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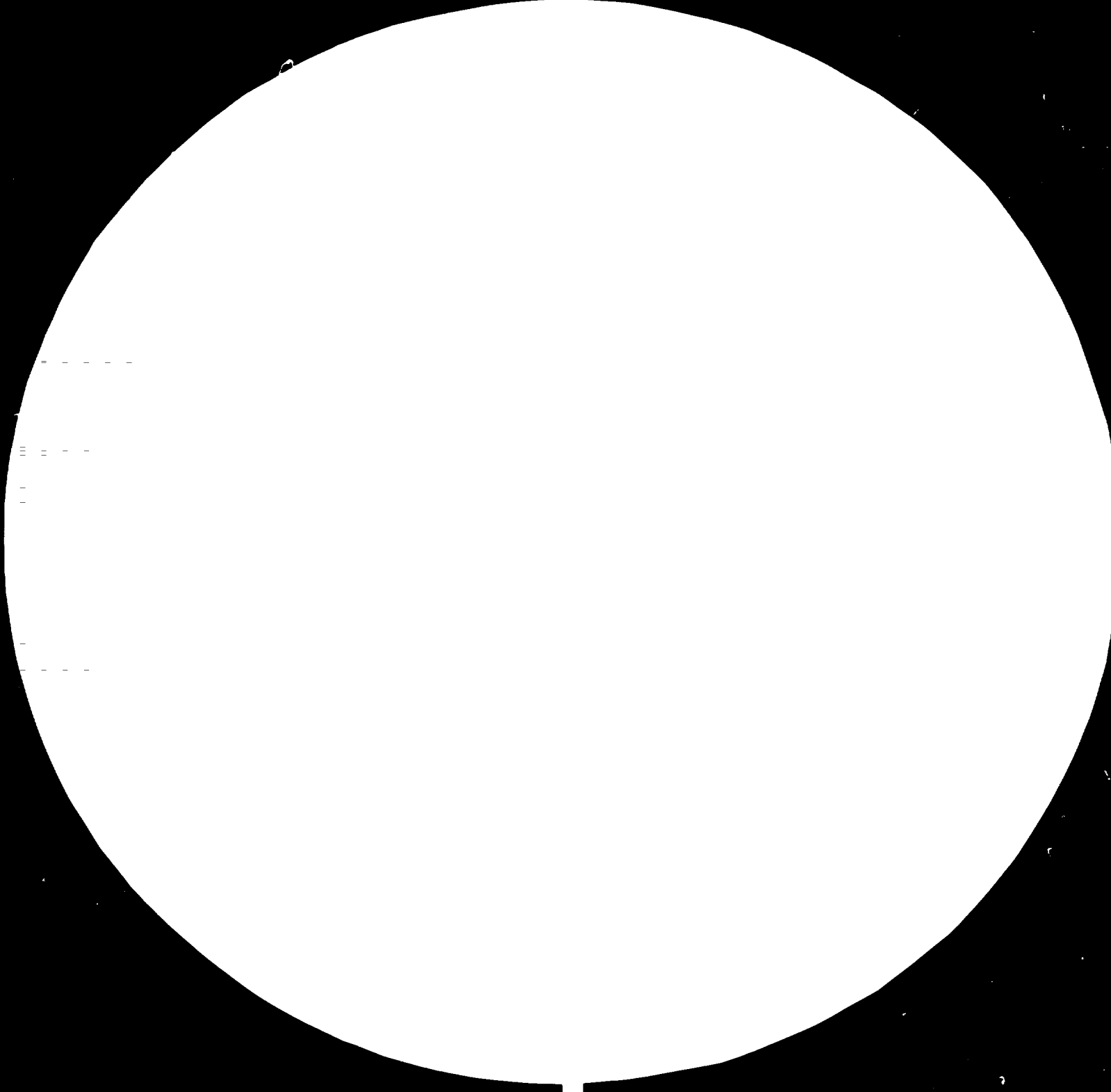
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ENGLISH

UNIDO TECHNICAL ASSISTANCE TO THE
TANZANIA INDUSTRIAL RESEARCH AND DEVELOPMENT
ORGANIZATION (TIRDO) IN ANALYTICAL ANALYSIS
AND TESTING SERVICES.

DP/URT/78/019

UNITED REPUBLIC OF TANZANIA

Report of a Preparatory Mission *

22 June - 12 August, 1981

Based on the work of
Frederick C. Strong III
UNIDO Consultant

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The author wishes to thank the many persons who kindly made their time available during visits to parastatal organisations, laboratories, private industry and equipment supply firms. The insights and information about existing instruments and equipment was most helpful to the mission.

It was a pleasure to work with my counterparts Director General, C.L. Tarimu and Principal Research Officer, Dr. P.K. Haule as well as the staff members who participated in a number of the institutional visits. Acknowledgement is also made of the interest and support of the Chief Technical Adviser, C.A. Stone.

1. Objectives of the Mission

The Tanzania Industrial Research and Development Organization (TIRDO) was established in April, 1979 by an Act of the Parliament of the United Republic of Tanzania. TIRDO has been created as multibranch, multipurpose service, research and development institute to assist and support Tanzanian industry. UNDP/UNIDO assistance to the establishment of TIRDO, begun in 1979, has been continually increasing in scope and includes expert missions to help plan for the equipment, activities and staff training necessary to implement the TIRDO mandate.

The Chemistry and Analysis Department of TIRDO has a staff of eight professionals and two undergraduate trainees. One of the first facilities to be occupied will be the chemical block of laboratories. The objective of this preparatory mission was to:

- Organise and conduct in-depth surveys and evaluation of the analytical and testing needs of Tanzanian industries in the chemical, food and agricultural processing, mineral exploration and extraction and textile sectors.
- Develop a five year TIRDO work programme which will establish and deliver service and research meeting industrial needs.
- Prepare detailed lists and specifications for laboratory equipment and supplies to fulfill the work programme.
- Identify and suggest priority research areas in this technical field.
- Advise on staffing and training schedules in support of the work programme.

2. Institutional Visits

The visits are described individually in Annex I. The places visited consisted of:

2 planning organizations the Tanzania Industrial Studies & Consultancy Organization (TISCO), and the Tanzania National Scientific Research Council (UTAFITI)

4 government laboratories, the Tanzania Bureau of Standards (TBS), the Central Government Chemical Laboratory (CGCL), the Tanzania Food and Nutrition Centre (TFNC), and the Central Veterinary Laboratory (CVL)

2 departments of the University of Dar es Salaam, Chemistry and Physics

7 Parastatal companies with laboratories

3 Private industrial companies.

At TISCO and UTAFITI, I learned something of the plans of the government for research promotion in various industrial areas, for example in the use of Tanzanian iron ore deposits and coal deposits to begin an iron and steel industry. TBS is in the process of completing laboratory construction and receiving new equipment. CGCL and TFNC have functioning laboratories and both are in the process of receiving new equipment, CVL has recently completed its installation of new equipment. My conclusion is that all four will be moderately well equipped for their work. I use the word "moderately" because, in general, possibly because of budgetary limitations or concern about maintenance, new instruments have been obtained without microprocessor and computer features, which is the trend in modern instrumentation. I noted that the laboratories which have been in existence longer have accumulated some equipment that is no longer functioning, due to lack of spare parts, unknown causes, or obsolescence.

Laboratories of parastatal and private companies ranged from adequate and well maintained to virtually no equipment. There was a prevalence of non-functioning apparatus and even one instrument whose purpose was not known. A number of laboratory directors were quite discouraged about their lack of appropriate instruments for quality control.

It would have been desirable to have visited more laboratories of different types, but time did not permit it. The preparation of purchase lists was very time consuming and made further visits impossible.

3. Five Year Work Programme

I will assume that the first of these five years is considered to begin immediately. According to the estimate of the Chief Technical Adviser, it will be an additional year until the first TIRDO laboratory will be available. I would suggest that the most important activity of this year be the acquisition and training of laboratory staff.

During this year, when a staff member is not outside the country receiving training, the current practice of seconding him (or her) to a particular company where he could assist an inadequate staff or learn more about the operations of the company could be maintained. Possibly a staff member working at a particular company could, if the company is willing, begin to try to solve a company problem with the assistance of the Principal Research Officer at TIRDO. Another activity could be literature searches relative to particular projects that have been proposed.

The second year is a period when experts can assist in the installation of the equipment in the new laboratory and training of staff in its use. I would suggest that, as much as possible, the sequence of instrument installation and training be co-ordinated with specific industrial problems, so that the training can be done on a practical problem and not on a measurement without purpose. It could also be a time of looking for problems to solve by contact with industries and a selection based on importance and probability of success.

The third, fourth and fifth years would be a period of expansion of service, acquisition of experience, and possibly, choice of areas of specialization in project research.

4. Equipment, Instrument and Supply Requirements

The first observation in preparing these lists was the enormous number of small items that are necessary in equipping a new laboratory. This was quite time consuming. An ever-present concern was that no essential item for laboratory work be overlooked.

The current trend in instrumentation is the attachment of microprocessors and computers to control instrument conditions and produce the desired result. There are several reasons in favour

of purchasing these accessories. Operation of the instrument by less trained personnel is possible, once the appropriate conditions have been entered into the microprocessor. Another reason for selecting instruments operated by microprocessors is that models without this capability are becoming obsolete and parts difficult to obtain. An argument against such sophistication for a location like Tanzania is instrument repair. There are two responses to this argument. In Dar es Salaam two organizations represent certain instrument manufacturers and undertake to provide service by factory trained technicians. One of these organizations (Aeradio Ltd.) arranges annual visits to Dar es Salaam by an engineer from a major manufacturer (Pye Unicam) who makes visits to any owner of their instruments having problems. Usually, the complicated electrical parts of such instruments consist of printed circuits that are readily replaced. To anticipate such needs, it would be desirable that a small part of the budget for the laboratory be held in reserve in an external account and used for spare parts and servicing.

A second factor is the TIRDO plan to offer instrument repair service, to industry. This, of course, will include maintenance and repair of TIRDO instruments. For the reasons cited, I have recommended inclusion of microprocessor and computer components of instruments when available.

It is not usual in a study such as this one to specify the manufacturer of an instrument. However, because of the distance of Tanzania from normal service centers and the prohibitive cost of a special trip by a service engineer, I consider it reasonable, in the case of manufacturers represented by Aeradio and Achelis, to recommend that their instruments be purchased since they can be serviced in Dar es Salaam. These instrument manufacturers are well known for the quality of their products and are located in Europe.

Considering the expected needs of industry, it is proposed to purchase the following major instruments; direct reading emission spectrometer, ultraviolet visible recording spectro-photometer, gas chromatograph, high-pressure liquid chromatograph, recording potentiometric titrimeter, polarograph, and polarizing

microscope. Another expensive, but extremely necessary and useful purchase recommended is sets of spectra: infrared, ultraviolet-visible, and fluorescence, plus small collections devoted to specific applications.

Detailed lists of instruments, equipment and supplies are given in Annex III. The costs have been estimated without freight, insurance and clearing as shown below.

Estimated Costs

Direct reading emission spectrometer	\$50,000*
UV-visible recording spectrophotometer	\$52,200
Infrared recording spectrophotometer	\$33,400
Atomic absorption spectrophotometer	\$87,000
Gas chromatograph	\$31,000
High pressure liquid chromatograph	\$33,600
Balances	\$17,000
Electrical Equipment - Metrohm	\$27,000
Refractometer	\$2,400
Microscope	\$8,200
Flame photometer	\$9,000
Polarimeter	\$3,000
UV-Visible spectrophotometer	\$5,200
Ovens, Furnace, centrifuge	\$16,000
Colorimeter	\$5,000*
Still	\$19,800
Voltage Stabilizers	\$11,500
Glass blowing equipment	\$6,000
Medium priced equipment	\$30,000
Simple equipment	\$76,800
Chemicals	\$7,000
Collections of spectra	\$69,700

\$600,800

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* Unverified estimates

5. Suggested Research Topics

The annual report for July 1, 1979 - June 30, 1980 of TISCO lists a number of industrial project opportunities which would be useful to Tanzania. Some which would appear to be appropriate for TIRDO to participate in are: Sulfuric acid (pyrites based), Pesticides and Insecticides, Alum (for water purification), Furfural (from maize or bagasse), dyes for leather and textiles, Alcohol and Coal based chemicals. Local plant coloring materials

are being investigated as dyes. The iron ore-coal project has already been mentioned. Some instruments listed above would be extremely useful in several of these projects - the direct reading emission spectrometer for analysis of iron ore and step-wise materials during ore treatment, the liquid chromatograph and infrared spectrophotometer for organic, natural products, etc.

Of more immediate importance would be research on problems encountered in industry. These remain to be identified by visiting companies and discussing their difficulties.

An activity for TIRDO is a program of solvent recovery and purification by fractional distillation. Considering the scarcity of solvents and the undesirable pollution effects of solvent disposal (as done by at least one company), it could be useful to systematically purify solvents used at TIRDO and help industry to do the same.

6. Staffing and Training Schedules

Regarding training schedules, it is difficult to be very specific in giving such advice. The training schedule has to be planned in consultation with staff members as is being done by the Chief Technical Adviser. Training at the factory producing the major instruments should be included. The Pye Unicam Company conducts one or two-day operator courses and one-week, more theoretical courses.

Since the construction of the laboratories will not be completed for some time, staff on a technician level have not been appointed. In order to find satisfactory candidates, the search for them should not be unduly delayed.

Included in the list of equipment and supplies is a glass blowing shop. This implies training a person in glassblowing. The glassblower at the University of Dar es Salaam has conducted a basic course in the subject and the person to be trained could start there. Afterward, it would be desirable to send him abroad to complete his training.

ANNEX I

1. Laboratories and Industrial Organizations Visited.

The following is a list of places visited, with dates. On each visit, I was accompanied by my counterpart, Dr. Paul K. Haule, Principal Research Officer of the Chemistry Section or by another TIRDO staff member, sometimes two. These consisted of Messrs. M. Ganyara, J. Nyonyi, A. Tingo and J. Kahatano, and Miss A. Magashi. The major items of equipment in each laboratory are listed in the next section.

a) Tanzania Bureau of Standards (TBS), 25/6 and 10/7. On the first visit, we met with the Director, Mr. B.L. Mwobahe, and with Mr. Olof Agren, Senior Consultant with SISSAB and Food Expert. On the second visit, I had a long conversation with Mr. Mwobahe.

It is expected that TBS will function as bureaus of standards normally do - setting physical and chemical standards for industry and commerce, and verifying that they are being obeyed. Its departments are: Standards (Agriculture & Food, Chemicals, Textiles, Mechanical Engineering, Electrical Engineering, and Building and Construction) and Quality Assurance (Laboratories for Food-Micro-biology, Chemicals, Textiles, Quality Control, Metrology, and Instrumentation). A shipment of equipment and supplies has been received from Yugoslavia and more will arrive shortly from Sweden. I was provided with both lists. From them, I concluded that TBS will be moderately well equipped. From my conversation with Mr. Mwobahe and comments of Mr. Tarimu, Director of TIRDO, I am convinced that TIRDO can count on excellent cooperation from TBS in every way, including the use of TBS equipment.

b) Central Government Chemical Laboratory (CGCL), also known as the Government Chemist, 27/6. It is under the Ministry of Health and works in the areas of toxicology, forensic chemistry and health in general. We met briefly with Dr. Madati, the Government Chief Chemist and had discussions with Mr. Kotecha, his assistant. Mr. Ganyara, the TIRDO staff member who accompanied me, was familiar with the laboratories and showed me

around. This laboratory contains a large number of instruments (see list). Some older ones are not functioning. Some had recently arrived and others are on order. From personal observation and based on the comments of various persons, I learned that CGCL is very understaffed and by the nature of the analyses sent to it to do, frequently has to provide results rapidly. Because of these factors, it does not appear feasible to expect that it could co-operate with TIRDO in the use of its equipment.

c) University of Dar es Salaam (UDSM), Departments of Chemistry and Physics, 26/6. After meeting the Head of the Chemistry Department, Professor A. Mulokozi, we toured the laboratories. Most instruments are Pye Unicam. One that is unique is a Linseis Thermoanalyzer Model 2000, used personally by Prof. Mulokozi for thermogravimetry research. The Department of Physics has no equipment of industrial interest, except oscillographs for electronic testing.

d) Tanzania Food and Nutrition Centre (TFNC), 27/6, 9/7. This laboratory, which is under the Ministry of Health, is being equipped to do food quality control at the village level. A Swedish expert, Mr. B. Jalquist, and the Director, Mr. C. Timalilwa, said food will be analyzed chemically for nutrients and micro-biologically for harmful bacteria. Several new Pye Unicam instruments had just arrived and were not yet in use. When completed, the laboratory will be very well equipped for its work.

e) Central Veterinary Laboratory (CVL), 1/7. This laboratory, a parastatal organisation under its own ministry, is concerned primarily with the analysis of livestock forage produced by the National Milling Corporation. It is also ready and willing to assist individual farmers with any problems they may have. The Danish Volunteer, Mr. Paul Foghmar, who showed us around, had been working in the laboratory for a year and was very familiar with all equipment and operations. In general the laboratory is well equipped and very efficiently run. Some set-ups and procedures are worthy of comment. The condensers

for the twelve-unit Soxhlet extraction apparatus for fats are cooled by circulating, refrigerated, distilled water, allowing the use of 40° - 60° petroleum ether solvent. The whole apparatus is located in a hood to remove any vapours that escape. A single record book of analyses is filled in by all technicians so that past results can be readily found. A pocket-sized, Hewlett-Packard calculator has programs for all routine, analytical calculations. Because of the importance of a muffle furnace to their work, Mr. Foghmar recommended having two, so if a heating element burns out, a spare is available until the first can be repaired. He also recommended strongly the use of voltage stabilizers for all instruments.

f) Tanzanian and Italian Petroleum Refining Co. Ltd. (TIPER), 3/7. This parastatal organization receives imported petroleum crude and refines it by standard procedures. In a preliminary interview with the Managing Director, Mr. V. Cognigni, I asked if the refinery could supply laboratory type solvents to TIRDO and he said it could. He then took us to the laboratory where Mr. Shoo, the Chief Chemist, explained the operation of the refinery.

Liquified petroleum gas (LPG), principally C₃/C₄, is produced for the Tanzanian market. Light gasoline (b.pt. 30-80°) is the next fraction. He said this could be provided to TIRDO for use as it is, or for further fractionation into standard petroleum ether fractions. He then explained the subsequent operations of the refinery and its various products. At the subsequent operations of the refinery and its various products. At one point, a product about 48% in aromatics is produced and conceivably could be fractionated into benzene, toluene, and Xylenes.

Some of the equipment in the laboratories of the refinery is standard equipment that would be found in other chemical laboratories and some is specialized, standardized, petroleum industry equipment: metal, ice-cooled stills, cloud point and pour point apparatus, ASTM colorimeter, etc.

g) National Milling Corporation (NMC), 2/7. We met Mr. Mohammed Salum, Mill Manager, Mr. Kinabo, Branch Manager, Mr. Nyonyi, Laboratory Director, and Mr. B. Kado, Laboratory Chemist. Mr. Kado explained the operation of the laboratory and showed us around. The mill at the site of the laboratory produces only wheat flour for bread, but the laboratory is responsible for analyzing the raw-materials for animal feeds that are prepared at other locations - simsim (sesame) cake, cottonseed cake, sunflower cake, fish meal, and meat meal. It also analyzes baby foods - cereals and soy beans. The company has a winery in Dodoma that has its own laboratory. The most sophisticated apparatus at NMC is a new Pye Unicam UV-Visible Spectrophotometer, SP6-200, used for phosphorus determination. They have some equipment that is not functioning which TIRDO could probably held repair.

h) Tanzania Breweries (TB), 1/7. We had a long and profitable meeting with the Brewery Manager, Mr. P.M. Mevada. He explained that, after the chlorine content of the city water is raised to 4 ppm, that part for making beer is passed through charcoal to remove the chlorine. He said their main problem in the laboratory is lack of reagent chemicals, their allotment of foreign exchange being used principally for machinery spare parts. (TIRDO could offer to help with analyses for which reagents are not available.) Other things M. Mevada said are lacking are a pilot plant for brewing and malting experiments and a refractometer.

ANNEX II

EQUIPMENT IN TANZANIAN LABORATORIES IN THE

DAR ES SALAAM AREA

Laboratories

BP - Banco Products (Tanzania) Ltd.
CGCL - Central Government Chemical Laboratory Government Chemist
CVL - Central Veterinary Laboratory
NMC - National Milling Corporation
SPT - Sadolins Paints (Tanzania) Ltd.
TB - Tanzania Breweries, Ltd.
TBS - Tanzania Bureau of Standards
TFNC - Tanzania Food and Nutrition Centre
TIPER - Tanzania & Italian Petroleum Refinery
UDSM - University of Dar es Salaam (Chemistry Department)

Comment

Only complex or specialized equipment is included. Balances, pH meters, Kjeldahl app., etc. are omitted.

<u>Instrument</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Laboratory</u>
Spectrophotometer, UV-Visible, double beam, scanning	Pye Unicam	SP8-100	CGCL, CVL
Spectrophotometer, UV-Visible, single beam	Pye Unicam	SP6-550	TBS
Spectrophotometer, UV-Visible, single beam	Pye Unicam	SP -600	CGCL
Spectrophotometer, UV-Visible, single beam	Pye Unicam	SP- 500	TB, CGCL*
Spectrophotometer, UV-Visible, single beam	Beckman	DU-2	TIPER**
Spectrophotometer, UV-Visible, single beam	Zeiss	PM-2A	CVL
Filter Photometer	Udy		NMC*
Spectrophotometer, Infrared, double beam, scanning	Pye Unicam	SP-1000	CGCL, TIPER

Footnotes

* Not functioning

+ Equipment on order

++ No attachments except lamps

** With flame attachment

<u>Instrument</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Laboratory</u>
Spectrophotometer, atomic absorption	Pye Unicam	SP9-800++	CGCL+
Absorption	Pye Unicam	SP9-700++	TBS
Absorption	Pye Unicam	SP 192	CVL
Absorption	Pye Unicam	SP 191	CGCL
Flame photometer	Corning	400	CVL
Spectrofluorimeter	C. Zeiss (NG)	4 M QIII	CGCL
Polarimeter Photoelectric, with Hg lamp	C. Zeiss (Jena)	Polomat A	CGCL
Polarimeter, Circle		SM	TBS
Saccharimeter		SU-3	TBS
Refractometer, Abbe	Bausch & Lomb		TIPER
Refractometer, Abbe	C. Zeiss (Jena)	LP-120	TBS
Refractometer, hand		OG-101	TBS
Tintometer, Lovibond	Tintometer Ltd.	E-AF 900	TBS
Colorimeter (x, u, Y)	Mom Hung. Opt. Wks	170M COLOR-D	TBS

SPECIAL BREWERY EQUIPMENT

Mashing bath	Glasblaserei, Berlin
Hazemeter	Copenhagen

FOOD ANALYSIS EQUIPMENT

Crude fibre extractor	Gallenkamp	CVL
Sophlet fat extractor (12)	Gallenkamp	CVL
Kjeldahl apparatus		CVL, TFNC

PAINT TESTING EQUIPMENT

Drying time tester		SP
ICI Coin & Plate Viscometer	Re Egpt. Co. (London)	SP
Illumination Box	Leslie Hubble Ltd (Leicester)	SP
Salt Spray Tester		BA

ANNEX III

Recommended Purchases

III. A. Major Equipment

Direct Reading Emission Spectrometer

The instrument should provide direct read-out for major elements and preferably, also be photographic. Equipment for processing of plates should be included, also a comparator - microphotometer.

Possible instrument sources are Philips, S.A., BD, de L'Europe, 1301 Wavre, Belgium and Jarrell-Ash, Le Locle, Switzerland.

UV-Visible Spectrophotometer (Pye Unicam)

	<u>No.</u>
SP8-250 UV-Visible recording spectrophotometer, double monochromator	9423 179 38261
Data control module	9423 179 38761
Derivative accessory	9423 179 38491
Thermocell	39371
Cell temperature controller	9423 179 80251
Automatic cell changer	9423 179 80181
Autocell	08401
Fluorescence accessory	9423 179 08271
Liquid chromatography kit	05281
HP 9815 A Calculator	
Difuse reflectance accessory	9423
Automatic sample changer (SP4-01)	9423 179 00521
Cells 1 mm glass	9423 168 10101
20 mm glass	10401
100 mm glass (cylindrical)	11701
1 mm silica	10111
10 mm silica	10411
100 mm silica (cylindrical)	11711

Infrared Spectrophotometer (Pye Unicam)

SP 2000 Double-beam grating IR Spec.	9423 279 05921
SP 2080 Data conversion unit	39311
HP 9825A Desk-top calculator*	39331
SP 2060 Air dryer	06891

Infrared Spectrophotometer (Pye Unicam) Contd.../...

	<u>No.</u>
Computer control interface PCB	270 77941
Visual display unit	279 39341
ATR 'Nine' reflection unit	257 03815
Polishing kit	02001
GC-IR 'Extrocell' collection kit	01691
Reference beam attenuator	03821
Desiccator cabinet	14131
Variable pathlength cell, non-rotating window, KBr	257 06671
Spare pair KBr windows	01421
Spare neoprene washers, pkt of 10	01431
Spare PTFE washer	01441
Key for variable path cell	01451
15 ton press	03011
13mm evacuatable die	05161
Set of upper and lower pellets for die	05121
Set of 'O' rings for die	05171

Infrared Sampling Accessories

	<u>Qty.</u>	<u>Material</u>	<u>Thickness</u>	<u>No.</u>
Sealed cells	3	KBr	0.025	9423 257 10121
	3		0.05	10131
	3		1.0	10191
	2	CsI	1.0	13171
Semi-permanent Cells	2	NaCl	0.025	13231
	2	KBr	0.025	13231
	2	CsI	0.025	13281
	2	polythene	0.025	13781
	2	BaF ₂	0.050	11631
Spare parts for sealed cells and semi-permanent cells Windows, sets of 2		2 NaCl		9423 257 00451

* Calculator can also be used for UV spectrophotometer

	<u>Qty.</u>	<u>Material</u>	<u>Thickness</u>	<u>No.</u>
Windows, sets of 2	2	NaCl		9423 257 00451
Windows	2	KBr		00461
Windows	1	CsI		13341
Windows	1	Polythene		13811
Windows	1	BaF ₂		11751
Front gaskets of lead, pkt. of	10			00721
Front gaskets of PTFE, pkt. of	5			00731
Rear gaskets of Neoprene, 2 pkts of	10			00741
PTFE plugs, pkts. of	5			00711
Syringes, Luer, 2 mL	4			4013 229 01851
Syringes, Luer, 5 mL	2			01861
Window spacers Pkts of 10	1	lead	0.025	9423 257 10521
	1		0.050	10531
	1		1.0	10591
Pkts of 50	1	PTFE	0.025	10621
			0.050	10631
Pkts. of 3	3		1.0	10691
Pkts. of 12	1	lead	assorted	00601
Pkts. of 12	1	PTFE	assorted	00701
Demountable ('Nujol') cells and spares				
Cell with assorted spacers and gaskets				
	2			9423 257 02561
Set windows (2)	3	NaCl		02571
	2	KBr		02851
	2	CsI		13351
	2	Polythene		13821
Assorted spacers, 2 of each, packet of 12				
	4	lead		9423 257 02711
	4	PTFE		13361
Paper frame film holder 10x25 mm aperture				263 96881
Disc holder 10 mm dia- meter				96891

	<u>Qty.</u>	<u>Cat. No.</u>
Low volume gas cell, KBr, 10cm		257 13761
Spare KBr windows for 10cm cell		14001
Seals for 10cm low volume cell, pkt of 6		14031
SP9-800 atomic absorption spectrophotometer	240V/50Hz	9423 379 35581
Wavelength scanning accessory		35691
SP9 Computer		35661
SP4-01 Autosampler		328 42371
SP9 Video furnace		379 38661
Full gas control option		
SP9 Furnace autosampler		328 42371
Auxiliary oxidant accessory		
Background corrector		
Interface Lead SP9 Furnaces- computer		4013 172 21991
Nitrous oxide burner		4013 172 04371
Trolley accessory		9423 170 72661
Micropipet 0-20 uL		357 05421
PU 9003 Compressor		390 03011
Red sensitive P.M.T.		4013 163 66771
SP9-20 EDL power supply with with hollow cathode adapter		9432 379 39351
Hydride kit		328 42041
Mercury cold vapour analyser kit		379 05571
Spare 150 mL conical flasks		2813 060 00119
Spare silica cell		9423 168 05641
Regulators: acetylene		352 43881
hydrogen		9435 179 21191
nitrous oxide		9423 354 02321
argon/nitrogen/air(3)		9435 179 21201
Pen serve remote control kit		9435 151 06771
Pens, blue	10	9443 298 57051
Pens, rod	10	098 57051

	<u>Qty</u>	
Spare chart paper	5	099 20001
Spectrophotometry input lead		9423 379 35691
Capillary tubing PP20		0813 011 98107
Capillary tubing PP40		98114
Spray chamber ren. kit		4013 172 20261
Printer paper		1212 053 98012
Over pressure disc.	2	4012 164 13881
Pack of 1000 Test tubes, 25 mL		229 13081
Graphite tubes uncoated	20	94451
Graphite tubes coated	2	94441
1000 Pipet tips		9423 357 05431
Furnace jaws, left h.	1	4013 164 61491
Furnace jaws, right h.	1	61501
Furnace pivots		61481
Polypropylene cups	1000	2423 328 42451
Wash cups	100	42461
PTFF needle spare	1	42471
0-50 mL syringe, spare	1	42491
PFTE cups	20	42481
Hollow Cathode lamps - Li, Na, K, Be, Mg, Ca, Sr, Ba, Ti, V, Cr, Mo, Mn, Fe, Co, Ni, Cu, Ag, Au, Zn, Cd, Al, Si, Sn, Pb.		

EDL's - As, Sb, Pb, Se, Te, Sn, Bi, Hg, Tl, P

Cylinders of: acetylene, hydrogen argon, nitrous oxide

Gas Chromatograph (Pye Unicam)

PU 4500 Gas chromatograph, capillary model, with dual FID, temperature programmer, universal capillary injector, pressure control unit
9435 845 00121

Accessories

Electron capture detector	535
Amplifier for above	900
CDP4 Computing integrator	9435 179 08941 4246
Recorder, dual pen	9443 154 02301 1870
HG-10 Hydrogen generator for FID	9435 154 02301 1870
Columns	
Syringes	

High Pressure Liquid Chromatograph (Pye Unicam)

LC-XP Gradient elution liquid chromatograph	240V/50HZ	9435 279 39211
LC-FL Detector		
Oven		
PU 4023 Refractive index detector		240 23001
High refractive index prism cell assembly		23101
LC-XPD Preparative beads		279 39621

Balances (Sartorius)

<u>Item</u>	<u>Qty.</u>	<u>Cat. No.</u>
Balance semi-analytical electronic, top loading, read- ability 0.01g, range 3000g	3	1264 MP
Balance, analytical, electronic, top loading, readability 0.1g, range 160g tare range 160g	3	1602 MP6
Microbalance, mechanical, readability 1 mg, range 30g	1	2405
Service manuals for each balance	-	DM 42531

Electrical Equipment (Metrohm)

Portable pH meter	2	E588
pH meter, digital	3	E532
Extra electrodes, combination	10	-
Iron activity meter	1	E580/2
Selective ion electrodes	-	-
Piston type, hand burette, 20 mL	-	E485
Reagent-piston exchange units PTFE 3-way stopcock, 20 mL	5	E414S
Reagent-piston "exchange unit" brown glass burette cylinder and reagent bottle	2	E552
Potentiograph	1	E538/3-204 E536/5
Modification kit	1	US320-47
Polarecord	1	E506
VA scanner	1	E612
VA controller	1	E608
Polarography stand with DME and changing drop electrode	1	E505/1

<u>Item</u>	<u>Qty.</u>	<u>Cat. No.</u>
VA-Timer	1	E621
Rotating disc electrode and power supply		E628/2
Coulostat	1	E524
Integrator	1	E525
Electrodes for coulometry Mains distributor with inter-ferece suppression filters	1	E615
Shaft stirrer		E622/4
Magnetic stirrer		E649/1
Karl Fischer E485 + E535 + E533A + E651		
Service manuals for all instruments		

Abbe refractometer Model A	1
Spare thermometer	
Spare prism	
Standard 18 polarizing micro- scope, binocular & accessories	1

Basic Optical Equipment

For transmitted light work

<u>Objectives</u>			<u>Cat. No.</u>
Planachromat	2.5/0.08	Pol Z	46 01 18
Achromat	10/0.22	Pol Z	46 04 08
Epiplan	4/0.10	Pol	46 20 01
Epiplan	8/0.20	Pol	46 20 03
<u>Objective lenses</u>			
Neofluar	25/0.60	Pol Z	46 06 28
Achromat	40/0.85	Pol Z	46 07 08
Plan-Neofluar	63/0.90	Pol Z	46 08 18
Achromat	100/1.25 oil	Pol Z	46 19 08
Epiplan	16/0.35	Pol	46 20 03
Epiplan	40/0.86	Pol	46 20 04
Epiplan	80/0.95	Pol	46 20 80
Epiplan	100/1.25	Pol	46 20 02-9903
Plus quintuple objective slide turret			47 31 50
Plus one centering change ring each			46 62 56

<u>Condensers</u>			<u>Cat. No.</u>
Transmitted condenser with swing-out front lens	1.3	Pol Z	46 52 63
Vertical illuminator II ST, reflector H-PI Pol, 6V 15W illuminator; polarizer			48 64 86
Transformer			39 25 64-9902
Neutral density filter NG9, 32 x 1			46 78 26
Blue glass, clear, 32 x 1.2			46 78 35
Holding ring for light filter			46 72 52
<u>Auxiliary objects</u>			
Auxiliary object			47 37 04
Auxiliary object			47 37 14
Quartz wedge 0-3			47 27 24
<u>Eyepieces</u>			
Kpl crosshair eyepiece	8X/18	Pol	46 39 25
Kpl eyepiece	8X/18	P	46 39 20
Kpl wide-angle eyepiece	12.5X/18	Pol Br (also for spec- tacle wearers)	46 41 45
Kpl wide-angle eyepiece	12.5X/18	Br (also for spectacle wearers)	46 41 42
Diopter			46 48 89
Flame photometer, FL7 Electrotomat for Na, K, Ca, Li, No. 50 36 34			
OLD Cells for above			
Polarimeter, digital			
Spectrophotometer PM2K, 200-850 mm Silica and glass cuvetts, 1 cm			
Service manuals for above			

Miscellaneous (Heraeus)

	<u>Qty.</u>	<u>Cat. No.</u>
Oven, Temperature to 250°C, 2-9 Shelves, internal dim. 500 mm (W), 500 mm (H), 480 mm (D); 200 Kw electronic T control	4	T.5050 E
Vacuum oven, 40-180°C, cylindrical, int. dim 340 mm (W) 520 mm (D), 1.10 Kw	2	RVT 360
Muffle furnace, max. Temp. 1150°C, int. dim. 225 mm (W), 215 mm (H) 300 mm (D), 4.5 Kw	2	K1150/2
Time switch	2	
Heat-treated box sealed by sand	2	
Adjustable unit T cut-out	2	
Centrifuge, digital, without accessories (including head) 2100 Angle head, 6000 rpm, for 12 x 90 mL tubes		1695

Service manuals for all instruments.

Colorimeter

Colorimeter for providing tristimulus values for paints, textiles, etc.

(Though some very sophisticated instruments exist (e.g. Carl Zeiss RFC3/24 Colorimeter) a less complicated instrument would suffice, for example like the one manufactured by Hunter Associates Laboratory, Inc., 11495 Sunset Hills Road, Reston, VA, USA 22090. Such instruments are also called color difference meters. It should provide x, y and y values.)

Service manual for above

Fractionating Stills

Teflon spinning band type, like Perkin Elmer Auto-Annular Still, 200 theoretical plates and accessories as per quotation No. 10723.

Large laboratory scale fractionating still

Voltage Stabilizers

Voltage stabilizer, 220V, 50Hz, e.g. unit of AEL, Gatwick House
Horley, Surrey RH6 9SU England TLX 051-87116
84A, 20 KVA 3 units

Glass-Blowing Equipment

Large Lathe

Burners

Tools for glass blowing

Annealing oven

Standard taper or Juickfit grinders

Grinding wheel

Cut-Off wheel

Glasses for absorbing sodium emission

Normal and clip-on

Shaping tools

Diamond Cutters

Supply of Pyrex tubing and rod,
assorted sizes

Asbestos sheet for covering benches

III. B. Equipment

<u>Item</u>	<u>Qty</u>	
Calorimeter, Gallenkamp. Autobomb, 200-250V	1	G CBA-302-110H
Calorific value microprocessor for above	1	G CBA-330-101V
Spares kit	1	341-010Y
Spare bomb	2	350-K
Spares kit	1	356-010R
Set sealing rings	1x10	030L
Valve cores	1x5	050F
Valve housing	2	070W
Electrodes, set	2	090Q
Pressure release valve	2	502T
Sealing rings	1x10	384-010Y
End ferrules	1x10	394-010B
Nylon tubing	20 m	030S
Freeze drying apparatus Edwards		G FMW-500-U
Connectors for above, 24/29	16	520-010D
Flasks, r.b., 50mL, 24/29	16	G QFH-110-C
100mL, 24/29	16	150-U
250mL, 24/29	16	250-M
Ice flake maker	1	G ICE-650-B

Kjeldahl apparatus, complete, semimicro scale

<u>Item</u>	<u>Qty</u>	<u>Cat. No.</u>
100 mL flasks	1	
Melting and boiling point oven, Mettler FP51	1	G MFM-380-E
Controller, Mettler FP5	1	300-X
Melting point tubes	2x150	390-050-F
Boiling point tubes	4x40	
Boiling point capillaries	10x10	
Mill Wiley	1	A 3375-E50
Spare belt	5	3379-L70
Spectroscope, Fuess. A visual instrument for the analysis of metals, manufactured by the Fuess Co. in Germany.	1	
Viscometer, industrial, Haake Model RV 12	1	G VHA-575-010V
Speed programmer	1	577-508W
X-Y Recorder	2	512Y
Chart paper	50	514F
Cone and plate sensor, PK	1	518T
Refrigerator, Bosch Model KS 42S ZL	3	
Freezer, Bosch Model GS 358 with 25 hour protection after power failure	2	

III.C. Simple Apparatus

Catalogs: A-Arthur H. Thomas, F- Fisher, G- Gallenkamp

<u>Item</u>	<u>Qty.</u>	<u>Cat. No.</u>
Balance, double beam, with rotated spring, cap. 310 g, sens. 0.01 g, Torbai ST-1 torsion type	4	A 1376-S30
Balance, Chans Dial-O-Gram, cap. 2610 g, sens 0.1 g with stain- less steel scoop	2	A 1381-H26
Plastic scoop for above	3	H40
Barometer aneroid	1	G BHL-500-D
Blender, Waring, SS jar	2	A 3390-D35
Caliper gauge, vernier, stainless	1	G GMH-420-X
Carts, laboratory	3	A 2419-C10
Cathetometer, 100 cm, with	1	A 2442-C65

<u>Item</u>	<u>Qty</u>	<u>Cat. No.</u>
Cement setting time tester	1	A 2463-B10
Spare needles	5	B25
Spare molds	10	B40
Chlorine comparator 0.1-4ppm	1	A 2687-C45
Sample cells	12	C52
Ortho tolidine	100 g	A C819-R55
Deionizer, gravity feed	1	G DCF-330-U
Resin cartridges, pack of 4	3x4	G DCF-350-010D
	5	G BMT-510-030N
Galvanometer, light spot	1	G EHG-690P
Fuses, 100 mA	5	G ECF-630-050P
Heating mantles, 100 mL	4	G HEA-400-050V
Heating elements, 100 mL	4	420-050H
Heating mantles, 250 mL	4	G HEA-470-070M
E with internal regulator 500	4	090G
E with internal regulator 1000	4	110D
E with internal regulator 2000	4	130U
Heating elements 250 mL	8	G HEA-490-070V
Heating elements 500 mL	8	090P
Heating elements 1000 mL	8	110M
Heating elements 2000 mL	8	130G
Hotplate, Corning	3	G HPS-200-010B
Hotplate, H57 x 305 mm	2	G HPS-460-050A
Thermohygrometer, hair	2	G HYT-410-K
Hygrometer, wet-dry bulbs	1	G HYT-470-030F
Hygrometer, wicks	2x10	490-030X
Hygrometer, tables	1	490-506X
Labelling kit	1	G LAB-470-T
Labels for above	2x1000	474-010P
Label tape, 38 mm	2x3	030-J
Label tape, 51 mm	2x3	502-R
Labelmaker	1	G LAB-500-X
Label tape, black	2x3 m	LAB-520-030X
Label tape, blue	2x3 m	LAB-520-050Y
Label tape, green	2x3 m	LAB-520-070C
Label tape, red	2x3 m	LAB-520-090T
Technical character wheel	1	514P
Tape, paper (masking)	5 rolls	G LAB-970-C

<u>Item</u>	<u>Qty</u>	<u>Cat. No.</u>
Magnetic stirrer, Gallenkamp, auto-reversing	5	G SWT-360-010Y
Magnetic stirrer/hotplate, Corning	5	G SWT-930-010E
Magnetic stirrer/hotplate, three-test, Gallenkamp	1	G SWT-740-010N
Support rods for above, 12 mm, Cd-plated steel, 750mm	10	G STA-800-070Y
Support rods for above, 12 mm, Cd-plated steel, 1000mm	10	G STA-800-090C
<u>Magnetic followers</u>		
PTFE covered, 12 mm	2x5	G SWX-350-050J
PTFE covered, 20 mm	8x3	070D
PTFE covered, 40 mm	8x3	130L
PTFE covered, 60 mm	8x1	150F
PTFE covered, star head 10x8 mm	3	G SWX-390-030K
PTFE covered, star head 17x13mm	10	050E
PTFE covered, start head 22x15mm	10	070V
PTFE covered, star head 40x14	5	110M
Mill, ball, PASCALL, 26	1	G MPF-330-W
Porcelain pot, 0.5 L	4	340-030G
Porcelain pot, 1 L	4	050A
Porcelain pot, 2.5 L	2	070R
Ball charge for 0.5 L	4	344-030F
Ball charge for 1 L	4	050W
Ball charge for 2.5 L	2	070Q
Manometer, Princo, mercury, glass jacketed, ready to use	1	A 6395-J10
Manometer, Griffin	1	G GML-200-E
Paper chromatography tank and accessories	1	G CJA-654-M
Paper for chromatography Whatman No. to fit above tank, pack of 100 sheets	3 packs	G CJF-250-050D
Whatman No. 4, ditto	1 pack	600-050G
Ultraviolet lamp box for paper chromatography	1	F 50719-590
Goggles, UV safety	3	A-5774-F10
Blower, hot air portable	2	G CJD-550-X

Thin-layer chromatography

<u>Item</u>	<u>Qty.</u>	<u>Cat. No.</u>
Quickfit (or Desaga)	1	G CJK-520-L
Spare plates 200x50 mm	1x20	540-110N
Spare plates 200x100 mm	2x20	130H
Spare plates 200x200	2x20	150B
TLC spot collector funnel	3	G CJK-650-F
Pipets, micro, "Transfer-pipette" 5 mL	2	G PMP-720-030A
Pipets, micro, "Transfer-pipette" 10 mL	2	050R
Pipets, micro, "Transfer-pipette" 20 mL	2	070L
Pipets, micro, "Transfer-pipette" 50 mL	2	090F
Pipets, micro, "Transfer-pipette" 100 mL	2	110C
Pipets, micro, "Transfer-pipette" 200 mL	2	130T
Pipets, micro, "Transfer-pipette" 500 mL	2	150N
Pipets, micro, "Transfer-pipette" 1000 mL	2	170H
Pipet tips for above	1x1000	G PMP-724-502H
Pipet tips for above	1x1000	506W
Rotary evaporator	2	G EVF-530-010K
Water bath for above	2	G EVF-542-690M
Rotary seal complete	1	130E
Joint locks, polypropylene	5x5	190J
Flasks for evaporator, 100 mL, 24/29	10	G QFH-150-U
Rack for drying glassware	4	G DRF-380-E
Salinity-tester, portable		A 3252-K20
Salinity-temperature probe	2	K30
Platinizing solution, 2 oz	2 Oz	K40
<u>Safety equipment</u>		
Glasses (eyeshield)	60	G SAP-290-E
Coats, laboratory		
Men 96 cm	30	G SAM-420-030M
Men 100 cm	40	050G
Men 108 cm	40	070A

<u>Item</u>	<u>Qty.</u>	<u>Cat. No.</u>
Men 112 cm	20	G SAM-420- 090R
Women 88 cm	15	G SAM-425-030F
Women 92 cm	20	050W
Women 96 cm	20	070Q
Women 100 cm	10	090K
Shaker, orbital, range 40-400 cycles/min	2	G SGM-300-010U
Flask platforms 36x250 mL	4	G INR-270-514N
Flask platforms 28x500	4	519D
Flask platforms 18x100	2	523M
Shaker, orbital, refrigerated, 20° below ambient to 70°C	1	G INR-250-110J
Spares kit	2	G INR-265-1105
Sieve shaker	1	G SIH-780-J
Sieve, stainless frame mesh 4mm	2	460-060G
mesh 3.35 mm	2	.070D
mesh 2.80 mm	2	080A
mesh 2.36 mm	2	090U
mesh 2 mm	2	100U
mesh 1.70 mm	2	110R
mesh 1.40 mm	2	120X
mesh 1.18 mm	2	130L
mesh 1 mm	2	140Y
mesh 850 um	2	150F
mesh 710 um	2	160C
mesh 600 um	2	170W
mesh 500 um	2	180T
mesh 425 um	2	190Q
mesh 355 um	2	200Q
mesh 300 um	2	210N
mesh 250 um	2	220K
mesh 212 um	2	230H
mesh 180 um	2	240E
mesh 150 um	2	250B
mesh 125 um	2	260V
mesh 106 um	2	270S
mesh 90 um	2	280P
mesh 75 um	2	290M

<u>Item</u>	<u>Qty.</u>	<u>Cat. No.</u>
Sieve, stainless frame mesh 63 um	2	300M
mesh 53 um	2	310J
mesh 45 um	2	320G
mesh 38 um	2	330D
Sieve brush, 12 mm	3	BUR-750C
Cover and receiver set, stainless	2 sets	G SIH-470-502Q
Sieve analysis graph paper	5 pads	SIH-550-A
Soxhlet water bath, stainless steel, for 6 flask	2	G EXP-300-010R
Spare heaters	3	320-010D
Sohlet assembly-extractor, condenser, flask (150 mL)	24	G EXP-630-030M
Thimbles, sintaglass, 22x80 mm, porosity 1	24	700-030C
Thimbles, sintaglass, 22x80 mm porosity 3	24	700-230R
Thimbles, paper, Whatman single thickness	10x25	800-110T
Double thickness	10x25	830-110V
Spatula, vibrating, Mettler	2	G SMK-750-030Q
Stopwatches, Hener, 1/5 sec		8790-F10
Stopwatches, Hener, 1/100 min	2	8790-F20
Stopwatch, portable electronic, digital, Hener	1	G TKM-600-M
Batteries for above Eveready alk. MV 1500	16	
Supports, jack 170x160 mm	3	G STK-220-030A
280x260 mm	3	050R
Rods for above	6	G STA-860-070M
Nuts for above, stainless	8	
Supports, funnel, hardwood	3	A 5262-J11
Transformers, variable input 240V, output 3A	4	G EFT-700-070K
8A	2	090E
Thermometer, digital, 0-150°	1	G THV-460-V
Vacuum pump, oil vac. 5x10 ⁻⁴ mbar, 5.6m ³ /h	2	G PYB-930-010X
Volt-ohm-ammeter, portable, Simpson 260-6	1	A 9740-M12

<u>Item</u>	<u>Qty.</u>	<u>Cat. No.</u>
Water bath, Gallenkamp, 6-place, stainless steel	2	G BJE-800-010B
Water still, Manesty OOB 4.5 L/hr	3	G WGS-290-110X
Spare heating elements	6	WGS-310-010U
Spare lids	3	110Q
Baffle caps	3	WGS-240-210W

III. D. Sample Preparation Equipment and Supplies for Emission Spectroscopy

(Catalog of Spex Industries GmbH)

<u>Description</u>	<u>Qty.</u>	<u>Cat. No.</u>
Enclosed "Shatterbox" (motorized grinder and blender)	1	8510
Rack to hold grinding dishes	1	8507R
Hardened steel grinding containers	3	8507
Tungsten carbide grinding container	1	8508
Mixer mill	1	5100
Plastic vials (½ x 1")	1 M	3100
Plastic vials (½ x 2")	1 M	3116
Plastic vials (¾ x 2")	1 M	6133
Balls (3/8"), methacrylate	3 M	3112
Vials, stainless steel (½ x 1") and ball	4	3114
Vials, hardened steel (½ x 1") and ball	4	3117
Vials, hardened steel (¾ x 2") and ball	4	3127
Sieve set, nylon	1	3536
Screens, nylon, 100 mesh	1 doz	3531
Screens, nylon, 200 mesh	1 doz	3532
Screens, nylon, 325 mesh	1 doz	3533
Screens, nylon, 400 mesh	1 doz	3534
Trays, methacrylate	2	3535

<u>Description</u>	<u>Qty.</u>	<u>Cat. No.</u>
Funnel for filling 1/4" electrodes	1	3001
Tweezers for handling electrodes	1	3503
Plastic electrode stand for 1/4" electrodes	1	3051
Emission element standards (49 elements, concentrations of 0.1%, 0.01%, 0.001% and 0.0001% in graphite), G standards, 2 g of each	5 sets	1002
Emission element standards (49 elements, concentrations of 0.1%, 0.033%, 0.01%, 0.0033%, 0.001%, 0.00033% and 0.0001% in graphite, plus 0.1% indium internal standard), G-7 standards, 2g of each	2 sets	10027
Graphite powder, high purity, less than 100 mesh	16 doz	4061
Graphite rods, 12" long	3x50	4086
Sample electrodes, necked crater, 1/4", 5/32 deep	2x100	4000
Sample electrodes, necked crater, 1/4", 1/16" deep	2x100	4016
Counter electrodes, 1/4", 120°	2x100	4010
Counter electrodes, 1/8", flat	100	4071
Counter electrodes, 1/4", 1/6" V	2x100	4041

III. E. Glass and Plastic Supplies

The numbers given here are from the Catalog of the Arthur H. Thomas Co. of the USA. It was used because of:

- (1) Personal familiarity with it,
- (2) The high quality of the products it lists,
- (3) Its clarity and completeness.

A European bidder should be able to offer many equivalent products. However, it will be important to be consistent in standard taper ware (denoted by E) which must all fit together. If the 24/40 size is available in European products, it would be desirable to offer it. If not, a single, comparable size should be offered, e.g. of Quickfit. Some Gallenkamp catalog numbers are given in a table that follows:

<u>item</u>	<u>Cat. No.</u>	<u>Size</u>	<u>Qty.</u>
Adapter tube, 105° angle one S 24/40 outer joint Pyrex	1032-C28	180 mm	1x2
Adapter tube, 105° angle two S 24/40 joints, inner and outer, Pyrex	1032-D38	180 mm	1x12
Adapter tube as above, but with side tube for vacuum	1032-F63	180 mm	1x6
Adapter distilling, two lower, inner S 24/40 joints parallel, upper S 10/30 joint for thermometer	3942-G12	200 mm	3x1
Adapter, distilling, straight, inner and outer S 24/40 joints, side tube for vacuum	3942-C10	137 mm	2x1
Beakers, Pyrex, Griffin graduated	1530-F28	10 ml	2x48
Beakers, Pyrex, Griffin, graduated	1531-H48	20 ml	2x48
Beakers, Pyrex, Griffin, graduated	H58	30 ml	2x48
Beakers, Pyrex, Griffin, graduated	H68	50 ml	2x48
Beakers, Pyrex, Griffin, graduated	H78	100 ml	4x48
Beakers, Pyrex, Griffin, graduated	H88	150 ml	4x48
Beakers, Pyrex, Griffin, graduated	J13	250 ml	4x48
Beakers, Pyrex, Griffin, graduated	J23	400 ml	4x48
Beakers, Pyrex, Griffin, graduated	J33	600 ml	3x36
Beakers, Pyrex, Griffin, graduated	J43	800 ml	3x24
Beakers, Pyrex, Griffin, graduated	J53	1000 ml	3x24
Beakers, Polypropylene or polymethylpentene	1542-E36	150 ml	1x12
or polymethylpentene	E48	250	1x36
or polymethylpentene	E58	400	1x36

<u>Item</u>	<u>Cat. No.</u>	<u>Size</u>	<u>Qty.</u>
or polymethylpentene	E68	600	1x24
"	E78	1000	3x12
"	E88	2000	5x6
"	E98	4000	2x4
Bottles, narrow mouth, with ground glass stoppers	1744-F21	60	4x6
Bottles, narrow mouth, with ground glass stoppers	F31	125	4x6
Bottles, narrow mouth, with ground glass stoppers	F43	250	1x36
Bottles, narrow mouth, with ground glass stoppers	F53	500	1x24
Bottles, narrow mouth, with ground glass stoppers	F63	1000	1x24
Bottles, narrow mouth, with ground glass stoppers	F73	2000	1x6
Bell jar, micro, Pyrex ground glass plate	1577-Q13	i.d.72mm, ht 94	1x4
Bell jar (vacuum chamber) polycarbonate, vacuum base	1577-T13	i.d.168mm, ht 235	1x2
Bell jar base plate	1577-T30	o.d.191mm	2x1
Bottles with handle and screw cap, colorless glass, PVC coated	1728-E32	1 gal.	1x6
Bottles with handle and screw cap, amber glass, PVC coated	1728-F17	1 gal.	1x4
Bottles, Pyrex, heavy welted neck	1729-B23	2.5 gal	1x4

<u>Item</u>	<u>Cat. No.</u>	<u>Size</u>	<u>Qty.</u>
Bottles, Pyrex, heavy walted neck	1729-B40	5 gal	2x1
Bottle stoppers, replacements for those in 1744-F21 to F73	1750-A20	Ø 19	15x1
Bottle stoppers, replacements for those in 1744-F21 to F73	A40	Ø 24	6x1
Bottles, aspirator, with outlet near bottom, Pyrex	1752-D23	2 L	1x6
Bottles, wide mouth, resistance glass	1739-T23	60 ml	1x36
Bottles, wide mouth, resistance glass	T33	125 ml	1x36
Bottles, wide mouth, resistance glass	T43	250 ml	1x24
Bottles, wide mouth, resistance glass	T53	500 ml	1x12
Bottles, wide mouth, resistance glass	T63	1000 ml	1x12
Bottles, wide mouth, resistance glass	T73	2000 ml	1x6
<u>Bottles, reagent, M.C.A. color-coded</u>			
Acetic acid	1779-F05	500 ml	4x1
Ammonium hydroxide	F21	500 ml	4x1
Hydrochloric acid, Con.	F29	500 ml	4x1
Hydrochloric acid, Dil.	F31	500 ml	4x1
Nitric acid, Con.	F37	500 ml	4x1
Nitric acid, Dil.	F39	500 ml	4x1
Sodium hydroxide	F45	500 ml	4x1
Sulfuric acid, Con.	F51	500 ml	4x1
Sulfuric acid, Dil.	F53	500 ml	4x1
Blank	F95	500 ml	24x1
Bottles, dropping, screw cap, rubber bulb	1760-D33	30 ml	24x12
Extra droppers and caps for above bottles	1760-K28		24x12

<u>Item</u>	<u>Cat.No.</u>	<u>Size</u>	<u>Qty.</u>
Bottles, aspirator, poly propene, spigot type, screw cap	1753-E22	10 L	1x6
Bottles, aspirator, poly propene, spigot type, screw cap	1753-E32	20 L	1x4
Bottles, wide mouth square, lined screw cap, high density polypropene	1717-V50	8 Oz	2x12
Bottles, wide mouth square, lined screw cap, high density polypropene	1717-64	16 Oz	2x12
Burets, Teflon PTFE Stopcocks	1978-K13	10 ml	2x4
Burets, Pyrex, 10 ml with flared top, 0.05ml divisions, 50 ml with 0.1 ml, 100 ml with 0.2 ml	1978-K33	50 ml	5x4
Burets, Pyrex, 10 ml with flared top, 0.05ml divisions, 50 ml with 0.1 ml, 100 ml with 0.2 ml	1978-K43	100 ml	1x4
Burets as above but with bent tip left hand	1979-H23	50 ml	2x2
Burets as above but with bent tip, left hand	1979-H33	100 ml	2x2
Burets right hand Pyrex, two E 24/40 joints, drip tip	3213-M33	300 ml	2x4
Condensers, Friedrichs, with drip tip and two E 24/40 joints, upper one at side	3219-F80	-	2x1
Crucibles, porcelain, high form, glazed except bottom outside	3319-B55	30 ml	4x36
Crucible covers for above	3319-D47	45 mm	2x72
Connecting tube at 75° angle, 2 inner E 24/40 joints	5738-E14	105 mm	3x1
Connecting tube, still head, 2 E 24/40 inner joints one E 10/30	5738-H82	-	1x6
<u>Crucibles, filter, Pyrex, with fritted glass disc</u>			
Coarse (40-60 μm)	3321-C60	30 ml	1x12
Medium (10-15 μm)	C68	30 ml	1x12
Fine (4 - 5.5 μm)	C76	30 ml	1x12
Crucibles, Gooch, porcelain perforated bottom	3320-C44	25 ml	2x24
Crucible holder, Nalter	3322-H60	i.d.22-38mm	1x12

Cylinders, graduated, Pyrex, with rim of Teflon (PTFE)

<u>Item</u>	<u>Cat. No.</u>	<u>Size</u>	<u>Qty.</u>
10 ml flared at top	3548-Q57	10 ml	2x24
10 ml flared at top	Q63	25 ml	2x18
10 ml flared at top	Q69	50 ml	2x18
10 ml flared at top	Q75	100 ml	6x12
10 ml flared at top	Q81	250 ml	3x12
10 ml flared at top	Q87	500 ml	2x8
10 ml flared at top	Q93	1000 ml	3x4
Desiccators, Fruhling & Schuly, with porcelain plate	3754-F20	i.d.250 mm	10x1
Desiccator covers	3754-G20	i.d.250 mm	3x1
Dishes, evaporating, with spout, glazed	3820-E18	35 ml	1x48
Dishes, evaporating, with spout, glazed	E28	70 ml	2x48
Dishes, evaporating, with spout, glazed	E58	120 ml	4x24
Dishes, evaporating, with spout, glazed	E68	150 ml	4x18
<u>Filter papers</u>			
Whatman No. 1, circles	4712-B15	5.5 cm	50x100
" "	B30	11 cm	100x100
" "	B35	12.5	100x100
Whatman No. 2, circles	F15	5.5 cm	10x100
" "	F30	11 cm	20x100
" "	F35	12.5cm	20x100
Whatman No. 3, circles	K15	5.5 cm	10x100
" "	K30	11 cm	30x100
" "	K35	12.5cm	30x100
Whatman No. 4, circles	N15	5.5 cm	10x100
" "	N30	11 cm	20x100
" "	N35	12.5cm	20x100
Whatman No. 5, circles	R15	5.5 cm	10x100
" "	R30	11 cm	20x100
" "	R35	12.5cm	20x100
Whatman No. 40, circles	4716-E25	11 cm	30x100

<u>Item</u>	<u>Cat. No.</u>	<u>Size</u>	<u>Qty.</u>
Whatman No. 541, circles	M25	11 cm	30x100
Whatman No. 43, circles	S25	11 cm	30x100
Whatman No. 44, circles	U25	11 cm	30x100
Flasks, erlenmeyer, Kimax (or Pyrex), graduated	4882-H12	25 ml	1x48
Flasks, erlenmeyer, Kimax (or Pyrex), graduated	H18	50 ml	1x48
Flasks, erlenmeyer, Kimax (or Pyrex), graduated	H24	125 ml	4x48
Flasks, erlenmeyer, Kimax (or Pyrex), graduated	H36	250 ml	4x48
Flasks, erlenmeyer, Kimax (or Pyrex), graduated	H42	300 ml	2x48
Flasks, erlenmeyer, Kimax (or Pyrex), graduated	H48	500 ml	3x36
Flasks, erlenmeyer, Kimax (or Pyrex), graduated	H60	1000 ml	1x24
Flasks, erlenmeyer, Kimax (or Pyrex), graduated	H72	2000 ml	1x8
Flasks, erlenmeyer, Pyrex, glass stoppered, §	4896-N39	125 ml	8x12
Flasks, erlenmeyer, Pyrex, glass stoppered, §	N45	250 ml	8x12
Flasks, erlenmeyer, Pyrex, glass stoppered, §	N57	500 ml	6x8
Flasks, erlenmeyer, Pyrex, glass stoppered, §	N63	1000 ml	4x6
Flasks with § joint, round bottom, Pyrex, one 24/40 joint, short neck	4865-K18	100 ml	1x12
Flasks with § joint, round bottom, Pyrex, one 24/40 joint, short neck	K30	250 ml	1x12
Flasks with § joint, round bottom, Pyrex, one 24/40 joint, short neck	K42	500 ml	1x12
Flasks with § joint, round bottom, Pyrex, one 24/40 joint, short neck	K48	1000 ml	1x12

<u>Item</u>	<u>Cat. No.</u>	<u>Size</u>	<u>Qty.</u>
Flasks with $\text{\textcircled{F}}$ joint, round bottom, Pyrex, one 24/40 joint, short neck	K54	2000 ml	1x6
Flasks, as above, 3-neck, all $\text{\textcircled{F}}$ 24/40, at angle, Kimax	4929-R30	250 ml	1x4
Flasks, as above, 3-neck, all $\text{\textcircled{F}}$ 24/40, at angle, Kimax	R36	500 ml	1x4
Flasks, as above, 3-neck, all $\text{\textcircled{F}}$ 24/40, at angle, Kimax	R42	1000 ml	1x4
Flasks, filtering, Pyrex, heavy glass	4947-G17	250 ml	2x6
Flasks, filtering, Pyrex, heavy glass	G23	500 ml	2x6
Flasks, filtering, Pyrex, heavy glass	G29	1000 ml	2x6
Flasks, Kjeldahl, b.b., Long neck, Pyrex	4954-C24	100 ml	4x24
Flasks, volumetric, Pyrex, g.s. $\text{\textcircled{F}}$, Class A	4889-E31	10 ml	5x12
Flasks, volumetric, Pyrex, g.s. $\text{\textcircled{F}}$, Class A	4889-E37	25 ml	5x12
Flasks, volumetric, Pyrex, g.s. $\text{\textcircled{F}}$, Class A	E42	50 ml	5x12
Flasks, volumetric, Pyrex, g.s. $\text{\textcircled{F}}$, Class A	E49	100 ml	12x12
Flasks, volumetric, Pyrex, g.s. $\text{\textcircled{F}}$, Class A	E55	200 ml	5x12
Flasks, volumetric, Pyrex, g.s. $\text{\textcircled{F}}$, Class A	E61	250 ml	12x12
Flasks, volumetric, Pyrex, g.s. $\text{\textcircled{F}}$, Class A	E66	500 ml	5x12
Flasks, volumetric, Pyrex, g.s. $\text{\textcircled{F}}$, Class A	E72	1000 ml	6x6
Flasks, volumetric, Pyrex, g.s. $\text{\textcircled{F}}$, Class A	E78	2000 ml	3x4

<u>Item</u>	<u>Cat. No.</u>	<u>Size</u>	<u>Qty.</u>
Funnels, Pyrex, 60°, 150mm stem, mold pressed, fluted	5191-F30	50 mm	1x48
Funnels, Pyrex, 60°, 150mm stem, mold pressed, fluted	36	65 mm	1x48
Funnels, Pyrex, 60°, 150mm stem, mold pressed, fluted	42	75 mm	1x48
Funnels, Pyrex, 60°, 150mm stem, mold pressed, fluted	48	100 mm	2x24
Funnels, powder, polythene, ribbed outside	5197-U13	65 mm	1x12
Funnels, powder, polythene ribbed outside	U20	80 mm	1x12
Funnels, powder, polythene ribbed outside	U26	100 mm	2x6
Funnels, powder, polythene ribbed outside	U34	150 mm	3x4
Funnels, filter, Büchner, porcelain, fixed plate	5212-B22	43 mm	6x1
Funnels, filter, Büchner porcelain, fixed plate	B42	75 mm	1x6
Funnels, filter, Büchner porcelain, fixed plate	B54	111 mm	1x4
Funnels, filter, Büchner porcelain, fixed plate	B60	126 mm	2x2
Funnels, separatory, addition, pressure equalizing, PTFE stopcock, Pyrex, # 24/40	5237-L18	250 ml	1x4
Funnels, separatory, addition, pressure equalizing, PTFE stopcock, Pyrex, # 24/40	L24	500 ml	2x2
Funnels, separatory, Squibb type, PTFE stopcock, # g.s.	5246-R18	60 ml	1x4
Funnels, separatory, Squibb type, PTFE stopcock, # g.s.	R24	125 ml	2x4

<u>Item</u>	<u>Cat. No.</u>	<u>Size</u>	<u>Qty.</u>
Funnels, separatory, Squibb type, PTFE stopcock, 3/8 g.s.	R30	250ml	2x4
Funnels, separatory, Squibb type, PTFE stopcock, 3/8 g.s.	R36	500ml	2x4
Funnels, separatory, Squibb type, PTFE stopcock, 3/8 g.s.	R42	1000ml	2x2
Gas wash bottles, tall	3632-F40	250ml	6x1
Form, fritted glass cylinder 3/8 29/42 joint, extracoarse frit	F58	500ml	6x1
Glass joints, Pyrex, inner	5718-D21	3/8 10/30	1x12
inner	D45	24/40	4x12
outer	F21	10/30	1x12
outer	F45	24/40	4x12
Glass joints, Pyrex ball socket	5715-F15	3/8 35/20	1x12
Glass joints, Pyrex ball socket	K15	35/20	1x12
<u>Hydrometers, 305 mm long</u>			
sp. gr. 0.7-0.81	6025-C10		3x1
0.8-0.91	C15		3x1
0.9-1.0	C20		3x1
0.7-1.0	C25		3x1
1.000-1.220	M10		3x1
1.200-1.420	M15		3x1
1.400-1.620	M20		3x1
1.600-1.820	M25		3x1
1.800-2,000	M30		3x1
1.000-1.600	M35		3x1
1.500-2,000	M40		3x1
1.000-2,000	M45		3x1
<u>Hydrometers, Brix, with temperature correction scales</u>			
0-10° Brix	6030-L10		2x1
10-20°	L15		2x1

<u>Item</u>	<u>Cat. No.</u>	<u>Size</u>	<u>Qty.</u>
15-25°	L20		2x1
20-30°	L25		2x1
30-40°	L30		2x1
40-50°	L35		2x1
50-60°	L40		2x1
60-70°	L50		2x1
Hydrometer cylinders, with enlarged cup at top	3542-K30	38x300mm	4x1
Hydrometer cylinders, with enlarged cup at top	K40	50x400mm	4x1
Mortars and pestles, porcelain	6882-D16	90 ml	4x1
Mortars and pestles, porcelain	22	135 ml	4x1
Mortars and pestles, porcelain	28	275 ml	4x1
Mortars and pestles, porcelain	34	400 ml	4x1
Pipets, dropping (medicine droppers), glass, with rubber bulb, sturdy tip	7765-D10	127 mm	8x12
Pipet washing chamber one piece molded plastic	7792-H64	600 mm	2x1
Pipet carrier for above	7792-H88	600 mm	2x1
Pipets, transfer (volumetric), Class A, tempered ends	7406-E12	1 ml	5x18
Pipets, transfer (volumetric), Class A, tempered ends	E18	2 ml	5x18
Pipets, transfer (volumetric) Class A, tempered ends	E24	3 ml	3x18
Pipets, transfer (volumetric) Class A, tempered ends	E30	4 ml	3x18
Pipets, transfer (volumetric) Class A, tempered ends	E36	5 ml	10x18
Pipets, transfer (volumetric) Class A, tempered ends	E66	10 ml	10x18
Pipets, transfer (volumetric) Class A, tempered ends	E72	15 ml	5x18
Pipets, transfer (volumetric) Class A, tempered ends	E78	20 ml	10x18

<u>Item</u>	<u>Cat. No.</u>	<u>Size</u>	<u>Qty.</u>
Pipets, transfer (volumetric) Class A, tempered ends	E84	25 ml	10x18
Pipets, transfer (volumetric) Class A, tempered ends	F18	50 ml	5x12
Pipets, transfer (volumetric), Class A, tempered ends	F30	100 ml	3x12
<u>Pipets, measuring (graduated)</u>			
Pyrex, tempered ends 1/100 dia	7460-C54	1 ml	3x18
1/10 dia	C60	2 ml	3x18
1/10 dia	C75	5 ml	5x18
1/10 dia	C84	10 ml	5x18
1/10 dia	C93	25 ml	2x12
Plates, spot test, white porcelain, 12 wells	7812-C36	118x91 mm	2x12
Plates, spot test, black porcelain, 12 wells	7812-E39	118x91 mm	1x12
Plates, Pyrex, 12 wells, 3 different sizes	7812-G24	85x100mm	1x18
Specific gravity bottles (pyrometers) with thermometer, conical	8350-F12	10ml	5x2
	F24	50ml	5x2
Spray bottles, chromatographic, Thomas-John	2753-J10	240ml	2x6
Stoppers, E, full length, Pyrex	8764-D23	10/30	2x6
Test tubes, Pyrex, medium Thickness, with lip and Marking spot		75x10mm	10x24
		125x15mm	10x24
		150x20mm	10x24
Test tubes, Pyrex, threaded, with screw cap having PTFE Liner	9212-C23	100x13mm	5x24
	C44	125x16	5x24
with screw cap having PTFE Liner	C59	150x20	5x24
Additional caps for above test tubes	9212-N16	9 mm	5x12

<u>Item</u>	<u>Cat. No.</u>	<u>Size</u>	<u>Qty.</u>
Additional caps for above test tubes	9212-N25	9	5x12
	N34	12	5x12
Thermometers, 76 mm Immersion, nitrogen filled	9286-C16	-20 to 110°C	40x1
Thermometers, 76 mm Immersion, nitrogen filled	C22	- 5 to 150°C	40x1
Thermometers, 76 mm Immersion, nitrogen filled	C28	-5 to 200°C	20x1
Thermometers, 76 mm Immersion, nitrogen filled	C34	- 5 to 250°C	20x1
Thermometers, 76 mm Immersion, nitrogen filled	C40	- 5 to 360°C	20x1
Thermometers, § 10/30 joint, 76 mm immersion, nitrogen filled	9292-C10	-10 to 110°C	10x1
Thermometers, § 10/30 joint 76 mm immersion, nitrogen filled	C16	-10 to 250°C	10x1
Thermometers, § 10/30 joint 76 mm immersion, nitrogen filled	C22	-10 to 360°C	5x1
Washbottles, polythene squeeze type	9765-E26	500ml	8x12
Watchglasses, Pyrex	9787-F29	65mm	6x12
Watchglasses, Pyrex	F35	75 mm	6x12
Watchglasses, Pyrex	F41	90 mm	6x12
Watchglasses, Pyrex	F47	100 mm	6x12
Watchglasses, Pyrex	F53	125 mm	6x12
Watchglasses, "Speedyvap" Pyrex, with 3 ribs underneath	9787-K10	3" 4½"	3x12 3x12
Weighing bottles, flat top, §	9868-B24	25x40 mm	2x18
Weighing bottles, low form, sealed stopper, §	9870-F18	50x30	5x6
Weighing papers, S&S, No. B-2	9885-M45	4x4"	10x500

<u>Item</u>	<u>Cat. No.</u>	<u>Size</u>	<u>Qty.</u>
<u>From Gallenkamp Catalog</u>			
Rings, cork	CSD-340-010E	75x45	2x5
Rings, cork	030V	115x85	2x5
Rings, cork	050P	150x120	2x3
Stoppers, cork	CSD-460-010F		1x330
Stoppers, cork	030W		1x330
Stoppers, cork	050Q		1x300
Stoppers, cork	070K		1x280
Stoppers, cork	090E		1x225
Stoppers, cork	110B		1x190
Stoppers, cork	130S		1x150
Stoppers, cork	150M		1x110
Stoppers, cork	170G		1x80
Stoppers, cork	190A		1x65
Stoppers, cork	210U		1x50
Stoppers, cork	230X		1x45
Stoppers, cork	250Y		1x40
Stoppers, cork	270C		1x38
Stoppers, cork	290T		1x35
Stoppers, cork	310Q		1x30
Stoppers, cork	330K		1x25
Stoppers, cork	350E		1x20
Stoppers, cork	370V		1x15
Stoppers, cork	390P		1x12
Stoppers, cork	410M		1x11

<u>Item</u>	<u>Cat.No.</u>	<u>Bore</u>	<u>Wall</u>	<u>Qty.</u>
Tubing, natural rubber, normal wall, B.S. 2775	TWR-250-170J	8 mm	2 mm	2x10 m
Tubing, natural rubber normal wall, B.S. 2775	192W	10 mm	2 mm	2x10 m
Tubing, natural rubber normal wall, B.S. 2775	212T	125 mm	2.25mm	4x10 m
Tubing, natural rubber normal wall, B.S. 2775	232N	16 mm	3.25mm	4x10 m

<u>Item</u>	<u>Cat. No.</u>	<u>Bore</u>	<u>Wall</u>	<u>Qty.</u>
Tubing, natural rubber, normal wall, B.S. 2775	272B	20 mm	3.25 mm	2x10 m
Tubing, natural rubber, normal wall, B.S. 2775	292S	25 mm	3.25 mm	2x10 m

<u>Item</u>	<u>Cat. No.</u>	<u>Bot. dia.</u>	<u>Qty.</u>
Stoppers, natural rubber, B.S. 2775, solid	SYH-450-030H	3	1x20
Stoppers, natural rubber, B.S. 2775, solid	040E	4	1x20
Stoppers, natural rubber, B.S. 2775, solid	050B	5	1x20
Stoppers, natural rubber, B.S. 2775, solid	060V	6	1x20
Stoppers, natural rubber, B.S. 2775, solid	070S	7	1x20
Stoppers, natural rubber, B.S. 2775, solid	080P	8	1x20
Stoppers, natural rubber, B.S. 2775, solid	090M	9	1x20
Stoppers, natural rubber, B.S. 2775, solid	100M	10	1x20
Stoppers, natural rubber, B.S. 2775, solid	110J	11	1x20
Stoppers, natural rubber, B.S. 2775, solid	120G	13	1x20
Stoppers, natural rubber, B.S. 2775, solid	130D	15	1x20
Stoppers, natural rubber, B.S. 2775, solid	140A	17	1x20
Stoppers, natural rubber, B.S. 2775, solid	150U	19	2x10
Stoppers, natural rubber, B.S. 2775, solid	160R	21	2x10

<u>Item</u>	<u>Cat. No.</u>	<u>Bot.dia.</u>	<u>Qty.</u>
Stoppers natural rubber, B.S. 2775, solid	170X	23	2x10
Stoppers natural rubber, B.S. 2775, solid	180L	25	2x10
Stoppers natural rubber, B.S. 2775, solid	190Y	27	2x10
Stoppers natural rubber, B.S. 2775, solid	200Y	29	2x10
Stoppers natural rubber, B.S. 2775, solid	210F	31	2x10
Stoppers natural rubber, B.S. 2775, solid	220C	33	2x10
Stoppers natural rubber, B.S. 2775, solid	-230W	35	2x10
Stoppers natural rubber, B.S. 2775, solid	-240T	37	2x10
Stoppers natural rubber, B.S. 2775, solid	-250Q	39	2x10
Stoppers natural rubber, B.S. 2775, solid	-260W	41	4x5
Stoppers natural rubber, B.S. 2775, solid	-270K	43	4x5

III. F. Metal Supplies

(A indicates catalog of Arlhur H. Thomas Co.,
G is Gallenkamp)

<u>Item</u>	<u>Cat. No.</u>	<u>Qty.</u>
Acid digestion bomb, Parr	A 3924-A10	3
Bomb cup, with cover, PTFE	A 3924-A50	3
Aspirators (filter pumps)	A 4790-L10	12
Burner, Tirrils, for LP gas	A 2066-D10	24
Burner, Meker, for LP gas	A 2069-B30	8
Clamps, extension, small, vinyl covered jaws, Al	A 2826-C10	48
Clamps, extension, large, vinyl covered jaws, Al	C65	48

<u>Item</u>	<u>Cat. No.</u>	<u>Qty.</u>
Clamp holders, right angle, limit 13 mm rod, Al	F10	48
Clamp holders, right angle, limit 19 mm rod, Al	F30	48
Clamp, large, cap. 89 mm, vinyl covered jaws, Al, with holder	J50	48
Clamp, small, castalloy-R, with holder, adjustable at any angle, vinyl covered jaws, cap. 19 mm	A 2831-070	48
Clamp, large castalloy-R with holder, adjustable at any angle, vinyl covered jaws, large, cap. 38 mm	D85	48
Clamps, buret, double	A 2833-E11	12
Clamps, gas cylinder Thomas, for bench	A 5592-C12	10
Cork borers, set of 18	G CSD-550-050P	4 sets
Cork borer sharpener	G CSD-570-Q	1
Cork boring machine with set of 15 borers	G CSD-600-L	1
Crucibles, platinum, 30 ml	G CWB-400-110T	3
Gas with lid cylinder trolley	G GGM-700-070W	1
<u>Sample divider, riffle type</u>		
12x1/4" openings	G SBX-450-R	1
12x1/2" openings	G SBX-480-T	1
12x1" openings	G SBX-550-J	1
Shears (scissors) 150 mm	A 8308-S10	6
Storage cabinets, metal with plastic drawers supports, porcelain	G TOL-470-050W	4
127x178x508 mm	A 8838-A20	10
165x216x610 mm	A30	10
<u>Storage cabinets, metal, plastic drawers for burets</u>		
356x178x610 mm	A 8838-M24	10

<u>Item</u>	<u>Cat. No.</u>	<u>Qty.</u>
<u>Storage cabinets, metal, plastic drawers for burets</u> Contd/...		
229x244x610 mm	S24	5
229x244x915 mm	S36	5
<u>Support rings, zinc plated steel, Al Clamp</u>		
64 mm diam.	A 8091-C22	4x5
89 mm diam.	C32	4x5
114 mm diam.	C42	4x5
<u>Support Rods, straight shank</u>		
52 mm diam.	A 8092-C30	20
75 mm diam.	C35	20
100 mm diam.	C40	20
125 mm diam.	C45	20
<u>Support rings, split</u>		
44 mm diam.	A 8092-K10	10
60 mm diam.	K20	10
92 mm diam.	K40	10
Swing-arm support plate, porcelain, 114 mm square with clamp	A 8855-S10	2
Tongs, crucible, stainless steel	A 9395-H45	10
Tongs with chromel tips for for platinum	A 9395-H35	2
Tongs, beaker	A 1557-S23	4
Fiberglass covers for tongs	S30	1x8
Tongs (beaker), vinyl covered	S80	4
Tongs (dish) stainless	A-3850-H10	2
<u>Triangles</u>		
1½ inches	A 9476-L10	1x10
2 inches	L18	1x10
2½ inches	L34	1x10
3 inches	L42	1x10

Wire gauze, nichrome

<u>Item</u>	<u>Cat. No.</u>	<u>Qty.</u>
5 inch	A 9930-N20	3x12
6 inch	N26	3x12
Scoop, stainless steel 260x75 mm	G SMJ-280-050Q	4

Spatulas, stainless steel

100x5 mm	730-030R	5x3
150x8 mm	070F	5x3
200x10 mm	090W	5x3
Spatulas, with handle 75x15 mm	SMK-460-030K	10
100x20 mm	050E	10
150x25 mm	070V	10
Spatulas, with handle 100x20 mm	SMK-400-030G	10
200x30 mm	070R	10
300x45 mm	110Y	10

III. G. Chemicals

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
10001-6X	Acetic acid, glacial	AnalaR	8x2.5 L
10002-3N	Acetic anhydride	"	500 ml
10003-6S	Acetone	"	16x2.5 L
15214-5J	Acetone for chromatography	"	2x1 L
29220-4G	Acetonitrile	-	6x500 ml
27035-3A	Acetylacetone	"	4x500 ml
10004-2Q	Acetyl bromide	"	2x25 ml
10005-3T	Acetyl chloride	"	2x100 ml
27044-3B	Acrolein	min 98%	250 ml
27046-3F	Acrylic acid	-	250 ml
33004-3V	Agar, fine powder	-	250 g
37005-5W	D-Alanine	min 99%	25 g
37006-4A	L-Alanine	min 99%	25 g
44004-3J	Albumin, crystallized bovine	-	5 g

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
20001-2Q	Alizarin (pH indicator)	-	10 g
20002-2S	Alizarin red (pH indicator)	-	5 g
20004-2W	Alizarin yellow G (pH indicator)	-	5 g
23001-4K	Alkaline coppersoln (Folin & Wu)	-	500 ml
15144-2L	n-Alkane reference mixture (C ₅ -C ₈)		25 ml
15145-2N	n-Alkane reference mixture (C ₉ -C ₁₂)		25 ml
27056-5K	Allyl alcohol	min 98%	1 L
27058-3M	Allyl bromide	-	4x250 ml
27059-4P	Allyl chloride	-	2x500 ml
27065-3J	Aluminium metal, powder	min 98%	500 g
10007-3A	Aluminium ammonium sulfate AlNH ₄ (SO ₄) ₂ .12H ₂ O	AnalaR	500 g
27073-4J	Aluminium chloride		500 g
27078-3S	Aluminium lithium hydride AlLiH ₄		25 g
10300-4W	Aluminium nitrate Al(NO ₃) ₃ .9H ₂ O	AnalaR	500 g
15141-4W	Aluminium oxide active Brockmann Grade I	Acidic	500 g
15140-4F	Aluminium oxide active Brockmann Grade I	basic	500 g
15139-4U	Aluminium oxide active Brockmann Grade I	neutral	500 g
15003-3R	Aluminium Oxide for TLC + 15% calcium sulfate binder		2x500 g
10009-3E	Aluminium potassium sulfate AlK(SO ₄) ₂ .12H ₂ O	AnalaR	500 g
13007-3P	Aluminon	-	10 g
10011-75	Ammonia solution	AnalaR	2(8x2.5 L)
10013-3S	Ammonium acetate CH ₃ COONH ₄	AnalaR	250 g

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
27147-5N	Ammonium carbonate (NH ₃ 30-33%)		1 Kg
10016-3B	Ammonium ceric nitrate (NH ₄) ₂ (Ce(NO ₃) ₆)	AnalaR	100 g
10017-3D	Ammonium chloride NH ₄ Cl	AnalaR	500 g
10021-3R	Ammonium ferric sulfate (NH ₄ Fe(SO ₄) ₂ ·12H ₂ O)	AnalaR	500 g
10022-3T	Ammonium ferrous sulfate (NH ₄) ₂ Fe(SO ₄) ₂ ·6H ₂ O	AnalaR	500 g
10302-5E	Ammonium hydrogen carbonate NH ₄ HCO ₃	AnalaR	1 Kg
10352-2Q	Ammonium iodide	AnalaR	100 g
10028-2H	Ammonium molybdate (NH ₄) ₆ Mo ₇ O ₂₄ ·4H ₂ O	AnalaR	2x100 g
27078-3S	Aluminium lithium hydride	-	25 g
10030-3S	Ammonium nitrate	AnalaR	500 g
10032-3W	Ammonium persulfate (NH ₄) ₂ S ₂ O ₈	-	500 g
27199-4Y	Ammonium sodium hydrogen orthophosphate NH ₄ NaHPO ₄ ·4H ₂ O		500 g
10033-3B	Ammonium sulfate (NH ₄) ₂ SO ₄	AnalaR	500 g
10034-3D	Ammonium sulfide solution (NH ₄) ₂ S	AnalaR	500 ml
10036-3H	Ammonium thiocyanate NH ₄ SCN	AnalaR	250 g
10037-4K	Amyl acetate	AnalaR	1 L
10038-3L	Amyl alcohol	AnalaR	500 ml
44005-3L	Aneurine hydrochloride		10 g
10041-3A	Aniline	AnalaR	250 ml
27229-4X	Aniline hydrochloride	-	500 g
27233-2D	O-Anisidine	min 98%	100 ml

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
27234-2F	m-Anisidine	min 98%	2x25 ml
27235-2H	p-Anisidine	99-101%	100 g
33009-3Y	Anti-bumping granules	-	2x250 g
10042-3C	Antimonyl potassium tartrate $\text{KSbOC}_4\text{H}_4\text{O}_6$	AnalaR	100 g
15089-2G	Apiezon grease L	-	50g tube
38007-3G	D(-) Arabinose	-	10 g
38008-2H	L(+) Arabinose	-	10 g
37190-2P	L-Arginine	min 98%	25 g
27268-4B	Arsenic acid	75%	500 ml
10044-3G	Arsenic trioxide	AnalaR	100 g
33014-4C	Asbestos for Gooch crucibles	-	500 g
10303-3E	L-Ascorbic acid	AnalaR	100 g
37022-3U	L-Aspartic acid	min 99%	100 g
15005-3V	Azobenzene for chromatography		100 g
10046-4L	Barium carbonate	AnalaR	500 g
10047-4N	Barium chloride $\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$	AnalaR	500 g
10048-3X	Barium hydroxide $\text{Ba}(\text{OH})_2 \cdot 8\text{H}_2\text{O}$	AnalaR	500 g
10049-4R	Barium nitrate $\text{Ba}(\text{NO}_3)_2$	AnalaR	500 g
33017-4Y	Beeswax, white	-	500 g
26022-5L	Bentonite powder technical		1 Kg
10051-2C	Benzene	AnalaR	10x1 L
14078-4V	Benzene, special for spectroscopy		500 ml
15235-5R	Benzene special for chromatography		4x1 L
10052-5H	Benzoic acid	AnalaR	500 g
27338-2R	Benzophenone	min 99%	100 g
10054-3J	Benzoyl Chloride	AnalaR	100 ml
27355-2R	Benzylamine		100 ml
44011-4H	D-Biotin	99-102%	1 g
10057-3P	Bismuth nitrate $\text{Bi}(\text{NO}_3)_3 \cdot 5\text{H}_2\text{O}$	99-102%	100 g

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
10058-3R	Boric acid H_3BO_3	99-102%	500 g
27419-4T	Boron trifluoride methanol complex 14% BF_3	-	500 ml
20010-2R	Brilliant orange		5 g
10059-IR	Bromine (in sealed tubes)	AnalaR	12x1 ml
27434-3X	Bromobenzene	min 97%	250 ml
20013-3B	Bromocresol green, water soluble		5 g
27459-2G	Bromoform		100 ml
20017-3J	Bromophenol blue, water soluble		5 g
20018-3L	Bromophenol red		5 g
20021-3A	Bromothymol blue, water soluble		5 g
13019-3W	Brucine		25 g
10061-5Y	Butan-1-ol	AnalaR	1 L
10316-5P	Butan-2-ol	AnalaR	1 L
15023-4B	Butanone, special for chromatography		2x500 ml
10337-4W	n-Butyl acetate	AnalaR	500 ml
27503-4Y	iso-Butyl acetate	-	500 ml
33154-2Q	Buffer tablets pH 4.0	-	3x50
33155-2S	Buffer tablets pH 7.0	-	3x50
33156-2U	Buffer tablets pH 9.2	-	3x50
27570-3E	n-Butylamine	-	250 ml
27515-3X	Butylated hydroxyanisole	-	2x100 g
27535-4V	n-Butyric acid	-	500 ml
10318-3R	Cadmium nitrate	AnalaR	250 g
27574-3H	Caffeine	-	100 g
44014-2L	Calciferol (vitamin D_2)(+4°)	-	1 g
10068-3U	Calcium carbonate	AnalaR	500 g
27587-4R	Calcium chloride $CaCl_2$ fused, 8-16 mesh	-	3x500 g
10070-3H	Calcium chloride dihydrate $CaCl_2 \cdot 2H_2O$	AnalaR	2x250 g

<u>BDM No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
27592-5L	Calcium fluoride (fluorspar)		1 Kg
27599-5C	Calcium hydroxide Ca(OH)_2	-	2 Kg
10304-4H	Calcium hydroxide Ca(OH)_2	AnalaR	500 g
10305-4J	Calcium nitrate hydrated $\text{Ca(NO}_3)_2 \cdot 4\text{H}_2\text{O}$	AnalaR	500 g
15010-4P	Calcium oxide for chromatographic analysis		500 g
27622-6S	Calcium sulfate (plaster of Paris) $\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$	-	3 Kg
10071-3J	Calcium sulfate dihydrate $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$	AnalaR	250 g
13026-3T	Calgamite	-	5 g
32124-2C	Capillary tubes, hard glass for m.pt. detn.		
33171-3R	Carbon beads		3x250 g
10072-7P	Carbon disulfide	AnalaR	5 L
14001-2H	Carbon disulfide for infrared spectry.		500 ml
10074-3P	Carbon tetrachloride	AnalaR	2x500 ml
33024-4F	Carborundum powder, coarse, 24 grit		500 g
33025-4H	Carborundum powder, medium, 80 grit		500 g
33026-4J	Carborundum powder, fine, 180 grit		500 g
11032-3D	Carbosorb AS, 14-22 mesh	MAR	3x100 g
27651-3W	Carminic acid	Purified	5 g
44018-4V	Casein, fat free, vitamin free		500 g
27564-4J	Cellulose acetate	100-140C ^S	500 g
27657-3L	Ceric sulfate, $\text{Ce(SO}_4)_2 \cdot 4\text{H}_2\text{O}$	Min. 98%	100 g
33030-5B	Charcoal, animal, granula		1 Kg
33032-6G	Charcoal, decolorizing powder, activated.		3 Kg
10338-5C	Chlorobenzene	AnalaR	1 L
10077-2U	Chloroform	AnalaR	4x2.5 L

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty</u>
14003-4N	Chloroform, special for spectroscopy		500 ml
20023-2D	Chlorophenol red	-	5 g
27732-3W	Chloroplatinic acid	-	5 g
43011-2A	Cholesterol	-	25 g
25043-1K	Cholesterol assay set	-	1 set
42014-2B	Choline chloride	-	100 g
27755-4M	Chromic nitrate, $\text{Cr}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$	AnalaR	500 g
10080-4L	Chromium trioxide, CrO_3	AnalaR	500 g
13029-3C	Chromotropic acid sodium salt	-	25 g
27768-2T	Cinchonine	-	25 g
27772-4M	Cinnamaldehyde	-	500 ml
10081-4N	Citric acid	AnalaR	1 Kg
10083-3Q	Cobaltous nitrate $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$	AnalaR	100 g
27806-4D	2,4,6-Collidine	-	500 ml
33042-4H	Collodion for preparing permeable membranes (14% nitrocellulose)		500 ml
20025-3Y	Congo red		10 g
10085-2T	Copper (metal) foil	AnalaR	100 g
11005-2A	Copper oxide wire form	MAR	100 g
36016-3U	Cotton wool, non-absorbent, bleached		2x500 g
37047-4X	Creatine	-	25 g
20026-2J	o-Cresolphthalein		5 g
20028-3X	m-Cresol purple		5 g
20030-3B	Cresol red, water soluble		5 g
27833-4G	Cupric carbonate (basic)		4x500 g
10089-4G	Cupric nitrate, $\text{Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$	AnalaR	500 g
10091-4Q	Cupric sulfate $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$	AnalaR	3x500 g
44023-3M	Cyanocobalamin (vitamin B_{12})		1 g

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
10319-4A	Cyclohexane		3x500ml
14004-4P	Cyclohexane special for spectroscopy		500 ml
27870-4M	Cyclohexanol		500 ml
27871-4X	Cyclohexanone		500 ml
27873-4S	Cyclohexene		500 ml
37055-2L	L-Cysteine hydrochloride		25 g
37057-3Q	L-Cystine		25 g
56001-4U	Detergent soln. for cleaning glassware		20x500 ml
28010-4N	Diacetone alcohol		500 ml
28016-3B	1,2-Diaminoethane	min.98%	250 ml
28671-2J	trans- 1,2-Diaminocyclohexane NNN' N' - tetraacetic acid (CDTA)		25 g
28052-4G	1,2-Dibromoethane	min.98.5%	500 ml
28073-4X	Di-n-butyl phthalate		500 ml
20034-3J	27-Dichlorofluorescein		10 g
14118-4H	1,2-Dichloroethane special for spec.		500 ml
10341-4N	Diethylamine	AnalaR	500 ml
10094-4W	Diethyl ether	"	2x500 ml
28133-6Y	Diethyl ether, stabilized with 1 ppm pyrogallol		6x2.5 L
28150-4G	Digol (diethylene glycol) purified		500 ml
28176-3A	Di-iodomethane		25 ml
10322-4J	Dimethylformamide	AnalaR	2x500 ml
28201-2S	Dimethylglyoxime sodium salt		100 g
13155-2G	2,9-Dimethyl-4, 7-diphenyl-1, 10-phenanthroline disulfonic acid disodium salt (bathocuproin sulfonate)		0.1 g
13047-3E	2,9-Dimethyl-1, 10-phenanthroline hydrochloride (neo-cuproin hydrochloride)		1 g

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
10323-4L	Dimethylsulfoxide	AnalaR	500 ml
20038-3R	2,4-Dinitrophenol		10 g
20039-2S	2,5-Dinitrophenol		1 g
10099-2H	2, 4-Dinitrophenylhydrazine		25 g
20041-2F	Diphenol purple		1 g
28268-5H	D-iso-propyl ether		1 L
13061-3V	Dithio-oxamide (rubeanic acid)		25 g
10104-3V	Dithizone	AnalaR	5 g
20043-3K	Eosin	-	10 g
20044-2L	Erioglaucine	-	25 g
10324-4N	Ethanediol	AnalaR	500 ml
10106-7G	Ethanol 95%	AnalaR	4x25 L
10107-8J	Ethanol absolute	AnalaR	4x2.5 L
10325-4P	Ethanolamine		500 ml
10108-4H	Ethyl acetate		2x500 ml
14111-2X	Ethylene diaminetetra-acetic acid diammonium salt		100 g
10093-5V	Ethylenediaminetetra-acetic acid disodium salt		2x500 g
20047-2R	Ethyl orange		1 g
20048-2T	Ethyl red		1 g
56036-3P	Extran 300 concentrate		2x5 L
10110-3Q	Ferric chloride hexahydrate $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$		250 g
10306-3K	Ferric nitrate $\text{Fe}(\text{NO}_3)_2 \cdot 9\text{H}_2\text{O}$	AnalaR	250 g
10112-4V	Ferrons sulfate $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$		2x500 g
19237-4R	Karl Fischer Solution A		10x500 ml
19238-4T	Karl Fischer Solution B		10x500 ml
19060-4E	Water solution		2x1 L
15024-3C	Florisil for chromatographic analysis		2x250 g
15025-3L	Florisil for chromatographic analysis		2x250 g

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
15026-3G	Florisil for chromatographic analysis		2x250 g
15027-3Y	Florisil for chromatographic analysis		2x250 g
44043-4U	Folic acid		10 g
10113-4A	Formaldehyde solution	AnalaR	2x500 ml
10326-4R	Formamide	AnalaR	500 ml
10115-4E	Formic acid, 98/100%	AnalaR	500 ml
28434-5V	D(-) Fructose low in glucose(1%)		2x500 g
28438-4F	Furfuraldehyde 98-100%		500 ml
26102-4Y	Furfuryl alcohol		tech. 500ml
10116-4G	Fusion mixture ($\text{Na}_2\text{CO}_3 + \text{K}_2\text{CO}_3$)	AnalaR	500 g
38026-3K	D(+) Galactose anh.	-	100 g
44045-4B	Gelatine powder	-	500 g
44048-2F	Gliadin	-	25 g
10117-4Y	D-Glucose, anh.	AnalaR	3x500 g
37102-2R	L-Glutamic acid	-	100 g
37107-4G	L-Glutamine	-	25 g
44049-4J	Gluten wheat	-	500 g
10118-4K	Glycerol	AnalaR	500 ml
10119-3L	Glycine	AnalaR	100 g
28467-2K	Guanidinium chloride	-	100 g
28473-4H	n-Heptane	IP spec.	4x500ml
12018-3P	Hexachlorobenzene	'OAS'	25 g
10353-4U	Hexamine (hexamethylene-tetramine)	AnalaR	500 g
14009-4C	Hexane, special for spectroscopy		2x500ml
28485-6Q	Hexane	min.85%	25 L
28488-4U	n-Hexane	min.99%	500ml
28491-4J	Hexan-1-ol	min.98%	500ml
33135-3N	High vacuum silicone grease 2 tubes		
14119-2H	Holmium perchlorate solution for spectrophotometer calibration		100ml

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty</u>
10122-4B	Hydriodic acid	AnalaR	500 ml
10124-4F	Hydrobromic acid	AnalaR	500 ml
10125-4H	Hydrochloric acid	AnalaR	32x2.5 L
14157-5S	Hydrochloric acid for AA spectroscopy		2x1 L
28512-4X	Hydrochloric acid "lead free" max 0.005 ppm Pb		500 ml
10308-3X	Hydrofluoric acid	AnalaR	2x500 ml
10366-5H	Hydrogen Peroxide min 30%	AnalaR	2x1 L
10129-5Q	Hydroxylammonium chloride	AnalaR	500 g
13156-2Y	Hydroxynaphthol blue indicator for calcium		25 g
10131-2A	8-Hydroxyquinoline Indicator and Test papers	AnalaR	100 g
31033-2R	FR (pH1-14) '4-packs'		2
31035-2V	NR(pH4-6) '4-packs'		2
31036-2A	NR(pH6-8) '4-packs'		2
31037-2C	NR (pH8-10) '4-packs'		2
31046-1C	The 8-Reel Set		2
31043-2U	Lead acetate (LA) test paper		4-pack
31045-2B	Starch iodide (SI) test paper		4-pack
57009-2Q	Colour cards for FR indicator		
21040-2Y	BDH 4460 Indicator		2x100 ml
21041-2K	BDH 4.5 Indicator		2x100 ml
21042-2M	BDH 6676 Indicator		100 ml
21045-2S	BDH 9011 Indicator		2x100 ml
21072-2V	BDH Full range indicator pH 1-14		2x100 ml
21049-2D	BDH Universal indicator pH 4-11		2x100 ml
57025-IN	BDH Universal indicator colour cards		
10134-3H	Iodic acid	AnalaR	100 g
20054-3P	Iodine indicator BDH		5x100 g

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
10135-3J	Iodine	AnalaR	2x100 g
28565-3L	Iodine bromide		100 g
28,83-3N	Iodoform		100 g
28601-4N	Iron (metal) powder electrolytic		500 g
55037-4N	Dowex 50W-X8 cation exchange resin 18-52 mesh		2x500 g
55161-3N	Dowex 50W-X8 cation exchange resin 50-100 mesh		500 g
55162-3P	Dowex 50W-X8 cation exchange resin 100-200 mesh		2x100 g
55041-4E	Dowex 21K anion exchange resin, 18-52 mesh		2x500 g
55159-3D	Dowex 1-X8 anion exchange resin, 50-100 mesh		2x100 g
55160-3L	Dowex 1-X8 anion exchange resin, 100-200 mesh		2x100 g
20055-2Q	Janus green		10 g
33060-4J	Kaolin (Soc. Leather Trades Chemist spec.)		500 g
15036-3J	Kieselguhr (+13% Ca sulfate for TLC)		2x500 g
10138-2X	Lactic acid		100 ml
10139-4S	Lactose monohydrate	AnalaR	500 g
33069-4E	Lanolin anhydrous		500 g
14133-2B	Lanthanum nitrate $\text{La}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$	For AA	2x25 g
41011-3X	Lauric acid	min 99%	100 g
29015-3E	Lead metal	99.999%	25 g
10143-3Y	Lead acetate, basic	AnalaR	250 g
10145-3M	Lead nitrate	AnalaR	250 g
37122-2A	DL-Leucine	98.5%	25 g
29055-6T	Ligroin		2x2.5 L
20058-3A	Lissamine green (erio green)		25 g
29076-2A	Lithium chloride $\text{LiNO}_3 \cdot 3\text{H}_2\text{O}$		100 g
37129-3P	L-Lysine monohydrochloride	99%	100 g
26120-2Y	Magenta		100 g

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
29086-1C	Magnesium (metal) ribbon		25 g
29089-2J	Magnesium (metal) turnings for Grignard reactions		2x500 g
10148-2R	Magnesium acetate hydrated (CH ₃ COO) ₂ Mg.4H ₂ O	AnalaR	100 g
10309-4R	Magnesium nitrate	AnalaR	500 g
15039-4X	Magnesium oxide for chromatographic analysis		500 g
11001-2P	Magnesium perchlorate dried		2x100 g
10151-4Y	Magnesium sulfate MgSO ₄ .7H ₂ O	AnalaR	500 g
26126-2U	Malachite green		100 g
29776-2F	L-Malic acid	min 98.5%	25 g
38091-2U	Maltose, extra pure, monohydrate		10 g
29131-2F	Maltose monohydrate sp. rot. + 127° to 132°		100 g
11015-2D	Manganese dioxide 10-30 mesh	MAR	100 g
10152-3J	Manganous chloride, MnCl ₂ .4H ₂ O	AnalaR	250 g
10330-4Y	Mannitol	AnalaR	500 g
38048-4V	D(+) Mannose		25 g
38051-4K	Melibiose		10 g
29153-3Q	Menthol	min 99%	100 g
10154-2M	Mercuric chloride	AnalaR	25 g
10155-2X	Mercurous chloride	AnalaR	25 g
10157-2S	Mercury metal	AnalaR	100 g
20063-2P	Metanil yellow	-	5 g
10158-3V	Methanol	AnalaR	4x2.5 L
29193-4G	Methanol, dried, for preparing Karl Fischer reagent		4x500ml
37131-4D	L-Methionine	min 99%	25 g
29202-4E	Methyl acetate		500 ml
29210-2B	Methylammonium chloride CH ₃ NH ₃ Cl		100 g
27214-4B	2-Methylbutan - 2-ol		500 ml

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
29250-4P	3-Methylbutan-2-one (MIK)		2x500 ml
20064-3S	Methylene blue		2x10 g
41035-2E	Methyl linoleate	min 99%	5 ml
41016-2A	Methyl myristate	min 99%	5 ml
41037-2Y	Methyl oleate		5 ml
20065-3U	Methyl orange	-	2x25 g
20066-3W	Methyl orange - xylene cyanol		25 g
41018-2E	Methyl palmitate	min 99%	5 ml
10331-4K	4-Methylpentan-2-one	AnalaR	500 ml
10062-3Y	2-Methylpropane-1-ol	AnalaR	500 ml
10358-4H	2-Methylpropan-2-ol	AnalaR	500 ml
21083-2E	Methyl purple O, 1% soln.		250 ml
20068-2C	Methyl red, water soluble		10 g
41019-2G	Methyl stearate	min 99%	5 g
20072-4S	Methyl violet (pH indicator)		25 g
20073-2S	Methylviologen (redox ind)		1 g
54003-3N	Molecular sieve Type 3	powder	250 g
54008-3A	Molecular sieve Type 4A		250 g
54012-4P	Molecular sieve Type 5A		500 g
54017-3B	Molecular sieve Type 13X(10A)		250 g
27197-4E	Murexide		25 g
41020-3P	Myristic acid		100 g
29275-6K	Naphtha solvent 150-184°		2.5 L
20075-3A	p-Naphtholbenzein		5 g
20076-3C	c-Naphtholphthalein		5 g
20078-2F	Neutral red		5 g
10166-3U	Nickel nitrate	AnalaR	250 g
44068-2L	Nicotinamide		100 g
29330-3M	Nicotine	min 98%	100 ml
44070-2V	Nicotinic acid		10 g
10132-4E	Ninhydrin	AnalaR	25 g
44071-2A	Ninhydrin spray (aerosol container)		4 g
20080-2P	Nitrazine yellow	-	1 g
10168-3B	Nitric acid, 70%	AnalaR	32x2.5 L

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
45004-4P	Nitric acid	ARISTAR	2x500 ml
10170-3L	Nitrobenzene	AnalaR	500 ml
13087-2P	4-(4-Nitrophenylazo) resorcinol (magneson)		10 g
29377-2X	2-Nitrophenol	min 99%	100 g
20081-2R	3-Nitrophenol	indicator	1 g
29379-2S	4-Nitrophenol	min 99%	25 g
29395-4S	4-Nitrotoluene		500 g
29407-3V	n-Octane	min 99.5%	100 ml
36064-6L	Oil of turpentine rectified		2.5 L
41034-4E	Oleic acid	92%	500 ml
21055-2V	Oracet blue, 0.5% soln in Ac. A.		100 ml
37191-2T	L-Ornithine monochloride	min 98.5%	5 g
10173-4S	Orthophosphoric acid	AnalaR	4x500 ml
10174-4U	Oxalic acid (COOH) ₂ .2H ₂ O	AnalaR	2x500 g
41022-3T	Palmitic acid	min 99%	100 g
49001-4G	Panacide, 40% soln		2x500 ml
49074-4Y	(+) Pantothenic acid Ca salt		100 g
39030-2F	Papain		25 g
33078-2D	Paraffin and rubber lubricant for stopcocks		5x25 g
14017-2W	Paraffin, liquid for infrared spectroscopy (Nujol)		100 ml
29445-3G	Paraffin wax, cong. pt. 60°C		3x500 g
29447-4L	Paraformaldehyde		500 g
38052-3L	Pectin, apple 250 grade		100 g
13096-3R	3,5,7,2',4' - Pentahydroxyflavone (morin)		2x5 g
29451-4C	n-Pentane	min 99%	2x500 ml
29455-4K	Pentan-1-ol	min 98%	500 ml
29456-4M	Pentan-2-ol	min 99%	500 ml
29249-4H	Pentan-2-one	-	500 ml
28136-6L	Pentan-3-one	-	250 ml
27210-4Q	Pentyl acetate	-	500 ml
39032-3K	Pepsin powder A	-	100 g
10175-5A	Perchloric acid, 60%	AnalaR	4x500 ml

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
10176-3A	Perchloric acid, 72%	AnalaR	2x250 ml
45008-4A	Perchloric acid, 72%	ARISTAR	500 ml
10177-4D	Petroleum spirit, 30-40°	AnalaR	2x250 ml
10178-2D	Petroleum spirit, 40-60°	AnalaR	4x2.5 L
10179-2F	Petroleum spirit, 60-80°	AnalaR	4x2.5 L
10180-4P	Petroleum spirit, 80-100°	AnalaR	2.5 L
10181-4R	Petroleum spirit, 100-120°	AnalaR	2.5 L
10182-4T	Petroleum spirit, 120-160°	AnalaR	2.5 L
20133-2K	1, 10-Phenanthroline hydrochloride (redox indicator)		5 g
21056-2A	1,10-Phenanthroline-ferrous sulfate-complex soln. 0.025M		100 ml
10188-4Y	Phenol	AnalaR	500 g
20086-3F	Phenolindo - 2,6-dichlorophenol		5 g
20089-2K	Phenolphthalein		100 g
20091-3V	Phenol red, water soluble		2x5 g
37138-4R	L-B-phenylalanine	min 99%	25 g
29508-3E	Phenylhydrazine	min 97.5%	2x250 ml
10190-3R	Phloroglucinol	AnalaR	25 g
29783-5F	Polyvinyl chloride, M.W. approx. 100 000		1 Kg
33170-6S	Phosphorus pentoxide drying agent with moisture indicator on inert carrier		2.8 L
29539-3P	Phthalic acid	min 99%	250 g
29551-3F	4-Picoline	98-100%	250 ml
10192-3V	Picric acid	AnalaR	100 g
29794-4J	Piperazine anh.		500 g
29569-4C	Platinum wire 0.46 mm diam		30 cm
15046-3M	Polyethylene powder for chromatographic analysis		250 g
14070-2D	Polyethylene powder, special for spectroscopy		25 g
15065-2P	Polyethylene glycol 20M for GLC		100 g
15165-2T	Polyethylene glycol 400 for GLC		100 ml
15100-3P	Polyethylene glycol 1540 for GLC		100 g
15064-2N	Polyethylene glycol adipate for GLC		25 g

<u>EDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
15085-2V	Polyethylene glycol succinate for GLC		25 g
29789-5R	Polystyrene M, W, approx. 100 000		1 Kg
10194-2B	Potassium bromate		100 g
14018-2B	Potassium bromide for IR spec		2x100 g
10196-4H	Potassium carbonate anh.	AnalaR	500 g
45215-2D	Potassium chloride	ARISTAR	3x100 g
14011-2K	Potassium chloride for IR spec		25 g
10199-3M	Potassium chromate	AnalaR	250 g
29601-3R	Potassium cobaltinitrite (potassium hexanitritocoba- ltate)		100 g
10201-3T	Potassium cyanide	AnalaR	250 g
10202-4W	Potassium dichromate	AnalaR	500 g
14114-5A	Potassium dichromate standard solutions for spectrophotometer calibration		
29607-3G	Potassium dihydrogen citrate		250 g
10203-4B	Potassium dihydrogen orthophosphate KH_2PO_4	AnalaR	500 g
10204-3C	Potassium ferricyanide $\text{K}_3\text{Fe}(\text{CN})_6$	AnalaR	250 g
10205-3E	Potassium ferrocyanide $\text{K}_4\text{Fe}(\text{CN})_6$	AnalaR	250 g
10344-4T	Potassium fluoride anh.	AnalaR	500 g
10206-4H	Potassium hydrogen carbonate	AnalaR	500 g
29617-4K	Potassium hydrogen difluoride KHF_2	-	500 g
29620-4W	Potassium hydrogen oxalate KHC_2O_4	99-100%	500 g
29623-4F	Potassium hydrogen sulfate	AnalaR	500 g

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
10207-5K	Potassium hydrogen phthalate	AnalaR	500 g
10209-4N	Potassium hydrogen (+)-tartrate	AnalaR	500 g
10210-4V	Potassium hydroxide pellets	AnalaR	4x500 g
10211-3W	Potassium iodate KIO_3	AnalaR	2x100 g
10212-5D	Potassium iodide	AnalaR	4x500 g
10213-4E	Potassium metabisulfite $K_2S_2O_5$	AnalaR	500 g
10214-4G	Potassium nitrate	AnalaR	500 g
10216-4K	Potassium periodate	AnalaR	250 g
10217-4M	Potassium permanganate	AnalaR	4x500 g
10219-4Q	Potassium sodium (+)-tartrate	AnalaR	500
10220-4B	Potassium sulfate	AnalaR	4x500 g
10221-4D	Potassium tetraoxalate $KH_3(C_2O_4)_2 \cdot 2H_2O$	AnalaR	500 g
10222-4F	Potassium thiocyanate	AnalaR	500 g
37143-2Y	L-Proline	min 99%	5 g
10345-6A	Propan-1-ol	AnalaR	2.5 L
10224-2H	Propan-2-ol	AnalaR	4x2.5 L
29688-4K	Propionic acid	min 99%	500 g
33083-4V	Pumice stone, granular 4-10 mesh		500 g
10225-4L	Pyridine	AnalaR	2x500 ml
10226-5X	Pyrogallol	AnalaR	500 g
20098-2L	Pyrogallol red	-	1 g
20099-2N	Quinaldine red	-	1 g
10227-3X	Quinhydrone	AnalaR	100 g
30006-2J	Quinine trihydrate	-	25 g
10312-2E	Quinol (hydroquinone)	AnalaR	100 g
10228-3Q	Resorcinol	AnalaR	100 g
44088-3S	Riboflavin	-	10 g
38058-3A	D(-)Ribose	-	5 g

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
30038-4B	Salicylic acid	AnalaR	250 g
30054-2U	Selenous acid, H_2SeO_3	min 98%	25 g
37146-2X	L-Serine	min 98.5%	5 g
30058-2F	Silica, precipitated, acid washed		100 g
30695-3N	Silica, fumed (CAB-O-SIL M-5)		250 g
30062-4R	Silica gel, self-indicating	corse	10x500 g
15050-3D	Silica gel+13% Ca sulfate for TLC		500 g
33151-2K	Silicone antifoaming agent		100 ml
15147-2R	Silicone OV-1 for GLC		5 g
15148-2T	Silicone OV-17 for GLC		5 g
15143-2J	Silicone gum XE-60 for GLC		5 g
15069-3B	Silicone SE-30 5% w/v in chloroform for GLC		250 ml
16233-4K	Silver nitrate		4x250 g
33097-4J	Sira adhesive wax		1 doz sticks
33107-4J	Soda lime granules, 10-16 mesh		2x500 g
30101-4F	Sodium (metal)	min 99.8%	360 g
10235-4X	Sodium acetate trihydrate $CH_3COONa \cdot 3H_2O$	AnalaR	500 g
10237-2Q	Sodium arsenate	AnalaR	100 g
10238-2S	Sodium bismuthate	AnalaR	25 g
30114-3N	Sodium borohydride		2x25 g
14131-2U	Sodium borohydride pellets for AA		100 g
30116-4S	Sodium bromide	min 99%	500 g
10240-4W	Sodium carbonate anh.	AnalaR	2x500 g
10241-5K	Sodium chloride	AnalaR	2x1 Kg
10242-4L	tri-sodium citrate	AnalaR	500 g
10354-3V	Sodium cyanide	AnalaR	250 g
30136-4B	Sodium dithionite $Na_2S_2O_4$		2x500 g

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
30142-4T	Sodium formate	min 98%	500 g
30143-2T	Sodium fumarate	min 98%	100 g
10247-5	Sodium hydrogen carbonate	AnalaR	1 Kg
30155-2D	Sodium hydrogen malate	-	100 g
10249-4C	di-Sodium hydrogen orthophosphate anh.	AnalaR	500 g
10252-5P	Sodium hydroxide pellets	AnalaR	8x1 Kg
18043-5A	Sodium hydroxide in 6 vials for diln. to 1 L of 0.1 N		4 ctns
10255-4U	Sodium nitrate	AnalaR	500 g
10256-3V	Sodium nitrite	AnalaR	250 g
10257-2N	Sodium nitroprusside		25 g
30193-4N	tri-Sodium orthophosphate $\text{Na}_3\text{PO}_4 \cdot 12\text{H}_2\text{O}$	min 98%	500 g
10258-4D	Sodium oxalate	AnalaR	500 g
10260-6P	Sodium peroxide	AnalaR	4x500 g
30215-4U	Sodium silicate	powder	2x500 g
30218-4D	Sodium stearate	purified	500 g
10264-5W	Sodium sulfate anh. powder	AnalaR	2x500 g
10265-3W	Sodium sulfide	AnalaR	250 g
10357-4F	Sodium sulphite anh.	AnalaR	500 g
10333-4K	Sodium (+) tartrate dihydrate	AnalaR	500 g
10267-4E	di-Sodium tetraborate decahydrate (borax)	AnalaR	100 g 500 g
10268-5H	Sodium thiosulfate pentahydrate	AnalaR	3x1 Kg
10269-3H	Sodium turgstate dihydrate	AnalaR	25 g
13120-3L	Solochrome darkblue		25 g
30242-4A	Sorbitol		500 g
38062-3X	L-Sorbose		100 g
30247-2Y	Stannic chloride hydrated $\text{SnCl}_4 \cdot 5\text{H}_2\text{O}$		100 g

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
10270-4Q	Stannous chloride dihydrate SnCl ₂ .2H ₂ O	AnalaR	2x500 g
30261-7H	Starch, maize		2.5 Kg
30262-7J	Starch, potatoe		3 Kg
30263-4Y	Starch, rice		500 g
30265-6X	Starch, wheat		2 Kg
10271-4S	Starch, soluble		2x500 g
41023-2U	Stearic acid	min 99%	25 g
10314-3J	Strontium nitrate	AnalaR	250 g
10273-2U	Succinic acid	AnalaR	100 g
10274-5C	Sucrose	AnalaR	4x1 Kg
15086-2A	Sudan red for chromatographic standardization		5 g
12031-3H	Sulphamic acid	OAS	25 g
30317-4F	Sulphur	pptd.	500 g
10276-4F	Sulphuric acid	AnalaR	32x2.5 L
10277-4H	Tartaric acid	AnalaR	500 g
56011-3W	Teepol L	-	4x5 L
10278-3Y	Telluric acid	AnalaR	100 g
14081-4K	Tetrachloroethylene-special for spectroscopy		500 ml
30405-3B	Theobromine	-	100 g
13129-3G	Thioacetamide	-	25 g
10280-2R	Thorium nitrate	AnalaR	25 g
30431-2B	Thorium Oxide		25 g
37150-2F	L-Theonine	min 99%	5 g
30433-2F	Thymol		100 g
20114-3H	Thymol blue, water soluble		5 g
20116-2K	Thymophthalein		5 g
20118-2X	Thymol violet		5 g
10281-2T	Tin(metal), granulated	AnalaR	100 g
30444-3L	Titanium (metal) crushed sponge		100 g
30446-4Q	Titanium dioxide		4x500 g

<u>BDE No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
20119-2Q	Titan yellow		5 g
44099-2W	DL-alpha-Tocopherol acetate		5 ml
16036-4P	o-Tolidine reagent for chlorine detn. in water		2x500 ml
10284-2N	Toluene	AnalaR	10x1 L
30467-4B	o-Toluidine	min 99%	500 g
30468-4D	m-Toluidine	min 98%	500 g
30469-2D	p-Toluidine	98-101%	100 g
30490-4T	Trichloroacetic acid for protein pptn		2x500 g
30502-4A	Triethylamine		500 ml
14083-2M	Trifluoroacetic acid, special for spectroscopy		2x100 ml
27749-2P	Trimethylchlorosilane		2x25 ml
14014-2S	2,2,4- Trimethypentane, special for spectroscopy		2x500 ml
30632-6P	Triton X-100		2.5 L
20121-2D	Tropacolin OO (orange IV)		5 g
20122-2F	Tropaeolin OOO (orange II)		5 g
37153-2L	Tryptophan	min 99%	5 g
30543-2M	Tungstic oxide		100 g
37156-2R	L-Tyrosine	min 98.5%	100 g
10289-2M	Uranyl nitrate	AnalaR	100 g
10290-3V	Urea	AnalaR	250 g
37160-4K	L-Valine	min 99%	25 g
30565-2W	Vanadium pentoxide	-	25 g
44105-3P	Vitamin A palmitate		5 g
33149-2A	'Voltalef' 90 grease		2 tubes
10293-4F	Xylene	AnalaR	4x500 ml
20123-3Y	Xylene cyanol FF		25 g
20124-2J	p-Xylenol blue		2x1 g
13137-3F	Xylenol orange		5 g
44106-4S	Zein		500 g
10294-5Y	Zinc (metal) granulated	AnalaR	1 Kg

<u>BDH No.</u>	<u>Name</u>	<u>Grade</u>	<u>Qty.</u>
26220-4X	Zinc chloride, fused tech.		500 g
10297-2L	Zinc acetate	AnalaR	100 g
30603-2E	Zinch bromide	-	100 g
26220-4X	Zinc chloride, fused tech.		500 g
10335-3R	Zinc nitrate hexahydrate	AnalaR	250 g
10298-4P	Zinc oxide	AnalaR	500 g

Pesticide Analytical Standards, Nanogen

	<u>Pesticide</u>
15177 2D	Aldrin
15178 2F	BHC
15179 2H	Carbaryl
15180 2P	Chlordane
15181 2R	DDE(p,p'-isomer)
15182 2T	o,p'-DDT
15183 2V	p,p'-DDT
15184 2A	DDT (mixed isomers)
15185 2C	DDVP
15186 2E	Diazinon
15188 2Y	Dieldrin
15189 2K	Disulfoton
15190 2S	Endosulfan
15191 2U	Endrin
15193 2B	Ethion
15194 2D	Heptachlor
15195 2F	Heptachlor epoxide
15196 2H	Lindane
15197 2J	Malathion
15198 2L	Methoxychlor
15200 2S	Parathion
15201 2U	Phorate
15203 2B	o,p'-TDE
15204 2D	p,p'-TDE
15205 2F	Toxaphene

Cylinders of compressed gases

	<u>No. of cylinders</u>
Nitrogen, high purity	5
Synthetic air	5
Oxygen	5
Hydrogen	5
Nitrous Oxide	3
Argon	3
Acetylene	

(Oxygen and acetylene are apparently available in Tanzania, but it might be advisable to import some cylinders in case they are in short supply.)

III. H. Collections of Spectra and Literature

The best published spectra are available from:

Sadtler Research Laboratories
3316 Garden Street
Philadelphia, PA, USA 19104

<u>Name of Set or Index</u>	<u>No. of Spectra</u>	<u>Vols</u>
Infrared grating spectra	59000	1-59
1980 Cumulative indices	-	
1980 Cumulative grating spectra-finder and numerical index	-	-
1981 Annual subscription	2000	60-63
Ultraviolet spectra	48000	1-106
1980 Cumulative indices	-	-
1980 Cumulative UV locator and numerical index		
1981 Annual subscription	2000	107-110
Infrared vapor phase spectra	6800	1-16
1981 Publications	1500	17-21
Fluorescence spectra	4000	1-8
(2000 excitation spectra, 2000 emission spectra)		
IR Spectra of inorganics	1300	5
IR Spectra of minerals	400	1

<u>Name of Set or Index</u>	<u>No. of Spectra</u>	<u>Vols</u>
IR Spectra of pharmaceuticals	1200	4
UV Spectra of pharmaceuticals 2000	2000	4
Fluorescence spectra of pharmaceuticals	300	1
IR Spectra of prepared and prescription drugs	600	2
UV Spectra of prepared and prescription drugs	600	2
IR Spectra of toxic chemicals	300	1
Coblentz Society spectra (IR)	10000	10
Infrared grating collections agricultural chemicals	300	1
Dyes, pigments & Stains	2400	6
IR Spectra of prepared and prescription drugs	600	2
UV Spectra of prepared and prescription drugs	600	2
IR Spectra of toxic chemicals	300	1
Coblentz Society spectra (IR)	1000	10
<u>Infrared grating collections</u>		
Agricultural chemicals	900	3
Dyes, pigments & stains	2700	9
Fats, waxes and derivatives	1200	4
Food additives	400	1
Monomers & Polymers	7800	26
Polymer additives	600	2
Rubber chemicals	600	2
Solvents	1200	4
Textile chemicals	300	1
Water treatment chemicals	300	1
<u>Ultraviolet collections</u>		
Agricultural chemicals	300	1
Dyes, pigments & Stains	2400	6



