

A MINI CATALOG OF MICROBIOLOGICAL AND IMMUNOLOGICAL SUPPLIES

**(Items listed in this catalogue are provided for educational purposes and are not intended
for use in clinical or other testing laboratories.)**

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1. THE PURPOSE OF THIS CATALOGUE

The purpose of this catalogue is to help revive classical microbiology - a subject that should never have been treated as a specialty subject but as a subject, which must be known and understood by everyone.

2. WHY REVIVE CLASSICAL MICROBIOLOGY

Microbiology is an exciting way of introducing students to science. It is also a way of orienting students towards a variety of careers. Medical and para-medical professions are the obvious ones but microbiology is also essential for environmental sciences such as water quality and waste management, pollution studies and abatement, management of toxic wastes, and agriculture, especially alternate methods of farming based on natural versus chemical farming. Microbiology is also essential for biotechnology, genetic engineering, fermentation, food and pharmaceutical industries, and space exploration.

Microbiology is also essential for understanding the economy of nature and the balanced way in which nature functions. As such it has direct application in the areas of economics and in developing sound economic institutions and policies - an application hitherto unexplored. This aspect of microbiology is especially useful now when we need to design interdependent, perpetual, productive and efficient economic systems, which could not only sustain but also aid in improving the quality of life of expanding human population.

There is no better place to learn and see principles of such systems in operation than in microbiology where an organism divides into two before it becomes inefficient, where small is sustaining, not only itself but the rest of the pyramid of life upto its very peak. It is this knowledge, which must go into the making of our economists, philosophers, and thinkers. Unfortunately, economic majors neither necessarily study biology nor microbiology. How can we expect them to create viable economic systems if we never exposed them to the only known perpetuating system which has existed from the beginning of time and which still goes on despite all the follies of humankind. A revival of classical microbiology with its philosophical implications should thus be a priority for teachers, administrators and planners and they should see to it that this knowledge becomes part of everyone's general knowledge.

Microbiology is also essential for personal hygiene and disease prevention. It was the knowledge of microbiology that, upon reaching the public via newspapers, enhanced standards of living and brought infectious diseases under control. Only when we took this knowledge out of public awareness that the diseases began to surface again. The public fought polio more than the established government and academic institutions. Same can be done for Aids but for that, teaching of classical microbiology has to be revived and it should, once again, be made part of everyone's knowingness.

Too many colleges and universities are now giving microbiology the back seat. In many cases, even though the departments are named "Microbiology," their course offerings and the thrust of their educational direction is no way near the classical discipline of microbiology. This, infact is

a disservice for the public and even the planners at the national and international level keep on believing that microbiology is alive and well. The reality surfaces only when they need a microbiologist and learn that the one who carried the credentials was not a functioning microbiologist.

This trend needs to be changed which is partly due to funding priorities forcing microbiologists to branch out into other areas yet continue to wear their original hats. Unfortunately, as time goes on, their newfound interests begin to shape their course contents at the expense of classical microbiology. Their students in turn reflect their own interests in the courses they offer, making each successive generation farther and farther removed from classical microbiology.

This shift in funding priorities, coupled with lack of appreciating the importance of classical microbiology, led many institutions, in the 70's, to make microbiology a lecture and demonstration course while to know this subject well, one needs to go through a hands-on curriculum which is lab based. No one can fully grasp the impact of microbiology unless they have seen living microorganisms under a phase contrast microscope. That is one of the reasons why Zernick was given the Nobel prize in 1935 for inventing this microscope. How many educational institutions are using this educational tool to open up the world of microorganisms to their students? You may be thinking that this will be an expensive proposition but in reality it is not so, especially when phase microscopes are not as expensive now as they once used to be and also when all one needs is one phase microscope per class and even that can be shared with other classes. The fact is that curriculum designers of today are not familiar with the educational value of such tools. This again casts a poor reflection on the educational institutions and their faculty who failed to appreciate the importance of their basic discipline and thereby failed to ensure its perpetuity. The damage in this area is far too severe which can be easily assessed by realizing that there exist, in this nation of ours, professional schools where microbiology is no longer taught to students of nursing and to students of pharmacy. Need I say more. That is why we have to revive classical microbiology and we have to do it now.

3. HOW TO REVIVE CLASSICAL MICROBIOLOGY

The best way to revive classical microbiology is to facilitate hands-on lab-based teaching of microbiology. Here, the most common complaint is that the essential materials and supplies are either too expensive or are not available. Most lab., supply houses, which once used to cater to schools and colleges, are now concentrating on supplying to hospitals, clinical laboratories, industries and research institutions mainly because that is where the money is.

Under these circumstances, the way to revive classical microbiology is to make available needed microbiological supplies and also to provide any guidance the institutions and the instructors may need for teaching this subject. It is for this reason that this mini-catalogue of microbiological supplies was put together. It contains only the essentials needed to teach a hands-on lab-based course in microbiology and to do so inexpensively. The supplies contained in this catalogue are designed for classroom use only and are not intended for clinical or other testing laboratories or for research.

4. ADVANTAGES OF USING THIS CATALOGUE

This catalogue provides you everything that you need to teach a good "hands on" course in microbiology in one place. Nothing extra to hunt for or to buy. By using this catalogue you can teach your students a comprehensive course in microbiology covering such topics as:

- An introduction to the ten major groups of microorganisms.
- Sampling techniques and the isolation and cultivation of microorganisms.
- Pure culture techniques in microbiology.
- Cytological, biochemical and serological procedures.
- Identification and quantitation of microorganisms.
- Immunological procedures.
- Microbial genetics.
- Industrial microbiology procedures.
- Sanitary and environmental microbiology procedures.
- Clinical microbiology procedures.
- Mycological procedures.
- Virological procedures - propagation and quantitation of viruses.

All items included in this catalogue are **GUARANTEED CLASS ROOM QUALITY MATERIALS** and are provided in standardized form in sufficient quantities to suffice for a class of up to 30 students.

A COMPLETE OBJECTIVE ORIENTED LABORATORY MANUAL covering the entire basic and applied field of microbiology is also available (see details on page 31 of this catalogue). This manual together with this catalogue is an ideal combination for you to update your microbiology courses and to make them exciting learning experiences for your students.

The use of the manual, however, is not mandatory, for the catalogue will compliment any laboratory manual that you may now be using or wish to use.

Please also note that since we specialize in providing only microbiological and immunological supplies through this catalogue, we can assure you prompt deliveries with almost no back orders. You will also like our low prices and when you call us you will find a knowledgeable person on the other end who can not only answer your questions but can also consult with you intelligently. So, please keep our phone and fax numbers handy.

Phone: (312) 243-2016; FAX: (312) 243-2041; E-mail: iibbt@iibbt.com

5. ORDERING INFORMATION

We provide supplies only to bonafide institutes of learning.

All items in this catalogue are guaranteed classroom quality®. They are intended for teaching purposes only and are not to be used for clinical or other testing purposes.

How to place an order:

Using your official purchase order form or letterhead, please supply the following information about each item ordered:

- Name of the product
- Catalogue number
- Size
- Quantity desired
- Date delivery required
- Price

Additionally, please provide your purchase order number and shipping and billing addresses and mail orders to:

**Educational Materials Division
Int. Inst. of Biochemical and Biomedical Technology
731 South Western Avenue
Chicago, Illinois, USA 60612-3532**

For expediency, place orders by **FAX: (312) 243-2041**.

We do not accept phone orders unless followed by an official faxed or mailed hard copy.

Credit

Credit is extended to all educational institutions who send their orders on their official purchase order form or letterhead and signed by an authorized individual from the institute. Such orders will be honored and shipped promptly. Payment for these orders is due when billed.

All other institutions and individuals are required to enclose payment with their order. Please include 15% shipping and handling costs with your payment.

Prices

Prices are f.o.b. our address and are subject to change without notice. All billing is done at current prices plus shipping and handling charges.

Guarantee

Our products are **Guaranteed Classroom Quality®** and they are unconditionally guaranteed. Items found unsatisfactory will be replaced. Please notify our Educational Materials Division before returning such items. We take used equipment as trade in.

6. INTRODUCTION TO MAJOR GROUPS OF MICROORGANISMS (KITS)

A. MATERIALS FOR INTRODUCING STUDENTS TO THE MAJOR GROUPS OF MICROORGANISMS

The vastness of microbiology can be overwhelming to a student especially when we, as teachers, emphasize that microorganisms constitute a large group of diverse organisms. A beginning student is not able to relate to such a generalized statement. He wishes to have a sense of reference and a way to relate to the vast number of organisms. One of the ways to give such a sense of reference is to introduce the students to the major groups of microorganisms. Generally, microorganisms are placed in anywhere from 10 to 12 major groups. These are: algae, protozoa, fungi, actinomycetes, blue green algae, bacteria, mycoplasma, L forms, Rickettsia, Chlamydia, slime molds, and viruses. Kits listed below provide related live and/or preserved materials to introduce students to all of the above groups of microorganism. With the help of these materials you will be able to show the students actual organisms and/or their colonies rather than just talk about them. As we all know, there is no substitute for learning by seeing and doing.

B. MATERIAL FOR INTRODUCING STUDENTS TO HIGHER PROTISTA

This material is supplied in a kit form and includes selected live and/or preserved material for introducing students to algae, protozoa, slime molds and fungi. Material is sufficient for a class of up to 30 students.

Catalogue # HP-1 Higher Protista Kit _____ \$75.00

C. MATERIAL FOR INTRODUCING STUDENTS TO LOWER PROTISTA

This material is supplied in a kit form and includes selected live and/or preserved material for introducing students to blue green algae, bacteria, actinomycetes, mycoplasma or L forms, rickettsia, chlamydia and viruses. Material is sufficient for a class of up to 30 students.

Catalogue # LP-2 Lower Protista Kit _____ \$75.00

D. FREE CONSULTATION

If you are designing a new course or are updating an old one - call us. We can enable you to offer a very comprehensive lab course at much less of a cost than you can imagine.

Phone: (312) 243-2016

FAX: (312) 243-2041

E-mail: iibbt@aol.com

7. CULTURES

While there is an overwhelming number of cultures, one needs only a few, in most cases nonpathogenic ones, to teach the essential principles of microbiology. Nonetheless, the list on the following pages is rather extensive and is provided so that different instructors can select cultures of their choice.

We would, however, like to emphasize that keeping too many unnecessary cultures in a teaching laboratory is time consuming as they need to be transferred frequently and also their purity has to be tested at frequent intervals. This time can be saved by keeping only the essential cultures and limiting one's stock of cultures to the hardier ones rather than those which die rapidly when maintained in the laboratory.

It should also be noted that live cultures are not always necessary for teaching principles of microbiology. Procedures designed to demonstrate morphology and staining reactions such as the Gram stain and cytological stains can be performed on killed cultures. Live cultures are essential only for biochemical reactions and for growth experiments. Immunological and serological reactions also do not require live cultures. Killed cultures are the cultures of choice here, and this catalogue provides such cultures. These are easy to keep and since they have a longer shelf life, they are economical to use. A considerable amount of cost can thus be saved by using the killed cultures as opposed to live cultures.

The use of the killed cultures also enables the students and staff to be less apprehensive about working with microbes, especially since the connotation "germs" is associated with disease production. Such cultures would, therefore, enable you to add lab based microbiology courses at introductory college or even at high school level.

NOTE: We regard most living cultures as potentially pathogenic and ship these only to colleges and universities. Cultures which we ship to high schools are marked with an asterisk. We do not ship cultures to individuals.

All bacterial and yeast cultures are available as live cultures on slants and also as killed suspensions.

Price per live culture is \$5.00 plus shipping and handling.

Price per 5.0 ml of killed suspension is \$7.50 plus shipping and handling.

All fungal and actinomycetes cultures are available as live cultures on slants and also as killed mycelial mass. The latter is prestained, ready to tease, mount, and observe.

Live fungal or actinomycetes cultures are \$7.50 each.

Preserved mycelial mass is \$20.00. The amount is sufficient for a class of 30 students.

Bacterial viruses are supplied as live suspensions. Price per 2.0 ml vial is \$10.00.

CULTURES OF BACTERIA - LIVE OR KILLED

<u>Catalog #</u>		
<u>Live</u>	<u>Killed</u>	<u>Description</u>
LB-01	KB-01	<i>Aeromonas hydrophilia</i>
LB-02	KB-02	<i>Alcaligenes faecalis</i>
LB-03	KB-03	<i>Alcaligenes viscolactis</i>
LB-04	KB-04	<i>Arizona hinshawii</i>
LB-05	KB-05	<i>Bacillus alvei</i>
LB-06	KB-06	<i>Bacillus cereus</i> *
LB-07	KB-07	<i>Bacillus cereus</i> var. <i>mycoides</i>
LB-08	KB-08	<i>Bacillus coagulans</i>
LB-09	KB-09	<i>Bacillus megaterium</i> *
LB-10	KB-10	<i>Bacillus polymyxa</i>
LB-11	KB-11	<i>Bacillus stearothermophilus</i>
LB-12	KB-12	<i>Bacillus subtilis</i> *
LB-13	KB-13	<i>Bacillus subtilis</i> var. <i>globigii</i>
LB-14	KB-14	<i>Bacteroides fragilis</i>
LB-15	KB-15	<i>Branhamella catarrhalis</i> (previously <i>Neisseria catarrhalis</i>)
LB-16	KB-16	<i>Chromobacterium violaceum</i>
LB-17	KB-17	<i>Citrobacter freundii</i> (previously <i>Escherichia freundii</i>)
LB-18	KB-18	<i>Citrobacter intermedius</i>
LB-19	KB-19	<i>Clostridium botulinum</i>
LB-20	KB-20	<i>Clostridium butyricum</i>
LB-21	KB-21	<i>Clostridium difficile</i>
LB-22	KB-22	<i>Clostridium histolyticum</i>
LB-23	KB-23	<i>Clostridium perfringens</i>
LB-24	KB-24	<i>Clostridium sporogenes</i>
LB-25	KB-25	<i>Clostridium tetani</i>
LB-26	KB-26	<i>Corynebacterium diphtheriae</i>
LB-27	KB-27	<i>Corynebacterium pseudodiphtheriticum</i> *
LB-28	KB-28	<i>Corynebacterium xerosis</i>
<u>Catalog #</u>		
<u>Live</u>	<u>Killed</u>	<u>Description</u>
LB-29	KB-29	<i>Edwardsiella tarda</i>
LB-30	KB-30	<i>Enterobacter aerogenes</i> (previously <i>Aerobacter aerogenes</i>)
LB-31	KB-31	<i>Enterobacter cloacae</i>
LB-32	KB-32	<i>Escherichia coli</i> *
LB-33	KB-33	<i>Escherichia coli</i> Strain B*
LB-34	KB-34	<i>Escherichia coli</i> (gene transfer donor)
LB-35	KB-35	<i>Escherichia coli</i> (gene transfer recipient)
LB-36	KB-36	<i>Flavobacterium capsulatum</i> *
LB-37	KB-37	<i>Gaffkya tetragena</i>
LB-38	KB-38	<i>Hafnia alvei</i>
LB-39	KB-39	<i>Halobacterium salinarium</i>
LB-40	KB-40	<i>Klebsiella pneumoniae</i>
LB-41	KB-41	<i>Lactobacillus acidophilus</i>

LB-42	KB-42	Lactobacillus casei
LB-43	KB-43	Leuconostoc mesenteroides
LB-44	KB-44	Listeria monocytogenes
LB-45	KB-45	Micrococcus luteus* (previously Sarcina lutea)
LB-46	KB-46	Morganella morganii (previously Proteus Morganii)
LB-47	KB-47	Mycobacterium smegmatis
LB-48	KB-48	Mycobacterium phlei*
LB-49	KB-49	Mycobacterium tuberculosis
LB-50	KB-50	Neisseria subflava
LB-51	KB-51	Neisseria sicca
LB-52	KB-52	Photobacterium fischeri
LB-53	KB-53	Proteus mirabilis
LB-54	KB-54	Proteus vulgaris
LB-55	KB-55	Pseudomonas aeruginosa
LB-56	KB-56	Pseudomonas cepacia
LB-57	KB-57	Pseudomonas fluorescens
LB-58	KB-58	Pseudomonas putida
LB-59	KB-59	Providencia rettgeri
LB-60	KB-60	Providencia stuartii
LB-61	KB-61	Rhodococcus rhodochrous
LB-62	KB-62	Rhodospirillum rubrum*
LB-63	KB-63	Salmonella cholerae-suis
LB-64	KB-64	Salmonella enteritidis
LB-65	KB-65	Salmonella montevideo
LB-66	KB-66	Salmonella paratyphi A
LB-67	KB-67	Salmonella gallinarum
LB-68	KB-68	Salmonella schottmuelleri (Salmonella paratyphi B)
LB-69	KB-69	Salmonella typhimurium
LB-70	KB-70	Salmonella typhosa
LB-71	KB-71	Sarcina lutea (see Micrococcus luteus)
LB-72	KB-72	Serratia marcescens*

Catalog #

<u>Live</u>	<u>Killed</u>	<u>Description</u>
LB-73	KB-73	Shigella boydii
LB-74	KB-74	Shigella dysenteriae
LB-75	KB-75	Shigella flexneri
LB-76	KB-76	Shigella sonnei
LB-77	KB-77	Spirillum itersonii
LB-78	KB-78	Spirillum serpens*
LB-79	KB-79	Staphylococcus epidermidis*
LB-80	KB-80	Staphylococcus aureus
LB-81	KB-81	Staphylococcus aureus (for CAMP test)
LB-82	KB-82	Staphylococcus saprophiticus*
LB-83	KB-83	Streptococcus agalactiae
LB-84	KB-84	Streptococcus sp., (cariogenic)
LB-85	KB-85	Streptococcus sp., viridans - alpha hemolytic

LB-86	KB-86	Streptococcus sp., ahemolyticus, - gamma hemolytic
LB-87	KB-87	Streptococcus sp., beta hemolytic - group A (S. pyogenes)
LB-88	KB-88	Streptococcus sp., beta hemolytic - group B
LB-89	KB-89	Streptococcus sp., beta hemolytic - group D
LB-90	KB-90	Streptococcus sp., enterococcus, alpha to gamma hemolytic Group D
LB-91	KB-91	Streptococcus faecalis
LB-92	KB-92	Streptococcus faecalis var. liquefaciens
LB-93	KB-93	Streptococcus lactis*
LB-94	KB-94	Streptococcus pneumoniae (Previously pneumococcus Pneumoniae)
LB-95	KB-95	Streptococcus salivarius
-----	PS-38	TB positive sputum smears. These are supplied unstained and are prepared from sterilized known positive TB sputum. \$1.50 ea.
-----	KB-96	Vibrio cholera - available only as a killed suspension
LB-97	KB-97	Vibrio fischeri

CULTURES OF ACTINOMYCETES - LIVE OR KILLED

Catalogue

<u>Live</u>	<u>Killed</u>	<u>Description</u>
LA-98	KA-98	Streptomyces griseus

CULTURES OF FUNGI (MOLDS AND YEAST) - LIVE OR KILLED

Catalogue

<u>Live</u>	<u>Killed</u>	<u>Description</u>
LF-99	KF-99	Alternaria sp.
LF-100	KF-100	Aspergillus niger*
LF-101	KF-101	Candida albicans
<u>Catalogue #</u>		
<u>Live</u>	<u>Killed</u>	<u>Description</u>
LF-102	KF-102	Candida parapsilosis
LF-103	KF-103	Candida pseudotropicalis
LF-104	KF-104	Candida tropicalis
LF-105	KF-105	Epidermophyton floccosum
LF-106	KF-106	Geotrichum candidum
LF-107	KF-107	Microsporum canis
LF-108	KF-108	Microsporum gypseum
LF-109	KF-109	Mucor genevensis
LF-110	KF-110	Mucor mucedo

LF-111	KF-111	Penicillium camemberti
LF-112	KF-112	Penicillium chrysogenum
LF-113	KF-113	Penicillium notatum*
LF-114	KF-114	Penicillium roqueforti
LF-115	KF-115	Rhizopus nigricans plus strain*
LF-116	KF-116	Rhizopus nigricans minus strain*
LF-117	KF-117	Saccharomyces cerevisiae*
LF-118	KF-118	Saccharomyces ellipsoideus
LF-119	KF-119	Trichophyton rubrum
LF-120	KF-120	Trichophyton mentagrophytes
LF-121	KF-121	Trichophyton tonsurans
LF-122	KF-122	Torula lactosa
LF-123	KF-123	Torula rosea

BACTERIAL VIRUSES - LIVE ONLY

Catalogue #

Live

VL-01

Killed

Description

Escherichia coli T4 phage (use E. coli strain B for propagation)

8. MEDIA - PREPARED

While you can prepare your own media, a considerable amount of cost and time can be saved by purchasing prepared media provided you limit the purchase of such media to what is actually needed. Even if you prepare your own media, do not prepare more than what is needed. Microbiological media, especially agar plates, have poor shelf life as they not only dry out but also tend to get contaminated with repeated handling.

For these reasons, this catalogue lists only those media which are essential for teaching a comprehensive course in microbiology. Prepared media are supplied, sterile, in tubes as slants, deeps, and broths and in standard size Petri plates as agar plates.

Certain media to be used as plates are also bulk packed in two size bottles. One size bottle has sufficient amount of the medium for preparing 15 plates. The other size has sufficient medium to prepare 5 plates. These bulk packs are especially useful for doing viable counts.

This is an economical way for preparing plates as the bulk packed medium can be melted and poured in plates as needed. If the entire contents of the bottle are not used, the leftover medium can still be saved and re-melted for preparing more plates. While such re-melted medium may not be suitable for performing clinical or other tests, it is perfectly acceptable for teaching purposes.

Occasionally also, when only a few plates are needed, agar medium supplied as deeps can be melted and poured into plates. For this reason each deep, as supplied, contains sufficient medium to pour one plate.

- **Size and description of containers of prepared media**

All broth tubes are supplied as 16 x 100 or 16 x 150 mm screw cap tubes.

All slants are supplied as 16 x 100 or 16 x 150 mm screw cap tubes.

All deeps are supplied as 20 x 150 mm screw cap tubes. Deeps contain approximately 18 ml of medium which is sufficient to pour one plate.

All stab media are solid or semisolid agars. They are supplied in 16 x 100 or 16 x 150 mm screw cap tubes.

All bulk packed medium is supplied in approximately 250 ml quantity in 500 ml screw capped bottles or in approximately 100 ml quantity in 250 ml screw capped bottles. Melt media in these bottles by immersing them, halfway, in a beaker of water and then bringing the water slowly to a boil. Keep boiling until the medium is fully melted. Cool medium to approximately 45 C and then pour plates.

This bulk packed solid medium is also useful for doing viable counts. For this purpose, medium packed in 100 ml quantities is preferred as this amount is sufficient to pour 5 plates.

MICROBIOLOGICAL MEDIA - PRICES

The following media are supplied sterile in screw cap tubes, bottles, or Petri plates. Minimum order is 10 tubes or plates. Order additional media in increments of 10 also. No minimum order on bottled media. Media marked with an * are special order media at \$1.50 each. All other media are priced as follows:

Regular broth tube or agar slant	\$0.60 ea.
Blood or chocolate agar slant	\$1.25 ea.
Agar deep	\$0.75 ea.
Broth tube with gas vial	\$1.25 ea.
Agar plate	\$0.65 ea.
Agar bottle containing 250 ml of medium	\$15.00 ea.
Agar bottle containing 100 ml of medium	\$10.00 ea.

NOTE: The institute assumes no responsibility for breakage of bottles or tubes while melting agar media contained in them.

• BACTERIOLOGICAL MEDIA

PM-62	Acetamide agar for acetamide hydrolysis *
PM-77	Azide dextrose broth
PM-63	Bile esculin agar slants
PM-01	Blood agar slant
PM-02	Blood agar plate
PM-03	BHI (Brain Heart Infusion) broth
PM-04	BHI agar slant
PM-05	BHI agar plate
PM-06	BHI agar deep
PM-07	BHI agar bottle 250 ml quantity
PM-08	BHI agar bottle 100 ml quantity
PM-09	BHI broth with 6.5% sodium chloride
PM-10	BCP glucose (Brom Cresol Purple) broth with gas vial
PM-11	BCP lactose broth with gas vial
PM-64	BCP Maltose broth with vial
PM-12	BCP sucrose broth with gas vial
PM-13	Brilliant green lactose bile broth with gas vial
PM-14	Chocolate agar plate
PM-15	Chocolate agar slant
PM-16	CTA glucose (Cystine Trypticase Agar) semisolid stab
PM-17	CTA lactose semisolid stab
PM-18	CTA sucrose semisolid stab
PM-19	CTA maltose semisolid stab
PM-65	Decarboxylase broth with arginine
PM-78	Decarboxylase broth with lysine
PM-79	Decarboxylase broth with ornithine
PM-20	Dextrose-starch agar plate
PM-21	DNase agar plate
PM-22	Egg yolk agar for lecithinase activity
PM-23	Eugene Agar plate*
PM-24	EMB (Eosin Methylene Blue) agar plate

PM-25	Endo broth
PM-80	F M agar for fusobacterium*
PM-26	Fluorescein agar slant
PM-66	Galatin agar plate for gelatine hydrolysis
PM-67	Gluconate peptone broth
PM-95	Hippurate broth
PM-96	KF broth detects group D strep from non D.* Also see SF broth
PM-27	Kligler's iron agar slant
PM-28	Lactose broth single strength with gas vial
PM-29	Lactose broths double strength with gas vial
PM-81	Lethen agar for environmental testing *
PM-30	Litmus milk broth tube
PM-68	Lysine iron agar slants
PM-69	Malonate broth
PM-31	Mannitol salt agar plate
PM-32	Milk agar slant
PM-33	Motility test medium
PM-34	MRVP (Methyl red-Voges-Proskauer) broth
PM-35	MacConkey agar plate
PM-36	Mueller Hinton agar plate
PM-37	Nitrate broth
PM-38	Nutrient broth
PM-39	Nutrient agar slant
PM-40	Nutrient Agar deep
PM-41	Nutrient agar plate
PM-42	Nutrient agar bottle-250 ml quantity
PM-43	Nutrient agar bottle-100 ml quantity

O-F (Oxidation-Fermentation medium with brom thymol blue (BTB) indicator for enterics*

PM-70	O-F Glucose for enterics *
PM-71	O-F Sucrose for enterics *
PM-72	O-F Lactose for enterics *
PM-97	O-F Maltose for enterics *
PM-98	O-F Mannitol for enterics *
PM-99	O-F Xylose for enterics *

O-F medium with brom cresol purple (BCP) Indicator for Staphylococci*

PM-100	O-F Glucose for Staph *
PM-101	O-F Mannitol for Staph *
PM-102	ONPG broth for beta galactosidase detection *
PM-82	Orange serum agar for lactobacilli and fungi *
PM-73	Phenylalanine agar slant
PM-44	Pyocyanin agar slant
PM-83	Photobacterium agar slant
PM-84	Selenite cystine broth enrichment broth
PM-103	SF broth detects group D enterococci from nonenterococci group D *
PM-45	Simmons citrate agar slant
PM-85	Snyder agar for oral lactobacilli *

- PM-74 Sodium hippurate broth
- PM-46 Spirit Blue agar plate (for detecting lipolysis - fat hydrolysis)
- PM-47 SS (Salmonella-Shigella) agar plate
- PM-75 Starch agar plates for starch hydrolysis test
- PM-86 Tetrathionate enrichment broths
- PM-48 Thioglycolate broth
- PM-76 Triple sugar iron agar
- PM-49 TS (Trypticase soy) broth
- PM-50 TS agar slant
- PM-51 TS agar deep
- PM-52 TS agar plate
- PM-53 TS agar bottle 250 ml quantity
- PM-54 TS agar bottle 100 ml quantity
- PM-55 Tryptone broth for indole test
- PM-56 Urea broth \$0.75 ea.
- PM-87 Veillonella agar*
- PM-88 XLD agar

• **MEDIA FOR GROWING FUNGI (MOLDS AND YEASTS) AND ACTINOMYCETES**

- PM-89 Actinomycete isolation agar plate
- PM-106 Corn meal agar slant
- PM-90 Cornmeal agar plate
- PM-104 Corn meal agar plates with Tween 80*
- PM-57 Malt extract agar slant
- PM-58 Potato dextrose agar slant
- PM-59 Potato dextrose agar plate
- PM-60 Sabouraud dextrose agar slant
- PM-61 Sabouraud dextrose agar plate
- PM-91 Trichophyton agar #4 plate *
- PM-92 Trichophyton agar slant *
- PM-93 Wolin Bevis agar for Candida chlamydospore production *

SPECIAL REAGENTS:

- PM-94 Mineral oil - sterile for overlay 10.0 ml \$1.00 ea.
- PM-105 Vaspar - sterile for overlay 2 oz \$4.50 ea

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9. ANTIBIOTIC DISKS FOR SENSITIVITY TESTING

The purpose of this test, in an educational setting, is to demonstrate to the student why this test is necessary and how the test is performed. In order to impart this knowledge, a set of 4-5 different antibiotic disks is sufficient. Students can place these disks on plates, swabbed with the test organisms, with flame sterilized forceps. While multidisk dispensers are helpful, they are not essential for teaching the concept. However, if funds allow it, it is advisable to procure a dispenser so that students can see how this important test is performed routinely in hospitals.

The recommended manual method for antibiotic sensitivity testing is the Kirby-Bauer method. Laboratory handouts describing this procedure including a laboratory exercise, are available from this Institute. For ordering information, see below.

While the choice of antibiotic discs can vary, Gram positive organisms are generally tested using the following antibacterial agents:

- A-01 Clindamycin 2 mcg
- A-02 Lincomycin 2 mcg
- A-03 Erythromycin 15 mcg
- A-04 Penicillin G 10 units
- A-05 Oxacillin 1 mcg or
- A-06 Methicillin 5 mcg
- A-07 Cephalothin 30 mcg
- A-08 Tetracycline 30 mcg
- A-09 Gentamicin 10 mcg

Likewise, Gram negative organisms are generally tested using the following antibacterial agents:

- A-10 Ampicillin 10 mcg
- A-07 Cephalothin 30 mcg
- A-08 Tetracycline 30 mcg
- A-09 Gentamicin 10 mcg
- A-11 Carbenicillin 100 mcg
- A-12 Kanamycin 30 mcg
- A-13 Tobramycin 10 mcg
- A-14 Amikacin 30 mcg
- A-15 Nitrofurantoin 300 mcg
- A-16 Trimethoprim 5 mcg or
- A-17 Sulfamethoxazole 0.25 mg

Price and Ordering Information

- A-18 Laboratory handout. A basic guide to the selection and use of antibiotics. Includes a laboratory exercise on sensitivity testing by the Kirby Bauer method. \$3.50

Individual vials separately containing the antibacterial agents listed above. Price per vial \$7.50

COST CUTTING TIP: Outdated antibiotic disks are still usable for teaching purposes; don't throw them away.

10. IMMUNOLOGICAL AND SEROLOGICAL REAGENTS

Major breakthroughs in microbiology and for that matter in biology since 1960 have been in the field of immunology and serology. Concepts and skills, especially methodology, of these important areas are, therefore, essential to providing a complete and up-to-date picture of microbiology and biology. Many of these techniques also form the basis of biotechnology and genetic engineering making their learning even more important.

Unfortunately, reagents used in these areas are produced for use by clinical laboratories and, therefore, are not only expensive, but are often hard to find. An answer to this dilemma is classroom quality immunological reagents, which are relatively inexpensive. This catalogue lists such reagents and thus opens ways for instructors to teach a variety of antigen-antibody reactions, such as the precipitin reaction, the agglutination reaction, the complement fixation reaction, the neutralization reaction, the hemagglutination reaction, the passive hemagglutination reaction, immunodouble diffusion or the Ouchterlony reaction and immunoelectrophoresis. Simultaneously, an instructor can also show how these tests are used in the design of serological tests for the diagnosis of disease, for testing the purity of proteins and other antigens and in medicolegal areas such as forensics.

In addition to providing serological reagents suitable for teaching, the Institute is also available to assist you in the design and implementation of immunological and serological experiments for your classes. So, feel free to call the Institute with your questions and comments.

DETAILED LABORATORY HANDOUTS explaining the principles and procedures of immunological and serological reactions are also available from the Institute. For price information, please refer to the end of this section.

REAGENTS FOR AGGLUTINATION REACTION - with directions

<u>Catalogue #</u>	<u>Description</u>	<u>Qty</u>	<u>Price</u>
IM-01	Killed, standardized suspension of Salmonella typhosa	5.0 ml	\$5.00
IM-02	Killed, standardized suspension of Salmonella Montevideo	5.0 ml	\$5.00
IM-03	Suspension of Salmonella typhosa marked as unknown #1	5.0 ml	\$5.00
IM-04	Suspension of Salmonella montevideo marked as unknown #2	5.0 ml	\$5.00
IM-05	Suspension of Salmonella cholerae-suis marked as unknown #3	5.0 ml	\$5.00
(Use of these suspensions as unknowns enables students to understand the usefulness of agglutination reactions and, also, to test their ability to read and differentiate between a positive and a negative agglutination reaction.)			
IM-06	Anti Salmonella typhosa	5.0 ml	\$12.50
IM-07	Anti Salmonella Montevideo	5.0 ml	\$12.50
IM-08	Anti Salmonella cholerae-suis	5.0 ml	\$12.50

REAGENTS FOR PRECIPITON REACTION ALSO FOR IMMUNODOUBLE DIFFUSION, ELECTROPHORESIS AND IMMUNOELECTROPHORESIS - with directions

<u>Catalogue #</u>	<u>Description</u>	<u>Qty.</u>	<u>Price</u>
IM-09	Human serum	5.0 ml	\$12.50

IM-10	Goat serum	5.0 ml	\$ 7.50
IM-11	Horse serum	5.0 ml	\$ 7.50
IM-12	Human gamma globulin	5.0 ml	\$20.00
IM-13	Human albumin	5.0 ml	\$10.00
IM-14	Anti human serum	5.0 ml	\$20.00
IM-15	Anti goat serum	5.0 ml	\$20.00
IM-16	Anti horse serum	5.0 ml	\$20.00

NOTE: For supplies for Ouchterloney double diffusion, electrophoresis and immuno-electrophoresis, refer to the Section on Special supplies and reagents for Immunological reactions.

REAGENTS FOR NEUTRALIZATION REACTION

a) Bacteriophage and antibacteriophage system - with directions

<u>Catalogue #</u>	<u>Description</u>	<u>Qty.</u>	<u>Price</u>
VL-01	Suspension of E. coli T4 bacteriophage	2.0 ml	\$10.00
IM-11	Anti E. coli T4 bacteriophage	5.0 ml	\$10.00
LB-33	E. coli strain B		\$5.00

Toxin and antitoxin system - with directions

<u>Catalogue #</u>	<u>Description</u>	<u>Qty.</u>	<u>Price</u>
IM-18	Bacterial filtrate containing hemolytic factors	3.0 ml	\$15.00
IM-19	Antihemolytic factors	3.0 ml	\$20.00
	Blood plate for hemolytic reaction		\$1.00

REAGENTS FOR PASSIVE HEMAGGLUTINATION REACTION - with directions

<u>Catalogue #</u>	<u>Description</u>	<u>Qty.</u>	<u>Price</u>
IM-20	Soluble antigen coupled to red blood cells	5.0 ml	\$25.00
IM-21	Red blood cells without soluble antigen	5.0 ml	\$10.00
IM-22	Anti soluble antigen	5.0 ml	\$15.00
IM-23	Soluble antigen solution	5.0 ml	\$20.00

REAGENTS FOR COMPLEMENT FIXATION REACTION - sufficient for 30 students - with directions

<u>Catalogue #</u>	<u>Description</u>	<u>Qty.</u>	<u>Price</u>
IM-24	Antigen suspension	3.0 ml	\$5.00
IM-25	Positive control serum for complement fixation	5.0 ml	\$15.00
IM-26	Negative control serum for complement fixation	5.0 ml	\$10.00
IM-27	Unknown serum - for complement fixation	5.0 ml	\$15.00
IM-28	Complement - for complement fixation	5.0 ml	\$25.00
IM-29	Sheep blood for complement fixation	10.0 ml	\$15.00
IM-30	Anti-sheep red blood cells for complement fixation	3.0 ml	\$15.00
IM-31	Veronal Buffer for complement fixation	250 ml	\$10.00

11. REAGENTS FOR BLOOD TYPING

IM-32	Anti-A serum	5.0 ml	\$7.50
IM-33	Anti-B serum	5.0 ml	\$7.50

IM-34	Anti-Rh serum	5.0 ml	\$20.00
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NOTE: We do not recommend students using their own blood for blood typing. The following blood cells and unknown blood cell suspensions are, therefore, provided. Quantities are sufficient for a class of up to 30 students:

<u>Catalogue #</u>	<u>Description</u>	<u>Qty.</u>	<u>Price</u>
IM-35	Human red blood cells from type A blood	5.0 ml	\$7.50
IM-36	Human red blood cells from type B blood	5.0 ml	\$7.50
IM-37	Human red blood cells from Rh positive blood	5.0 ml	\$7.50
IM-38	Human red blood cells unknown #1	5.0 ml	\$7.50
IM-39	Human red blood cells unknown #2	5.0 ml	\$7.50
IM-40	Human red blood cells unknown #3	5.0 ml	\$7.50

12. REAGENTS FOR SEROLOGICAL TESTS FOR SYPHILIS - with directions

IM-41	VDRL antigen	5.0 ml (0.5 ml + 4.5 ml VDRL Buffer)	\$20.00
IM-42	RPR antigen	3.0 ml	\$25.00
IM-43	Positive serum VDRL or RPR Tests	3.0 ml	\$15.00
IM-44	Negative serum VDRL or RPR Tests	3.0 ml	\$15.00
IM-45	Unknown serum #1 VDRL or RPR Tests	3.0 ml	\$15.00
IM-46	Unknown serum #2 VDRL or RPR Tests	3.0 ml	\$15.00
IM-47	Card for RPR Test		\$1.00

13. SPECIAL SUPPLIES AND REAGENTS FOR IMMUNOLOGICAL REACTIONS

IM-48	Special agar deep for Outchترلoney double diffusion analysis	\$1.00
IM-49	Special agar deep for electrophoresis or immunoelectrophoresis	\$1.00
IM-50	Filter Paper or gauze wicks for electrophoresis	\$1.00
IM-51	Buffer for electrophoresis 8 oz	\$10.00
IM-52	Washing solution to remove unbound protein for ouchterloney and Immunoelectrophoresis	\$15.00
IM-53	Staining solution for agar gels	\$15.00
IM-54	Destaining or clearing solution for agar gels	\$15.00
IM-55	Agar Coated slides for electrophoresis and immunoelectrophoresis	\$12.00 doz.
IM-56	Blood plate for neutralization reaction for toxin-antitoxin systems	\$1.50
IM-57	Precipitation tubes (6 X 50 mm)	\$3.00 doz.
IM-58	Capillary tubes for precipitation reactions	\$3.00 doz.
IM-59	LABORATORY HANDOUTS on principles and procedures of immunological and serological reactions	\$5.00

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14. SLIDES - PREPARED

Prepared slides have a special place in teaching microbiology for they enable a student to acquire an appreciation of cellular structure. Cytological studies of this nature also enable a student to develop an ability to search for detail, to identify special structures and to relate structure with function. This form of exercise thus enhances comprehension and prepares one for further scientific pursuits. Furthermore, when a student eventually prepares his or her own slides, the experience gained with prepared slides enables the student to judge and improve his or her technique. Manual dexterity and neatness gained through such exercises is extremely vital for becoming a good scientist.

BACTERIAL SLIDES

Bacterial smears showing typical shape and arrangement

\$2.50 ea/except as otherwise noted.

- PS-01 Bacillus anthracis
- PS-02 Bordetella pertussis
- PS-03 Branhamella catarrhalis (previously Neisseria catarrhalis)
- PS-04 Brucella abortus
- PS-05 Clostridium tetani
- PS-06 Clostridium perfringens
- PS-07 Corynebacterium diphtheriae
- PS-08 Escherichia coli
- PS-09 Haemophilus influenza
- PS-10 Lactobacillus casei
- PS-11 Legionella pneumophila ----- \$5.50 ea
- PS-12 Listeria monocytogenes

- PS-13 Micrococcus luteus (previously Sarcina lutea)
- PS-14 Mycobacterium tuberculosis
- PS-15 Mixed bacterial smear showing coccus, bacillus and spiral shapes
- PS-16 Neisseria gonorrhoeae
- PS-17 Pasteurella pestis
- PS-18 Pseudomonas aeruginosa
- PS-19 Proteus vulgaris
- PS-20 Salmonella typhosa
- PS-21 Shigella dysenteriae
- PS-22 Spirillum serpens
- PS-23 Staphylococcus aureus
- PS-24 Staphylococcus epidermidis
- PS-25 Streptococcus pyogenes
- PS-26 Streptococcus pneumoniae (previously Diplococcus pneumoniae)
- PS-27 Streptococcus lactis
- PS-28 Treponema pallidum ----- \$10.50 ea
- PS-29 Vibrio cholera ----- \$ 5.50 ea

Bacterial smears showing selected cytology

- Spore stain ----- \$3.50 ea

- PS-30 Bacillus subtilis stained with malachite green to show spores
- PS-31 Bacillus subtilis stained with methylene blue to show unstained spores

Capsule stain - - - - - \$3.50 ea

- PS-32 Klebsiella pneumoniae showing capsule stained with Maneval's solution
- PS-33 Streptococcus pneumoniae showing capsules stained with Maneval's solution

Flagella Stain - - - - - \$10.50 ea

- PS-34 Bacterial cells showing flagella

Metachromatic granules - - - - - \$5.50 ea

- PS-35 Corynebacterium diphtheria stained with Albert's stain

Acid-fast stain - - - - - 3.50 ea

- PS-36 Acid-fast stain showing Mycobacterium tuberculosis mixed with non acid-fast bacteria
- PS-37 TB Positive sputum smear stained with acid-fast stain
- PS-38 TB Positive sputum smear unstained - \$1.75 ea

Cell wall stain - - - - - \$6.50 ea

- PS-39 Bacillus subtilis stained to show cell walls
- PS-40 Escherichia coli stained to show cell walls

Fat granules - - - - - \$6.50 ea

- PS-41 Bacillus subtilis stained to show fat granules

FUNGAL SLIDES (MOLDS AND YEASTS) - - - - - \$5.50 ea except as otherwise noted

- PS-42 Aspergillus niger
- PS-43 Penicillium notatum
- PS-44 Rhizopus nigricans
- PS-45 Saccharomyces cerevisiae
- PS-46 Trichophyton mentagrophytes \$10.50 ea.
- PS-47 Trichophyton rubrum \$10.50 ea.
- PS-48 Microsporum canis \$10.50 ea.
- PS-49 Microsporum gypseum \$10.50 ea.
- PS-50 Epidermophyton floccosum \$10.50 ea.
- PS-51 Sporothrix schenckii \$12.50 ea.
- PS-52 Coccidioides immitis \$12.50 ea.
- PS-53 Histoplasma capsulatum \$12.50 ea.
- PS-54 Blastomyces dermatitidis \$12.50 ea.
- PS-55 Candida albicans - yeast phase \$ 4.00 ea.
- PS-56 Candida albicans – chlamydospores \$12.50 ea.

ACTINOMYCETES SLIDES ----- \$10.50 ea.

- PS-57 *Actinomyces bovis*
- PS-58 *Actinomyces israelii*
- PS-59 *Actinomyces viscosus*
- PS-60 *Nocardia asteroides*
- PS-61 *Streptomyces griseus*

15. STAINS AND STAINING REAGENTS - PREPARED

The following stains and staining reagents are supplied prepared, ready to use in screw cap bottles. Prices and quantities are as shown. A booklet describing selected staining procedures is also available at \$5.00 each.

ACID FAST STAINING

Ziehl-Neelsen's method

SR-01 Ziehl-Neelsen carbol fuchsin - 4 oz.	\$ 8.00
SR-02 Acid alcohol - 8 oz.	\$10.00
SR-03 Loeffler's Methylene blue - 4 oz.	\$ 5.00

Kinyoun's method

SR-04 Kinyoun's carbol fuchsin - 4 oz.	\$ 8.00
SR-02 Acid alcohol for decolorizing - 8 oz.	\$10.00
SR-03 Loeffler's Methylene blue - 4 oz.	\$ 5.00

CAPSULE STAINING

Maneval's method

SR-05 Congo red solution - 4 oz.	\$ 8.00
SR-06 Maneval's solution - 4 oz.	\$ 10.00

Novelli's method

SR-07 Alcian blue - 4 oz.	\$ 8.00
SR-01 Ziehl-Neelsen's carbol fuchsin (same as for acid fast stain - 4 oz.	\$ 8.00

Tyler's modification of Anthony's method

SR-08 Acetic acid-crystal violet - 4 oz.	\$ 5.00
SR-09 Copper sulfate solution - 4 oz.	\$ 5.00

Muir's method

SR-01 Ziehl-Neelsen's carbol fuchsin - 4 oz.	\$ 8.00
SR-10 Muir's mordant - 4 oz.	\$ 10.00
SR-03 Loeffler's methylene blue - 4 oz.	\$ 5.00

CELL WALL STAINING

Dyar's method

SR-11 Cetyl pyridinium chloride - 4 oz.	\$ 20.00
SR-05 Congo red (same as for capsule stain by the Maneval's method) - 4 oz.	\$ 8.00

Robinow's method

SR-12 Tannic acid - 4 oz.	\$ 6.00
SR-13 Crystal violet solution (0.01%) - 4 oz.	\$ 6.00

Hale's method

SR-14 Phosphomolybdic acid - 4 oz.	\$20.00
SR-15 Methyl green solution - 4 oz.	\$ 8.00

Tomcsik and Grace's method

SR-16 Alcian blue ethanolic solution - 4 oz.	\$ 8.00
SR-01 Ziehl-Neelsen's carbol fuchsin (as for acid fast stain) - 4 oz.	\$ 8.00

CYTOPLASMIC MEMBRANE STAINING**Knaysi's method**

SR-17 Knaysi's mordant - 4 oz.	\$ 15.00
SR-01 Ziehl-Neelsen's carbol fuchsin (same for acid fast stain) - 4 oz.	\$ 8.00

GRAM STAINING

SR-18 Crystal violet solution - 8 oz.	\$ 6.00
SR-19 Gram's iodine solution - 8 oz.	\$ 6.00
SR-20 Acetone alcohol - 8 oz.	\$ 6.00
SR-21 Safranin solution - 8 oz.	\$ 6.00

FAT DROPLET STAINING**Burdon's method**

SR-22 Sudan black B solution - 4 oz.	\$ 15.00
SR-23 Safranin solution, 0.25% aqueous - 4 oz.	\$ 5.00

FLAGELLA STAINING**Leifson's method**

SR-24 Leifson's flagella stain (supplied as dry powder - prepare fresh just before use) - 2.0 gm.	\$ 8.00
SR-03 Loeffler's methylene blue - 4 oz.	\$ 5.00

METACHROMATIC GRANULES STAINING**Albert's method**

SR-25 Albert's staining solution - 4 oz.	\$ 10.00
SR-26 Lugol's iodine - modified - 4 oz.	\$ 8.00

Methylene blue method

SR-27 Dilute alcoholic solution of methylene blue - 4 oz.	\$ 6.00
SR-28 Sulfuric acid solution 1% - 4 oz.	\$5.00

NUCLEAR MATERIAL STAINING**Robinow's method**

SR-29 Hydrochloric acid IN - 4 oz.	\$ 5.00
SR-30 Giemsa stain - 4 oz.	\$ 8.00

SR-31 Basic fuchsin (aqueous) 0.3% - 4 oz.	\$ 5.00
SR-32 Osmium tetroxide (supplied as dry crystals - prepare fresh before use) 1/2 g.	\$ 50.00
SR-33 Schaudinn's fixative - 4 oz.	\$ 15.00
SR-34 Bouin's fixative - 4 oz.	\$ 15.00

SPORE STAINING

Negative staining method

SR-03 Loeffler's Methylene blue solution - 4 oz.	\$ 5.00
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Kinyoun's method

SR-04 Kinyoun's carbol fuchsin (same as for acid fast stain) - 4 oz.	\$ 8.00
SR-35 Alcohol - 4 oz.	\$ 5.00
SR-03 Loeffler's Methylene blue solution - 4 oz.	\$ 5.00

Wirtz method

SR-36 Malachite green solution - 4 oz.	\$ 6.00
SR-21 Safranin (same as for Gram stain) - 4 oz.	\$ 5.00

SIMPLE AND NEGATIVE STAINING OF BACTERIA

Simple staining method

SR-18 Crystal violet solution - 8 oz.	\$ 6.00
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Negative, relief or indirect staining method

SR-37 Nigrosine solution (bacteriological grade) - 4 oz.	\$ 20.00
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FUNGAL STAINS

Lactophenol cotton blue method

SR-38 Lactophenol cotton blue stain - 2 oz.	\$ 15.00
SR-39 Clear mounting fluid - 2 oz. for permanent mounts	\$ 15.00
SR-40 One-step staining and mounting fluid for permanent mounts - contains mounting fluid and lactophenol cotton blue) - 2 oz.	\$ 20.00
SR-41 BOOKLET DESCRIBING STAINING PROCEDURES	\$ 5.00 ea

16. BIOCHEMICAL TESTS

Biochemical tests are the heart of microbiological laboratory procedures. These teach not only the basis of microbial identification but also Chemistry and Biochemistry. From the philosophical standpoint, these procedures reveal that life is possible with varying degrees of biochemical and biological diversity. Appreciating these parameters of life thus enhances a student's understanding of life. Additionally, these procedures help students understand their own nutrition and thus aid in healthful living.

These procedures are also important for understanding genetic engineering for it is these procedures which help select strains with biochemical traits of special interest. Markers which may aid pathogenesis are also studied via similar procedures.

BIOCHEMICAL TEST REAGENTS - PREPARED

The following reagents for biochemical tests are supplied prepared, ready to use in screw cap bottles. Prices and quantities are as shown. A booklet describing selected biochemical tests is also available at \$ 5.00 each. See below.

Bacitracin sensitivity test (for identifying group A beta hemolytic streptococci)

BR-01 Bacitracin disks - vial of 50 discs \$8.50 ea.

Bile solubility test reagent

BR-02 Sodium taurocholate or bile solution - 4 oz. \$6.00 ea.

CAMP test reagent

BR-20 Filter strips or discs with staph beta hemolysin. 10 for \$10.00

-

Catalase test reagent

BR-03 Hydrogen peroxide solution 3% - 4 oz. \$4.00

Coagulase test reagent

BR-04 Sterile plasma - reconstitute to 15 ml. \$20.00 ea.

DNase test reagent

BR-05 Hydrochloric acid solution - 4 oz. \$5.00

Gelatin hydrolysis test reagent

BR-06 Acidified mercuric chloride - 4 oz. \$15.00

Gluconate oxidation reagent

BR- Benedict reagent – 2oz. \$ 10.00

Hippurate hydrolysis reagent

BR-22 12% acidified ferric chloride - 4 oz. \$7.50

Indole test reagent

BR-07 Kovac's reagent - 4 oz. \$12.00

Methyl red test reagent

BR-08 Methyl red solution - 4 oz. \$7.50

Nitrate reduction test reagents

BR-09 Sulfanilic acid - 4 oz. \$10.00

BR-10 N,N-dimethyl- α -naphthylamine(replaces α -naphthylamine which has been shown to be carcinogenic) - 4 oz. \$15.00

BR-11 Zinc dust suspension 1 oz. \$5.

Optochin test reagent

BR-12 Optochin disks - vial of 50 disks \$8.50 ea.

Oxidase test reagent

BR-13 Para-amino-dimethyl-aniline oxalate - 2 oz. \$10.00

Phenylalanine deaminase test reagent

BR-14 Acidic ferric chloride solution - 4 oz. \$10.00

Phosphatase test reagent

BR-15 Ammonium hydroxide - 2 oz. \$7.50

Starch hydrolysis test reagent

BR-16 Modified Lugol's iodine solution - 4 oz. \$7.50

Voges-Proskauer test (VP test) reagent

BR-17 Potassium hydroxide solution 40% - 4 oz. \$5.00

BR-18 Alpha-naphthol - 4 oz. \$10.00

BR-19 BOOKLET DESCRIBING SELECTED BIOCHEMICAL TEST PROCEDURES \$5.50

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17. RAPID AND MULTITEST IDENTIFICATION SYSTEMS

MATERIALS FOR RAPID BIOCHEMICAL IDENTIFICATION OF MICROORGANISMS

Since 1960 emphasis has been shifting to rapid identification of micro-organisms using micro techniques and multiple test procedures.

Conventional procedures using media contained in test tubes and Petri plates were found to be too cumbersome, time consuming and uneconomical. Consequently, mini methods using just one isolated colony as the inoculum were developed. These methods speed up the identification procedures and provide diagnostic information in less time than the conventional methods. They also use less space and are standardized so that persons with a limited training can perform these procedures on a routine basis.

The first such method which became popular was the Enterotube method. Subsequently, other methods such as the API followed.

Concurrently, methods using multiple inoculating devices were also introduced. These methods have the advantage in that they use conventional procedures and, therefore, do not require retraining of personnel.

Since rapid test procedures are becoming more popular and are likely to be the methods of the future, it is suggested that a good microbiology course include, at least as demonstrations, some of these rapid and multitest procedures.

RAPID AND MULTITEST IDENTIFICATION SYSTEMS

Catalogue

RM-01 Enterotube multitest system complete with directions	\$8.50 ea tube
RM-02 API microtube strip system complete with directions	\$8.50 ea strip

NOTE: One tube or one strip is sufficient for demonstrating the respective system per class. Each tube or strip tests one organism. If you wish to demonstrate reactions of more than 1 organism, order as many additional tubes or strips as needed. **Additional reagents** required are listed below. Quantities shown are sufficient for up to 50 tests.

For Enterotube System:

RM-03	Kovacs reagent	5.0 ml	\$3.00
RM-04	Potassium hydroxide	5.0 ml	\$3.00
RM-05	Alpha naphthol solution	5.0 ml	\$3.00
RM-08	Oxidase test reagent	10.0 ml	\$5.00

For API System:

RM-06	Sterile mineral oil	10.0 ml	\$5.00
RM-03	Kovacs reagent	5.0 ml	\$3.00
RM-07	10% Ferric chloride	5.0 ml	\$3.00
RM-04	Potassium hydroxide (20%)	5.0 ml	\$3.00
RM-05	Alpha naphthol solution	5.0 ml	

18. GLASS AND PLASTICWARE AND MISCELLANEOUS LABORATORY SUPPLIES AND MATERIALS DESCRIPTION AND RECOMMENDATIONS

Teaching laboratories often get over equipped by purchasing too many unnecessary items of glass and plastic ware and other laboratory supplies. In order to curtail this waste a description of what is essential for teaching a comprehensive course in microbiology is provided below. Adhering to these guidelines and limiting purchases to what is absolutely essential can cut costs drastically. Some of these essential supplies are supplied by the institute (see page 30 for description of items and their catalogue numbers).

Test Tubes

A microbiology teaching laboratory will do well by selecting disposable screw cap tubes of the following sizes:

13 x 100 mm
16 x 100 mm
16 x 125 mm
16 x 150 mm
20 x 150 mm

Of these, the most versatile size is 16 x 150 mm and a fairly large supply of these should always be kept on hand. These should be used for maintaining cultures and for preparing various types of media. The use of plain tubes without screw caps for these purposes is wasteful as they accelerate dehydration of media and cultures and thus increase costs. These tubes also require the use of various sizes of closures or cotton plugs which consume both time and space and thereby increase costs.

A microbiology laboratory however, should have some supply of plain disposable test tubes. The following sizes are recommended:

6 x 50 mm for use as gas vials and for precipitin reactions
10 x 75 mm for titration purposes
16 x 150 mm for general purpose use
20 x 150 mm for general purpose use

A limited supply of 16 x 150 mm pyrex plain and screw cap tubes is also desirable to have on hand, especially when specimens need to be boiled in a water bath for a long period of time. Disposable tubes will stand temperatures in a boiling water bath for a short period of time and thus can be used for preparing deeps which need to be melted prior to use.

Selecting mostly screw cap tubes and a few plain tubes also does away with the need of purchasing and storing test tube closures, as mere non-absorbent cotton can be used in place of these closures. This leads to an additional cost saving. Also, while disposable glassware is referred to as such, it almost always can be sterilized, washed, and reused.

Petri dishes

Disposable plastic Petri dishes of 15 x 100 mm size are still the best buys. Subsequent to use, these should be autoclaved and discarded. These are available from the institute.

A microbiological laboratory should also have a few 20 x 150 mm glass Petri dishes. These come in handy for immunological work such as incubating double diffusion plates and immunoelectrophoresis plates. But if you do not have these, standard plastic Petri plates would do fine.

Slides, cavity slides, and cover slips

Slides: Precleaned slides with one end frosted on one side are the best buys for classroom purposes. Specimens can be identified by writing with an ordinary lead pencil on the frosted edge. This also helps students to know as to which side the smear was prepared, thus avoiding problems with focusing under the oil immersion lens. Slides turned upside down cannot be focused under oil immersion because the lens cannot get close enough to the specimen.

Used slides should be discarded. Cleaning and reusing them is not only time consuming but also suffers from the drawback that smears can never be completely removed from them. Such residual smears add confusion when newly prepared smears on these slides are to be examined. For instance, smears of pure cultures of Gram negative organisms made on slides previously used for making smears of Gram positive organisms will appear mixed as both Gram negative (new) and Gram positive (residual) cells will be seen.

Cavity slides: Use single cavity slides. Since cavity slides are expensive, these should be reclaimed. It is best that students discard these into a separate container containing a detergent solution. Used slides should be autoclaved prior to washing.

Cover slips: The most versatile size is 22 x 22 mm rectangular cover slips of number 1 thinness.

Flasks

Erlenmeyer flasks of 500 ml and 1,000 ml capacity are recommended sizes. It is also advisable to have a few 250 ml capacity Erlenmeyer flasks.

Round bottom, Florence or other similar flasks are superfluous.

Beakers

Glass or plastic beakers of 50 ml, 100 ml, 250 ml, 500 ml, and 1,000 ml capacity are recommended sizes. Glass should be preferred over plastic.

Graduated cylinders

Cylinders of 100 ml, 250 ml and 1,000 ml capacity are recommended sizes.

Volumetric flasks

Volumetric flasks with ground glass stopper of 100 ml, 250 ml, 500 ml, and 1,000 ml capacity are recommended but these are not essential.

Pipettes

Glass disposable pipettes which can be cleaned and reused a few times are the best buys. For classroom purposes, 1.0 ml and 10 ml sizes of serological pipettes are recommended. The useful life of disposable glass pipettes can be increased provided the pipettes are not left soaking in the detergent or the disinfectant solution for unnecessarily long periods of time.

Syringes and Needles

Syringes: 1.0 ml, 5.0 ml, 10.0 ml, and 30 ml plastic sterile disposable syringes are the best buys. It is also advisable to have a few 50.0 ml glass syringes. All syringes should be equipped with Luer locks.

Needles: 22 gauge 1 inch long and 18 gauge 1-1/2 inches long, sterile disposable needles are recommended as these are versatile sizes.

Centrifuge tubes

While there are a variety of centrifuge tubes, the best suited for microbiological and general purpose work are the Corex brand tubes. These are made of glass and are sturdy enough to withstand sufficiently high speeds of centrifugation. Recommended sizes are 15.0 ml and 25 ml sizes. Use only the screw cap centrifuge tubes.

Among plastic centrifuge tubes, those made of polypropylene are recommended as these are autoclavable. The sizes recommended are 10.0, 30.0 and 48.0 ml capacity. These should be screw cap tubes.

Filter flasks

250 ml, 500 ml and 1,000 ml sizes are recommended. The 500 ml size is most versatile.

Funnels

Glass and plastic funnels of approximately 100 mm top ID each are most useful. Similar size stainless steel funnels are also useful. These funnels take a filter paper of 185 mm diameter. To keep funnels of different sizes is wasteful. It is good to have a few Buchner funnels though.

Membrane (bacteriological) filters

These are essential but expensive items and if not purchased by first reviewing your needs, can run into considerable expense. We have found that the preassembled disposable filters of 25 mm diameter, which attach to syringes, are the best buys. Those which attach to syringes but which you have to assemble yourself are uneconomical, for these are not only time

consuming, but one often loses their parts. This is an additional expense and an aggravation, for one has to check the catalogue to find which parts are lost and also to ascertain which is the correct way of assembling them. Faulty assembly causes leakage and the filtrate obtained from poorly assembled filters can never be sterile.

The preassembled disposable filters described above are useful for filter sterilizing small quantities of fluids only. For larger quantities one needs to have larger filters and there is a diversity of sizes available. But for classroom purposes, filters of 47 mm dia., which fit into a glass or plastic filter assembly, are the most versatile as these can be used for sterilizing liquids as well as for testing water sewage and other liquids. The funnel of these filters has a capacity of about 250 ml and this is sufficient for most classroom needs. These filters, however, are to be assembled and sterilized, but if you limit their purchase to one size and brand, the problems due to assembly and lost parts are manageable.

For filter sterilizing, filters of 0.2 micron pore size are the best. The Institute thus recommends and supplies filters of only this pore size - see page 30 for price information.

MISCELLANEOUS MATERIALS AND SUPPLIES

Catalogue

MM-01	Applicator sticks plain - 72 dozen per box	\$12.00 box
MM-02	Cotton - absorbent	\$ 12.50 lb.
MM-03	Cotton - nonabsorbent	\$ 22.50 lb.
MM-04	Cover slips 22 x 22 mm #1	\$ 5.50 oz.
MM-05	Detergent for glassware - 1 lb. canister	\$ 15.60
MM-06	Disinfectant - 1 gallon	\$15.00
MM-07	Dropper bottles for staining - polyethylene - 1 oz.	\$ 1.75 ea.
MM-08	Filter paper 18.5 cm dia.	\$ 15.25 pkg.
MM-09	Funnel glass - versatile 100 mm takes 18.5 cm filter	\$ 6.50 ea.
MM-10	Funnel plastic - 100 mm takes 18.5 cm filter	\$3.50ea

MM-11	Immersion oil - 4 oz.	\$ 6.00
MM-12	Inoculating handles for loops and needles	\$18.00
MM-12A	Nichrome wire for above handles	\$5.00
MM-12B	Needles, nichrome wire for above handle	\$3.00
MM-12C	Loops, nichrome wire for above handles	\$5.00
MM-13	Inoculating loops of nichrome wire with handles	\$4.00 ea.
MM-14	Inoculating needles of nichrome wire with handles	\$2.75 ea.
MM-15	Lens paper - book of 50 sheets	\$1.00 ea.
MM-16	Lens cleaner - 2 oz.	\$5.50 ea.
MM-17	Membrane filters 25 mm dia., sterile disposable	\$2.00 ea.
MM-18	Membrane filter assembly, plastic of 47 mm dia.	\$75.00 ea.
MM-19	Filters for above 47 mm dia., 0.2 micron pore size – packet of 100 filters	\$65.00 pack
MM-20	Mounting fluid for permanent slides - 2 oz.	\$7.00
MM-21	Petri plates disposable sterile - 500 per box - 20 per sleeve	\$65.00 box \$5.00 sleeve
MM-22	Plastic bags - autoclavable for disposing hazardous material - 14" x 19" 19" x 23" 25" x 35"	\$0.35 ea. \$0.70 ea. \$1.10 ea.
MM-23	Slides, cavity 1 x 3" with single cavity	\$1.50 ea.
MM-24	Slides, 1 end frosted - 1/2 gross box	\$6.00 box
MM-25	Slides - plain - 1/2 gross box	\$5.50 box
MM-26	Swabs, sterile - 200 swabs	\$11.75 box
MM-27	Teasing needles – straight	\$2.00 ea.
MM-28	Teasing needles - angular point	\$2.00 ea.
MM-29	Tongue depressors, 500/pkg.	\$15.00 pkg.
MM-30	Tooth picks	\$0.50 pkg.
MM-31	Vaseline for motility test - 1 oz.	\$1.50
MM-32	Vaspar for sealing cover slips to slides - 2 oz.	\$ 4.50
MM-33	Wash bottles, 16 oz. Polyethylene	\$4.00 ea.
MM-34	Wax marking pencil	\$0.75 ea.
MM-35	Xylene - 8 oz.	\$7.50

19. THE LABORATORY MANUAL - A COMPLETE CURRICULUM OF BASIC AND APPLIED MICROBIOLOGY

The Institute provides a detailed laboratory manual which covers more ground in a short period of time than other manuals. It covers the entire discipline of microbiology - both basic and applied - and thus enables the student to grasp the essence of this subject quickly and thoroughly. The manual is divided into 10 study units which are:

1. Introduction to microbiology and microscopy
2. Major groups of microorganisms, their identification and cultivation
3. Bacteria in our environment - isolation and pure culture techniques
4. Staining characteristics and cytological features of bacteria
5. Biochemical activities of bacteria
6. Identification and classification of bacteria
7. Immunology
8. Clinical microbiology
9. Industrial and sanitary microbiology
10. Virology, molecular biology, and genetic engineering

As you can see, nothing meaningful is left out. Rather, more material is covered than is generally covered in most other manuals. The concept of 10 study units provides sufficient time during a quarter, and even more during a semester, to cover the units without undue pressure. In fact, other manuals, which have 30 - 40 laboratory exercises put the instructor and the students under undue pressure expecting them to complete at least one exercise during each laboratory session. The instructor and the students thus feel pushed to complete the exercise which leaves no time for discussion. The learning process is thus grossly short-changed.

In contrast, the unit concept presented in this manual allows a minimum of one whole week to cover one unit. The unit includes not only the laboratory sessions, but other pertinent material also. As a matter of fact, relevant material in sufficient detail is presented such that some instructors may find additional textbooks unnecessary. A schedule of 2 to 3 three-hour sessions per week has worked well with lectures, demonstrations, discussions, and laboratory experiments all done during these hours.

Another feature of this manual is that it considers memorization of material detrimental to learning. Emphasis is, therefore, placed on acquiring, understanding, and using concepts, techniques, and skills. This is done through assignments included in the manual which the student completes and hands in to the instructor for comments and possible grading. A systematic atmosphere of learning is thus generated. For the same reason, the objectives of each unit are clearly listed in the beginning of each unit. These serve as a checklist of goals to be achieved and help contain the vastness of the subject within the grasp of comprehension.

Laboratory supply kits containing all the materials needed to complete each unit by a class of up to 30 students are also available from the institute. They take the bother out of setting up the laboratory. In most cases all you need to do is open and display the contents of the kit and proceed with teaching. Together with the manual, they enable you to be a more effective teacher. You, of course, do not have to buy the kits. The manual provides detailed lists of supplies needed for each unit. This gives you the option of checking your own stock and purchasing only the supplies you need. The manual can thus be used with or without the kits. In either case all of the supplies you need are available from the institute making their procurement easy.

The manual is available from the Institute at \$20.00 each.