	Sulfur oxides and bromides		
Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	None
Section VI - Health Hazard Data			
Route(s) of Entry: Inhalation? Yes Skin? Yes Ingestion? Yes			
Health Hazards (Acute and Chronic) Acute eye contact: May cause irritation			
Carcinogenicity:	NTP?	IARC Monographs?	OSHA Regulation?
		No data	No data
Signs and Symptoms of Exposure May cause skin or eye irritation			
Medical Conditions Generally Aggravated by Exposure None reported			
Emergency First Aid Procedures Treat symptomatically and supportively. Rinse contacted areas with copious amounts			

Section VII - Precautions for Safe Handling and Use

Steps to be Taken in case Material is Released for Spilled
Wear eye and skin protection and mop/wipe spill area. Rinse with water.

Waste Disposal Method
Observe all federal, state, and local regulations.

Precautions to be Taken in Handling and Storing
Avoid eye and skin contact.

Other Precautions
None

Section VIII - Control Measures


Respiratory Protection (Specify Type) NIOSH/MSHA approved

Ventilation	Local Exhaust	Yes	Special	None
	Mechanical (General)	Yes	Other	None


Protective Gloves Yes Eye Protection Splash proof goggles

Other Protective Clothing or Equipment None required


Work/Hygienic Practices Avoid eye and skin contact

 Material Safety Data Sheet May be used to comply with OSHA's Hazard Communication Standard. 29 CFR 1910.1200 Standard must be consulted for specific requirements.			
IDENTITY (As Used on Label and List) Coomassie Blue			
Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.			
Section I			
Manufacturer's Name EDVOTEK, Inc. Address (Number, Street, City, State, Zip Code) 14676 Rothgeb Drive Rockville, MD 20850	Emergency Telephone Number (301) 251-5990 Telephone Number for information (301) 251-5990 Date Prepared 09-17-2002 Signature of Preparer (optional)		
Section II - Hazardous Ingredients/Identify Information			
Hazardous Components [Specific Chemical Identity; Common Name(s)] OSHA PEL ACGIH TLV Other Limits Recommended % (Optional) CH3OH CAS # 67-56-1			
Section III - Physical/Chemical Characteristics			
Boiling Point	65 C	Specific Gravity (H ₂ O = 1)	.79
Vapor Pressure (mm Hg.)	96mmHg	Melting Point	N/A
Vapor Density (AIR = 1)	1.11	Evaporation Rate (Butyl Acetate = 1)	4.6
Solubility in Water		complete (100%)	
Appearance and Odor		Blue liquid/alcoholic, pungent odor	
Section IV - Physical/Chemical Characteristics			
Flash Point (Method Used)	(closed cup) 12C	Flammable Limits	LEL 6.0% UEL 36.0%
Extinguishing Media Use alcohol foam, dry chemical or carbon dioxide. (water may be ineffective)			
Special Fire Fighting Procedures Wear protective gear and SCBA w/ full facepiece operated in positive pressure mode. Move containers from fire area if possible.			
Unusual Fire and Explosion Hazards Vapors may flow along surfaces to distant ignition sources and flash back.			


Section V - Reactivity Data			
Stability	Unstable		Conditions to Avoid
	Stable	X	Heat, flames, other sources of ignition
Incompatibility Strong oxidizing agents, strong acids, zinc, aluminum, magnesium			
Hazardous Decomposition or Byproducts Carbon monoxide, carbon dioxide, formaldehyde, nitrogen sulfur dioxide			
Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	None
Section VI - Health Hazard Data			
Route(s) of Entry: Inhalation? Yes Skin? Yes Ingestion? Yes			
Health Hazards (Acute and Chronic) Chronic kidney damage, liver damage			
Carcinogenicity: NTP? IARC Monographs? OSHA Regulation? Non-identified No No No			
Signs and Symptoms of Exposure Skin/eye irritation, headache, nausea, vomiting, dizziness, narcosis, respirator, low blood pressure			
Medical Conditions Generally Aggravated by Exposure Eye disorders, skin disorders, liver or kidney disorders			
Emergency First Aid Procedures Inhalation: remove to fresh air Skin/eye contact: flush with copious amounts of water Ingestion: Call physician. If conscience give copious amts of water			
Section VII - Precautions for Safe Handling and Use			
Steps to be Taken in case Material is Released for Spilled Wear SCBA and full protective clothing. Shut off sources. Stop leak if possible without Use water spray to induce vapors. Use sand or non combustible absorbent material and sweep up			
Waste Disposal Method Dispose in accordance with all applicable federal, state, and local regulations			
Precautions to be Taken in Handling and Storing No flames, smoking, or flames in area. Keep container tightly closed. Store in a dry, well ventilated, flammable liquid storage area.			
Other Precautions			
Section VIII - Control Measures			
Respiratory Protection (Specify Type) At concentrations above 200ppm, wear SCBA			
Ventilation	Local Exhaust	Yes must meet TLV require	Special None
	Mechanical (General)	Yes	Other None
Protective Gloves	Yes	Eye Protection	safety goggles
Other Protective Clothing or Equipment Faceshield, uniform, protective suit			
Work/Hygienic Practices Avoid contact			

 Material Safety Data Sheet May be used to comply with OSHA's Hazard Communication Standard. 29 CFR 1910.1200 Standard must be consulted for specific requirements.			
IDENTITY (As Used on Label and List) Methyl Orange			
Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.			
Section I			
Manufacturer's Name EDVOTEK, Inc. Address (Number, Street, City, State, Zip Code) 14676 Rothgeb Drive Rockville, MD 20850	Emergency Telephone Number (301) 251-5990 Telephone Number for information (301) 251-5990 Date Prepared 07/01/03 Signature of Preparer (optional)		
Section II - Hazardous Ingredients/Identify Information			
Hazardous Components [Specific Chemical Identity; Common Name(s)] OSHA PEL ACGIH TLV Other Limits Recommended % (Optional) This product contains no hazardous materials as defined by the OSHA Hazard Communication Standard. CAS # 547-58-0			
Section III - Physical/Chemical Characteristics			
Boiling Point	No data	Specific Gravity (H ₂ O = 1)	No data
Vapor Pressure (mm Hg.)	No data	Melting Point	N/A
Vapor Density (AIR = 1)	No data	Evaporation Rate (Butyl Acetate = 1)	No data
Solubility in Water		Soluble	
Appearance and Odor		Yellow-orange color, liquid, no odor	
Section IV - Physical/Chemical Characteristics			
Flash Point (Method Used)	No data	Flammable Limits	LEL No data UEL No data
Extinguishing Media N/A			
Special Fire Fighting Procedures N/A			
Unusual Fire and Explosion Hazards None			

Section V - Reactivity Data			
Stability	Unstable		Conditions to Avoid
	Stable	X	Unknown
Incompatibility None			
Hazardous Decomposition or Byproducts Sulfur oxides and bromides			
Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	None
Section VI - Health Hazard Data			
Route(s) of Entry: Inhalation? No Skin? Yes Ingestion? Yes			
Health Hazards (Acute and Chronic) Acute eye contact: may cause irritation			
Carcinogenicity: NTP? IARC Monographs? OSHA Regulation? None No data No data No			
Signs and Symptoms of Exposure May cause skin or eye irritation			
Medical Conditions Generally Aggravated by Exposure None reported			
Emergency First Aid Procedures Rinse contacted areas with copious amounts of water			
Section VII - Precautions for Safe Handling and Use			
Steps to be Taken in case Material is Released for Spilled Wear eye and skin protection and mop/wipe spill area. Rinse with water.			
Waste Disposal Method Can be disposed in the trash or down the sink			
Precautions to be Taken in Handling and Storing Avoid eye and skin contact			
Other Precautions None			
Section VIII - Control Measures			
Respiratory Protection (Specify Type) NIOSH/MSHA - approved respirator			
Ventilation	Local Exhaust	No	Special None
	Mechanical (General)	No	Other None
Protective Gloves	Yes	Eye Protection	Splash prof goggles
Other Protective Clothing or Equipment None required			
Work/Hygienic Practices Avoid eye and skin contact			

 Material Safety Data Sheet May be used to comply with OSHA's Hazard Communication Standard. 29 CFR 1910.1200 Standard must be consulted for specific requirements.			
IDENTITY (As Used on Label and List) A/101 Orange		Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.	
Section I		Emergency Telephone Number (301) 251-5990	
Manufacturer's Name EDVOTEK, Inc.		Telephone Number for information (301) 251-5990	
Address (Number, Street, City, State, Zip Code) 14676 Rothgeb Drive Rockville, MD 20850		Date Prepared 09-18-2002	
		Signature of Preparer (optional)	
Section II - Hazardous Ingredients/Identify Information			
Hazardous Components [Specific Chemical Identity; Common Name(s)] OSHA PEL ACGIH TLV Other Limits Recommended % (Optional) This product contains no hazardous materials as defined by the OSHA Hazard Communication Standard.			
Section III - Physical/Chemical Characteristics			
Boiling Point	No data	Specific Gravity (H ₂ O = 1)	No data
Vapor Pressure (mm Hg.)	No data	Melting Point	N/A
Vapor Density (AIR = 1)	No data	Evaporation Rate (Butyl Acetate = 1)	No data
Solubility in Water Soluble			
Appearance and Odor Orange liquid, no odor			
Section IV - Physical/Chemical Characteristics			
Flash Point (Method Used)	No data	Flammable Limits	LEL No data UEL No data
Extinguishing Media Water spray, carbon dioxide, dry chemical powder, alcohol or polymer foam.			
Special Fire Fighting Procedures Wear SCBA and protective clothing to prevent contact with skin and eyes.			
Unusual Fire and Explosion Hazards Emits toxic fumes of carbon monoxide, carbon dioxide, nitrogen oxides and sulfur oxides under fire conditions.			

Section V - Reactivity Data			
Stability	Unstable		Conditions to Avoid
	Stable	X	None
Incompatibility None			
Hazardous Decomposition or Byproducts Toxic fumes of carbon monoxide, carbon dioxide, nitrogen oxides and sulfur oxides.			
Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	None
Section VI - Health Hazard Data			
Route(s) of Entry: Inhalation? Skin? Ingestion?			
Yes Yes Yes			
Health Hazards (Acute and Chronic) Not thoroughly investigated			
Carcinogenicity: NTP? IARC Monographs? OSHA Regulation?			
N/A N/A			
Signs and Symptoms of Exposure No data			
Medical Conditions Generally Aggravated by Exposure No data			
Emergency First Aid Procedures Ingestion: Rinse mouth with water if person is conscious. Inhalation: Remove to fresh air Skin & eye contact: Rinse with copious amounts of water.			
Section VII - Precautions for Safe Handling and Use			
Steps to be Taken in case Material is Released for Spilled Wear protective clothing: ventilate area and wipe with absorptive material. Dispose of absorptive material properly.			
Waste Disposal Method Mix with combustible solvent and burn in chemical incinerator equipped with afterburner and scrubber. Observe all federal, state, and local laws.			
Precautions to be Taken in Handling and Storing None			
Other Precautions None			
Section VIII - Control Measures			
Respiratory Protection (Specify Type) NIOSH/MSHA - approved respirator			
Ventilation	Local Exhaust	No	Special None
	Mechanical (General)	Yes	Other None
Protective Gloves	Rubber		Eye Protection Chem. safety goggles
Other Protective Clothing or Equipment Rubber boots			
Work/Hygienic Practices Do not ingest. Avoid contact with skin, eyes and clothing.			

 Material Safety Data Sheet May be used to comply with OSHA's Hazard Communication Standard. 29 CFR 1910.1200 Standard must be consulted for specific requirements.			
IDENTITY (As Used on Label and List) C/101 Red		Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.	
Section I		Emergency Telephone Number (301) 251-5990	
Manufacturer's Name EDVOTEK, Inc.		Telephone Number for information (301) 251-5990	
Address (Number, Street, City, State, Zip Code) 14676 Rothgeb Drive Rockville, MD 20850		Date Prepared 09-19-2002	
		Signature of Preparer (optional)	
Section II - Hazardous Ingredients/Identify Information			
Hazardous Components [Specific Chemical Identity; Common Name(s)] OSHA PEL ACGIH TLV Other Limits Recommended % (Optional) Red CAS# 34487-61-1			
Section III - Physical/Chemical Characteristics			
Boiling Point	No data	Specific Gravity (H ₂ O = 1)	No data
Vapor Pressure (mm Hg.)	No data	Melting Point	285°C
Vapor Density (AIR = 1)	No data	Evaporation Rate (Butyl Acetate = 1)	No data
Solubility in Water Water Soluble			
Appearance and Odor Red powder			
Section IV - Physical/Chemical Characteristics			
Flash Point (Method Used)	No data	Flammable Limits	LEL No data UEL No data
Extinguishing Media Water spray, carbon dioxide, dry chemical powder, or appropriate foam.			
Special Fire Fighting Procedures Wear SCBA and protective clothing to prevent contact with skin and eyes.			
Unusual Fire and Explosion Hazards Emits toxic fumes under fire conditions.			

Section V - Reactivity Data			
Stability	Unstable		Conditions to Avoid
	Stable	X	Incompatibles
Incompatibility Strong oxidizing agents			
Hazardous Decomposition or Byproducts CO, CO ₂ , Sulfur Dioxide			
Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	Unknown
Section VI - Health Hazard Data			
Route(s) of Entry: Inhalation? Skin? Ingestion?			
Yes Yes Yes			
Health Hazards (Acute and Chronic)			
Carcinogenicity: NTP? IARC Monographs? OSHA Regulation?			
Signs and Symptoms of Exposure Eye-skin irritation			
Medical Conditions Generally Aggravated by Exposure No data			
Emergency First Aid Procedures Flush with copious amounts of H ₂ O for at least 15 minutes. Remove to fresh air & remove contaminated clothing			
Section VII - Precautions for Safe Handling and Use			
Steps to be Taken in case Material is Released for Spilled Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after pickup.			
Waste Disposal Method See above			
Precautions to be Taken in Handling and Storing Store in a cool dry place			
Other Precautions Avoid contact			
Section VIII - Control Measures			
Respiratory Protection (Specify Type) NIOSH/MSHA - approved respirator			
Ventilation	Local Exhaust	Yes	Special None
	Mechanical (General)	No	Other None
Protective Gloves	Chemical resistant		Eye Protection Safety goggles
Other Protective Clothing or Equipment Lab coat			
Work/Hygienic Practices Do not ingest. Avoid contact with skin, eyes and clothing.			



Material Safety Data Sheet
 May be used to comply with OSHA's Hazard Communication Standard. 29 CFR 1910.1200 Standard must be consulted for specific requirements.

IDENTITY (As Used on Label and List)
 Xylene Cyanol

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I
 Manufacturer's Name
 EDVOTEK, Inc.
 Address (Number, Street, City, State, Zip Code)
 14676 Rothgeb Drive
 Rockville, MD 20850

Emergency Telephone Number (301) 251-5990
 Telephone Number for information (301) 251-5990
 Date Prepared 07/01/03
 Signature of Preparer (optional)

Section II - Hazardous Ingredients/Identify Information

Hazardous Components [Specific Chemical Identity; Common Name(s)] OSHA PEL ACGIH TLV Other Limits Recommended % (Optional)
 This product contains no hazardous materials as defined by the OSHA Hazard Communication Standard. CAS # 2650-17-1

Section III - Physical/Chemical Characteristics

Boiling Point	No data	Specific Gravity (H ₂ O = 1)	No data
Vapor Pressure (mm Hg.)	No data	Melting Point	N/A
Vapor Density (AIR = 1)	No data	Evaporation Rate (Butyl Acetate = 1)	No data
Solubility in Water	Soluble		
Appearance and Odor	_____ color, liquid, no odor		

Section IV - Physical/Chemical Characteristics

Flash Point (Method Used)	No data	Flammable Limits	LEL No data	UEL No data
Extinguishing Media	N/A			
Special Fire Fighting Procedures	N/A			
Unusual Fire and Explosion Hazards	None			

Section V - Reactivity Data

Stability	Unstable		Conditions to Avoid
	Stable	X	
Incompatibility	None		
Hazardous Decomposition or Byproducts	Sulfur oxides and bromides		
Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	

Section VI - Health Hazard Data

Route(s) of Entry: Inhalation? No Skin? Yes Ingestion? Yes
 Health Hazards (Acute and Chronic) Acute eye contact: may cause irritation
 Carcinogenicity: NTP? No data IARC Monographs? No data OSHA Regulation? No
 Signs and Symptoms of Exposure May cause skin or eye irritation
 Medical Conditions Generally Aggravated by Exposure None reported
 Emergency First Aid Procedures Rinse contacted areas with copious amounts of water

Section VII - Precautions for Safe Handling and Use

Steps to be Taken in case Material is Released for Spilled
 Wear eye and skin protection and mop/wipe spill area. Rinse with water.
 Waste Disposal Method
 Can be disposed in the trash or down the sink
 Precautions to be Taken in Handling and Storing
 Avoid eye and skin contact
 Other Precautions
 None

Section VIII - Control Measures

Respiratory Protection (Specify Type) NIOSH/MSHA - approved respirator

Ventilation	Local Exhaust	No	Special	None
	Mechanical (General)	No	Other	None

 Protective Gloves Yes Eye Protection Splash prof goggles
 Other Protective Clothing or Equipment None required
 Work/Hygienic Practices Avoid eye and skin contact