



## **NATIONAL COUNCIL FOR HIGHER EDUCATION**

# **GUIDELINES ON MINIMUM TEACHING LABORATORY REQUIREMENTS FOR BACHELOR OF MEDICAL LABORATORY SCIENCE/ TECHNOLOGY PROGRAMMES IN UGANDA.**



## **Preface**

Since the training of graduates in Medical Laboratory Sciences in Uganda started in 2000 at Mbarara University of Science and Technology, several Universities have started this training or desire to start in the near future.

The degree training was a result of evidence of a sizeable demand for Medical Laboratory Scientists that are needed to fill the positions in government establishments, Universities and private sector at university graduate level.

Laboratory diagnosis being key in health services delivery, requires training to be of quality to produce the desired graduates. There is, therefore, the need to have required training skill and competence targets. This minimum requirements for teaching laboratories document has been produced to address this need. The requirements are put to the minimum standard for each institution to follow. This document is meant to complement the Minimum Standards for Courses of Study Medical Laboratory Sciences /Technology (Undergraduate Programme) issued by the National Council for Higher Education with the approval of the Allied Health Professional Council.

The document sets out minimum requirements for human resource, infrastructure, equipment, reagents/consumables and library needs. It is hoped that all universities training Medical Laboratory Scientists in Uganda will embrace it.

The National Council for Higher Education would like to thank Baylor Uganda for the generous support to develop this important document. Equally we are grateful for the academia and Laboratory experts from Mbarara University of Science and Technology, Kampala International University (Western Campus) and Makerere University who tirelessly worked on this document.

Lastly, we believe that if this guide of minimum requirements is adhered to, it will facilitate exchange of students in Uganda without fear of compromised quality.

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## **1.0 INTRODUCTION:**

The National Council for Higher Education was set up by an Act of Parliament to regulate the establishment and management of higher education in Uganda. By this mandate, the National Council sets standards and supervises higher education institutions to make sure these standards are met and maintained . It does this in line with the National Aims and Objectives of Education as stipulated in the Government Education White Paper of 1992, the Education Act of 2008, The Allied Health Professional Act, 1996, the BTBET Act of 2008, and the Uganda National Health Laboratory Services Policy, 2009 and above all The Universities and Other Tertiary Institutions Act, 2001.

Higher education institutions are accountable to the parents, teachers, learners, community leaders and the community. Diagnostic services, being key in provision of health services, require personnel that have been groomed to offer competent services. It is therefore imperative that minimum requirements for their training are set to meet this need.

### **1.1 THE ROLE OF NATIONAL COUNCIL IN TRAINING**

The National Council in liaison with the relevant government ministries has a major role in making sure that standards in higher education institutions are maintained by:

- (i) Providing policy guidelines and standards in higher education institutions training in medical programmes, including medical laboratory training.
- (ii) Issuing minimum requirements and minimum standards and tools that are used as a measure in assessing the standards of teaching institutions.
- (iii) Carrying out inspections for monitoring compliance with the minimum Standards in liaison with the Allied Health Professional Council (AHPC)

## **2.0 REQUIREMENTS FOR DEGREE TRAINING IN MEDICAL LABORATORY SCIENCES/TECHNOLOGY**

### **2.1 GENERAL REQUIREMENTS**

All general requirements are as set out in the Universities and Other Tertiary Institutions Acts 2001 (as amended) and the various Statutory Instruments from the National Council for Higher Education issued from time to time.

## **2.2 TEACHING LABORATORY**

**2.2.1** Each major discipline in medical Laboratory science Technology should have its own teaching Laboratory. These are;

- ❖ **Microbiology**
- ❖ **Parasitology**
- ❖ **Clinical Chemistry,**
- ❖ **Haematology and Blood Transfusion; and**
- ❖ **Histopathology.**

Each of the laboratories should have a store, wash up, preparation room/office.

- A store for inflammables should be constructed outside the main laboratory with concrete
- Store shelves should start 0.5m from the floor, 0.3m in width and 0.5m apart extending to the ceiling

**2.2.2 Sizes:** Each student should have a working space of at least  $2m^2$  with an adjacent sink

### **2.2.3. Fittings;**

- a) Windows: The window area should be approximately 15-20% of the total room floor area and should be fitted with clear glass; not tinted.
- b) Doors: Should be double doors opening outwards
- c) Emergency exit: At least one emergency exit opening outwards
- d) Floor: Should be cemented, non-slippery and without cracks
- e) Ceiling: Should be cast and smooth
- f) Wall: Should be painted white using non - oily paints
- g) Sinks and basins: Should be made of chemical resistant material e.g. ceramic or PVC (plastic)
- h) Water supply: Should be supplied with continuous clean running water
- i) Power supply: Should be supplied with continuous electric power
- j) Desks/fixed benches: Should be high enough to allow students work while

standing at least 0.9m high and 1m wide and should have a white ceramic top

- k) Drainage: Must be closed and connected to a septic tank
  - l) Disposal: should have deep pit and accessibility to an incinerator;
  - m) Fire fighting devices should be in place e.g. sand buckets (labeled red), fire extinguishers (co<sub>2</sub> type) and fire blankets
- n) Safety cabinet: At least one class I safety cabinet.
- o) Furniture:
  - i) Lockable cupboard underneath the benches may extend throughout the working room except the power sockets area
  - ii) Shelves above the work benches should start 0.6m above the bench measuring 0.3m in width and strong enough to support the weight of all prepared reagents.
  - iii) Stools should be 0.6m high.
- p) Ventilation: Should be 1/100 of the floor area and either cross/through ventilation.)
- q) Essential Laboratory apparatus/equipments as per prescribed list.

### **2.3 TEACHING STAFF**

A Lecturer/Student ratio of 1:20 is recommended for class room teaching (Lectures).There should be at least 2 Lecturers with specialization in that discipline and 2 Medical Laboratory Technologists per medical science discipline.

A Lecturer / students ratio of 1:10 is recommended for practical demonstrations.

A Technologist/student ratio of 1:20 is recommended for class practical

## **2.4 EQUIPMENT REQUIRED PER SPECIFIC LABORATORY/INSTITUTION**

**(All equipment must be engraved by the institution)**

### **2.4.1 MICROBIOLOGY**

1. Anaerobic jars	1 : 5 student
2. Assorted microbiology glassware	Refer to section 2.5 below
3. Autoclave (portable)	12 per institution
4. Balance (Analytical and ordinary)	2 per Laboratory
5. Bunsen burners	1 between 2 students
6. Butane Gas	2 cylinders per Laboratory
7. Carbon dioxide incubators	1 for the laboratory
8. Centrifuge electrical (8 buckets)	2 per Laboratory
9. Colony counters	1 between 5 students
10. Distiller	2 per institution
11. ELISA reader	1 per Institution
12. ELISA washer	1 per Institution
13. Flow cytometer	1 per Institution
14. Fluorescence microscope	2 per Institution
15. Food masserator	2 per Institution
16. Gas cylinders (100kg)	2 per Laboratory
17. Hot Air Oven	2 per Laboratory
18. Hot plate /Microwave	2 per Laboratory
19. Hydrogen gas cylinder	1 between 20 students
20. Nitrogen gas	2 per Laboratory
21. Incubator 25 litres	2 per Laboratory
22. Inoculating loops	2 per student

23. Inspissator	1 per Institution
24. Inverted microscope	2 per Laboratory
25. Laboratory freezer	1 per Laboratory
26. Laboratory refrigerator	2 per Lab
27. Laboratory stools	1 per student
28. Lovibond Comparator	1 per Laboratory
29. Lovibond Comparator disks	5 per Laboratory
30. Mechanical mixer	2 per Laboratory
31. Balance	2 per Laboratory
32. Mechanical shaker	2 per Laboratory
33. Microscopes (Binocular)	1: 4 students
34. Microscope (Phase contrast)	2 per Institution
35. Microscope (Teaching)	2 per Institution
36. pH meter	2 per Laboratory
37. Pippetes (adjustable 10-100ul, 100-1000ul)	10 of each per Laboratory
38. Safety Cabinet class 1	1 per laboratory
39. Seitz filter	2 per Laboratory
40. Test tube racks	1 per student
41. Thermocycler	1 per institution
42. Timers	1 per student
43. Tripod stand	1: 2 students
44. Vacuum pump	1 per institution
45. Vaginal speculum	2 per Laboratory
46. Vortex mixer	2 per Laboratory
47. Wash bottles	20 per Laboratory

48. Water bath 25 litres	2 per Laboratory
49. Woods lamp	1 between 20 students
50. Sample labeling machine	2 per Laboratory
51. Computers	2 per Laboratory
52. Printers	2 per Laboratory

#### **2.4.2 CLINICAL CHEMISTRY**

1. Balance (Analytical 0.001g sensitivity)	2 per Laboratory
2. Balance (ordinary)	2 per Laboratory
3. Blood gas analyzer	2 per institution
4. Centrifuge (8 buckets)	2 per Laboratory
5. Chromatographic sets	1 of each per Institution
- Gas liquid chromatography	
- High pressure liquid chromatography	
6. Colorimeter	5 per Laboratory
7. Comparator disks	5 per Laboratory
8. Computers	2 per Laboratory
9. Printer	1 per Laboratory
10. Bunsen burners	1 between 2 students
11. Butane Gas	2 cylinders per Laboratory
12. Deionizer	1 per institution
13. Distiller	1 per Institution
14. Electrophoretic tank	2 per Laboratory
15. ELISA reader	1 per Institution
16. ELISA washer	1 per Institution
17. Flame photometer	2 per institution

18. Fluorimeter	2 per institution
19. Gas cylinder (100kg)	2 per Laboratory
20. Hot Air Oven	2 per Laboratory
21. Immunochemistry analyzer	2 per institution
22. Incubator (25 litres)	2 per Laboratory
23. Ion selective electrode machine	2 per institution
24. Laboratory deep freezers	1 per laboratory
25. Laboratory refrigerator	2 per Laboratory
26. Laboratory stools	1 per student
27. Mechanical Mixer	2 per Laboratory
28. Mechanical shaker	2 per Laboratory
29. Nephelometer	2 per Laboratory
30. Pestles and motors	2 per Laboratory
31. pH meter	2 per Laboratory
32. Pipettes (adjustable;10-100ul,100-1000ul)	10 of each per Laboratory
33. Refractometer	2 per Laboratory
34. Scintillation counter	2 per institution
35. Spectrophotometer	2 per institution
36. Spectroscope	2 per Laboratory
37. Test tube racks	1 per student
38. Thermometers	1 each (refrigerator/freezer/water bath/Incubator)
39. Timers (1 hour)	1 per student
40. Tripod stands	1: 2 students
41. Vortex mixer	2 per Laboratory

42. Wash bottles	20 per Laboratory
43. Water bath (25 litres)	2 per Laboratory

#### **2.4.3 HAEMATOLOGY AND BLOOD TRANSFUSION**

1. Balance (Analytical,sensitivity 0.001g)	1 per Laboratory
2. Blood bank refrigerator	1 per institution
3. Blood mixer rollers	2 per institution
4. Bunsen burners	1 : 2 students
5. Centrifuge (Electrical 8 tubes)	2 per Laboratory
6. Colorimeter	5 per Laboratory
7. Comparator Disks APTW	5 per Laboratory
8. Computers	2 per Laboratory
9. Printer	1 per Laboratory
10. Deionizer	1 per Institution
11. Distiller	1 per Institution
12. E.S.R. stands ( 10 slots)	5 per Laboratory
13. Electrophoretic Tank	2 per Institution
14. Grouping tiles	1 per student
15. Haematology Analyzer	2 per Institution.
16. Haemoglobinometers (sahli's apparatus)	1 between 5 students
17. Incubators 25 litres	2 per Laboratory
18. Laboratory deep freezer (-80 <sup>0</sup> C)	1 per Laboratory
19. Laboratory refrigerator	2 per Laboratory
20. Laboratory stools	1 per student
21. Lovibond comparator	5 per Laboratory

22. Mechanical mixer	2 per Laboratory
23. Microhaematocrit centrifuge	2 per Laboratory
24. Microhaematocrit ruler/reader	1 per student
25. Microscope (Binocular)	1:4 students
26. Microscope(Teaching-4heads)	2 per Institution
27. Neubauer Chambers	1 for each student
28. Pestle and motor	2 per Laboratory
29. pH meter	2 per Laboratory
30. Pipettes (Adjustable10-100ul, 100-1000ul)	10 of each per Laboratory
31. Plasma extractors	2 per institution
32. Refrigerated centrifuge	2 per institution
33. Sphygmomanometers	5 per Laboratory
34. Stethoscopes	5 per Laboratory
35. Test tube racks	1 per student
36. Thermometers	1 per referagerator/freezer/incubator
37. Timers (1 hour)	1 per student
38. Wash bottles	20 per Laboratory
39. Water bath 25 Litres	2 per Laboratory
40. Tally counters	
i.    Single	1 per student
ii.   Multiple/Differential	1: 4 students

#### **2.4.4 HISTOPATHOLOGY**

1. Butane gas 100kg                                  2 cylinders
2. Cold plate    2 per Laboratory

3. Computers	2 per Laboratory
4. Printer	1 per Laboratory
5. Cryostat	1 per Laboratory
6. Cyto centrifuge	2 per Laboratory
7. Driers	2 per Laboratory
8. Embedding capsules	100 pieces per Laboratory
9. Embedding molds	10 pieces per Laboratory
10. Floatation baths	2 units per Laboratory
11. Fume chamber	1 per laboratory
12. Gas cylinders	2 cylinders
13. Histokinette	1 per Laboratory
14. Hone and strope	2 per Laboratory
15. Incubators 25 Litres	2 per Laboratory
16. Manual tissue processing set	2 per Laboratory
17. Microscope (Binocular)	1 : 4 students
18. Microscope (Teaching with 4 heads)	2 per institution
19. Microtome (Rocking/Rotary)	2 per institution
20. Microtome blade holders	2 per Laboratory
21. Microtome knives (Disposable)	1 per Laboratory
22. Microtome knives (Non-disposable)	1 of each type per Laboratory
23. Microtome knife sharpeners (manual)	1 per Laboratory
24. Microtome knife sharpeners (Automatic)	1 per Laboratory
25. Microtome lubrication kit	1 per Laboratory
26. Microwave oven	2 per Laboratory
27. Postmortem kit	2 per institution

28. Reagent troughs and jars	2 sets each per Laboratory
29. Staining jars/troughs	2 sets per Laboratory
30. Staining racks	1 per student
31. Tissue baskets	10 per Laboratory
32. Tissue cassettes	10 per Laboratory
33. Vacuum impregnator	1 per Laboratory
34. Vacuum tissue processor	1 per Laboratory
35. Water bath medium size 10 liters	2 per Laboratory
36. Wax baths 20 litres	1 per Laboratory
37. Ice making machine	1 per institution
38. Wax Station	1 per institution.

#### **2.4.5 MEDICAL PARASITOLOGY**

1. Balance (Analytical-0.001g sensitivity) and ordinary	1 per institution
2. Centrifuge (8 tubes)	2 per Laboratory
3. Computer	2 per Laboratory
4. Printer	11 per Laboratory
5. Deionizer	1 per Institution
6. Distiller	1 per institution
7. Enamel tray	2 per Laboratory
8 Hand lenses	1 per student
9 Hot Air Oven	1 per Laboratory
10 Insect traps/tubes	4 per Laboratory
11 Kato kits	1 per student

12	Knap sack/spray pumps	1 per institution
13	Laboratory stools	1 per student
14	Mcmaster chambers	1:4 students
15	Microhaematocrit centrifuge	2 per Laboratory
16	Microscopes (Binocular)	2 per Institution
17	Microscopes (Teaching-4 heads)	1 between 10 students
18	Mosquito scoops	1 per student
19	Pestle and motor	1 between 2 students
20	Test tube racks	1 per student
21	Timers (1 hour)	1 per student
22	Wash bottles	20 per Laboratory
23	Quantitative Buffy Coat (QBC) unit	2 per institution
24	Stereo microscope/dissecting microscope	1:8 students
25	Sucking tubes	1 per student
26	Traps for small mammals	1 between 10 students
27	Laboratory animal House with animals (e.g. rats, rabbits, mice):	1 per institution.

## **2.5 ESSENTIAL GENERAL ASSORTED GLASS/PLASTIC WARE/ APPARATUS**

1. Bijou bottles: 300 pieces
2. Castaneda bottles: 200 pieces
3. Centrifuge tubes: 200 pieces
4. Conical flasks: 50 for each required volume (i.e. 100, 250, and 500ml capacity)
5. Cover slips (22x22cm): 20packets x 100
6. Durham tubes: 100 pieces
7. Forceps: 50 pieces

8. Fuchs Rosenthal counting chamber: 20 pieces
9. Funnels: 50 pieces
10. Glass beakers: 50 for each required volume (i.e. 100, 250, and 500ml capacity)
11. Glass Petri dishes (90mm): 100 pairs
12. Glass pipettes (graduated): 50 pieces of each (i.e. 1ml, 2ml, 5ml and 10ml)
13. Glass pipettes (Volumetric): 50 pieces of each (i.e. 20ul, 50ul)
14. Hand lenses: 50 pieces
15. Pair of scissors: 10 pairs
16. Pipette fillers to hold up to 2ml and up to 5 ml: 50 pieces each
17. Pyrex tubes 75x16 mm: 300 pieces
18. Scalpels: 50 pieces
19. Slide racks: 4 pieces
20. Slides: 50 pieces x 50
21. Spatula: 50 pieces
22. Stirring rods: 100 pieces
23. Test tube racks: 50 pieces
24. Universal bottles: 200 pieces

## **2.6 GENERAL CONSUMABLES/REAGENTS**

### **2.6.1 Blood Transfusion**

1. Absolute Ethanol
2. Absolute methanol
3. Acetic acid
4. Acetone
5. Aluminum sulphate

6. Ammonium sulphate (AR)
7. Amyl alcohol
8. Anti-A
9. Anti-AB
10. Anti-B
11. Anti-D
12. Antihuman Globulin (AHG)
13. Applicator sticks
14. Autoclave tapes
15. Bacillus stearothermophilus spores
16. Barium chloride
17. Blood lancets
18. Bovine Albumin
19. Buffer tablets
20. Calcium chloride
21. Capillary tubes i.e plain and heparinised
22. Carbon tetrachloride
23. Chloroform
24. Citrate
25. Citric acid
26. Clostridium tetani (non-toxigenic spores)
27. Copper sulphate ( $CuSO_4 \cdot 5H_2O$ )
28. Cotton wool
29. Cover slips
30. Detergents
31. Dextrose
32. Diagnostic Sensitivity agar (DST)

33. Dibutylphthalate
34. Dioxane
35. Disinfectants
36. Disodium hydrogen orthophosphate
37. Disodium hydrogen phosphate (unhydrated)
38. Disodium/ Dipotassium ethylene diamine tetra-acetic acid
39. Disodium p-nitrophenyl phosphate
40. Disposable gloves
41. Distilled water
42. Ethanol
43. Ether for laboratory use
44. Ethyl alcohol
45. Ethylene diamine tetra-acetic acid
46. Filter paper
47. Formalin or Formaldehyde (40% w/v)
48. Gauze
49. Gelatin
50. Glacial Acetic Acid
51. Glass slides
52. Glucose
53. Heparin
54. Hydrochloric acid
55. Hydrogen peroxide
56. Isopropyl alcohol
57. Kaolin/platelet substitute mixture
58. Magnesium sulphate
59. Mannitol
60. Membrane filter
61. Methanol

- 62. Oil immersion
- 63. Petri dishes Glass
- 64. Petri dishes plastic
- 65. Pipette tip (yellow and blue)
- 66. Pipette tip (yellow and blue): 4 x 100
- 67. Potassium dichromate
- 68. Sodium bicarbonate
- 69. Sodium carbonate (anhydrous)
- 70. Sodium chloride
- 71. Sodium Citrate
- 72. Sodium dihydrogern phosphate (unhydrous)
- 73. Sodium dithionite
- 74. Sodium hydroxide
- 75. Sterile swabs
- 76. Surgical blades:
- 77. Toluene
- 78. Urea
- 79. Vacutainer needles
- 80. Vacutainer tubes

## **2.6.2 Clinical Chemistry**

- 1. Absolute Ethanol
- 2. Absolute methanol
- 3. Acetest tablets
- 4. Acetic acid
- 5. Acetoacetic acid
- 6. Acetone

7. Ammonia
8. Ammonium citrate
9. Ammonium oxalate
10. Ammonium sulphate (AR)
11. Ammonium/Potassium alum
12. Amyl alcohol
13. Barium chloride
14. Blood lancets
15. Bovine Albumin
16. Buffer tablets
17. Calcium chloride
18. Calcium test kit
19. Capillary tubes i.e plain and heparinised
20. Clinitest tablets
21. Copper sulphate ( $\text{CUSO}_4 \cdot 5\text{H}_2\text{O}$ )
22. Cotton wool
23. C-reactive protein test kit
24. Creatine kinase test kit
25. Detergents
26. Disinfectants
27. Disodium hydrogen orthophosphate
28. Disodium hydrogen phosphate (unhydrous)
29. Disodium/ Dipotassium ethylene diamine tetra-acetic acid
30. Disodium p-nitrophenyl phosphate
31. Disposable gloves
32. Distilled water
33. Estrogen hormone test kit
34. Ethanol
35. Ethyl alcohol

36. Ethylene diamine tetra-acetic acid
37. Ferric chloride
38. Filter paper
39. Follicle stimulating hormone test kit
40. Formalin or Formaldehyde (40%w/v)
41. Fructose powder
42. Gauze
43. Glacial Acetic Acid
44. Glucose oxidase test kit
45. Glucose powder
46. Glucose strips (blood)
47. Glycosylated haemoglobin test kit
48. Grease
49. hCG test kit
50. HDL Cholesterol test kit
51. Heparin
52. Hydrochloric acid
53. Hydrogen peroxide
54. Ictotest tablets
55. Inorganic phosphate test kit
56. Iodine crystal
57. Iron chloride
58. Isopropyl alcohol
59. Lactose powder
60. LDL Cholesterol test kit
61. Lipase test kit
62. Luteinising hormone test kit
63. Magnesium sulphate
64. Maltose

- 65. Membrane filter
- 66. Methanol
- 67. Methylamine hydrochloride
- 68. Nitric acid
- 69. Para-dimethylaminobenzaldehyde
- 70. Pentose powder
- 71. Phenol
- 72. Phosphate
- 73. Phosphotungstic acid
- 74. Picric acid
- 75. Pipette tip (yellow and blue)
- 76. Pipette tip (yellow and blue): 4 x 100
- 77. Potassium dichromate
- 78. Potassium dihydrogen orthophosphate
- 79. Potassium dihydrogen phosphate
- 80. Potassium ferricyanide
- 81. Potassium hydrogen phosphate
- 82. Potassium iodide
- 83. Potassium Oxalates
- 84. Progesterone test kit
- 85. Prolactin hormone test kit
- 86. PSA (Prostate Specific Antigen)
- 87. Resorcinol
- 88. Serum Alanine transaminase Test Kit
- 89. Serum Albumin Test Kit
- 90. Serum Amylase Test Kit
- 91. Serum Aspartate transaminase Test Kit

92. Serum Bilirubin Test Kit
93. Serum Creatinine test kit
94. Serum Protein test kit
95. Serum Urea test kit
96. Sodium acetate
97. Sodium bicarbonate
98. Sodium carbonate (anhydrous)
99. Sodium chloride
100. Sodium Citrate
101. Sodium dihydrogern phosphate (unhydrous)
102. Sodium dithionite
103. Sodium fluoride
104. Sodium hydroxide
105. Sodium iodate
106. Sodium iodide
107. Sodium nitroprusside
108. Sodium oxalate
109. Sodium sulphate
110. Sucrose powder
111. Sulphosalicylic acid
112. Testosterone hormone test kit
113. Tetra - iodothyronine (T4) test kit
114. Thyroid stimulating hormone (TSH) test kit
115. Total Lactate Dehydrogenase (LH) test kit
116. Toluene
117. Total cholesterol test kit
118. Total Creatine kinase (CK) test kit
119. Transfer pipettes
120. Tri - iodothyronine (T3) test kit

121. Trichloroacetic acid
122. Triglycerides test kit
123. Urea
124. Uric acid test kit
125. Urine containers
126. Urine dipsticks (10 parameter)
127. Urine dipsticks (3 parameter)
128. Vacutainer needles
129. Vacutainer tubes
130. Vitamin Assay test kits (A,D, E, K, B, C)

### **2.6.3 Haematology**

1. Absolute Ethanol
2. Absolute methanol
3. Acetic acid
4. Acetone
5. Acridine orange
6. Adenine
7. Ammonia
8. Ammonium oxalate
9. Ammonium sulphate (AR)
10. Amyl alcohol
11. Applicator sticks
12. Autoclave tapes
13. Azure II
14. Azure II-Eosin
15. Bacillus stearothermophilus spores

16. Barium chloride
17. Blood lancets
18. Bovine Albumin
19. Brilliant cresyl blue
20. Buffer tablets
22. Calcium chloride
23. Capillary tubes i.e plain and heparinised
24. Carbon tetrachloride
25. Celloidin
26. Cellophane
27. Cellulose acetate membrane 9Titan 111 cellulose acetate plate
28. Chloroform
29. Chlorine
30. Chromic acid
31. Citrate
32. Citric acid
33. Copper sulphate ( $CuSO_4 \cdot 5H_2O$ )
34. Cotton wool
35. Cover slips
36. Cresyl fast violet acetate
37. Crystal violet
38. Cyanmethaemoglobin standards
39. Detergents
40. Dextrose
41. Disinfectants
42. Disodium hydrogen orthophosphate
43. Disodium hydrogen phosphate (unhydrated)
44. Disodium/ Dipotassium ethylene diamine tetra-acetic acid

45. Disodium p-nitrophenyl phosphate
46. Disposable gloves
47. Distilled water
48. Dodeca-Tungstophosphoric acid
49. DPX mountant
50. Drabkin's capsule
51. Eosin
52. Ethanol
53. Ether for laboratory use
54. Ethyl alcohol
55. Ethylene diamine tetra-acetic acid
56. Ferric chloride
57. Field stain A
58. Field stain B
59. Filter paper
60. Formalin or Formaldehyde (40%w/v)
61. Formic acid
62. Gauze
63. Giemsa powder
64. Glacial Acetic Acid
65. Glass slides
66. Glucose powder
67. Glycerol
68. Grease
69. Heamatotoxylin
70. Heparin
71. Hydrochloric acid
72. Hydrogen peroxide

73. Iodine crystal
74. Iron chloride
75. Isopropyl alcohol
76. Kaolin/platelet substitute mixture
77. Lactic acid
78. Leishman powder
79. Lithium carbonate
80. Magnesium sulphate
81. Membrane filter
82. Mercuric chloride
83. Mercuric oxide
84. Methanol
85. Methylene Blue powder
86. Methylene blue tablets
87. New Methylene blue
88. Nitric acid
89. Nonidet P40
90. Oil immersion
91. Osmium tetroxide
92. Paraffin wax MP 56<sup>0</sup>C-60<sup>0</sup>C
93. PAS (Periodic Acid and Sciffs)
94. Petri dishes Glass
95. Petri dishes plastic
96. Phenol
97. Phosphate
98. Phosphotungstic acid
99. Picric acid
100. Pipette tip (yellow and blue)

101. Pipette tip (yellow and blue): 4 x 100
102. Polystyrene
103. Potassium cyanide
104. Potassium dichromate
105. Potassium dihydrogen orthophosphate
106. Potassium dihydrogen phosphate
107. Potassium ferricyanide
108. Potassium hydrogen phosphate
109. Potassium iodide
110. Potassium Oxalates
111. Potato dextrose agar
112. Sealant
113. Sodium acetate
114. Sodium bicarbonate
115. Sodium carbonate (anhydrous)
116. Sodium chloride
117. Sodium Citrate
118. Sodium dihydrogern phosphate (unhydrous)
119. Sodium dithionite
120. Sodium fluoride
121. Sodium hydroxide
122. Sodiumiodate
123. Sodiumiodide
124. Sodium metabisulphite
125. Sodium nitroprusside
126. Sodium oxalate
127. Sodium sulphate
128. Sodium thiosulphate
129. Starch powder

- 130. Sterile swabs
- 131. Sucrose powder
- 132. Sulphosalicylic acid
- 133. Surgical blades:
- 134. Thrombin
- 135. Thymol
- 136. Toluene
- 137. Transfer pipettes
- 138. Transport media
- 139. Trichloroacetic acid
- 140. Trichrome stains
- 150. Tris EDTA-borate buffer
- 151. Urea
- 152. Urease agar
- 153. Vacutainer needles
- 154. Vacutainer tubes
- 155. Wax
- 156. Well plate
- 157. White saponin
- 158. Wright's stain powder
- 159. Xylene (sulphur free)

#### **2.6.4 Histopathology**

- 1. Absolute Ethanol
- 2. Absolute methanol
- 3. Acetic acid

4. Acetoacetic acid
5. Acetone
6. Acridine orange
7. Adenine
8. Aluminum sulphate
9. Ammonia
10. Ammonium citrate
11. Ammonium oxalate
12. Ammonium sulphate (AR)
13. Ammonium/Potassium alum
14. Amyl alcohol
15. Arsenic trioxide
16. Asebestos filters
17. Autoclave tapes
18. Azure II
19. Azure II-Eosin
20. Bacillus stearothermophilus spores
21. Barium chloride
22. Basic Fuchsin
23. Bile salts (Sodium taurocholate)
24. Bovine Albumin
25. Brilliant cresyl blue
26. Buffer tablets
27. Calcium chloride
28. Canada balsam
29. Carbon tetrachloride
30. Cedar wood oil
31. Celestin blue
32. Celloidin
33. Cellophane
34. Chloroform

- 35. Chlorine
- 36. Chromic acid
- 37. Citrate
- 38. Citric acid
- 39. Cotton wool
- 40. Cover slips
- 41. Cresyl fast violet acetate
- 42. Crystal violet
- 43. Detergents
- 44. Dextrose
- 45. Dibutylphthalate
- 46. Dioxane
- 47. Disinfectants
- 48. Disodium hydrogen orthophosphate
- 49. Disodium hydrogen phosphate (unhydrated)
- 50. Disodium/ Dipotassium ethylene diamine tetra-acetic acid
- 51. Disodium p-nitrophenyl phosphate
- 52. Disposable gloves
- 53. Distilled water
- 54. Dodeca-Tungstophosphoric acid
- 55. DPX mountant
- 56. Eosin
- 57. Ethanol
- 58. Ether for laboratory use
- 59. Ethyl alcohol
- 60. Ethylene diamine tetra-acetic acid
- 61. Ferric chloride
- 62. Field stain A
- 63. Field stain B
- 64. Filter paper

65. Formalin or Formaldehyde (40% w/v)

66. Formic acid

67. Gauze

68. Gelatin

69. Giemsa powder

70. Glacial Acetic Acid

71. Glass slides

72. Glucose powder

73. Glycerol

74. Grease

75. Haematoxylin

76. Heparin

77. Hydrochloric acid

78. Hydrogen peroxide

79. Iodine crystal

80. Iron chloride

81. Isopropyl alcohol

82. Kaiserling solution

83. Karo corn syrup

84. Lactic acid

85. Lactose powder

86. Laevulose

87. Leishman powder

88. Lithium carbonate

89. Low Viscosity nitrocellulose

90. Malachite green

91. Membrane filter

92. Mercuric chloride

93. Mercuric oxide

94. Methanol

95. Methyl benzoate
96. Methylamine hydrochloride
97. Methylene Blue powder
98. Methylene blue tablets
99. New Methylene blue
100. Nitric acid
101. Oil immersion
102. Orange G
103. Orcein
104. Orcinol
105. Osmium tetroxide
106. Para-dimethylaminobenzaldehyde
107. Paraffin wax MP 56<sup>0</sup>C-60<sup>0</sup>C
108. Pap stain (OG6, EA50,EA36)
109. PAS (Periodic Acid and Sciffs)
110. Perspex
111. Phenol
112. Phosphate
113. Phosphotungstic acid
114. Picric acid
115. Pipette tip (yellow and blue)
116. Pipette tip (yellow and blue): 4 x 100
117. Polystyrene
118. Potassium cyanide
119. Potassium dichromate
120. Potassium dihydrogen orthophosphate
121. Potassium dihydrogen phosphate
122. Potassium ferricyanide
123. Potassium hydrogen phosphate

- 124. Potassium iodide
- 125. Potassium Oxalates
- 126. Resorcinol
- 127. Sealant
- 128. Sodium acetate
- 129. Sodium bicarbonate
- 130. Sodium carbonate (anhydrous)
- 131. Sodium chloride
- 132. Sodium Citrate
- 133. Sodium dihydrogern phosphate (unhydrorous)
- 134. Sodium dithionite
- 135. Sodium fluoride
- 136. Sodium hydroxide
- 137. Sodium iodate
- 138. Sodium iodide
- 139. Sodium metabisulphite
- 140. Sodium nitroprusside
- 141. Sodium oxalate
- 142. Sodium sulphate
- 143. Sodium thiosulphate
- 144. Starch powder
- 145. Sterile swabs
- 146. Sucrose powder
- 147. Suphur powder
- 148. Surgical blades:
- 149. Thrombin
- 150. Toluene
- 151. Transfer pipettes
- 152. Trichloroacetic acid
- 153. Trichrome stains
- 154. Tris EDTA-borate buffer

- 155. Wax
- 156. Wright's stain powder
- 157. Xylene (sulphur free)

#### **2.6.4 Microbiology**

- 1. Absolute Ethanol
- 2. Absolute methanol
- 3. Acetest tablets
- 4. Acetic acid
- 5. Acetoacetic acid
- 6. Acetone
- 7. Acridine orange
- 8. Aluminum sulphate
- 9. Ammonia
- 10. Ammonium citrate
- 11. Ammonium oxalate
- 12. Ammonium sulphate (AR)
- 13. Ammonium/Potassium alum
- 14. Amyl alcohol
- 15. Anaerobic catalysts
- 16. Anaerobic indicators
- 17. Applicator sticks
- 18. ASOT
- 19. Arsenic trioxide
- 20. Asebestos filters
- 21. Autoclave tapes
- 22. Bacillus stearothermophilus spores
- 23. Basic Fuchsin
- 24. Bile salts (Sodium taurocholate)

25. Blood lancets
26. Bovine Albumin
27. Brain Heart Infusion agar
28. Brain Heart Infusion broth
29. Browne's tube (Blue, Black, Green spots)
30. Brucella abortus
31. Brucella melitensis
32. Citrate agar
33. CLED agar
34. Clostridium tetani (non-toxigenic spores)
35. Cotton blue
36. Cotton wool
37. Cover slips
38. Cresyl fast violet acetate
39. Crystal violet
40. Deoxycholate citrate agar (DCA)
41. Detergents
42. Dextrose
43. Diagnostic Sensitivity agar (DST)
44. Disinfectants
45. Disposable gloves
46. Distilled water
47. DNase agar
48. DPX mountant
49. Earthenware filters
50. Eosin
51. Ethanol

52. Ether for laboratory use

53. Ethyl alcohol

54. Filter paper

55. Fructose powder

56. Gauze

57. Gelatin

58. Glass slides

59. Glucose powder

60. HCG test kit

61. Heamatoxylin

62. Heparin

63. Hepatitis B surface Antigen

64. Helicobactor pylori antigen

65. HIV1/2 rapid test kits

66. Hydrochloric acid

67. Hydrogen peroxide

68. Indian Ink

69. Iodine crystal

70. Iron chloride

71. Isopropyl alcohol

72. Lactose powder

73. MacConkey agar

74. MacConkey broth

75. Malachite green

76. Maltose

77. Mannitol

78. Mannitol agar

79. Membrane filter
80. Methanol
81. Methylene Blue powder
82. Methylene blue tablets
83. Muller Hinton agar
84. New Methylene blue
85. Nigrosin
86. Nitric acid
87. Nonidet P40
88. Nutrient agar
89. Nutrient broth
90. Oil immersion
91. Oxidase reagent
92. Para-dimethylaminobenzaldehyde
93. Pentose powder
94. Peptone water
95. Petri dishes Glass
96. Petri dishes plastic
97. Phenol
98. Picric acid
99. Pipette tip (yellow and blue)
100. Pipette tip (yellow and blue): 4 x 100
101. Potato dextrose agar
102. Proteus OX,OX<sub>2</sub>, OXK antigens
103. PSA (Prostate Specific Antigen)
104. Resorcinol

- 105. Rheumatoid factor reagent
- 106. RPR (Rapid Plasma Reagin) test kit
- 107. Sabouraud agar
- 108. Salmonella H antigen
- 109. Salmonella O antigen
- 110. Sealant
- 111. Selenite F/U
- 112. Serum CRAG test kit
- 113. Sodium chloride
- 114. Starch powder
- 115. Sterile swabs
- 116. Stool containers
- 117. Sucrose powder
- 118. Sulphosalicylic acid
- 119. Sulphur powder
- 120. Surgical blades:
- 121. TCBS agar
- 122. Toluene
- 123. Treponema pallidum Haem-Agglutination Antigen
- 124. Transfer pipettes
- 125. Transport media
- 126. Trichloroacetic acid
- 127. Trichrome stains
- 128. Urea
- 129. Urease agar
- 130. Urine containers
- 131. Urine dipsticks (10 parameter)
- 132. Urine dipsticks (3 parameter)
- 133. Vacutainer needles

134. Vacutainer tubes
135. VDRL (Venereal Disease Research Laboratory) Cardiolipin Antigen
136. Well plate
137. XLD agar
138. Xylene (sulphur free)
139. Yeastrel agar

## **2.6.5 Parasitology**

1. Absolute Ethanol
2. Absolute methanol
3. Acetic acid
4. Acetone
5. Acridine orange
6. Aluminum sulphate
7. Ammonium citrate
8. Ammonium oxalate
9. Ammonium sulphate (AR)
10. Ammonium/Potassium alum
11. Amyl alcohol
12. Applicator sticks
13. Eosin
14. Barium chloride
15. Basic Fuchsin
16. Blood lancets
17. Bovine Albumin
18. Buffer tablets
19. Canada balsam
20. Capillary tubes i.e plain and heparinised

21. Carbon tetrachloride
22. Cedar wood oil
23. Celestin blue
24. Celloidin
25. Cellophane
26. Chloroform
27. Clinitest tablets
28. Copper sulphate ( $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ )
29. Cotton wool
30. Cover slips
31. Crystal violet
32. Detergents
33. Dextrose
34. Disinfectants
35. Disodium hydrogen orthophosphate
36. Disodium hydrogen phosphate (unhydrated)
37. Disodium/ Dipotassium ethylene diamine tetra-acetic acid
38. Disposable gloves
39. Distilled water
40. DPX mountant
41. Eosin
42. Ethanol
43. Ether for laboratory use
44. Ethyl alcohol
45. Ferric chloride
46. Field stain A
47. Field stain B
48. Filter paper
49. Formalin or Formaldehyde (40% w/v)

- 50. Gauze
- 51. Giemsa powder
- 52. Glacial Acetic Acid
- 53. Glass slides
- 54. Glycerol
- 55. Glycosylated haemoglobin test kit
- 56. Grease
- 57. Heamatoxylin
- 58. Heparin
- 59. Iodine crystal
- 60. Isopropyl alcohol
- 61. Leishman powder
- 62. Low Viscosity nitrocellulose
- 63. Magnesium sulphate
- 64. Membrane filter
- 65. Methanol
- 66. Methylene Blue powder
- 67. Methylene blue tablets
- 68. Oil immersion
- 69. Oleum ricini
- 70. Para-dimethylaminobenzaldehyde
- 71. Pentose powder
- 72. Petri dishes Glass
- 73. Petri dishes plastic
- 74. Pipette tip (yellow and blue)
- 75. Pipette tip (yellow and blue): 4 x 100
- 76. Sodium bicarbonate

77. Sodium carbonate (anhydrous)  
78. Sodium chloride

79. Sodium Citrate

80. Sterile swabs

81. Stool containers

82. Sucrose powder

83. Surgical blades:

84. Toluene

85. Transfer pipettes

86. Tris EDTA-borate buffer

87. Urine containers

88. Urine dipsticks (10 parameter)

89. Urine dipsticks (3 parameter)

90. Vacutainer needles

91. Vacutainer tubes

92. Wright's stain powder

93. Xylene (sulphur free)

94. Zinc sulphate

## **2.7: RECOMMENDED TEXTBOOKS**

The most recent editions not above 5 years of last publication in each of the disciplines of Medical Laboratory Sciences. The books should in a ratio of 1:4 students.