

LABORATORY HANDBOOK



**Department of Laboratory Services
Ministry of Health, Brunei Darussalam**

4th Edition, 2013

MESSAGE FROM THE DIRECTOR GENERAL OF MEDICAL SERVICES



السلام عليكم ورحمة الله وبركاته

The Laboratory service is an essential part of the healthcare system and plays a crucial role in the management of patients. Decisions made for diagnosis and treatment of diseases are influenced by the results produced by the Laboratory services, hence, high quality laboratory services are necessary and imperative.

In line with the Ministry of Health's 2035 Vision 'Together towards a Healthy Nation', the Department of Laboratory Services has made great efforts in ensuring excellent laboratory services are provided to the population of Brunei Darussalam. Besides achieving ISO 15189 accreditation in 2011 and sustaining high quality of services, the Department of Laboratory Services also continued to provide adequate and comprehensive information of their services to all healthcare providers.

The Department of Laboratory Services on – going efforts of reviewing, updating and improving the contents of the laboratory handbook are to ensure not only accurate and clear information are communicated properly but also to ensure this laboratory handbook serves as a user friendly guideline for all healthcare providers.

I hope that this updated edition will be fully utilised by all healthcare facilities within and outside the Ministry of Health. I also hope that healthcare providers will continue to support the Department of Laboratory Services by providing their comments and feedback for the purpose of further improving the quality of their services.

Last but not least, I would like to congratulate all editorial board members for their invaluable contributions towards the improvement and revision of this Laboratory Handbook and hope that the Department of Laboratory Services will continue to provide accurate, efficient, cost – effective and high quality services.

Dr Hj Zulaidi bin Hj Awg Latif
Director General of Medical Services
Ministry of Health

MESSAGE FROM THE DIRECTOR OF LABORATORY SERVICES

السلام عليكم ورحمة الله وبركاته

The Department of Laboratory Services is striving to deliver comprehensive and high quality services. Since its inception in January 2001, the Department has expanded from three laboratory sections to its current disciplines namely Clinical Chemistry, Haematology, Microbiology, Virology, Mycology, Immunology, Histology and Cytology as well as a Blood Bank in RIPAS Hospital. We also offer essential laboratory tests and are expanding our services in the peripheral district laboratories.

We have more than 200 staff comprising of Consultants, Medical Officers, Scientific Officers, Laboratory Technologists, Laboratory Technicians and Laboratory Assistants and offer our clients with diagnostic testing and clinical consultative services.

The Department of Laboratory Services successfully obtained ISO15189 accreditation in 2011 and is strongly committed to retain this prestigious recognition of its high standards. It is our sincere hope that with this achievement, we can continue to provide our nation with excellent laboratory services for quality patient care.

In this 4th edition of Laboratory Handbook, we have categorized the test menu according to disciplines and provided guidelines and relevant information on patient preparation, sample collection and handling and phlebotomy technique.

I wish to extend my sincere thanks to all staffs who have worked so hard to put this issue together. It is our hope that this Handbook will meet your needs by providing useful and up-to-date laboratory information. We welcome your feedback and suggestions so that together we will provide the best care to our patients.

Hjh Siti Aisah Binti Hj Md Jaafar
Director of Laboratory Services

MESSAGE FROM THE SPECIALIST PATHOLOGIST

With the advancement of technology, the range of tests performed in the medical laboratories continues to increase and laboratory personnel need to be geared to handle them efficiently to meet the challenges. Just as the specimen, the relevant data input is also important to the laboratory staff to arrive at an accurate diagnosis. In addition, the quality of the laboratory report depends principally on the quality of the sample received by the laboratory. Therefore for the successful completion of tests, the samples should be properly collected according to the prescribed procedure and transported to the laboratory safely, as early as possible.

The new edition of the handbook will serve as a guide for doctors, nurses in the proper methods to be adopted in the collection of specimens for laboratory investigations.

Accreditation with ISO 15189 by the Singapore Accreditation Council in 2011 has been a significant achievement for our laboratory. It is also challenging that we need to work towards keeping up this standard. In order to do that, it is vital that the laboratory and clinical caregivers work as a team. Accurate data recording is essential in Quality Management. When Bru-HIMS becomes operational it will link all healthcare facilities in the country and serve as an efficient and swifter means of transferring the data between clinicians and the laboratory. Our aim is to assist the clinical staff in the management of the patient as efficiently as possible. I hope this manual will link us together to achieve that goal.

I am confident that this handbook will serve as a valuable tool for the doctors and nurses alike in providing necessary information on the selection, collection, handling and transportation of clinical samples.

Finally, I wish to thank the editorial board for their untiring efforts in bringing out this edition of handbook.

Dr P.U. Telisinghe

Specialist Pathologist

Raja Isteri Pengiran Anak Saleha Hospital

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1 WHO WE ARE

1.1. Our Commitment (Quality Policy)

- We are committed to deliver reliable laboratory results that ensure appropriate and timely patient care
 - in all facilities of the Department of Laboratory Services
 - in all tests that have accredited as well as tests which are yet to be accredited

1.2. Our Objectives

- Ensure accuracy of the test results
- Ensure all the test results are released to clinicians on time
- Ensure availability of safe blood and blood products
- Ensure the requirements and expectations of our customers are satisfied

1.3. Our Guideline (work ethics)

- We respect the laws of our country
- We observe the rules and regulations set by our Department
- We care about our patients
 - we maintain confidentiality of patients' information at all time
 - we protect and respect their right to privacy
- We practise with professionalism and integrity
 - we are fair, honest and impartial in our dealings
 - we treat others with dignity and respect
 - we exercise due skill, care and diligence in performing our duties
 - we strive to maintain our knowledge, skills and technical competencies up-to-date
 - we give all of our colleagues the care and courtesy that we would wish to receive
 - we are attentive to the interests of the broader community
- We avoid conflicts of interest
 - we do not falsify records, prepare fraudulent reports, or make false claims
 - we do not conduct non-laboratory business on laboratory time

- we are fair and honest with our suppliers and vendors
- we do not seek or use information or data for the purpose beyond the scope of our employment

1.4. Our Quality System

Our quality system is in accordance with ISO 15189. It applies to all tests that have been accredited as well as tests that are yet to be accredited in all facilities of the Department.

We conduct annual internal audits based on ISO 15189 requirements and establish internal quality control measures to ensure the accuracy and the reliability of test results.

Our laboratories participate in external quality assessment (EQA) programs, the Royal College of Pathologist of Australasia (RCPA) on:

- Anatomical Pathology
- Chemical Pathology
- Gynaecological Cytopathology
- Haematology-General
- Specialised Haematology
- Immunology
- Microbiology
- Serology
- Blood Transfusion

1.5. Our Organisation

Name	Department of Laboratory Services Ministry of Health, Brunei Darussalam
Address	Raja Isteri Pengiran Anak Saleha (RIPAS) Hospital Jalan Putera Al-Muhtadee Billah/Jalan Tutong Brunei Darussalam, BA1710
Telephone	Tel +673 2242424, 2221317/9, 2221320/1
Fax no	+ 673 2220869

1.6. Our Background and Scope

We have been providing clinical laboratory services in Brunei since 1927. Over the years the services have been expanded and eventually recognised as the Department of Laboratory Services on 2nd January 2001 by the Ministry of Health, Brunei Darussalam.

Our services cover all laboratories in the government hospitals in Brunei Darussalam, namely:

- Raja Isteri Pengiran Anak Saleha (RIPAS) Hospital, Bandar Seri Begawan
- Suri Seri Begawan (SSB) Hospital, Belait
- Pengiran Muda Mahkota Pengiran Muda Haji Al-Muhtadee Billah (PMMPMHAMB) Hospital, Tutong
- Pengiran Isteri Hajah Mariam (PIHM) Hospital, Temburong

We also provide laboratory services to all government health clinics in Brunei Darussalam.

Our Department's administration is located at RIPAS Hospital. It is the centre for most disciplines of clinical laboratory services in Brunei such as Clinical Chemistry, Haematology, Blood Transfusion, Bacteriology, Mycology, Histology, Cytology, Mortuary, Immunology, Virology and Mycobacteriology.

District Hospital Laboratories provide limited services in Blood Donation, Clinical Chemistry, Haematology and Microbiology.

Our Department has been accredited with ISO 15189 by the Singapore Accreditation Council – Singapore Laboratory Accreditation Scheme (SAC-SINGLAS) since October 2011.

1.7. Our Services

Clinical Chemistry Laboratory Services

The laboratory provides a wide range of biochemical tests, analysing electrolytes, enzymes, hormones and proteins in the blood, urine and cerebrospinal fluid. State-of-the-art instrumentation and stringent quality control measures enable quality-assured results reported in a timely manner.

General and STAT Chemistry unit offers tests on general chemistry such as electrolytes, cardiac enzymes, liver function, lipids and glucose monitoring. Automated immunoassay analyzers enable accurate testing of hormones and tumour markers.

Special Chemistry unit concentrates on glycated haemoglobin (HbA1c) measurement, neonatal screening, phaeochromocytoma screening, renal calculi analysis, specialized protein testing and therapeutic drugs monitoring.

Haematology Laboratory Services

Haematology Laboratory Services provide routine and specialised haematological tests and interpretation of results. It is closely linked to Clinical Haematology and Blood Donation services.

The laboratory provides:

- Routine haematology and coagulation tests.
- Specialised tests include:
 - Haematological oncology diagnosis
 - Process and interpret bone marrow studies
 - Haemostasis and thrombosis (Haemophilia and Thrombophilia)
 - Haemoglobinopathy (Thalassaemia and Sickle Cell diseases)
- Transfusion Medicine
 - Blood Grouping antibody screening, antibody identification and red cell phenotyping
 - Crossmatching and issuing compatible blood for blood transfusion
 - Issuing blood product such as platelet, FFP and cryoprecipitate
 - Blood transfusion reaction investigation

Microbiology Laboratory Services

The main role of Microbiology Laboratory Services is to identify the aetiological agents of diseases caused by bacteria, fungi and parasites. The laboratory also carries out urinalysis and stool microscopic examination, infection control screening and bacterial serology.

Microbiology laboratory also works closely with Hospital Infection Control Unit in activities related to bacterial and fungal infections in all hospitals in Negara Brunei Darussalam.

Blood Donation Centre

The main function of the Blood Donation Centre is to provide safe and quality blood and blood products by conducting mobile campaigns and providing walk-in donor services.

The serology laboratory of Blood Donation Centre performs initial screening of infectious diseases and determination of ABO blood group, Rh blood type and red cell antibodies on donated blood with the aim is to ensure the safest blood is transfused to the recipients.

Blood Donation Centre also provides plateletpheresis and leukocyte depleted blood, performs venesection for polycythaemia rubra vera (PRV) patients and do follow-up and consultation for donors who have been tested positive for certain infectious diseases.

Histology and Cytology Laboratory Services

The Histology and Cytology Laboratory Services include Histology, Cytology and Mortuary services. Both Histology and Cytology laboratories offer services for diagnosis of malignant and non-malignant diseases.

Histology laboratory provides routine and special diagnostic examinations on surgical biopsies. Special diagnostic examination includes rapid frozen section and immunohistochemistry / immunofluorescence studies.

Cytology laboratory provides diagnostic examinations of pap tests, body fluids, and sputum, urine and fine needle aspiration specimens. Investigation of male infertility including basic semen analysis is also done in this laboratory.

The mortuary provides cadaveric storage, autopsy and embalming service.

Virology Laboratory Services

The Laboratory provides investigation for detection of viral antigens and antibodies and some non-viral antigens such as *Treponema pallidum* and *Chlamydia trachomatis*.

Immunology Laboratory Services

The laboratory carries out immunological investigations on the detection and quantitation of auto-antibodies. Services provided aid in diagnosing and monitoring the therapeutic response of a variety of systemic autoimmune diseases such as Systemic Lupus Erythematosus, Scleroderma, Sjogren Syndrome and Rheumatoid Arthritis.

National TB Reference Laboratory

The National TB Reference Laboratory (NTRL) provides laboratory diagnosis for tuberculosis and other non-tuberculosis mycobacterial infections from clinical specimens for all hospitals and health clinics in Brunei Darussalam.

Services provided include microscopy, culture, identification of *Mycobacterium tuberculosis* (MTB) and mycobacteria other than tuberculosis (MOTT), antimycobacterial susceptibility testing, serology and nucleic acid testing of mycobacteria.

The Laboratory also collaborates with healthcare providers and National TB Coordinating Centre for the effective surveillance, prevention and control of tuberculosis in Brunei Darussalam.

Phlebotomy and Central Specimen Receiving Area

Phlebotomy is the focal point of blood collection for patients from Specialist Clinics in RIPAS Hospital.

Central Specimen Receiving Area (CSRA) is the centre for receiving specimens from RIPAS Hospital, Brunei Muara Health Clinics and referred specimens from District Hospitals. Services provided include registration of specimens and distribution of specimens to the respective laboratories at RIPAS Hospital and Sumbiling.

Note: Specimens for Histology and Cytology Laboratory Services are to be sent directly to the respective laboratories and NOT to CSRA.

SSB Hospital Laboratory Services

The Laboratory provides a range of tests in Clinical Chemistry, Haematology and Microbiology, and Phlebotomy and blood banking services, in Belait District. Tests not available in this Laboratory are sent to RIPAS Hospital laboratories.

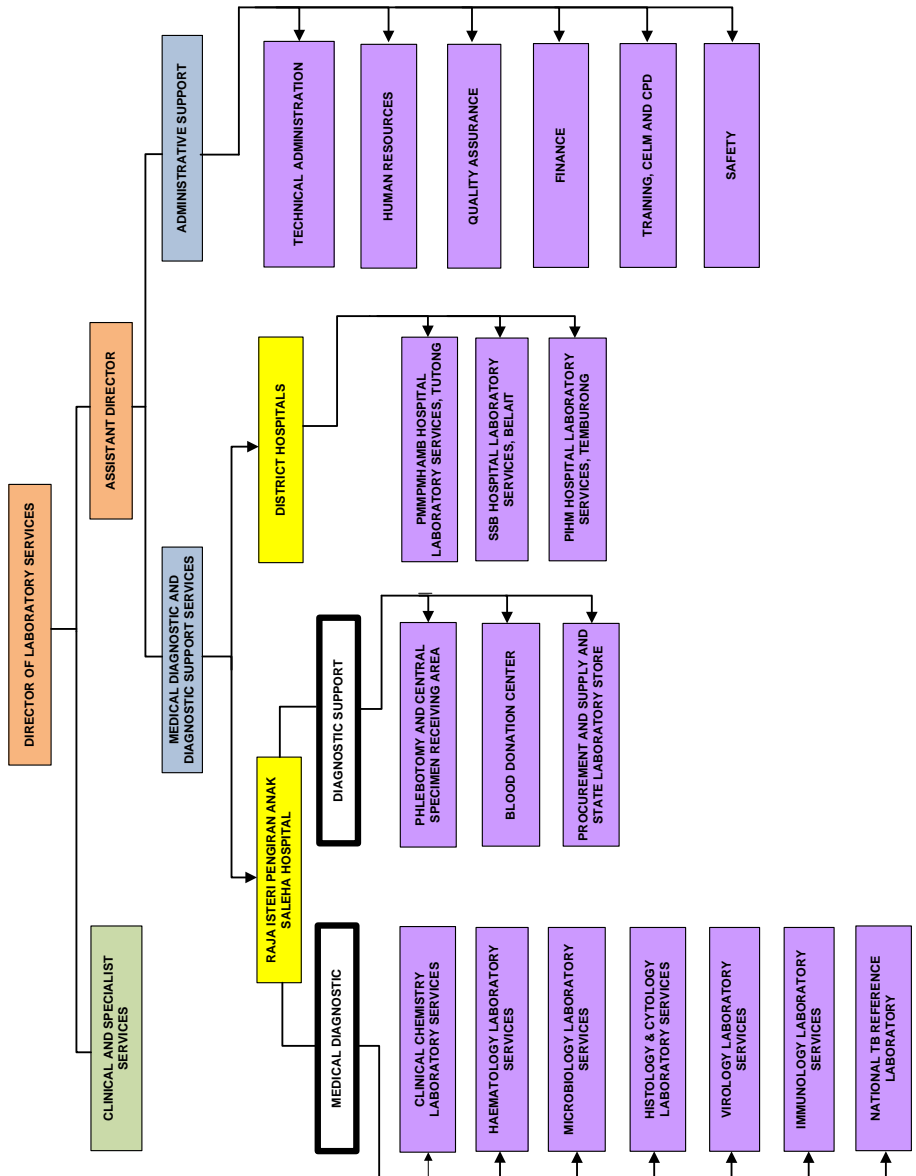
PMMPMHAMB Hospital Laboratory Services

The Laboratory provides a range of tests in Clinical Chemistry, Haematology and Microbiology, and Phlebotomy and blood banking services in Tutong District. Tests not available in this Laboratory are sent to RIPAS Hospital laboratories.

PIHM Hospital Laboratory Services

The Laboratory provides limited services in Clinical Chemistry, Haematology, Microbiology, Phlebotomy and blood banking in Temburong District. Tests not available in this Laboratory are sent to RIPAS Hospital laboratories.

1.8. Our Organisational Chart



1.9. Our Operating Hours

OFFICE HOURS

Monday to Thursday and Saturday	:	7.45 a.m. – 12.15 p.m. 1.30 p.m. – 4.30 p.m.
Fasting Month	:	8.00 a.m. – 2.00 p.m.

SERVICE HOURS

Clinical Chemistry Laboratory Services	24 Hours (Shift-24/7)
Haematology Laboratory Services	24 Hours (Shift – 24/7)
Microbiology Laboratory Services	24 Hours (On-Call) Full operation during weekend/public holiday from 8.00 am to 12.00 pm
Histology and Cytology Laboratory Services	Office Hours Mortuary – 24 Hours (On-Call)
Blood Donation Centre	Office Hours Including Serology Laboratory
Virology Laboratory Services	24 Hours (On-Call)
Immunology Laboratory Services	Office Hours
National TB Reference Laboratory Services	Office Hours
Suri Seri Begawan Hospital, Kuala Belait	24 Hours (On-Call)
Pengiran Muda Mahkota Pengiran Muda Haji Al-Muhtadee Billah Hospital, Tutong	24 Hours (On-Call)
Pengiran Isteri Hajah Mariam Hospital, Temburong	24 Hours (On-Call)

Phlebotomy Services, Raja Isteri pengiran Anak Saleha Hospital

Monday to Thursday and Saturday	:	7.30 a.m. – 4.15 p.m.
Fasting Month	:	8.00 a.m. – 1.45 p.m.

Central Specimen Receiving Area (CSRA), Raja Isteri Pengiran Anak Saleha Hospital

Monday to Thursday and Saturday	:	7.45 a.m. – 4.15 p.m.
Fasting Month	:	8.00 a.m. – 1.45 p.m.

1.10. How to Contact Us

Raja Isteri Pengiran Anak Saleha Hospital Laboratory Tel no: 2242424 / 2232189	
Section	Extension
Director	6317
Administration	6313 / 6776 / 6315
Blood Donation	7124 / 7125 / 7338
Blood Bank, Serology	7350
Central Specimen Receiving Area (CSRA)	8811 / 8805
Clinical Chemistry Laboratory	6321 / 6703
Cytology Laboratory	6326 / 6327
Cytology Screening Room	6704
Haematology Laboratory & Blood Transfusion	6622 / 6701
Histology Laboratory	6512
Histology & Cytology Medical Officer	6516
Immunology	6349 / 6348 / 6351
Microbiology Laboratory	6329 / 6330 / 6331
Microbiology Laboratory Medical Officer	6515
Mortuary	7672/ 8898 / 2232339 (direct line)
Phlebotomy	6587 / 8925
Quality Assurance Unit	7318 / 6314
Specialist Haematology	6702
Specialist Pathologists	6506 / 6508 / 7356
Store	6354 / 6358

Biomedical Sciences Research Unit, Sumbiling Tel no: 2221821 / 2221837 / 2221843	
Section	Extension
Virology Serology Laboratory	114
Virology-Molecular Laboratory	107
National TB Reference Laboratory	130
Suri Seri Begawan Hospital Laboratory, Belait Tel no: 3334174 / 3335333	
Section	Extension
Reception / Phlebotomy	4130
Microbiology	4116
Clinical Chemistry Laboratory	4128
Haematology Laboratory	4114
Blood Bank	4100
Urinalysis	4116
Pengiran Muda Mahkota Pengiran Muda Haji Al-Muhtadee Billah Hospital Laboratory, Tutong Tel 4260721	
Section	Extension
Clinical Chemistry Laboratory	224
Haematology Laboratory	226
Microbiology Laboratory	225
Pengiran Isteri Hj Mariam Hospital Laboratory, Temburong Tel 5221528	
Section	Extension
Hospital Laboratory	123
Phlebotomy	125

2 OUR POLICIES

2.1 Specimen Receiving

All specimens sent to the Laboratory must be in satisfactory condition and properly labelled. The following specimen information is **mandatory** on every specimen:

- Full patient's name
- Patient's ID - Identity Card (IC) or Brunei Electronic Patient Record Number (BN)
- Date of collection
- Nature of specimen (if applicable)

Request forms should be clearly and completely filled.

For blood transfusion samples, incomplete or incorrect information will lead to specimen rejection. The information required is as below:

- Patient's name
- Patient ID-Identification Certificate number (IC) or Brunei Electronic Patient Record Number (BN)
- Doctor signature
- Phlebotomist's name

All specimens with electronic order must have an appropriate Brunei Darussalam Healthcare Information and Management System (Bru-HIMS) barcode label securely attached lengthwise on the specimen tube/container.

Unsatisfactory specimens that will compromise the quality of test results or create safety hazard will not be processed.

Criteria for Unacceptable Specimens

- **Incomplete request**
 - Missing mandatory information (depending on Laboratory requirements)
 - Test not requested by provider
 - Wrong test requested

- **Improper specimen collection**
 - Incorrect sample container
 - Improper or incorrect preservative for 24-hr urine collection
 - Specimen not suitable for culture:
 - Specimen not in the correct media
 - Specimen placed in non-sterile container for culture
 - Wrong sample collected:
 - Saliva is collected instead of sputum:
(Sputum will show mucoid material. If the specimen is watery and almost clear, it is most probably saliva and therefore not suitable for culture)
- **Inadequate or incorrect specimen Identification**
 - Unlabelled specimen tube or container
 - Insufficient mandatory identification details on specimens
 - Patient's information on the specimen container does not match with that on the corresponding request form
 - Sample label illegible
- **Improper Specimen transport**
 - Specimen not complying with temperature, transportation or storage requirement
 - Delay in transportation not within the acceptable period
 - Specimen submitted in a manner that could create a health or safety hazard to Laboratory personnel
 - Missing sample or no sample received for request
- **Insufficient or inappropriate quantity of specimen**
 - Incorrect blood volume for coagulation specimens (above / below the mark indicated on the tube)
 - Quantity not sufficient (QNS)
- **Unsatisfactory specimen Quality**
 - Haemolysed specimens
 - Clotted blood detected in anticoagulated specimens
 - External contamination (Broken or leaked tube/container)

Procedure for Rejection of Specimen:

1. The Laboratory will inform the respective location or requesting doctor.
2. A comment will be entered in the LIS indicating that the sample is unacceptable, and the reason for rejection along with the date and the name of the person notified.

2.2 Verbal Add-On Requests

Verbal add-on test request can be done on the same day provided there is adequate volume and stability of the sample has been maintained. The request should be followed by completion of an “Add-on Request Form” by the requesting doctors.

2.3 Improperly Labelled Precious Specimens

These are samples which are difficult or impossible to redraw, specimens obtained by invasive procedures or tests that are life-saving.

Examples of Precious Specimens

- arterial blood gases
- neonatal specimens
- body fluids such as CSF, joint fluid, pleural fluid, and amniotic fluid
- bone marrow
- fine needle aspirates
- timed blood / urine specimens
- tissues / biopsies
- Pap tests

Policy

The Laboratory may consider testing improperly labelled precious specimens after a “**Sample Identification Correction for Irretrievable Specimen (SIC)**” form has been signed.

Procedure:

- 1 The requesting doctor or respective location will be informed of improperly labelled irretrievable specimen.
- 2 The person who collected the specimen will come to the Laboratory; complete **Sample Identification Correction for Irretrievable Specimen form**; and take responsibility for properly identifying and re-labelling the specimen.
- 3 Laboratory result will be released upon the completion of task 2.

Note:

SPECIMEN FOR BLOOD TRANSFUSION CANNOT BE RELABELLED UNDER ANY CIRCUMSTANCES.

2.4 Short-Turn-Around-Time (STAT) and Urgent Requests

A **STAT** request is critical for immediate patient management and is given priority over all other requests and performed immediately.

An **Urgent** request is when the doctor requires the result as soon as possible, but the result is not critical for immediate management of the patient. Test is performed promptly and the results are given within the day.

Procedure

- 1 The doctor or respective location must inform the Laboratory concerned in advance prior to sending STAT request
- 2 Request form should indicate clearly of STAT or Urgent request
- 3 Specimen should be sent directly to the Laboratory concerned.
- 4 Result will be available in the computer as soon as it is validated.

2.5 Request for Tests Not Available Locally

Tests which are not available in the test catalogue will be referred to overseas accredited laboratories. The Laboratory may be contacted prior to requesting the tests. The Laboratory reserves the right to accept or decline the request based on the situation of the case forwarded. Please contact respective Laboratory for further information.

All requests for referred tests should be authorised by the Specialist or Head of the Unit. Specimen should be sent directly to the respective Laboratory on the day of the appointment.

2.6 Laboratory Reports

All Laboratory results are treated with the strictest confidentiality.

Laboratory reports are not released until the internal quality control (IQC) has been reviewed and results found to be acceptable.

Most reports are available through the Laboratory Information System once they are reviewed, evaluated and validated by authorised personnel.

2.7 Reports by Phone

Conveying results through the telephone is not recommended because of possible transcription errors and misinterpretations. Results may be conveyed to requesting doctor through the phone by senior Laboratory personnel of the Laboratory concerned.

The requesting doctor must repeat the name of the patient and the results to confirm correct transmission of results. Information provided verbally will be followed by a properly recorded result.

2.8 Special Laboratory Reports

Laboratory reports such as medico-legal, histopathology, cytopathology, sexually transmitted infection (STI) and bone marrow reports are not displayed through the Laboratory Information System terminal. These reports are distributed through the normal delivery channels.

2.9 Reports from Referral (Overseas) Laboratories

Laboratory reports from referral laboratories are not displayed through the Laboratory Information System. A copy of the original report can be obtained from the respective laboratory or Director's Office.

2.10 Amended Reports

A report that has been amended after the release of results will be immediately conveyed to the respective location or requesting doctor by phone.

Amended results will be indicated on the report. It is imperative to attach the amended report into the patient's case-note immediately and discard any hardcopy of erroneous report.

2.11 Delayed Reports or Tests Not Being Done

The requesting doctor or relevant location will be informed when the followings are anticipated:

- Delay in giving Laboratory reports
- Tests requested are not done due to technical reasons

2.12 Critical Values (Call-Back Values)

Critical values (call-back values) are grossly abnormal values which need urgent attention of the clinicians. The following values are considered critical values (call-back-values):

Amikacin	> 8 trough	> 35 peak	mg/L
Calcium	< 1.75	> 3.00	mmol/L
Carbamazepine	-	>100	umol/L
Cyclosporine A	< 100	> 800	mg/L
Gentamycin	> 2.0 trough	> 12 peak	mg/L
Glucose	< 2.5	> 25.0	mmol/L
Magnesium	< 0.4	-	mmol/L
Paracetamol	-	> 200	mg/L
Phenytoin	-	> 100	umol/L
Phenobarbitone	-	>300	umol/L

GUIDELINES TO SPECIMEN COLLECTION

Potassium	< 2.5	> 6.0	mmol/L
Salicylate	-	> 300	mg/L
Sodium	< 120	> 160	mmol/L
Tacrolimus	< 4.0	> 12.0	ng/ml
Valporate	-	> 1400	umol/L
Vancomycin	> 10 trough	> 80 peak	mg/L
APTT	-	> 100	seconds
INR	-	> 5.0	
Haemoglobin	< 5.0	> 18.0	g/dL
Platelets	< 50	> 800	X 10 ⁹ /L
WBC	< 1.0	> 50.0	X 10 ⁹ /L
Positive Malaria Parasite, AFB smears, blood cultures and CSF Gram stain results will be notified immediately.			

The requesting doctor / staff in charge will be notified of any critical values (call back values) by phone. Reports through Laboratory Information System (LIS) will be available as soon as the results are validated.

3 GUIDELINES IN SPECIMEN COLLECTION

3.1. REQUESTS TO THE LABORATORY

Laboratory Request Forms

The table below summarises colour-coded forms for various Laboratory requests.

No	Form	Colour	Types of Request
1	Clinical Chemistry	Green	All Clinical Chemistry
2	Haematology	Pink	Haematology Coagulation Special tests
3	Blood Transfusion	Pink	Blood transfusion
4	Microbiology 1	Blue	Bacteriology Mycology
5	Microbiology 2	Blue	Miscellaneous
6	Mycobacteriology	Blue	TB investigations
7	Immunology	Blue	Immunology
8	Virology	White	Virology
9	Histopathology	White / yellow	Histology Frozen section
10	Cytopathology	White / yellow	Gynaecology Non-gynaecology Semen analysis

Laboratory Requisitions

Requisitions are made by electronic order via Bru-HIMS. This requires all mandatory fields to be filled.

For manual requisition, patient's information should be clearly written using block capitals on the laboratory request form.

The following information is mandatory on all requisitions and should be stated for clear identification of the patient and specimen:

Patient's name:

The patient's name should be clearly printed on the label. If it is handwritten, write the name clearly and legibly using the following name convention:

First name followed by title; father's name followed by title. For examples:

ABD RAHIM (PG), AHMAD (PGHJ)

MD YAZID (PEHIN DATO HJ), MD SALLEH (HJ)

ABD KADIR (DR HJ), IBRAHIM (HJ)

NORA (HJH), ABU BAKAR (HJ)

or

Surname; name followed by title. For example:

LAU, ENG GUAN MICHAEL

Patient's Identity Card Number or/and Brunei Electronic Patient Record Number (BN):

Brunei Identity Card number using 8 digits

Patients below 12 years old, use Mother's IC or Father's IC using 8 digits

Patient's Date of Birth (DOB) and Gender:

This information is required for appropriate reference ranges in the patients' reports.

Location:

The ward or clinic admitting the patient must be correctly indicated.

Date and Time of Specimen Collection:

The date and time of specimen collection is important for checking specimen validity. Outdated specimen may give erroneous results.

Timed specimens are critical for proper evaluation of results especially if there are diurnal differences, as for some hormone levels.

Name of the Person Collecting and Labelling the Specimen:

Identification of the person collecting and labelling the specimen is required for audit and traceability. For blood transfusion, specimens will be rejected if there is no name of the person collecting the blood indicated on the request form.

Name or Code of Requesting Doctor / Specialist:

Name and / or code of requesting Doctor must be clearly identified. This is for accountability and auditing. This allows the Laboratory to contact the Doctor when necessary.

Name of Specialist must be indicated for request of referred tests (overseas).

Signature of Requesting Doctor:

It is the responsibility of the Doctor to sign the request form for accountability.

Relevant Clinical Data and Diagnosis:

This information is extremely useful for justification of request, auditing, interpretation of test results, and helps the Laboratory to assess the quality of the report.

Please provide additional information when necessary e.g. reaction due to previous blood transfusion.

Test Requests:

Tests are ordered by marking the appropriate boxes on the request forms or from electronic request. Additional information on the test requested is available in the Test Catalogue.

Specimen Collection

Specimen should be collected properly to avoid poor outcome of the laboratory results. Improper collection of the specimen may lead to:

- Delays in reporting test results
- Unnecessary re-draws or re-tests
- Incorrect diagnosis / treatment

Specimen labelling

Write minimum information or paste clearly printed barcode on all specimen containers immediately after collection at patient's side. The minimum information includes:

- Patient's name
- Patient's IC number or National Record number
- Date of sample collected
- Nature of specimen (if necessary)

Printed barcode should be paste vertical and does not cover the visible indication of fluid level.

Specimen Handling

- **STAT** specimen is indicated as **"STAT"** on the printed barcode or written clearly on the request form.
- **"High risk patient"** specimen is indicated as **"**"** on the printed barcode or written indication on the request form.
- **Use proper tube or container for collection**
Specimen must be submitted to the Laboratory in the container provided for collection. Specimen in wrong container will not be processed.
- **DO NOT** decant patient's blood from one type of tube into another.

3.2. BLOOD COLLECTION

Phlebotomy Instructions

When drawing blood, please follow approved venepuncture procedures recommended for use by recognised organisation.

Median cubital and cephalic veins are used most frequently; they are close to the surface, stable and skin is less sensitive. Wrist and hand veins are also acceptable for venepuncture.

The tourniquet should be applied approximately three to four inches above the venepuncture site and should be on the arm no longer than one (1) minute.

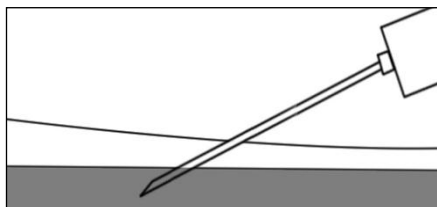
Label the tubes in front of the patient immediately after collection, confirming all the necessary information with the patient. Send the specimen with the request form (if necessary) to the Laboratory immediately.

Avoid the following sites:

- Intravenous therapy / blood transfusion – fluid may dilute the specimen
- Extensive scars from burns and surgery
- Haematoma – may cause erroneous test results
- Oedematous extremities – tissue fluid accumulation may alter test results

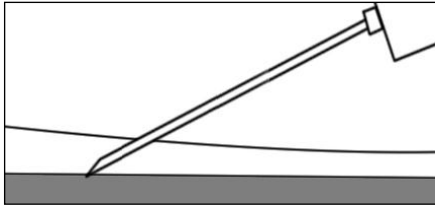
Needle positioning

With the bevel up, puncture the vein with needle of insertion of 30 degrees or less.

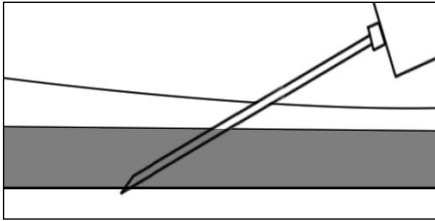


Correct insertion techniques.

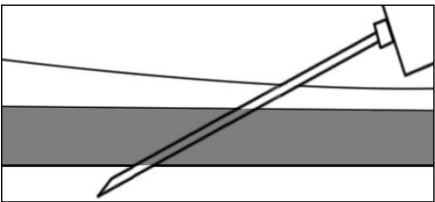
Blood flows freely into the needle.



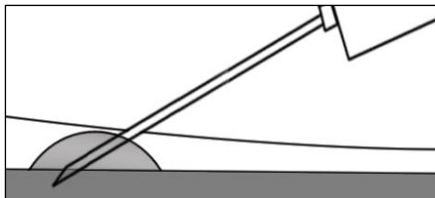
Bevel on upper wall of vein does not allow blood to flow.



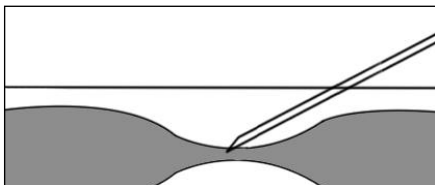
Bevel on lower wall of vein does not allow blood to flow.



Needle inserted through both vein walls does not allow blood to flow and haematoma may form.









Partial insertion of needle causes blood leakage into tissue causing haematoma.



Do not draw blood from collapsed vein.

Blood Collection Tubes

The following directory identifies the colour-coding tube tops for sampling of different types of tests and the recommended tube mixing (inversions).

Order of Draw	Tube Stopper Colour		Tube Inversion	Rationale for the Collection Order
Blood culture (sterile collections)			8-10X	Minimise microbial contamination
Coagulation tubes	Light blue		4 X	The first additive tube in the draw order because all other additives affects the coagulation tests
Glass plain tubes	Red		Nil	Prevents contamination by additives in other tubes. Plain glass tube should be drawn before the plastic serum tube with SST.
Clot activator, silicon coated (plastic) tubes	Red		5 X	Filled after coagulation tests because silica particles in the plastic tubes activate clotting and affect coagulation tests
SST clot activator, gel separator tubes	Gold		5 X	
Heparin tubes	Green		8 X	Causes the least interference in tests other than the coagulation tests

EDTA tubes	Lavender		8 X	This additive is responsible for more carry-over problems than any other additives. It causes elevated Na^+ and K^+ levels but chelates and decreases Ca^{++} and Fe levels. Additive also elevates PT and APTT results.
Oxalate / fluoride tubes	Grey		8 X	Oxalate is used after haematology tube (lavender stopper) because oxalate interferes in the enzyme reaction, damages cell membranes and causes abnormal RBC morphology.
ESR tube	Black		5X	

Order of Draw for Multiple Tube Collections

Blood must be drawn in a specific order to avoid cross-contamination of additive between tubes. Clinical and Laboratory Standard Institute (CLSI) recommends the order as follow:

- First - Blood culture tube
- Second - Coagulation tube (Light blue)
- Third - Plain (red top) or SSTII clot activator, gel separator tubes (gold top)
- Fourth - Additive tube in the order
 - Heparin (Green top)
 - EDTA (Lavender top)
 - Oxalate/ Fluoride (Grey top)
 - ESR tube (Black)

Needle for transferring blood from one tube to another tube should not be in contact with the additive or anticoagulant inside the tube.

Blood taken must be adequate and able to fill into the designated level of the tube. This ensures proper mixing of the blood with the anticoagulant.

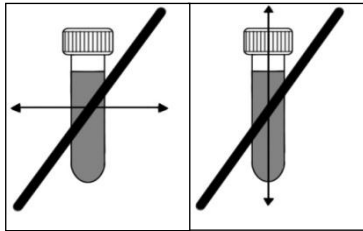
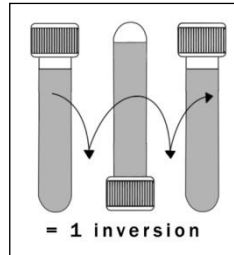
Tube Mixing (Inversions)

All additive tubes should be filled to their stated volumes and gently inverted as soon as possible after filling so that the additives mix evenly throughout the specimen.

Recommended Mixing Technique

Immediately after drawing, hold the tube upright, gently invert 180° and back with the recommended number of inversion times.

Do not vigorously shake the tubes.



Rocking, shaking and jiggling of tube are not acceptable. This could cause sample to be lysed (breaking of red blood cells).

Blood Collection Problems

Problems	Common Causes	Consequences
Haemolysis	<ul style="list-style-type: none"> Forcing blood sample through a needle into tube Air leakage around the needle or loss of vacuum in the tube Removing the needle from the vein with the tube still engaged. Vigorous mixing of tube and frothing of sample Drawing blood from a haematoma Drawing plunger back too forcefully in the syringe Probing a traumatic venepuncture Long delay in specimen transit Long exposure to heat 	<ul style="list-style-type: none"> Erroneous results Interferences in colorimetric assays Activates clotting factors Red cell parameters altered in FBC Falsely elevated potassium, magnesium and calcium levels Altered lipid values
Clot in Anticoagulated Blood	<ul style="list-style-type: none"> Difficult venepuncture Specimens not mixed well 	<ul style="list-style-type: none"> Inaccurate coagulation results False results for assays requiring whole blood specimens
Increase/ Decrease in Haemoconcentration	<ul style="list-style-type: none"> Prolonged tourniquet application Massaging, squeezing or probing a site Long-term IV therapy Blood obtained from in-dwelling lines or catheters 	<ul style="list-style-type: none"> Erroneous results Affects packed cell volume, cell counts and calcium level

Lipaemic Specimens	<ul style="list-style-type: none"> • Specimen taken immediately after fatty meals • Patients with hypertriglyceridemia 	<ul style="list-style-type: none"> • Optical interference with many assays • Low sodium • Elevated haemoglobin
Quantity not sufficient	<ul style="list-style-type: none"> • Difficult venepuncture 	<ul style="list-style-type: none"> • Erroneous results • Repeat drawing of blood
Delay in sending specimens to the Laboratory	<ul style="list-style-type: none"> • Overnight storage • Delay in transit 	<ul style="list-style-type: none"> • Erroneous results • Inaccurate coagulation results

3.3. URINE COLLECTION

Random Urine

- 10-15 ml of “first morning” urine is usually taken for routine analysis.
- Clean-catch / midstream urine is preferred.
- After collection, the urine container should be capped and tighten secure to prevent leakage.

Clean-Catch / Midstream Urine

- Urine is free of contamination and usually use for culture of bacteria and/or for microscopic examination.
- The first morning specimen is preferred
- Patient should be explained on the proper procedure of collection.
- Instruct the patient to :
 - Clean his hand and the area thoroughly prior to collection.
 - Void the first portion of urine stream. This first portion of urine will wash most contaminations from the urethra.
 - Collect the remaining portion of urine (midstream) in a sterile urine container. The midstream represents bladder flora.

- Specimen should be sent to the Laboratory immediately. Refrigerate if delay is anticipated.
- For paediatric patients, use a strapped-on bag device after carefully cleaning the surrounding area from the front to the back between the folds of the skin.

24-Hour Urine

Time urine specimens are required to detect abnormalities involving hormones, kidney and other organs and system body. It is necessary to analyse a sample taken from an entire 24-hour excretion.

Some specimen requires preservative and patient should be explained verbally on precaution of the use of chemical preservative for the collection and the proper collection of 24-hour urine. Incorrect collection and wrong preservation of the 24-hour urine collection are two of the most frequent errors.

The 24-hour urine collection containers and instruction sheet can be obtained from the Central Specimen Receiving Area (CSRA).

Patient Preparation:

- Inform the patient of the presence of potentially hazardous preservatives in the collection container.
- Dietary restrictions are required for some procedures and are specified in the individual test catalogue.
- A normal intake of fluid during collection is desirable unless otherwise instructed.

Instructions for Patient:

- On the day of collection, discard the first morning urine completely. Do not collect this sample. Record the date and time on the urine container.
- Collect all urine in the next 24 hours. Empty the bladder first if the patient wishes to defecate. This is to avoid any urine loss and faecal contamination.

- Exactly 24 hours from the starting time, completely empty the bladder into the urine container. This is the final urine collection for the 24-hour period.
- Refrigerate urine specimen during the period of collection.
- Send the specimen to the Laboratory as soon as possible.

Preservatives of 24 Hours Urine Collection:

Analyte /Test	Preservative
Calcium	20 ml of 6M Hydrochloric Acid
Creatinine	Not required
Magnesium	20 ml of 6M Hydrochloric Acid
Phosphate	20 ml of 6M Hydrochloric Acid
Protein	Not required
Uric Acid	10 ml of Sodium Hydroxide (NAOH)
VMA	12 ml of 25% Hydrochloric Acid

Please contact the Clinical Chemistry Laboratory Services if test is not listed in the table

3.4. MICROBIOLOGY SPECIMENS

Specimen Collection (General)

- Collect specimens for culture before any antibiotic therapy. If this is not possible, specify the antibiotic administered on the request form.
- Indicate any relevant clinical data and diagnosis and any particular organism suspected.
- Collect specimens in sterile, screw-capped containers or transwab provided.
- Use sterile apparatus and aseptic technique to collect the specimens to avoid contamination by indigenous microorganisms during invasive procedures.
- Send the specimen to the Laboratory as soon as possible.

Blood Culture

- Once decided on blood culture ALWAYS do 2 sets (one aerobic and one anaerobic) of blood culture from two different veins at 30 minutes interval.
- If the patient is on a central line (CVP or arterial line) obtain blood for one set of blood culture from peripheral vein and blood for another set of blood culture through the central line drawing both one after other at the same time.
- Always label the blood culture bottles appropriately as to whether the blood was obtained from peripheral vein or central line and indicate the same in the request form.

Equipment:

- Blood culture bottles.
- Sterile gloves.
- 70% alcohol and 2-4% Chlohexidine or 7.5% povidone iodine and cotton wool swabs
- Sterile disposable 20 ml syringe and needle.

Venepuncture procedure for blood culture is not the same as blood collection for biochemical and haematological tests.

Procedure:

- Collect all specimens aseptically
- Prior to collection of blood for culture, check the blood culture bottle for evidence of damage, contamination or turbidity. Do not use bottles which show turbidity (cloudiness), bulging or depressed septum or leakage
- Select the vein for venepuncture
- Wash hands and wear sterile gloves
- Swab the venepuncture site centrifugally (e.g. anti cubital fossa) with 70% alcohol followed by 2-4% chlohexidine or 7.5% povidone iodine using at least 3 swabs for each.

GUIDELINES TO SPECIMEN COLLECTION

- Allow to dry in between swabbing. Allow Chlohexidine / Povidone Iodine to dry for 2 min.
- After cleaning **DO NOT** palpate the vein AGAIN.
- Use a sterile needle and syringe & draw 16 -20 ml of blood from the adult and 3-5 ml from the child and 1-2 ml from the neonate.
- Remove the flap covering the blood culture bottle and clean the rubber bung with 70% alcohol prior to dispensing blood into them
- In the case of adults dispense 8 -10 ml of blood first into aerobic bottle and then 8 -10 ml into anaerobic bottle
- Mix the blood well with the culture medium in the bottle.
- After inoculating the blood into the blood culture bottle do not paste a plaster on top of the rubber bung. This plaster will increase the possibility of contamination.
- Label the bottles with patient identification details, date, time, and site of collection
- Send to the Laboratory **AS SOON AS POSSIBLE**. If there is a delay, keep at room temperature. **DO NOT REFRIGERATE** (keep the bottles as far as possible away from direct blowing of air condition).
- Use Bactec ® bottles supplied by the Laboratory, as indicated below:

Bactec ® bottles	Colour of Bottle Cap	Use for
Bactec ® Plus Aerobic	Grey	Aerobic and/or fungal culture
Bactec ® Plus Anaerobic	Orange	Anaerobic culture
Bactec ® Peds Plus	Pink	Aerobic culture for paediatrics

Note:

- Order both aerobic and anaerobic investigations simultaneously.
- Withdraw blood for anaerobic culture first.
- For paediatric cases, a single aerobic culture using the Bactec® Peds Plus bottle is acceptable.
- Do not paste any sticker, or write, over the bar code printed on each bottle. The bar code is used for registration in the Bactec® System.

Body Fluids Other than CSF

- Collect not less than 3mL volume of specimens in two sterile containers.
- If TB culture and examination are requested, collect a separate specimen and fill in a Mycobacteriology form.

Cerebro-spinal Fluid (CSF)

- Collect not less than 3mL volume of specimens in three sterile bottles (minimum 1 mL for each bottle)
 - 1st bottle – Chemistry analysis or any immunological testings
 - 2nd bottle – For culture
 - 3rd bottle – Cell count
- If Tuberculosis (TB) meningitis is suspected, send a third bottle with request (Mycobacteriology form) to National Reference TB Laboratory.

Eye Swabs

- Use swabs supplied.
- If Gram-stain is required, make a smear on a glass slide. Label the slide on the frosted side.

Fine Needle Aspirates

- If possible, remove the needle before transporting the specimen to the Laboratory without addition of formalin or fixative.
- Specify the source of the aspirate.

Fungal Investigations

Collect superficial lesions or scrapings as follows:

- Clean the surface with sterile water.
- For skin scraping, use a scalpel blade to scrap the periphery of the lesion and place the scrapings in a sterile container.
- For hair, pull the hair from the affected scalp lesions and place the specimen in a sterile container. Cut hair is unacceptable.
- For nails, clip the infected nail and obtain the scrapings beneath the nail plate and place the specimen in a sterile container.

MRSA Screening

- Only nasal, throat, axillary and groin/perineal are accepted for screening.

Pus

- Pus specimen is preferable to pus swab.
- Collect in sterile container, or transwab provided.

Sputum

- Collect the specimen in a sterile container.
- Early morning specimen is preferred. Reduce contamination with buccal flora by rinsing mouth with water. It is important that sputum is collected rather than saliva.
- A good specimen will show mucoid material. If the specimen is watery and almost clear it is most probably saliva and therefore unsuitable for culture.

Stool

- Stool specimens are preferred to rectal swabs. Container should not be more than half full.
- If rectal swab is collected, it must contain adequate faecal material.

- Send fresh specimen for examination of amoebae.

Infectious Diseases Specimens

- Collect blood specimen in a plain tube (red or SSTII gold top).
- For antibody titre, send samples at intervals of 2 weeks to distinguish between active and past infection. A greater than 4-fold rise in antibody titres usually provides evidence of recent infection.
- Specific IgM suggests recent infection.
- Haemolysed specimens are not suitable for serological tests.

Tissues

- Place tissue for culture aseptically into a sterile container **WITHOUT** formalin or any other preservative.
- Do not wrap with gauze or tissue paper.

Urine

- Collect mid-stream urine in a sterile container.
- For paediatric patients, transfer urine collected from the strapped-on device to a sterile container.
- In case of urethritis and prostatitis, collect the initial flow of urine.

Wound Swabs

- The representative specimen is at the advancing margin of the wound. Indicate clearly the site of the wound on the request form.

Other Swabs

- May include throat, nasal, endocervical or vaginal sites.

3.5. MYCOBACTERIOLOGY SPECIMENS

Instruction on Specimen Collection

- Use MYCOBACTERIOLOGY (TB) REQUEST FORM ONLY.
- Specimen shall be collected before starting patients on anti-mycobacterial drug therapy.
- Specimen shall be collected in sterile, screw-capped, leak-proof, disposable plastic containers with caps which should fit tightly and cannot possibly become accidentally loose or cause leakage.
- Specimen shall be collected aseptically, using standard precautions and minimising contamination with commensal organisms. These microbes will affect the smear and culture results.
- First-morning sputum shall be collected for acid-fast smears and culture from patients with clinical and chest x-ray findings compatible with tuberculosis, on three separate days. If this is not possible, separate collections of three consecutive samples in an 8 to 24 hour period is acceptable; one of which should be a first morning specimen.
- Specimen shall not be collected on swabs as these provide limited material for analysis. If swabs are received, the Laboratory shall only process for microscopy only.
- Specimen shall not be collected in syringes with needles as the needles will pose a hazard to personnel. Ideally, dispense the specimen into a sterile, screw-capped container; minute amounts can be aspirated and flushed out into the containers with sterile saline. Otherwise, aspirate the specimen back into the syringe and replace the needle with a rubber stopper/cap.
- Specimens should be refrigerated at 4°C within one hour of collection. Frozen specimens are unacceptable.

Aspirates or Abscess

- Disinfect skin with 70% alcohol before aspiration
- Aspirate material from under the margin of the lesion/abscess
- Submit as much volume as possible in a sterile container

- Use swab to collect only if volume is insufficient for aspiration

Bone marrow

- Obtain specimen as much as possible (minimum 10 - 15ml) in a sterile leak-proof, screw-capped, single-use container

Body Fluid

- Abdominal (peritoneal, dialysis, bile): collect 10-15mL aseptically into a sterile tube.
- Pericardial, synovial & exudates: collect 3-5mL aseptically into a sterile tube.

Broncho-alveolar Washings/ Bronchial Washings

- Minimum specimen volume is 5mL.
- Avoid contamination of bronchoscope with tap water as tap water may contain environmental *Mycobacterium* species.

Cerebro-spinal Fluid (CSF)

- Collect specimen as much as possible in a sterile container
- If a small volume is available after initial lumbar puncture and the findings of cell counts and protein suggest TB meningitis, a second procedure should be considered.

Gastric Lavage Fluid

- 10 ml in sterile disposable container
- Collect specimens early in the morning (before breakfast) and at least 8 hours after the patient has eaten or taken oral drugs
- Send the specimen to the Laboratory as soon as possible to avoid acidic deterioration of organisms

Lymph Node

- Collect node or portion of node into a sterile disposable container with no fixative or preservative
- Minute amounts may be submitted in a 1-2 ml of sterile saline
- Do not freeze, immerse in formalin or other preservatives or wrap in gauze

Skin Lesion Material

- Send biopsy specimen or aspirate in sterile disposable container with no fixative or preservative
- For cutaneous ulcers, collect biopsy sample from periphery of lesion or aspirate material from under margin of lesion
- Swabs in transport medium (Amies or Stuarts) are acceptable only if biopsy sample or aspirate is not obtainable
- If infection was suspected to have been acquired outside Brunei, state the country on request form because *Mycobacterium ulcerans* requires prolonged incubation for primary isolation.

Sputum

- Volume required: 5- 10 mL
- Collect an early-morning specimen from deep productive cough on at least three consecutive days - this provides the best yield.
- Do not pool specimens (e.g. 24-hr pooled sputum); such samples and saliva are unacceptable.
- Mark "INDUCED" on the request form if induced sputum is sent since nebulized sputum is watery and could be mistaken for saliva

TATACARA PENGAMBILAN KAHAK BAGI UJIAN MAKMAL TB SPUTUM COLLECTION PROCEDURE FOR TB LABORATORY TESTS	
 	<p>1. Berkumur-kumur dengan air sahaja untuk membersihkan mulut dari makanan</p> <p><i>Rinse mouth with water to avoid contamination from food</i></p>
 	<p>2. Tarik dan keluarkan nafas 3 kali, seterusnya batukkan dari dalam dada</p> <p><i>Breathe in and out 3 times, then cough from within the chest</i></p>
	<p>3. Dekatkan mulut ke bekas yang disediakan dan keluarkan kahak</p> <p><i>Put your mouth close to the container and give a sputum sample</i></p>
	<p>4. Tutup bekas dengan betul dan rapat untuk mengelakkan dari kebocoran</p> <p><i>Close and tighten the lid of the container properly to prevent leakage</i></p>
	<p>5. Masukkan bekas yang berisi kahak dan borang permohonan ke dalam beg plastik biohazard</p> <p><i>Place container containing sputum and laboratory request form in the biohazard plastic bag</i></p>

Figure 1. Sputum collection procedure for TB laboratory tests

Stool

- Recommended only for detection of Mycobacterium avium complex (MAC) involvement in the gastrointestinal tracts of patients with AIDS
- Contact National TB Reference Laboratory before sending specimen

Tissue Biopsy

- 1g of tissue, if possible, in sterile disposable container without fixative or preservative
- Do not freeze, immerse in formalin or other preservatives or wrap in gauze
- Minute amounts may be submitted in a 1-2 ml of sterile saline. Record on request form that sterile saline has been used
- Select a caseous portion as the majority of organisms will be found in the periphery of a caseous lesion

Urine

- Collect at least 40ml in sterile disposable containers
- Collect specimens early in the morning on three consecutive days in a sterile container
- Collect as much as possible of suprapubic urine in sterile disposable containers
- Unacceptable specimens
 - urine from catheter bag
 - specimen less than 40mL
 - 24 hour pooled specimen

3.6. HISTOPATHOLOGY SPECIMENS

Request Forms

- Provide adequate clinical information especially with specimens such as lymph nodes, liver and skin, in order to give a more useful report.
- Provide the correct site of the surgical specimens and the nature of the tissue or organ removed.

- Identification of the specimens is important especially in the case of paired organs for immediate and future reference.
- Information on any previous histological investigation enables revision of previous material and comparison as to progress.
- Drugs including oral contraceptives may alter histological appearances of tissue and may induce iatrogenic disease.
- Request form must be completed by medical staff not by nursing staff.
- Ensure that request forms are completed before leaving the operating theatres / wards / clinics.

Routine Histology Specimens

- Be aware of the dangers associated with incorrect labelling of the surgical specimens.
- Avoid leaving specimens on the theatre benches after the operating list is completed.
- Specimen dries up and autolyses rapidly. Ensure that specimen is tightly secured in clean containers, jars or plastic bags (in the case of very large specimens) whilst being immersed entirely in 10% Formal Saline (8 times the volume of the specimen) immediately after removal from patient.
- Send testicular biopsy in Bouin's fluid supplied by the Laboratory.
- Mount multiple small biopsies such as gastro-intestinal on a piece of filter paper before placing them in containers.
- Wherever possible, place only one specimen per container.
- When necessary, make a note in the Histology request form (a diagram may be more informative) of the specimen orientation.
- Do not crush or force the specimen into small containers.
- Do not dissect the removed tissues in parts as they become distorted thus making it difficult to obtain representative blocks.

Conisation

Cone excision is complete excision of the precancerous lesion of the cervix. Cone biopsy is neither a biopsy nor a diagnostic procedure. Therefore it is very important that the excised cervical tissue as a cone is well fixed before sectioning for best evaluation of the parameters.

Procedure for conisation (after excision of the cone):

- Cut through 12 o'clock position.
- Open the specimen as flat piece of tissue.
- Pin it down with mucosal surface on top of the cork. (Cork will be provided by the Histology Laboratory).
- Insert the cork upside down in a formalin container so that the tissue is fully immersed in formalin. Cork floats in formalin; hence the cork should be inserted upside down so the tissue is continuously in contact with formalin. Pinning helps to negate the retraction artifact.

Frozen Section

- Book frozen section examination with the Histology Laboratory or Pathologist prior to sending the specimen.
- Notify AT LEAST 24 HOURS before the operation to ensure a pathologist is present in the Laboratory when the specimen is received.
- NOTIFY THE PATHOLOGIST DIRECTLY AND IMMEDIATELY - in rare circumstances where a frozen section is required unexpectedly during surgery.
- Frozen section specimen should be FRESH.
- Do not send fresh specimen without contacting the Histology Laboratory Technical Staff or Pathologist, especially outside office hour.
- Avoid fixing immediate frozen sections during lunch hour.
- If immediate frozen section report is not necessary during operation, NOTIFY the Laboratory IMMEDIATELY as the pathologist and technical staff will not leave the Laboratory until the coast is clear.

- Reports are given via telephone by the Pathologist to the Doctor in the operating theatre and not to the Nursing staff in the theatre. Reports will NOT BE GIVEN by the Technical staff.
- AVOID specimens that may be infected with tubercle bacilli and other infective pathogens.
- Please discuss with the Pathologist if specimens are of infected material.
- Fumigation of Laboratory equipment must be done after the handling of infective materials and subsequent frozen section facility will not be available until fumigation process is complete.

Immunofluorescence

- Immunofluorescence test is performed on renal and skin biopsies.
- Notify the Pathologist before performing the biopsies.
- Send two biopsy fragments - one in 10% Formal Saline and the other on a small piece of filter paper in a small sterile plastic tube with a drop of saline (The containers may be obtained from Histology laboratory).
- **DO NOT LEAVE THE SPECIMEN AT THE RECEPTION AREA.** Hand it over to the Histology Laboratory staff personally.
- The test needs urgent frozen sections. Pathologist will first examine the first slide for adequacy and orientation of the specimen.
- Once the sections are cut, the actual direct immunofluorescence test can be done on the same day or the following morning depending on the time.
- Detailed clinical history of the patient is paramount. Do provide a differential diagnosis if possible.
- Report will be incorporated into the detailed histology report.

Urgent Specimens

- If a report on surgical specimen is required under 48 hours, dispatch the specimen immediately to the Laboratory BEFORE 3 PM on the same day of specimen collection.

- Rapid fixation of some tissues is possible BUT it may not produce good sections. It is better to wait 48 hours to obtain an unequivocal diagnosis.
- Bring urgent specimens to the attention of the Pathologist. DO NOT SEND URGENT SPECIMEN TOGETHER WITH ROUTINE SPECIMEN.

Reports

- Reports are released 48 – 72 hours after the specimens are received (provided the specimens are received on the same day). Friday, Sunday and Public holiday are excluded.
- Specimens taken from the blocks are fixed for 24 hours and processed overnight. Sections are cut, stained and presented to the Pathologists the following day. Reports are ready on the second day or the third day.
- Some specimens may require additional techniques such as immunohistochemistry which may cause delay. If undue delay is likely, the requesting Doctor will be informed.
- Original signed copy of surgical report will be issued and must be collected from the Main Reception, 1st floor, Central State Laboratory building. This report is to be kept in the patient's file.
- Read all the reports of patients who have been discharged. Unexpected malignancies may have been reported and require early attention than normal follow up at a review at surgical clinical.
- Do not keep the patients reports in white coat pockets.
- Verbal reports are given by the Pathologists to the Medical staff and not to nursing staff of the theatres, wards or clinics. No verbal reports are given by the Laboratory technical staff or secretarial staff.
- Normal working days: Monday to Thursday & Saturday (7.45 am to 12.15 pm & 1.30 to 4.30 pm)

3.7. CYTOPATHOLOGY SPECIMENS

Preparation of Smears

- Write the name and IC number of the patient on the frosted end of clean glass slide using a **LEAD PENCIL**.
- Place the collected material near the frosted end of the glass slide and smear it thinly along the entire length of the slide.
- Fix the smeared material immediately with fixative spray before the smear dries up (gynaecological cytology).
- Place inside the slide container and close the lid only after the fixative is dry.
- 95% ethyl alcohol can also be used as fixative

Preparation of Surepath Liquid-based Cytology Pap test

- Write the name and IC number of the patient clearly and in block letters on the vial.
- Indicate by writing "SP" on the top part of the request form.
- Ensure the head/s of the collection device/s for each patient is/are left in the vial containing the preservative.
- Tighten the vial cap properly.
- Send to the Cytology Laboratory.

Fine Needle Aspiration Cytology (FNAC)

- Direct request for FNAC service to Cytology Laboratory at extension 6327 or 6326.
- Patients should be made aware of the FNAC procedure.
- Fill request forms with complete clinical details of the patient.

- Perform FNAC only after the Laboratory technician has arrived. This helps to ensure good smear preparation and avoids specimen clotting.
- Air-dry completely at least three (3) slides without adding any fixative. Also, wet-fix at least another one (1) slide by spraying the slide with the fixative immediately after making the smear.
- Rinse any remaining material aspirated in Shandon Cytorich Collection fluid (red colour solution) and send together with the prepared smears to Cytology Laboratory. Shandon Cytorich Collection fluid acts as a transport media and can be obtained from Cytology Laboratory.

Body Fluids (e.g. urine, sputum, serous fluids and CSF)

- Send specimen to Cytology Laboratory within 2 hours of collection.
- If there is any delay in sending the specimen, please refrigerate the specimen at 4°C and send it to the Laboratory as soon as possible.
- If the specimen cannot be brought to the Laboratory within 12 – 24 hours, please add equal volume of fixative (70% alcohol) to the specimen, refrigerate at 4°C and send it to the Laboratory as soon as possible.
- Collect urine and sputum specimens on three consecutive days.

Semen

- Appointments for semen analysis are normally arranged by the O&G Department, RIPAS Hospital. Only patients referred from the Surgical Outpatient Department (SOPD) are sent to the Cytology Laboratory for semen analysis appointment and specimen collection instructions.
- Collect specimen between 2 – 7 days of abstinence, as recommended by the WHO Laboratory guideline.
- Produce specimen by masturbation into a sterile wide-necked plastic container provided by the Laboratory. **DO NOT USE LUBRICANT OR CONDOMS** (most condoms contain spermicidal chemicals).
- Specimen collected should be complete. Any spillage must be noted, as it might influence the test result.

- Deliver specimen to the Cytology Laboratory within 1 hour to ensure quality of specimen will not be compromised.
- Keep specimen warm (20°C – 40°C) by carrying the container close to the body, in pockets of shirt or trousers.

Final Cytology Reports

- All negative gynaecological cytology smears are signed out by assigned Scientific Officers or Senior Technical staff.
- Final reports for all other specimens are signed out by the respective Pathologists.
- Semen analysis reports are signed out by the Scientific Officers or Senior Technical staff.
- Collect reports from Cytology Laboratory as they are not retrievable through the ward computer terminals.
- Direct all inquiries to extensions 6326 / 6327. Please give the name of the patient, identity number, date of specimen submitted and the type of specimen e.g. CSF, pleural fluid.
- If required, the Cytology Laboratory staff will direct you to the Pathologist handling that particular specimen.
- FNAC reports are NOT given over the telephone by the technical staff in the Cytology Laboratory.
- Two copies of Pap test reports will be given. Keep the original signed report in the patient's file and hand the other copy into the patient for her own record.

Pathology Specimen from Medicolegal Cases

Call the Pathologist on-call to collect pathology specimens taken by the Obstetrician/Gynaecologist.

Pathology specimens include the following:

- Vaginal swab for culture.
- Two vaginal swabs for spermatozoa.

- Vaginal swab for prostate specific antigen.

Pathology test kits for medicolegal cases victims are provided by the Cytology Laboratory.

3.8. POST MORTEM

Notify the Pathologist on-call and the police if a death is due to an unnatural cause i.e. accident, suicide or homicide and body is brought to the Accident & Emergency (A&E) Department. Please give the following information, if available, to the Pathologist on-call.

- Name of the deceased
- Nationality (local or expatriate)
- Religion
- Nature of death
- Police station

Pathologist on-call will take over the case.

The A&E Medical officer can give a probable cause of death and release the body with death due to natural causes and under non-suspicious circumstances.

Notify the police and the Pathologist on-call if the Medical officer in the A&E Department cannot give the cause of death.

4 TRANSPORTATION OF SPECIMEN

Blood and other specimens must always be delivered to the Laboratory as soon as possible via the pneumatic tubes or porter. If there is delay in sending the specimen, contact the Laboratory services for advice.

All specimens must be transported in appropriate biohazard bags or containers and protect from exposure to direct sunlight.

Transporting specimens that are sensitive to high temperature, such as ACTH, Ammonia, Blood Gases, and Lactate, need to be kept at 2-8°C. Specimen should be immersed in the mixture of ice and water immediately after collection.

For safety reasons, needles should be removed when sending specimen in syringe to the laboratory.

5 TEST CATALOGUE

5.1. CLINICAL CHEMISTRY LABORATORY SERVICES, RIPAS HOSPITAL

We operate 24 hours daily for common chemistry tests. Low volume tests and more specialised tests are performed during office hours.

We also aim to provide STAT results within 2 hours upon specimens receipt in the laboratory. An ongoing improvement is in place to reduce turn-around time further. Do not label STAT excessively so that STAT test orders can be attended immediately. STAT test results are critical for immediate patient management.

TEST ORDERS THAT REQUIRED PRIOR NOTIFICATION

Please inform laboratory prior to sending the specimen for the following tests:

- Ammonia
- Lactate
- Arterial Blood Gases

These samples must **NOT** be delivered through pneumatic tube in case there is an unforeseen technical issue.

Sample Collection Instruction for Arterial Blood Gases:

Please obtain dedicated heparinised sample syringe from the laboratory.

Ensure blood is mixed well with the heparin by gently rotating syringe between the palms of the hands. Remove air bubbles if present in the sample. Remove the needle and use the cap provided to recap the syringe tightly. Chill specimen in crushed ice and send immediately to the laboratory within 30 minutes.

ADD-ON REQUEST

Add-on request is not encouraged due to sample evaporation (e.g. Osmolality) and sample degradation (e.g. Ammonia, Lactate and Glucose.)

We reserve the right to reject the add-on request if:

- No add-on form received after verbal request
- Sample volume is insufficient
- Request is not within the same day
- Stability of sample is in doubt

REFERENCE RANGES FOR PAEDIATRIC AND PREGNANT WOMEN

Please contact the laboratory for further information on these reference ranges.

TESTS NOT AVAILABLE LOCALLY

Please contact the laboratory at 2242424 ext. 6321 for sample requirement and special instruction for collection if required.

The tests sent abroad will be processed as soon as possible. Results are generally available within one month and can be collected from the Laboratory during office hours.

Alanine Transaminase (ALT, GPT)

Specimen	Blood (SSTII gold top-5ml)
Unacceptable	Haemolysed
Method	Kinetic rate
TAT	1 day
Clinical Usage	Liver profile assessment
Reference Range	< 55 U/L

Albumin

Specimen	Blood (SSTII gold top - 5ml)
Method	Colorimetry
TAT	1 day
Clinical Usage	Indicator of nutritional status
Reference Range	35 – 50 g/L

Albumin:Creatinine Ratio (ACR),Urine

Specimen	Random urine, 20ml in sterile screw-capped container	
Method	Calculated from urine albumin and urine creatinine, colorimetry	
TAT	1 day	
Clinical Usage	Early detection of diabetic nephropathy	
Reference Range	Normal	< 3.0 mg/mmol
	Microalbuminuria	3.0 - 30.0 mg/mmol
	Albuminuria	> 30.0 mg/mmol

Alkaline Phosphatase (ALP)

Specimen	Blood (SSTII gold top- 5ml)
Unacceptable	Haemolysed
Method	Kinetic rate
TAT	1 day

Clinical Usage	Liver profile assessment	
Reference Range	Adults	40 – 150 IU/L

Alpha-1-Antitrypsin (AAT)

Specimen	Blood (SSTII gold top - 5mL)
Method	Immunoturbidimetric
TAT	1 week
Clinical Usage	Test for Alpha-1-antitrypsin deficiency
Reference Range	0.9 – 2.0 g/L

Alpha-foeto Protein (AFP)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Electrochemiluminescence Immunoassay
TAT	1 week
Clinical Usage	A tumour marker for hepatocellular carcinoma and testicular cancer
Reference Range	≤ 7.0 ng/mL

Amikacin Level, Peak

Specimen	Blood (SSTII gold top – 5ml or red top - 6mL or green top - 4mL) Collect 30 min after end of IV infusion, 60 min after IM injection
Unacceptable	Haemolysed, more than 24 hours old
Method	Particle-enhanced turbidimetric immunoassay (PETIA)
TAT	Daily, 24hrs STAT
Clinical Usage	Therapeutic drug monitoring
Reference Range	25.0 – 35.0 mg/L

Amikacin Level, Trough

Specimen	Blood (SSTII gold top – 5ml or red top - 6mL or green top - 4mL) Collect specimen immediately before next dose
Unacceptable	Haemolysed, more than 24 hours old
Method	Particle-enhanced turbidimetric immunoassay (PETIA)
TAT	Daily, 24hrs STAT
Clinical Usage	Therapeutic drug monitoring
Reference Range	4.0 – 8.0 mg/L

Ammonia (NH₃)

Specimen	Blood (green top only- 4mL)
Transport	Please call Lab prior to collection. Specimen in ice. Send to the Lab immediately.
Unacceptable	Specimen not chilled
Method	Enzymatic
TAT	Daily, 24hrs STAT
Clinical Usage	Screening test for amino acid disorders
Reference Range	Adult 18 – 72 µmol/L

Amylase,serum

Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Haemolysed, overnight
Method	Two-point rate test
TAT	Daily, 24hrs STAT
Clinical Usage	Diagnosis of pancreatitis
Reference Range	25 – 125 U/L

Aspartate Aminotransferase (AST, SGOT)

Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Haemolysed, overnight
Method	Kinetic rate or NADH (without P-5'-P)
TAT	Daily, 24hrs STAT
Clinical Usage	Liver and cardiac assessments
Reference Range	Adults : 5 – 34 U/L

Bence Jones Protein, Urine (Screening)

Specimen	Random urine, 20mL in sterile screw-capped container, no preservative, preferred early morning urine specimen
Transport	Send to the Lab immediately
Method	Bradshaw's test
TAT	1 day
Clinical Usage	Screening test for multiple myeloma and amyloidosis
Reference Range	Not detected in normal individuals

Beta-2-Microglobulin

Specimen	Blood (SSTII gold top - 5mL)
Method	Microparticle Enzyme Immunoassay
Performed	Thrice weekly
TAT	3-5 days
Clinical Usage	Monitoring of lymphoma and multiple myeloma
Reference Range	0.97-2.64 mg/L

Bicarbonate, Serum (HCO₃)

Specimen	Blood (SSTII gold top - 5mL), test not suitable for add-on.
Transport	Send to the Lab immediately
Method	Enzymatic
TAT	Routine- 1 day, STAT – 2hrs
Clinical Usage	Acid-base balance
Reference Range	22 – 29 mmol/L

Bilirubin, Direct

Specimen	Blood (SSTII gold top - 5ml or green top- 4ml)
Transport	Protect sample from light and send to the Lab
Unacceptable	Haemolysed
Method	Enzymatic
TAT	Daily, 24hrs STAT
Clinical Usage	Differential diagnosis of jaundice
Reference Range	0 – 1 week < 15.3 µmol/L
	8 days & above < 3.4 umol/L
	Adults < 8.7 µmol/L

Bilirubin, Total

Specimen	Blood (SSTII gold top - 5ml or green top- 4ml)
Transport	Protect sample from light and send to the Lab
Unacceptable	Haemolysed, overnight
Method	Colorimetry
TAT	Daily, 24hrs STAT

Clinical Usage	Diagnosis of neonatal jaundice			
Reference Range	Adults			3 – 21 µmol/L
	Full term	0 – 1 day		34 – 103 µmol/L
	baby	1 – 2 day		103 – 120 µmol/L
		2 – 5 day		68 – 103 µmol/L
		>5 day		5.0 – 30 µmol/L
	Premature	0 – 1 day		17 – 103 µmol/L
	baby	1 – 2 day		103 – 137 µmol/L
		3 – 5 day		171 – 205 µmol/L

Blood Gases, Arterial

Specimen	Blood in heparinised syringe or capillary tube (Sample syringe can be obtained from the Laboratory)		
Transport	Ensure blood is mixed well and remove air bubbles if present in the sample. Needle must be removed and use the cap provided to recap the syringe tightly. Chill specimen in crushed ice and send immediately to the laboratory within 30 minutes.		
Unacceptable	Clotted, specimen not chilled, air bubbles in blood		
Method	Potentiometry		
TAT	Daily, 24hrs STAT		
Clinical Usage	Evaluate acid-base status		
Reference Range	pH	7.350	– 7.450
	pCO ₂	32.0	– 45.0 mmHg
	pO ₂	75.0	– 100.0 mmHg
	Bicarbonate-Act	21.0	– 27.5 mmol/L
	Bicarbonate-Std	22.0	– 26.0 mmol/L
	BE	-2.0	– 2.0 mmol/L
	O ₂ Saturation	95.0	– 100.0 %

CA 125

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Electrochemiluminescence Immunoassay
TAT	1 week
Clinical Usage	Monitoring therapy in ovarian cancer
Reference Range	M/F : ≤ 35.0 U/mL

CA 15-3

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
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Method	Electrochemiluminescence Immunoassay
TAT	1 week
Clinical Usage	Monitoring therapy in breast cancer
Reference Range	M/F : ≤ 25.0 U/mL

CA 19-9

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Electrochemiluminescence Immunoassay
TAT	1 week
Clinical Usage	Monitoring therapy in pancreatic and hepatobiliary cancer
Reference Range	≤ 34.0 U/mL

Caeruloplasmin

Specimen	Blood (SSTII gold top - 5mL)
Method	Immunoturbidimetric
TAT	1 – 2 weeks
Clinical Usage	Assessment of disorder of copper metabolism
Reference Range	0.20 – 0.60 g/L

Calcium, Ionised

Specimen	Blood (SSTII gold top - 5ml or green top - 6ml) Additional tube is required for this test if it is requested with other tests.
Unacceptable	Haemolysed
Method	Potentiometry
TAT	Daily, 24hrs STAT
Clinical Usage	Evaluation of calcium metabolism
Reference Range	1.16 – 1.32 mmol/L

Calcium, Urine

Specimen	Random urine, 20mL in a screw-capped container or 24 hr urine collection, preservative : 6 M HCL
Method	Colorimetric

TAT	1 day
Clinical Usage	Evaluation of calcium metabolism
Reference Range	2.50 – 7.50 mmol/day, varies with diet

Calcium, Total

Specimen	Blood (SSTII gold top - 5ml or green top- 6ml)
Unacceptable	Haemolysed
Method	Colorimetric
TAT	Daily, 24hrs STAT
Clinical Usage	Evaluation of calcium metabolism
Reference Range	Adults : 2.23 – 2.50 mmol/L

Calculi Analysis

Specimen	Indicate source, rinse with distilled water, air dry sample, send it in a screw-capped container
Method	Biochemical tests
TAT	2 weeks
Clinical Usage	Management of patient with recurrent renal calculi
Reference Range	Report indicates presence/absence of components

Carbamazepine

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Enzyme immunoassay
TAT	Daily, 24hrs STAT
Clinical Usage	Monitoring of Carbamazepine dosage
Reference Range	Therapeutic: 16.9 – 50.8 µmol/L

Carboxyhaemoglobin, Blood (CoHb)

Specimen	Heparinised blood gas syringe. Mix well to prevent clotting. Only anaerobic samples must be submitted
Transport	Send in ice to the laboratory immediately
Unacceptable	Specimen that has been left at room temperature for more than 30 minutes, been opened or spun.
Method	Co-oximetry
Performed	Daily

TAT	Daily, 24hrs STAT
Clinical Usage	Assessment of carbon monoxide poisoning
Reference Range	Toxic level >15% May increase with heavy smokers

Carcinoembryonic Antigen (CEA)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Electrochemiluminescence Immunoassay
TAT	1 week
Clinical Usage	Monitoring therapy in colon cancer ; Increased levels seen in smokers
Reference Range	Non-smoker: < 5.0 ng/mL

Chloride (Cl)

Specimen	Blood (SSTII gold top - 5ml)
Method	Indirect ISE
TAT	Routine - 1 day, STAT – 2 hrs
Clinical Usage	Electrolyte balance
Reference Range	98 – 107 mmol/L

Chloride, Urine

Specimen	Random urine, 20mL in sterile screw-capped container or 24 hr urine collection, no preservative
Method	Indirect ISE
TAT	1 day
Clinical Usage	Electrolyte balance
Reference Range	110 – 250 mmol/day, varies with chloride intake

Cholesterol

Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Fasting less than ,10 – 12 hrs
Method	Enzymatic
TAT	1 day
Clinical Usage	Evaluation of lipid status
Reference Range	Desirable: < 5.18 mmol/L

Cholinesterase

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Kinetic Colorimetric
TAT	1 – 2 weeks
Clinical Usage	Indicator of organophosphate poisoning
Reference Range	Adult: 5859 – 13060 U/L

Complement 3

Specimen	Blood (SSTII gold top - 5ml)
Method	Immunoturbidimetric
Performed	Office hours only
TAT	1 – 2 weeks
Clinical Usage	Assessment of classical and alternate complement pathway
Reference Range	Adult, Male 0.82 – 1.85 g/L Female 0.83 – 1.93 g/L

Complement 4

Specimen	Blood (SSTII gold top - 5ml)
Method	Immunoturbidimetric
Performed	Office hours only
TAT	1 – 2 weeks
Clinical Usage	Assessment of classical and alternate complement pathway
Reference Range	Adult, Male 0.15 – 0.53 g/L Female 0.15 – 0.57 g/L

Cortisol, Serum

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Electrochemiluminescence Immunoassay
Performed	Daily
TAT	1 day
Clinical Usage	Screening test for Cushing's Syndrome
Reference Range	Adults, 7-10am : 171 – 536 nmol/L Afternoon : 64 – 327 nmol/L

C-peptide, Fasting

Specimen	Blood (SSTII tube or red top- 5ml), fasting specimen (8-10 hrs) required
Unacceptable	Non-fasting
Method	ElectroChemiluminescence Immunoassay
Performed	Office hours only
TAT	7 – 14 days
Clinical Usage	Indicator of pancreatic secretory function. Helpful in differential diagnosis of hypoglycaemia
Reference Range	370 – 1470 pmol/L

C-Reactive Protein (CRP), high sensitive

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Immunoturbidimetric
TAT	Daily, 24hrs STAT
Clinical Usage	Detect inflammation and tissue injury
Reference Range	< 0.5 mg/dL

Creatine Kinase – MB Mass (CKMB)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Unacceptable	Haemolysed, lipaemic , overnight
Method	ElectroChemiluminescence Immunoassay
Performed	Daily
TAT	Routine - 1 day, STAT – 2 hrs
Clinical Usage	Test for myocardial infarction
Reference Range	Adults, Males: 1.35 - 4.94 ng/ml 0.97 – 2.88 ng/ml Females :

Creatine Kinase (CK)

Specimen	Blood (SSTII gold top - 5ml or green top- 4ml)
Unacceptable	Haemolysed, overnight
Method	Enzymatic rate
TAT	Daily, 24hrs STAT
Clinical Usage	Assessment of skeletal & cardiac muscle disorders

Reference Range	Adults, Male:	30 – 200 U/L
	Female:	29 – 168 U/L

Creatinine

Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 5mL)	
Method	Kinetic Alkaline Picrate (Modified Jaffe)	
Performed	Daily	
TAT	Routine - 1 day, STAT – 2 hrs	
Clinical Usage	Renal function test	
Reference Range	Adult, Male:	63.6 – 110.5 $\mu\text{mol/L}$
	Female:	50.4 – 98.1 $\mu\text{mol/L}$

Creatinine Clearance Test (CCT), (24Hr)

Specimen	1.	24 hr urine collection, no preservative
	2.	Serum creatinine (blood in SSTII gold top - 5mL) taken during the collection period. Send both specimens together
Unacceptable	Only one specimen type received	
Method	Calculated	
Performed	Office hours only	
TAT	1 day	
Clinical Usage	Estimation of Glomerular Filtration Rate (GFR)	
Reference Range	66 – 163 ml/min	
	Concentration is based on urine output of 1.5 L	

Creatinine, Urine (24Hr)

Specimen	24 hr urine collection, no preservative	
Unacceptable	Collection instruction not followed	
Method	Kinetic Alkaline Picrate (Jaffe Reaction)	
Performed	Daily	
TAT	1 day	
Clinical Usage	Renal function test	
Reference Range	Adult Male	8.4 – 22.0 mmol/day
	Female	6.3 – 14.6 mmol/day

CSF Chemistry (Glucose and Total Protein)

Specimen	1mL of CSF, in sterile screw-capped container	
Transport	Send to the Lab immediately	
Unacceptable	Contaminated with blood	
Method	Potentiometry, Colorimetry	
TAT	Daily, 24hrs STAT	
Clinical Usage	Assessment of CNS diseases and infection	
Reference Range	CSF Glucose	2.22 – 3.89 mmol/L
	CSF Protein	0.15 – 0.40 g/L
	Appearance	Clear

Cyclosporine A

Specimen	Blood (purple top 2-4mL) 2 hrs after dose	
Method	Chemiluminescence immunoassay	
Performed	Weekly	
TAT	Daily, 24hrs STAT	
Clinical Usage	Therapeutic drug monitoring	
Reference Range	Kidney < 6 Months	400 – 800 mg/L
	> 6 Months	200 – 400 mg/L

Dehydroepiandrosterone-Sulphate (DHEA-S)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)	
Method	Chemiluminescence Immunoassay	
Performed	Weekly	
TAT	1 – 2 weeks	
Clinical Usage	Evaluation of androgen status	
Reference Range	Age-specific, See Laboratory report	

Digoxin

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml) Draw blood at least 6 hrs after the last dose	
Method	Particle-enhanced turbidimetric immunoassay	
TAT	Daily, 24hrs STAT	
Clinical Usage	Monitoring of Digoxin dosage	

Reference Range	1.02 – 2.56 nmol/L
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Estradiol (E2)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)		
Method	Electrochemiluminescence Immunoassay		
Performed	Office hours only		
TAT	1 week		
Clinical Usage	Evaluation of hypothalamic -pituitary-ovarian axis. Investigation of infertility. Males : Investigate unexplained gynecomastia		
Reference Range	Male		7.63 – 42.6 pg/mL
	Female Follicular		12.5 - 166 pg/m L
	Midcycle		85.5 - 498 pg/mL
	Luteal		43.8 – 211 pg/mL

Ferritin

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)		
Method	Electrochemiluminescence Immunoassay		
Performed	Office hours only		
TAT	1 week		
Clinical Usage	Screening test for iron status		
Reference Range	Adults, Males		30 – 400 ng/mL
	Females		13 – 150 ng/mL

Folate

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml) wrap tube in aluminium foil to protect from light		
Transport	Send to the Lab immediately		
Method	Electrochemiluminescence Immunoassay		
Performed	Office hours only		
TAT	1 week		
Clinical Usage	Investigation for megaloblastic anaemia and assessment of folate deficiency		
Reference Range	Adults		10.4 – 42.4 nmol/L

Follicular Stimulating Hormone (FSH)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)		
Method	Electrochemiluminescence Immunoassay		
Performed	Office hours only		
TAT	1 week		
Clinical Usage	Evaluation of hypothalamic -pituitary-ovarian axis. Investigation of infertility.		
Reference Range	Male		1.5 – 12.4 IU/L
	Female	Follicular	3.5 – 12.5 IU/L
		Midcycle	4.7 – 21.5 IU/L
		Luteal	1.7 – 7.7 IU/L

Free Thyroxine (Free T4)*See Thyroxine, Free***Gamma-Glutamyl Transferase (GGT)**

Specimen	Blood (SSTII gold top - 5ml)	
Unacceptable	Haemolysed	
Method	Multiple-Point Rate Test	
Performed	Daily	
TAT	1 day	
Clinical Usage	Liver profile assessment	
Reference Range	Adults, Male	12 – 64 U/L
	Female	9 – 36 U/L

Gentamicin Level, Peak

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
	Collect 30 min after end of IV infusion, or 1 hr after IM injection
Unacceptable	Haemolysed, more than 24 hours old
Method	Chemiluminescent microparticle immunoassay (CIMA)
TAT	Daily, 24hrs STAT
Clinical Usage	Therapeutic drug monitoring
Reference Range	5.0 – 10.0 mg/L

Gentamicin Level, Trough

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml) Collect specimen immediately before next dose
Unacceptable	Haemolysed, more than 24 hours old
Method	Chemiluminescent microparticle immunoassay (CIMA)
TAT	Daily, 24hrs STAT
Clinical Usage	Therapeutic drug monitoring
Reference Range	≤ 2.0 mg/L

Glucose Tolerance Test (GTT)

Specimen	Blood (grey top - 3mL). Submit 2 specimens: <ul style="list-style-type: none"> Fasting and 2 hours after glucose (75g) intake 		
Unacceptable	Time taken not labelled on tubes		
Method	Colorimetry		
TAT	Daily, 24hrs STAT		
Clinical Usage	Diagnosis of diabetes mellitus		
Reference Range		Normal	Impaired
	Fasting	3.5–6.0 mmol/L	6.1–6.9 mmol/L
	2 hrs after glucose intake	4.0–7.7 mmol/L	7.8–11.0 mmol/L
			Diabetic ≥7.0 mmol/L ≥11.1 mmol/L

Glucose, Fasting (FBS)

Specimen	Blood (grey top - 3mL) preferred or (SSTII gold top - 5mL)
Unacceptable	Fasting less than 8 hrs
Method	Colorimetry
TAT	Daily, 24hrs STAT
Clinical Usage	Diagnosis and monitoring of diabetes mellitus
Reference Range	3.5 – 6.0 mmol/L

Glucose, Post-prandial (2PPS)

Specimen	Blood (grey top - 3mL) preferred or (SSTII gold top - 5mL)
Unacceptable	Time taken less than 2 hours
Method	Colorimetry
TAT	Daily, 24hrs STAT

Clinical Usage	Diagnosis and monitoring of diabetes mellitus
Reference Range	4.0 – 7.8 mmol/L

Glucose, Random (RBS)

Specimen	Blood (grey top- 3mL) or (SSTII gold top, 5mL)
Method	Colorimetry
Performed	Daily
TAT	Daily, 24hrs STAT
Clinical Usage	Diagnosis and monitoring of diabetes mellitus
Reference Range	Adults : 4.0 – 7.8 mmol/L

Glucose-6-Phosphate Dehydrogenase

Specimen	Neonatal cord blood or whole blood (green top, 4mL or purple top, 4mL)
Method	Fluorescence Spot Test
Performed	Daily
TAT	1 day
Clinical Usage	Screening test for G6PD deficiency. (Note: any recent blood transfusion or acute haemolysis can affect the results obtained with this test.)

Glycated Haemoglobin A1c (HbA1c)

Specimen	Blood (purple top, 2-4mL)
Unacceptable	Clotted
Method	HPLC
Performed	Daily
TAT	5 days
Clinical Usage	Long term monitoring of glucose control in diabetes mellitus
Reference Range	Good control : < 7.0 %

Haptoglobin

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Immunoturbidimetric
Performed	Office hours only

TAT	1 week	
Reference Range	Adults, Male	0.14 – 2.58 g/L
	Female	0.35 – 2.50 g/L

HDL Cholesterol

Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Fasting less than 10 – 12 hrs
Method	Homogeneous, colorimetric
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation of lipid status
Reference Range	Desirable : > 1.55 mmol/L

Human Chorionic Gonadotropin (hCG), Beta Total

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)	
Method	Electrochemiluminescence Immunoassay	
Performed	Daily	
TAT	1 day	
Clinical Usage	Tumour Marker for hydatiform mole, choriocarcinoma and testicular cancer	
Reference Range	Non-pregnant females	< 5.3 IU/L

Immunofixation Electrophoresis, Serum

Specimen	Blood (red top - 6mL or SSTII gold top - 5mL)	
Method	Capillary electrophoresis	
TAT	2 weeks	
Clinical Usage	Identification of different types of myeloma	
Reference Range	See Lab report	

Immunofixation Electrophoresis, Urine

Specimen	Random urine (20mL in sterile screw-capped container), no preservative, preferred 24 hr urine collection or early morning urine specimen	
Method	Capillary electrophoresis	
TAT	1 week	

Clinical Usage	Identification of different types of myeloma
Reference Range	See Lab report

Immunoglobulin A

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Immunoturbidimetric
Performed	Office hours only
TAT	1 week
Clinical Usage	Evaluation of humoral immunity
Reference Range	Adults, 12- 60 Y, Male 0.63 – 4.84 g/L Female 0.65 – 4.21 g/L

Immunoglobulin G

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Immunoturbidimetric
Performed	Office hours only
TAT	1 week
Clinical Usage	Evaluation of humoral immunity
Reference Range	Adults, 2 – 80 Y, Male 5.40 – 18.22 g/L Female 5.52 – 16.31 g/L

Immunoglobulin M

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Immunoturbidimetric
Performed	Office hours only
TAT	1 week
Clinical Usage	Evaluation of humoral immunity
Reference Range	Adults, > 12 Y, Male 0.22 – 2.40 g/L Female 0.33 – 2.93 g/L

Insulin, Fasting

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml), fasting specimen (8 hrs) required
Unacceptable	Non-fasting

Method	Electrochemiluminescence Immunoassay
Performed	Daily
TAT	1 week
Clinical Usage	Indicator of pancreatic beta-cells function
Reference Range	Fasting : 2.6-24.9 μ U/mL

Iron (Fe)

Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Haemolysed
Method	Ferene
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation of iron status
Reference Range	Adults, Male 10.7 -28.6 μ mol/L Female 7.2 – 25.9 μ mol/L

Lactate

Specimen	Blood (grey top only, 3mL), draw blood without stasis to avoid spurious lactate elevation. Please call lab prior to collection.
Transport	Specimen in ice, send to the Lab immediately
Unacceptable	Specimen not chilled, haemolysed, overnight
Method	Enzymatic
TAT	Daily, 24hrs STAT
Clinical Usage	Evaluation of metabolic and lactic acidosis
Reference Range	Adults : Venous, 0.5 – 2.2 mmol/L

Lactate Dehydrogenase (LDH)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Unacceptable	Haemolysed, overnight
Method	Colorimetry Lactate to pyruvate (NADH)
TAT	Daily, 24hrs STAT day
Clinical Usage	Non-specific marker of cellular damage
Reference Range	125 – 220 U/L

LDL Cholesterol (calculated value)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Unacceptable	Fasting less than 10 – 12 hrs
Method	Calculated, homogenous, colorimetric
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation of lipid status
Reference Range	Desirable < 3.36 mmol/L

Lipid Panel

Specimen	Blood (SSTII gold top - 5ml). Fasting specimen (10-12 hrs) required
Unacceptable	Non-fasting specimen
Method	<i>Panel test: Cholesterol, Triglyceride, HDL, LDL (calculated) See individual test</i>
Performed	Daily
TAT	1 day
Clinical Usage	Lipid profile assessment
Reference Range	Refer to individual analytes

Liver Function Test (LFT)

Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Haemolysed, overnight
Method	<i>Panel test: Total Protein, Albumin, Total Bilirubin, ALT, ALP, GGT see individual test</i>
Performed	Daily
TAT	1 day
Clinical Usage	Liver profile assessment
Reference Range	Refer to individual analytes

Luteal Hormone (LH)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Electrochemiluminescence Immunoassay
Performed	Office hours only

TAT	1 week		
Clinical Usage	Evaluation of hypothalamic-pituitary-ovarian axis. Investigation for infertility.		
Reference Range	Male		1.7 – 8.6 IU/L
	Females	Follicular	2.4 – 12.6 IU/L
		Midcycle	14.0 – 95.6 IU/L
		Luteal Phase	1.0 – 11.4 IU/L

Magnesium (Mg)

Specimen	Blood (SSTII gold top - 5ml)	
Unacceptable	Haemolysed, overnight	
Method	Colorimetry	
TAT	Daily, 24hrs STAT	
Clinical Usage	Diagnosis and monitoring of hypo- and hypermagnesemia	
Reference Range	Adults	0.66 – 1.07 mmol/L

Magnesium, Urine

Specimen	24 hr urine collection, preservative: 6M HCL, keep refrigerated during collection	
Unacceptable	Collection instruction not followed	
Method	Colorimetry	
Performed	Daily	
TAT	1 day	
Clinical Usage	Diagnosis and monitoring of hypo- and hypermagnesemia	
Reference Range	1.97 – 4.94 mmol/day	

Methotrexate

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)	
Method	Flourescence Polarization Immunoassay (FPIA)	
TAT	Daily, 24hrs STAT	
Clinical Usage	Therapeutic drug monitoring	
Reference Range	Post treatment	5.0 – 10.0 µmol/L
	24 – 48 hrs	0.5 – 1.0 µmol/L
	48 – 72 hrs	< 0.2 µmol/L

Microalbumin, Urine

Specimen	Random urine, 20mL in sterile screw-capped container, no preservative, preferred first morning urine specimen	
Method	Immunoturbidimetric	
Performed	Daily	
TAT	1 day	
Clinical Usage	Early detection of diabetic nephropathy	
Reference Range	Normal	< 30.0 mg/L
	Microalbuminuria	30.0 – 300.0 mg/L
	Proteinuria	> 300.0 mg/L

Myoglobin, Urine (qualitative)

Specimen	Random urine, 20mL in sterile screw-capped container
Method	Ultra-centrifugation
TAT	Daily, 24hrs STAT
Clinical Usage	Presence indicates muscle damage

NT-Pro BNP

Specimen	Blood (SST II Tube / Gold top – 5 ml)
Unacceptable	Non-serum sample
Method	Electrochemiluminescence Immunoassay
Performed	Daily
TAT	Daily, 24hrs STAT
Clinical Usage	Biomarker for excluding acute Congestive Heart Failure (CHF) and for detection of mild forms of cardiac dysfunction
Reference Range	< 300 pg/mL have a 98% negative predictive value for excluding acute CHF (this serves as a guide only – always correlate clinically)

Osmolality, Serum

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml), test not suitable for add-on.
Method	Freezing point osmometry
TAT	Daily, 24hrs STAT
Clinical Usage	Assessment of fluid and electrolyte balance
Reference Range	275 – 305 mmol/L

Osmolality, Urine

Specimen	Random urine (20mL screw-capped container), no preservative. Test not suitable for add-on.
Transport	Send to the Lab immediately
Method	Freezing point osmometry
TAT	Daily, 24hrs STAT
Clinical Usage	Assessment of fluid and electrolyte balance
Reference Range	50 – 1200 mmol/L

Paracetamol (Acetaminophen)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Enzymatic / colorimetric
TAT	Daily, 24hrs STAT
Clinical Usage	Diagnosis of paracetamol toxicity
Reference Range	Therapeutic 10 – 30 mg/L Toxic levels after 4 hrs > 200 mg/L after 8 hrs > 75 mg/L after 12 hrs > 50 mg/L

Paraquat, Urine (Qualitative)

Specimen	Urine (20mL in a sterile screw-capped container)
Method	Colorimetry
TAT	Daily, 24hrs STAT
Clinical Usage	Screening test for paraquat poisoning
Reference Range	Not detected

Parathyroid Hormone, Intact (PTH)

Specimen	Blood EDTA - 5ml, fasting specimen (8 hrs) required
Transport	Send to the Lab immediately
Method	Electrochemiluminescence Immunoassay
Performed	Office hours only
TAT	1 week
Clinical Usage	Evaluation of calcium metabolism

Phenobarbital

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Chemiluminescent microparticle immunoassay (CIMA)
TAT	Daily, 24hrs STAT
Clinical Usage	Monitoring of Phenobarbitone dosage
Reference Range	Therapeutic : 65 - 172 µmol/L

Phenytoin

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Enzyme immunoassay
TAT	Daily, 24hrs STAT
Clinical Usage	Monitoring of Phenytoin dosage
Reference Range	Therapeutic : 39.6 – 79.2 µmol/L

Phosphate (PO₄)/Phosphorus,Serum

Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Haemolysed, overnight
Method	Colorimetry
TAT	Daily, 24hrs STAT
Clinical Usage	Assessment of calcium and phosphate disorders
Reference Range	Adults : 0.74 – 1.52 mmol/L

Phosphate, Urine (24 Hr)

Specimen	24 hr urine collection, preservative : 6M HCL
Method	Colorimetry (phosphomolybdate)
Performed	Daily
TAT	1 day
Clinical Usage	Assessment of calcium and phosphate disorders
Reference Range	Adults, 12.9 – 42.0 mmol/day on non-restricted diet

Potassium, (K)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Unacceptable	Haemolysed, overnight

Method	Indirect ISE
TAT	Daily, 24hrs STAT
Clinical Usage	Evaluation/assessment of electrolyte imbalance
Reference Range	Adults 3.5 – 5.1 mmol/L

Potassium, Urine

Specimen	Random urine, 20mL in sterile screw-capped container or 24 hr urine collection, no preservative
Method	Indirect ISE
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation/assessment of electrolyte imbalance
Reference Range	Adults 25 – 125 mmol/day varies with diet

Progesterone

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)								
Method	Electrochemiluminescence Immunoassay								
Performed	Office hours only								
TAT	1 week								
Clinical Usage	Evaluation of ovarian function. Detect progesterone- secreting tumour								
Reference Range	<table> <tr> <td>Males</td><td>0.7–4.3 nmol/L</td></tr> <tr> <td>Females</td><td> <table> <tr> <td>Follicular</td><td>0.6 – 4.7 nmol/L</td></tr> <tr> <td>Luteal Phase</td><td>5.3 – 86.0 nmol/L</td></tr> </table> </td></tr> </table>	Males	0.7–4.3 nmol/L	Females	<table> <tr> <td>Follicular</td><td>0.6 – 4.7 nmol/L</td></tr> <tr> <td>Luteal Phase</td><td>5.3 – 86.0 nmol/L</td></tr> </table>	Follicular	0.6 – 4.7 nmol/L	Luteal Phase	5.3 – 86.0 nmol/L
Males	0.7–4.3 nmol/L								
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Follicular	0.6 – 4.7 nmol/L								
Luteal Phase	5.3 – 86.0 nmol/L								

Prolactin

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)						
Method	Electrochemiluminescence Immunoassay						
Performed	Office hours only						
TAT	1 week						
Clinical Usage	Evaluation of subfertility, hypogonadism and pituitary gland function						
Reference Range	<table> <tr> <td>Children</td><td>See Laboratory report</td></tr> <tr> <td>Adults, Males</td><td>4.6 – 21.4 ng/ml</td></tr> <tr> <td>Females</td><td>6.0 – 29.9 ng/ml</td></tr> </table>	Children	See Laboratory report	Adults, Males	4.6 – 21.4 ng/ml	Females	6.0 – 29.9 ng/ml
Children	See Laboratory report						
Adults, Males	4.6 – 21.4 ng/ml						
Females	6.0 – 29.9 ng/ml						

Prostate Specific Antigen, Free (fPSA)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Electrochemiluminescence Immunoassay
Performed	Office hours only
TAT	1 week
Clinical Usage	Tumour marker for prostate cancer
Reference Range	% fPSA < 25% require further evaluation

Prostate Specific Antigen, Total (PSA)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml) Draw before rectal examination or biopsy procedure.
Method	Electrochemiluminescence Immunoassay
Performed	Office hours only
TAT	1 week
Clinical Usage	Tumour marker for prostate cancer
Reference Range	Adults, < 4.0 ng/mL

Protein Electrophoresis, Serum

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)												
Method	Agarose gel / capillary electrophoresis												
Performed	Office hours only												
TAT	14 days												
Clinical Usage	Diagnosis of multiple myeloma, macroglobulinaemia												
Reference Range	<table> <tr> <td>Total Protein</td><td>62 – 82 g/L</td></tr> <tr> <td>Albumin</td><td>35 – 48 g/L</td></tr> <tr> <td>Alpha 1 Globulin</td><td>1 – 3 g/L</td></tr> <tr> <td>Alpha 2 Globulin</td><td>4 – 8 g/L</td></tr> <tr> <td>Beta Globulin</td><td>6 – 11 g/L</td></tr> <tr> <td>Gamma Globulin</td><td>10 – 19 g/L</td></tr> </table>	Total Protein	62 – 82 g/L	Albumin	35 – 48 g/L	Alpha 1 Globulin	1 – 3 g/L	Alpha 2 Globulin	4 – 8 g/L	Beta Globulin	6 – 11 g/L	Gamma Globulin	10 – 19 g/L
Total Protein	62 – 82 g/L												
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Alpha 1 Globulin	1 – 3 g/L												
Alpha 2 Globulin	4 – 8 g/L												
Beta Globulin	6 – 11 g/L												
Gamma Globulin	10 – 19 g/L												

Protein Electrophoresis, Urine

Specimen	Early morning urine, 20mL in sterile container, no preservative
Method	Agarose gel / capillary electrophoresis
Performed	Office hours only
TAT	14 days

Clinical Usage	Detect Bence-Jones protein in urine
Reference Range	See Lab report

Protein, Total

Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Haemolysed, overnight
Method	Colorimetry (Biuret)
Performed	Daily
TAT	1 day
Clinical Usage	Marker of nutritional status
Reference Range	Adults : 60 – 83 g/L

Protein, Urine

Specimen	24 hr urine collection, no preservative.
Unacceptable	Collection instruction not followed
Method	Colorimetry
Performed	Daily
TAT	1 day
Clinical Usage	Indicator of renal impairment
Reference Range	< 0.2 g/24 hr

Protein:Creatinine Ratio, Urine

Specimen	Early morning urine, 20mL in sterile container
Method	Calculated
TAT	1 day
Clinical Usage	Assessment of renal impairment
Reference Range	Proteinuria > 45 mg/mmol

Reducing Sugar, Stool

Specimen	Stool in sterile screw-capped container
Transport	Send to the lab immediately
Method	Biochemical tests
Performed	Daily

TAT	1 day
Clinical Usage	Test for disorders of carbohydrate metabolism in newborns
Reference Range	Negative

Reducing Sugar, Urine

Specimen	Random urine, 20mL
Transport	Send to the Lab immediately
Method	Biochemical tests
Performed	Daily
TAT	1 day
Clinical Usage	Test for disorders of carbohydrate metabolism in newborns
Reference Range	Negative

Salicylate

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Enzymatic/Colorimetric
TAT	Daily, 24hrs STAT
Clinical Usage	Diagnosis of salicylate poisoning
Reference Range	Adult Therapeutic: 150 – 300 mg/L Toxic : > 300 mg /L

Sex Hormone Binding Globulin (SHBG)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Chemiluminescence immunoassay
Performed	Office hours only
TAT	1 – 2 weeks
Clinical Usage	Useful in investigation of hirsutism and virilisation in females
Reference Range	Adults, Male 11-78 nmol/L Female 12-137 nmol/L

Sodium (Na)

Specimen	Blood (SSTII gold top - 5ml)
Unacceptable	Haemolysed, overnight or lipaemic
Method	Indirect ISE

TAT	Daily, 24hrs STAT
Clinical Usage	Evaluation of fluid and electrolyte imbalance
Reference Range	Adults 136 – 145 mmol/L

Sodium, Urine

Specimen	Random urine, 20mL in sterile screw-capped container, no preservative
Method	Indirect ISE
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation of fluid and electrolyte imbalance
Reference Range	Adults 40 – 220 mmol/day

Synacthen Test: Cortisol at 0',30' & 60'

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml) Clearly label individual tube
Method	Electrochemiluminescence Immunoassay
Performed	Office hours only
TAT	1 day
Clinical Usage	Assessment of adrenal function
Reference Range	See individual report

Tacrolimus (FK506)

Specimen	Blood (purple top, 2-4mL)
Method	Chemiluminescent Microparticle Immunoassay
Performed	Every Monday
TAT	7 days, 24hrs STAT
Clinical Usage	Therapeutic drug monitoring
Reference Range	Target 12 hr trough whole blood: 5 – 12 ng/mL early post transplant

Testosterone

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Method	Electrochemiluminescence Immunoassay
Performed	Office hours only

TAT	1 week
Clinical Usage	Evaluation of subfertility in males; hirsutism and virilisation in females
Reference Range	Adult, 20 – 49Y, Male 8.64 – 29.0 nmol/L Female 0.29 – 1.67 nmol/L

Theophylline

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Enzyme immunoassay (EIA)
TAT	Daily, 24hrs STAT
Clinical Usage	Monitoring of Theophylline dosage
Reference Range	Adult Asthmatic 55.5 – 111 µmol/L

Thyroxine, Free (Free T4)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Electrochemiluminescence Immunoassay
Performed	Daily
TAT	1 day
Clinical Usage	Diagnose hyperthyroidism and hypothyroidism
Reference Range	Adults 12 – 22 pmol / L

Thyroid Stimulating Hormone (TSH), 3rd Gen.

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Electrochemiluminescence Immunoassay
Performed	Daily
TAT	1 day
Clinical Usage	Diagnose hyperthyroidism and hypothyroidism
Reference Range	Adult 0.27 – 4.2 mU/L
	Children Newborns 0.70 – 15.2 mU/L
	6 d – 3 mths 0.72 – 11.0 mU/L
	4 – 12 mths 0.73 – 8.35 mU/L
	1 – 6 yr 0.70 – 5.97 mU/L
	7 – 11 yr 0.60 – 4.84 mU/L

Transferrin

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Unacceptable	Haemolysed
Method	Immunoturbidimetric
Performed	Daily
TAT	1 day
Clinical Usage	Differential diagnosis of microcystic anaemia
Reference Range	Adults, Male 1.74 – 3.64 g/L Female 1.80 – 3.82 g/L

Triglyceride, Fasting

Specimen	Blood (SSTII gold top - 5ml) Fasting specimen (10-12 hrs) required
Unacceptable	Fasting less than 10 – 12 hrs
Method	Enzymatic
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation of lipid status and acute pancreatitis
Reference Range	Desirable : < 1.70 mmol/L

Triiodothyronine, Free (Free T3)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Electrochemiluminescence Immunoassay
Performed	Daily
TAT	1 day
Clinical Usage	Diagnosis of hyperthyroidism
Reference Range	Adults 3.1– 6.8 pmol/L

Troponin T, high sensitive STAT

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)
Method	Electrochemiluminescence Immunoassay
TAT	Daily, 24hrs STAT
Clinical Usage	Marker of myocardial injury
Reference Range	< 14 pg/mL (Strongly considered myocardial infarction if > 100 pg/mL - WHO criteria)

Urea, Serum

Specimen	Blood (SSTII gold top - 5ml)		
Method	Enzymatic rate /Urease		
TAT	Daily, 24hrs STAT		
Clinical Usage	Assessment of fluid balance and renal function		
Reference Range	Adults : Male	< 50 yrs old	3.2 – 7.4 mmol/L
		> 50 yrs old	3.0 – 9.2 mmol/L
	Female	< 50 yrs old	2.5 – 6.7 mmol/L
		> 50 yrs old	3.5 – 7.2 mmol/L

Urea, 24 hr Urine

Specimen	24 hr urine collection, no preservative
Method	Enzymatic rate
Performed	Daily
TAT	1 day
Clinical Usage	Assessment of fluid balance and renal function
Reference Range	428 - 714 mmol/day

Uric Acid (UA)

Specimen	Blood (red top - 6mL or SSTII gold top - 5mL)	
Unacceptable	Lipaemic	
Method	Enzymatic	
Performed	Daily	
TAT	1 day	
Clinical Usage	Evaluation of uric acid metabolism	
Reference Range	Adults, Male	210 - 420 µmol/L
	Female	150 - 350 µmol/L

Uric Acid (UA), 24 hr urine

Specimen	24 hr urine collection, preservative:10mL 5% NaOH
Method	Enzymatic
Performed	Daily
TAT	1 day

Clinical Usage	Evaluation of uric acid metabolism	
Reference Range	Average diet,	1.480 – 4.430 mmol/day

Valproic Acid (Valproate)

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml)		
Method	Homogenous	microparticle-enhanced	turbidimetric
	Immunoassay		
TAT	Daily, 24hrs STAT		
Clinical Usage	Monitoring of Valproate dosage		
Reference Range	Therapeutic range: 346.5 – 693 µmol/L		

Vancomycin Level, Peak

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml) Collect 30 min after end of IV infusion, or 60 min after IM injection		
Unacceptable	Haemolysed, more than 24 hours old		
Method	Chemiluminescent microparticle immunoassay (CIMA)		
TAT	Daily, 24hrs STAT		
Clinical Usage	Therapeutic drug monitoring		
Reference Range	Adults, Therapeutic	20 – 40 mg/L	

Vancomycin Level, Trough

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml). Collect specimen immediately before next dose		
Unacceptable	Haemolysed, more than 24 hours old		
Method	Chemiluminescent microparticle immunoassay (CIMA)		
TAT	Daily, 24hrs STAT		
Clinical Usage	Therapeutic drug monitoring		
Reference Range	Adults, Therapeutic	5 – 10 mg/L	

Vanillyl Mandelic Acid (VMA), Urine

Specimen	24 hr urine collection, preservative: 6M HCL. Please adhere to the strict dietary instructions for three days prior to the 24hr urine collection		
Unacceptable	Collection instruction not followed		
Method	Column spectrophotometry		

Performed	Weekly
TAT	1 – 2 weeks
Clinical Usage	Screening test for phaeochromocytoma
Reference Range	5.0 – 40.4 $\mu\text{mol/day}$

Vitamin B12

Specimen	Blood (SSTII gold top - 5ml or red top- 6ml). Wrap tube in aluminium foil to protect from light
Transport	Send to the Lab immediately
Unacceptable	Haemolysed
Method	Electrochemiluminescence Immunoassay
Performed	Office hours only
TAT	1 week
Clinical Usage	Assessment of Vitamin B12 deficiency
Reference Range	Adults, Fasting : 156-698 pmol/L

5.2. HAEMATOLOGY LABORATORY SERVICES, RIPAS HOSPITAL

ABO Group and Rh Type

Specimen	Blood (EDTA, purple top - 4mL)
Unacceptable	Haemolysed
Method	Immune agglutination or column agglutination technology
Performed	Office hours only
TAT	1 day (Routine), 3 days (Ante-natal, Medical records and Haji screening)
Clinical Usage	Determine ABO and Rh(D) blood group

Activated Partial Thromboplastin Time (APTT)

Specimen	Blood (Sodium Citrate, blue top - up to the mark)
Transport	Send to the Lab Immediately
Unacceptable	Below or above the mark, haemolysed, clotted
Method	Clotting
Performed	Daily
TAT	2 Hrs
Clinical Usage	Monitoring heparin therapy and screening test for clotting factors
Reference Range	25.6 – 41.5 sec

Antibody Identification (Red Cell)

Specimen	Blood (EDTA, purple top - 4mL)
Unacceptable	Haemolysed
Method	Immune agglutination or column agglutination technology
Performed	Office hours only
TAT	3 days, 2 weeks (Sample sent overseas)
Clinical Usage	Determine the specificity of antibody/antibodies detected during antibody screening

Antibody Screen (Red Cell)

Specimen	Blood (EDTA, purple top - 4mL)
Unacceptable	Haemolysed

Method	Immune agglutination or column agglutination technology
Performed	Daily
TAT	1 day
Clinical Usage	Detect clinically significant alloantibodies
Reference Range	Not detected

Antibody Titre	
Specimen	Blood (EDTA, purple top - 4mL)
Unacceptable	Haemolysed
Method	Immune agglutination
Performed	Office hours only
TAT	3 days
Clinical Usage	Measures the amount of antibody present in blood or serum based on a dilution method

Anti-Thrombin	
Specimen	Blood (Sodium Citrate, blue top – up to the mark)
Transport	Send to the Lab Immediately. Sample may be collected and frozen at -20°C (or lower) before sending to Haematology Lab, RIPAS.
Unacceptable	Below or above the level, haemolysed
Method	Chromogenic assay
Performed	Office hours only
TAT	3 weeks
Clinical Usage	Investigation of inherited and acquired thrombotic tendency
Reference Range	75.0 – 125.0 %

APTT 50% Correction	
Specimen	Blood (Sodium Citrate, blue top - up to the mark)
Transport	Send to the Lab immediately
Unacceptable	Below or above the mark, haemolysed and clotted
Method	Clotting
Performed	Daily

TAT	2 Hrs
Clinical Usage	To detect the presence of inhibitors of coagulation
Reference Range	25.6 – 41.5 sec

Bleeding Time

Specimen	Bedside procedure, prearrange with the Lab
Method	Ivy's method
Performed	Office hours only
TAT	1 day
Clinical Usage	Aid diagnosis of platelet dysfunction, von-Willebrand disease, vascular abnormalities
Reference Range	2.0 – 8.0 minutes

Blood Film

Specimen	Blood (EDTA, purple top - 3mL)
Transport	Send to the Lab
Unacceptable	Haemolysed, clotted
Method	Light microscopy
Performed	Office hours only
TAT	2 – 3 days

Bone Marrow Aspirate

Transport	Specimen collected by Lab staff
Unacceptable	No bone marrow fragment
Method	May-Grunwald Giemsa Stain, Perl's Stain
Performed	Office hours only. Procedure performed by doctor
TAT	2 – 3 days

Cold Agglutinin

Specimen	Blood (red top - 4mL), collect in pre-warmed tube at 37°C
Transport	Send to the Lab immediately
Unacceptable	Haemolysed
Method	Haemagglutination

Performed	Appointment with the Lab required, office hours only
TAT	1 day
Clinical Usage	To determine presence of cold agglutinin in conditions such as autoimmune haemolytic anaemias, mycoplasma infection and infectious mononucleosis
Reference Range	Titre < 64 (Negative)

Crossmatch

Specimen	Blood (purple top - 4mL)
Unacceptable	Haemolysed
Method	Immune agglutination or column agglutination technology
Performed	Daily
TAT	1 Hr (STAT), 1day (Routine)
Clinical Usage	Compatibility for blood transfusion

Cryoglobulin Screen

Specimen	Blood (red top - 6mL), collect in pre-warmed tube at 37°C
Transport	Send to the Lab immediately
Unacceptable	Haemolysed
Method	Precipitation of cryoglobulin at 4°C
Performed	Appointment with the Lab required, office hours only
TAT	5 days
Clinical Usage	Screen for presence of abnormal globulins in conditions such as systemic lupus erythematosus, myeloma and lymphoma
Reference Range	Not detected

D-Dimer

Specimen	Blood (Sodium Citrate, blue top – up to the mark)
Transport	Send to the Lab immediately
Unacceptable	Below or above the level, haemolysed, clotted
Method	Automated turbidimetric immunoassay
Performed	Daily
TAT	2 Hrs
Clinical Usage	Aid in the diagnosis of disseminated intravascular coagulation

	(DIC), acute thromboembolic event
Reference Range	Less than 250 ng/ml D-Dimer Units (DDU)

Differential Count (Diff)

Specimen	Blood (EDTA, purple top - 3mL)
Unacceptable	Haemolysed, clotted
Method	Light Microscopy or Light Scattering Flow Cytometry, Cyto
Performed	Daily
TAT	1 – 2 days
Reference Range	See Lab Report

Direct Antiglobulin (Coomb's) Test (DCT)

Specimen	Blood (purple top - 3mL)
Method	Tube method or column agglutination technology
Performed	Daily
TAT	1 day
Clinical Usage	To detect the presence of globulins (IgG and C3d) coating red cells
Reference Range	Negative

Erythrocyte Sedimentation Rate (ESR)

Specimen	Blood (ESR Vacuum Tube- inbetween the two lines)
Unacceptable	Haemolysed, clotted, below or above level
Method	Westergreen
Performed	Office hours only
TAT	1 day
Reference Range	Male 2 – 6 mm/hr
	Female 2 – 12 mm/hr
	>60 yrs 1 – 20 mm/hr

Exchange Transfusion Compatibility Test

Specimen	Blood (purple top - 4mL)
Unacceptable	Haemolysed

Method	Tube method or column agglutination technology
Performed	Daily
TAT	1 day
Clinical Usage	Compatibility testing

Fibrinogen Degradation Product (FDP) (Replaced by D-dimer)

Specimen	Blood (Sodium Citrate, blue top - up to the mark)
Transport	Send to the Lab immediately
Unacceptable	Below or above the mark, haemolysed, clotted
Method	Latex particles agglutination
Performed	Daily
TAT	2 Hrs
Reference Range	Less than or equal to 5 µg/mL

Fibrinogen Level

Specimen	Blood (Sodium Citrate, blue top - up to the mark)
Transport	Send to the Lab immediately
Unacceptable	Below or above the mark, haemolysed, clotted
Method	Clotting
Performed	Daily
TAT	2 Hrs
Clinical Usage	Aids in the detection of fibrinogenaemia, disseminated intravascular coagulation and fibrinolysis
Reference Range	2.35 – 4.26 g/L

Full Blood Count (FBC)

Specimen	Blood (EDTA, purple top - 3mL)
Unacceptable	Haemolysed, clotted
Method	Test includes machine operated differential count by light scattering flow cytometry, cytochemistry
Performed	Daily
TAT	2 Hrs STAT, 1 day (Routine)

Reference Range	Newborn	Male	Female
WBC x 10 ⁹ /L	10.0 – 26.0	3.6 – 10.2	3.8 – 11.8
RBC x 10 ¹² /L	5.0 – 7.0	4.06 – 5.63	3.63 – 4.92
HB g/dL	14.0 – 22.0	12.5 – 16.3	10.9 – 14.3
PCV %	44.0 – 75.0	36.7 – 47.1	31.2 – 41.9
MCV fL	100 – 120	73.0 – 96.2	75.5 – 95.3
MCH pg	31 – 37	23.8 – 33.4	24.7 – 32.8
MCHC g/dL	30 – 36	32.5 – 36.3	32.3 – 35.6
PLT x 10 ⁹ /L	100 – 450	150 – 450	150 – 450
MPV fL		7.4 – 11.4	7.9 – 10.8

Ham's Test

Specimen	Blood (red top - 10mL and EDTA, purple top - 3mL)
Transport	Send to the Lab immediately
Unacceptable	Haemolysed
Method	Acidified serum test
Performed	Appointment with the Lab required, office hours only
TAT	1 day
Clinical Usage	Diagnosis of Paroxysmal Nocturnal Haemoglobinuria. Patient should not have blood transfusion in the last 3 months
Reference Range	Negative

Indirect Antiglobulin Test (see Antibody Screen)

International Normalised Ratio (INR)

Specimen	Blood (Sodium Citrate, blue top - up to the mark)
Unacceptable	Below or above the mark, haemolysed, clotted
Method	Clotting
Performed	Daily
TAT	2hr
Clinical Usage	Monitoring of warfarin dosage
Reference Range	0.8 – 1.2

Kleihauer Test

Specimen	Blood (EDTA, purple top - 3mL)
Unacceptable	Clotted

Method	Acid elution
Performed	Appointment with the Lab required, office hours only
TAT	1 day
Clinical Usage	Semi-quantitative determination of fetal Hb in blood smears. Aids in the detection & quantitation of transplacental haemorrhage
Reference Range	Negative

Lupus Anticoagulant

Specimen	Blood (Sodium Citrate, blue top - up to the mark)
Transport	Send to the Lab immediately
Unacceptable	Haemolysed, clotted
Method	Diluted Russell's Viper Venom Test (DRVVT) tests
Performed	Office hours only
TAT	3 weeks
Clinical Usage	To screen and confirm the presence of Lupus Anticoagulant

Lupus Erythemstosis Cell Test (LE Cell Test)

Specimen	Whole blood (Lithium Heparin, green top - 4mL)
Transport	Send to the Lab immediately
Unacceptable	Haemolysed, clotted
Method	Light microscopy
Performed	Office hours only
TAT	2 days
Clinical Usage	Diagnosis of SLE

Malarial Parasites

Specimen	Blood (EDTA, purple top - 3mL)
Unacceptable	Haemolysed, clotted
Method	Light microscopy
Performed	Daily

TAT	2hr(STAT), 1 day(Routine)
Clinical Usage	Detection and identification of malarial parasites

Neutrophil Alkaline Phosphatase Score (NAP Score)

Specimen	Blood (green top - 4mL), prearrange with the Lab before ordering
Transport	Send to the Lab immediately
Unacceptable	Clotted
Method	Light microscopy
Performed	Daily
TAT	1 day
Clinical Usage	Aids in the diagnosis of CML,PNH and Chronic myeloproliferative disorders
Reference Range	Cell score : 30 – 100

Osmotic Fragility (Red Cell)

Specimen	Fresh blood (Lithium Heparin,green top - 5mL)
Transport	Send to the Lab immediately
Unacceptable	Haemolysed
Method	Spectrometry
Performed	Appointment with the Lab required, office hours only
TAT	2 days
Clinical Usage	Detection of the presence of red cell with membrane defects e.g. hereditary spherocytosis

Prothrombin Time (PT)

Specimen	Blood (Sodium Citrate, blue top - up to the mark)
Unacceptable	Below or above the mark, haemolysed, clotted
Method	Clotting
Performed	Daily
TAT	2 Hrs
Clinical Usage	Screening test for clotting disorders. Monitoring of anticoagulation therapy
Reference Range	Adult 9.9 – 12.9 sec

Prothrombin Time 50% Correction (PT50%)

Specimen	Blood (Sodium Citrate, blue top - up to the mark)
Unacceptable	Below or above the mark, haemolysed, clotted
Method	Clotting
Performed	Daily
TAT	2 hrs
Clinical Usage	To detect presence of inhibitors of coagulation or factor deficiencies

Reticulocyte Count

Specimen	Blood (EDTA, purple top - 3mL)
Unacceptable	Haemolysed, clotted
Method	Light scattering flow cytometry, cytochemistry
Performed	Daily
TAT	2hrs (STAT), 1 day (Routine)
Clinical Usage	Assessment of erythropoietic activity
Reference Range	Newborn 2.3 – 5.4 % Male 0.42 – 2.23 % Female 0.51 – 2.17 %

Rhesus (Rh) Phenotype

Specimen	Blood (EDTA, purple top - 4mL)
Method	Tube method or column agglutination technology
Performed	Daily
TAT	1 day
Clinical Usage	To determine the presence of C, c, E and e antigens of the Rh Blood Group System

Sickling Test

Specimen	Blood (EDTA, purple top - 3mL), fresh
Method	Reduction test (Sodium bisulphate)
Performed	Office hours only

TAT	1 day
Clinical Usage	Detection of the presence of Hb S
Reference Range	Negative

Sucrose Lysis

Specimen	Blood (red top - 10mL). Prearrange with the Lab before ordering the test
Transport	Send to the Lab immediately
Unacceptable	Haemolysed
Method	Red blood cell hemolysis
Performed	Appointment with the Lab required, office hours only
TAT	1 day

Thalassaemia Screen or Hb Electrophoresis

Specimen	Blood (EDTA, purple top - 5mL)		
Unacceptable	Clotted		
Method	HPLC, electrophoresis, Brilliant Cresyl Blue Stain		
Performed	Office hours only		
TAT	14 days		
Clinical Usage	Investigation of thalassaemia and other haemoglobinopathies. Patient should not have blood transfusion in the last 3 months		
Reference Range	Test	Hb	1.8 – 3.5 %
	A2		0.1 – 1.7 %
	Hb F		Absent
	Hb C		Absent
	Hb S		

Thrombin Time

Specimen	Blood (Sodium Citrate, blue top - up to the mark)
Transport	Send to the Lab immediately
Unacceptable	Below or above the mark, haemolysed, clotted
Method	Clotting
Performed	Daily
TAT	2 Hrs

Clinical Usage	Aids in the detection of presence of heparin, dysfibrinogenaemia, DIC
Reference Range	12.8 – 17.5 sec

Urine Haemosiderin

Specimen	Urine - 20mL, freshly taken
Transport	Send to the Lab immediately
Method	Perl's Prussian Blue
Performed	Office hours only
TAT	1 day

5.3. MICROBIOLOGY LABORATORY SERVICES, RIPAS HOSPITAL

Amoeba, Microscopy

Specimen	Stool and aspirate, fresh
Transport	Send to the Lab immediately
Method	Light microscopy
Performed	Daily
TAT	STAT – 2 hrs
Clinical Usage	Diagnosis of amoebiasis

Anti-Streptolysin O Titre (ASOT)

Specimen	Blood (red top, 6mL or SSTII gold top, 5mL) Submit acute and convalescent sera 2 weeks apart
Unacceptable	Haemolysed
Method	Latex agglutination
Performed	Daily
TAT	2 days
Clinical Usage	Diagnosis of acute group A streptococci infection
Reference Range	< 200 IU/mL

Brucella Agglutination

Specimen	Blood (red top, 6mL or SSTII gold top, 5mL) Submit acute and convalescent sera 2 weeks apart
Unacceptable	Haemolysed
Method	Agglutination
TAT	3 days
Clinical Usage	Diagnosis of Brucellosis
Reference Range	Titre < 1:20

***Clostridium difficile* Toxin**

Specimen	Stool
Method	Rapid immunochromatographic assay
TAT	2 days

Clinical Usage	Detects <i>Clostridium difficile</i> Toxin A and/or Toxin B
Reference Range	Negative

***Cryptococcus neoformans* antigen**

Specimen	CSF (serile screw-capped container)
Performed	Daily
TAT	2 days
Clinical Usage	Presumptive screen for meningitis
Reference Range	Negative

***Cryptococcus neoformans* antigen**

Specimen	Blood (red top, 6mL or SSTII gold top, 5mL)
Unacceptable	Haemolysed
Performed	Daily
TAT	2 days
Clinical Usage	Presumptive screen for meningitis
Reference Range	Negative

CSF Bacterial Antigen

Specimen	CSF (sterile screw-capped container - 1mL)
Transport	Send to the Lab immediately
Method	Latex agglutination
Performed	Daily
TAT	STAT – 2 hrs
Clinical Usage	Presumptive screen for common bacteria causing meningitis
Reference Range	Negative

CSF Exam - Microscopy and Culture

Specimen	CSF (2 sterile screw-capped containers, 3mL)
Transport	Send to the Lab immediately
Method	Conventional
Performed	Daily

TAT	Microscopy – 2 hrs; Culture: 2 to 6 days, or 14 days for Cryptococcus
Clinical Usage	Diagnosis of meningitis

Culture & Sensitivity –Blood (Aerobic & Anaerobic)

Specimen	8 to 10mL of blood into aerobic and anaerobic Bactec blood culture bottles, do not refrigerate if there is delay in transportation
Method	Automated Bactec (fluorescence) & conventional culture
Performed	Daily
TAT	2 – 8 days
Clinical Usage	Diagnosis of septicaemia
Reference Range	No growth

Culture & Susceptibility – Blood (Paediatrics)

Specimen	1 to 3mL of blood into Peds Plus Bactec blood culture bottle. Do not refrigerate if there is delay in transportation
Method	Automated Bactec (fluorescence) & conventional culture
Performed	Daily
TAT	2 – 8 days
Clinical Usage	Diagnosis of septicaemia
Reference Range	No growth

Culture & Sensitivity - Biopsy, Bone, Pus and Tissue

Specimen	Specimen in sterile screw-capped container
Transport	Send to the Lab immediately
Unacceptable	Specimens in formalin
Method	Conventional culture
Performed	Daily
TAT	2 – 5 days
Clinical Usage	Diagnosis of bacterial infection
Reference Range	No growth

Culture & Sensitivity - Body Fluids and FNA

Specimen	Specimen in sterile screw -capped container, indicate the source of the specimen on the request form
Transport	Send to the Lab immediately
Method	Conventional culture
Performed	Daily
TAT	2 – 5 days
Clinical Usage	Diagnosis of bacterial infection
Reference Range	No growth

Culture & Sensitivity - Enteric Bacterial Pathogens

Specimen	Stool in sterile screw-capped container with attached spatula, rectal swab
Unacceptable	Chlamydia swab, dry swab and viral transport swab
Method	Conventional culture
Performed	Daily
TAT	2 – 5 days
Clinical Usage	Diagnosis of infection caused by enteric bacteria

Culture & Sensitivity - Enteric Bacterial Pathogens for Medical Fitness

Specimen	Stool in sterile screw-capped container with attached spatula
Unacceptable	Swab
Method	Conventional culture
Performed	Daily
TAT	2 – 5 days
Clinical Usage	Diagnosis of infection caused by enteric bacteria

Culture & Sensitivity and Microscopy - Genital Specimens

Specimen	Endocervical, vaginal and high vaginal swabs
Unacceptable	Chlamydia swab, dry swab and viral transport swab
Method	Conventional culture
Performed	Daily
TAT	2 – 5 days

Clinical Usage	Diagnosis of vaginitis
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Culture & Sensitivity – Gonococcus

Specimen	Endocervical, urethral and rectal swabs
Transport	Send to the Lab immediately
Unacceptable	Chlamydia swab, dry swab and viral transport swab
Method	Conventional culture
Performed	Daily
TAT	2 – 5 days
Clinical Usage	Diagnosis of gonorrhoea

Culture & Sensitivity - PD Fluid (Peritoneal dialysis fluid)

Specimen	10mL fluid in aerobic and anaerobic blood culture bottles. Do not refrigerate if there is delay in transportation.
Unacceptable	Specimen in unsterile container
Method	Automated Bactec (fluorescence) and conventional culture
TAT	2 to 8 days
Clinical Usage	Diagnosis of peritonitis
Reference Range	No growth

Culture & Sensitivity - Other Specimens

Specimen	Specimen (screw-capped container) or transwabs, indicate source of specimen
Unacceptable	Chlamydia swab, dry swab and viral transport swab
Method	Conventional culture
Performed	Daily
TAT	2 – 5 days
Clinical Usage	Diagnosis of bacterial infection

Culture & Sensitivity and Microscopy - Sputum

Specimen	Sputum (sterile screw-capped container)
Unacceptable	Saliva, food-containing specimen
Method	Conventional

	culture
Performed	Daily
TAT	2 – 5 days
Clinical Usage	Diagnosis of lower respiratory tract infection

Culture & Sensitivity – Urine

Specimen	Urine (sterile screw-capped container), indicate MSU, catheterised or SPA
Unacceptable	Unrefrigerated specimens of more than 24 hours old
Method	Conventional culture
Performed	Daily
TAT	2 – 5 days
Clinical Usage	Diagnosis of urinary tract infection

Culture for Fungus

ext 6514

Specimen	Specimen (sterile screw-capped container)
Unacceptable	Swab unsuitable for recovery of filamentous fungi, dry swab
Method	Conventional culture
Performed	Daily
TAT	2 – 28 days
Clinical Usage	Diagnosis of fungal infection

Fungus KOH examination

ext 6514

Specimen	Specimen (sterile screw-capped container), corneal scraping on a clean glass slide
Unacceptable	Swab
Method	Light microscopy
Performed	Daily
TAT	1 day
Clinical Usage	Presumptive diagnosis of fungal infection

Gram-Stain

Specimen	Specimen (sterile screw-capped container) or transwab. Smear
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	on a labelled slide
Unacceptable	Chlamydia swab, dry swab and viral transport swab
Method	Light microscopy
Performed	Daily
TAT	Routine - 1 day, STAT – 2 hrs
Clinical Usage	Presumptive diagnosis of bacterial infection

Microfilaria parasite

Specimen	Blood (EDTA, purple top, 3 – 5mL), best taken between 8 – 12 pm
Method	Microscopy
TAT	1 – 2 days
Clinical Usage	Diagnosis of filariasis
Reference Range	Not seen

Microscopy, Body Fluids

Specimen	Fluid (sterile, screw-capped container, 1 – 3mL), indicate source of specimen
Transport	Send to the Lab immediately
Unacceptable	Clotted
Method	Light microscopy
Performed	Daily
TAT	Routine - 1 day, STAT – 2 hrs

Mycoplasma IgM

Specimen	Blood (red top - 6mL or SSTII gold top - 5mL)
Unacceptable	Haemolysed
Method	ELISA
TAT	3 – 5 days
Clinical Usage	Diagnosis of <i>Mycoplasma pneumoniae</i> infection
Reference Range	Negative

PD Fluid (Peritoneal dialysis fluid), Microscopy

Specimen	50mL fluid in sterile screw-capped container Send to the Lab as soon as possible
Unacceptable	Specimen in unsterile container
Method	Automated Bactec (fluorescence) and conventional culture
TAT	1 day
Clinical Usage	Diagnosis of peritonitis

Pregnancy Test, Urine

Specimen	Urine (sterile screw-capped container - 10mL), early morning specimen is preferred
Method	Immunochromatographic 1 -step test
Performed	Daily
TAT	1 day, STAT – 1 hr
Clinical Usage	Diagnosis of pregnancy and gestational trophoblastic diseases

Stool Microscopic Examination (Stool ME)

Specimen	Stool (sterile screw-capped container with attached spatula)
Unacceptable	Swab
Method	Light microscopy
Performed	Daily
TAT	2 days
Clinical Usage	Diagnosis of parasitic infections

Stool Microscopic Examination (Stool ME), Medical Fitness

Specimen	Stool in sterile screw-capped container with attached spatula
Unacceptable	Swab
Method	Light microscopy
Performed	Daily
TAT	2 days
Clinical Usage	Diagnosis of parasitic infections

Stool Occult Blood (SOB)

Specimen	Stool in sterile screw-capped container with attached spatula
Unacceptable	Specimens other than stool
Method	Immunochromatographic Test
Performed	Daily
TAT	1 day
Clinical Usage	Detect the presence of blood in stool specimen
Reference Range	Negative

Urinalysis

Specimen	Random urine (sterile screw-capped container, 15-20mL)
Unacceptable	More than 24 hours old
Transport	Send to the Lab as soon as possible
Method	Dipstick / microscopy
Performed	Daily
TAT	1 day

Urine for Dysmorphic RBC

Specimen	Random urine (sterile screw-capped container, 15-20mL), fresh
Unacceptable	More than 6 hours old
Transport	Send to the Lab immediately
Method	Light microscopy
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation of glomerular diseases

Weil-Felix (WF)

Specimen	Blood (red top - 6mL or SSTII gold top – 5mL). Submit acute and convalescent sera 2 weeks apart.
Unacceptable	Haemolysed
Method	Agglutination
Performed	Daily

TAT	3 days
Clinical Usage	Diagnosis of rickettsial infection
Reference Range	Titre < 1:20

Widal	
Specimen	Blood (red top - 6mL or SSTII gold top – 5mL). Submit acute and convalescent sera 2 weeks apart.
Unacceptable	Haemolysed
Method	Agglutination
Performed	Daily
TAT	3 days
Clinical Usage	Diagnosis of salmonella infection
Reference Range	Titre < 1:20

5.4. CYTOLOGY LABORATORY SERVICES, RIPAS HOSPITAL

Barr Body Detection

Specimen	<ul style="list-style-type: none">• Buccal mucosal scraping.• Specimen collection is performed by Laboratory technical staff
Method	Routine / special stains for microscopic analysis
Performed	Contact Cytology Laboratory for appointment
TAT	1 working day
Clinical Usage	Gender verification

Bronchial Brushing

Specimen	Bronchial brushing (prepared smears)
Transport	Send to the Cytology Laboratory immediately
Method	Routine / special stains for microscopic analysis
TAT	2 working days
Clinical Usage	To detect malignancy and specific infection

Bronchial Washing and Bronchoalveolar Lavage (BAL)

Specimen	<ul style="list-style-type: none">• Bronchial washing and bronchoalveolar lavage.• After office hours, refer to the Guidelines on Specimen Collection
Transport	Send to the Cytology Laboratory immediately
Method	Routine/special stains; cell block if necessary for microscopic analysis
TAT	2 working days (additional 1 working day if cell block is done and 2 working days if immunohistochemical studies are needed)
Clinical Usage	To detect malignancy and specific infection

Cytology, Cerebrospinal Fluid (CSF)

Specimen	<ul style="list-style-type: none">• Cerebrospinal fluid (CSF).• After office hours, refer to the Guidelines on Specimen Collection• Contact the Laboratory for earlier result enquiry
Transport	Send to the Cytology Laboratory immediately

Method	Routine / special stains for microscopic analysis
TAT	1 working day
Clinical Usage	To detect malignancy and specific infection

Cytology, Pap Test

Specimen	Cervical / vaginal conventional smear (fixed) and/or liquid-based preparation, refer to the Guidelines on Specimen Collection
Method	Pap stain for microscopic analysis
Performed	Office hours only
TAT	21 days
Clinical Usage	To detect premalignancy / malignancy and specific infection

Cytology, Postcoital Test (PCT)

Specimen	<ul style="list-style-type: none"> • Cervical mucus, test should be done just before ovulation • Specimen in syringe
Transport	Send to the Cytology Laboratory immediately
Unacceptable	Specimen smeared on slides
Method	Wet preparation for microscopic analysis
Performed	Office hours only
TAT	Within 1 hour
Clinical Usage	To detect inhibitory effect of cervical mucus on spermatozoa motility

Cytology, Serous Effusions

Specimen	<ul style="list-style-type: none"> • Pleural, pericardial and peritoneal fluids. • After office hours, refer to the Guidelines on Specimen Collection.
Transport	Send to the Cytology Laboratory immediately
Method	Routine / special stains; cell block if necessary for microscopic analysis
Performed	Office hours only
TAT	2 working days (additional 1 working day if cell block is done and 2 working days if immunohistochemical studies are needed)
Clinical Usage	To detect malignancy and specific infection

Cytology, Sputum

Specimen	Sputum, refer to the Guidelines on Specimen Collection
Method	Routine / special stains; cell block if necessary for microscopic analysis
Performed	Office hours only
TAT	2 working days (additional 1 working day if cell block is done and 2 working days if immunohistochemical studies are needed)
Clinical Usage	To detect malignancy and specific infection

Cytology, Synovial Fluid

Specimen	Synovial fluid
Transport	Send to the Cytology Laboratory immediately
Method	Wet preparation for microscopic analysis
Performed	Office hours only
TAT	1 working day
Clinical Usage	To detect crystals and specific infection

Cytology, Urine

Specimen	<ul style="list-style-type: none">• Urine (bladder / kidney / voided / selective).• After office hours, refer to the Guidelines on Specimen Collection
Method	Routine / special stains; cell block if necessary for microscopic analysis
Performed	Office hours only
TAT	2 working days (additional 1 working day if cell block is done and 2 working days if immunohistochemical studies are needed)
Clinical Usage	To detect malignancy and specific infection

Fine Needle Aspiration Cytology, FNAC

Specimen	<ul style="list-style-type: none">• Fine needle aspirate (fixed and air-dried smears)• Contact the Cytology Laboratory for FNAC service, refer to the Guidelines on Specimen Collection
Method	Routine / special stains; cell block if necessary for microscopic analysis
Performed	Office hours only

TAT	2 working days (additional 1 working day if cell block is done and 2 working days if immunohistochemical studies are needed)
Clinical Usage	To detect malignancy and specific infection

Nipple Discharge Cytology

Specimen	Nipple Discharge
Transport	Send to the Cytology Laboratory immediately
Method	Routine / special stains; cell block if necessary for microscopic analysis
Performed	Office hours only
TAT	2 working days (additional 1 working day if cell block is done and 2 working days if immunohistochemical studies are needed)
Clinical Usage	To detect malignancy and specific infection

Scraping

Specimen	Eye or skin scraping (fixed or air-dried smears)
Transport	Send to the Cytology Laboratory immediately
Method	Routine / special stains for microscopic analysis
Performed	Office hours only
TAT	2 working days

Semen Analysis

Specimen	Semen, refer to the Guidelines on Specimen Collection	
Transport	Send to the Cytology Laboratory immediately	
Method	Wet preparation for microscopic analysis; modified pap stain	
Performed	Monday, Tuesday, Thursday and Saturday Wednesday done in SSBH Laboratory)	
TAT	5 working days	
Clinical Usage	Determination of male fertility status	
Reference Range	Volume	1.5 ml or more
	PH	7.2 or more
	Motility	40% or more
	Concentration	15 million/ml or more
	Morphology	4% or more (Normal forms)

5.5. HISTOLOGY LABORATORY SERVICES, RIPAS HOSPITAL

Bone

Specimen	Bone biopsies
Method	Routine / special / pretreatment with decalcifying solution for microscopic analysis
Performed	Office hours only
TAT	3 working days after the process of decalcification

Frozen Section Histology, Frozen Tissue Biopsy

Specimen	<ul style="list-style-type: none">• Fresh tissue biopsy• Prearrange with the Lab before ordering,• Refer to the Guidelines on Specimen Collection
Transport	Send to the Lab immediately
Method	Cryostat sectioning and routine stain for microscopic analysis
Performed	Daily (Monday-Thursday & Saturday only, Friday & Sunday – make an arrangement with the Pathologist)
TAT	20 minutes after the specimen is received
Clinical Usage	Intraoperative diagnosis

Routine Histology, Tissue Biopsy

Specimen	All tissue fixed in 10% Formal Saline at a volume of 8-10 times of the volume of specimen except testicular biopsy which should be fixed in Bouin's solution.
Method	Routine / special stains for microscopic analysis
Performed	Daily
TAT	3 working days (further delay if histochemical & immunohistochemistry stains is required)
Clinical Usage	Tissue diagnosis

Special Histology, Bone Marrow Biopsy

Specimen	Bone marrow biopsy, fixed in 10% Formal Saline at a volume of 8 times of the specimen's volume
Method	Routine / special stains; pretreatment with decalcifying solution for microscopic analysis

Performed	Office hours only
TAT	4 working days (including pretreatment with decalcifying solution)

Special Histology, Gastro-Intestinal Biopsy

Specimen	<ul style="list-style-type: none">• Gastro-Intestinal biopsy• Fixed in 10% Formal Saline at a volume of 8 times of the specimen's volume• Mounted on a piece of filter paper before placing in the container. (The filter paper should be fully immersed in the fixative).
Method	Routine / special stains for microscopic analysis
Performed	Office hours only
TAT	2 working days (further delay if immunohistochemistry is required)
Clinical Usage	Diagnosis of gastro-intestinal diseases

Special Histology, Liver Biopsy

Specimen	Liver biopsy, fixed in 10% Formal Saline at a volume of 8 times of the specimen's volume
Method	Routine / special / immunohistochemical stains for microscopic analysis
Performed	Office hours only
TAT	4 working days
Clinical Usage	Diagnosis and assessment of liver diseases

Special Histology, Muscle Biopsy

Specimen	<ul style="list-style-type: none">• Muscle biopsy• Mounted on a wooden board and held by needle/pins• Fixed in 10% Formal Saline at a volume of 8 times that of specimen.• The wooden board can be obtained from Histology Lab with prior arrangement with Histology staff
Method	Routine / special stains for microscopic analysis
Performed	Office hours only
TAT	3 working days
Clinical Usage	Diagnosis of neuromuscular disorders

Special Histology, Renal and Skin Biopsies

Specimen	<ul style="list-style-type: none">• Renal and skin biopsies that require immunofluorescence examination• Send 2 samples:<ul style="list-style-type: none">○ 1 fresh sample and○ 1 sample fixed in 10% Formal Saline at a volume of 8 times of the specimen's volume.• Prearrange with the Lab and Pathologist at least 1 day before sending if immunofluorescence is required.
Method	Routine / special / immunohistochemical stains, immunofluorescence (if applicable) for microscopic analysis
Performed	Office hours only
TAT	4 working days
Clinical Usage	Diagnosis and monitoring of renal and skin diseases

5.6. VIROLOGY LABORATORY SERVICES, RIPAS HOSPITAL

Antenatal Screening (Panel Test)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	See individual tests
TAT	2 – 7 days
Clinical Usage	Screening for HIV 1/2 antibodies, Syphilis, Rubella IgG and Hepatitis B Surface antigen

Chlamydia trachomatis Antigen

Specimen	<ul style="list-style-type: none">• Endocervical swab (female)• Urine (male) and• Eye swab (conjunctivitis cases).• Dacron tipped swabs are supplied by the Lab
Method	Rapid immunoassay
TAT	7 days
Clinical Usage	Diagnosis of Chlamydia trachomatis infection
Reference Range	Negative

Cytomegalovirus (CMV) IgG Antibody

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Microparticle enzyme immunoassay (MEIA)
Performed	Every Monday
TAT	7 days
Clinical usage	A positive result suggests past cytomegalovirus infection
Reference Range	Negative

Cytomegalovirus (CMV) IgM Antibody

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Microparticle enzyme immunoassay (MEIA)

Performed	Every Monday
TAT	7 days
Clinical Usage	A positive result suggest current active Cytomegalovirus infection
Reference Range	Negative

EBV VCA IgM Antibody

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Enzyme-linked immunosorbent assay (ELISA)
Performed	Every Wednesday
TAT	7 days
Clinical Usage	Epstein-Barr Virus IgM to Viral Capsid Antigen. Indicative of current or recent EBV infection
Reference Range	Negative

Dengue Screening (NSI, IgM & IgG)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Method	Rapid strip test followed by ELISA for positive confirmation
Performed	Office hours only
TAT	7 days
Clinical Usage	Detection of both NS1 antigens for the diagnosis of early acute dengue infection and differential IgG/IgM antibodies intended for the presumptive diagnosis between primary and secondary dengue infection.
Reference Range	Negative

Hepatitis A IgM Antibody (Anti-HAV)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Electrochemiluminescence immunology (ECLIA)
TAT	2 – 7 days
Clinical Usage	A positive result suggests a current or recent hepatitis A infection

Reference Range	Negative
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Hepatitis A Total Antibody (HAV IgM + IgE)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Electrochemiluminescence immunology (ECLIA)
TAT	2 – 7 days
Clinical Usage	A positive result suggests a current or recent hepatitis A infection
Reference Range	Negative

Hepatitis B Core Antibody (Anti-HBc)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Electrochemiluminescence immunology (ECLIA)
Performed	Every Saturday
TAT	2 – 7 days
Clinical Usage	A positive result suggests active infection with hepatitis B virus or infection in the past leaving the person immune
Reference Range	Negative

Hepatitis B Core IgM (AHBc-IgM)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Electrochemiluminescence immunology (ECLIA)
Performed	Every Saturday
TAT	2 – 7 days
Clinical Usage	A positive result suggests active infection with hepatitis B virus or infection in the past leaving the person immune
Reference Range	Negative

Hepatitis B E Antibody (Anti-HBe)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Electrochemiluminescence immunology (ECLIA)
Performed	Every Saturday
TAT	2 – 7 days
Clinical Usage	Indicates seroconversion from infective stage, suggesting good prognosis for resolution of acute infection or chronic cancer stage
Reference Range	Negative

Hepatitis B E Antigen (HBeAg)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Electrochemiluminescence immunology (ECLIA)
Performed	Every Saturday
TAT	2 – 7 days
Clinical Usage	A positive result suggests current hepatitis B infection
Reference Range	Negative

Hepatitis B Markers (Panel test)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Electrochemiluminescence immunology (ECLIA)
Performed	Every Saturday
TAT	2 - 7 days
Clinical Usage	Screening for Anti-HBc, HBeAg and Anti-HBe to follow the patient's progress and determine the state of infection
Reference Range	Negative

Hepatitis B Surface Antibody (Anti-HBs)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
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Unacceptable	Haemolysed	
Method	Electrochemiluminescence immunology (ECLIA)	
TAT	2 – 7 days	
Clinical Usage	Presence of hepatitis B surface antibody suggests previous hepatitis B infection or vaccination	
Reference Range	Negative	< 10 IU/ml
	Positive	> 10 IU/ml

Hepatitis B Surface Antigen (HBsAg)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)	
Unacceptable	Haemolysed	
Method	Electrochemiluminescence immunology (ECLIA)	
TAT	2 – 7 days	
Clinical Usage	A positive results suggests current hepatitis B infection	
Reference Range	Negative	

Hepatitis B virus DNA (HBV DNA)

Specimen	Blood (purple top - 6mL – X3) / (Gold top – X2)	
Method	Polymerase chain reaction	
Performed	In batches of 21 specimens	
TAT	2 – 3 weeks	
Clinical Usage	For detection and quantitative measurement of hepatitis B viral DNA in human serum	

Hepatitis C Antibody (Anti-HCV)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)	
Unacceptable	Haemolysed	
Method	Electrochemiluminescence immunology (ECLIA)	
TAT	2 – 7 days	
Clinical Usage	A positive result suggests that the patient has been infected or is currently infected with hepatitis C virus	
Reference Range	Negative	

Hepatitis C virus RNA (HCV RNA)

Specimen	Blood (purple top - 6mL- X3)
Transport	Specimen in ice. Send to the Lab immediately.
Method	Polymerase chain reaction
Performed	In batches of 21 specimens
TAT	2 – 3 weeks
Clinical Usage	Quantitative assessment of HCV infection

Herpes Simplex IgM Antibody (HSV IgM)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Method	Enzyme-linked immunosorbent assay (ELISA)
Performed	Every Monday
TAT	7 days
Clinical Usage	A positive results suggest current HSV infection
Reference Range	Negative

Herpes Simplex Virus I (HSV I) IgG Antibody

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Method	Enzyme-linked immunosorbent assay (ELISA)
TAT	7 days
Clinical Usage	Diagnosis of Herpes simplex I infection
Reference Range	Negative

Herpes Simplex Virus II (HSV II) IgG Antibody

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Method	Enzyme-linked immunosorbent assay (ELISA)
TAT	7 days
Clinical Usage	Diagnosis of Herpes simplex II infection
Reference Range	Negative

HIV 1/2 Antibodies

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
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Unacceptable	Haemolysed
Method	Electrochemiluminescence immunology (ECLIA)
TAT	2 – 7 days
Clinical Usage	Detection of antibodies to HIV type 1 and/or type 2 which is associated with AIDS
Reference Range	Non-reactive

Influenza A Antigen

Specimen	Nasopharyngeal, throat or nasal swab and nasopharyngeal aspirate
Transport	Specimen in ice, send to the Lab immediately in viral transport medium
Method	Rapid immunochromatographic assay followed by polymerase chain reaction (PCR) for confirmation
Performed	Office hours only
TAT	1 day
Clinical Usage	Detection of Influenza A antigen & subtyping
Reference Range	Negative

Influenzae A subtyping – A/H1N1 – Swine Influenza (Pandemic strain)

Specimen	Nasopharyngeal, throat or nasal swab and nasopharyngeal aspirate
Transport	Specimen in ice, send to the Lab immediately in viral transport medium
Method	RT-PCR
Performed	Office hours only
TAT	3 Day
Clinical Usage	Diagnosis of influenza A/H1N1 infection (Swine Influenza)

Influenzae A subtyping – A/H5N1 – Avian Influenza

Specimen	Nasopharyngeal, throat or nasal swab and nasopharyngeal aspirate
Transport	Specimen in ice, send to the Lab immediately in viral transport medium

Method	RT-PCR
Performed	Office hours only
TAT	3 Day
Clinical Usage	Diagnosis of influenza A/H5N1 infection (Avian Influenza)

Influenza A subtyping - A/H7N9

Specimen	Throat swab in viral transport media, nasal swab in viral transport media, nasal aspirate and nasopharyngeal aspirate
Transport	Send to the lab immediately in ice
Method	RT-PCR
Performed	Office hours and on-call
TAT	1 day
Clinical Usage	Diagnosis of influenza A/H7N9 infection (travel history to affected areas)

Influenza B Antigen

Specimen	Nasopharyngeal, throat or nasal swab and nasopharyngeal aspirate
Transport	Specimen in ice, send to the Lab immediately in viral transport medium
Method	Rapid immunochromatographic assay followed by polymerase chain reaction (PCR)
Performed	Office hours only
TAT	1 day
Clinical Usage	Detection of Influenza B antigen
Reference Range	Negative

Measles IgG antibody

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Enzyme-linked immunosorbent assay (ELISA)
Performed	Every Wednesday
TAT	4 days

Clinical Usage	A positive result suggests previous or immunisation to measles
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Measles IgM Antibody

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Enzyme-linked immunosorbent assay (ELISA)
Performed	Every Wednesday
TAT	4 days
Clinical Usage	A positive result suggests current or recent exposure to measles

Middle East Respiratory Syndrome (MERS-CoV)

Specimen	Bronchoalveolar lavage, tracheal aspirate, nasopharyngeal aspirate and sputum
Transport	Send to the lab immediately in ice
Method	RT-PCR
Performed	Office hours and on-call
TAT	1 day
Clinical Usage	Diagnosis of MERS-CoV infection (travel history to affected areas)

Mumps IgG Antibody

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Enzyme-linked immunosorbent assay (ELISA)
Performed	Every Wednesday
TAT	7 days
Clinical Usage	A positive result suggests previous exposure or immunisation to mumps

Mumps IgM Antibody

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Enzyme-linked immunosorbent assay (ELISA)

Performed	Every Wednesday
TAT	7 days
Clinical Usage	A positive result suggests current or recent exposure to mumps

Parvovirus B19 IgG Antibody

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Enzyme-linked immunosorbent assay (ELISA)
Performed	Every Wednesday
TAT	7 days
Clinical Usage	A positive result suggests previous exposure or immunisation to parvovirus

Parvovirus B19 IgM Antibody

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Enzyme-linked immunosorbent assay (ELISA)
Performed	Every Wednesday
TAT	7 days
Clinical Usage	A positive result suggests current or recent exposure to parvovirus

Respiratory Syncytial Virus (RSV) Antigen

Specimen	Nasopharyngeal, throat or nasal swab and nasopharyngeal aspirate
Transport	Specimen in ice, send to the Lab immediately in viral transport medium
Method	Enzyme immunoassay membrane test
Performed	Office hours only
TAT	2 – 3 hours
Clinical Usage	Diagnosis of RSV infection
Reference Range	Negative

Rotavirus Antigen

Specimen	Stool in sterile container
Method	Enzyme immunoassay membrane test
Performed	Office hours only
TAT	2 – 3 hours
Clinical Usage	Diagnosis of Rotavirus infection
Reference Range	Negative

Rubella IgG Antibody

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)	
Unacceptable	Haemolysed	
Method	Electrochemiluminescent immunoassay (ECLIA)	
TAT	2 – 7 days	
Clinical Usage	A positive result suggests previous exposure or immunisation to rubella	
Reference Range	Negative	< 10.0 IU/ml
	Positive	> 10.0 IU/ml
	Equivocal	10.0 IU/ml

Rubella IgM Antibody

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)	
Unacceptable	Haemolysed	
Method	Electrochemiluminescent immunoassay (ECLIA)	
Performed	Every Monday	
TAT	2 – 7 days	
Clinical Usage	A positive result suggests current or recent exposure to rubella	
Reference Range	Negative	

Syphilis Screening

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Electrochemiluminescent immunoassay (ECLIA)
TAT	2 – 7 days

Clinical Usage	Screening test for syphilis infection
Reference Range	Non-reactive

Torch IgM Screening (Panel Test)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	See individual tests
Performed	Every Monday
TAT	7 days
Clinical Usage	Screening tests for diagnosis of infections by Toxoplasma, Rubella, CMV and HSV

Toxoplasma IgG Antibody (Toxo IgG)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Microparticle enzyme immunoassay (MEIA)
Performed	Every Monday
TAT	7 days
Clinical Usage	A positive result suggests past toxoplasma infection

Toxoplasma IgM Antibody (Toxo IgM)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Microparticle enzyme immunoassay (MEIA)
Performed	Every Monday
TAT	7 days
Clinical Usage	A positive result suggests recent or current infection

Varicella zoster IgG

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Enzyme-linked immunosorbent assay (ELISA)
Performed	Every Wednesday

TAT	7 days
Clinical Usage	A positive result suggests previous exposure or immunisation to Varicella zoster

Varicella zoster IgM	
Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Enzyme-linked immunosorbent assay (ELISA)
Performed	Every Wednesday
TAT	7 days
Clinical Usage	A positive result suggests current or recent exposure to Varicella zoster

5.7. IMMUNOLOGY LABORATORY SERVICES, RIPAS HOSPITAL

Anti-Cardiolipin Antibodies

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Enzyme linked immunosorbent assay (ELISA)
Performed	Office hours only
TAT	14 working days
Clinical Usage	<ul style="list-style-type: none">• Aids in the diagnosis of antiphospholipid syndrome• Associated with arterial/venous thrombosis, recurrent foetal loss and thrombocytopenia

Anti-Cyclic Citrullinated Peptides (anti-CCP)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	ELISA
Performed	Office hours only
TAT	14 working days
Clinical Usage	Useful in the diagnosis of rheumatoid arthritis (RA)

Anti-DNA Antibodies

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Indirect immunofluorescence assay (IIFA) and ELISA
Performed	Office hours only
TAT	14 working days
Clinical Usage	Useful in the diagnosis of systemic lupus erythematosus (SLE). The titre of these antibodies relates to disease activity in most SLE patients.

Anti-La (SSB)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	ELISA

Performed	Office hours only
TAT	14 working days
Clinical Usage	Aid in the diagnosis and treatment of autoimmune connective tissue disorders

Anti-Mitochondrial Antibody (AMA)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	IIFA
Performed	Office hours only
TAT	14 working days
Clinical Usage	A high AMA titre aids in the diagnosis of primary biliary cirrhosis. Low titres of AMA may be detected in other liver disorders which include chronic active hepatitis and cryptogenic cirrhosis

Anti-Neutrophil Cytoplasmic Antibody (ANCA)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	IIFA and ELISA
Performed	Office hours only
TAT	14 working days
Clinical Usage	Useful in the diagnosis of autoimmune vasculitic diseases such as Wegener's granulomatosis, microscopic polyangiitis, polyarteritis nodosa and Churg-Strauss Syndrome

Anti-Nuclear Antibodies (ANA)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	IIFA
Performed	Office hours only
TAT	14 working days

Clinical Usage	A positive ANA result usually occurs in patients with autoimmune disorders such as SLE, mixed connective tissue disease (MCTD), RA, Sjogren's syndrome (SS), and progressive systemic sclerosis (PSS)
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Anti-Parietal Cell Antibodies (APCA)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	IIFA
Performed	Office hours only
TAT	14 working days
Clinical Usage	APCA occurs in the serum of 90% of patients with autoimmune pernicious anaemia

Anti-RNP

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	ELISA
Performed	Office hours only
TAT	14 working days
Clinical Usage	Aid in the diagnosis and treatment of autoimmune connective tissue disorders

Anti-Ro (SSA)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	ELISA
Performed	Office hours only
TAT	14 working days
Clinical Usage	Aid in the diagnosis and treatment of autoimmune connective tissue disorders

Anti-ScI70

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
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Unacceptable	Haemolysed
Method	ELISA
Performed	Office hours only
TAT	14 working days
Clinical Usage	Aid in the diagnosis and treatment of autoimmune connective tissue disorders

Anti-Sm

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	ELISA
Performed	Office hours only
TAT	14 working days
Clinical Usage	Aid in the diagnosis and treatment of autoimmune connective tissue disorders

Anti-Smooth Muscle Antibody (ASMA)

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	IIFA
Performed	Office hours only
TAT	14 working days
Clinical Usage	Useful in the diagnosis of autoimmune hepatitis

Rheumatoid Arthritis (RA) Factors

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	Immunoturbidity
Performed	Office hours only
TAT	14 working days
Clinical Usage	Supports diagnosis of Rheumatoid Arthritis and evaluation of ankylosing spondylitis, Sjogren's syndrome, scleroderma, dermatomyositis and SLE

Thyroglobulin Antibodies

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	ELISA
Performed	Office hours only
TAT	14 working days
Clinical Usage	Useful in the diagnosis of Graves disease, postpartum thyroiditis

Thyroid Peroxidase Antibodies

Specimen	Blood (red top, 6mL or SSTII gold top, 3.5-5mL)
Unacceptable	Haemolysed
Method	ELISA
Performed	Office hours only
TAT	14 working days
Clinical Usage	Useful in diagnosis of Graves disease, postpartum thyroiditis

5.8. NATIONAL TB REFERENCE LABORATORY, RIPAS HOSPITAL

Acid- Fast Bacilli (AFB) Culture , Mycobacterial Culture	
Specimen	<ul style="list-style-type: none"> • Early morning sputum, urine, gastric juice, body fluids, aspirations and secretions, FNA, pus and tissues • Collect specimen in sterile clean screw-capped containers
Unacceptable	<ul style="list-style-type: none"> • Saliva • Sputum containing food particles • Sputum less than 5 mL • 24 hours pooled urine • Specimen taken with swab • Specimen in fixatives or preservatives • Specimen found leaking upon receiving
Method	<ul style="list-style-type: none"> • Culture by BACTEC MGIT 960 System and Lowenstein-Jensen culture • Includes reflex testing: <ol style="list-style-type: none"> • TB Susceptibility Testing for <i>M.tuberculosis</i> (MGIT method) for new TB cases • Molecular detection of Rifampicin and Isoniazid resistance genes • Subspeciation of <i>M.tuberculosis</i> Complex (MTBC) • Identification of Non Tuberculous Mycobacterium (Criteria applies)
Performed	Mon-Thurs & Sat
TAT	Negative: 6 weeks Receipt of specimen to detection of growth: 6 weeks Detection of growth to final identification : 14 days
Clinical Usage	Diagnosis of Mycobacterium infection
Reference Range	<ul style="list-style-type: none"> • No growth • Species identified reported • AFB culture overgrown with non- mycobacterial organism/s • Full antibiotic susceptibility testing to follow

Acid Fast Bacilli (AFB) Smear, Microscopy

Specimen	<ul style="list-style-type: none"> • Early morning sputum, urine, gastric juice, body fluids, aspirations and secretions, FNA, pus and tissues
Unacceptable	<ul style="list-style-type: none"> • Saliva • sputum containing food particles • sputum less than 3 mL • 24 hours pooled urine • Specimen taken with swab • Specimen in formalin
Method	<ul style="list-style-type: none"> • Smear prepared from digested, decontaminated, and concentrated clinical samples • Screening: Auramine O Stain (Fluorescent Microscopy) • Confirmatory: Kinyoun stain • Includes reflex testing: Molecular detection of Rifampicin & Isoniazid resistance genes
TAT	2 working days
Clinical Usage	Preliminary diagnosis of Mycobacterium infection
Reference Range	<ul style="list-style-type: none"> • No acid-fast bacilli seen • AFB recorded

Susceptibility Testing for *Mycobacterium Tuberculosis* Complex (MTBC)

Specimen	Isolates identified as MTBC
Method	<ul style="list-style-type: none"> • BACTEC MGIT 960 System • Drugs available: <ul style="list-style-type: none"> - Streptomycin, - Isoniazid, - Rifampicin, - Ethambutol& - Pyrazinamide - High Level Isoniazid (0.4µg/ mL)
Performed	Mon- Thurs, & Sat
TAT	From detection of growth:14 days
Clinical Usage	Treatment for MTBC infection
Reference Range	Sensitive, Resistant

Molecular Diagnostics-Direct Detection of Isoniazid (INH) and Rifampicin (RIF) resistance genes in *Mycobacterium tuberculosis complex*

Specimen	Pulmonary specimens only
Unacceptable	Extrapulmonary specimens not recommended
Method	<ul style="list-style-type: none"> • Line Probe Assay using Hain Lifesciences System <p>Note: Confirmatory identification of MDR-TB isolate shall be performed by an appointed WHO Supranational Mycobacteriology Laboratory (sent overseas)</p>
Performed	In Batch- Twice a week
TAT	2 days
Clinical Usage	Screening for Multi-Drug Resistance Tuberculosis (MDR-TB) infection
Reference Range	Sensitive, Resistance

Molecular Diagnostics- Direct Detection for nuclei acid of *Mycobacterium tuberculosis* Complex (MTBC)

Specimen	Pulmonary specimen only such as sputum, pleural fluid and BAL
Unacceptable	Extra-pulmonary specimens are not recommended
Method	Strand displacement amplification (SDA) using BD ProbeTec System
Performed	In batch ; Twice a week
TAT	4 days
Clinical Usage	Preliminary identification of <i>Mycobacterium tuberculosis</i> complex (MTBC)
Reference Range	MTBC DNA detected/ Not detected

QuantiFERON

Specimen	<ul style="list-style-type: none"> • Whole Blood • Collection in three specialised QuantiFERON Gold IT blood collection tubes <ul style="list-style-type: none"> ○ Nil Control (Grey Cap with white ring) ○ TB Antigen (Red Cap with white ring) ○ Mitogen Control (Purple Cap with white ring) • QuantiFERON • Acceptable volume per tube : 1 mL
Unacceptable	<ul style="list-style-type: none"> • Blood in other blood collection tubes
Method	<ul style="list-style-type: none"> • QuantiFERON TB-Gold In-tube. IFN-g-level detected by EIA
TAT	1 week
Clinical Usage	Diagnosis of latent tuberculosis infection (LTBI)
Reference Range	<ul style="list-style-type: none"> • Positive, Negative, Indeterminate

5.9. SSB HOSPITAL LABORATORY SERVICES, BELAIT

Availability of the test provided is limited. Please refer to the RIPAS Hospital Laboratory Services test catalogue.

Test to be performed by the Referral Laboratories shall be transported via RIPAS Hospital Laboratory Services. Sample must be processed where necessary and send appropriately to the laboratory immediately. In the event if it was not possible to transport the sample, inform the assigned laboratory for further action.

Alanine Transaminase (ALT, GPT)		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or green top - 4mL)	
Unacceptable	Haemolysed	
Method	Kinetic rate	
TAT	1 day	
Clinical Usage	Liver profile assessment	
Reference Range	< 55 U/L	

Albumin		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)	
Method	Colorimetry	
TAT	1 day	
Clinical Usage	Indicator of nutritional status	
Reference Range	35 – 50 g/L	

Albumin:Creatinine Ratio (ACR),Urine		Clinical Chemistry Ext 4128
Specimen	Random urine - 20mL in sterile screw-capped container	
Method	Calculated from urine albumin and urine creatinine, colorimetry	
TAT	1 day	
Clinical Usage	Early detection of diabetic nephropathy	
Reference Range	Normal	< 3.0 mg/mmol
	Microalbuminuria	3.0 - 30.0 mg/mmol
	Albuminuria	> 30.0 mg/mmol

Alkaline Phosphatase (ALP)		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)	
Unacceptable	Haemolysed	
Method	Kinetic rate	
TAT	1 day	
Clinical Usage	Liver profile assessment	
Reference Range	Adults 40 – 150 IU/L	

Ammonia (NH₃)		Clinical Chemistry Ext 4128
Specimen	Blood (green top - 4mL)	
Transport	Specimen in ice, send to the Lab immediately	
Unacceptable	Specimen not chilled	
Method	Enzymatic	
TAT	1 day, STAT	
Clinical Usage	Screening test for amino acid disorders	
Reference Range	Adult	18 – 72 µmol/L

Amylase		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)	
Unacceptable	Haemolysed, overnight	
Method	Two-point rate test	
TAT	1 day, STAT	
Clinical Usage	Diagnosis of pancreatitis	
Reference Range	25 – 125 U/L	

Aspartate Aminotransferase (AST, SGOT)		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4.5mL)	
Unacceptable	Haemolysed, overnight	
Method	Kinetic rate or NADH (without P-5'-P)	
TAT	1 day	
Clinical Usage	Liver and cardiac assessments	

Reference Range	Adults : 5 – 34 U/L
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Bence Jones Protein, Urine (Screening)		Clinical Chemistry Ext 4128
Specimen	Random urine - 20mL in sterile screw-capped container, no preservative, preferred early morning urine specimen	
Transport	Send to the Lab immediately	
Method	Bradshaw's test	
TAT	1 day	
Clinical Usage	Screening test for multiple myeloma and amyloidosis	
Reference Range	Not detected in normal individuals	

Bicarbonate, Serum (HCO₃)		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL)	
Transport	Send to the Lab immediately	
Method	Enzymatic	
TAT	1 day	
Clinical Usage	Acid-base balance	
Reference Range	22 – 29 mmol/L	

Bilirubin, Direct		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top 5mL or green top - 4mL)	
Transport	Protect sample from light and send to the Lab	
Unacceptable	Haemolysed	
Method	Enzymatic	
TAT	1 day, STAT	
Clinical Usage	Differential diagnosis of jaundice	
Reference Range	0 – 1 week	< 15.3 µmol/L
	8 days & above	< 3.4 µmol/L
	Adults	< 8.7 µmol/L

Bilirubin, Total		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)	
Transport	Protect sample from light and send to the Lab	

Unacceptable	Haemolysed, overnight		
Method	Colorimetry		
TAT	1 day, STAT		
Clinical Usage	Diagnosis of neonatal jaundice		
Reference Range	Adults	3 – 21 $\mu\text{mol/L}$	
	Full term baby	0 – 1 day	34 – 103 $\mu\text{mol/L}$
		1 – 2 day	103 – 120 $\mu\text{mol/L}$
		2 – 5 day	68 – 103 $\mu\text{mol/L}$
		>5 day	5.0 – 30 $\mu\text{mol/L}$
	Premature baby	0 – 1 day	17 – 103 $\mu\text{mol/L}$
		1 – 2 day	103 – 137 $\mu\text{mol/L}$
		3 – 5 day	171 – 205 $\mu\text{mol/L}$

Blood Gases, Arterial		Clinical Chemistry Ext 4128
Specimen	Heparinised syringe or capillary tube	
Transport	Specimen in ice, send to the Lab immediately	
Unacceptable	Clotted, specimen not chilled, bubbles in blood	
Method	Potentiometry	
TAT	1 day, STAT	
Clinical Usage	Evaluate acid-base status	
Reference Range	pH	7.350 – 7.450
	pCO ₂	32.0 – 45.0 mmHg
	pO ₂	75.0 – 100.0 mmHg
	Bicarbonate-Act	21.0 – 27.5 mmol/L
	Bicarbonate-Std	22.0 – 26.0 mmol/L
	BE	-2.0 – 2.0 mmol/L
	O ₂ Saturation	95.0 – 100.0 %

Calcium, Ionised		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)	
Unacceptable	Haemolysed	
Method	Potentiometry	
TAT	1 day	
Clinical Usage	Evaluation of calcium metabolism	
Reference Range	1.15 – 1.35 mmol/L	

Calcium, Urine		Clinical Chemistry Ext 4128
Specimen	Random urine - 20mL in a screw-capped container or 24 hr urine collection, preservative : 6 M HCL	
Method	Colorimetric	
TAT	1 day	
Clinical Usage	Evaluation of calcium metabolism	
Reference Range	2.5 – 7.5 mmol/24hr, varies with diet	

Calcium, Total		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)	
Unacceptable	Haemolysed	
Method	Colorimetric	
TAT	1 day	
Clinical Usage	Evaluation of calcium metabolism	
Reference Range	Adults : 2.10 – 2.55 mmol/L	

Chloride (Cl)		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)	
Method	Indirect ISE	
TAT	1 day, STAT	
Clinical Usage	Electrolyte balance	
Reference Range	98 – 107 mmol/L	

Chloride, Urine		Clinical Chemistry Ext 4128
Specimen	Random urine - 20mL in sterile screw-capped container or 24 hr urine collection, no preservative	
Method	Indirect ISE	
TAT	1 day	
Clinical Usage	Electrolyte balance	
Reference Range	110 – 250 mmol/day, varies with chloride intake	

Cholesterol		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)	
Unacceptable	Fasting less than 10 – 12 hrs	
Method	Enzymatic	
TAT	1 day	
Clinical Usage	Evaluation of lipid status	
Reference Range	Desirable < 5.18 mmol/L	

C-Reactive Protein (CRP), high sensitive		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL)	
Method	Immunoturbidimetric	
Performed	Daily	
TAT	1 day	
Clinical Usage	Detect inflammation and tissue injury	
Reference Range	≤ 0.5 mg/dL	

Creatine Kinase – MB (CKMB)		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4.5mL)	
Unacceptable	Haemolysed, lipaemic, overnight	
Method	Colorimetric	
Performed	Daily	
TAT	1 day, STAT	
Clinical Usage	Test for myocardial infarction	
Reference Range	Adult ≤ 24 IU/L	

Creatine Kinase (CK)		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII tube gold top - 5mL or green top - 4.5mL)	
Unacceptable	Haemolysed, overnight	
Method	Enzymatic rate	
Performed	Daily	

TAT	1 day, STAT	
Clinical Usage	Assessment of skeletal & cardiac muscle disorders	
Reference Range	Adult male	30 – 200 U/L
	Adult female	29 – 168 U/L

Creatinine	Clinical Chemistry Ext 4128	
Specimen	Blood (red top - 6mL or SSTII tube gold top - 5mL or green top - 4.5mL)	
Method	Kinetic Alkaline Picrate (Jaffe Reaction)	
Performed	Daily	
TAT	1 day, STAT	
Clinical Usage	Renal function test	
Reference Range	Adult male	63.6 – 110.5 µmol/L
	Adult female	50.4 – 98.1 µmol/L

Creatinine Clearance Test (CCT), (24Hr)	Clinical Chemistry Ext 4128	
Specimen	24 hr urine collection, no preservative AND blood (red top - 6mL or SSTII gold top - 5mL) taken during the collection period. Send both specimens together	
Unacceptable	Only one specimen type received	
Method	Calculated	
Performed	Office hours only	
TAT	1 day	
Clinical Usage	Estimation of Glomerular Filtration Rate (GFR)	
Reference Range	75 – 135mL/min	

Creatinine, Urine (24Hr)	Clinical Chemistry Ext 4128	
Specimen	24 hr urine collection, no preservative	
Unacceptable	Collection instruction not followed	
Method	Kinetic Alkaline Picrate (Jaffe Reaction)	
Performed	Daily	
TAT	1 day	
Clinical Usage	Renal function test	

Reference Range	Adult Male	5.6 – 14.7 mmol/L
	Female	4.2 – 9.7 mmol/L

CSF Chemistry (Glucose and Total Protein)

Clinical Chemistry Ext 4128

Specimen	1mL in sterile screw-capped container	
Transport	Send to the Lab immediately	
Unacceptable	Contaminated with Blood	
Method	Potentiometry, Colorimetry	
TAT	Daily 24-hr STAT	
Clinical Usage	Assessment of CNS diseases and infection	
Reference Range	CSF Glucose	2.22 – 3.89 mmol/L
	CSF Protein	0.15 – 0.40 g/L
	CSF Chloride	120 – 130 mmol/L
	Appearance	Clear

Ferritin

Clinical Chemistry Ext 4128

Specimen	Blood (red top - 6mL or SSTII gold top - 5mL)	
Unacceptable	Haemolysed	
Method	Chemiluminescence immunoassay	
Performed	Daily	
TAT	1 day	
Clinical Usage	Screening test for iron status	
Reference Range	Male	21.8 – 274.7 ug/L
	Female	4.6 – 204.0 ug/L

Gamma-Glutamyl Transferase (GGT)

Clinical Chemistry Ext 4128

Specimen	Blood (red top - 6mL or SSTII gold top - 5mL)	
Unacceptable	Haemolysed	
Method	Multiple-Point Rate Test	
Performed	Daily	
TAT	1 day	
Clinical Usage	Liver profile assessment	
Reference Range	Male	12 – 64 U/L
	Female	9 – 36 U/L

Glucose Tolerance Test (GTT) **Clinical Chemistry Ext 4128**

Specimen	Blood (Grey top - 3mL). Submit 2 specimens: Fasting and 2 hours after glucose (75g) intake		
Unacceptable	Fasting less than 8 hrs		
Method	Colorimetry		
Performed	Daily		
TAT	1 day		
Clinical Usage	Diagnosis of diabetes mellitus		
Reference Range	Normal	Impaired	Diabetic
	Fasting	3.5– 6.0 mmol/L	6.1– 6.9 mmol/L ≥ 7.0 mmol/L
	2 hours	4.0 – 7.7 mmol/L	7.8–11.0mmol/L ≥ 11.1 mmol/L

Glucose, Fasting (FBS) **Clinical Chemistry Ext 4128**

Specimen	Blood (grey top - 3mL) preferred or SSTII gold top - 5mL
Unacceptable	Fasting less than 8 hrs
Method	Colorimetry
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Diagnosis and monitoring of diabetes mellitus
Reference Range	3.89 – 6.10 mmol/L

Glucose, Post-prandial (2PPS) **Clinical Chemistry Ext 4128**

Specimen	Blood (grey top - 3mL) preferred or SSTII gold top - 5mL
Unacceptable	Time taken less than 2 hours
Method	Colorimetry
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Diagnosis and monitoring of diabetes mellitus
Reference Range	3.8 – 11.1 mmol/L

Glucose, Random (RBS) **Clinical Chemistry Ext 4128**

Specimen	Blood (grey top - 3mL) preferred or SSTII gold top - 5mL
Method	Colorimetry
Performed	Daily

TAT	1 day, STAT
Clinical Usage	Diagnosis and monitoring of diabetes mellitus
Reference Range	Adults : 4.0 – 11.1 mmol/L

Glucose-6-Phosphate Dehydrogenase Clinical Chemistry Ext 4128	
Specimen	Blood or cord blood (green top, 4mL)
Method	Fluorescence Spot Test
Performed	Daily
TAT	1 day
Clinical Usage	Screening test for G6PD deficiency. (Note: any recent blood transfusion or acute haemolysis can affect the results obtained with this test.)

Glycated Haemoglobin A1c (HbA1c) Clinical Chemistry Ext 4128	
Specimen	Blood (purple top - 3mL)
Unacceptable	Clotted
Method	HPLC
Performed	Daily
TAT	5 days
Clinical Usage	Long term monitoring of glucose control in diabetes mellitus
Reference Range	Good control : < 7.0 %

HDL Cholesterol Clinical Chemistry Ext 4128	
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4.5mL)
Unacceptable	Fasting less than 10 – 12 hrs
Method	Homogeneous, colorimetric
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation of lipid status
Reference Range	Desirable : 1.0 – 1.6 mmol/L

Human Chorionic Gonadotropin (hCG), Beta Total		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4.5mL)	
Unacceptable	Haemolysed	
Method	Chemiluminescence immunoassay	
Performed	Daily	
TAT	1 day	
Clinical Usage	Evaluation of pregnancy status	
Reference Range	Males	< 3.0 IU/L
	Non-pregnant female	< 5.0 IU/L

Iron (Fe)		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL)	
Unacceptable	Haemolysed	
Method	Ferene	
Performed	Daily	
TAT	1 day	
Clinical Usage	Evaluation of iron status	
Reference Range	Male	5.5 – 25.78 µmol/L
	Female	4.48 – 27.92 µmol/L

Lactate		Clinical Chemistry Ext 4128
Specimen	Blood (grey top - 3mL)	
	Draw blood without stasis to avoid spurious lactate elevation	
Transport	Specimen in ice, send to the Lab immediately	
Unacceptable	Specimen not chilled, haemolysed, overnight	
Method	Enzymatic	
Performed	Daily	
TAT	1 day	
Clinical Usage	Evaluation of metabolic and lactic acidosis	
Reference Range	Adult : Venous, 0.5 – 2.2 mmol/L	

Lactate Dehydrogenase (LDH)		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top -	

	4.5mL)
Unacceptable	Haemolysed, overnight
Method	Colorimetry Lactate to pyruvate (NADH)
Performed	Daily
TAT	1 day
Clinical Usage	Non-specific marker of cellular damage
Reference Range	125 – 243 U/L

LDL Cholesterol	Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4.5mL)
Unacceptable	Fasting less than 10 – 12 hrs
Method	Calculated, homogenous, colorimetric
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation of lipid status
Reference Range	Optimal : < 2.6 mmol/L

Lipid Panel	Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4.5mL) Fasting 10-12 hrs is required
Unacceptable	Non-fasting specimen
Method	<i>Panel test: Cholesterol, Triglyceride, HDL, LDL (calculated) See individual test</i>
Performed	Daily
TAT	1 day
Clinical Usage	Lipid profile assessment
Reference Range	Refer to individual analytes

Liver Function Test (LFT)	Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL)
Unacceptable	Haemolysed, overnight

Method	<i>Panel test: Total Protein, Albumin, Total Bilirubin, ALT, ALP, GGT see individual test</i>
Performed	Daily
TAT	1 day
Clinical Usage	Liver profile assessment
Reference Range	Refer to individual analytes

Magnesium (Mg) Clinical Chemistry Ext 4128	
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4.5mL)
Unacceptable	Haemolysed, overnight
Method	Colorimetry
Performed	Daily
TAT	1 day
Clinical Usage	Diagnosis and monitoring of hypo- and hypermagnesemia
Reference Range	0.66 – 1.07 mmol/L

Magnesium, Urine Clinical Chemistry Ext 4128	
Specimen	24 hr urine collection, preservative: 6M HCL, keep refrigerated during collection
Unacceptable	Collection instruction not followed
Method	Colorimetry
Performed	Daily
TAT	1 day
Clinical Usage	Diagnosis and monitoring of hypo- and hypermagnesemia
Reference Range	3.00 – 5.00 mmol/day

Microalbumin, Urine Clinical Chemistry Ext 4128	
Specimen	Random urine, 20mL in sterile screw-capped container, no preservative. Preferred first morning urine specimen
Method	Immunoturbidimetric
Performed	Daily

TAT	1 day
Clinical Usage	Early detection of diabetic nephropathy
Reference Range	Normal < 30.0 mg/L
	Microalbuminuria 30.0 – 300.0 mg/L
	Proteinuria > 300.0 mg/L

Osmolality, Serum	Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4.5mL)
Method	Freezing point osmometry
Performed	Daily
TAT	1 day
Clinical Usage	Assessment of fluid and electrolyte balance
Reference Range	275 – 305 mmol/kg

Osmolality, Urine	Clinical Chemistry Ext 4128
Specimen	Random urine (20mL screw-capped container), no preservative
Transport	Send to the Lab immediately
Method	Freezing point osmometry
Performed	Daily
TAT	1 day
Clinical Usage	Assessment of fluid and electrolyte balance
Reference Range	100 – 1200 mmol/kg

Paracetamol (Acetaminophen)	Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4.5mL)
Method	Enzymatic / colorimetric
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Diagnosis of paracetamol toxicity
Reference Range	Toxic levels
	after 12 hrs > 50 mg/L
	after 8 hrs > 100 mg/L
	after 4 hrs > 200 mg/L

Phosphate (PO₄)/Phosphorus,Serum		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4.5mL)	
Unacceptable	Haemolysed, overnight	
Method	Colorimetry	
Performed	Daily	
TAT	1 day	
Clinical Usage	Assessment of calcium and phosphate disorders	
Reference Range	Adults : 0.74 – 1.52 mmol/L	

Phosphate, Urine (24 Hr)		Clinical Chemistry Ext 4128
Specimen	24 hr urine collection, preservative : 6M HCL	
Method	Colorimetry (phosphomolybdate)	
Performed	Daily	
TAT	1 day	
Clinical Usage	Assessment of calcium and phosphate disorders	
Reference Range	12.9 – 42.0 mmol/day	

Potassium, (K)		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4.5mL)	
Unacceptable	Haemolysed, overnight	
Method	Indirect ISE	
Performed	Daily	
TAT	1 day, STAT	
Clinical Usage	Evaluation/assessment of electrolyte imbalance	
Reference Range	Adults 3.5 – 5.1 mmol/L	

Potassium, Urine		Clinical Chemistry Ext 4128
Specimen	Random urine, 20mL in sterile screw-capped container or 24 hr urine collection No preservative	
Method	Indirect ISE	
Performed	Daily	

TAT	1 day
Clinical Usage	Evaluation/assessment of electrolyte imbalance
Reference Range	Adults 25 – 125 mmol/day varies with diet

Protein, Total		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4.5mL)	
Unacceptable	Haemolysed, overnight	
Method	Colorimetry (Biuret)	
Performed	Daily	
TAT	1 day	
Clinical Usage	Marker of nutritional status	
Reference Range	Adults : 60 – 83 g/L	

Protein, Urine		Clinical Chemistry Ext 4128
Specimen	24 hr urine collection, no preservative. Refer to Guideline	
Unacceptable	Collection instruction not followed	
Method	Colorimetry	
Performed	Daily	
TAT	1 day	
Clinical Usage	Indicator of renal impairment	
Reference Range	< 0.2 g/24 hr	

Protein:Creatinine Ratio, Urine		Clinical Chemistry Ext 4128
Specimen	Early morning urine, 20mL in sterile container	
Method	Calculated	
Performed	Daily	
TAT	1 day, STAT	
Clinical Usage	Assessment of renal impairment	
Reference Range	Proteinuria > 45 mg/mmol	

Sodium (Na)		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4.5mL)	

Unacceptable	Haemolysed, overnight or lipaemic
Method	Indirect ISE
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Evaluation of fluid and electrolyte imbalance
Reference Range	136 – 145 mmol/L

Sodium, Urine	Clinical Chemistry Ext 4128
Specimen	Random urine, 20mL in sterile screw-capped container, no preservative
Method	Indirect ISE
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation of fluid and electrolyte imbalance
Reference Range	40 – 220 mmol/day

Thyroxine, Free (Free T4)	Clinical Chemistry Ext 4128
Specimen	Blood (red top – 6mL or SSTII gold top – 5 ml)
Unacceptable	Haemolysed
Method	Chemiluminescence immunoassay
Performed	Daily
TAT	1 day
Clinical Usage	Diagnose hyperthyroidism and hypothyroidism
Reference Range	Adults 9.00 – 19.05 pmol/L

Thyroid Stimulating Hormone (TSH)	Clinical Chemistry Ext 4128
Specimen	Blood (red top – 6mL or SSTII gold top – 5 ml)
Unacceptable	Haemolysed
Performed	Daily
TAT	1 day
Clinical Usage	Diagnose hyperthyroidism and hypothyroidism
Reference Range	Adults 0.35 - 4.94 mIU/L

Triiodothyronine, Free (Free T3)		Clinical Chemistry Ext 4128
Specimen	Blood (red top – 6mL or SSTII gold top – 5 ml)	
Method	Chemiluminescence immunoassay	
Performed	Daily	
TAT	1 day	
Clinical Usage	Diagnose hyperthyroidism	
Reference Range	Adults	2.63 – 5.70 pmol/L

Transferrin		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL)	
Unacceptable	Haemolysed	
Method	Immunoturbidimetric	
Performed	Daily	
TAT	1 day	
Clinical Usage	Differential diagnosis of microcystic anaemia	
Reference Range	Male	1.74 – 3.64 g/L
	Female	1.80 – 3.82 g/L

Triglyceride, Fasting		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4.5mL) 10-12 hrs fasting is required	
Unacceptable	Fasting less than 10 – 12 hrs	
Method	Enzymatic	
Performed	Daily	
TAT	1 day	
Clinical Usage	Evaluation of lipid status and acute pancreatitis	
Reference Range	Desirable : < 1.7 mmol/L	

Troponin I		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL)	
Method	Chemiluminescence immunoassay	
Performed	Daily	
TAT	Daily 24-hr STAT	

Clinical Usage	Marker of myocardial injury
Reference Range	< 0.032 ng/mL

Urea, Serum		Clinical Chemistry Ext 4128	
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4.5mL)		
Method	Enzymatic rate /Urease		
Performed	Daily		
TAT	1 day, STAT		
Clinical Usage	Assessment of fluid balance and renal function		
Reference Range	Adults : Male	< 50 yrs old	2.9 – 7.1 mmol/L
		> 50 yrs old	6.0 – 9.2 mmol/L
	Female	< 50 yrs old	2.5 – 6.7 mmol/L
		> 50 yrs old	3.5 – 7.2 mmol/L

Urea, Urine		Clinical Chemistry Ext 4128
Specimen	24 hr urine collection, no preservative	
Method	Enzymatic rate	
Performed	Daily	
TAT	1 day	
Clinical Usage	Assessment of fluid balance and renal function	
Reference Range	430 – 715 mmol/day	

Uric Acid (UA)		Clinical Chemistry Ext 4128
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL)	
Unacceptable	Lipaemic	
Method	Enzymatic	
Performed	Daily	
TAT	1 day	
Clinical Usage	Evaluation of uric acid metabolism	
Reference Range	Male	0.21 – 0.42 mmol/L or 210-420 µmol/L
	Female	0.15 – 0.35 mmol/L or 150-350 µmol/L

Uric Acid (UA), 24 hr urine		Clinical Chemistry Ext 4128
Specimen	24 hr urine collection, preservative : 10mL 5% NaOH	
Method	Enzymatic	
Performed	Daily	
TAT	1 day	
Clinical Usage	Evaluation of uric acid metabolism	
Reference Range	Male	< 2.48 mmol/day
	Female	Slightly lower

ABO Group and Rh Type		Haematology ext 4113
Specimen	Blood (EDTA, purple top - 4mL)	
Transport	Send to the Lab Immediately	
Unacceptable	Haemolysed	
Method	Immune agglutination or column agglutination technology	
Performed	Office hours only	
TAT	1 day	
Clinical Usage	Determine ABO and Rh(D) blood group	

Activated Partial Thromboplastin Time (APTT)		Haematology ext 4113
Specimen	Blood (Sodium Citrate, blue top - up to the mark)	
Transport	Send to the Lab Immediately	
Unacceptable	Below or above the mark, haemolysed, clotted	
Method	Clotting	
Performed	Daily	
TAT	1 day, STAT	
Clinical Usage	Monitoring heparin therapy and screening test for clotting factors	
Reference Range	29.0 – 41.0 sec	

Antibody Screen (Red Cell)		Haematology ext 4113
Specimen	Blood (EDTA, purple top - 4mL)	
Unacceptable	Haemolysed	
Method	Immune agglutination or column agglutination technology	

Performed	Daily
TAT	1 day
Clinical Usage	Detect clinically significant alloantibodies
Reference Range	Not detected

APTT 50% Correction

Haematology ext 4113

Specimen	Blood (Sodium Citrate, blue top - up to the mark)
Transport	Send to the Lab immediately
Unacceptable	Below or above the mark, haemolysed and clotted
Method	Clotting
Performed	Daily
TAT	1 day
Clinical Usage	To detect the presence of inhibitors of coagulation

Cold Agglutinin

Haematology ext 4113

Specimen	Blood (red top - 6mL), collect in pre-warmed tube at 37°C
Transport	Send to the Lab immediately
Unacceptable	Haemolysed
Method	Haemagglutination
Performed	Appointment with the Lab required, office hours only
TAT	1 day
Clinical Usage	To determine presence of cold agglutinin in conditions such as autoimmune haemolytic anaemias, mycoplasma infection and infectious mononucleosis
Reference Range	Titre < 64 (Negative)

Crossmatch

Haematology ext 4113

Specimen	Blood (EDTA, purple top - 4mL)
Transport	Send to the Lab immediately
Unacceptable	Haemolysed
Method	Immune agglutination or column agglutination technology
Performed	Daily
TAT	1 day, STAT

Clinical Usage	Compatibility for blood transfusion
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Differential Count (Diff)		Haematology ext 4114
Specimen	Blood (EDTA, purple top - 3mL)	
Unacceptable	Haemolysed, clotted	
Method	Microscopy or Light Scattering Flow Cytometry, Cytochemistry	
Performed	Daily	
TAT	1 – 2 days	
Reference Range	See Lab Report	

Direct Antiglobulin (Coomb's) Test (DCT)		Haematology ext 4113
Specimen	Blood (EDTA, purple top - 3mL)	
Transport	Send to the Lab immediately	
Method	Immune agglutination or column agglutination technology	
Performed	Daily	
TAT	1 day	
Clinical Usage	To detect the presence of globulins (IgG and C3d) coating red cells	
Reference Range	Negative	

Erythrocyte Sedimentation Rate (ESR)		Haematology ext 4114
Specimen	Blood (ESR Vacuum tube-inbetween the two lines)	
Transport	Send to the Lab immediately	
Unacceptable	Haemolysed, clotted	
Method	Westergreen	
Performed	Office hours only	
TAT	1 day	
Reference Range	Male	1 – 10 mm/hr
	Female	3 – 15 mm/hr
	>60 yrs	1 – 20 mm/hr

Exchange Transfusion Compatibility Test		Haematology ext 4113
Specimen	Blood (EDTA, purple top - 4mL)	
Transport	Send to the Lab immediately	

Unacceptable	Haemolysed
Method	Immune agglutination or column agglutination technology
Performed	Daily
TAT	1 day
Clinical Usage	Compatibility testing

Full Blood Count (FBC)		Haematology ext 4113		
Specimen	Blood (EDTA, purple top - 3mL)			
Unacceptable	Haemolysed, clotted			
Method	Test includes machine operated differential count by light scattering flow cytometry, cytochemistry			
Performed	Daily			
TAT	1 day, STAT			
Reference Range		Newborn	Male	Female
	WBC x 10 ⁹ /L	10.0 – 26.0	4.0 – 11.0	4.0 – 11.0
	RBC x 10 ¹² /L	4.8 – 7.1	4.5 – 6.3	4.2 – 5.4
	HB g/dL	13.5 – 19.5	13.5 – 18.0	12.0 – 16.0
	PCV %	44.0 – 64.0	38 – 52	36 – 46
	MCV fL	96 – 108	80 – 96	80 – 96
	MCH pg		27 – 32	27 – 32
	MCHC g/dL		32 – 36	32 – 36
	PLT x 10 ⁹ /L		150 – 450	150 – 450
	MPV fL		6.3 – 10.1	6.3 – 10.1

International Normalised Ratio (INR)		Haematology ext 4113
Specimen	Blood (Sodium Citrate, blue top - up to the mark)	
Unacceptable	Below or above the mark, haemolysed, clotted	
Method	Clotting	
Performed	Daily	
TAT	1 day, STAT	
Clinical Usage	Monitoring of warfarin dosage	
Reference Range	0.8 – 1.2	

Platelet Donor Testing (including Blood Grouping and Antibody Screen) **Haematology ext 4113**

Specimen	Blood (EDTA, purple top - 4mL)
Unacceptable	Haemolysed
Method	Immune agglutination or column agglutination technology
Performed	Daily Sent to RIPAS Lab
TAT	1 day
Clinical Usage	Compatibility testing

Prothrombin Time (PT) **Haematology ext 4113**

Specimen	Blood (Sodium Citrate, blue top - up to the mark)
Unacceptable	Below or above the mark, haemolysed, clotted
Method	Clotting
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Screening test for clotting disorders. Monitoring of anticoagulation therapy
Reference Range	10.5 – 13.5 sec

PT 50% Correction **Haematology ext 4113**

Specimen	Blood (Sodium Citrate, blue top - up to the mark)
Unacceptable	Below or above the mark, haemolysed, clotted
Method	Clotting
Performed	Daily
TAT	1 day
Clinical Usage	To detect presence of inhibitors of coagulation

Reticulocyte Count **Haematology ext 4114**

Specimen	Blood (EDTA, purple top - 3mL)
Unacceptable	Haemolysed, clotted
Method	Light scattering flow cytometry, cytochemistry
Performed	Daily
TAT	1 day

Clinical Usage	Assessment of erythropoietic activity
Reference Range	Newborn 2.0 – 5.0 %
	Adult 0.2 – 2.0 %

Amoeba, Microscopy	Microbiology ext 4116
Specimen	Stool and aspirate, fresh
Transport	Send to the Lab immediately
Method	Light microscopy
Performed	Daily
TAT	Routine - 1 day
Clinical Usage	Diagnosis of amoebiasis

CSF Bacterial Antigen	Microbiology ext 4116
Specimen	CSF (sterile screw-capped container, 1mL)
Transport	Send to the Lab immediately
Method	Latex agglutination
Performed	Daily
TAT	STAT – 1 Hr
Clinical Usage	Presumptive screen for common bacteria causing meningitis
Reference Range	Negative

CSF Exam - Microscopy and Culture	Microbiology ext 4116
Specimen	CSF (2 sterile screw-capped containers, 3mL)
Transport	Send to the Lab immediately
Method	Conventional
Performed	Daily
TAT	Microscopy: Immediately. Culture: 2 to 6 days, or 14 days for Cryptococcus
Clinical Usage	Diagnosis of meningitis

Culture & Susceptibility –Blood (Aerobic & Anaerobic)	Microbiology ext 4116
Specimen	8 to 10mL of blood into aerobic and anaerobic Bactec blood culture bottles, do not refrigerate if there is delay in transportation

Method	Automated Bactec (fluorescence) & conventional culture
Performed	Daily
TAT	2 – 8 days
Clinical Usage	Diagnosis of septicaemia
Reference	No growth
Range	

Culture & Susceptibility – Blood (Paediatrics) Microbiology ext 4116	
Specimen	1 to 3mL of blood into Peds Plus Bactec blood culture bottle. Do not refrigerate if there is delay in transportation
Method	Automated Bactec (fluorescence) & conventional culture
Performed	Daily
TAT	2 – 8 days
Clinical Usage	Diagnosis of septicaemia
Reference	No growth
Range	

Culture & Susceptibility - Gonococcus Microbiology ext 4116	
Specimen	Endocervical, urethral, rectal swabs
Transport	Send to the Lab immediately
Unacceptable	Chlamydia swab and dry swab.
Method	Conventional culture
Performed	Daily
TAT	2 – 5 days
Clinical Usage	Diagnosis of gonorrhoea

Culture and Susceptibility - PD Fluid (Peritoneal dialysis fluid) Microbiology ext 4116	
Specimen	10mL fluid in aerobic and anaerobic blood culture bottles. Do not refrigerate if there is delay in transportation.
Unacceptable	Specimen in unsterile container
Method	Automated Bactec (fluorescence) and conventional culture
TAT	2 - 8 days
Clinical Usage	Diagnosis of peritonitis

Reference Range	No growth
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Culture & Susceptibility – Urine		Microbiology ext 4116
Specimen	Urine (sterile screw-capped container), indicate MSU, catheterised or SPA	
Unacceptable	Unrefrigerated specimens of more than 24 hours old	
Method	Conventional culture	
Performed	Daily	
TAT	2 – 5 days	
Clinical Usage	Diagnosis of urinary tract infection	

Gram-Stain		Microbiology ext 4116
Specimen	Specimen (sterile screw-capped container) or transwab. Smear on a labelled slide	
Unacceptable	Dry swab	
Method	Light microscopy	
Performed	Daily	
TAT	Routine - 1 day, STAT – 1 hr	
Clinical Usage	Presumptive diagnosis of bacterial infection	

Microfilaria parasite		Microbiology ext 4116
Specimen	Blood (purple top, 2-4mL), best taken between 8 – 12 pm	
Method	Microscopy	
TAT	1 – 2 days	
Clinical Usage	Diagnosis of filariasis	
Reference Range	Negative	

Microscopy, Body Fluids		Microbiology ext 4116
Specimen	Fluid (sterile, screw-capped container, 1–3mL), indicate source of specimen	
Transport	Send to the Lab immediately	
Unacceptable	Clotted	

Method	Light microscopy
Performed	Daily
TAT	Routine - 1 day, STAT – 2 hrs

PD Fluid (Peritoneal dialysis fluid), Microscopy		Microbiology ext 4116
Specimen	50mL fluid in sterile screw-capped container Send to the Lab as soon as possible	
Unacceptable	Specimen in unsterile container	
Method	Automated Bactec (fluorescence) and conventional culture	
TAT	Routine - 1 day, STAT – 2 hrs	
Clinical Usage	Diagnosis of peritonitis	

Pregnancy Test, Urine		Microbiology ext 4116
Specimen	Urine (sterile screw-capped container, 10mL), early morning specimen is preferred	
Method	Immunochromatographic 1 -step test	
Performed	Daily	
TAT	Routine - 1 day, STAT – 1 hr	
Clinical Usage	Diagnosis of pregnancy and gestational trophoblastic diseases	

Stool Microscopic Examination (Stool ME)		Microbiology ext 4116
Specimen	Stool (sterile screw-capped container with attached spatula)	
Unacceptable	Swab	
Method	Light microscopy	
Performed	Daily	
TAT	2 days	
Clinical Usage	Diagnosis of parasitic infections	

Stool Occult Blood (SOB)		Microbiology ext 4116
Specimen	Stool in sterile screw-capped container with attached spatula	
Unacceptable	Specimens other than stool	
Method	Immunochromatographic Test	
Performed	Daily	
TAT	1 day	

Clinical Usage	Detect the presence of blood in stool specimen
Reference	Negative
Range	

Urinalysis	Microbiology ext 4116
Specimen	Random urine (sterile screw-capped container, 10-20mL)
Unacceptable	More than 24-hour old
Transport	Send to the Lab as soon as possible
Method	Dipstick / microscopy
Performed	Daily
TAT	1 day

Urine for Dysmorphic RBC	Microbiology ext 4116
Specimen	Random urine (sterile screw-capped container, 10-20mL), fresh
Unacceptable	More than 6 hour old
Transport	Send to the Lab immediately
Method	Light microscopy
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation of glomerular diseases

5.10. PMMPHAMB HOSPITAL LABORATORY SERVICES, TUTONG

Availability of the tests provided is limited. Please refer to the appropriate RIPAS Hospital test catalogue.

Tests to be performed by the Referral Laboratories (overseas) shall be sent via RIPAS Hospital Laboratory Services. Samples must be processed where necessary and sent to the appropriate laboratory immediately. If it was not possible to deliver the sample, inform the assigned laboratory for further action.

Alanine Transaminase (ALT, GPT)		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Haemolysed	
Method	Kinetic rate	
TAT	1 day	
Clinical Usage	Liver profile assessment	
Reference Range	MALE	17 – 63 IU/l
	FEMALE	14-54 IU/L

Albumin		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Haemolysed	
Method	Bichromatic digital endpoint	
TAT	1 day	
Clinical Usage	Liver profile assessment	
Reference Range	AGE	MALE/FEMALE
	0M-7D	27-48 G/L
	1 Y	31-48 G/L
	19 Y	35-48 G/L

Alkaline Phosphatase (ALP)		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Haemolysed	
Method	Kinetic rate	
TAT	1 day	
Clinical Usage	Liver and bone profile assessment	

Reference Range	AGE	MALE/FEMALE
	4 – 15 Y	54 – 369 U/L
	Adults	32 – 91 U/L

Amylase		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Haemolysed, overnight	
Method	Enzymatic rate	
TAT	1 day, STAT	
Clinical Usage	Diagnosis of pancreatitis	
Reference Range	AGE	MALE/FEMALE
	0 – 5 M	5 – 65 U/L
	6 M – <3 Y	12 – 113 U/L
	3 – <6 Y	26 – 163 U/L
	6 – <12 Y	27 – 113 U/L
	12 – <18 Y	30 – 126 U/L
	> 18 Y	23 – 144 U/L

Aspartate Aminotransferase (AST, SGOT)		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Haemolysed, overnight	
Method	Enzymatic rate	
TAT	1 day	
Clinical Usage	Liver profile assessment	
Reference Range	15 – 41 IU/L	

Bence Jones Protein, Urine (Screening)		Clinical Chemistry (ext 224)
Specimen	Random urine - 20mL in sterile screw-capped container, no preservative, preferred early morning urine specimen	
Transport	Send to the Lab immediately	
Method	Bradshaw's test	
TAT	1 day	
Clinical Usage	Screening test for multiple myeloma and amyloidosis	

Reference Range	Not detected
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Bicarbonate, Serum (HCO₃)		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Transport	Send to the Lab immediately	
Method	Differential pH	
TAT	1 day, STAT	
Clinical Usage	Acid-base balance evaluation	
Reference Range	22 – 32 mmol/L	

Bilirubin, Direct		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Transport	Protect sample from light and send to the Lab	
Unacceptable	Haemolysed	
Method	Diazo	
TAT	1 day, STAT	
Clinical Usage	Differential diagnosis of jaundice	
Reference Range	0 – 1 week	< 15.3 µmol/L
	8 days & above	< 3.4 µmol/L
	Adults	1.7 – 8.6 µmol/L

Bilirubin, Total		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Transport	Protect sample from light and send to the Lab	
Unacceptable	Haemolysed, overnight	
Method	Diazo	
TAT	1 day, STAT	
Clinical Usage	Evaluation of neonatal jaundice	
Reference Range	Full Term Baby	
	0 – 1 day	34 – 103 µmol/L
	1 – 2 day	103 – 120 µmol/L
	2 – 5 day	68 – 103 µmol/L

>5 day	5.0 – 30 µmol/L
Premature	
0 – 1 day	17 – 103 µmol/L
1 – 2 day	103 – 137 µmol/L
3 – 5 day	171 – 205 µmol/L
1M OD	0 – 33 µmol/L
18Y	3 – 17 µmol/L
21Y	5 – 21 µmol/L

Blood Gases, Arterial

Clinical Chemistry (ext 224)

Specimen	Heparinised syringe or capillary tube	
Transport	Specimen in ice, send to the Lab immediately	
Unacceptable	Clotted, specimen not chilled, bubbles in blood	
Method	Potentiometry	
TAT	1 day, STAT	
Clinical Usage	Evaluation of acid-base status	
Reference Range	pH	7.350 – 7.450
	pCO ₂	32.0 – 45.0 mmHg
	pO ₂	83.0 – 108.0 mmHg
	Bicarbonate-Act	21.0 – 27.5 mmol/L
	Bicarbonate-Std	22.0 – 26.0 mmol/L
	BE	-3.0 – 3.0 mmol/L
	O ₂ Saturation	94.0 – 98.0 %

Bone Panel

Clinical Chemistry (ext 224)

Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)
Unacceptable	Haemolysed
Method	Panel test: Calcium, Phosphate, ALP.
Performed	Daily
TAT	1 day
Clinical Usage	Bone profile assessment
Reference Range	Refer to individual analytes

Calcium, Total		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Haemolysed	
Method	Indirect ISE	
TAT	1 day	
Clinical Usage	Evaluation of calcium metabolism	
Reference Range	2.23 – 2.58 mmol/L	

Chloride (Cl)		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Method	Indirect ISE	
TAT	1 day, STAT	
Clinical Usage	Electrolyte balance assessment	
Reference Range	101 – 111 mmol/L	

Cholesterol		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Fasting less than 10-12 hrs	
Method	Enzymatic timed-endpoint	
TAT	1 day	
Clinical Usage	Evaluation of lipid status	
Reference Range	Desirable < 5.2 mmol/L	

C-Reactive Protein (CRP), high sensitivity		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Method	Near Infrared Particle immunoassay rate	
Performed	Daily	
TAT	1 day	
Clinical Usage	Detect inflammation and tissue injury and assessment of cardiac events and risk	
Reference Range	< 0.75 mg/dL	

Creatine Kinase – MB (CKMB)		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Haemolysed, lipaemic , overnight	
Method	Immunoinhibition	
Performed	Daily	
TAT	1 day, STAT	
Clinical Usage	Test for acute myocardial infarction	
Reference Range	2 – 14 IU/L	

Creatine Kinase (CK)		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Haemolysed, overnight	
Method	Enzymatic rate	
Performed	Daily	
TAT	1 day, STAT	
Clinical Usage	Assessment of cardiac & skeletal muscle disorders	
Reference Range	MALE	49 – 397 IU/L
	FEMALE	38-234 IU/L

Creatinine		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Method	Jaffe rate	
Performed	Daily	
TAT	1 day, STAT	
Clinical Usage	Renal function test	
Reference Range	MALE	62 – 106 $\mu\text{mol/L}$
	FEMALE	35 – 88 $\mu\text{mol/L}$

CSF Chemistry (Glucose and Total Protein)		Clinical Chemistry (ext 224)
Specimen	CSF – 1mL, in sterile screw-capped container	
Transport	Send to the Lab immediately	
Unacceptable	Contaminated with blood	

Method	Potentiometry, Colorimetry	
TAT	STAT	
Clinical Usage	Assessment of CNS diseases and infection	
Reference Range	CSF Glucose	2.2 – 3.9 mmol/L
	CSF Protein	0.15 – 0.45 g/L

Gamma-Glutamyl Transferase (GGT)		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Haemolysed	
Method	Multiple-Point Rate Test	
Performed	Daily	
TAT	1 day	
Clinical Usage	Liver profile assessment	
Reference Range	7 – 50 IU/L	

Glucose Tolerance Test (GTT)		Clinical Chemistry (ext 224)	
Specimen	Blood (grey top - 3mL). Submit 2 specimens: Fasting and 2 hours after glucose (75g) intake		
Unacceptable	Time taken not labelled on tubes		
Method	O ₂ Depletion / Glucose Oxidase		
Performed	Daily		
TAT	1 day		
Clinical Usage	Diagnosis of diabetes mellitus		
Reference Range	Normal	Impaired	Diabetic
	Fasting 3.5 – 6.0 mmol/L	6.1 – 6.9 mmol/L	≥ 7.0 mmol/L
	2 hours 4.1 – 7.7 mmol/L	7.8 – 11.0 mmol/L	≥ 11.1 mmol/L

Glucose, Fasting (FBS)		Clinical Chemistry (ext 224)
Specimen	Blood (grey top - 3mL preferred or SSTII gold top, 5mL).	
Unacceptable	Fasting less than 8 hrs	
Method	O ₂ Depletion / Glucose Oxidase	
Performed	Daily	
TAT	1 day, STAT	
Clinical Usage	Diagnosis and monitoring of diabetes mellitus	

Reference Range	4.1 – 6.0 mmol/L
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Glucose, Post-prandial (2PPS)	Clinical Chemistry (ext 224)
Specimen	Blood (grey top - 3mL preferred or SSTII gold top, 5mL).
Unacceptable	Time taken less than 2 hours
Method	O ₂ Depletion / Glucose Oxidase
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Diagnosis and monitoring of diabetes mellitus
Reference Range	4.1 – 11.0 mmol/L

Glucose, Random (RBS)	Clinical Chemistry (ext 224)
Specimen	Blood (grey top - 3mL preferred or SSTII gold top, 5mL).
Method	O ₂ Depletion / Glucose Oxidase
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Diagnosis and monitoring of diabetes mellitus
Reference Range	4.1 – 11.0 mmol/L

Glucose-6-Phosphate Dehydrogenase	Clinical Chemistry (ext 224)
Specimen	Blood (heparin - green top, 4mL)
Method	Fluorescence Spot Test
Performed	Daily
TAT	1 day
Clinical Usage	Screening test for G6PD deficiency. (Note: any recent blood transfusion or acute haemolysis can affect the results obtained with this test).
Reference Range	Normal

HDL Cholesterol	Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)
Unacceptable	Fasting less than 10 – 12 hrs
Method	Homogeneous, colorimetric
Performed	Daily

TAT	1 day
Clinical Usage	Evaluation of lipid status
Reference Range	Desirable : 1.0 – 1.6 mmol/L

Lactate Dehydrogenase (LDH)		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Haemolysed, overnight	
Method	Enzymatic rate, pyruvate to lactate	
Performed	Daily	
TAT	1 day	
Clinical Usage	Non-specific marker of cellular damage	
Reference Range	266 – 500 IU/L	

LDL Cholesterol		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Fasting less than 10 – 12 hrs	
Method	Calculated (Friedewald formula)	
Performed	Daily	
TAT	1 day	
Clinical Usage	Evaluation of lipid status	
Reference Range	Optimal < 2.6 mmol/L	

Liver Function Test (LFT)		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Haemolysed, overnight	
Method	Panel test: Total Protein, Albumin, Total Bilirubin, ALT, ALP, GGT.	
Performed	Daily	
TAT	1 day	
Clinical Usage	Liver profile assessment	
Reference Range	Refer to individual analytes	

Microalbumin, Urine		Clinical Chemistry (ext 224)	
Specimen	Random urine - 20mL in sterile screw-capped container or 24 hr urine collection, no preservative		
Method	Immunoturbidimetric		
TAT	1 day		
Clinical Usage	Early detection of diabetic nephropathy		
Reference Range		RANDOM:	24 HOURS:
	Normal	<19.0 mg/L	<30.0 mg/24 hrs
	Microalbuminuria		30.0-300.0 mg/24 hrs
	Proteinuria		>300.0 mg/24 hrs

Paracetamol (Acetaminophen)		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Method	Particle enhanced turbidimetric inhibition immunoassay	
TAT	1 day, STAT	
Clinical Usage	Diagnosis of paracetamol toxicity	
Reference Range	Toxic levels:	
	After 12hrs	>50 mg/L
	After 8 hrs	>100 mg/L
	After 4 hrs	>200 mg/L

Phosphate (PO4)		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Haemolysed, overnight	
Method	Colorimetry	
Performed	Daily	
TAT	1 day	
Clinical Usage	Assessment of calcium and phosphate disorders	
Reference Range	0.78 – 1.53 mmol/L	

Pleural Fluid Chemistry		Clinical Chemistry (ext 224)
Specimen	Screw-capped container	
Performed	Daily	
TAT	1 day	
Clinical Usage	Evaluation of pleural effusions	

Potassium, (K)		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Haemolysed, overnight	
Method	Indirect ISE	
Performed	Daily	
TAT	1 day, STAT	
Clinical Usage	Evaluation/assessment of electrolyte imbalance	
Reference Range	3.6 – 5.1 mmol/L	

Potassium, Urine		Clinical Chemistry (ext 224)
Specimen	Random urine - 20mL in sterile screw-capped container or 24 hr urine collection, no preservative	
Method	Indirect ISE	
Performed	Daily	
TAT	1 day	
Clinical Usage	Evaluation/assessment of electrolyte imbalance	
Reference Range	25 – 125 mmol/24 hrs.	

Protein, Total		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Haemolysed, overnight	
Method	Rate biuret	
Performed	Daily	
TAT	1 day	
Clinical Usage	Marker of nutritional status	
Reference Range	61 – 79 g/L	

Protein, Urine (M-TP)		Clinical Chemistry (ext 224)
Specimen	Random urine - 20mL in sterile screw-capped container or 24 hr urine collection, no preservative.	
Unacceptable	Collection instruction not followed	
Method	Colorimetry	
Performed	Daily	

TAT	1 day
Clinical Usage	Indicator of renal impairment
Reference Range	RANDOM: 0.01 – 0.14 g/L 24 HOURS: 0.05 – 0.1 g/24 hrs

Renal Panel (RP1 & RP2)		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Haemolysed, overnight	
Method	Panel test: Glucose, Urea, Electrolytes, Creatinine, CO ₂ , Uric Acid, Calcium, Phosphate, Total Protein, Albumin, ALP.	
Performed	Daily	
TAT	1 day	
Clinical Usage	Renal profile assessment	
Reference Range	Refer to individual analytes	

Sodium (Na)		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Haemolysed, overnight or lipaemic	
Method	Indirect ISE	
Performed	Daily	
TAT	1 day, STAT	
Clinical Usage	Evaluation of fluid and electrolyte imbalance	
Reference Range	136 – 144 mmol/L	

Sodium, Urine		Clinical Chemistry (ext 224)
Specimen	Random urine - 20mL in sterile screw-capped container, no preservative	
Method	Indirect ISE	
Performed	Daily	
TAT	1 day	
Clinical Usage	Evaluation of fluid and electrolyte imbalance	
Reference Range	40 – 220 mmol/24 hours	

Triglyceride		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Fasting less than 10-12 hrs	
Method	Enzymatic endpoint	
Performed	Daily	
TAT	1 day	
Clinical Usage	Evaluation of lipid status	
Reference Range	Desirable : < 1.7 mmol/L	

Troponin I (cTnI)		Clinical Chemistry (ext 224)
Specimen	Blood (heparin -green top, 4mL)	
Method	ELISA	
TAT	1 day	
Clinical Usage	Diagnosis of acute Myocardial infarction	
Reference Range	0.00 – 0.03 ng/mL	

Urea, Serum		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Method	Enzymatic conductivity rate	
Performed	Daily	
TAT	1 day, STAT	
Clinical Usage	Assessment of renal function	
Reference Range	2.9 – 7.1 mmol/L	

Uric Acid (UA)		Clinical Chemistry (ext 224)
Specimen	Blood (SSTII gold top, 5mL or heparin- green top, 4mL)	
Unacceptable	Lipaemic	
Method	Enzymatic endpoint	
Performed	Daily	
TAT	1 day	
Clinical Usage	Evaluation of uric acid metabolism	
Reference Range	MALE : 286 – 518 µmol/L FEMALE: 155 – 476 µmol/L	

ABO Group and Rh Type		Haematology (ext 226)
Specimen	Blood (EDTA, purple top - 3mL)	
Unacceptable	Haemolysed	
Method	Immune agglutination or column agglutination technology	
TAT	1 week	
Clinical Usage	Determine ABO and Rh(D) blood group	

Activated Partial Thromboplastin Time (APTT)		Haematology (ext 226)
Specimen	Blood (Sodium Citrate, blue top – up to the fill mark)	
Transport	Send to the Lab Immediately	
Unacceptable	Below or above the fill mark, haemolysed, clotted	
Method	Clotting	
TAT	1 day, STAT	
Clinical Usage	Monitoring heparin therapy and screening test for clotting factors	
Reference Range	29.0 – 41.0 sec	

APTT 50% Correction		Haematology (ext 226)
Specimen	Blood (Sodium Citrate, blue top - up to the fill mark)	
Transport	Send to the Lab immediately	
Unacceptable	Below or above the fill mark, haemolysed and clotted	
Method	Clotting	
TAT	1 day	
Clinical Usage	To detect the presence of inhibitors of coagulation	
Reference Range	29.0 – 41.0 sec	

Antibody Screen (Red Cell)		Haematology (ext 226)
Specimen	Blood (EDTA, purple top - 3mL)	
Unacceptable	Haemolysed	
Method	Immune agglutination or column agglutination technology	
TAT	1 day	
Clinical Usage	Detect clinically significant alloantibodies	

Reference Range	Not Detected
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Bleeding Time	Haematology (ext 226)
Specimen	Bedside procedure, prearrange with the Lab
Method	Ivy's method
Performed	Office hours only. Contact Lab for appointment
TAT	1 day
Clinical Usage	Aids in the diagnosis of platelet dysfunction, von-Willebrand disease, vascular abnormalities
Reference Range	2.0 –8.0 minutes

Crossmatch	Haematology (ext 226)
Specimen	Blood (EDTA, purple top - 3mL)
Unacceptable	Haemolysed
Method	Immune agglutination or column agglutination technology
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Compatibility for blood transfusion

Cryoglobulin Screen	Haematology (ext 226)
Specimen	Blood (EDTA, purple top - 3mL or red top - 6mL)
Unacceptable	Haemolysed
Method	Precipitation of cryoglobulin at 4°C
Performed	By schedule. Contact laboratory for appointment.
TAT	1 week
Reference Range	Not Detected

D-Dimer	Haematology (ext 226)
Specimen	Blood (Sodium Citrate, blue top - up to the mark)
Transport	Send to the Lab immediately
Unacceptable	Below or above the level, haemolysed, clotted
Method	Rapid latex agglutination slide test
Performed	Daily

TAT	1 day
Clinical Usage	Aid in the diagnosis of disseminated intravascular coagulation (DIC), acute thromboembolic event
Reference Range	Less than 0.5 µg/mL

Differential Count (Diff)		Haematology (ext 226)
Specimen	Blood (EDTA, purple top - 3mL)	
Unacceptable	Haemolysed, clotted	
Method	Microscopy or Light Scattering Flow Cytometry, Cytochemistry	
Performed	Daily	
TAT	1 – 2 days	
Reference Range	See Lab Report	

Direct Antiglobulin (Coomb's) Test (DCT)		Haematology (ext 226)
Specimen	Blood (EDTA, purple top - 3mL)	
Method	Immune agglutination or column agglutination technology	
Performed	Daily	
TAT	1 day	
Clinical Usage	To investigate the presence of globulins (IgG and C3d) coating red cells	
Reference Range	Negative	

Erythrocyte Sedimentation Rate (ESR)		Haematology (ext 226)
Specimen	Blood (EDTA, purple top - 3mL)	
Unacceptable	Haemolysed, clotted	
Method	Infrared detection correlated to Westegren method	
Performed	Office hours only	
TAT	1 day	
Reference Range	<div>MALE 0 – 15 mm/hr</div> <div>FEMALE 0 – 20 mm/hr</div>	

Fibrinogen Degradation Product (FDP)		Haematology (ext 226)
Specimen	Blood (Sodium Citrate, blue top - up to the mark)	
Transport	Send to the Lab immediately	

Unacceptable	Below or above the mark, haemolysed, clotted
Method	Latex particle agglutination
Performed	Daily
TAT	1 day
Reference Range	Less than 5 µg/mL

Full Blood Count (FBC)		Haematology (ext 226)	
Specimen	Blood (EDTA, purple top - 3mL)		
Unacceptable	Haemolysed, clotted		
Method	Light scatter flow cytometry, cytochemistry		
Performed	Daily		
TAT	1 day, STAT		
Reference Range	Newborn	Male	Female
WBC x10 ⁹ /L	10.0 – 26.0	4.0 – 11.0	4.0 – 11.0
RBC x 10 ¹² /L	4.8 – 7.1	4.5 – 6.3	4.2 – 5.4
HB g/dL	13.5 – 19.5	13.5 – 18.0	12.0 – 16.0
PCV %	44.0 – 64.0	38 – 52	36 – 46
MCV fL	96 – 108	80 – 96	80 – 96
MCH pg		27 – 32	27 – 32
MCHC g/dL		32 – 36	32 – 36
PLT x10 ⁹ /L		150 – 450	150 – 450
MPV fL		6.3 – 10.1	6.3 – 10.1

Indirect Antiglobulin Test (see Antibody Screen)	Haematology (ext 226)
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International Normalised Ratio (INR)		Haematology (ext 226)
Specimen	Blood (Sodium Citrate, blue top - up to the fill mark)	
Unacceptable	Below or above the fill mark, haemolysed, clotted	
Method	Clotting	
Performed	Daily	
TAT	1 day, STAT	
Clinical Usage	Monitoring of warfarin dosage	
Reference Range	0.8 – 1.2	

Malaria Parasite		Haematology (ext 226)
Specimen	Blood (EDTA, purple top - 3mL)	
Unacceptable	Haemolysed, clotted	
Method	Light microscopy	
Performed	Daily	
TAT	1 day, STAT	
Clinical Usage	Detection and identification of malaria parasites	
Reference Range	No malaria parasite seen	

Prothrombin Time (PT)		Haematology (ext 226)
Specimen	Blood (Sodium Citrate, blue top - up to the fill mark)	
Unacceptable	Below or above the fill mark, haemolysed, clotted	
Method	Clotting	
Performed	Daily	
TAT	1 day, STAT	
Clinical Usage	Screening test for clotting disorders. Monitoring of anticoagulation therapy.	
Reference Range	10.5 – 13.5 sec	

PT 50% Correction		Haematology (ext 226)
Specimen	Blood (Sodium Citrate, blue top - up to the fill mark)	
Unacceptable	Below or above the fill mark, haemolysed, clotted	
Method	Clotting	
Performed	Daily	
TAT	1 day	
Clinical Usage	To detect the presence of inhibitors of coagulation	
Reference Range	10.5 – 13.5 sec	

Reticulocyte Count		Haematology (ext 226)
Specimen	Blood (EDTA, purple top - 3mL)	
Unacceptable	Haemolysed, clotted	
Method	Light scattering flow cytometry, cytochemistry	
Performed	Daily	

TAT	1 day
Clinical Usage	Assessment of erythropoietic activity
Reference Range	Newborn 2.3 – 5.4%
	1 month 0.7 – 1.1%
	6 month 1.0 – 1.8%
	1 yr old 0.76 – 1.9%
	Female Adult 0.5 – 1.7%
	Male Adult 0.51 – 1.81%

Amoebae, Microscopy Microbiology (ext 225)	
Specimen	Stool and aspirate, fresh
Transport	Send to the Lab immediately
Method	Light microscopy
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Diagnosis of amoebiasis

CSF Exam (Microscopy) Microbiology (ext 225)	
Specimen	CSF (2 sterile screw-capped containers - 3mL)
Transport	Send to the Lab immediately
Method	Conventional
Performed	Daily
TAT	Microscopy: Immediately.
Clinical Usage	Diagnosis of meningitis

Culture and Sensitivity, Blood, Aerobic & Anaerobic Microbiology (ext 225)	
Specimen	8 to 10mL of blood into aerobic and anaerobic Bactec blood culture bottles, do not refrigerate if there is delay in transport
Method	Automated Bactec (fluorescence)
Performed	Daily
TAT	2 – 8 days
Clinical Usage	Diagnosis of septicaemia
Reference Range	No growth

Culture and Sensitivity, Blood, Paediatrics		Microbiology (ext 225)
Specimen	1 to 3mL of blood into Peds Plus Bactec blood culture bottle. Do not refrigerate if there is delay in transport	
Method	Automated Bactec (fluorescence)	
Performed	Daily	
TAT	2 – 8 days	
Clinical Usage	Diagnosis of septicaemia	
Reference Range	No growth	

Gonococcus gram stain		Microbiology (ext 225)
Specimen	Endocervical, urethral, rectal swabs	
Transport	Send to the Lab immediately	
Unacceptable	Specimens from other sites of genital tract, dry swab	
Method	Gram stain	
Performed	Daily	
TAT	2 – 5 days	
Clinical Usage	Diagnosis of gonorrhoea	

Culture and Sensitivity, Urine		Microbiology (ext 225)
Specimen	Urine (sterile screw-capped container), indicate MSU, catheterised or SPA	
Unacceptable	Specimen more than 24 hours old	
Method	Conventional culture	
Performed	Daily	
TAT	2 – 5 days	
Clinical Usage	Diagnosis of urinary tract infection	
Reference Range	No growth	

Gram-Stain Smear		Microbiology (ext 225)
Specimen	Specimen (sterile screw-capped container) or transwab. Smear on a labelled slide	
Unacceptable	Dry swab	
Method	Light microscopy	
Performed	Daily	

TAT	1 day, STAT
Clinical Usage	Presumptive diagnosis of bacterial infection

Microscopy, Body Fluids Microbiology (ext 225)	
Specimen	Fluid (sterile, screw-capped container, 1-3mL), indicate source of specimen
Transport	Send to the Lab immediately
Unacceptable	Clotted
Method	Light microscopy
Performed	Daily
TAT	1 day, STAT

Pregnancy Test, Urine Microbiology (ext 225)	
Specimen	Urine (sterile screw-capped container, 10mL), early morning specimen is preferred
Method	Immunochromatographic 1 -step test
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Diagnosis of pregnancy and gestational trophoblastic diseases

Stool Microscopic Examination (Stool ME) Microbiology (ext 225)	
Specimen	Stool (sterile screw-capped container with attached spatula)
Unacceptable	Swab
Method	Light microscopy
Performed	Daily
TAT	2 days
Clinical Usage	Diagnosis of parasitic infections and cholera

Stool Occult Blood (SOB) Microbiology (ext 225)	
Specimen	Stool in sterile screw-capped container with attached spatula
Unacceptable	Specimens other than stool
Method	Immunochromatographic Test
Performed	Daily
TAT	1 day

Clinical Usage	Detect the presence of blood in stool specimen
Reference Range	Negative

Urinalysis	Microbiology (ext 225)
Specimen	Random urine (sterile screw-capped container, 10mL)
Transport	Send to the Lab as soon as possible
Method	Dipstick / microscopy
Performed	Daily
TAT	1 day

Urine for Dysmorphic RBC	Microbiology (ext 225)
Specimen	Random urine (sterile screw-capped container, 10mL), fresh
Transport	Send to the Lab immediately
Method	Light microscopy
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation of glomerular diseases

5.11. PIHM HOSPITAL LABORATORY SERVICES, TEMBURONG

Availability of the test provided is limited. Please refer to the appropriate RIPAS Hospital test catalogue.

Test to be performed by the Referral Laboratories shall be transported via RIPAS Hospital Laboratory Services. Sample must be processed where necessary and send appropriately to the laboratory immediately. In the event if it was not possible to transport the sample, inform the assigned laboratory for further action.

Amylase		Clinical Chemistry Ext 123
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)	
Unacceptable	Haemolysed, overnight	
Method	Enzymatic rate	
TAT	1 day, STAT	
Clinical Usage	Diagnosis of pancreatitis	
Reference Range	36 – 128 U/L	

Bicarbonate, Serum (HCO₃)		Clinical Chemistry Ext 123
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL)	
Transport	Send to the Lab immediately	
Method	Differential pH	
TAT	1 day	
Clinical Usage	Acid-base balance	
Reference Range	22 – 32 mmol/L	

Bilirubin, Direct		Clinical Chemistry Ext 123
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)	
Transport	Protect sample from light and send to the Lab	
Unacceptable	Haemolysed	
Method	Diazo	
TAT	1 day, STAT	
Clinical Usage	Differential diagnosis of jaundice	
Reference Range	0 – 1 week	< 15.3 µmol/L
	8 days & above	< 3.4 µmol/L
	Adults	1.7 – 8.6 µmol/L

Bilirubin, Total		Clinical Chemistry Ext 123
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)	
Transport	Protect sample from light and send to the Lab	
Unacceptable	Haemolysed, overnight	
Method	Diazo	
TAT	1 day, STAT	
Clinical Usage	Diagnosis of neonatal jaundice	
Reference Range	Full Term Baby	
	0 – 1 day	34 – 103 $\mu\text{mol/L}$
	1 – 2 day	103 – 120 $\mu\text{mol/L}$
	2 – 5 day	68 – 103 $\mu\text{mol/L}$
	>5 day	5.0 – 30 $\mu\text{mol/L}$
	Premature	
	0 – 1 day	17 – 103 $\mu\text{mol/L}$
	1 – 2 day	103 – 137 $\mu\text{mol/L}$
	3 – 5 day	171 – 205 $\mu\text{mol/L}$
	1M OD	0 – 33 $\mu\text{mol/L}$
	18Y	3 – 17 $\mu\text{mol/L}$
	21Y	5 – 21 $\mu\text{mol/L}$

Blood Gases, Arterial		Clinical Chemistry Ext 123
Specimen	Heparinised syringe or capillary tube	
Transport	Specimen in ice, send to the Lab immediately	
Unacceptable	Clotted, specimen not chilled, bubbles in blood	
Method	Potentiometry	
TAT	1 day, STAT	
Clinical Usage	Evaluate acid-base status	

Reference Range	pH	7.350 – 7.450
	pCO ₂	32.0 – 45.0 mmHg
	pO ₂	75.0 – 100.0 mmHg
	Bicarbonate-Act	21.0 – 27.5 mmol/L
	Bicarbonate-Std	22.0 – 26.0 mmol/L
	BE	-2.0 – 2.0 mmol/L
	O ₂ Saturation	95.0 – 100.0 %

Calcium, Ionised		Clinical Chemistry Ext 123
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)	
Unacceptable	Haemolysed	
Method	Potentiometry	
TAT	1 day	
Clinical Usage	Evaluation of calcium metabolism	
Reference Range	1.15 – 1.35 mmol/L	

Calcium, Total		Clinical Chemistry Ext 123
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)	
Unacceptable	Haemolysed	
Method	Indirect ISE	
TAT	1 day	
Clinical Usage	Evaluation of calcium metabolism	
Reference Range	Adults : 2.23 – 2.58 mmol/L	

Chloride (Cl)		Clinical Chemistry Ext 123
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)	
Method	Indirect ISE	
TAT	1 day, STAT	
Clinical Usage	Electrolyte balance	
Reference Range	101 – 111 mmol/L	

Creatine Kinase (CK)		Clinical Chemistry Ext 123
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)	
Unacceptable	Haemolysed, overnight	
Method	Enzymatic rate	

Performed	Daily
TAT	1 day, STAT
Clinical Usage	Assessment of skeletal & cardiac muscle disorders
Reference Range	33 – 200 IU/L

Creatinine		Clinical Chemistry Ext 123
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)	
Method	Colorimetry	
Performed	Daily	
TAT	1 day, STAT	
Clinical Usage	Renal function test	
Reference Range	Adults Male	62 – 106 μ mol/L
	Adult Female	35 – 88 μ mol/L

Glucose Tolerance Test (GTT)		Clinical Chemistry Ext 123	
Specimen	Blood (grey top - 3mL). Submit 2 specimens: Fasting and 2 hours after glucose (75g) intake		
Unacceptable	Time taken not labelled on tubes		
Method	O2 Depletion / Glucose Oxidase		
Performed	Daily		
TAT	1 day		
Clinical Usage	Diagnosis of diabetes mellitus		
Reference Range			
	Normal	Impaired	Diabetic
Fasting	3.5–6.0 mmol/L	6.1–6.9 mmol/L	≥7.0 mmol/L
2 hrs after glucose intake	4.0–7.7 mmol/L	7.8–11.0 mmol/L	≥11.1 mmol/L

Glucose, Fasting (FBS)		Clinical Chemistry Ext 123
Specimen	Blood (grey top - 3mL preferred or red top - 6mL or SSTII gold top - 5mL). Mix specimen well to avoid clotting.	
Unacceptable	Fasting less than 8 hrs	
Method	O2 Depletion / Glucose Oxidase	

Performed	Daily
TAT	1 day, STAT
Clinical Usage	Diagnosis and monitoring of diabetes mellitus
Reference Range	3.5 – 6.0 mmol/L

Glucose, Post-prandial (2PPS)

Clinical Chemistry Ext 123

Specimen	Blood (grey top - 3mL preferred or red top - 6mL or SSTII gold top - 5mL). Mix specimen well to avoid clotting.
Unacceptable	Time taken less than 2 hours
Method	O2 Depletion / Glucose Oxidase
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Diagnosis and monitoring of diabetes mellitus
Reference Range	3.8 – 11.1 mmol/L

Glucose, Random (RBS)

Clinical Chemistry Ext 123

Specimen	Blood (grey top - 3mL preferred or red top - 6mL or SSTII gold top - 5mL). Mix specimen well to avoid clotting.
Method	Potentiometry
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Diagnosis and monitoring of diabetes mellitus
Reference Range	Adults : 4.0 – 11.1 mmol/L

Osmolality, Serum

Clinical Chemistry Ext 123

Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)
Method	Freezing point osmometry
Performed	Daily
TAT	1 day
Clinical Usage	Assessment of fluid and electrolyte balance
Reference Range	100 – 1200 mmol/kg

Potassium, (K)		Clinical Chemistry Ext 123
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)	
Unacceptable	Haemolysed, overnight	
Method	Indirect ISE	
Performed	Daily	
TAT	1 day, STAT	
Clinical Usage	Evaluation/assessment of electrolyte imbalance	
Reference Range	Adults : 3.6 – 5.0 mmol/L	

Potassium, Urine		Clinical Chemistry Ext 123
Specimen	Random urine - 20mL in sterile screw-capped container or 24 hr urine collection, no preservative	
Method	Indirect ISE	
Performed	Daily	
TAT	1 day	
Clinical Usage	Evaluation/assessment of electrolyte imbalance	
Reference Range	25 – 125 mmol/L. Varies with diet	

Protein, Total		Clinical Chemistry Ext 123
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)	
Unacceptable	Haemolysed, overnight or lipaemic	
Method	Colorimetry	
Performed	Daily	
TAT	1 day	
Clinical Usage	Marker of nutritional status	
Reference Range	Adults : 65-80 g/L	

Sodium (Na)		Clinical Chemistry Ext 123
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)	
Unacceptable	Haemolysed, overnight or lipaemic	
Method	Indirect ISE	
Performed	Daily	
TAT	1 day, STAT	

Clinical Usage	Evaluation of fluid and electrolyte imbalance
Reference Range	136 – 144 mmol/L

Troponin I	Clinical Chemistry Ext 123
Specimen	Blood (green top - 4mL)
Unacceptable	Haemolysed, overnight or lipaemic
Method	Chemiluminescence immunoassay
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Marker of myocardial injury
Reference Range	<0.03 ng/mL

Urea, Serum	Clinical Chemistry Ext 123
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)
Method	Enzymatic rate
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Assessment of fluid balance and renal function
Reference Range	Adults : 2.9 – 7.1 mmol/L

Uric Acid (UA)	Clinical Chemistry Ext 123
Specimen	Blood (red top - 6mL or SSTII gold top - 5mL or green top - 4mL)
Unacceptable	Lipaemic
Method	Enzymatic rate
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation of uric acid metabolism
Reference Range	Adults : 232 – 494 µmol/L

ABO Group and Rh Type	Haematology Ext 123
Specimen	Blood (EDTA, purple top - 3mL or red top - 6mL)
Unacceptable	Haemolysed
Method	Immune agglutination or column agglutination technology

TAT	1 day
Clinical Usage	Determine ABO and Rh(D) blood group

Activated Partial Thromboplastin Time (APTT)		Haematology Ext 123
Specimen	Blood (Sodium Citrate, blue top, up to the mark)	
Transport	Send to the Lab Immediately	
Unacceptable	Below or above the mark, haemolysed, clotted	
Method	Clotting	
TAT	1 day, STAT	
Clinical Usage	Monitoring heparin therapy and screening test for clotting factors	
Reference Range	29.0 – 41.0 sec	

APTT 50% Correction		Haematology Ext 123
Specimen	Blood (Sodium Citrate, blue top, up to the mark)	
Transport	Send to the Lab immediately	
Unacceptable	Below or above the mark, haemolysed and clotted	
Method	Clotting	
TAT	1 day	

Antibody Identification (Red Cell)		Haematology Ext 123
Specimen	Blood (EDTA, purple top - 4mL or red top - 6mL)	
Unacceptable	Haemolysed	
Method	Immune agglutination or column agglutination technology	
Performed	Office hours only	
TAT	Variable	
Clinical Usage	Determine the specificity of antibody/antibodies detected during antibody screening	

Antibody Screen (Red Cell)		Haematology Ext 123
Specimen	Blood (EDTA, purple top - 4mL or red top - 6mL)	
Unacceptable	Haemolysed	
Method	Immune agglutination or column agglutination technology	

Performed	Daily
TAT	1 day
Clinical Usage	Detect clinically significant alloantibodies
Reference Range	Not detected

Antibody Titre	Haematology Ext 123
Specimen	Blood (EDTA, purple top - 4mL or red top - 6mL)
Unacceptable	Haemolysed
Method	Immune agglutination
Performed	Office hours only
TAT	3 days
Clinical Usage	Measures the amount of antibody present in plasma or serum based on a dilution method

Blood Film	Haematology Ext 123
Specimen	Blood (EDTA, purple top - 3mL)
Transport	Send to the Lab
Unacceptable	Haemolysed, clotted
Method	Light microscopy
Performed	Office hours only. Report by Haematology Laboratory, RIPAS Hospital
TAT	2 – 3 days

Crossmatch	Haematology Ext 123
Specimen	Blood (EDTA, purple top - 4mL or red top - 6mL)
Unacceptable	Haemolysed
Method	Immune agglutination or column agglutination technology
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Compatibility for blood transfusion

Differential Count (Diff)	Haematology Ext 123
Specimen	Blood (EDTA, purple top - 3mL)

Unacceptable	Haemolysed, clotted
Method	Microscopy or Light Scattering Flow Cytometry, Cytochemistry
Performed	Daily
TAT	1 – 2 days
Reference Range	See Lab Report

Direct Antiglobulin (Coomb's) Test (DCT)		Haematology Ext 123
Specimen	Blood (EDTA, purple top - 3mL)	
Method	Immune agglutination or column agglutination technology	
Performed	Daily	
TAT	1 day	
Clinical Usage	To investigate the presence of globulins (IgG and C3d) coating red cells	
Reference Range	Negative	

Erythrocyte Sedimentation Rate (ESR)		Haematology Ext 123
Specimen	Blood (EDTA, purple top - 3mL)	
Unacceptable	Haemolysed, clotted	
Method	Westergreen	
Performed	Office hours only	
TAT	1 day	
Reference Range	Male	1 – 10 mm/hr
	Female	3 – 15 mm/hr
	>60 yrs	1 – 20 mm/hr

Full Blood Count (FBC)		Haematology Ext 123	
Specimen	Blood (EDTA, purple top - 3mL)		
Unacceptable	Haemolysed, clotted		
Method	Test includes machine operated differential count by light scattering flow cytometry, cytochemistry		
Performed	Daily		
TAT	1 day, STAT		
Reference Range	Newborn	Male	Female
WBC x10 ⁹ /L	10.0 – 26.0	4.0 – 11.0	4.0 – 11.0

RBC x 10 ¹² /L	4.8 – 7.1	4.5 – 6.3	4.2 – 5.4
HB g/dL	13.5 – 19.5	13.5 – 18.0	12.0 – 16.0
PCV %	44.0 – 64.0	38 – 52	36 – 46
MCV fL	96 – 108	80 – 96	80 – 96
MCH pg		27 – 32	27 – 32
MCHC g/dL		32 – 36	32 – 36
PLT x10 ⁹ /L		150 – 450	150 – 450
MPV fL		6.3 – 10.1	6.3 – 10.1

International Normalised Ratio (INR)

Haematology Ext 123

Specimen	Blood (Sodium Citrate, blue top, up to the mark)
Unacceptable	Below or above the mark, haemolysed, clotted
Method	Clotting
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Monitoring of warfarin dosage
Reference Range	0.8 – 1.2

Lupus Anticoagulant screen (LA)

Haematology Ext 123

Specimen	Blood (Sodium Citrate, blue top, up to the mark)
Transport	Send to the Lab immediately
Unacceptable	Below or above the mark, haemolysed, clotted
Method	Clotting

Malarial Parasites

Haematology Ext 123

Specimen	Blood (EDTA, purple top - 3mL)
Unacceptable	Haemolysed, clotted
Method	Light microscopy
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Detection and identification of malarial parasites

Prothrombin Time (PT)

Haematology Ext 123

Specimen	Blood (Sodium Citrate, blue top, up to the mark)
Unacceptable	Below or above the mark, haemolysed, clotted

Method	Clotting
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Screening test for clotting disorders. Monitoring of anticoagulation therapy.
Reference Range	10.5 – 13.5 sec

PT 50% Correction

Haematology Ext 123

Specimen	Blood (Sodium Citrate, blue top, up to the mark)
Unacceptable	Below or above the mark, haemolysed, clotted
Method	Clotting
Performed	Daily
TAT	1 day
Clinical Usage	To detect presence of inhibitors of coagulation

Reticulocyte Count

Haematology Ext 123

Specimen	Blood (EDTA, purple top - 3mL)
Unacceptable	Haemolysed, clotted
Method	Light scattering flow cytometry, cytochemistry
Performed	Daily
TAT	1 day
Clinical Usage	Assessment of erythropoietic activity
Reference Range	Newborn 2.0 – 5.0 % Adult 0.2 – 2.0 %

Rhesus Genotyping

Haematology Ext 123

Specimen	Blood (EDTA, purple top - 4mL or red top - 6mL)
Unacceptable	Haemolysed
Method	Immune agglutination or column agglutination technology
Performed	Daily
TAT	1 day
Clinical Usage	Rh genotyping

Amoebae, Microscopy

Microbiology Ext 123

Specimen	Stool and aspirate, fresh
Transport	Send to the Lab immediately
Method	Light microscopy
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Diagnosis of amoebiasis

Gram-Stain Smear

Microbiology Ext 123

Specimen	Specimen (sterile screw-capped container) or transwab. Smear on a labelled slide.
Unacceptable	Dry swab
Method	Light microscopy
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Presumptive diagnosis of bacterial infection

Pregnancy Test, Urine

Microbiology Ext 123

Specimen	Urine (sterile screw-capped container, 10mL), early morning specimen is preferred
Method	Immunochromatographic 1-step test
Performed	Daily
TAT	1 day, STAT
Clinical Usage	Diagnosis of pregnancy and gestational trophoblastic diseases

Stool Microscopic Examination (Stool ME)

Microbiology Ext 123

Specimen	Stool (sterile screw-capped container with attached spatula)
Unacceptable	Swab
Method	Light microscopy
Performed	Daily
TAT	2 days
Clinical Usage	Diagnosis of parasitic infections and cholera

Stool Occult Blood (SOB)**Microbiology Ext 123**

Specimen	Stool in sterile screw-capped container with attached spatula
Unacceptable	Specimens other than stool
Method	Immunochromatographic Test
Performed	Daily
TAT	1 day
Clinical Usage	Detect the presence of blood in stool specimen
Reference Range	Negative

Urinalysis**Microbiology Ext 123**

Specimen	Random urine (sterile screw-capped container, 10mL)
Transport	Send to the Lab as soon as possible
Method	Dipstick / microscopy
Performed	Daily
TAT	1 day

Urine for Dysmorphic RBC**Microbiology Ext 123**

Specimen	Random urine (sterile screw-capped container, 10mL), fresh
Transport	Send to the Lab immediately
Method	Light microscopy
Performed	Daily
TAT	1 day
Clinical Usage	Evaluation of glomerular diseases

LABORATORY FORM

DEPT OF LABORATORY SERVICES MINISTRY OF HEALTH NEGARA BRUNEI DARUSSALAM		Please fill in the form completely													
		Full name: (Block capitals)													
CLINICAL CHEMISTRY	IC			-								Y	P	G	
	D.O.B. / /				Sex M / F		Race			Paying Y / N					
For laboratory use Specimen no.	Location						Name/code of requesting doctor								
							Dr's signature								
							Specialist								
	Date collected			Time taken			Sample collected & labelled by								
Type of specimen Blood <input type="checkbox"/> Urine <input type="checkbox"/> CSF <input type="checkbox"/> Others _____							Nature of specimen Fasting <input type="checkbox"/> Random <input type="checkbox"/> 24-hr <input type="checkbox"/>								
Relevant clinical data and diagnosis															
Please tick <input checked="" type="checkbox"/> appropriate box (es) below. For Inpatient please use SST II TUBE (gold top) for all tests unless stated otherwise. For Outpatient Clinics, please use GREY top for all glucose.															
<input type="checkbox"/> Na/K	<input type="checkbox"/> GGT	<input type="checkbox"/> OGTT(0'/120') (grey)	<input type="checkbox"/> Chol, total	<input type="checkbox"/> Urea	<input type="checkbox"/> TP	<input type="checkbox"/> HbA1c (purple)	<input type="checkbox"/> TG	<input type="checkbox"/> Creatinine	<input type="checkbox"/> ALB	<input type="checkbox"/> Uric acid	<input type="checkbox"/> HDL-Chol	<input type="checkbox"/> TBil	<input type="checkbox"/> Glu,fasting (grey)	<input type="checkbox"/> TSH / FT4 / FT3	<input type="checkbox"/> LDL-Chol
<input type="checkbox"/> ALT	<input type="checkbox"/> Glu,random (grey)	<input type="checkbox"/> Ferritin	<input type="checkbox"/> ALP	<input type="checkbox"/> Glu,2hpost (grey)											
Others, please specify															

LABORATORY FORM

DEPT OF LABORATORY SERVICES MINISTRY OF HEALTH NEGARA BRUNEI DARUSSALAM		Full name: (Block capitals)																	
HAEMATOLOGY		<input type="checkbox"/>	IC	<input type="checkbox"/>	<input type="checkbox"/>	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Y	P	G	
		D.O.B. / /				Sex M / F		Race				Paying Y / N							
For laboratory use: Specimen no		Location								Name/code of requesting doctor									
										Doctor's Signature									
Date & time taken		Sample collected & labelled by								Specialist									
Type of specimens																			
<input type="checkbox"/> Blood <input type="checkbox"/> Urine Others (specify) _____																			
Relevant clinical data and diagnosis																			
Patient on <input type="checkbox"/> Warfarin <input type="checkbox"/> Heparin																			
Please tick <input checked="" type="checkbox"/> appropriate box(es) below																			
HAEMATOLOGY TESTS																			
<input type="checkbox"/> Full blood count <input type="checkbox"/> Differential count <input type="checkbox"/> Blood film <input type="checkbox"/> ESR																			
<input type="checkbox"/> Reticulocyte count <input type="checkbox"/> Others (specify) _____																			
COAGULATION TESTS																			
<input type="checkbox"/> APTT <input type="checkbox"/> PT-INR <input type="checkbox"/> Lupus anticoagulant																			
<input type="checkbox"/> Others (specify) _____																			
PRIOR ARRANGEMENT REQUIRED BEFORE ORDERING																			
<input type="checkbox"/> Hb. Electrophoresis <input type="checkbox"/> Sickling test <input type="checkbox"/> Bleeding time <input type="checkbox"/> NAP score																			
<input type="checkbox"/> Ham's test <input type="checkbox"/> Sucrose lysis test <input type="checkbox"/> Haemosiderin, urine <input type="checkbox"/> Malarial parasites																			
<input type="checkbox"/> Kleihauer test <input type="checkbox"/> Osmotic fragility <input type="checkbox"/> Bone marrow aspirate																			
<input type="checkbox"/> Others (specify) _____																			

LABORATORY FORM

DEPT OF LABORATORY SERVICES MINISTRY OF HEALTH NEGARA BRUNEI DARUSSALAM		Full name: (Block capitals)																									
BLOOD TRANSFUSION		<table border="1"> <tr> <td>IC</td> <td></td> <td></td> <td>-</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Y</td> <td>P</td> <td>G</td> </tr> </table>												IC			-								Y	P	G
		IC			-								Y	P	G												
<i>For laboratory use:</i> <i>Specimen no</i>		D.O.B. / /		Sex M / F		Race				Paying Y / N																	
		Location				Name/code of requesting doctor																					
		Date & time taken				Doctor's Signature																					
Sample collected & labelled by						Specialist																					
Relevant clinical data and diagnosis																											
TRANSFUSION HISTORY																											
Previous transfusion? <input type="checkbox"/> Yes <input type="checkbox"/> No Transfusion reactions? <input type="checkbox"/> Yes <input type="checkbox"/> No																											
Date of last transfusion _____ Type of reactions _____																											
Known blood group/Rh(D) _____ Previous pregnancies? <input type="checkbox"/> Yes <input type="checkbox"/> No																											
Known antibodies? <input type="checkbox"/> Yes <input type="checkbox"/> No																											
Please tick <input checked="" type="checkbox"/> appropriate box(es) below																											
TEST(S) REQUIRED (EDTA or otherwise stated)																											
<input type="checkbox"/> ABO and Rh(D) <input type="checkbox"/> Direct Coomb's test (DCT)																											
<input type="checkbox"/> Group and save <input type="checkbox"/> Cold agglutinin (appointment required) _____																											
<input type="checkbox"/> Crossmatch <input type="checkbox"/> Cryoglobulin (appointment required) _____																											
BLOOD PRODUCTS																											
Required on: _____ Time _____																											
Red blood cells _____ Units Other Blood Components(specify) _____ Unit _____																											
PLEASE NOTE: <ul style="list-style-type: none"> INCORRECT AND/OR INCOMPLETE REQUEST FORMS WILL BE REJECTED. ONLY DOCTORS ARE AUTHORISED TO FILL IN THE FORM. 																											

LABORATORY FORM

DEPT OF LABORATORY SERVICES MINISTRY OF HEALTH NEGARA BRUNEI DARUSSALAM		Full name: (Block capitals)													
MICROBIOLOGY 1 (BACTERIOLOGY & MYCOLOGY)		<input type="checkbox"/>	IC	<input type="checkbox"/>	<input type="checkbox"/>	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Y	P	G
		D.O.B. / /			Sex M / F		Race			Paying Y / N					
For laboratory use		Location						Name/code of requesting doctor							
Specimen no								Signature							
Date & time taken		Sample collected & labelled by						Specialist							
Relevant clinical data and diagnosis/Significant previous cultures															
Antibiotics															
<input type="checkbox"/> Recent _____ <input type="checkbox"/> Current _____ <input type="checkbox"/> To start _____															
Please tick <input checked="" type="checkbox"/> the appropriate box(es) below.															
TYPE OF SPECIMENS (Please use separate form for each type of specimen)															
Blood, specify:		<input type="checkbox"/> Sputum				<input type="checkbox"/> Ear swab				<input type="checkbox"/> Urethral swab					
<input type="checkbox"/> Vein		<input type="checkbox"/> Stool/Rectal swab				<input type="checkbox"/> Catheter swab				<input type="checkbox"/> Throat swab					
<input type="checkbox"/> Catheter		<input type="checkbox"/> Hair				<input type="checkbox"/> Conjunctival swab				<input type="checkbox"/> Ascitic fluid					
CSF, specify:		<input type="checkbox"/> Nail				<input type="checkbox"/> Cord swab				<input type="checkbox"/> Joint fluid					
<input type="checkbox"/> LP		<input type="checkbox"/> Skin scraping				<input type="checkbox"/> Nasal swab				<input type="checkbox"/> PD fluid					
<input type="checkbox"/> Shunt		<input type="checkbox"/> Corneal scraping				<input type="checkbox"/> Pus swab				<input type="checkbox"/> Pleural fluid					
Urine, specify:		<input type="checkbox"/> Aspirate from _____													
<input type="checkbox"/> MSU <input type="checkbox"/> CSU		<input type="checkbox"/> FNA from _____													
<input type="checkbox"/> SPA <input type="checkbox"/> Bag		<input type="checkbox"/> Tissue from _____													
<input type="checkbox"/> Others, specify:		_____													
TYPE OF TESTS															
<input type="checkbox"/> Bacterial culture & sensitivity				<input type="checkbox"/> Gram stain				<input type="checkbox"/> CSF bacterial antigen							
<input type="checkbox"/> Fungus culture				<input type="checkbox"/> KOH preparation				<input type="checkbox"/> ZN for Acid Fast Bacilli (AFB)							
<input type="checkbox"/> MRSA screening				<input type="checkbox"/> India ink for <i>Cryptococcus</i>				<input type="checkbox"/> Others, specify:							
<input type="checkbox"/> Medical fit screening				<input type="checkbox"/> Cell counts											

LABORATORY FORM

DEPT OF LABORATORY SERVICES MINISTRY OF HEALTH NEGARA BRUNEI DARUSSALAM		Full name: (Block capitals)														
MICROBIOLOGY 2 (MISCELLANEOUS)		<input type="checkbox"/>	IC	<input type="checkbox"/>	<input type="checkbox"/>	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Y	P	G
For laboratory use: <i>Specimen no</i>		D.O.B. / /			Sex M / F		Race			Paying Y / N						
		Location						Name/code of requesting doctor								
		Date & time taken						Signature								
Sample collected & labelled by:										Specialist:						
Relevant clinical data and diagnosis/Significant previous cultures																
Antibiotics <input type="checkbox"/> Recent _____ <input type="checkbox"/> Current _____ <input type="checkbox"/> To start _____																
Please tick <input checked="" type="checkbox"/> the appropriate box(es) below.																
TYPE OF TESTS (Please use separate form for each type of specimen)																
URINE				STOOL				BLOOD								
<input type="checkbox"/> Urinalysis/Microscopy (ME) <input type="checkbox"/> Pregnancy test <input type="checkbox"/> Medical fit <input type="checkbox"/> Dysmorphic RBC (fresh, send to lab immediately)				<input type="checkbox"/> Microscopy (ME) <input type="checkbox"/> Occult blood <input type="checkbox"/> Medical fit <input type="checkbox"/> Amoeba (fresh, send to lab immediately)				<input type="checkbox"/> Widal <input type="checkbox"/> Weil-Felix <input type="checkbox"/> ASOT <input type="checkbox"/> Mycoplasma IgM <input type="checkbox"/> Microfilaria (EDTA, taken at night)								
<input type="checkbox"/> Others (specify):																

LABORATORY FORM

DEPT OF LABORATORY SERVICES MINISTRY OF HEALTH NEGARA BRUNEI DARUSSALAM	Full name: (Block capitals)																												
CYTOLOGY (GYNAECOLOGY)		IC			-							Y	P	G															
	For laboratory use: Specimen no	D.O.B. / /			Sex F / M		Race			Paying Y / N																			
		Location						Name/code of requesting doctor																					
		Date & time taken						Signature																					
Sample collected & labelled by										Specialist																			
Relevant clinical data and diagnosis																													
Please complete the following. Last smear Reference no.: <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>P</td><td>G</td><td></td><td></td><td></td><td>/</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </table>															P	G				/									
P	G				/																								
LMP:					Parity:					Age at 1 st coitus:																			
Contraception:					Duration of usage:																								
Symptoms & history: (Please tick <input checked="" type="checkbox"/> where applicable)																													
<input type="checkbox"/> Irregular period					<input type="checkbox"/> Vaginal discharge					<input type="checkbox"/> Radiotherapy																			
<input type="checkbox"/> Post coital bleeding					<input type="checkbox"/> Pregnant ___ Wks					<input type="checkbox"/> Hormone therapy																			
<input type="checkbox"/> Post menstrual bleeding					<input type="checkbox"/> Post partum					<input type="checkbox"/> Gynaecological surgery																			
<input type="checkbox"/> Intermenstrual bleeding					<input type="checkbox"/> Symptom free																								
LABORATORY REPORT (FOR LAB USE)																													
<div style="display: flex; justify-content: space-between;"> <div>Date & time received:</div> <div>Pathologist signature:</div> </div>																													

LABORATORY FORM

DEPT OF LABORATORY SERVICES MINISTRY OF HEALTH NEGARA BRUNEI DARUSSALAM	Full name: (Block capitals)													
CYTOLOGY (NON-GYNAECOLOGY)														IC
For laboratory use: Specimen no	D.O.B. / /			Sex M / F		Race				Paying Y / N				
	Location						Name/code of requesting doctor							
	Date & time taken						Signature							
Sample collected & labelled by										Specialist				
Relevant clinical data and diagnosis														
Please tick <input checked="" type="checkbox"/> the appropriate box below and INDICATE CLEARLY THE SITE(S) OF SPECIMEN COLLECTION. <input type="checkbox"/> FNA <input type="checkbox"/> Others Nature of specimen: _____														

LABORATORY FORM

DEPT OF LABORATORY SERVICES MINISTRY OF HEALTH NEGARA BRUNEI DARUSSALAM	Full name: (Block capitals)														
CYTOLOGY (SEMEN ANALYSIS)		IC			-								Y	P	G
	D.O.B. / /		Sex M		Race				Paying Y / N						
For laboratory use: Specimen no	Location								Name/code of requesting doctor						
	Date & time taken								Signature						
	Specialist:														
	Relevant clinical data and diagnosis														
Date of appointment Tarikh perjanjian															
Recommended dates of abstinence Tarikh dicadangkan supaya bertahan dari mengeluarkan air mani															
TO BE FILLED BY PATIENT / UNTUK DIISIKAN OLEH PESAKIT															
Time of specimen collection Masa mengeluarkan specimen															
Duration of abstinence (days) Jumlah hari bertahan dari mengeluarkan air mani (hari) _____ days hari															
Is there any spillage during collection? Adakah ketumpahan berlaku semasa mengeluarkan specimen? <input type="checkbox"/> Yes Ya <input type="checkbox"/> No Tidak															

LABORATORY FORM

DEPT OF LABORATORY SERVICES MINISTRY OF HEALTH NEGARA BRUNEI DARUSSALAM	Full name: (Block capitals)															
ROUTINE HISTOLOGY																
	IC				-									Y	P	G
For laboratory use: Specimen no	D.O.B.				Sex				Race				Paying			
	/ /				M / F								Y / N			
	Location								Name/code of requesting doctor							
	Date & time taken								Signature							
Sample collected & labelled by								Specialist								
Nature of specimen(s)								Note: <ul style="list-style-type: none"> • All specimens EXCEPT for frozen section and immunofluorescence stain must be placed in fixative. • Specimen container(s) must be properly labelled and the request form properly filled. • Testicular biopsies must be sent in Bouin's fluid. 								
Please quote previous biopsy, FNAC or cytology lab ref no, if any:																
Relevant clinical data and diagnosis																

LABORATORY FORM

DEPT OF LABORATORY SERVICES MINISTRY OF HEALTH NEGARA BRUNEI DARUSSALAM	Full name: (Block capitals)													
VIROLOGY	IC			-								Y	P	G
	D.O.B. / /		Sex M / F		Race				Paying Y / N					
For laboratory use: Specimen no	Location						Name/code of requesting doctor							
	Date & time taken						Signature							
	Sample collected & labelled by						Specialist							
Type of specimen <input type="checkbox"/> Blood <input type="checkbox"/> CSF <input type="checkbox"/> Viral Swab <input type="checkbox"/> Stool <input type="checkbox"/> Urine														
Relevant Clinical data and diagnosis														
Please tick <input checked="" type="checkbox"/> the appropriate box(es) below. Use PLAIN or SST II TUBE for tests listed. Refer to the Laboratory Handbook or contact 2221821 ext 114 for availability & requirement of other tests.														
LABORATORY TESTS														
<input type="checkbox"/> Antenatal Screening					<input type="checkbox"/> Hepatitis A IgM					<input type="checkbox"/> Hepatitis B Surface Ag				
<input type="checkbox"/> HIV 1/2 Screening					<input type="checkbox"/> Hepatitis C Ab					<input type="checkbox"/> Hepatitis B Surface Ab				
<input type="checkbox"/> Rubella IgG					<input type="checkbox"/> Hepatitis C Ag					<input type="checkbox"/> Syphilis				
<input type="checkbox"/> Torch Screening														
<input type="checkbox"/> Others, specify:														

LABORATORY FORM

DEPT OF LABORATORY SERVICES MINISTRY OF HEALTH NEGARA BRUNEI DARUSSALAM	IMPORTANT NOTICE: TO AVOID COMPLICATION, PLEASE FILL IN ALL REQUIRED DETAILS CLEARLY												
IMMUNOLOGY	Full name: (Block capitals)												
	IC			-							Y	P	G
	D.O.B. / /				Sex M / F		Race			Paying Y / N			
<i>For laboratory use Specimen no.</i>	Location						Name/code of requesting doctor						
							Doctor's Signature						
Sample collected & labelled by	Date Collected				Time taken		Specialist						
Relevant clinical data and diagnosis													
Please tick <input checked="" type="checkbox"/> appropriate box (es) below.													
<div style="list-style-type: none; padding-left: 0;"> <input type="checkbox"/> Antinuclear antibody <input type="checkbox"/> Anti-DNA antibody <input type="checkbox"/> Extractable nuclear antigens (anti-Ro/La/Sm/RNP/Scl-70) <input type="checkbox"/> Rheumatoid arthritis factors (RA factors) <input type="checkbox"/> Anti-cyclic citrullinated peptide (Anti-CCP) <input type="checkbox"/> Anticardiolipin antibodies (AC IgG & AC IgM) <input type="checkbox"/> Antineutrophil cytoplasmic Antibody (C-ANCA / P-ANCA / Anti-MPO / Anti - PR3) <input type="checkbox"/> Thyroid antibodies (anti-thyroglobulin antibodies / anti-TPO) <input type="checkbox"/> Antimitochondrial antibodies (AMA) <input type="checkbox"/> Antismooth muscle antibodies (ASMA) <input type="checkbox"/> Antiparietal cell antibodies (APCA) </div>													
FOR ALL THE ABOVE, PLEASE COLLECT 8 ML BLOOD SAMPLE IN PLAIN TUBE FOR FURTHER INFORMATION, PLEASE REFER DLS LABORATORY HANDBOOK													

LABORATORY FORM

DEPT OF LABORATORY SERVICES MINISTRY OF HEALTH NEGARA BRUNEI DARUSSALAM		Full name: (Block capitals)																																												
MYCOBACTERIOLOGY (TB)		<table border="1"> <tr> <td>IC</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>												IC																																
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For laboratory use: Specimen no		D.O.B. / /		Sex M / F		Race			Paying Y / N																																					
		Location					Name/code of requesting doctor																																							
		Date & time taken					Signature																																							
Sample collected & labelled by							Specialist																																							
Relevant clinical data and diagnosis/Significant previous cultures																																														
Please tick <input checked="" type="checkbox"/> the appropriate box(es) below.																																														
NATURE OF SPECIMENS																																														
<table border="0"> <tr> <td><input type="checkbox"/> Abscess</td> <td><input type="checkbox"/> Endotracheal tube/tip</td> <td><input type="checkbox"/> Peri-dialysis (PD) fluid</td> </tr> <tr> <td><input type="checkbox"/> Ascitic fluid</td> <td><input type="checkbox"/> Faeces/stool</td> <td><input type="checkbox"/> Peritoneal fluid</td> </tr> <tr> <td><input type="checkbox"/> Blood</td> <td><input type="checkbox"/> Knee fluid</td> <td><input type="checkbox"/> Pleural fluid</td> </tr> <tr> <td><input type="checkbox"/> Bone marrow</td> <td><input type="checkbox"/> Liver biopsy</td> <td><input type="checkbox"/> Skin slit</td> </tr> <tr> <td><input type="checkbox"/> Bronchial alveolar lavage</td> <td><input type="checkbox"/> Lymph node</td> <td><input type="checkbox"/> Synovial fluid</td> </tr> <tr> <td><input type="checkbox"/> Bronchial washing</td> <td><input type="checkbox"/> Pericardial fluid</td> <td><input type="checkbox"/> Tracheal aspiration/secretion</td> </tr> <tr> <td><input type="checkbox"/> Cerebrospinal fluid</td> <td></td> <td><input type="checkbox"/> Tracheostomy swab</td> </tr> <tr> <td colspan="3"><input type="checkbox"/> Early morning sputum (contact screening)</td> </tr> <tr> <td colspan="3"><input type="checkbox"/> Fine needle aspiration, specify: _____</td> </tr> <tr> <td colspan="2"><input type="checkbox"/> Pus specimen, specify: _____</td> <td><input type="checkbox"/> Swab, specify: _____</td> </tr> <tr> <td colspan="2"><input type="checkbox"/> Tissues, specify: _____</td> <td><input type="checkbox"/> Others, specify: _____</td> </tr> </table>														<input type="checkbox"/> Abscess	<input type="checkbox"/> Endotracheal tube/tip	<input type="checkbox"/> Peri-dialysis (PD) fluid	<input type="checkbox"/> Ascitic fluid	<input type="checkbox"/> Faeces/stool	<input type="checkbox"/> Peritoneal fluid	<input type="checkbox"/> Blood	<input type="checkbox"/> Knee fluid	<input type="checkbox"/> Pleural fluid	<input type="checkbox"/> Bone marrow	<input type="checkbox"/> Liver biopsy	<input type="checkbox"/> Skin slit	<input type="checkbox"/> Bronchial alveolar lavage	<input type="checkbox"/> Lymph node	<input type="checkbox"/> Synovial fluid	<input type="checkbox"/> Bronchial washing	<input type="checkbox"/> Pericardial fluid	<input type="checkbox"/> Tracheal aspiration/secretion	<input type="checkbox"/> Cerebrospinal fluid		<input type="checkbox"/> Tracheostomy swab	<input type="checkbox"/> Early morning sputum (contact screening)			<input type="checkbox"/> Fine needle aspiration, specify: _____			<input type="checkbox"/> Pus specimen, specify: _____		<input type="checkbox"/> Swab, specify: _____	<input type="checkbox"/> Tissues, specify: _____		<input type="checkbox"/> Others, specify: _____
<input type="checkbox"/> Abscess	<input type="checkbox"/> Endotracheal tube/tip	<input type="checkbox"/> Peri-dialysis (PD) fluid																																												
<input type="checkbox"/> Ascitic fluid	<input type="checkbox"/> Faeces/stool	<input type="checkbox"/> Peritoneal fluid																																												
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<input type="checkbox"/> Tissues, specify: _____		<input type="checkbox"/> Others, specify: _____																																												
Early morning sputum <input type="checkbox"/> X1 <input type="checkbox"/> X2 <input type="checkbox"/> X3				Early morning urine <input type="checkbox"/> X1 <input type="checkbox"/> X2 <input type="checkbox"/> X3				Fasting gastric juice <input type="checkbox"/> X1 <input type="checkbox"/> X2 <input type="checkbox"/> X3																																						
TEST(S) REQUIRED																																														
<input type="checkbox"/> AFB smear <input type="checkbox"/> AFB culture <input type="checkbox"/> AFB serology <input type="checkbox"/> ZN smear for leprosy bacilli <input type="checkbox"/> Others, specify: _____																																														

LABORATORY FORM

DEPT OF LABORATORY SERVICES MINISTRY OF HEALTH NEGARA BRUNEI DARUSSALAM		PATIENT NAME : (Block capital)	
ADD-ON REQUEST	IC NO:	Sex: M / F	Race:
For Laboratory use: Specimen No.	Location:	Specimen Collection Date: Time taken:	
LABORATORY SERVICES			
<div style="display: flex; justify-content: space-around;"> <div><input type="checkbox"/> Clinical Chemistry</div> <div><input type="checkbox"/> Haematology</div> </div> <div style="display: flex; justify-content: space-around;"> <div><input type="checkbox"/> Microbiology</div> <div><input type="checkbox"/> Others</div> </div>			
ADD-ON TESTS (Please write the test):			
Name of Requesting Doctor:		Signature:	
		Date/time:	

FOR LABORATORY USE

Add-on test can be done on the same day provided there is adequate volume and stability of sample is maintained

Reason for the specimen not being processed:

Verified by:

Date:

Time:

LABORATORY FORM

Department of Laboratory Services
Ministry of Health
Brunei Darussalam

MF#8-SIC (SAMPLE IDENTIFICATION CORRECTION FORM FOR PRECIOUS SPECIMENS)

1. TO BE COMPLETED BY THE LABORATORY

Laboratory /Year/Month/Running Number/...../...../.....

Missing or incomplete information:

☐

Form incompletely filled

☐

Unlabelled specimen container

☐

Patient information on sample container & request form do not match

☐

Others (please specify)

Received and checked by

Signature

Person notified

Date and time

2. TO BE COMPLETED BY THE REQUESTING PHYSICIAN / AUTHORISED PERSONNEL

Name of patient

IC

Nature of specimen

Date and time taken

I verify the accuracy of information provided and request the specimen to be analysed.

Name

Position

Signature

Location.....

Date and Time

Note: Corrected / added specimen information on the specimen container and the requisition must agree

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