

PATHOLOGY SERVICE HANDBOOK

DEPARTMENT OF PATHOLOGY
DEPARTMENT OF TRANSFUSION MEDICINE

2025



KEMENTERIAN KESIHATAN
MALAYSIA



BERSEKUTUAN MELAKSANAKAN TRANSFORMASI
KESIHATAN MELAYSI



HOSPITAL SULTAN IDRIS SHAH, SERDANG

PATHOLOGY SERVICE HANDBOOK

4th EDITION



DEPARTMENT OF PATHOLOGY
DEPARTMENT OF TRANSFUSION MEDICINE

**HOSPITAL SULTAN IDRIS SHAH,
SERDANG
2025**

FOREWORD

HOSPITAL DIRECTOR

Pathology Service Handbook is the fourth edition and the production of each new edition is a huge task. In each edition builds on the contributions that others have made to earlier editions so that the current handbook is a testament to the hard work of many teams of people over time.

This means that we constantly remind ourselves that associated with every specimen, every report, every piece of anonymous data, every phone query, there is a person who rightfully expects us to treat them “personally”.

This also means that our supporting doctors and their teams can rely on each of us at Pathology lab, irrespective of our role, to behave as part of a medical practice where we are each known by you, and are personally committed to ensuring the best possible service for you and your practice.

I hope that this Handbook will help us improve our service to the staffs. I also hope it will assist you and your staff to achieve the ultimate aim of us all: to improve the health of our patients and our community.



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HEAD OF PATHOLOGY DEPARTMENT

First and foremost, I would like to express my gratitude and congratulate the whole working committee who has worked hard to successfully produce this handbook.

As we are all aware, Hospital Sultan Idris Shah (HSIS), Serdang serves as a tertiary referral center for various subspecialty services which includes Pusat Jantung being the main referral center for handling complex cardiac cases. In view of that, Department of Pathology Hospital Sultan Idris Shah, Serdang, being the support system in clinical management has also upgraded our services to meet the demand of the current health care management.

In this fourth edition of Pathology Service Handbook, there are updated information involving new tests, its turn-around time (LTAT) as well as guidelines on specimen handling and list of rejection criteria.

I hope the updated version of this book will benefit our clients and they'll be able to make the best use of our laboratory service for the betterment of patient and health care in Malaysia.

Thank you.



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PATHOLOGY SERVICE HANDBOOK 2025

Fourth Edition

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VISION

Pathology department provide comprehensive range of excellent diagnostic services and, therapeutic blood and blood products that is accredited and internationally recognized, in line with the expert services offered by HSIS.

MISSION

- Focusing on quality improvement and productivity by implementing teamwork, caring and professionalism.
- Ensure continuous learning and training for all personnel.
- Utilizing appropriate best available technology with good networking.

QUALITY POLICY

- To ensure accurate and timely results are provided to laboratory customers for management of patients.
- To maintain the quality and continually improve the pathology service by monitoring of performance indicators.
- To continually monitor specimen rejection rate to ensure test results are not delayed for patient diagnosis and treatment.
- To ensure the equipment used in providing test results are well maintained and functioning well at all times.
- To ensure all lab personnel are equipped with knowledge and skills in the form of continuous training and updates.
- To maintain a customer responsive service through regular customer feedback.

CLIENT CHARTER

- Blood supply for emergency cases will be issued within 30 minutes provided the sample condition is adequate and not damaged.
- Urgent full blood count (FBC) result will be released in ≤ 45 minutes provided the specimen is suitable for testing and no repeat test needed.
- Urgent / stat biochemical test result will be released in ≤ 60 minutes provided the specimen is suitable for testing and no repeat test needed.
- Blood for Malaria Parasite (BFMP) result will be released in ≤ 2 hours subject to thick and thin blood film smear are in good condition (blood taken by “finger prick”).
- Urgent biopsy report will be released in ≤ 3 working days (not more than 3 containers and/or not require further levels or additional tests).
- Urgent non-gynaecology and fine-needle aspiration cytology report will be released in ≤ 3 working days (provided PER PAT 301 form is completed and no additional test are required).

GENERAL OPERATING POLICY



A. GENERAL OPERATING POLICIES

1.0 INTRODUCTION

Pathology Department is one of the Clinical Support Services in Hospital Sultan Idris Shah, Serdang (HSIS). It provides pathology services which support the specialty services in HSIS as a tertiary hospital. Integrated concept is practised in this department for all routine and urgent tests including Chemical Pathology, Haematology, Medical Microbiology, Anatomic Pathology and Transfusion Medicine. This department incorporates "Laboratory Information System (LIS)" which is one of the components in "Hospital Information System (HIS)" in HSIS.

Pathology Department of HSIS provides screening, diagnostic and consultancy services in the disciplines of Pathology:

- Chemical Pathology
- Medical Microbiology
- Haematology
- Anatomic Pathology
- Transfusion Medicine

2.0 LOCATION

Pathology Department is located on the third floor at the west wing of the hospital building, opposite the Specialist Office.

3.0 FUNCTIONS

- 3.1 To provide diagnostic services in the field of Chemical Pathology, Haematology, Medical Microbiology, Anatomic Pathology and Transfusion Medicine to HSIS and surrounding health facilities.
- 3.2 To provide training in technical and analytical skills for personnel, staff of other government institutions and students from institutes of higher learning.
- 3.3 To provide advisory and consultancy services to customers in matters related to pathology services.
- 3.4 To conduct and assist research and development in pathology and other relevant clinical fields.

4.0 SCOPE OF SERVICES

4.1 The department of pathology provides the following services:

1. Chemical Pathology
2. Haematology
3. Medical Microbiology
4. Anatomic Pathology (includes Histopathology, Cytology and Clinical Autopsy)
5. Transfusion Medicine

5.0 SERVICE HOURS

Chemical Pathology, Haematology, Medical Microbiology and Transfusion Medicine provide 24 hours services for routine testing.

Haematology, Anatomic Pathology and Medical Microbiology also provide 24 hours coverage for certain specialized tests.

Name of Functional Unit	Specimen Reception Counter	Service hour
Chemical Pathology	Main Reception Counter	24 hours
Haematology	Main Reception Counter	24 hours
Medical Microbiology	Main Reception Counter	24 hours
Transfusion Medicine	Transfusion Medicine Counter	24 hours
Cytology	Cytology Reception Counter	Monday to Thursday: i) 0800-1300 hours ii) 1400-1630 hours Friday: i) 0800-1215 hours ii) 1445 -1630 hours
Histopathology	Histopathology Counter	

6.0 COMMUNICATION

Any queries or problems related to pathology services can be directed to the phone extensions as stated below:

LOCATION	EXTENSION
Head of Department	5298
Department's Office	1709
CHEMICAL PATHOLOGY	
Head of Unit	1725
Senior Scientific Officer	1721/1722
Scientific Officer	1690/1691/1697
Main Reception Counter	1678
Senior Laboratory Technologist	2017
Main Chemical Pathology Laboratory	1679
Outsource Section	1720
HAEMATOLOGY	
Head of Unit/ Pathologist (Haematology)	1735
Scientific Officer	1741
Routine Haematology	1681
Special Haematology	1734
MEDICAL MICROBIOLOGY	
Head of Unit	1731
Pathologist (Medical Microbiology)	1707/1708
Scientific Officer	1696/1695
Senior Laboratory Technologist	1752
Bacteriology / Mycology / Parasitology Laboratory	1757/1755/1753
Virology / Serology Laboratory	1728/2016/1732
TB Laboratory	1727
ANATOMIC PATHOLOGY	
Cytology	
Head of Unit	1758
Scientific Officer	1718
Cytology Laboratory	7046
Screening Area	1718

LOCATION	EXTENSION
Histopathology	
Head of Unit	1744
Pathologist	1706/1711/1713/1715/5332
Medical Officer	1768
Scientific Officer	1694
Senior Laboratory Technologist	2014
Grossing Room	1746
Histopathology Laboratory & Enquiry Counter	1750/1751
TRANSFUSION MEDICINE	
Head of Unit	1742
Scientific Officer	1741
Laboratory Main Building	2018
Laboratory <i>Pusat Jantung Serdang</i>	8321

7.0 GENERAL TEST REQUEST INSTRUCTION

7.1 Laboratory requests are made through eHIS except:

- (i) When system is down.
- (ii) Uncrossmatch blood request.
- (iii) Request from external agencies.

7.2 All tests for referral lab shall be accompanied by system generated PER PAT 301 or other special forms related to the tests (Refer to Table 1). Forms are available virtually at **Public Folder P:\Borang\Patologi**.

7.3 All related forms must be filled and should be signed by the Medical Officer or Specialist (if applicable) and accompanied by properly labeled specimens. Relevant information on clinical history, provisional diagnosis and treatment should be provided. The test requested must be clearly indicated. In addition, site of tissue / specimen taken should be stated for Histopathology, Cytology and Medical Microbiology request. Abbreviations are discouraged.

7.4 Outsourced specimens will be dispatched out to the respective referral center by 9.30 a.m. (every Monday - Friday). These specimens must reach the laboratory before 9.00 a.m. Samples that are received after 9.00 am will be delivered according to schedule prepared.

7.5 All tests from external clients should be received with PER PAT 301 form and duplicate of request list. Laboratory has the right to reject the specimen if external clients fail to fulfil the requirement.

Table 1. List of Request Forms

NO.	FORM	TEST
1	PER-PAT 301 Kementerian Kesihatan Malaysia	- All tests except for form no 2 to 25 - All tests during system down
2	Platelet Immunology Test Request PDN /IH/QP-02, ver 01	Platelet antibody identification
3	PER-SS-BT 105 (Pind.1/2016)	Blood crossmatch & blood products request
4	BTS/TR/2/2016	Investigation of blood transfusion reaction
5	UPD- 1 (Pindaan)	Screening and confirmation of cannabinoid, morphine & ATS in urine
6	PAP smear Request / report PS 1/98 (Pindaan 2020)	Gynecological Pap smear
7	KIMIA 15a Pin 1/69	Toxicological examination
8	Borang Permohonan Ujian IEM HTA/PAT/GEN/PK-01-03 Biochemical Genetic Tests Request Form IMR/SDC/BC/FORM-RQ Version 7.0 IMR.SDC.UPK.REQUEST FORM	Dried Blood Spot IEM Screening Biochemical Genetic Tests
9	Endocrine Request Form 2024 (IMR/SDC/ENDOC/RF-01-2021)	Insulin Autoantibodies
10	TDM Request Form (HKL/JP/CT/PK-01-06)	Therapeutic Drug Monitoring test

NO.	FORM	TEST
11	Requisition for Molecular Diagnostic Services IMR/SDC/UMD/Request Form	Molecular Diagnostic Tests
12	Cytogenetics Request Form (For Congenital Anomalies)	• Conventional Cytogenetics • Molecular Cytogenetics (FISH)
13	DNA Analysis For Thalassemia Syndromes & Haemoglobinopathies	• DNA analysis of the alpha and beta globin gene • Further testing for alpha globin gene • Confirmation for haemoglobinopathy
14	Haemophilia Genetic Testing Request Form	• Factor VIII and IX genotyping
15	Haematology / Serology Request Form (PDN)	Lupus anticoagulant testing
16	Hospital Ampang Special Hematology Requisition Form	All tests send to Clinical Haematology Referral Laboratory (MRKH), Hospital Ampang
17	Molecular Analysis for Haemato-Oncology	• Leukaemia translocation studies • AML mutation studies • BCR-ABL1 kinase domain mutation studies
18	Molecular Tests Request Form	• Congenital disorders • Cancer genetics
19	Informed Consent for DNA testing	• Molecular analysis for red cell Membrane disorders

NO.	FORM	TEST
20	IMR/Viro/HIV/2	Polymerase Chain Reaction (PCR) Test for Human Immunodeficiency Virus (HIV) in neonates
21	HLA Crossmatch Test Request Form IMR/AIRC/TI/RF-1 HLA Typing Test Request Form IMR/AIRC/TI/RF-2 HLA Typing Test Request Form (Disease Association) IMR/AIRC/TI/RF-3 HLA Antibody Test Request Form IMR/AIRC/TI/RF-4 HLA Crossmatch Test Request Form IMR/AIRC/TI/RF-5	- HLA Crossmatch Test (Living donor) - HLA Typing Test - HLA Typing Test (Disease Association) - HLA Antibody Test - HLA Crossmatch Test (Deceased donor)
22	Bacteriology Request Form IMR/BACT/FORMS/SMIS/01	<i>Bordetella pertussis</i> PCR - Detection of <i>Burkholderia pseudomallei</i> IgM (Meliodosis) - Fungal PCR
23	Autoimmune Request Form IMR/AIRC/Autoimmune/RF	- Anti-Acetylcholine Receptor Antibody (ACR) - Diabetes Antibodies - Panel Skin Antibodies - Anti-N-Methyl-D-Aspartate Receptor (NMDAR) - Anti-Aquaporin 4 (AQ4) - Phospholipase A₂ Receptor antibody (PLA2R) - Paraneoplastic Neurological Syndrome (PNS) - Anti-Ganglioside Antibodies (Anti-GQ1b)

NO.	FORM	TEST
		Coeliac Antibodies Panel
24	Primary Immunodeficiency (PID) Request Form IMR/AIRC/PID/RF	- T & B Cells enumeration - Dihydrorhodamine test (DHR) - Panel IgG Subclass (IgG1, IgG2, IgG3, IgG4) - Bruton Tyrosine Kinase (BTK) protein detection - Lymphocyte Activation test
25	Brucellosis Laboratory Request Form IMR/IDRC/BACT/BRUCE/01	Brucella Test
26	Allergy Request Form IMR/AIRC/ALLERGY/RF	- Specific Ig E Test - Total IgE Test - Tryptase
27	Leptospirosis Laboratory Request Form IMR/IDRC/BACT/LEPTO/01	Leptospirosis Test
28	Mycology Request Form IMR/IDRC/BACT/MYCO/01	Fungal PCR
29	Virology Test Request Form IMR/IDRC/VIRO/ADMIN/53	- Nipah Virus Antibody - Viral Culture
30	Acute Flaccid Paralysis (AFP) Case Investigation Form	Poliovirus - Virus Isolation
31	Measles – Borang Permohonan dan Keputusan Ujian Makmal MSLF:01/2004	Measles Test
32	Permohonan Ujian TB TBIS20C	TB Culture & Sensitivity Test

NO.	FORM	TEST
		• PCR MTB • Gene Xpert MTB • LPA • IGRA
33	Borang Permohonan Ujian Makmal Kesihatan Awam (MKAK) MKAK- BPU-U01/Rev2018	• Adenosine Deaminase (ADA) testing • Methanol

8.0 GENERAL SPECIMEN COLLECTION

- 8.1 Check the details and identify the patient and label the blood tube (s) properly prior blood collection.
- 8.2 Specimen collected must be properly labelled.
- 8.3 Specimen must be properly managed i.e. collect and dispatch in system before specimen is sent to the laboratory.
- 8.4 All specimen to Transfusion Medicine Unit must be initial at sticker label by the collected person.

9.0 BLOOD COLLECTION PROCEDURE

- 9.1 Venous blood is preferred.
- 9.2 To ensure consistent and accurate result, strictly follow the requirement of blood volume collection of the test or filled blood till the mark on the label.
- 9.3 To prevent hemolysis:
- Avoid collecting blood from an area of haematoma.
 - The site of collection should be allowed to air dry after cleansing with 70% isopropyl or ethyl alcohol.
 - Ensure smooth venipuncture and steady flow of blood into the syringe.
 - Do not force blood through needle while transferring blood into blood collection tube.
- 9.4 Order of draw is blood culture followed by blood collection tubes i.e. sodium citrate tube, plain tube, heparin tube, EDTA tube and sodium fluoride tube. **(Refer to Appendix 1)**
- 9.5 Immediately and gently mix blood collection tube by inverting for 3 - 10 times depending on type of collection tube **(Refer to Appendix 1)**. Do not mix vigorously.
- 9.6 Send specimen to Pathology Department as soon as possible either by pneumatic tube or portal system.

10.0 TRANSPORTATION OF SPECIMEN

- 10.1 Specimen must be dispatched to the laboratory in appropriate container or blood collection tube as specified. **(Refer section List of Tests)**.
- 10.2 Specimen container or blood collection tube must be placed in a biohazard plastic bag with the request form (for outsourced and Histopathology test) inserted into the pocket of the plastic bag.
- 10.3 Specimen must be sent immediately to the laboratory after collection either by pneumatic tube **(Refer Appendix 3 Garis Panduan Penghantaran dan Pembungkusan Spesimen Melalui Tiub Pneumatik)** or porter system as specified in the department instruction (eHIS).
- 10.4 Specimen must be sent to the Specimen Receiving Counter except for Histopathology and Cytology specimen which is directly send to the Histopathology and Cytology Laboratory respectively.

11. RESULTS / REPORTS

- 11.1 Results will be released to the eHIS. During down time, hardcopy of results will be made available for collection.
- 11.2 Hardcopy reports will be made available for external clients. In addition, reports are also transmitted via email to clients with email facilities and for Chemical Pathology Unit, reported results will be transmitted to most clients by a newly established AGILE system.
- 11.3 Results exceeding critical limit or findings will be notified to the clinician.
- 11.4 Clients are advised to check test request status in eHIS before enquiring for results / reports.
- 11.5 If waiting time for results / reports has exceeded the recommended turnaround time, clients are advised to contact respective laboratory immediately. **(Refer to Section Lists of Tests - Lab Turn Around Time).**
- 11.6 Preliminary reports released shall be followed by final reports.
- 11.7 Any discrepancy between clinical findings and results / reports should be conveyed immediately to relevant Pathology personnel.

12.0 SPECIMEN REJECTION

- 12.1 Request which does not fulfill the laboratory requirements will be rejected. Please refer to **Appendix 2** for rejection criteria.

13.0 URGENT TESTS/ STAT TEST

- 13.1 One of the services provided by the Department of Pathology is URGENT Service. A test should only be ordered URGENT when the result of the test is required for immediate patient management and delay in treatment might result in patient morbidity and mortality. The service is provided on a 24-hour basis.
- 13.2 Urgent / Stat requests must be separated from non-Stat (other request) to make sure the result reported timely.

13.3 The following table is the list of tests which can be requested for urgent requests during and after office hours:

Table 2. List of Urgent Test Offered 24 hours

Unit	Test	LTAT
Chemical Pathology	• Amylase	1 hour
	• Ammonia	1 hour
	• BUSE	1 hour
	• Creatinine	1 hour
	• Lactate	1 hour
	• Lactate Dehydrogenases (LDH)	1 hour
	• Aspartate Transaminase (AST)	1 hour
	• Creatine Kinase (CK)	1 hour
	• CSF Biochemistry	1 hour
	• Glucose	1 hour
	• Serum Bilirubin (Neonatal)	1 hour
	• Serum Calcium	1 hour
	• Serum Magnesium	1 hour
	• Serum Phosphate	1 hour
	• Serum Acetaminophen	1 hour
	• Serum Troponin-I	70 minutes
	• Salicylate (Serum)	1 hour
	• Serum Beta HCG	2 hours
	• Urine Pregnancy Test (UPT)	1 hour
	• Urinalysis	1 hour
	• Urine Paraquat	1 hour

Unit	Test	LTAT
Haematology	• Full Blood Count (FBC)	45 minutes
	• Reticulocytes	1 hour
	• Full Blood Picture	1 working day
	• Prothrombin Time (PT)	90 minutes
	• Activated Partial Thromboplastin Time (APTT)	90 minutes
	• Fibrinogen	2 hours
	• D-dimer	2 hours
Medical Microbiology	• Blood film for malaria parasites (BFMP)	1 hour
	• CSF microscopy	1 hour
Transfusion Medicine	• Uncrossmatch Blood (Safe O)	5 minutes
	• Emergency Crossmatch (1st stage)	30 minutes
	• Urgent full crossmatch	45 minutes

14.0 CRITICAL VALUE/RESULT NOTIFICATION

14.1 Critical value / result is defined as test result of value that falls outside the critical limits or the presence of any unexpected abnormal finding, cells or organism which may cause imminent danger to the patient, and / or require immediate medical attention.

14.2 The following table is list of Critical Value that will be informed as soon as possible after result verification.

Table 3. List of Critical Value**3.1 Chemical pathology**

No	Test/ Analytes	Age	Limit Low	Limit High	Unit
1	Potassium (K ⁺)	All	≤2.8	≥6.0	mmol/L
2	Sodium (Na ⁺)	All	≤125	≥155	mmol/L
3	Calcium	All	≤1.5	≥3.0	mmol/L
4	Total Bilirubin	≤28 days	-	≥340	umol/L
5	Ammonia	≤12 years	-	≥100	mmol/L

3.2 Haematology

No	Test / Analytes	Age	Limit (Low)	Unit
1	Haemoglobin	Adult Paeds Neonates	≤6.0 ≤6.0 ≤8.0	g/dL
2	Platelets	All ages	≤20 x 10 ³	μL

14.3 The following table is the list of critical findings in Microbiology that must be informed within the listed time of reporting.

Table 4. List of Critical Findings for Microbiology

Test	Critical Findings
Acid Fast Bacilli smear	Positive smear result or/and culture
Alert Organism / Specific Pathogen of Infection Control Aspect	ESBLs producer organism, Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA), Multidrug-Resistant Organism (MRO), Vancomycin-resistant <i>Enterococcus</i> (VRE), Vancomycin-resistant <i>Staphylococcus aureus</i> (VRSA),

	Vancomycin-Intermediate <i>Staphylococcus aureus</i> (VISA), Carbapenem-resistant Enterobacteriaceae (CRE), Carbapenem-resistant <i>Pseudomonas aeruginosa</i> (CR-PAE), Penicillin-resistant <i>Streptococcus pneumonia</i> (PRSP)
Blood culture	Positive result from Gram Stain or/ and culture
Cerebrospinal fluid (CSF) Cryptococcal Antigen detection	Positive Cryptococcal antigen
Cerebrospinal fluid (CSF) culture & sensitivity	Microscopy result (normal or abnormal)
Malaria Parasite on blood film	Presence of malaria parasite
Perinasal swab culture	<i>Bordetella pertussis</i> , <i>Corynebacterium diphtheria</i>
Sterile body fluids	Positive result from Gram Stain and culture
Stool culture	<i>Salmonella typhi</i> , <i>Vibrio cholera</i> , <i>Shigella</i>

14.4 The critical findings for Histopathology and Cytology tests, the result must be informed within 24 hours of reporting.

Table 5. List of Critical Findings for Anatomical Pathology

Test	Critical Findings
Unexpected or discrepant findings	Unexpected malignancy
Report of infections	Bacterial in heart valves or bone marrow Organisms in an immune-compromised patient such as AFB, viral, protozoa Organisms in Cerebrospinal Fluid (CSF) Unusual organisms or organisms in unusual sites e.g. amoeba in the eye
Reports on critically ill patients requiring immediate therapy	Crescents in greater than 50% of glomeruli in renal biopsy specimen Transplant rejections
Cases that have immediate clinical consequences	Fat in endometrial curettage Mesothelial cells in heart biopsy Fat in share colon biopsy specimens

*** Reference:**

1. Pekeliling Ketua Pengarah Kesihatan Malaysia Bil 3 Tahun 2016: Penambahbaikan *Malaysian Safety Goals No 8: To improve Clinical Communication by Implementing Critical Value Programme*.
2. Quick Guide for Improving Notification of Critical Laboratory Results in MOH Hospitals, February 2010.

15.0 SERVICE FOR PRIVATE HOSPITAL / LABORATORY

Request of test and service from private hospital / laboratory will only be performed after receiving approval from Head of Department.

16.0 SERVICE TO PRIVATE HOSPITAL / LABORATORY

Department of Pathology do not offer tests that need to be outsourced to private hospital / laboratory.

Complaint & Feedback Form

Handbook users are welcome to provide feedback or complaints to help us improve the quality of our service.

Kindly scan the QR code or click on the link address to fill in the details:



<https://forms.gle/VbhvhgAgEefsSLbs7>

The QR code can also be found at the Counter Receiving Area (CRA) of the Pathology Department. All complaints will be responded to within five (5) working days from the received date.

CHEMICAL PATHOLOGY



CHEMICAL PATHOLOGY UNIT

1.0 INTRODUCTION OF UNIT

The Chemical Pathology unit provides extensive range of biochemical testing. We provide services in analysis of serum / plasma and body fluids for diagnostic, monitoring and screening of diseases. We also provide consultative laboratory services to Hospital Sultan Idris Shah, Serdang for patient management.

2.0 SERVICES

Samples for chemical pathology tests will be received at Specimen receiving Counter either by porter or pneumatic tube.

The diagnostic services provided are:

- i) **STAT services:** Short turn around tests which are required for immediate patient management as indicated by clinician within 1 hour after registration in the Laboratory Receiving Counter.
- ii) **Routine service:** Laboratory Turn Around Time (LTAT) is 3 hours, which include all tests that are offered 24 hours.
- iii) **Scheduled / Special tests:** include all tests that will be analyses in only during working days such as HbA1c, Thyroid Function Tests, Cortisol, Vitamin B12, Folate, Ferritin, IPTH, Tumour Markers and special proteins (Rheumatoid Factor, C3, C4 and Procalcitonin). Specimens for scheduled tests sent to the laboratory during weekend and public holidays will be kept and analyzed on the next working / scheduled days.

3.0 REQUEST OF TESTS

All Chemical Pathology tests must be requested through Clinician Access (CA) in Hospital Sultan Idris Shah, Serdang Information System (eHIS). All special test below must be ordered by Medical Officer or related Specialist:

- Thyroid Function Test (TSH, FT4)
- Iron Profile (Iron, Transferrin)
- Tumor Marker (AFP, CEA, CA 125, Total PSA, Free PSA, CA19-9)
- Hs Troponin I

Duplicate standard PERPAT 301 can be used for external clients and in cases of eHIS breakdown.

All outsource tests to referral labs should be sent to lab during office hours. However, in any circumstances where the sample has to be taken out of office hours, medical officers / paramedics are required to call Chemical Pathologist on call for prompt action by Lab Technologist upon receiving the sample. All outsource tests need to be accompanied by PERPAT 301 generated from the eHIS or specific request forms which can be downloaded from hospital public folder > Borang > Patologi.

Make sure all outsourced tests requested in the request form are **TALLY** with the orderable test in eHIS to avoid problem in reporting results later. Follow the instruction or patient preparation available in eHIS prior collecting specimen.

Special test listed below need to be approved and counter signed by specialist:

- Renin Aldosterone Ratio
- Urine Metanephrine
- Dynamic Function Test e.g Saline Loading Test, Short Synachten Test and Gonadotropin- Releasing Hormone Stimulation Test.

All test listed below are restricted to the minimal re-testing interval which require the clinicians to communicate with the laboratory personnel to proceed the orderable:

- HbA1c
- Thyroid Function Test
- CRP
- Vitamin B12 & Folate

4.0 COLLECTION PROCEDURE FOR CHEMICAL PATHOLOGY SPECIMENS

4.1 BLOOD SPECIMENS

Most tests in Chemical Pathology require serum sample that need to be collected in plain tube. Special requirements are needed for certain test.

4.1.1. Ammonia

Collection of a satisfactory specimen for ammonia analysis requires special procedure to prevent changes in ammonia concentration during and after the specimen is drawn.

Procedure of collection

- A venous specimen is best drawn without a tourniquet or immediately after the tourniquet has been briefly applied.
- If the tourniquet has been applied for a long duration, it should be removed after the puncture has been performed and blood allowed circulating for at least 2 minutes before blood is drawn.
- 2 ml of blood is collected into EDTA tube and immediately placed in ice.
- Send immediately to the laboratory (delay may cause falsely high result).

4.1.2 Lactate

The over production or underutilize of lactate will lead to lactic acidosis. Increased of lactate can be due to tissue hypoxia, diabetes mellitus, malignancies, glycogen storage disease, metabolic acidosis, and ethanol, methanol or salicylate ingestion.

Procedure of collection

- It is recommended to draw lactic acid without a tourniquet or immediately after applying the tourniquet.
- Collect sample using sodium fluoride tube and immediately placed on ice.
- Send immediately to the laboratory.

4.1.3 Cryoglobulin

This test is offered by Special Biochemistry Unit Hospital Ampang. Attending practitioners have to arrange appointment for patient and the appointment shall be made to the respective laboratory personnel in Protein lab, Special Biochemistry Unit Hospital Ampang (03 - 4289 6216). Particulars of attended practitioner including requesting physician, patient's identification and respective contact number shall be provided. Patient is required to go to Hospital Ampang on the appointed date and blood sampling procedure will be done at FNAC Clinic (nearby O&G Clinic) located at level 1, Hospital Ampang by Pathology Medical Officer.

Procedure of collection (in Ampang)

- In charged Laboratory personnel shall contact the patient / requesting physician for confirmation few days before the appointment date.
- Blood taking equipment (the tubes, syringe and needle and flask) are incubated at 37 degree Celsius for at least 24 hours before appointment date.
- In charged Laboratory personnel shall attend to the respective site with the flask containing pre-warmed blood taking equipment on the day of appointment.
- Blood collection must be carried out using instruments and containers provided.
- Samples will be drawn into two separate tubes as follows: -EDTA tube (sample volume is 9 ml) -Plain tube without gel (sample volume is 12 ml).
- Immediately placed all the samples into the flask and transport to Special Biochemistry Lab, Hospital Ampang for further processing.

4.1.4 Therapeutic Drug Monitoring (TDM)

The monitoring of therapeutic drugs involves measuring drug concentrations in plasma, serum or blood. This information is used to maintain drug concentrations within the target range.

Procedure of collection:

- Many of these samples require to be taken at specific time pre (trough) or post (peak) dose.
- All in-house TDM samples receive after 4.30 pm will be analyzed on the next working days. For urgent TDM request out of office hours please call Chemical Pathologist on call for test request.
- TDM testing is not available during weekends and public holidays except PCM dan salicylate.

4.2 URINE SPECIMENS

Urine specimens are classified by the type of collection procedure used to obtain the specimens. Random urine mostly sent to the laboratory for analysis by using universal container and can be conducted at any time of day or night. However, there are also test that requiring timed specimens. Timed specimen is collected to measure the concentration of substances in urine over a specified length of time.

4.2.1 24-hour urine specimen

Procedure of collection:

- On the day of collection, the first urine voided must be discarded. Time of first urine voided is start of the timing for the 24-hour urine collection.
- Collect the second and subsequent voided urine for 24 hours into the 24-hour urine container.
- At the end of 24 hours, the last urine voided is collected.
- If preservative is used, mix the contents thoroughly after each addition of urine.
- Send the specimen immediately to the laboratory, otherwise store it at 4°C and deliver to the laboratory as soon as possible.

4.2.2 Creatinine Clearance Test

Procedure of collection:

- Collect a 24-hour urine specimen (as above).
- Take 3 ml of blood in plain tube for serum creatinine at the same day during the 24 hours urine collection period.
- The blood sample and the 24-hour urine sample are sent to the laboratory.

4.2.3. 24 -hour Urine Metanephrine

Patient preparation:

- Abstain from chilies, nuts, caffeine (e.g.; coffee, tea), chocolate or cocoa, eggplant, tomato, avocado, kiwi, fruit juices, pineapple, watermelon and banana one week prior to and during the 24-hour urine collection.
- Avoid patient stress, exercise, smoking and pain one week prior to and during collection.
- Advise to stop certain drugs* that can alter metabolism of Metanephrine at least one week prior to urine sampling.

* List of drugs that may alter the metabolism of catecholamine:

Tricyclic antidepressant	Labetolol	Sotalol
Levodopa	Halothane (Anesthetic Gas)	Alcohol
Benzodiazepines	Phenothiazine	Central acting hypertensive drugs

Acetamenophen	Tricyclic antidepressants	Meprobamate
Acetanilide	Opioids	Metaclopramide
Acedophenetidin	Codeine	Metaproterenol
Aldomet	Dextro Amphetamine	Methanamine
Aspirin	Ethanol	Methyldopa
Alpha methyl normetanephrome	Glyceril guaicolate	Monoamine oxidase inhibitor
Aminophylline	Ephedrine	p- chlorophenylalanine
Auspirone/Buspirone	Imipramine	Phenothiazine
B- Complex vitamin	Isoproterenol	Prochloroperazine
Quinidine	Promethazine	Quinine
Cocaine & LA (Catecholamine reuptake inhibitor)	Mandelamine	

Specimen collection

- Collect 24 -hour urine container which containing 10 ml of 25% HCL from the laboratory.
- Collect urine in 24-hour as described above into the container. Advise patient not to pass urine directly into the container (to avoid acid splash).
- Shake the container every time of filling to mix the urine. Refrigerate the urine during and after collection completed (if possible). Send the sample as soon as possible to the laboratory.

Rejection Criteria:

- Urine sample volume < 750ml
- Request form not signed by specialist
- Urine pH >5

4.3 BODY FLUID SPECIMENS

Body fluids specimens are Cerebrospinal Fluids (CSF), pleural fluids, peritoneal fluids, vitreous fluid and dialysate.

Test includes Total Protein, Glucose and others as requested.
Please state the type of body fluids upon ordering.

Disclaimer: Methodology for fluids (except CSF) testing are not validated by the reagent manufacturer.

4.3.1 Cerebrospinal Fluid (CSF)

Test includes Total Protein, Glucose and Chloride.

Procedure of collection:

- Collect CSF specimen into a sterile container (universal container) and glucose tube (Grey cap).
- Collect minimum of 2.0 ml specimens.
- Send CSF specimen to laboratory immediately.

4.4 GUIDELINE FOR SPECIAL ENDOCRINE TESTING

Reference: Department of Pathology, Hospital Putrajaya

4.4.1 ORAL GLUCOSE TOLERANCE TEST (OGTT):

Procedure of collection:

1) Suspected Diabetes Mellitus

- Fast patient overnight (at least 8 hours). No food or drink except plain water.
- Take fasting blood glucose at 0 hour (FBS).
- Give 75g glucose in 250-350 ml water (For children: 1.75g / kg body weight up to maximum 75g) and drink within 5 minutes. Patient should rest throughout test with only plain water allowed.
- Repeat blood sampling at 120 min (2HPP) after the glucose load.

2) Diagnosis of Acromegaly

- Fast patient overnight.
- Take fasting blood glucose and Growth hormone at 0 hour. Give oral glucose as above.
- Repeat blood sampling for blood glucose and growth hormone and at 60 min and 120 min after the oral glucose.

4.4.2 SHORT SYNACTHEN TEST

Indication: To establish diagnosis of primary hypoadrenalism

Rationale:

Administration of ACTH to normal individuals results in rapid rise in the serum cortisol concentration. Patients with adrenal destruction (Addison's disease) show no change in serum cortisol concentration after ACTH administration. Patient with atrophy of adrenal cortex caused by exogenous glucocorticoid treatment or dysfunction of pituitary gland or hypothalamus may show a slight rise in serum cortisol concentration.

Procedure:

If patient on steroid therapy, withhold if possible; this test can be performed reliably 24 hours after the last intake.

- Take blood specimen for baseline cortisol level (0 minute).
- Give 250 µg Synacthen / cosyntropin (synthetic ACTH) intramuscularly or intravenously.
- Take blood specimen for cortisol at 30 minutes and 60 minutes after Synacthen / cosyntropin administration.

Time	Test	Tube
0 min (basal)	Cortisol	1 plain tube
30 min	Cortisol	1 plain tube
60 min	Cortisol	1 plain tube

4.4.3 DEXAMETHASONE SUPPRESSION TESTS

4.4.3.1 Overnight Test

Indication: Screening for inappropriate hypercortisolism

Procedure of collection:

- Give an oral dexamethasone of 1-2mg at around 11.00 pm.
- Take blood sample for cortisol level at 8.00 am in the next morning.

4.4.3.2 Low dose Test

Indication: To confirm the presence of Cushing's syndrome

Procedure of collection:

- At 8.00 am of Day 1: take patient's blood for cortisol.
- Immediately after sampling, give 0.5mg oral dexamethasone in 6-hourly for 48 hours.
- Take blood sample for cortisol level at 8.00 am on Day 3.

4.4.3.3 High dose Test

Indication: Determine etiology of Cushing's Syndrome

Procedure of collection:

- At 8.00 am of Day 1: Take patient's blood for cortisol level.
- Immediately after sampling, give oral dexamethasone of 2mg in 6-hourly for 48 hours.
- Take blood samples for serum cortisol levels for basal (pre-test) and at 8.00 am on day 3.

4.4.4. PLASMA RENIN AND PLASMA ALDOSTERONE (ALDOSTERONE RENIN RATIO)- FOR CLINICIAN

Indication:

Screening for primary hyperaldosteronism in hypertensive patients with spontaneous or diuretic induced hypokalemia. Suggested candidates for screening:

1. Patients with hypertension and hypokalemia
2. Patients with resistant hypertension
3. Young hypertensive (age < 40)
4. Patients with adrenal incidentaloma

Principle:

The renin-aldosterone axis is primarily regulated by renal blood flow. Subjects under investigation should, therefore, not be taking any drugs that interfere with fluid balance or potassium.

Patient Preparation:

- i. Drugs to avoid: *spironolactone, ACE inhibitors, ARB, beta-blockers, cyclic progestogens, estrogens and licorice.
- ii. Drugs that do not interfere with the renin-aldosterone axis include: Prazosin, verapamil and terazosin.
- iii. Subject should be normally hydrated and has an adequate oral intake of sodium.
- iv. Avoid hypokalaemia as it suppresses aldosterone secretion. Give potassium replacement (Slow K tabs) sufficient to raise plasma potassium >4.0 mmol/L.

*Spironolactone must be stopped for 6 weeks to be certain that any elevation in plasma renin activity is not due to inhibition of aldosterone by the drug.

Ideally all interfering drugs should be stopped at least 2 weeks prior to sampling.

Please refer to table below:

Drug	Physiological effect	Time to remove interference
ACE inhibitors	Increase PRA & reduce aldosterone	2 weeks
Calcium channel blockers	Reduce aldosterone and stimulate renin production	2 weeks
Diuretics	Increase PRA and aldosterone	2 weeks
hypokalaemia	Inhibits aldosterone secretion	-
NSAIDs	Retain sodium & reduce PRA ? effect on aldosterone	2 weeks
Oestradiol	Increase renin substrate	6 weeks
Spironolactone	Increase PRA, variable effect on aldosterone	6 weeks

Requirements:

- Potassium EDTA (K2EDTA) tube for renin (DRA).
- Potassium EDTA (K2EDTA) tube for aldosterone.
- Blood samples should be sent rapidly to the laboratory but not in ice (within 30 minutes) as cooling would cause cryoactivation of prorenin to renin, leading to falsely raised renin.

Procedure of collection:

- i. The patient should remain seated for 10 minutes prior to venipuncture.
- ii. Collect samples into 2 tubes of EDTA.
(Please use different tubes for Renin and Aldosterone. Suggest to collect minimum 3mL blood per sample, as at least 500µl plasma need for each analysis).
- iii. Fill-up the PER- PAT 301 form. Only single form is required for requesting Aldosterone Renin Ratio (ARR).
- iv. Patient's **clinical history** and **drug history** are **MANDATORY**.
- v. Test should be requested by Specialist / Endocrine Specialist only.
- vi. Please record patient's posture whether supine or upright.
Supine sample: Sample taken in the early morning before the subject arises (If feasible).
Upright sample: Subject should be upright for ≥ 2 hours prior to sampling
- vii. Samples should be taken between 8.00am to 10.00am.

INSTRUCTIONS FOR LAB PERSONNEL (SCIENTIFIC OFFICER / MLT)

Upon arrival

- Separate plasma (Renin or Aldosterone) immediately.
- Transfer the plasma into a plastic / secondary tube.
- Minimum volume for Plasma Renin and Plasma Aldosterone is **500 ul of PLASMA EACH**.
- Sample should be **frozen as soon as possible** (-20° C or lower).
- Each sample tubes should have the following information (barcode or manually labeled)
 - ✓ Requested test
 - ✓ Patient's name
 - ✓ Identity card number / Medical Registration Number (MRN)
 - ✓ Date of collection
- Potassium EDTA (K2EDTA) tube for aldosterone.
- Blood samples should be sent rapidly to the laboratory but not in ice (within 30 minutes) as cooling would cause cryoactivation of prorenin to renin, leading to falsely raised renin.

Reason of Rejection

- | | |
|---------------------------------|---|
| ▪ Wrong container | ▪ Incomplete request form |
| ▪ Insufficient sample | ▪ Incomplete patient information |
| ▪ Haemolysis or lipaemic sample | ▪ No test indication/no clinical history |
| ▪ Incorrect patient preparation | ▪ No requesting doctor's name and signature |

4.4 MEASUREMENT UNCERTAINTY

Chemical Pathology tests are subjected to a degree of uncertainty in the measurement. This may be due to a variety of factors including:

- a. Biological Variation within individuals
- b. Analytical measurement imprecision
- c. Pre -examination factors

Please contact Chemical Pathology Unit if you wish to know or discuss the uncertainty values for each analyte measured in the laboratory.

HAEMATOLOGY



HAEMATOLOGY UNIT

1.0 INTRODUCTION

The Haematology Unit, Department of Pathology, Hospital Sultan Idris Shah, Serdang provides diagnostic and consultative haematology services that include basic and specialized haematology tests for patient care management in the hospital. Since year 2012, specialized haematology tests were also offered to the various Health Clinics within the vicinity. This unit consists of Routine Haematology Section as well as Specialized Haematology Section.

General Haematology Section include tests such as:

- a) Full blood count ± Slide review
- b) Coagulation tests (PT/APTT)
- c) Erythrocytes sedimentation rate (ESR)
- d) D-Dimer
- e) Fibrinogen
- f) G6PD screening
- g) Reticulocyte count
- h) Mixing test

Special Haematology Section include tests such as:

- a) Full blood picture
- b) Haemoglobin analysis
- c) Bone marrow aspiration
- d) Kleihauer test

2.0 SPECIMEN COLLECTION

- 2.1 Proper procedure & correct specimen container are of paramount importance in ensuring the quality of laboratory test results.
- 2.2 A duly-filled latest version of laboratory request form must accompany every specimen submitted for testing.
- 2.3 Before any specimen is collected, the patient identity must be verified by asking them to state their name or by checking the patient's wrist band (if available).
- 2.4 Needle must be removed from the syringe and transfer the blood immediately into specimen containers. Vigorous suction during collection or forceful transfer may cause haemolysis.
- 2.5 If tube contains anticoagulants or additives, mix gently by inverting the tube 3 - 10 times depending on the type of collection tube.

- 2.6 All outsource specimens must be accompanied by relevant form and sent to the laboratory before 9 a.m. on working days.

3.0 SPECIAL REQUIREMENT

Special requirements for certain test are as follows: -

A. Full Blood Picture

- Request form: PER.PAT 301 in 2 copies (for external request)
- Form **MUST HAVE RELEVANT CLINICAL HISTORY, PHYSICAL FINDINGS**, current assessment / diagnosis / medication.
- Please state the **RELEVANT FEATURE** to look for and the **INDICATION** for FBP: -
 - 1) History and clinical findings of: -
 - Unexplained cytopenia:
 - a. Hb < 8 g/dL,
 - b. WBC < $3 \times 10^9/L$ or
 - c. Platelet < $100 \times 10^9/L$
 - Unexplained polycythemia:
 - a. Hb > 18 g/dL (Male),
 - b. Hb > 16.5 g/dL (Female)
 - Unexplained leukocytosis:
 - a. WBC > $30 \times 10^9/L$,
 - b. Neutrophils > $20 \times 10^9/L$,
 - c. Lymphocytes > $5 \times 10^9/L$,
 - d. Monocytes > $1.5 \times 10^9/L$, or
 - e. Eosinophils > $1.5 \times 10^9/L$.
 - Unexplained thrombocytosis: Platelet > $1000 \times 10^9/L$
 - 2) Features suspicion of haematological malignancy e.g. acute/chronic leukaemia, Myeloproliferative Neoplasm, Myelodysplastic syndrome, Lymphoproliferative disease
 - Symptomatic: weight loss, fever, easy bruising, hyperviscosity syndrome, itchiness, PUO
 - Clinical findings: lymphadenopathy, hepatomegaly, splenomegaly, plethora, petechia
 - 3) Non-hematopoietic malignancies with suspicion of bone marrow involvement
 - 4) Clinical suspicion of:
 - Hemolysis including microangiopathic hemolytic anemia (MAHA)
 - Red cell fragmentation syndrome supported by relevant investigation results

- 5) Infection/inflammatory condition requiring FBP to confirm / support diagnosis e.g. parasitic infestation, infectious mononucleosis
 - 6) Clinical suspicion of thalassemia, haemoglobinopathy and red cell membranopathy
 - 7) Part of treatment protocol e.g. bone marrow transplant, therapeutic apheresis
 - 8) When performing bone marrow aspirate procedure (within 3 days)
- Urgent case:
 - Urgent FBP is indicated in cases suspected with:
 - 1) Acute Leukaemia especially Acute Promyelocytic Leukaemia (APML)
 - 2) Microangiopathic haemolytic anemia (MAHA) secondary to Thrombotic Thrombocytopenic Purpura (TTP)
 - All urgent FBP request need to go through Medical Officer on duty call.
 - Priority case:
 - FBC parameters falls into critical value as listed in Table 3.2
 - Not indicated for FBP:
 - 1) Healthy individual with normal blood cell indices except personnel exposed to radiation
 - 2) Post transfusion sample (within 3 months) except part of transfusion reaction investigation
 - 3) Investigation of anemia with clinical evidence of recent bleed
 - 4) Confirmed dengue cases with thrombocytopenia
 - 5) Family screening for Thalassemia/Haemoglobinopathy
 - 6) Prolonged neonatal jaundice
 - Samples have to be sent to the lab as soon as possible (within 4 hours of sample collection to ensure appropriate morphology assessment).

B. Bone Marrow Aspirate & Trepine

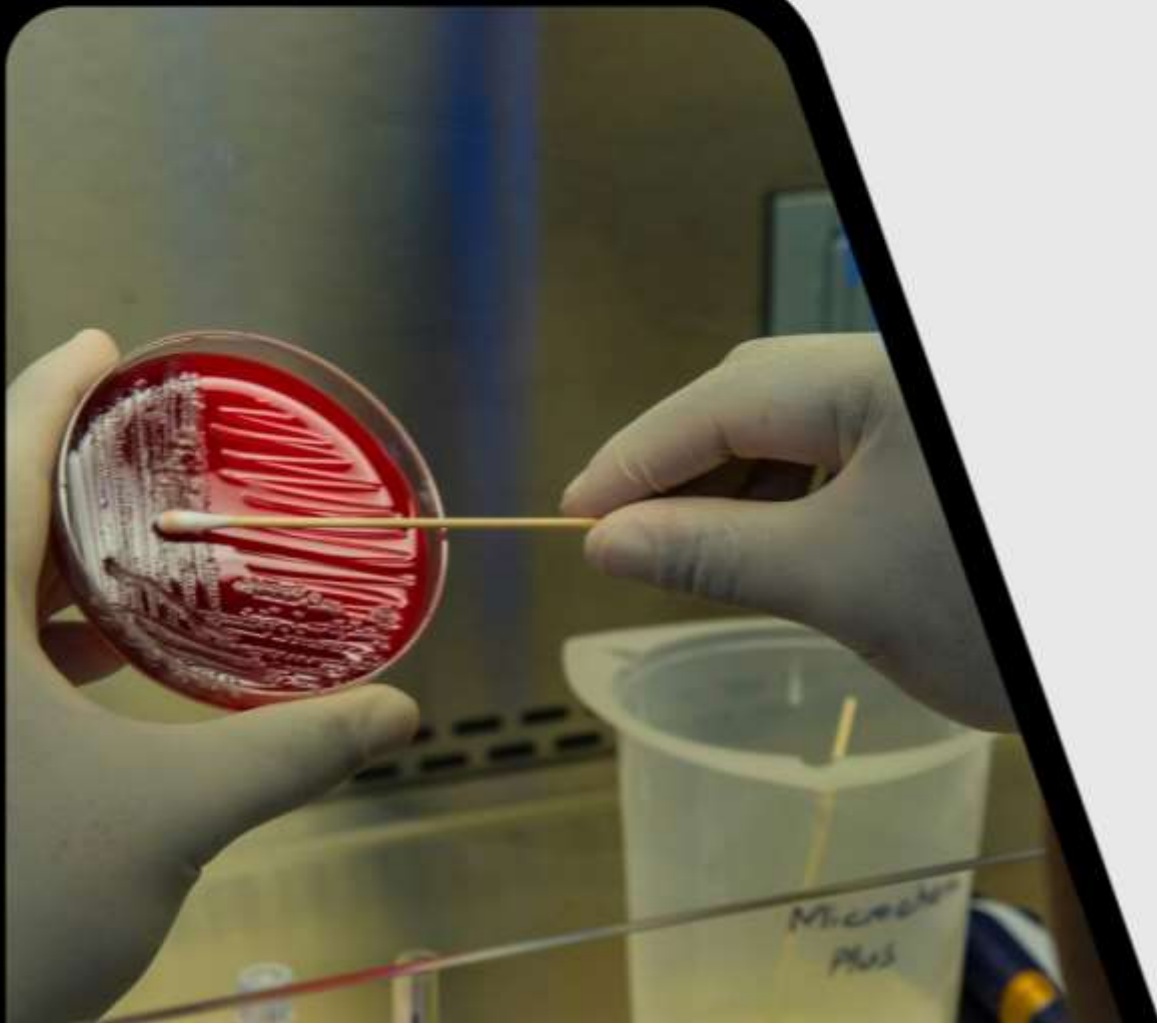
- Get an appointment date from hematology lab at extension 1734
- Contact Hematologist in advance to discuss the patient's case before making the appointment at extension 1735.
- Make an order in the system for the tests 1 DAY before the procedure date:
 - Bone Marrow Aspiration
 - Bone Marrow Trepine Biopsy
 - Bone Marrow Immunophenotyping
 - SP Bone
 - Chromosome Analysis Bone Marrow (Please complete the Hospital Ampang Special Hematology Requisition Form available at folder P:\Borang\Patologi\Hematologi).

- Molecular Diagnostic Leukaemia/Lymphoma (Please complete the Hospital Ampang Special Hematology Requisition Form available at folder P:\Borang\Patologi\Hematologi).
- Please prepare four (4) PER PAT forms each for the above tests.
- Send Full Blood Picture (FBP) test the day before the appointment date.
- Perform the procedure at 8.30 am to allow the specimen to be sent to referral laboratory via hospital transport.
- If fails to perform the procedure until 9.30 am, appointment is canceled and please get a new appointment date.

C. Kleihauer test (Fetal Haemoglobin)

- Informed lab prior to blood collection at ext. 1734/1735
- Collect blood in K2EDTA blood collection tube:
 - 2.0ml of maternal blood
 - 2.0ml of cord blood
 - 2.0ml of adult female with similar blood group as mother's (if possible)
- Send to the laboratory as soon as possible.

MEDICAL MICROBIOLOGY



MEDICAL MICROBIOLOGY UNIT

1.0 INTRODUCTION OF UNIT:

Medical Microbiology is an essential component in the field of infectious disease. Knowledge in this area is important in the clinical management of infections. Microbiology Unit function to provide quality result for investigation of pathogen of infectious disease, hospital infection outbreak and investigation of immunological disorder. These services provided by various laboratories such as Bacteriology (also processing Mycology and Parasitology samples), Serology (processing Immunology, Virology and manage send away samples) and Mycobacteriology.

Laboratory turnaround time (LTAT) for culture and sensitivity test result depends on type of sample, speed and purity of bacterial growth. Slow and/or mixed bacterial growth will result in longer LTAT.

For urgent test, requester need to contact Medical Officer Microbiology on call through hospital operator. Relevant clinical history is important to ensure test request is justified and timely quality result produced.

24 hours services offered for these following test requests:

- i. Blood culture processing: loading of new samples into blood culture machine, processing of positive culture bottle including informing gram stain result.
- ii. Processing all new sample for culture.
- iii. Blood film Malaria parasite: LTAT is 2 hours, for blood smear prepared from finger prick. Longer LTAT expected if blood smear prepared from EDTA, which should be avoided as possible. Positive result will be informed to requester as soon as possible within 2 hours. In occasion where there is a difficulty to report Malaria parasite species identification within 2 hours, *Plasmodium sp.* result will be reported as "DETECTED" first, followed by full parasite species identification.
- iv. Rapid test for urgent infectious disease screening: Dengue Combo (Dengue NS1 Ag, Dengue IgM Dengue IgG) and *Leptospira* IgM.
- v. Urgent infective disease screening for victim and source of sharp injury and donor for Transplant Organ Procurement.

2.0 GENERAL GUIDELINES

- 2.1 Quality of a result relies largely on proper collection and handling of specimen as well as obtaining satisfactory material for examination.
- 2.2 Specimen must be obtained from the actual infection site and collected with minimum contamination from adjacent tissues, organs or secretions.
- 2.3 Sufficient quantity of specimen is required in order to perform the investigation required.
- 2.4 Appropriate collection devices, specimen containers and culture media must be used to ensure optimal recovery of microorganisms.
- 2.5 Ideally, specimen must be collected before commencement of antibiotic therapy.
- 2.6 Specimen container must be properly labeled, placed in a specimen biohazard plastic bag and accompanied by updated clinical comment in LIS (in house test) and a laboratory request form (send away specimen).

3.0 BACTERIOLOGY

Specific Collection Guidelines for Bacteriological Examination: Collection, Media and Transport

3.1 Blood culture

An automated blood culture system with different types of bottles according to age is used:

Adults	Pediatric
Aerobic and anaerobic culture bottle Volume: 8-10mls into each bottle	A single blood culture bottle Volume: 0.5 -5.0mls

Method of collection:

- i. Prepare blood culture bottle/s, which is of good condition i.e., no sign of contamination. Remove the cap and wipe rubber septum with 70% isopropyl alcohol and allow to air dry.
- ii. Palpate for the vein first and identify the best vein for venipuncture.

- iii. Disinfect venipuncture site using SteriPrep (2% chlorhexidine-gluconate, 70% isopropyl alcohol). Swab the area in concentric motion, starting at middle of venipuncture site. Allow the site to air dry.
Note: Chlorhexidine-gluconate is recommended for infants 2 months and older and patient with iodine sensitivity.
- iv. Perform venipuncture and withdraw required amount of blood. Inoculate the specified volume of blood into each bottle.
- v. Do not refrigerate the specimen.

3.2 Bone marrow aspirate

1-2 ml of aspirate is required and to be inoculated directly into the bottles.

Method of collection:

As per blood culture.

3.3 Cerebrospinal Fluid (CSF)

Method of collection via lumbar puncture:

- i. Disinfect site with 2% iodine tincture.
- ii. Insert needle with a stylet at L3-L4, L4-L5 or L5-S1 interspace.
- iii. Upon reaching the subarachnoid space, remove the stylet and collect 1- 2 mls of fluid into sterile container.
- iv. Submit CSF (preferably the most turbid) for the examination of:
 - Microscopy and culture for bacteria and yeast.
 - Smear and culture for *Mycobacterium* if indicated.

Transportation:

- i. Send specimen immediately to the laboratory.
- ii. Do not store in the refrigerator. Only CSF for viral studies could be refrigerated or frozen.

3.4 Sterile Body Fluid (excluding CSF and blood)

Method of collection:

- i. Clean needle puncture site with iodine solution.

- ii. Aseptically perform percutaneous aspiration to obtain pleural, pericardial, peritoneal or synovial fluid.
- iii. Collect fluid into a sterile screw-cap container.
- iv. For anaerobic culture, send specimen immediately in the syringe with stopper.
Do not send syringe with needle as this will expose to risk of needle stick injury to person transporting specimen and laboratory staff receiving it.

3.5 Genital samples

a) Endocervical swab

Method of collection:

- i. Do not use lubricant during this procedure.
- ii. This is the best specimen for the diagnosis of gonorrhea and puerperal sepsis.
- iii. Under direct vision, gently compress cervix with blades of speculum and use a rotating motion with swab, obtain exudate from the endocervical canal.
- iv. If no exudate is seen, insert the sterile swab into endocervical canal and rotate the swab.
- v. Inoculate the swab into Amies transport media and accompanied with smear on slide (for Gram stain test)

b) Cervical Swab

Method of collection:

- i. Take two swabs using Cisco speculum, the first swab for culture and the second for preparation of a smear. For vulvo–vaginitis of childhood, the swab should be pushed well into the vagina without speculum and withdrawn with some discharge on it.
- ii. For gonorrhea, discharge is collected using charcoal impregnated swab, inoculated immediately on GC media and incubated in 10% carbon dioxide, or transported in Stuart's transport media if direct inoculation cannot be done.

Transportation:

The swab should be sent immediately to the laboratory in transport media (e.g., Amies).

c) High vaginal swab (HVS)

Method of collection:

- i. This is suitable for the diagnosis of candidiasis and other causes of vaginitis but NOT gonorrhea in female.
- ii. Using a sterile speculum lubricated with normal saline without antiseptic cream or lubricant, swab either from the posterior fornix or lateral wall of the vagina.
- iii. Inoculate the swab into Amies transport media and send specimen to the laboratory as soon as possible.

d) Low Vaginal Swab (LVS)**Method of collection:**

- i. Use normal saline and clean the vulva area.
- ii. Rotate a sterile swab and obtain exudates from vaginal mucosa.

e) Urethral swab**Method of collection:****Female**

- i. Collect specimen 1 hour or longer after patient has urinated.
- ii. Stimulate discharge by gently massaging the urethra against the pubic symphysis through the vagina.
- iii. Collect the discharge using a sterile swab.
- iv. If the discharge cannot be obtained, wash external urethra with betadine soap and rinse with water.
- v. Then insert an urethrogenital swab 2 – 4 cm into the urethra, gently rotate the swab and leave it in place for 1-2 seconds.
- vi. Inoculate into Amies or Stuart's transport media and accompany with smear on slide (for Gram stain test).

Male

- i. It is used primarily to detect *Neisseria gonorrhoeae*.
- ii. Wipe urethra with sterile gauze or swab.
- iii. Collect exudate with a sterile swab and inoculate into Amies transport media.
- iv. If discharge cannot be obtained, 'milk' the urethra. Using a sterile swab, collect material from about 2 – 4 cm inside the urethra, gently rotate it, leave it in place for 1 – 2 sec, and withdraw it.

Place the swab into Amies or Stuart's transport media and accompany with smear on slide (for Gram stain test).

3.6 *Mycobacterium*: Acid-fast bacilli stains and culture

Acceptable specimen: respiratory secretion, urine, CSF, body fluids, whole blood and tissue biopsy.

Note: Specimen obtained via swab is NOT acceptable.

Method of collection:

- i. Collect in a sterile container (for AFB stain).
- ii. Collect a minimum of 3 early morning sputum specimen in successive 24 hour period.
- iii. Send specimen to laboratory immediately

3.7 Peritoneal dialysis effluent

Method of collection

Obtain specimen from the bag as follows:

- i. Disinfect the port of the bag with 70% alcohol.
- ii. Collect at least 20 ml of fluid through the disinfected area using a needle and syringe.
- iii. Place the sample into a sterile container and send to the laboratory immediately.

Note:

Repeat culture sampling during therapy for CAPD peritonitis is discouraged unless there is clearly no clinical response to treatment or the effluent remains cloudy after 72 hours of therapy.

3.8 Pus / Swab / Tissue

Method of collection:

- i. Pus should be aspirated aseptically using needle aspiration, and send for culture in a sterile universal container or syringe.
- ii. Pus swab is an inferior substitute, and should be sent in Amies transport medium.
- iii. Tissue for culture is collected in a sterile container. Do not add formalin to the specimen.

Note:

- i. A 'dry' swab may fail to yield organisms in smear and culture.
- ii. Surface swab of deeply infected lesion e.g; sinus tracts of osteomyelitis and pressure sores usually grow surface contaminants like coliforms and pseudomonads.
- iii. Clean the surface with sterile water before sampling.
- iv. Using sterile swab, rub into areas of exudation / inflammation and place into Amies transport medium.

3.9 Respiratory specimens**Method of collection:****Upper Respiratory****a) Nasal swab**

This is commonly done for screening of MRSA carrier.

- i. Moisten a swab with sterile saline.
- ii. Swab both the anterior nares and insert the swab into the nose and gently rotate against the nasal mucosa.

b) Per nasal (Nasopharyngeal swab / aspirate)

This is especially useful for the diagnosis of whooping cough and diphtheria.

c) Nasopharyngeal swab

- i. Special per nasal swab mounted on a soft flexible wire is passed through the nostril and along the floor of the nasal cavity into the nasopharynx. Rotate it and withdraw.
- ii. Place it in the carrier tube / bag and send it immediately for processing (suitable transport media are Amies or Stuart's).
- iii. Use Dafflon or Rayon swab for sampling of PCR testing, and place the swab in sterile container. Do not use cotton swab to take sample for PCR for *Bordetella* as it inhibits the test.

d) Nasopharyngeal aspirate

- i. Gently pass a sterile catheter through one nostril as far as the nasopharynx.
- ii. Attach a sterile syringe to the catheter and aspirate mucous specimen.
- iii. Put into sterile container and send immediately to the laboratory.

e) Throat swab

In the majority of cases, throat swab are obtained to recover Group A Streptococcus (*Streptococcus pyogenes*), Diptheria and Gonococci.

- i. Depress tongue gently using a tongue depressor
- ii. Extend sterile swab between the tonsillar pillars and behind the uvula (Avoid touching the cheeks, tongue, uvula or lips).
- iii. Sweep the swab ack and forth across the posterior pharynx, tonsillar areas, and any inflamed or ulcerated areas to obtain clinical samples. Put it in suitable transport medium (Amies Transport Media).

Note:

Do not perform throat swab if epiglottitis is inflamed, as sampling may cause serious respiratory obstruction.

Lower Respiratory

a) Sputum

- i. Collect early morning, after rinsing the mouth and gargling with water.
- ii. Instruct patient to cough deeply and expectorate only sputum and not saliva into sterile screw-cap container.
- iii. If delay is anticipated, store specimen in refrigerator at 2°C – 8°C.

b) Bronchial alveolar lavage (BAL) / Bronchial washing / Tracheal aspirate / Lung aspirate / Lung biopsies

- i. Place the specimen obtained via bronchoscopy into sterile container.
- ii. Immediately send specimen to the laboratory.

3.10 Stool C&S, *Clostridium difficile* C&S and toxin

Method of collection

- i. Collect stool into a sterile /clean wide-mouth screw capped plastic container.
- ii. If the stool is liquid, the container may be filled to one-third full (excessive amount will result in spillage upon opening of cap).

Note:

- i. Enrichment medium i.e., Alkaline Peptone Water for *Vibrios* and Selenite F for *Salmonella* or *Shigella* can be obtained from the laboratory during outbreak.
- ii. For stool clearance culture in cases of typhoid, stool should only be sent upon completion of therapy.

3.11 Urine culture

Method of collection:

a) Mid-stream urine (MSU)

Male patients

- i. Withdraw prepuce, clean glans penis using soapy water and thoroughly rinse with water.
- ii. Pass the first few milliliters of urine to flush out the bacteria from the urethra. Collect mid-stream portion in sterile universal container and close tightly.

Female patients

- i. Clean the periurethral area and perineum with soapy water and thoroughly rinse with water.
- ii. Hold labia apart during voiding and pass the first few milliliters of urine.
- iii. Collect midstream portion in a sterile container and close the container tightly.

Note:

When culture for tubercle bacilli is required, collect at least 5 mls of early morning midstream urine into sterile containers.

b) Catheterized urine

- i. Clean the catheter collection port with 70% alcohol.
- ii. Puncture collection port using needle attached to syringe under sterile technique.
- iii. Aspirate urine and place in sterile container.

Note:

- i. Do not collect urine from urine bag.
- ii. Culturing urine catheter tip is not recommended as it is invariably contaminated by urethral organisms.

c) Bladder urine specimen

- i. This is obtained via suprapubic aspiration or cystoscopically.
- ii. Collect in sterile container.

3.12 Autopsy material

Method of collection:

a) Blood

- i. Aspirate 10 mls of right heart blood from right ventricle either through skin and chest wall or through unopened heart after removal of sternum.
- ii. Place into a set of blood culture broths or a sterile tube.

Note:

- i. Apart from blood culture, block of splenic tissue is also suitable for culture study.
- ii. Avoid contamination by bacteria from water faucet and enteric organ.

b) Tissue

- i. Best to collect before body is being handled at an earlier stage. Decontaminate skin or sear surface of heart or other organ before inserting needle or cutting out tissue block.
- ii. Collect tissue and place in sterile container. Large piece is preferred as aseptic collection is difficult. In the laboratory, 1cm cube will be aseptically cut from the suspicious area including some normal tissue for processing.

6.0 GUIDELINE FOR COLLECTION, PACKAGING AND TRANSPORTING OF INFECTIOUS SUBSTANCES AND DIAGNOSTIC SPECIMENS

DEFINITIONS

Infectious Substances

An infectious substance is defined as a substance containing a viable microorganism that is may cause or known to cause diseases in humans or animals. Examples of infectious substances are bacteria, viruses, parasite, rickettsia or fungus.

Diagnostic Specimens

A diagnostic specimen is defined as any human or animal material collected for diagnostic purposes. The specimens are including, but not limited to;

- 1) Bloods and its components
- 2) Excreta
- 3) Body fluids
- 4) Tissue and tissue fluid
- 5) Swab (vagina swab, rectal swab, nasopharyngeal and oropharyngeal swab, eye swab, nasal swab, ear swab, wound swab and etc.)

PACKAGING, LABELLING AND DOCUMENTATION FOR TRANSPORT

Basic Triple Packaging System

The packaging requirements described below are based on World Health Organization (WHO) guidelines (Guidelines for the Safe Transport of Infectious Substances and Diagnostic Specimens, WHO/EMC/97.3). Figure 1 showed an illustration of triple layer packaging as described in the guideline. The triple layer packaging of infectious materials for transport was design to minimize the potential for damage during transport, to ensure the integrity of the materials and for the safety of sender, carrier and receiver. Transportation of the infectious substances and specimen may include:

1. Transport of specimens from a ward/operation theatre / doctor's working station to a laboratory
2. For transportation within pathology department
3. From pathology department to courier services vehicle (which may be operated by hospital)
4. From hospital to a referral diagnostic laboratory

Primary receptacle (First layer)

- A labelled primary watertight, leak-proof receptacle which contain the specimen.
- The receptacle is wrapped in enough absorbent material to absorb all fluid in case of breakage

Secondary receptacle (Second layer)

- Durable, watertight, leak-proof receptacle to enclose and protect primary receptacle(s).
- Several wrapped primary receptacles may be placed in one secondary receptacle
- Sufficient additional absorbent material must be used to cushion multiple primary receptacles.
- The biohazard marking should be on the secondary receptacle and may be on the primary receptacle.

Outer shipping package (Third layer)

- The secondary receptacle is placed in a third layer package which protects it and its contents from outside influences such as physical damage and water while in transit.
- Specimen data forms, letters and other types of information that identify or describe the specimen and also identify the shipper and receiver should be taped to the outside of the secondary receptacle. Ice when use in shipment must be placed inside the outer shipping package.

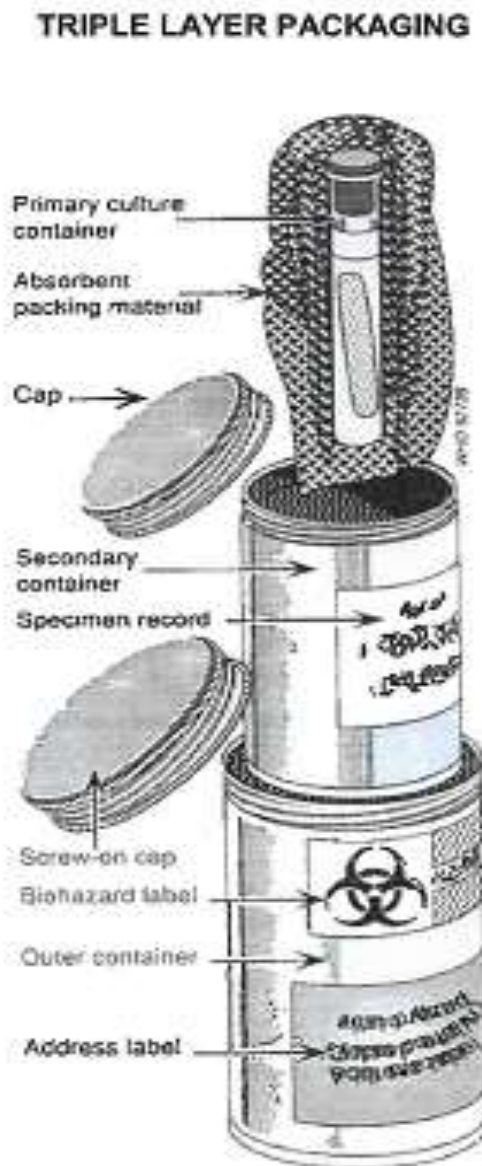


Figure 1

Transport Planning

The sender is responsible in ensuring the correct designation, packaging, labelling and documentation of all specimens. In the event of transporting highly infectious specimens (e.g. SARS-CoV sample), advance arrangements with receiver need to be done.

The carrier must responsible to maintains and archives the documentation for transportation, monitor required holding conditions of the shipment while in transit and notify the sender of any anticipated (or actual) delays in transit

The receiver is responsible to arrange for the most timely and efficient collection on arrival and immediately acknowledges receipt to the sender.

SPILL CLEAN-UP PROCEDURE

In the event of a spill of infectious or potentially infectious material, the following spill clean-up procedures should be used:

1. Wear glove and protective clothing, include face and eye protection
2. Cover the spill with cloth or paper towels to contain it
3. Pour an appropriate disinfectant over the paper towels and the immediately surrounding area.
4. Apply disinfectant concentrically beginning at the outer margin of the spill area, working toward the centre
5. After the appropriate amount of time (e.g 30 minutes), clear away the materials. If there is broken glass or other sharps involved, use a dustpan or a piece of stiff cardboard to collect the material and deposit it into a puncture-resistant container for disposal.

CHECKLIST FOR SAMPLE COLLECTION FOR INFECTIOUS SUBSTANCES

A. Items required for TRIPLE LAYER PACKAGING:

- i. Collection Kit (to be collected from the laboratory)
 1. Dacron swab x 2
 2. Viral Transport Media (*First layer*)
 3. Gauze
 4. Rubber bands
 5. Parafilm strips

6. Biohazard plastic bag
7. Screw-capped container (*Second layer*)
8. Ice pack
9. Polystyrene box (*Third layer*)

- ii. 4 stickers (1 sticker to sample, 3 to PER-PAT 301 forms)
- iii. 3 copies of PER-PAT 301 form (complete with signature and phone number of requesting doctor)

B. Sample collection

Type of Sample	Primary layer	Secondary layer	Tertiary layer
Swab (NPS/OPS/Ear/Eye/Vaginal/Wound/Rectal)	Swab in Viral Transport Media (VTM).	Screw-capped container	Polystyrene box
Lower respiratory sample (sputum/BAL/NPA/Tracheal aspirate)	Sterile container.		
Whole blood/ Plasma/ Serum	Serum Separation Gel (SSGT) Tube EDTA tube		
CSF & Body fluid	Bijou bottle Sterile container		

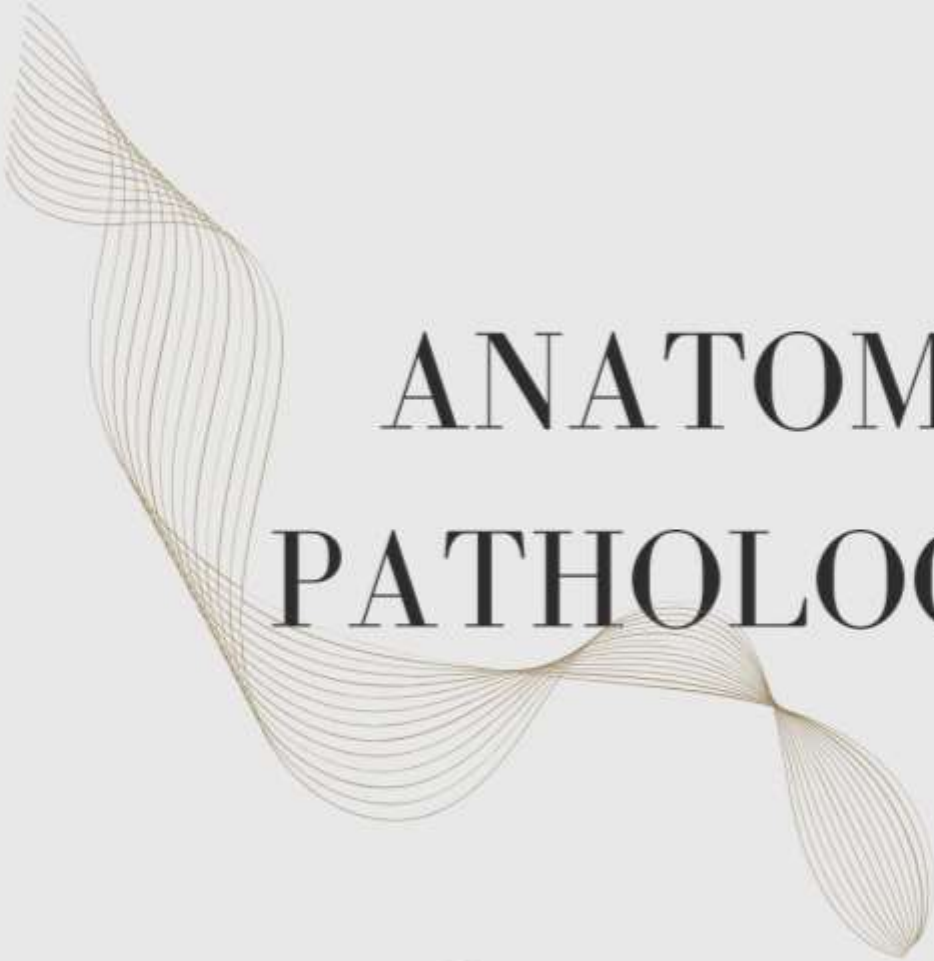
- i. For swab (NPS/OPS/Ear/Eye/Vaginal/Wound/Rectal):
 1. Take swab from targeted site and put in 1 VTM together.
 2. Apply parafilm around the VTM's cap.
 3. Wrap the VTM with gauze and tie it with rubber bands.
 4. Place the VTM in the biohazard plastic bag.
 5. Then put it in the screw-capped container.
 6. Disinfect the surface of the secondary container with alcohol swab.
 7. Place the container in the polystyrene box together with ice pack in upright position.
- ii. For lower respiratory sample:
 1. Collect sputum/BAL/NPA/Tracheal aspirate sample and put in sterile container.
 2. Apply parafilm around the sterile container's cap.
 3. Wrap the sterile container with gauze and tie it with rubber bands.
 4. Place the sterile container in the biohazard plastic bag.
 5. Then put it in the secondary container.
 6. Wipe the surface of the secondary container with alcohol swab
 7. Place the container in the ice box together with ice. Make sure in upright position.

iii. Whole blood/Plasma/Serum

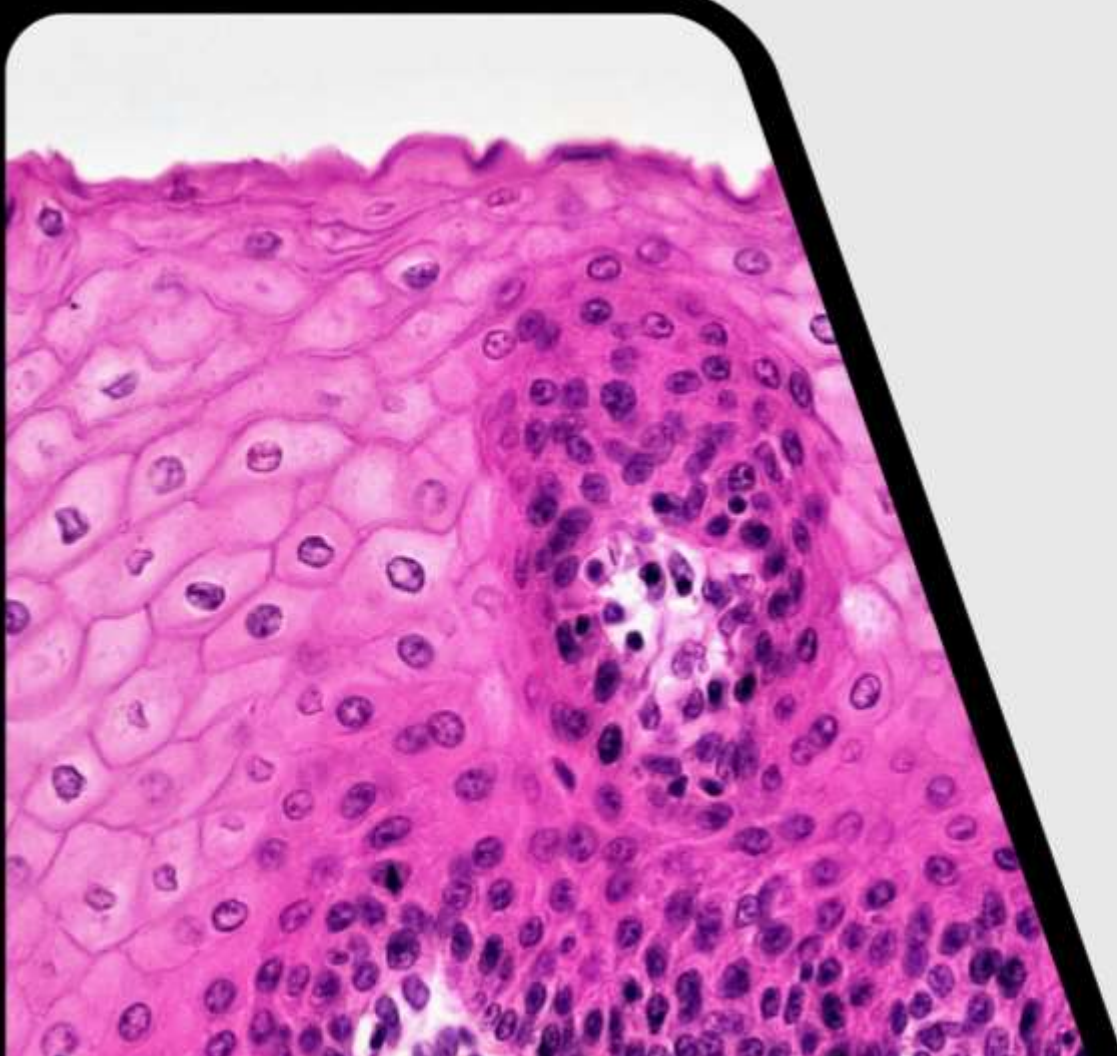
1. Collect whole blood/plasma/serum sample in a plain tube / EDTA tube.
2. Apply parafilm around the tube's cap.
3. Wrap the sterile container with gauze and tie it with rubber bands.
4. Place the sterile container in the biohazard plastic bag.
5. Then put it in the secondary container.
6. Swab the surface of the secondary container with alcohol swab.
7. Place the container in the ice box together with ice. Make sure in upright position.

iv. CSF & Body fluid

1. Collect CSF or body fluid samples in a sterile container.
2. Apply parafilm around the sterile container's cap.
3. Wrap the sterile container with gauze and tie it with rubber bands.
4. Place the sterile container in the biohazard plastic bag.
5. Then put it in the secondary container.
6. Swab the surface of the secondary container with alcohol swab
7. Place the container in the ice box together with ice. Make sure in upright position.

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ANATOMIC PATHOLOGY



ANATOMIC PATHOLOGY

1.0 INTRODUCTION

Anatomic Pathology services include histopathology examination (HPE) of tissue, cytology study and clinical post-mortem. These services are provided for internal patients (Hospital Sultan Idris Shah, Serdang) and external patients (hospitals and *Klinik Kesihatan*) inclusive of full paying patients.

Histopathology examination (HPE) is a study of tissue for diagnostic interpretation via macroscopic and microscopic assessment. Tissue is obtained during surgical procedure or post-mortem examination. Clinical information inclusive of radiological findings is crucial in concluding the entire examination and assessment.

Cytology is a study on morphology of exfoliated cells from various organs or cells obtained via aspiration. Exfoliative cytology involves examination of cells from cervico-vaginal (Pap) smear, sputum and body fluid from various sites. Aspiration cytology involves examination of cells obtained via fine needle aspiration. Clinical information inclusive of radiological findings is crucial in interpreting a cytology study.

Clinical post-mortem is an examination performed on dead patient. It is conducted for further assessment to identify the extent of disease or for further investigation in cases that do not respond to the therapy given.

2.0 CONSULTATION

Anatomical Pathologists are available for consultation at these contact numbers (office hour):

Anatomical Pathologist Room 1:	extension 5332 or 03-89475332 extension 1711 / 1712 / 1713
Anatomical Pathologist Room 2:	extension 1744
Anatomical Pathologist Room 3:	extension 1706
Anatomical Pathologist Room 4:	extension 1715

3.0 REPORT ENQUIRY

Histopathology examination (HPE) and cytology studies are generally reported within the stipulated laboratory turnaround time, unless it requires further studies or second/expert opinion. Please refer to turnaround time of tests provided.

Enquiry of report is feasible by providing patient's identification.

- i. Histopathology examination (HPE) at extension 1750 / 1751
- ii. Cytology study at extension 1718 / 1763

4.0 CLINICAL-PATHOLOGICAL CONFERENCE

Interdepartmental Clinical-Pathological Conference (CPC) and Multidisciplinary Team Meeting (MDT). List of cases to be discussed to be forwarded one week prior to the scheduled date.

5.0 OTHER SERVICES

1. Request of images on histopathology examination (HPE) and cytology study for publication / research to be forwarded one month prior to date of utilization.
2. Request of patient's unstained slides for further investigation or research purposes is provided by the managing doctor. The request must be forwarded one week prior to date of utilization.
3. Patient is allowed to acquire residual tissue specimen (sent for HPE) at one month after the report is finalized. Request is made by the managing doctor within one month of sending the tissue specimen.

ANATOMIC PATHOLOGY: HISTOPATHOLOGY

1. HISTOPATHOLOGY SERVICES

- 1.1 Routine Surgical
 - 1.1.1 Biopsies
 - 1.1.2 Resected specimens
 - 1.1.3 Tissue from autopsy
- 1.2 Frozen Section
- 1.3 Special Biopsy
 - 1.3.1 Renal biopsy
 - 1.3.2 Skin biopsy
 - 1.3.3 Muscle biopsy
 - 1.3.4 Rectal biopsy
- 1.4 Clinical post mortem

2. REQUEST OF TESTS

2.1 Internal Specimen

Request is made via eHIS and accompanied by PER-PAT 301 form.

2.2 External Specimen

A completely filled PER-PAT 301 form is required.

2.3 PER-PAT 301 form must include:

- 2.2.1 Patient's name, age, sex and identification number.
- 2.2.2 For urgent specimen, please indicate as 'URGENT' clearly at the right upper corner of PER-PAT 301 form.
- 2.2.3 Hospital registration number, ward / clinic and contact number, as this facilitates work process.
- 2.2.4 Summary of clinical, radiology and operative findings.
- 2.2.5 Type of specimen (biopsy / incision / excision / resection) and anatomical site.
- 2.2.6 Surgical excision margin to be indicated and properly marked (suture tie, ink / dye, wire etc.).
- 2.2.7 Provisional diagnosis.

- 2.2.8 Name and MMC number of specialists in charge.
 - 2.2.9 Previous histopathology examination (HPE) finding and reporting institution.
 - 2.2.10 Only one form is required, if the patient has more than one specimen collected from the same procedure.
- Note: Specimen processing is delayed if PER-PAT 301 form is incompletely filled or data is discrepant. This may delay in HPE reporting.

3. GUIDELINE ON SPECIMEN HANDLING

3.1 Routine HPE

- 3.1.1 Specimen for routine HPE is to be fixed immediately in 10% Neutral Buffered Formalin (10% NBF) in a clean leak-proof container. Specimen should not be left to dry on gauze or tissue paper or immersed in normal saline.
- 3.1.2 Volume of 10% NBF should be at least 10 times volume of specimen.
- 3.1.3 Specimen should be placed in appropriate sized container to ensure proper fixation and avoid distortion.
- 3.1.4 Container should be correctly labeled with patient's name, identification number and anatomical site.
- 3.1.5 Small biopsy (e.g. GIT biopsy, core biopsy, TRUS biopsy) should be mounted on a filter paper and immediately immersed in formalin.
- 3.1.6 Specimen from various anatomical sites and/or locations (e.g. stomach biopsy, colon biopsy) should be sent in separate containers which are properly labelled and itemized in PER-PAT 301 form.
- 3.1.7 Specimen orientation and surgical excision margin to be properly indicated and marked (suture tie, ink / dye, wire etc.) e.g. mastectomy, breast wide local excision, skin tumor excision, thymus excision, cervical cone biopsy, LEEP and LLETZ procedures.

3.2 Frozen Section

- 3.2.1 Appointment via Pathologist in-charge is required at least one day prior to procedure. This is to ensure frozen section equipment is at its optimum state.
- 3.2.2 Cases scheduled for frozen section examination are best placed first in the operating list. So, it can be done during normal working hours.
- 3.2.3 Immediately send specimen in a clean leak-proof container without fixative.

- 3.2.4 Container should be correctly labelled with patient's name, identification number and anatomical site.
- 3.2.5 Specimen from various anatomical sites and/or locations should be sent in separate containers which are properly labelled and itemized in PER-PAT 301 form.

3.3 Renal and Skin Biopsy for Immunofluorescence (IF) Study

- 3.3.1 Two specimens are required:
 - i. Formalin fixed tissue for light microscopy examination.
 - ii. Fresh tissue for immunofluorescence staining.For renal biopsy, specimen size should be at least 3mm long.
- 3.3.2 Specimen for IF study should be sent on filter paper moistened with phosphate-buffered solution in a clean closed container to prevent drying. Phosphate-buffered solution and filter paper are available at histopathology laboratory.

3.4 Rectal Biopsy for Enzyme Histochemical Study

- 3.4.1 This test is performed at Hospital Kuala Lumpur (HKL).
- 3.4.2 Arrangement at least one day prior to procedure:
 - 3.4.2.1 Appointment with Pathologist in-charge of HKL.
 - 3.4.2.2 Inform Histopathology Laboratory Hospital Sultan Idris Shah, Serdang for transportation arrangement.Please refer to Para 4.3.
- 3.4.3 Specimen is to be sent fresh immediately without fixative in closed container and moistened with normal saline to prevent drying.

3.5 Muscle Biopsy for Enzyme Histochemical Study

- 3.5.1 This test is performed at Hospital Kuala Lumpur (HKL).
- 3.5.2 Arrangement at least one day prior to procedure:
 - 3.5.2.1 Appointment with Pathologist in-charge of HKL.
 - 3.5.2.2 Inform Histopathology Laboratory Hospital Sultan Idris Shah, Serdang for transportation arrangement. Please refer to para 4.3.
- 3.5.3 Important information in PER-PAT 301 form (as required by HKL Histopathology Unit guideline):

- Creatine Kinase level
- Lactate Dehydrogenase level
- Contact number of clinicians in-charge and relevant fax number.

3.5.4 For open biopsy (as recommended by HKL Histopathology Unit guideline):

- Usually, the biceps or quadriceps muscle would suffice in most cases
- Remove at least one good cylinder of muscle measuring 1.0 x 0.5 x 0.5 cm, the smaller diameter being the cross-section of the muscle.
- For optimal processing, muscle specimen must be wrapped with aluminum foil and sent fresh in an air tight, dry and clean container.
- The specimen should be transported in a container containing ice or gel ice (never use dry ice).
- Do not tie the muscle to stretch it and do not put tissue on gauze.
- Do not put saline or formalin.

Note: HKL laboratory will accept fresh muscle biopsy specimen up to 6 hours upon removal. However, optimal result requires the specimen to be as fresh as possible.

4. DESPATCH & TRANSPORTATION OF SPECIMEN

4.1 Specimen should be sent to Histopathology Laboratory during office hours as below:

i. Monday to Thursday: 8:00 am - 1:00 pm

2:00 pm - 4:30 pm

ii. Friday: 8:00 am - 12:15 pm

2:45 pm - 4:30 pm

4.2 Specimen for IF study, if taken after office hour should be kept in refrigerator and sent directly to Histopathology Laboratory as soon as possible on the next working day.

4.3 Transportation of specimen to referral laboratory.

Daily Pathology transport departure (working days):

Monday-Thursday: 9:30 am

Friday: 8:30 am

Note:

i. Specimen must reach Histopathology Laboratory at least 30 minutes prior to transport departure.

ii. Respective clinic / ward should arrange for alternative specimen transportation to referral laboratory if Pathology transport has departed.

5. HISTOPATHOLOGY EXAMINATION (HPE) REPORT

5.1 Verified HPE report is available and can be viewed by the requesting practitioner in the system.

5.2 For hospitals without access to eHIS, verified HPE report is e-mailed out to the respective Pathology Department.

5.3 Frozen Section findings are immediately conveyed to the requesting practitioner via telephone and the report will be made available in the system.

5.4 Cases are generally reported within Laboratory Turnaround Time (LTAT) as mentioned in *Table: List of Test*; unless the cases need further studies or second opinion.

6. GUIDELINES FOR REQUEST OF CLINICAL POST MORTEM

6.1 Informed consent must be obtained from the next of kin before the procedure by the requesting clinician. Consent can only be taken after proper explanation regarding the

post-mortem has been given to the next of kin. For cases without next of kin, consent for post-mortem can be given by the director of hospital. For foreigners, consent can be given by the embassy.

- 6.2 Once consent has been obtained; the clinician is requested to discuss with the Anatomic Pathologist on call regarding the indication for the post-mortem.
- 6.3 If the clinical post-mortem takes place, the requesting clinician is needed to attend the post-mortem. Clinical summary is prepared and made available to Anatomic Pathologist on call.
- 6.4 Verified HPE report is available and can be viewed by the requesting practitioner in the system.
- 6.5 For hospitals without access to eHIS, verified HPE report is e-mailed out to the respective Pathology Department.

ANATOMIC PATHOLOGY: CYTOLOGY

1 CYTOLOGY SERVICES

1.1 Gynaecological Cytology

1.1.1 Conventional Gynaecological Cytology

1.1.2 Liquid Based Gynaecological Cytology

1.2 Non-Gynaecological Cytology:

1.2.1 Sputum

1.2.2 Body fluid (cerebrospinal fluid (CSF), vitreous, pleural, peritoneal, synovial fluid and urine)

1.2.3 Bronchoalveolar Lavage (BAL):

1.2.3.1 BAL Cytology

1.2.3.2 BAL Cytology and Differential Cell Count

1.2.4 Brushing cytology (e.g. bronchial brushing / bile duct brushing)

1.2.5 Washing cytology (e.g. bronchial washing / peritoneal washing)

1.2.6 Nipple discharge

1.3 Fine Needle Aspiration (FNA) Cytology

1.3.1 Superficial lesion

1.3.2 Ultrasound guided FNA

1.3.3 Transbronchial Needle Aspiration Cytology (TBNA)

These services are provided during office hours.

2 REQUESTS OF TESTS

2.1 Internal Specimen

2.1.1 Request for non-gynaecological cytology and FNA is made via eHIS and accompanied by PER-PAT 301 form.

2.1.2 Request for gynaecological cytology is made via eHIS accompanied by a completely filled PS 1/98 Pindaan 2020 form.

2.2 External Specimen

2.2.2 Request for non-gynaecological cytology and FNA is made using a completely filled PER-PAT 301 form.

2.2.1 Request for gynaecological cytology is made using a completely filled PS 1/98 Pindaan 2020 form.

2.3 PER-PAT 301 and PS 1/98 Pindaan 2020 forms must include:

2.3.1 Patient's name, age, sex and identification number.

2.3.2 For urgent specimen, please indicate as 'URGENT' clearly at the right upper corner of PER-PAT 301 form.

2.3.3 Hospital registration number, ward/clinic and contact number, as this facilitates work progress.

2.3.4 Summary of clinical, radiological and operative findings.

2.3.5 Type of specimen and anatomical site.

2.3.6 Provisional diagnosis.

2.3.7 Name and MMC number of requestor (nurse, medical officer or specialist in-charge).

2.3.8 Only one form is required, if the patient has more than one specimen collected from the same patient.

Note: Specimen processing is delayed if PER-PAT 301 and PS 1/98 Pindaan 2020 forms are incompletely filled or data is discrepant. This may delay in Cytology reporting.

3 SPECIMEN CONTAINER / SLIDE

3.1 Cytology specimen should be correctly labelled with patient's name, identification number and type of specimen or anatomical site (where applicable).

3.2 Body fluid should be placed in clean universal leak-proof container without preservative.

3.3 Slide (e.g. conventional gynaecological cytology, nipple discharge, brushing and FNA) should be properly placed in slide mailer.

4 SPECIMEN COLLECTION

- 4.1 Conventional Gynaecological Cytology DO NOT use lubricant in the sampling procedure.
 - 4.1.1 Ensure spatula or brush is rotated through 360 degrees at squamo-columnar junction.
 - 4.1.2 Smear the material onto a clean, labelled glass slide.
 - 4.1.3 Ensure adequate fixation and prevent air drying artifact by:
 - 4.1.3.1** Immediately place the slide in 95% alcohol for 30minutes. If more than one slide is to be placed in the same container, ensure the smeared slides are not placed face to face.
 - or
 - 4.1.3.2** Immediately spray a fine mist of commercial aerosol fixative over the entire smear from a distance of approximately 30cm. Allow the smear to dry completely.
- 4.2 Liquid Based Gynaecological Cytology Collection is as per manufacturer recommendation.
- 4.3 Body fluid (pleural fluid, peritoneal fluid, CSF, vitreous fluid etc) and Washing Cytology Collect in clean container (except for vitreous fluid in LBC vial) and dispatch immediately.
 - 4.3.1 Place in **refrigerator at 2–8°C**, if **delay of more than 2hours** is anticipated. This is to minimize cellular degeneration.
 - 4.3.2 Inform Cytology personnel for request of BAL for Cytology and Differential Cell Count and Oil Red-O staining. Dispatch immediately to Cytology laboratory to ensure cellular integrity.
- 4.4 Brushing Cytology
 - 4.4.1 Gently rotate the brush, immediately smear onto a clean slide and fixed in 95% alcohol for 30minutes.
- 4.5 Nipple Discharge
 - 4.5.1 Imprint smear is performed by placing the labeled slide onto the nipple. Prepare at least 2 smears.
 - 4.5.2 One slide is fixed in 95% alcohol and labeled as 'fixed'.
The other slide is allowed to dry at room temperature and labeled as 'air-dried'.

4.6 Sputum

- 4.6.1 Collection is performed early in the morning after emptying saliva from the mouth (ideally minimum of 3 samples over 3 consecutive days).
- 4.6.2 Patient should cough deeply and collected sputum is placed in a clean container.
- 4.6.3 Dispatch fresh sample immediately to the laboratory.

4.7 Urine

- 4.7.1 Indicate type of urine: voided or catheterized.
- 4.7.2 For voided urine, patient should discard the first void in the morning and collect the next voided urine.
- 4.7.3 **Dispatch immediately. Do not send overnight urine** as most of the cells in this specimen are degenerated.
- 4.7.4 Keep in **refrigerator at 2–8°C**, if **delay of more than 2 hours** is suspected.

4.8 Fine Needle Aspiration (FNA) Cytology / Transbronchial Needle Aspiration (TBNA) procedure

- 4.8.1 FNA clinic and radiology guided FNA / TBNA in Hospital Sultan Idris Shah, Serdang are conducted as scheduled:

Bil	Clinic	Day	Time
1.	ENT	Monday	2.30 pm – 5.00 pm
2.	MOPD	Tuesday	11.30 am – 1.00 pm
3.	RADIOLOGI	Wednesday	9.00 am – 5.00 pm
4.	SOPD	Thursday	10.30 am – 1.00 pm
5.	TBNA	Thursday	9.30 am – 1.00 pm
6.	WAD	Waktu pejabat selain waktu Klinik FNA dan Prosedur TBNA	

For the scheduled FNAC/TBNA procedure, the list of cases must be submitted to The Cytopathology Laboratory at least a day prior to the procedure. Please Contact the Cytopathology Laboratory (Ext no: 7046) immediately before sample Collection, to obtain Medical Lab Technologist (MLT) assistance for slide preparation. The presence of MLT / Medical Officer can ensure that the sample is

sufficient for further analysis (ROSE – Rapid On-Site Evaluation).

- 4.8.2 For inpatient cases (Hospital Sultan Idris Shah, Serdang), requiring FNAC procedure in ward / clinic, the treating doctor needs to contact Pathologist / Medical Officer oncall.
- 4.8.3 Consent shall be obtained by the performing doctor. Use the latest KKM consent form.
- 4.8.4 FNA for superficial lesions can be performed either by doctor of the respective department or Pathology Department. TBNA in Hospital Sultan Idris Shah, Serdang is conducted as scheduled by the doctor of Pulmunology Department.
- 4.8.5 Below is the indication for Fine Needle Aspiration (FNA) procedure:

Breast	1. To confirm carcinoma preoperatively. 2. Diagnosis of simple cyst. 3. Investigation of recurrent or metastatic lesion. 4. To confirm locally advance carcinoma for chemotherapy.
Thyroid	1. Solitary thyroid nodule. 2. A dominant nodule or growing nodule in multinodular goitre. 3. Change in consistency of nodule. 4. Rapidly enlarging diffuse mass in older age patient. 5. Thyroiditis.
Lymph Node	1. Metastatic lesion. 2. Staging of malignancy. 3. Abscess/Infectious diseases (unknown cause). 4. Diagnosis lymphoid malignancy.
Salivary Gland	Any palpable lesion.
Others Superficial Lesion	1. Rapidly enlarging superficial lumps. 2. Metastatic nodule.

- 4.8.6 FNA for deep seated lesion is performed under radiological guidance by the radiologist or the respective specialized doctor.

4.8.7 Rejection Criteria for FNA / TBNA procedure:

4.8.7.1 Patients who do not consent to the FNA procedure

4.8.7.2 The tumour size is less than 0.5cm or is not palpable and deep seated.

4.8.7.3 Clinically confirmed cases of abscess of infection.

- recommended for culture & sensitivity testing only.

4.8.7.4 Clinically confirmed cases of Tuberculosis (TB) (Lymph node).

- recommended for TB culture only to reduce the risk of infection to staff on duty and contamination of the procedure room.

4.8.7.5 For thyroid cases, if there is no palpable solitary nodule, the FNA procedure must be carried out with the assistance of radiology.

4.8.7.6 Inappropriate tumour characteristics:

- Pulsatile mass
- Vascular neoplasm
- Intraoral lesions

4.8.7.7 Clinically confirmed cases of lipoma.

- recommended for histopathological examination (HPE) after excision.

4.8.7.8 Patients with Bleeding Disorders and using anti-coagulant medication.

- it is recommended that the treating doctors obtain advice from a General Physician before referring the patient for FNA procedure.

4.8.7.9 Unstable or critical patients.

5 DESPATCH & TRANSPORTATION OF SPECIMEN

5.1 Specimen should be sent immediately (preferably within one hour) to Cytology Specimen Receiving Counter in Cytology Unit of Pathology Department during office hours.

5.2 Specimen (non- gynae only) collected after office hours should be kept in refrigerator at 2-8°C and to be sent immediately on the next working day.

5.3 Body fluids for cytological examination from external institutions should be transported in optimum temperature, 2-28°C.

6 CYTOLOGY REPORT

6.1 Internal request

6.1.1 Verified cytology report is available and can be viewed by the requesting practitioner in the system.

6.2 External request

6.2.1 Verified cytology reports for Hospital Ampang, Hospital Tengku Permaisuri Norashikin, Hospital Cyberjaya and Pejabat Kesihatan Daerah (PKD) are e-mailed out upon releasing the report in the system. Cases are generally reported within the Laboratory Turn Around Time (LTAT) as mentioned in *Table: List of Test*; unless the cases need further studies, second opinion and etc.

TRANSFUSION MEDICINE



TRANSFUSION MEDICINE

1. INTRODUCTION

Transfusion Medicine is one of the units under Department of Pathology Hospital Sultan Idris Shah, Serdang. We are operating with two laboratories; main lab is located at level 3 main building Hospital Sultan Idris Shah and satellite lab at level 3 Pusat Jantung Hospital Sultan Idris Shah, Serdang.

Blood transfusion service has established as part of patient therapy. Generally, blood transfusion is given to replace blood loss during surgery, other injury or certain illnesses. However, error or complication may occur following blood transfusion. In order to prevent this, clinician should follow the established guidelines for the appropriate use of blood and blood components.

Clinician must also be aware of all matters pertaining to transfusion practices, e.g. Maximum Surgical Blood Ordering Schedules (MSBOS), procedure for requesting and transfusing blood and blood products during elective and emergency situation, handling and reporting adverse reaction and documentation of clinical outcomes, information on the use of blood products and components, transfusion dosages, risk associated with transfusion, contraindication and available alternatives.

Recent improvements in the safety of blood and its components, and increasing cost associated with transfusion therapies have led to a reevaluation of the clinical practice of blood transfusion. An effective quality system which is in place allows the continuous monitoring of the transfusion practices and ensuring haemovigilance in the hospital.

2. LISTS OF SERVICE

- Blood Transfusion Services which include transfusion laboratory testing and clinical transfusion consultations.
- Supply of safe blood and blood products to Hospital Sultan Idris Shah, Serdang patients. Please refer to Table- List of Test.

3. REQUEST

All tests should be requested through the system. Sample must be sent with complete PER-SS-BT 105 (PIND. 1/2016) form.

4. REQUEST FORMS

(Refer to table: List of request form in chapter General Operating Procedures)

- 4.1 PER-SS-BT 105 (PIND. 1/2016) form to be filled upon request for all blood and blood products. If patient has history of blood transfusion, write the date and type of blood group.
- 4.2 PER-SS-BT 105 (PIND. 1/2016) form to be filled upon request for antibody identification and crossmatching of suitable blood. If patient has history of blood transfusion, write the date and type of blood group.
- 4.3 The form must be completely filled and clearly written. For URGENT TEST, please indicate STAT / URGENT on the request form.

5. SPECIMEN COLLECTION

ORDERING BLOOD FOR TRANSFUSION

Most transfusion errors are due to clerical mistake when specimen is taken from the patient or when blood is administered. The practical precautions given in this section are therefore extremely important.

A. Patient identification and blood sampling for compatibility testing

The ordering doctor must ensure the following:

- (a) The patient must be correctly identified. The doctor / medical practitioner taking the blood specimen must ask the patient to state their full name and IC number (use of at least 2 identifiers) in open ended question such as “Can you tell me your full name and IC number?”. This information shall be checked against the wristband, pre-printed patient identification label and/or case notes.
- (b) If it is not possible to identify the patient in the above manner (e.g. in case of unconscious patient, paediatric patients or in case of emergencies), the doctor shall identify the patient by asking the relative or caregiver to name the patient, check patient's wristband and then checked against the case notes or pre-printed patient identification label.

B. Labeling the specimen

- (a) The specimen must be labeled with system generated barcode label.
- (b) The person who takes the blood from the patient has to take full responsibility in ensuring that the blood specimen is placed in the correct tube. The healthcare provider's simple signature on the tube's label is required to imply that she/he has ensured that the specimen has been accurately identified.
- (c) The process of taking and labeling of blood samples shall be carried out as one process by one person at the patient's bedside.
- (d) Only one patient shall be attended to at any one time till completion
- (e) Never label specimen for 2 or more patients at the same time.

C. Blood specimen requirement for elective surgery / transfusion

Specimen should be sent to the Transfusion Medicine Laboratory during office hours at least 24 hours before blood is required. The following is requirement for blood specimen sent for grouping and compatibility testing.

(a) Specimen from infants less than 4 months of age

- i. Infant's sample 1.5-2.0 mls in pediatric EDTA and
- ii. Mother's sample 3-5 mls in EDTA tube.

The sample from infant and mother shall be sent together under a single request

(b) Specimen from patients above 4 months of age

3-5mls of blood sample in EDTA tube.

Refer Practice Guidelines for Clinical and Laboratory Personnel 4th Edition, Jun 2016, pg. 42.

- In cases of massive bleeding when multiple units of blood components are needed, each request requires new sample and new order in the system.

D. Blood sample requirement for blood component such as platelets, fresh frozen plasma and cryoprecipitate

- (a) A new request for blood component other than red cells shall be accompanied by a blood sample taken in EDTA tube.
- (b) For patient who has at least two previous blood grouping records at the hospital blood bank, a new blood sample need NOT accompany the request for blood component.
- (c) For ABO mismatched haemopoietic stem cell transplantation, this is not applicable. A new sample must accompany all requests in the immediate post-transplant period until the patient's blood group has change to that of the donor.

6. GROUP, SCREEN AND HOLD (GSH)

The aim of Group, Screen and Hold (GSH) protocol is to control the quality of blood, maximized the use of blood and screening for the presence of alloantibody which can cause incompatibility.

GSH protocol consists of an ABO and Rh D group and an antibody screen on the patient's plasma. Plasma is retained for 72 hours in the Transfusion Medicine Laboratory in the event that cross-matching blood is required at a later stage.

In the circumstances where the likelihood of blood use is minimal a GSH protocol is recommended in the first instance. If blood is required following a GSH, cross-matched blood should be available for issue within 30 minutes of the request. GSH protocol should be used in conjunction with a Maximum Surgical Blood Order Schedule (MSBOS) for Selangor (revise 2014), MSBOS for adult cardiothoracic surgeries Hospital Serdang 3rd version (Dec 2019) and MSBOS for Obstetrics and Gynecology Hospital Serdang 3rd version (Jan 2019).

7. EMERGENCY TRANSFUSION

In Malaysia, about 95 – 98% of the populations are Rhesus D positive. Only about 2% is Rhesus D negative. Group O Rhesus D positive packed cells are used as Safe O (uncrossmatch group O RhD Positive Packed Cells) in emergency cases only.

- a) In life threatening situations, clinicians can make the decision to transfuse group O Rh D positive packed cells for resuscitation which is available in Transfusion Medicine Laboratory, General OT and Maternity OT.

- b) Decision to transfuse uncrossmatch group O RhD positive blood must only be made after the clinician has fully assessed the patient's condition. The decision should not be made in haste.
- c) The requesting doctor must state the reasons for such a decision on the request form (manual; original + carbon copy) and signed. The carbon copy will be attached to the Safe O.
- d) Emergency blood can be released after crossmatched at room temperature is compatible. After releasing, full blood grouping and crossmatching procedures must be undertaken immediately by using the segment from the released blood bag. Problems encountered during the crossmatching shall be immediately notified by phone to the clinician concerned immediately to enable timely patient intervention.
- e) If there is insufficient time to perform complete full compatibility testing, blood that is provided must match the patients' ABO and Rh D groups. This can usually be issued within 20 minutes from the time Transfusion Medicine Laboratory receives the patient's blood specimen.

8. RECEIPT OF SPECIMEN AND REQUEST

Specimen must be sent to Specimen Receiving Counter except for emergency request whereby the porter has to wait for the blood and blood components.

9. SPECIMEN REJECTION

Refer to General Operating Procedure for rejection criteria. Exceptions are made only in life threatening situation after consulting and obtaining the approval from laboratory personnel.

10. ISSUE, COLLECTION, STORAGE AND TRANSPORT OF BLOOD TO THE WARD

The person collecting the blood shall bring collection slip contains patient's identity.

For storage and transport:

- 10.1 Blood and blood component should be kept in the Transfusion Medicine Laboratory until it is to be transfused.
- 10.2 The person collecting the blood / blood components must bring appropriate storage containers according to the appropriate storage temperature. Blood and blood component must not be in direct contact with ice.

- 10.3 Cryoprecipitate and fresh frozen plasma should be transfused within 30 minutes after thawed; otherwise, the blood component will no longer be suitable for use.
- 10.4 Red cell product should not be kept more than 4 hours in the ward. Blood which is not used must be returned to Blood Bank immediately. (*Transfusion Practice Guidelines for Clinical and Laboratory Personnel 4th Edition, Jun 2016, Appendix 12, Instruction on Proper Handling of Blood and Blood Components in the Ward, pg 134*).

11. GUIDELINES OF ADMINISTRATION OF BLOOD AND BLOOD COMPONENTS

11.1 Identification check of intended recipient

- 11.1.1 A generated Recipient Card label will be attached to the blood and blood components supplied from the blood bank. On the card, there will be information of the patient and blood.
- 11.1.2 The information provided must be checked carefully with the patient's identification details including the patient's wristband. The blood or blood components should not be transfused if the spelling of the patient's name or the identification number of the patient does not match exactly with the details given on the blood pack.

1.1.1 Consent

- a. The patient must give written informed consent prior to transfusion.
- b. The clinician in- charge of the patient has the responsibility to explain to the patient regarding the need of transfusion, risks and alternatives to transfusion therapy.
- c. The patient (except in an emergency case) should be given an opportunity to ask questions and his/her informed decision should be documented.
- d. If the patient is unable to give consent, a responsible family member may be asked to do so. If this is not possible, the decision to transfuse shall be made by two fully registered clinicians and clearly documented.
- e. Consent shall be obtained from parents or legal guardians if patient is below the legal age or unable to give consent.
- f. Consent for blood transfusion valid for each admission except for regular transfused patients such as transfusion dependent thalassemia, validity is every 6 months.

BEFORE YOU GIVE THE BLOOD OR BLOOD COMPONENTS TO A PATIENT:

- 1) Confirm patient's name, identification number, registration number, ward by :-
 - a. Asking the patient or relative to confirm the patient's name via open ended question.
 - b. Checking:
 - The patient's wristband and/or case note
 - The generated Recipient Card label (PPDK 1 card)
 - PER-SS-BT 105 (PIND.1/2016) form
 - Collection slip which generated from the patient's eHIS
- 2) Confirm that the blood or a blood product is compatible by checking the blood group on:
 - Blood bag label
 - The generated Recipient Card label (PPDK 1 card)
 - PER-SS-BT 105 (PIND.1/2016) form
 - Collection slip which generated from the patient's eHIS
- 3) Check expiry date and conditions of the blood or plasma on the blood bag.
- 4) Record in **patient's note**:
 - Date of transfusion
 - Time of transfusion
 - Number of units of blood or blood products given
 - Blood or blood products unit number

11.2 Observe patient according to Transfusion Practices Guidelines for Clinical and Laboratory Personnel 4th Edition, Jun 2016, page 53

If transfusion reaction is suspected, stop transfusion immediately followed by investigation for reaction (Transfusion Practices Guidelines for Clinicians and Laboratory Personnel 4th Edition, Jun 2016, page 69 - 70).

11.3 Record keeping

- 11.3.1 Details of all blood component infused must be entered into **patient's case record**.
- 11.3.2 On completion of blood transfusion, ward personnel must ensure that the Recipient Card attached to each bag of blood is completely filled.
- 11.3.3 Manage blood consumption in the system and return blood bag with Recipient Card to the Transfusion Medicine Laboratory before reserved date as stated in the card.
- 11.3.4 Do not send by pneumatic system.

11.4 Used blood or remnants of blood

- 11.4.1 Blood discontinued for any reason must not be used again and must be returned to the Transfusion Medicine Laboratory as soon as possible. The details of the transfusion and the reasons for discontinuing the transfusion must be stated on the Recipient Card attached to the bag and manage blood consumption in the system.
- 11.4.2 All discontinued blood must be **labeled "USED BLOOD"** clearly in red font and amount infused written on the Recipient Card before it is returned to the Blood Bank.

12. GUIDELINES ON INVESTIGATION OF BLOOD TRANSFUSION REACTION

- 12.1 Please refer to Transfusion Practices Guidelines for Clinical and Laboratory Personnel 4th Edition, Jun 2016, Transfusion Reaction, pg 69 – 70 for investigation and immediate management
- 12.2 Fill up request form for transfusion reaction investigation as per Appendix 18 in Transfusion Practices Guidelines for Clinical and Laboratory Personnel 4th Edition, Jun 2016, pg 140 – 141.
- 12.3 Report the Reaction to Blood or Plasma Transfusion in the system and sent all required samples to the Transfusion Medicine Laboratory.

13. GUIDELINES ON TRANSFUSION OF BLOOD AND BLOOD COMPONENT IN RhD-NEGATIVE PATIENT

In elective cases involving RhD negative patient, the treating clinician shall inform the blood bank of the case at least seven working days prior to the procedure that may require transfusion. This notification is essential to allow the hospital blood bank enough time to source for the required blood.

In emergency situation, where ABO group specific RhD negative blood is not available in time, the blood bank may issue, in order of preference:

- a. Group O RhD negative blood, or
- b. ABO group specific RhD positive blood, only if the patient does not have pre-formed anti-D.

This shall be done only after discussing with and agreed by the treating clinician. (Transfusion Practices Guidelines for Clinical and Laboratory Personnel 4th Edition, Jun 2016, pg 65 and Appendix 14, Flowchart for Transfusion of RhD Negative Patients, pg 136).

APPENDIX



SPECIMENS' ORDER OF DRAW

PLEASE FOLLOW THIS ORDER WHEN FILLING BLOOD IN MULTIPLE TUBES!

Tube Type and Order	Volume Of Specimen & Collection Instructions	Common Tests
1. BLOOD CULTURES 	Blood Volume: Adults 10mls Paediatric/Neonates: 1-5mls. Aerobic (green) bottle MUST be collected first then Anaerobic (Orange). Paediatric Collection- Yellow bottle only. <u>Mix the specimen with gentle agitation.</u> <u>Store at Room Temperature.</u>	MICROBIOLOGY: Culture & Sensitivity
2. SODIUM CITRATE 3.2% (BLUE) 	Correct volume critical. See marker level on tube. *Mixing test: Fresh blood (2 tubes) *Factor Assay/Inhibitor, Lupus anticoagulant, Protein C/S: 6 – 7 tubes (adult) minimum 4 tubes (1–12-year-old) minimum 2 tubes (<1 year-old) Note: INVERT tube GENTLY 3-4 times after collection.	HAEMATOLOGY: PT/APTT/INR, Thrombin Time, Fibrinogen, D-Dimer, Mixing Test, Coagulation Factor Assay, Factor Inhibitor Assay, Lupus Anticoagulant, Protein C Antigen/Activity, Protein S Antigen/Activity, Von Willebrand Factor, Antithrombin Activity, Activated Protein C Resistance, ADAM TS-13 Activity/Inhibitor, Anti-Xa Assay, Platelet Aggregation Test.
3. SODIUM CITRATE 3.8% (BLACK) 	Correct volume critical. See marker level on tube. Note: INVERT tube GENTLY 3-4 times after collection	HAEMATOLOGY: ESR
4. PLAIN (RED) 	Blood Volume: 3-5mls *For Creatinine Clearance: Collect tube when 24hour urine protein is collected. *Antibody Identification, Isohemagglutinin test, Anti D titre, Cold Agglutinin titre, Platelet antibody test: 2 tubes *Each serology or infectious disease test requires minimum volume of 1ml. *Tests according to package/bundle requires minimum 4-5mls ie - HIV/Hepatitis/Syphilis: 4-5mls. - ANA, dsDNA, ENA: 4-5mls Note: INVERT tube GENTLY 6-8 times after collection.	TRANSFUSION MEDICINE: Antibody Identification, Isohemagglutinin, Cold Agglutinin Titre, Anti-D Titre, Platelet Antibody Test BIOCHEMISTRY: LFT, Albumin, Amylase, Calcium, Lipid Profile, Creatinine Kinase, CRP, Buse/cr, Creatinine clearance, Ferritin, GGT, Iron studies, LDH, Magnesium, Osmolality, Phosphate, Troponin I, Uric acid TDM: ALL tests except tacrolimus & Cyclosporine. ENDOCRINOLOGY: Cortisol, Oestradiol, FSH, LH, Progesterone, Prolactin, Testosterone, TFT, Tumour markers SEROLOGY: Anti-dsDNA, Anti-dsDNA titre, Anti-CCP, ANA, ANA titre, ASOT, ENA, Serum Immunoglobulin level (IgG/AM), Rheumatoid factor INFECTIOUS DISEASES: Dengue ELISA IgM/IgG, HBs Ag, AntiHCV, HIV 1/2 Ab ELISA, HAV IgG, HAV IgM, HBc IgM, HBc Total IgG, Anti HBc, HBc Ag, AntiHBs, HCV Ab Serodia (PA), HCV LIA, HIV Ab Serodia (PA), HIV 1/2 LIA, Rapid Leptospiral IgM, RPR, TPPA, TORCHES, EBV Antibody, Mycoplasma pneumoniae Antibody, Leptospiral IgM.

CLSI RECOMMENDATION

5. SERUM SEPARATOR TUBE (GOLD or RED & YELLOW) 	Blood Volume: 4mls *For Creatinine Clearance: Collect tube when 24hour urine protein is collected. *Each serology or infectious disease test requires minimum volume of 1ml. *Tests according to package/bundle requires minimum 4-5mls; ie - HIV/Hepatitis/Syphilis: 4-5mls. - ANA, dsDNA, ENA: 4-5mls *Erythropoietin: 2 tubes	BIOCHEMISTRY: LFT, Albumin, Amylase, Calcium, Lipid Profile, Creatinine Kinase, CRP, Buse/cr, Creatinine clearance, Ferritin, GGT, Iron studies, LDH, Magnesium, Osmolality, Phosphate, Troponin I, Uric acid. ENDOCRINOLOGY: Cortisol, Oestradiol, FSH, LH, Progesterone, Prolactin, Testosterone, TFT, Tumour markers. TDM: ALL tests except Methotrexate, Tacrolimus & Cyclosporin. HAEMATOLOGY: Erythropoietin SEROLOGY: Anti-dsDNA, Anti-dsDNA titer, Anti-CCP, ANA, ANA titer, ASOT, ENA, Serum immunoglobulin level (IgG/A/M), Rheumatoid factor. INFECTIOUS DISEASES: Dengue ELISA IgM/IgG, HBs Ag, AntiHCV, HIV 1/2 Ab ELISA, HAV IgG, HAV IgM, HBc IgM, HBc Total IgG, Anti HBc, HBe Ag, AntiHBs, HCV Ab Serodia (PA), HCV LIA, HIV Ab Serodia (PA), HIV 1/2 LIA, Rapid Leptospiral IgM, RPR, TPPA, TORCHES, EBV Antibody, Mycoplasma pneumoniae Antibody, Leptospiral IgM
6. LITHIUM HEPARIN (GREEN) 	Blood Volume: 4mls Note: INVERT tube GENTLY 8-10 times after collection.	HAEMATOLOGY: Chromosome Study for Genetic testing (FISH, Karyotyping) BIOCHEMISTRY: Paediatric samples only (Routine Biochemistry, TDM, TFT)
7. SODIUM HEPARIN (GREEN) 	Blood Volume: 4mls Note: INVERT tube GENTLY 8-10 times after collection.	HAEMATOLOGY: Chromosome Study for haematological malignancy (FISH, Karyotyping)
8. EDTA (PURPLE) 	Blood Volume: 3mls *Ammonia: Adult (2.5mls), paed (1mls), (in ice bath). *Immunophenotyping, Molecular Analysis: 2 tubes (5ml) *HIV RNA Viral load(PCR): 2 tubes (2.5mls in each) *Antibody Identification, Isohemagglutinin test, Anti D titre, Cold Agglutinin titre, Platelet antibody test: 2 tubes Note: INVERT tube GENTLY 8-10 times after collection.	TRANSFUSION MEDICINE: Blood Grouping-ABO & Rh(D), Antibody Screening/ Identification, Coomb's Test, GSH, Red Cell Phenotyping, Anti-D Titre, GXM, Transfusion Reaction Investigation, Isohemagglutinin, Platelet Antibody Test, Cold Agglutinin Titre. HAEMATOLOGY: FBC, Retic count, FBP, Hb Analysis, Immunophenotyping, CD4/CD8, G6PD Assay, Molecular Analysis, Kleihauer Test. BIOCHEMISTRY: Glycated Hb (HbA1C), Ammonia, Blood Ketone, iPTH. TDM: Tacrolimus & Cyclosporin SEROLOGY: HIV RNA Viral load (PCR)
9. Fluoride Oxalate (GREY) 	Blood Volume: Glucose: Random(2.5ml), Fasting(2.5ml) Note: INVERT tube GENTLY 8-10 times after collection.	BIOCHEMISTRY: Glucose, Glucose Tolerance Test, Lactate (in cold chain).

NOTE: Always label tubes with patient's full name, IC, date & time of collection.
 **For further information on certain tests, kindly refer to the Pathology Service Handbook.

LIST OF REJECTION CRITERIA

No	Code	Rejection criteria
1	CLOT	Blood clotted
2	LYSE	Blood hemolysed
3	CONT	Contaminated specimen
4	DDOR	Duplicate order
5	IINF	Incomplete information
6	XRAT	Incorrect ratio to anticoagulant
7	INSF	Insufficient sample
8	IT	IT Testing Purpose Only
9	LBC	LBC Specimen not accompanied with brush
10	LTRI	Less than recommended test interval
11	LIPE	Lipaemic blood received
12	MA	Microcytic Anaemia
13	NCI	No Clinical Indication
14	NISL	No initial on sticker label
15	NLAB	No label
16	NPP	No Pathologists Approval
17	N2ND	No Second Verifier
18	XSSS	No specialist signature & Official Stamp

No	Code	Rejection criteria
19	NSPE	No specimen
20	NR2X	Not reportable > than 2x due to Hb variant
21	CBD	Order is cancelled by doctor
22	DTLS	Patient details/container label differ
23	PSME	Poor Smear
24	RPS	Rejected by performing site
25	LEAK	Specimen leakage/broken/spill
26	SM	Specimen merged
27	SNF	Specimen not accompanied with form
28	NICE	Specimen not in ice
29	NST	Specimen not suitable for test
30	SMB	Specimen with more than one barcode
31	TCS	Test is not indicated for cancer screening
32	NTES	Test request is not stated
33	NOFD	Test requested not offered
34	TSUS	Test temporary suspended
35	UCUL	Unsuitable sample for culture
36	XCON	Wrong container
37	XODR	Wrong order
38	WOL	Wrong ordered by lab
39	XMED	Wrong transport medium

GUIDELINES FOR SPECIMEN TRANSPORTATION AND PACKAGING THROUGH PNEUMATIC TUBES

INTRODUCTION

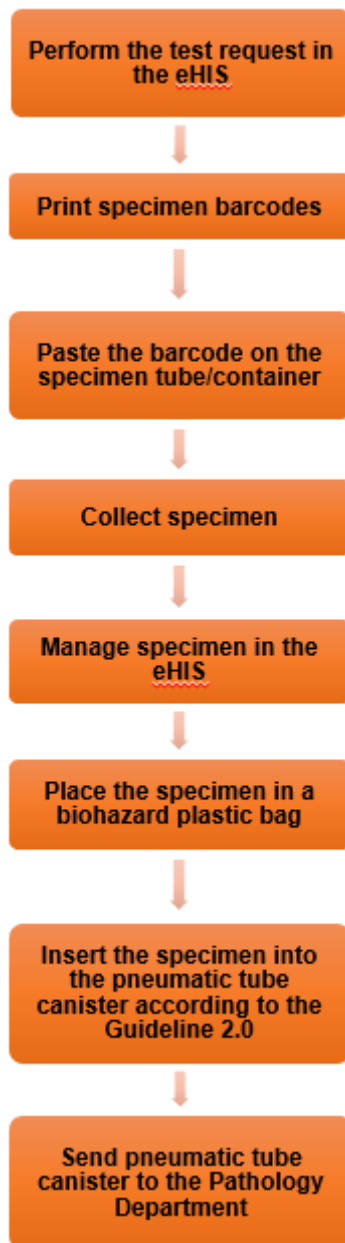
These guidelines aim to guide how to transport and package patient specimens via pneumatic tubes properly. Transporting specimens using a pneumatic tube system is one of the alternative methods of transporting specimens to achieve the following goals:

- Reducing pre-analytical errors in test results
- Reducing the time it takes to transport specimens to the Pathology Department; and
- Improving the quality of pathology diagnostic services at Hospital Sultan Idris Shah, Serdang.

Good cooperation between the client and the Pathology Department is essential to achieving these goals. The client is responsible for transporting specimens using the correct packaging method as explained in these guidelines.

The Pathology Department requests cooperation to comply with these guidelines in ensuring that test results are correct and accurate in order to ensure that the right treatment is provided to patients.

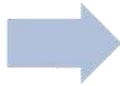
1.0 GUIDELINE FOR SPECIMEN MANAGEMENT AND PACKAGING USING PNEUMATIC TUBE



2.0 GUIDE TO INSERTING SPECIMENS INTO THE CANISTER FOR PNEUMATIC TUBE SYSTEM



Use a canister that is reserved for specimen delivery only



Place sponge into the bottom of the pneumatic tube canister.



Insert the specimen that has been wrapped in biohazard plastic into the canister horizontally to the bottom of the canister.



The canister is ready to be sent to the Pathology Department via the pneumatic tube system.



Insert another piece of sponge until there is no room for the specimen to move* during delivery



Insert the specimen delivery record slip (if any) into the canister along with the specimen.

NOTE*

- Strong movement inside the canister can cause hemolysis of the blood.
- Specimens that experience hemolysis will be rejected as it interferes with the test results.

3.0 EXAMPLES OF INCORRECT USE OF PNEUMATIC TUBE CANISTER



Specimen not placed in biohazard plastic



Putting sponge at one end only in the canister



Using the wrong canister
(example: document
canister)

4.0 LIST OF SPECIMENS THAT ARE ACCEPTED AND NOT ACCEPTED VIA PNEUMATIC TUBE SYSTEM

ACCEPTED	NOT ACCEPTED
● All blood specimens in vacutainer tubes such as plain tube, EDTA, heparin tube, glucose tube. ● Specimens for GSH and GXM (for non-urgent cases only) ● Swab (in amies transport medium)	● Urine specimens ● Body fluid specimens such as CSF ● Stool specimens ● Bone Marrow aspirate ● Blood & Urine for culture & sensitivity ● Glass slides (BFMP/filarial/smear) ● Swab in viral transport media ● Specimens for cytology tests ● Tissue specimens for histopathology tests (HPE) ● Used blood bags ● Specimens that need to be shipped with ice ● Specimens that need to be shipped in specific conditions (e.g., 37 degrees Celsius) ● Specimens that are shipped with needles/syringes

COMMON FACTORS AFFECTING TEST RESULTS

There are many factors that may cause an interference in the performance of a test including physiological aspects such as age and sex of the patient, whether patient is supine or erect, fasting or non- fasting. In general reference ranges will allow for these factors. Table below indicates some common analytical factors which cause an interference, but the list is by no means exhaustive.

Factors	Precautions
Haemolysis	Avoid shaking blood tubes which may cause trauma to the red cells (for tube containing anti-coagulant, gently invert the tubes 3 times immediately on collection). Never inject a syringe needle into the vacutainer to empty the syringe. Avoid extremes of temperature. Hemolysis badly affects potassium, folate , bilirubin, AST, ALT, LDH CK, Mg and PO4.
Contamination	Avoid taking blood from the arm where an IV infusions has been set up, which can cause a dilution effect on most analytes. Depending on the composition of IV or solution infused, it may increase glucose, sodium, chloride and potassium levels. Avoid decanting blood from one tube to another. Tubes contained K2 EDTA preservative must be filled up after Serum Separator Tubes (SST) to avoid EDTA chelation effects on chemistry analytes such as calcium, falsely high potassium due to K2 (potassium) content and inhibition of alkaline phosphatase (ALP).
Venous constriction	Avoid tourniquet where possible or at least apply it as brief as possible. Venous constriction can badly affect calcium , lactate, electrolytes and proteins.
Delayed sample processing (>4 hours)	Delay in sample processing; delayed centrifugation or delayed in keeping the sample in the ideal storage condition can cause significant changes in analyte concentration. The most commonly affected analytes are potassium, but others could also be affected.
Icterus	Icterus can badly affect creatinine, cholesterol, ammonia and triglycerides
Lipemia	Lipemia can affect sodium, ammonia, ALT, AST and Salicylate
Drugs	It is not possible to list all the drugs that may interfere with analytes analysis. Advice can be obtained from Clinical laboratory staff if required.
Incorrect tube/container used	Please ensure the correct sample collection tubes/ container is used for intended test ordered.

LIST OF TESTS



LIST OF TESTS

Scan QR code to access the list of tests on the website



CHEMICAL
PATHOLOGY



ANATOMIC
PATHOLOGY



HAEMATOLOGY



TRANSFUSION
MEDICINE



MEDICAL
MICROBIOLOGY

CHEMICAL PATHOLOGY TEST

1.1 IN HOUSE TEST

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
1	Acetaminophen	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	1 hour	
2	Alpha Feto-Protein (AFP)	Blood	Plain Gel Tube only (for both adult and paed)	Working days	Hospital Sultan Idris Shah, Serdang	3 working days	Serum sample instead of plasma for pediatric patients
3	Amikacin, Peak	Blood	Plain gel tube, 3ml Heparin tube (paed)	Working days	Hospital Sultan Idris Shah, Serdang	1 working day	
4	Amikacin, Random	Blood	Plain gel tube, 3 ml Heparin tube (paed)	Working days	Hospital Sultan Idris Shah, Serdang	1 working day	
5	Amikacin, Trough	Blood	Plain gel tube, 3 ml Heparin tube (paed)	Working days	Hospital Sultan Idris Shah, Serdang	1 working day	
6	Ammonia	Blood	EDTA, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	1 hour	Send in ice to lab immediately
7	Amylase	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
8	Amylase, urine (Diastase)	Urine, Random	Universal container, 10 ml	Working days	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	
9	B 12, Vitamin	Blood	Plain gel tube, 3 mL	Working days	Hospital Sultan Idris Shah, Serdang	3 working days	
10	Beta Human Chorionic Gonadotropin	Blood	Plain Gel Tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 2 hours Routine :3 hours	
11	Bilirubin Total and Direct, neonates	Blood	Plain gel tube, 1.0 ml (pediatric tube)	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	
12	Bilirubin, Total and Direct	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	
13	Body Fluid (biochemistry)	Body fluid	Universal container, 10 ml	Working days	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	
14	Calcium, Magnesium, Phosphate (panel)	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	
15	Calcium, urine	Urine,	Random urine	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
16	Calcium,24hr Urine	Urine, 24 hours	24hr urine container	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
17	Cancer Antigen 125 (CA 125)	Blood	Plain Gel Tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	3 working days (in house) 5 working days (external sample)	
18	Cancer Antigen 19-9 (CA 19-9)	Blood	Plain Gel Tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	3 working days (in house) 5 working days (external sample)	
19	CAPD Adequacy of Dialysis	Urine and Blood	Universal container and Plain Gel Tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
20	Carbamazepine	Blood	Plain gel tube, 3 ml Heparin tube (paed)	Working days	Hospital Sultan Idris Shah, Serdang	1 working day	
21	Carcinoembryonic Antigen (CEA)	Blood	Plain Gel Tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	3 working days 5 working days (external sample)	
22	Chloride Dialysis Fluid	Dialysis Fluid	Universal container, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
23	Chloride, 24 hr Urine	Urine, 24 hours	24hr urine container	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
24	Chloride, urine	Urine, Random	Universal container, 10 ml	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
25	Cholesterol	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	Routine :3 hours	
26	Complement 3 (C3)	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	3 working days (in house) 5 working days (external sample)	
27	Complement 4 (C4)	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	3 working days (in house) 5 working days (external sample)	
28	Cortisol, 24 hr Urine	24 hours urine collection	24 hr Universal container	Working days	Hospital Sultan Idris Shah, Serdang	3 working days (in house) 5 working days (external sample)	
29	Cortisol, Mid-night	Mid night Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	3 working days (in house) 5 working days (external sample)	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
30	Cortisol, Morning	Early Morning Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	3 working days (in house) 5 working days (external sample)	
31	C-Reactive Protein (CRP)	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	3 hours	
32	Creatine Kinase	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	
33	Creatinine Clearance	Blood and 24 hours urine	Plain gel tube + 24hr urine container	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
34	Creatinine, 24 hr Urine	Urine, 24 hours	24hr urine container	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
35	Creatinine, urine	Urine,	Random urine	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
36	CSF Biochemistry (Chloride, Glucose and Total Protein)	CSF	Plain sterile container, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	1 hour	
37	Digoxin	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	1 working day	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
38	Electrolytes (Na, K, Cl.)	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	
39	Ferritin	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	3 working days (in house) 5 working days (external sample)	
40	Folate	Blood	Plain Gel Tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	3 working days (in house) 5 working days (external sample)	
41	Free PSA	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	3 working days (in house) 5 working days (external sample)	Offered only for Total PSA > 4 to 10 ng/ml, ordered by Pathologist
42	Gamma Glutamyl Transferase (GGT)	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	3 hours	
43	Gentamicin, Peak	Blood	Plain gel tube, 3 ml Heparin tube (paed)	Working days	Hospital Sultan Idris Shah, Serdang	1 working day	
44	Gentamicin, Random	Blood	Plain gel tube, 3 ml Heparin tube (paed)	Working days	Hospital Sultan Idris Shah, Serdang	1 working day	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
45	Gentamicin, Trough	Blood	Plain gel tube, 3 ml/ Heparin tube (paed)	Working days	Hospital Sultan Idris Shah, Serdang	1 working day	
46	Glucose	Blood	Sodium fluoride tube, 2ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	
47	Glucose, 2HPP	Blood	Sodium fluoride tube, 2 ml	24 hours	Hospital Sultan Idris Shah, Serdang	3 hours	
48	Glucose, body fluids	Body Fluids	Sodium fluoride tube, 2 ml	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
49	Glucose, Fasting	Blood	Sodium fluoride tube, 2 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	
50	Glucose, Post-dinner	Blood	Sodium fluoride tube, 2 ml	24 hours	Hospital Sultan Idris Shah, Serdang	3 hours	
51	Glucose, Pre-dinner	Blood	Sodium fluoride tube, 2 ml	24 hours	Hospital Sultan Idris Shah, Serdang	3 hours	
52	Glucose, Pre-lunch	Blood	Sodium fluoride tube, 2ml	24 hours	Hospital Sultan Idris Shah, Serdang	3 hours	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
53	Haemoglobin A1c (HbA1c)	Blood	EDTA tube, 3ml	Working days	Hospital Sultan Idris Shah, Serdang	5 working days (in house) 10 working days (external sample)	
54	High Dose Dexamethasone Suppression Test	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	3 working days (in house) 5 working days (external sample)	
55	Iron Profile (Iron, Transferrin & Transferrin saturation)	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	1 working days	
56	Lactate	Blood	Sodium fluoride tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	
57	Lactate Dehydrogenase (LDH)	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	
58	Lactate Dehydrogenase (LDH) – Fluid	Fluid	Plain sterile container, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
59	Lipid Profile (Cholesterol, HDL, LDL)	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	Routine :3 hours	
60	Lipid Profile, Fasting (Cholesterol, Triglycerides, HDL, LDL)	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	Routine :3 hours	
61	Liver Function Test Profile (Total Protein, Albumin, Globulin (calculated), Albumin: Globulin ratio, Alanine transaminase (ALT), Aspartate Aminotransferase (AST), Alkaline Phosphatase (ALP), Bilirubin Total	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	
62	Low-Dose Dexamethasone Suppression Test	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	3 working days	
63	Magnesium	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
64	Magnesium, 24H Urine	Urine, 24H	24hr urine container	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
65	Magnesium	Urine	Universal container, 10 ml	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
66	Microalbumin Urine	First- morning urine is preferred; random urine is acceptable if a first- morning urine is not available	Universal container, 5 ml urine	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
67	Overnight Low-Dose Dexamethasone Suppress	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	3 working days	
68	Occult Blood	Stool	Non-sterile container, ± 1 gram	Working days	Hospital Sultan Idris Shah, Serdang	1 working day	
69	Osmolality	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
70	Osmolality Urine	Urine, Random	Universal container, 10 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	
71	Pediatrics HbA1c	Blood	EDTA tube 3ml	Working days	Hospital Sultan Idris Shah, Serdang	5 working days	
72	Paraquat	Urine	Nonsterile container, 10 ml	24 hours	Hospital Sultan Idris Shah, Serdang	90 minutes	
73	Parathyroid Hormone (intact)	Blood	EDTA, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	3 working days	
74	Peritoneal Equilibrium Test (PET)	Peritoneal fluid (timed) and Blood	Universal container (10 ml) and Plain Gel Tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
75	pH, body fluids	Body Fluids	Universal container, 5 ml	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
76	Phenobarbital	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	1 working day	
77	Phenytoin (Dilantin)	Blood	Plain gel tube, 3 ml Heparin tube (paed)	Working days	Hospital Sultan Idris Shah, Serdang	1 working day	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
78	Phosphate Inorganic	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	
79	Phosphate Inorganic, 24hr Urine	24hr urine	24hr urine container	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
80	Phosphate Inorganic, Urine	Urine, 24 hours	24hr urine container	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
82	Potassium, 24hr Urine	24hour urine	24hr urine container	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
83	Potassium, Urine	Urine	Universal container, 5 ml urine	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
84	Procalcitonin	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	1 working day	
85	Prostate Specific Antigen (PSA) Total	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	3 working days	
86	Protein, body fluids	Body Fluids	Universal container, 2 ml	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
87	Protein, Total	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	
88	Protein, Urine (Total Protein), 24 hours	Urine, 24 hours	24hr urine container	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
89	Protein, Urine	Urine	Universal container, 10 ml	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
90	Protein/Creatinine Index	Urine, Random	Universal container, 5 ml	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
91	Renal Profile (Urea, Chloride, Sodium, Potassium, Creatinine, eGFR)	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	
92	Rheumatoid Factor	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	3 working days	
93	Salicylate	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	1 hour	
94	Sodium, 24hr Urine	Urine, 24hour	24hr urine container,	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
95	Sodium, Urine	Urine	Universal container, 5 ml	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
96	Synacthen (Cosyntropin) test, short	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	3 working days	
97	Thyroid Function Test (FT4/TSH) -Thyroxine, Free (FT4) & TSH	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
98	Thyroid Stimulating Hormone (Neonate)	Cord Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	48 hours	
99	Thyroid Stimulating Hormone (TSHA)	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
100	Tri-Iodothyronine, Free (FT3)	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	3 working days	Department only. Ordered by Pathologist
101	Troponin-I (High Sensitivity)	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 70 minutes Routine :3 hours	
102	Urea, Sodium, Potassium, Chloride (BUSE)	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
103	Urea Dialysis	Dialysate	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
104	Urea Post Haemodialysis	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
105	Urea Pre Haemodialysis	Blood	Plain gel tube, 3 ml	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
106	Urea, 24 hr Urine	Urine, 24 hours	24hr urine container	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
107	Urea, Urine	Urine	Non-sterile container, 10 ml	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
108	Uric Acid	Blood	Plain gel tube, 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	
109	Uric Acid, 24 hr Urine	Urine, 24 hours	24hr urine container	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	
110	Uric Acid, Urine	Urine	Non-sterile container, 10 ml	Working days	Hospital Sultan Idris Shah, Serdang	2 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
111	Urinalysis (Urine FEME)	Urine	Non-sterile container, 10 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	
112	Urine Pregnancy Test (UPT)	Urine	Urine container, 10 ml	24 hours	Hospital Sultan Idris Shah, Serdang	STAT: 1 hour Routine :3 hours	
113	Valproic acid	Blood	Plain gel tube, 3 ml Heparin tube (paed)	Working days	Hospital Sultan Idris Shah, Serdang	1 working day	
114	Vancomycin, Peak	Blood	Plain gel tube, 3 ml Heparin tube (paed)	Working days	Hospital Sultan Idris Shah, Serdang	1 working day	
115	Vancomycin, Random	Blood	Plain gel tube, 3 ml Heparin tube (paed)	Working days	Hospital Sultan Idris Shah, Serdang	1 working day	
116	Vancomycin, Trough	Blood	Plain gel tube, 3 ml Heparin tube (paed)	Working days	Hospital Sultan Idris Shah, Serdang	1 working day	

Note: Please use paediatric Lithium Heparin 0.6mL tube (green cap) for all Biochemistry tests except AFP (plain gel tube) for paediatric patients.

1.2 OUTSOURCE NON-MOLECULAR

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
1	24 Hr Urinary Metanephrine	24-hour Urine	24-hour urine container with 10ml 25% HCl	Working days	Institute Endocrine Hospital Putrajaya	30 working days	Please obtain the 24-hour urine container from Pathology Department (By appointment only). Please fill up the PER PAT301 form with specialist signature
2	24 Hr Urinary 5-hydroxyindolacetic acid (5-HIAA)	24-hour Urine	24-hour urine bottle with 10ml 25% HCl	Working days	Biochemistry Unit, IMR	21 working days	Please obtain the 24-hour urine container from Pathology Department (By appointment only). Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
3	Acid Alpha Glucosidase (POMPE)	Dried blood spot	3 circles of Dried Blood Spot (DBS), Whatman 903 Filter paper	Working days	Biochemistry Unit, IMR	14 working days	Properly dried at room temperature for 4hrs before putting in plastic bag. Transport at room temperature. Please fill up Biochemical Genetic Test Request Form; (available in Public Folder) P:\Borang\Patologi\Patologi Kimia

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
4	Acid Bile	Blood	Plain gel tube, 3 ml	Working days	Hospital Selayang	35 working days	Please fill up the PER PAT301 form with specialist signature
5	Adenosine Deaminase (ADA)	Pleural Fluid	Plain Tube without gel (Red Cap)	Working days	MKAK Sg Buloh	10 days	Please fill up Borang Permohonan Ujian Makmal (Spesimen Klinikal) MKAK-BPU-U01/Rev2018); available in Public Folder P:\Borang\Patologi\Patologi Kimia
6	Adrenocorticotrophic Hormone (ACTH)	Blood	EDTA tube, 3 ml	Working days	Chemical Pathology Unit, HKL	14 working days	Put in ice once blood drawn and send to the lab immediately packed with ice. Please Fill up the PER PAT 301 form
7	Alcohol (Ethanol)	Blood	Plain gel tube, 3 ml	Working days	Makmal Teras HKL	10 working days	Please fill up the TDM HKL form
8	Alcohol (Methanol)	Blood/ urine	Sodium Fluoride tube, 3 ml	Working days	MKAK Sungai Buloh	21 working days	Please fill up Borang Permohonan Ujian Makmal (Spesimen Klinikal) MKAK-BPU-U01/Rev2018); available in Public Folder P:\Borang\Patologi\Patologi Kimia
9	Alpha-1-Antitrypsin	Blood	Plain gel tube, 3 ml	Working days	Hospital Ampang	21 working days	Please fill up the PER PAT301 form
10	Alpha-1-Antitrypsin (Phenotyping)	Blood	Plain gel tube, 3 ml	Working days	Hospital Ampang	30 working days	Please fill up the PER PAT301 form

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
11	Amino Acid, CSF	Cerebrospinal fluid	Transport tube with screw cap, 1 ml	Working days	Makmal Genetik HTA	30 working days	Sample must be sent together with plasma Please fill up IEM Request Form (IMR/SDC/BC/FORM-RQ); available in Public Folder P:\Borang\Patologi\Patologi Kimia
12	Amino Acids, Plasma	Plasma	Heparin tube, 2 ml of plasma	Working days	Specialized Protein Unit, IMR	30 working days	Please fill up IEM Request Form (IMR/SDC/BC/FORM-RQ); available in Public Folder P:\Borang\Patologi\Patologi Kimia
13	Amino Acids, Urine	Random urine	Universal container, 2 ml urine	Working days	Specialized Protein Unit, IMR Makmal Genetik, Hospital Tunku Azizah	30 working days	For IMR, please consult Specialized Protein Unit, IMR for test request. Please state the person's name whom you spoken to on the request form. For WCH Please fill up IEM Request Form (IMR/SDC/BC/FORM-RQ) or IEM HTA@WCH; available in Public Folder P:\Borang\Patologi\Patologi Kimia
14	Panel Test - Anti- Glutamic Acid Decarboxylase (GAD) - Anti- Insulinoma Associated Antigen 2 (IA2) - Anti- Islet Cells (ICA)	Blood	Plain gel tube, 3 ml	Working days	Endocrine IMR	30 working days	Please fill up Endocrine Request Form 2024 with specialist signature; available in Public Folder P:\Borang\Patologi\Patologi Kimia

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
15	Anti- Mullerian Hormone (AMH)	Blood	Plain gel tube, 3 ml	Working days	Endocrine IMR	30 working days	Please fill up Endocrine Request Form 2024 with specialist signature; available in Public Folder P:\Borang\Patologi\Patologi Kimia
16	Arginosuccinic Acid, Urine ASA	Urine	Universal container, 2 ml	Working days	Biochemistry, IMR	21 working days	Please fill up IEM Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
17	Benzodiazepine	Blood	Plain gel tube, 3 ml	Working days	Chemical Pathology Unit, HKL	7 working days	Please Fill up TDM HKL form
18	Beta-2 Microglobulin	Blood	Plain gel tube, 3 ml	Working days	Hospital Ampang	21 working days	Please fill up the PER PAT301 form
19	Biogenic Amines, CSF	CSF	Transport tube with screw cap, 2 ml	Working days	Biochemistry, IMR	30 working days	2ml CSF in transport tube with screw cap obtained from lab. Send immediately to Lab.and cover from light. (easily destroyed by heat) Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
20	Biogenic Amines, Urine	Urine	Universal container, 2 ml	Working days	Biochemistry, IMR	21 working days	Cover from light. (easily destroyed by heat) Please fill Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
21	Biotinides Enzyme Activity	Dried blood spot	3 circles of Dried Blood Spot (DBS), Whatmann 903 Filter paper	Working days	Biochemistry, IMR	30 working days	Properly dried at room temperature for 4hrs before putting in plastic bag. Transport at room temperature. Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
22	Caeruloplasmin	Blood	Plain gel tube, 3 ml	Working days	Makmal Teras, HKL	14 working days	Please Fill up PER PAT 301 form
23	Carnitine Total and Free	Blood	Heparin Tube 2ml	Working days	Biochemistry Unit IMR	14 Working days	Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
24	Carnitine Urine, 24 Hour	Urine 24 Hour	24-hour Urine bottle	Working days	Biochemistry, IMR	14 Working days	Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
25	Cholinesterase	Blood	Plain gel tube, 3ml	Working days	Makmal Teras, HKL	5 working days	Please Fill up PER PAT 301 form
26	Combined Anterior Pituitary Function Test	Blood	Plain gel tube, 3 ml	Working days	Chemical Pathology Unit, HKL	21 working days	Please Fill up PER PAT 301 form with specialist signature
27	Copper	Blood	Plain tube without gel, 2 ml	Working days	Hospital Selayang	30 working days	2 ml plain tube without gel is required. Please obtain the tube from Makmal Patologi Kimia (ext: 1720/1722). Send immediately to the lab after collection. Please Fill up PER PAT 301 form with Specialist signature
28	Copper Urine, 24H	24 hours urine	24 hr Universal container	Working days	Hospital Selayang	35 working days	24 hr urine container is required. Please obtain the 24 hr urine container from Pathology department. Please Fill up PER PAT 301 form with Specialist signature
29	C-Peptide	Blood	Plain gel tube, 3 ml	Working days	Chemical Pathology Unit, HKL	30 working days	Please Fill up PER PAT301 form
30	Creatine & Guanidinoacetic Acid	Urine	Universal container, 2 ml	Working days	Biochemistry Unit, IMR	30 working days	Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
31	Creatine & Guanidinoacetic Acid	Dried blood spot	3 circles of Dried Blood Spot (DBS), Whatmann 903 Filter paper	Working days	Biochemistry Unit, IMR	21 working days	Properly dried at room temperature for 4hrs before putting in plastic bag. Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
32	Creatine & Guanidinoacetic Acid	Blood	EDTA/ Heparin, 1 ml	Working days	Biochemistry Unit, IMR	21 working days	Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
33	CSF Oligoclonal Band	Cerebrospinal fluid & Serum	Transport tube with screw cap and plain gel tube	Working days	Hospital Ampang	30 working days	CSF specimens should be collected with care to avoid blood contamination. Blood and CSF from the same patient must be collected at the same occasion within 4 hours and sent to the lab Please Fill up PERPAT 301 form
34	Cyclosporine, Random	Blood	EDTA tube, 3 ml	Working days	Makmal Teras, HKL	10 working days	Please fill up TDM Request Form, HKL; available in Public Folder P:\Borang\Patologi\Patologi Kimia
35	Cysteine & Homocysteine	Urine	Sterile Universal container, 2 ml	Working days	Biochemistry Unit, IMR	21 working days	Please fill up IEM Request Form Ver 7.0; available in Public Folder P:\Borang\Patologi\Patologi Kimia

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
36	CSF Pterins (CPTE)	Cerebro spinal fluid	Clean Universal bottle with preservative (DTE & EDTA) provided by Biochemistry Unit, IMR, 0.5 ml	Working days	Biochemistry Unit, IMR	30 working days	Obtain container from Biochemistry Unit, IMR Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
37	Dehydroepiandrosterone Sulphate (DHEAS)	Blood	Plain gel tube, 3 ml	Working days	Chemical Pathology Unit, HKL	30 working days	Please Fill up PER PAT 301 form
38	Delta Amino Levulinic Acids (Delta-ALA)	Urine (Random)	Universal container, 5 ml	Working days	Unit Protein Khas (SDC), IMR	30 working days	At least 2ml random urine in universal container. Send immediately to Lab. Please fill up Unit Protein Khas Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
39	Everolimus	Blood	EDTA tube, 3 ml	Working days	Makmal Dadah, HKL	7 working days	Please fill up HKL TDM Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
40	Free Light Chain	Blood	Plain gel tube, 3 ml	Working days	Hospital Ampang	20 working days	Please Fill up PER PAT 301 form
41	Fructosamine	Blood	Plain gel tube, 3 ml	Working days	Hospital Ampang	20 working days	Please Fill up PER PAT 301 form
42	Follicle Stimulating Hormone, (FSH)	Blood	Plain gel tube, 3 ml	Working days	Makmal Teras, HKL	20 working days	Please Fill up PER PAT 301 form

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
43	Galactosemia screening	Dried blood spot	Whatman 903 Filter paper	Working days	Biochemistry Unit, IMR	30 working days	Properly dried at room temperature for 4hrs before putting in plastic bag. Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
44	Gonadotropin Releasing Hormone Stimulation	Blood	Plain gel tube,	Working days	Makmal Teras, HKL	30 working days	Please Fill up PERPAT 301 form
45	Growth Hormone (Somatotrophin)	Blood	Plain gel tube, 3 ml	Working days	Chemical Pathology Unit, HKL	30 working days	Please Fill up PERPAT 301 form
46	Haptoglobin	Blood	Plain gel tube, 3 ml	Working days	Chemical Pathology Unit, HKL	30 working days	Please Fill up PERPAT 301 form
47	Homocysteine Total, Plasma	Blood	EDTA, 2 ml	Working days	Biochemistry Unit, IMR	30 working days	Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
48	IEM Screening, Blood Spot	Dried blood spot	3 circles of Dried Blood Spot (DBS), Whatmann 903 Filter paper	Working days	Makmal Genetik, Hospital Tunku Azizah	15 working days	Properly dried at room temperature for 4hrs before putting in plastic bag. Please fill up HTA or WCH Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
49	IgA	Blood	Plain gel tube, 3 ml	Working days	Hospital Ampang	21 working days	Please Fill up PERPAT 301 form
50	IgG	Blood	Plain gel tube, 3 ml	Working days	Hospital Ampang	21 working days	Please Fill up PERPAT 301 form
51	IgM	Blood	Plain gel tube, 3 ml	Working days	Hospital Ampang	21 working days	Please Fill up PERPAT 301 form
52	Insulin	Blood	Plain gel tube, 3 ml	Working days	Chemical Pathology Unit, HKL	30 working days	Please Fill up PERPAT 301 form
53	Insulin Auto Antibodies (IAA)	Blood	Plain gel tube, 3 ml	Working days	Endocrine IMR	30 working days	Please fill up Endocrine Request Form with specialist signature; available in Public Folder P:\Borang\Patologi\Patologi Kimia
54	Insulin-like Growth Factor, 1	Blood	Plain gel tube, 3 ml	Working days	Institut Endocrine, Hospital Putrajaya	35 working days	Please Fill up PERPAT 301 form with Specialist signature
55	Insulin Stress Test	Blood	Plain gel tube, sodium fluoride tube	Working days	Chemical Pathology Unit, HKL	30 working days	Please Fill up PERPAT 301 form
56	Insulin Tolerance Test	Blood	Plain gel tube, sodium fluoride tube	Working days	Chemical Pathology Unit, HKL	30 working days	Please Fill up PERPAT 301 form
57	Lead	Blood	EDTA Tube	Working days	Hospital Selayang	30 working days	Please Fill up PERPAT 301 form with Specialist signature

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
58	Lithium	Blood	Plain gel tube, 3 ml	Working days	Makmal Teras, HKL	10 working days	Please Fill up HKL TDM Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
59	Luteinizing Hormone (LH)	Blood	Plain gel tube, 3 ml	Working days	Makmal Teras, HKL	20 working days	Please Fill up PERPAT 301 form
60	Lysine Metabolism Profile (P6C)	Urine	Universal container, 2 ml urine	Working days	Biochemistry Unit, IMR	30 working days	Please fill up Biochemical Genetic Test Request Form; (available in Public Folder) P:\Borang\Patologi\Patologi Kimia
61	Lysosomal Storage Disease Enzyme Assays (Panel test) - α -mannosidase (AMAN) - β -Mannosidosis (BMAN) - Acid Sphingomyelinase (ASM) - Ceroid Lipofuscinosis – (PPT) - Fabry Disease (AGAL) - Fucosidosis (AFUC) - Gaucher Disease (BGLU) - General LSD Marker Chitotriosidase (CHITO) - GM1-Gangliosidosis (BGAL) - Krabbe Disease (GALC) - Leukodystrophy (ASA) - Mucopolipidosis (AMANP) - Niemann Pick A/B (ASM) - Schindler Disease (ANAG) - Tay-Sachs Disease (MUGS)	Whole blood	EDTA tube, 6ml	Working days	Biochemistry, IMR	60 working days	Please choose not more than two diseases of enzyme in the request form. Test need consultation by geneticist. Please state the name whom you referred to upon requesting the test on the request form. Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
62	Methotrexate (MTX)	Blood	Plain gel tube, 3 ml	Working days	Makmal Biokimia Hospital Tunku Azizah (WCH), HKL	10 working days	Please Fill up HKL TDM Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
63	Mucopolysaccharides (GAGs / HRE)	Urine (First morning)	Sterile Universal container, 5 ml	Working days	Biochemistry Unit, IMR	21 working days	5 ml first morning urine in universal container. Send immediately to the lab. Please fill Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
64	Mucopolysaccharidoses Enzyme Assay i. MPS type I ii. MPS type II iii. MPS type IIIA iv. MPS type IIIB v. MPS type IVA vi. MPS type IVB vii. MPS type VII viii. MPS type Multiple Sulfatase (Only choose not more than two diseases of enzyme in the request form)	Whole blood	EDTA, 6ml	Working days	Biochemistry Unit, IMR	40 working days	Send whole blood immediately to the lab after sample collection. Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
65	Mycophenolic Acid (MPA)	Blood	EDTA tube, 3 ml	Working days	Chemical Pathology Unit, HKL	10 working days	Please fill up HKL TDM Request Form; available in Public Folder) P:\Borang\Patologi\Patologi Kimia

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
66	Myoglobin urine	Urine (random)	Universal bottle, 5 ml	Working days	Hospital Ampang	10 working days	Please fill up PERPAT301 Request Form with specialist signature
67	Oestradiol	Blood	Plain gel tube, 3 ml	Working days	Makmal Teras, HKL	20 working days	Please Fill up PERPAT 301 form
68	Oligosaccharide (OLIGO), urine	Urine (First morning)	Universal bottle, 5 ml	Working days	Biochemistry Unit, IMR	30 working days	5 ml first morning urine in universal container. Send immediately to the lab. Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
69	Organic Acid (POA) - Forensic Only	Blood	EDTA/ Heparin, 1 ml	Working days	Biochemistry Unit, IMR	21 working days	To consult Biochemistry Unit IMR. Please state the person's name whom you spoken to upon requesting the test on request form. Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
70	Organic Acid (POA) - Forensic Only	Vitreous Humour	Universal bottle, 2 ml	Working days	Biochemistry Unit, IMR	21 working days	To consult Biochemistry Unit IMR. Please state the person's name whom you spoken to upon requesting the test on request form. Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
71	Organic Acid (UOA)	Urine	Universal container, 5 ml	Working days	Makmal Genetik, Hospital Tunku Azizah	10 working days	At least 2ml urine in sterile container. Random urine is required. Send immediately to lab. Please fill up HTA or WCH IEM Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
72	Orotic Acid (ORO)	Urine	Universal container, 5 ml	Working days	Biochemistry Unit, IMR	10 working days	At least 2ml urine in sterile container. Random (morning) urine is required. Send immediately to lab. Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
73	Peroxisomal Disorder Profile (VLCFA, phytanic, Pristanic)	Plasma/ Serum	EDTA/ Heparin/ Plain tube 1ml	Working days	Biochemistry Unit, IMR	20 Working days	Please fill up IEM Request Form (IMR/SDC/BC/FORM-RQ); available in Public Folder P:\Borang\Patologi\Patologi Kimia
74	Pipecolic acid	Blood	Heparin tube, 2 ml	Working days	Unit Protein Khas, IMR	30 working days	Please fill up Unit Protein Khas (SDC) Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
75	Porphyria Profile	Urine (Random)	Clean Universal bottle, 5 ml urine	Working days	Biochemistry Unit, IMR	30 working days	Protect from light. Porphobilinogen and porphyrin easily destroyed by light Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
76	Progesterone	Blood	Plain gel tube, 3ml	Working days	Makmal Teras, HKL	20 working days	Please fill up PERPAT301 Request Form
77	Progesterone, 17 Hydroxy	Blood	Plain gel tube, 3ml	Working days	Institute Endocrine Hospital Putrajaya	21 working days	Please Fill up PERPAT 301 form with Specialist signature
78	Prolactin	Blood	Plain gel tube, 3ml	Working days	Makmal Teras, HKL	20 working days	Please Fill up PERPAT 301 form with Specialist signature

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
79	Protein, Electrophoresis Serum	Serum	Plain tube, 3ml	Working days	Hospital Ampang	30 working days	Please fill up PERPAT301 Request Form
80	Protein, Electrophoresis, 24hr Urine (paired serum & urine)	Serum, Urine	Plain tube & Universal container, 5ml	Working days	Hospital Ampang	30 working days	Send in pair, serum & urine. Urine from the same patient must be collected at the same occasion within 4hours. Please Fill up PERPAT 301
81	Pterins, Urine	Random urine	Universal bottle, 2 ml	Working days	Biochemistry Unit, IMR	30 working days	2ml random urine in universal container. Send immediately to Lab. Cover from light (Pterins easily destroyed by heat and light) Please fill Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
82	Renin	Blood	EDTA tube, 3ml	Working days	Institute Endocrine Hospital Putrajaya	21 working days	Send Blood 3ml in EDTA tube. Blood sample should be sent to the Lab immediately. Please fill up PERPAT301 Request Form with specialist signature

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
83	Renin and Aldosterone Supine	Blood	EDTA tube, 3 ml	Working days	Institute Endocrine Hospital Putrajaya	30 working days	Send Blood 3ml in EDTA tube. Blood sample should be sent to the Lab immediately. Please fill up PERPAT301 Request Form with specialist signature
84	Renin and Aldosterone Upright	Blood	EDTA tube, 3 ml	Working days	Institute Endocrine Hospital Putrajaya	30 working days	Send Blood 3ml in EDTA tube. Blood sample should be sent to the Lab immediately Please fill up PERPAT 301 Request Form with specialist signature.
85	Saline Suppression Test (SST)	Blood	EDTA tube, 3 ml	Working days	Institute Endocrine Hospital Putrajaya	30 working days	Please fill up PERPAT301 Request Form with specialist signature
86	Sialic Acid (Total & Free)	Urine (First Morning)	Universal bottle, 5 ml	Working days	Biochemistry Unit, IMR	30 working days	5ml First Morning Urine in universal container. Send immediately to Lab Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi
87	Sirolimus	Blood	EDTA Tube, 3 ml	Working days	Hospital Tunku Azizah (WCH), HKL	5 working days	Please fill in HKL TDM Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
88	S-sulphocysteine urine	Urine (random)	Universal bottle, 5 ml	Working days	Unit Protein Khas, IMR	30 working days	5 ml random urine in universal container. Send immediately to Lab Please fill up Unit Protein Khas (SDC) Request Form; available in Public Folder, P:\Borang\Patologi\Patologi Kimia
89	Succinylacetone	Urine (random)	Universal bottle, 5 ml	Working days	Biochemistry Unit, IMR	30 working days	At least 1ml random urine in sterile bottle Specimen should be protected from light Please fill up IEM Request Form (IMR/SDC/BC/FORM-RQ); available in Public Folder P:\Borang\Patologi\Patologi Kimia
90	Sugar & Polyols	Urine (random)	Universal bottle, 5 ml	Working days	Biochemistry Unit, IMR	30 working days	Specimen should be protected from light Please fill up Biochemical Genetic Test Request Form; available in Public Folder P:\Borang\Patologi\Patologi

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
91	Tacrolimus	Blood	EDTA tube, 3 ml	Working days	Makmal Teras, HKL	7 working days	Please fill up HKL TDM Request Form; available in Public Folder, P:\Borang\Patologi\Patologi Kimia
92	Testosterone	Blood	Plain gel tube, 3 ml	Working days	Makmal Teras, HKL	20 working days	Please Fill up PERPAT 301 form
93	Thiamine	Blood	EDTA tube, 3 ml	Working days	MKAK	30 working days	Please fill up Borang Permohonan Ujian Makmal (Spesimen Klinikal) MKAK-BPU-U01/Rev2018); available in Public Folder P:\Borang\Patologi\Patologi Kimia
94	Theophylline	Blood	Plain gel tube, 3 ml	Working days	Makmal Teras, HKL	7 working days	Please fill up HKL TDM Request Form; available in Public Folder P:\Borang\Patologi\Patologi Kimia
95	Thyroglobulin	Blood	Plain gel tube, 3 ml	Working days	Chemical Pathology Unit, HKL	30 working days	Please fill up PERPAT301 Request Form
96	Thyroid -specific Peroxidase Antibody (Anti-TPO)	Blood	Plain gel tube, 3 ml	Working days	Hospital Selayang	30 working days	Please fill up PERPAT 301 Request Form
97	Thyroglobulin Antibody (Anti-Tg)	Blood	Plain gel tube, 3 ml	Working days	Hospital Selayang	30 working days	Please fill up PERPAT 301 Request Form

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
98	Thyroid Stimulating Hormone Receptor Antibody (Anti-TSHR)	Blood	Plain gel tube, 3 ml	Working days	Chemical Pathology Unit, HKL	21 working days	Please fill up PERPAT 301 Request Form with specialist signature
99	Total 25 Hydroxy Vitamin D	Blood	Plain gel tube, 3 ml	Working days	Institute Endocrine Hospital Putrajaya	35 working days	Please fill up PERPAT301 Request Form with specialist signature
100	Toxicology	Blood	Potassium Oxalate tube, 3 ml	Working days	Jabatan Kimia	60 working days	Please Fill up Borang Jabatan Kimia (Kimia 15-Pin. 1/2004) available in Public Folder P:\Borang\Patologi\Patologi Kimia
101	Toxicology	Urine	Potassium Oxalate tube, 3 ml	Working days	Jabatan Kimia	60 working days	Please Fill up Borang Jabatan Kimia (Kimia 15-Pin. 1/2004) available in Public Folder P:\Borang\Patologi\Patologi Kimia
102	Tryptase (Forensic)	Blood	Plain gel tube, 3 ml	Working days	Allergy Unit, IMR - NIH	21 working days	Tryptase test: Within 15 min up to 24 hr after onset of allergic symptoms Please fill up Allergy Request Form (IMR/AIRC/Allergy/RF) available in Public Folder P:\Borang\Patologi\Patologi Kimia
103	Tryptase (Anaphylaxis) 15 minutes	Blood	Plain gel tube, 3 ml	Working days	Allergy Unit, IMR - NIH	14 working days	Tryptase test after anaphylaxis: 1st sample within 15 min up to 3 hrs after onset of symptoms Please fill up 'Allergy Request Form' (Awam(P):\Borang\Patologi\Patologi Kimia)

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
104	Tryptase (Anaphylaxis) 24-48 Hrs	Blood	Plain gel tube, 3 ml	Working days	Allergy Unit, IMR - NIH	14 working days	2nd sample after 24-48 hrs to confirm return to baseline levels. Please fill up 'Allergy Request Form' (Awam(P):\Borang\Patologi\Patologi Kimia)
105	Tryptase (Anaphylaxis) 1-2 weeks	Blood	Plain gel tube, 3 ml	Working days	Allergy Unit, IMR - NIH	14 working days	3rd sample after 1-2 wks. if incidents of mastocytosis or other causes of elevated basal levels are suspected Please fill up 'Allergy Request Form' (Awam(P):\Borang\Patologi\Patologi Kimia)
106	Urine Delta Aminolaevulinic Acid (ALA)	Random Urine	Universal container, 5 ml	Working days	Biochemistry Unit, IMR	21 working days	At least 2ml of random urine in universal container Protect from light, D-ALA easily destroyed by light Please fill in IEM Request Form (IMR/SDC/BC/FORM-RQ); (available in Public Folder) P:\Borang\Patologi\Patologi Kimia

1.3 OUTSOURCE MOLECULAR

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
1	Acute Intermittent Porphyrin-Panel (HMBS Sequence Analysis / Deletion/Duplication Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	21 working days	By Consultation Only Request Form for Molecular Diagnostic Services (IMR/SDC/UMD/Request Form) available in Public Folder) P:\Borang\Patologi\Patologi Kimia
2	Alagille Syndrome Alagille Syndrome (JAG1)-Deletion/Duplication	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
3	Alagille Syndrome (JAG1)-Sequencing	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
4	Alexander Disease (GFAP)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
5	Alpha 1-Antitrypsin Deficiency (SERPINA 1 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
6	Angelman Syndrome (SNRPN)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
7	Angelman Syndrome (UBE3A) – Sequencing	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
8	Angelman Syndrome (uniparental disomy/imprinting defect) - FOR GOVERNMENT HOSPITALS ONLY (COMPULSORY TO SEND PROBAND AND BOTH BIOLOGICAL PARENTAL SAMPLES)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	By Consultation Only Request Form for Molecular Diagnostic Services (IMR/SDC/UMD/Request Form) available in Public Folder) P:\Borang\Patologi\Patologi Kimia *Please fill up Borang Permohonan Ujian Genetik HTA/PAT/GEN/PK-01-02. (available in Public Folder) P:\Borang\Patologi\Patologi Kimia
9	Arginosuccinate Lyase Deficiency (ASL Sequence analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
10	Arginosuccinate Synthase Deficiency (ASS1 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
11	Aromatic Amino Acid Decarboxylase Deficiency (DDC sequence analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
12	Barth Syndrome (TAZ sequence analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
13	*Becker Muscular Dystrophy	Blood	2 EDTA Tubes, 3 ml each	Working days	Genetic Lab Hospital Tunku Azizah (HTA)	30 working days	
14	*Beckmann-Wiedemann Syndrome	Blood	2 EDTA Tubes, 3 ml each	Working days	Genetic Lab Hospital Tunku Azizah (HTA)	30 working days	
15	Berardinelli Congenital Lipodystrophy (AGPAT2)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
16	Berardinelli Congenital Lipodystrophy (BSCL2)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	By Consultation Only Request Form for Molecular Diagnostic Services (IMR/SDC/UMD/Request Form) available in Public Folder) P:\Borang\Patologi\Patologi Kimia *Please fill up Borang Permohonan Ujian Genetik HTA/PAT/GEN/PK-01-02. (Available in Public Folder) P:\Borang\Patologi\Patologi Kimia
17	Biotinidase Deficiency (BTD Sequence Analysis)	Blood	1-2x2.5ml Blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
18	*Breast/Ovarian Cancer Gene Panel	Blood	2 EDTA Tubes, 3 ml each	Working days	Genetic Lab Hospital Tunku Azizah (HTA)	30 working days	
19	Canavan Disease (ASPA Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
20	Carbamoyl Phosphate Synthetase 1 (CPS1) Deficiency (CPS1 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
21	Carnitine Palmitoyltransferase 1 (CPT1) Deficiency (CPT1A Sequence Analysis))	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
22	Carnitine Palmitoyltransferase 2 Deficiency (CPT2 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
23	Carnitine Uptake Deficiency (OCTN2 Sequence Analysis)	Blood	EDTA tube	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
24	Carnitine-Acylcarnitine Translocase Deficiency (SLC25A20 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
25	Cartilage Hair Hypoplasia (CHH) (RMRP Sequence Analysis)	Blood	EDTA tube	Working days	Molecular Diagnostic & Protein, IMR	90 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
26	*CGH Microarray	Blood	2 EDTA Tubes, 3 ml each	Working days	Genetic Lab Hospital Tunku Azizah (HTA)	30 working days	By Consultation Only Request Form for Molecular Diagnostic Services (IMR/SDC/UMD/Request Form) available in Public Folder) P:\Borang\Patologi\Patologi Kimia *Please fill up Borang Permohonan Ujian Genetik HTA/PAT/GEN/PK-01-02. (Available in Public Folder) P:\Borang\Patologi\Patologi Kimia
27	Cerebral Autosomal Dominant Arteriopathy with Subcortical Infarcts and Leukoencephalopathy (CADASIL) - NOTCH3 gene sequence Cerebral	Blood	EDTA tube	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
28	Citrin Deficiency (Type II Citrullinemia) (SLC25A13 Sequence Analysis) Citrulinemia (SLC25A13 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
29	Classical Galactosemia (GALT Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein	90 working days	
30	Classical Homocystinuria (CBS Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein	90 working days	
31	*Colorectal/Gastric Cancer Gene Panel	Blood	2 EDTA Tubes, 3 ml each	Working days	Genetic Lab Hospital Tunku Azizah (HTA)	30 working days	
32	Cystinuria (SLC 3A1 Sequence analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein	90 working days	
33	Dihydropyrimidinase (DHP) Deficiency (DPYS Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein	90 working days	
34	DNA Extraction and Storage	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostics Lab, IMR	90 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
35	*Duchenne Muscular Dystrophy	Blood	EDTA Tube, 6 ml	Working days	Genetic Lab Hospital Tunku Azizah (HTA)	30 working days	By Consultation Only Request Form for Molecular Diagnostic Services (IMR/SDC/UMD/Request Form) available in Public Folder) P:\Borang\Patologi\Patologi Kimia *Please fill up Borang Permohonan Ujian Genetik HTA/PAT/GEN/PK-01-02. (Available in Public Folder) P:\Borang\Patologi\Patologi Kimia
36	*EGFR Mutation Testing	Blood	2 EDTA Tubes, 3 ml each	Working days	Genetic Lab Hospital Tunku Azizah (HTA)	30 working days	
37	Ethylmalonic Encephalopathy (ETHE1 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
38	FGFR2-Related Disorders (FGFR2 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	60 working days	
39	FGFR3-Related Disorders (FGFR3 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	60 working days	
40	Floating -Harbor Syndrome (FHS) - SRCAP gene sequence	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
41	Fragile X Syndrome (FRAXA) - Expansion of CGG repeats of FMR1 gene	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	60 working days	
42	Friedreich Ataxia (FRDA), Expansion of GAA repeats of FXN gene	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
43	Fructose-1,6-Bisphosphatase Deficiency (FBP1 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
44	Fucosidosis (FUCA1 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
45	Galactokinase Deficiency (GALK1 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	By Consultation Only Request Form for Molecular Diagnostic Services (IMR/SDC/UMD/Request Form) available in Public Folder) P:\Borang\Patologi\Patologi Kimia
46	Galactose Epimerase Deficiency (GALE Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
47	Galactose Epimerase Deficiency (GALE Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
48	Gaucher Disease (GBA Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
49	Glutaric Aciduria Type 1 (SLC37A4 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
50	Glycogen Storage Disease Type 1a (G6PC Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
51	(SLC37A4 Sequence Analysis) Glycogen Storage Disease Type 1b	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
52	Glycogen Storage Disease Type III (AGL Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
53	Hereditary Orotic Aciduria (UMPS Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	By Consultation Only Request Form for Molecular Diagnostic Services (IMR/SDC/UMD/Request Form) available in Public Folder) P:\Borang\Patologi\Patologi Kimia *Please fill up Borang Permohonan Ujian Genetik HTA/PAT/GEN/PK-01-02. (Available in Public Folder) P:\Borang\Patologi\Patologi Kimia
54	Hypophosphatasia (ALPL Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots, 3 ml	Working days	Molecular Diagnostics Lab, IMR	90 working days	
55	Kennedy Disease, Expansion of CAG repeats in exon 1 of AR gene	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
56	*KRAS Mutation Testing	Blood	2 EDTA Tubes, 3 ml each	Working days	Genetic Lab Hospital Tunku Azizah (HTA)	30 working days	
57	Leber Hereditary Optic Neuropathy (LHON) - Panel (m.3460G>A, m.11778G>A, m.14459G>A and m.14484T>C Sequence Analysis) Leber Hereditary Optic Neuropathy (LHON)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
58	Leigh Syndrome - 8993 Hotspot (mt-ATP6 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	30 working days	
59	Leigh Syndrome – Full Panel (MT-ATP6, MT-TL1, MT-TK, MT-TW, MT-TV, MT-ND1, MT-ND2, MT-ND3, MT-ND4, MT-ND5, MT-ND6, MT-CO3 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	30 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
60	Leigh Syndrome - 8993 Hotspot	Blood	1-2 x 2.5ml blood EDTA or dried blood spot	Working days	Molecular Diagnostic & Protein, IMR	90 working days	By Consultation Only Request Form for Molecular Diagnostic Services (IMR/SDC/UMD/Request Form) available in Public Folder) P:\Borang\Patologi\Patologi Kimia *Please fill up Borang Permohonan Ujian Genetik HTA/PAT/GEN/PK-01-02. (Available in Public Folder) P:\Borang\Patologi\Patologi Kimia
61	Leigh Syndrome- (MT-ATP6 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
62	Lesch-Nyhan Syndrome (HPRT1 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
63	Lissencephaly - Panel (LIS1/DCX Sequence analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
64	Long Chain 3 Hydroxyacyl CoA Dehydrogenase (LCHAD) Deficiency (HADHA Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
65	*Lung Cancer Gene Panel	Blood	2 EDTA Tubes, 3 ml each	Working days	Genetic Lab Hospital Tunku Azizah (HTA)	30 working days	
66	Lysinuric Protein Intolerance (LPI) (SLC7A7 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
67	Maple Syrup Urine Disease (MSUD) - Panel (BCKDHA / BCKDHB / DBT Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	By Consultation Only Request Form for Molecular Diagnostic Services (IMR/SDC/UMD/Request Form) available in Public Folder) P:\Borang\Patologi\Patologi Kimia *Please fill up Borang Permohonan Ujian Genetik HTA/PAT/GEN/PK-01-02. (Available in Public Folder) P:\Borang\Patologi\Patologi Kimia
68	Maple Syrup Urine Disease (MSUD) (DLD Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
69	Maroteaux-Lamy Syndrome, MPS VI (ARSB Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
70	MCT8-Specific Thyroid Hormone Cell Transporter Deficiency (SLC16A2 gene sequence)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
71	Medium Chain Acyl CoA Dehydrogenase (MCAD) Deficiency (ACADM Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
72	*Microsatellite Instability (MSI) Testing	Blood	2 EDTA Tubes, 3 ml each	Working days	Genetic Lab Hospital Tunku Azizah (HTA)	30 working days	
73	Mitochondrial Encephalomyopathy, Lactic Acidosis, and Stroke-Like Episodes (MELAS) Syndrome – 3243 Hotspot	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
74	Mitochondrial Encephalomyopathy, Lactic Acidosis, and Stroke-Like Episodes (MELAS) Syndrome – Full Panel	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	By Consultation Only Request Form for Molecular Diagnostic Services (IMR/SDC/UMD/Request Form) available in Public Folder) P:\Borang\Patologi\Patologi Kimia
75	Myoclonic Epilepsy with Ragged-Red Fibers (MERRF) Syndrome – 8344 Hotspot	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	91 working days	
76	Metachromatic Leukodystrophy (MLD) (ARSA Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
77	Methylenetetrahydrofolate Reductase Deficiency (MTHFR Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
78	Methylmalonic Acidemia (MMA) - Panel (MMUT / MMAA / MMAB Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
79	Methylmalonic Aciduria and Homocystinuria Type C (MMACHC Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
80	Methylmalonic Aciduria & Homocystinuria Type D (MMADHC Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
81	Methylmalonyl-CoA Epimerase Deficiency (MCEE Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	By Consultation Only Request Form for Molecular Diagnostic Services (IMR/SDC/UMD/Request Form) available in Public Folder) P:\Borang\Patologi\Patologi Kimia
82	Mitochondrial Deletion (mtDNA Deletion/Duplication Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
83	POLG-Related Disorders - Panel	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	94 working days	
84	Mitochondrial HMG-CoA Synthase Deficiency (HMGCS2 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
85	Mitochondrial Neurogastrointestinal Encephalopathy (MNGIE) (TYMP Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
86	Mitochondrial Short -Chain Enoyl-CoA Hydratase 1 Deficiency (ECHS1 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
87	Mitochondrial Trifunctional Protein Deficiency (HADHB Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
88	Morquio A Disease (MPS IVA) (GALNS Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
89	mtDNA Deletion Syndromes - Chronic Progressive External Ophthalmoplegia (CPEO)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
90	mtDNA Deletion Syndromes - Kearns-Sayre Syndrome (KSS)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	By Consultation Only Request Form for Molecular Diagnostic Services (IMR/SDC/UMD/Request Form) available in Public Folder) P:\Borang\Patologi\Patologi Kimia
91	mtDNA Deletion Syndromes - Pearson Syndrome	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
92	mtDNA Depletion Syndrome (MDS) - Panel	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
93	Mucopolysaccharidosis Type III B (MPS III B) (NAGLU Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	95 working days	
94	Multiple Respiratory Chain Deficiencies (Mitochondrial Translation Defect/ OXPHOS Deficiency)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
95	N-Acetylglutamate Synthase (NAGS) Deficiency (NAGS Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
96	Neuropathy, Ataxia and Retinitis Pigmentosa (NARP) Syndrome – 8993 Hotspot	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	92 working days	
97	Non Ketotic Hyperglycinemia (NKH) - Panel (AMT / GLDC / GCSH Sequence Analysis / GLDC Deletion/Duplication Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
98	Noonan Syndrome (PTPN11 sequence analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
99	Ornithine Transcarboxylase Deficiency	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	By Consultation Only Request Form for Molecular Diagnostic Services (IMR/SDC/UMD/Request Form) available in Public Folder) P:\Borang\Patologi\Patologi Kimia
100	Ornithine Transcarbamylase (OTC) Deficiency (OTC Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
101	Phosphomannomutase 2 Deficiency (PMM2-CDG) (PMM2 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA tube or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
102	Pompe Disease (GSD II) (GAA Sequence Analysis)	Blood	S&S or Whatman 903,3 circles of DBS	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
103	Prader Willi Syndrome	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
104	Early-onset Primary Dystonia (TOR1A gene sequence)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
105	Primary Dystonia THAP 1 (DYT6)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
106	Primary Hyperoxaluria Type 1 (AGXT Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
107	Pseudorheumatoid Dysplasia (WISP3 gene sequence)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	By Consultation Only Request Form for Molecular Diagnostic Services (IMR/SDC/UMD/Request Form) available in Public Folder) P:\Borang\Patologi\Patologi Kimia *Please fill up Borang Permohonan Ujian Genetik HTA/PAT/GEN/PK-01-02. (available in Public Folder) P:\Borang\Patologi\Patologi Kimia
108	PTEN-Related Disorders - (PEN Sequence Analysis / Deletion/Duplication Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
109	Purine Nucleoside Phosphorylase Deficiency (PNP Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
110	Pyruvate Dehydrogenase Deficiency (PDHA1 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
111	Retinoblastoma - Panel (RB1 Sequence Analysis / Deletion/Duplication Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
112	*Rett Syndrome	Blood	2 EDTA Tubes, 3 ml each	Working days	Genetic Lab Hospital Tunku Azizah (HTA)	30 working days	
113	*Russell-Silver Syndrome	Blood	2 EDTA Tubes, 3ml each	Working days	Genetic Lab Hospital Tunku Azizah (HTA)	30 working days	
114	Schinzel Giedion Syndrome (SETBP1 gene sequence)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
115	SCN1A-Related Seizure Disorders (SCN1A gene sequence)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
116	Severe Congenital Neutropenia (ELANE Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	By Consultation Only Request Form for Molecular Diagnostic Services (IMR/SDC/UMD/Request Form) available in Public Folder) P:\Borang\Patologi\Patologi Kimia
117	Short-Chain 3-Hydroxyacyl-CoA Dehydrogenase (SCHAD) Deficiency	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
118	Short Chain Acyl-CoA Dehydrogenase (SCAD) Deficiency (ACADS Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
119	Short Syndrome (PIK3R1 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	91 working days	
120	Specific Mutation Screening	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
121	Spinal Muscular Atrophy (SMA) Panel - SMN1 gene deletion, copy number	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
122	Spinocerebellar Ataxia (SCA) – Full Panel (Expansion of CAG repeats of ATXN1, ATXN2, ATXN3, CACNA1A and ATXN7 genes)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
123	Spinocerebellar Ataxia Type 1 (Expansion of CAG repeats of ATXN1 gene)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
124	Spinocerebellar Ataxia Type 2 (Expansion of CAG repeats of ATXN2 gene)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	By Consultation Only Request Form for Molecular Diagnostic Services (IMR/SDC/UMD/Request Form) available in Public Folder) P:\Borang\Patologi\Patologi Kimia
125	Spinocerebellar Ataxia Type 3 (Expansion of CAG repeats of ATXN3 gene)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
126	Spinocerebellar Ataxia Type 6 (Expansion of CAG repeats of CACNA1A gene)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
127	Spinocerebellar Ataxia Type 7 (Expansion of CAG repeats of ATXN7 gene)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
128	Sulfite Oxidase (SUOX) Deficiency	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
129	Testing of Familial Mutations/Carrier Testing	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
130	Tyrosine Hydroxylase Deficiency (TH Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
131	Very Long Chain Acyl CoA Dehydrogenase (VLCAD) Deficiency (ACADVL Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
132	Whole Mitochondrial DNA - mtDNA hotspots	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	By Consultation Only Request Form for Molecular Diagnostic Services (IMR/SDC/UMD/Request Form) available in Public Folder) P:\Borang\Patologi\Patologi Kimia *Please fill up Borang Permohonan Ujian Genetik HTA/PAT/GEN/PK-01-02. (available in Public Folder) P:\Borang\Patologi\Patologi Kimia
133	X-Chromosome Inactivation (AR Fragment Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
134	X-linked Adrenoleukodystrophy (ABCD1 Sequence Analysis)	Blood	1-2 x 2.5ml blood EDTA or dried blood spots	Working days	Molecular Diagnostic & Protein, IMR	90 working days	
135	*Y-Microdeletion	Blood	2 EDTA Tubes, 3 ml each	Working days	Genetic Lab Hospital Tunku Azizah (HTA)	30 working days	

2.0 HAEMATOLOGY TEST

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
1	Anti-PF4 Antibody	Blood (Frozen Serum)	Plain gel tube x2	Daily	Hospital Ampang	18 weeks	Use Hospital Ampang Special Hematology Requisition form
2	Anti-Xa	Blood (Frozen Platelet Poor Plasma)	Sodium Citrate Tube 3.2% x1	By Appointment	Hospital Ampang	1 day (urgent) – Verbally informed 2 weeks – Formal report	Use Hospital Ampang Special Hematology Requisition form
3	ADAM TS13 Activity / Inhibitor	Blood (Frozen Platelet Poor Plasma)	Sodium Citrate Tube 3.2% x 2	Daily	Hospital Ampang	8 weeks	Use Hospital Ampang Special Hematology Requisition form
4	Bone Marrow Aspiration	Bone Marrow	EDTA Tube / Slide (3 ml / 10 Slide)	By Appointment	Hospital Sultan Idris Shah, Serdang	7 days	PER PAT 301 Form
5	Bone Marrow Trephine	Bone Marrow Tissue	Universal Plain Container	By Appointment	Hospital Sultan Idris Shah, Serdang	4 weeks	PER PAT 301 Form
6	CD4 / CD8 Enumeration	Blood	EDTA Tube x1	Monday - Thursday (Before 9am)	Hospital Tunku Azizah	7 days	PER PAT 301 Form
7	Chromosomal Analysis / Cytogenetics for Haematological Malignancies	Bone Marrow	Heparin Transport Media, 2 ml	Monday - Thursday	Hospital Ampang	8 weeks	Use Hospital Ampang Special Hematology Requisition form
		Blood	Heparin Transport Media, 10 ml				

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
			or Sodium Heparin Tube x3				
8	Chromosomal Analysis / Cytogenetics for Congenital Anomalies	Cord Blood Blood	Lithium Heparin Tube x 2	Monday - Thursday	Genetic Lab, Hospital Tunku Azizah	6 months	Use Cytogenetics Request Form
9	Coagulation Factor Assay - Factor VIII Antigen / Activity - Factor IX Antigen / Activity - Factor Inhibitors (Bethesda Assay)	Blood (Plasma)	Sodium Citrate Tube 3.2% x2	Daily	Hospital Tengku Ampuan Rahimah	14 days	PER PAT 301 Form
10	Coagulation Factor Assay (Rare) - Factor II Antigen / Activity - Factor V Antigen / Activity - Factor VII Antigen / Activity - Factor X Antigen / Activity - Factor XII Antigen / Activity - Factor XIII Antigen / Activity	Blood (Plasma)	Sodium Citrate Tube 3.2% x 2	By Appointment	Hospital Tunku Azizah	4 weeks	PER PAT 301 Form
11	Coagulation Screen - PT - APTT	Blood	Sodium Citrate Tube 3.2% x1	Daily	Hospital Sultan Idris Shah, Serdang	4 hours	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
12	D-Dimer	Blood	Sodium Citrate Tube 3.2% x1	Daily	Hospital Sultan Idris Shah, Serdang	4 hours	
13	Disseminated Intravascular Coagulation Screen (DVC)	Blood	Sodium Citrate Tube 3.2% x1	Daily	Hospital Sultan Idris Shah, Serdang	4 hours	
14	DNA Analysis: • α / β globin gene • Haemoglobinopathy (HbE, HbS and HbC only)	Blood	EDTA Tube x1	Daily	Hospital Kuala Lumpur	90 days	Use DNA Analysis for Thalassaemia and Haemoglobinopathies Syndromes form
15	DNA Analysis: • Haemoglobinopathy • DNA analysis of β globin gene (other than HKL offered) • Further testing for alpha and of β globin gene	Blood	EDTA Tube x1	Daily	Institute for Medical Research (IMR), National Institutes of Health (NIH)	120 days	Use DNA Analysis for Thalassaemia and Haemoglobinopathies Syndromes form
16	Erythrocyte Sedimentation Rate (ESR)	Blood	EDTA Tube x1	Daily	Hospital Sultan Idris Shah, Serdang	4 hours	
17	Erythropoietin	Blood (Frozen Serum)	Plain gel tube x2	Daily	Hospital Ampang	12 weeks	Use Hospital Ampang Special Hematology Requisition form

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
18	Fibrinogen	Blood	Sodium Citrate Tube 3.2% x1	Daily	Hospital Sultan Idris Shah, Serdang	4 hours	
19	Full Blood Count (FBC)	Blood	EDTA Tube x1	Daily	Hospital Sultan Idris Shah, Serdang	Urgent: 45 minutes Routine: 4 hours	
20	Full Blood Picture (FBP)	Blood	EDTA Tube x1	Daily	Hospital Sultan Idris Shah, Serdang	Urgent: 1 day Routine: 7 days	
21	G6PD Assay / Enzyme Activity	Blood	EDTA Tube x1	By Appointment (Monday only)	Hospital Sungai Buloh	3 weeks	PER PAT 301 Form
22	G6PD Deficiency Screening	Blood	Dried blood on filter paper Or EDTA Tube x1	Daily	Hospital Sultan Idris Shah, Serdang	1 day	
23	Haemoglobin Analysis	Blood	EDTA Tube x1	Daily	Hospital Sultan Idris Shah, Serdang	4 weeks	Hb Analysis Request Form
24	Immunophenotyping Leukemia / Lymphoma	Blood Bone marrow	EDTA Tube x1	Monday - Thursday	Hospital Tunku Azizah	Verbal: 36 hours Formal: 21 days	PER PAT 301 Form

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
25	Immunophenotyping Paroxysmal Nocturnal Haemoglobinuria (PNH)	Blood	EDTA Tube x1	Monday - Thursday	Hospital Tunku Azizah	21 days	PER PAT 301 Form
26	Kleihauer Test	Blood	EDTA Tube x1	By Appointment	Hospital Sultan Idris Shah, Serdang	3 days	PER PAT 301 Form
27	Lupus Anticoagulant	Blood	Sodium Citrate Tube 3.2% : - Adult (>12years old) x3 tubes - Paeds x2 tubes	Daily	Hospital Selayang	8 weeks	Use Haematology / Serology Request Form (PDN) or PER PAT 301 Form
28	Mixing Test	Blood	Sodium Citrate Tube 3.2% x2	Working days	Hospital Sultan Idris Shah, Serdang	1 day	PER PAT 301 Form
29	Molecular BCR-ABL1 Qualitative Diagnostic Analysis	Blood	EDTA Tube x2	Working days	Institute for Medical Research (IMR), National Institutes of Health (NIH)	6 weeks	Use Molecular Analysis for Haemato-Oncology form
		Bone Marrow	EDTA Tube x1				
30	Molecular Genetic for Congenital Disorder	Blood	EDTA tube 3 – 5 mls	By Appointment	Genetic Lab, Hospital Tunku Azizah	6 months	Use Molecular Test Request Form Form

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
31	Molecular Haemophilia - HaemophiliaA - Haemophilia B	Blood	EDTA Tube x1	Working days	Institute for Medical Research (IMR), National Institutes of Health (NIH)	3 months	Use Haemophilia Genetic Testing Request Form
32	Molecular for Haematological Malignancy	Blood	EDTA Tube x4	Working days	Hospital Ampang	8 weeks	Use Hospital Ampang Special Hematology Requisition form
		Bone Marrow	EDTA Tube x1				
33	Molecular PCR for JAK2 / CALR	Blood	EDTA Tube x4	Working days	Hospital Ampang	10 weeks	Use Hospital Ampang Special Hematology Requisition form
		Bone Marrow	EDTA Tube x1				
34	Molecular Red Cells Membrane Disorder (Southeast Asian Ovalocytosis)	Blood	EDTA Tube x1	By Appointment (Monday only)	Hospital Sultanah Bahiyah, Alor Setar	8 weeks	PER PAT 301 Form Informed Consent for DNA Testing
35	Reticulocyte Count	Blood	EDTA Tube x1	Daily	Hospital Sultan Idris Shah, Serdang	4 hours	
36	Thrombophilia Screening - Activated Protein C Resistance - Antithrombin Activity - Protein C Antigen / Activity - Protein S Antigen / Activity	Blood	Sodium Citrate Tube 3.2% x3	Daily	Hospital Tunku Azizah	8 weeks	PER PAT 301 Form

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
37	Von Willebrand Profile • VWF Antigen / Activity • VWF : Ricof • Collagen Binding Assay	Blood	Sodium Citrate Tube 3.2% x3	Working days	Hospital Tunku Azizah	6 weeks	PER PAT 301 Form

3.0 MICROBIOLOGY TEST

3.1 Bacteriology

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
1	Air Sampling	Air sampled by air sampler	Culture Plate	By Appointment	Hospital Sultan Idris Shah, Serdang	2 – 3 days	Contact Infection Control Unit for further information.
2	<i>Bartonella hensalae</i> serology	Serum	Plain Gel Tube, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
3	<i>Borellia Burgdorferi</i> serology	Serum	Plain Gel Tube, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
4	<i>Burkholderia pseudomallei</i> Antibody	Blood	Plain Gel Tube, 5 ml	By Batch	IMR	3 – 4 weeks	Bacteriology Request Form IMR/BACT/FORMS/SMIS/01
5	<i>Brucella</i> Antibody	Blood	Plain Gel Tube, 5 ml	By Batch	IMR	3 – 4 weeks	Brucellosis Laboratory Request Form IMR/IDRC/BACT/BRUCE/01
6	<i>Clostridium difficile</i> Culture	Stool	Sterile container	Daily	Hospital Sultan Idris Shah, Serdang	3 – 5 days	Send immediately
7	<i>Coxiella Burnetti</i> Antibody	Serum	Plain Gel Tube, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
8	Culture Environment	Environment Samples	Environment samples in sterile swab / container	By Appointment	Hospital Sultan Idris Shah, Serdang	3 – 5 days	Contact Infection Control Unit for further information

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
9	Culture for <i>Corynebacterium diphtheriae</i>	Throat Swab / Nasopharyngeal swab	Sterile cotton swab in Amies transport media	Daily	Hospital Sultan Idris Shah, Serdang	3 – 5 days	Send immediately and notify Medical Officer (Medical Microbiology) on-call before sending
10	Culture & Sensitivity for <i>Helicobacter pylori</i>	Tissue	Sterile container	By Batch	Hospital Kuala Lumpur	3-4 weeks	By Consultation only PER PAT 301 FORM
11	Culture & Sensitivity	Aqueous Fluid	Sterile container, 3 - 4 ml	Daily	Hospital Sultan Idris Shah, Serdang	3 – 5 days	Send immediately. Do not put sticker onto barcode area (blood culture bottle)
		Blood	For adult: inoculate 5 -10 ml into both Aerobic and Anaerobic Blood Culture Bottle For paediatric : inoculate 1 - 3 ml into Paediatric Blood Culture bottle. Do not refrigerate after inoculation.				
		Body Fluid	Sterile container, 3 - 4 ml Specify site of collection				
		Bone Marrow	For adult: inoculate 5 -10 ml into both Aerobic and Anaerobic Blood				

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
	Culture & Sensitivity		Culture Bottle For paediatric : inoculate 1 - 3 ml into Paediatric Blood Culture bottle. Do not refrigerate after inoculation	Daily	Hospital Sultan Idris Shah, Serdang	3 – 5 days	Send immediately
		Bronchoalveolar lavage	Sterile container, 3 - 4 ml				
		Bone	Sterile container (avoid formalin)				
		Contact Lens	Sterile container				
		Corneal Scrapping	Scrap onto Chocolate agar + Blood Agar + Sabouraud Agar + MacConkey Agar + 1 glass slide for gram stain.				
		CSF	Sterile container, 1 - 2 ml				
		Eye discharge	Sterile cotton swab in Amies transport media				

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
	Culture & Sensitivity	Ear discharge	Sterile cotton swab in Amies transport media	Daily	Hospital Sultan Idris Shah, Serdang	3 – 5 days	Send immediately
		Intra-uterine contraceptive device (IUCD) C & S	Sterile container				
		High Vaginal Swab	Sterile cotton swab in Amies transport media				
		Intravascular Device Catheter (IVDC)	Send tip of catheter in sterile container				
		Low Vaginal Swab	Sterile cotton swab in Amies transport media				
		Nasal swab	Sterile cotton swab in Amies transport media				
		Nasopharyngeal Aspirate	Sterile container, 3 - 4 ml				

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
	Culture & Sensitivity	Peritoneal dialysis	Sterile container, 3 - 4 ml	Daily	Hospital Sultan Idris Shah, Serdang	3 – 5 days	Send immediately
		Peritoneal dialysis Aerobe / Anaerobe	Inoculate 5 -10 ml into both Aerobic and Anaerobic Blood Culture Bottle				
		Peritoneal Fluid	Sterile container, 3 - 4 ml				
		Peritoneal Fluid Aerobe / Anaerobe	Inoculate 5 -10 ml into both Aerobic and Anaerobic Blood Culture Bottle				
		Pleural Fluid	Sterile container, 3 - 4 ml				
		Pus	Sterile container Specify site of collection				
		Rectal swab	Sterile cotton swab in Amies transport media				
		Sputum	Sterile container, 3 - 4 ml				
		Stool	Fresh stool in stool container				

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
	Culture & Sensitivity	Throat Swab	Sterile cotton swab in Amies transport media	Daily	Hospital Sultan Idris Shah, Serdang	3 – 5 days	Send immediately
		Tissue	Sterile container Specify site of collection				
		Tracheal Aspirate	Sterile container, 3 - 4 ml				
		Urethral Swab	Sterile cotton swab in Amies transport media				
		Urine	Sterile container, 5 ml				
		Vitreous Tap	Sterile container, 3 ml				
		Wound Swab	Sterile cotton swab in Amies transport media Specify site of collection				

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
12	Neisseria gonorrhoeae C & S	Endocervical swab/ Urethral swab/ Oropharynx swab/ Neonatal eye swab/ Rectal swab	Sterile cotton swab in Amies transport media	Daily	Hospital Sultan Idris Shah, Serdang	3 – 5 days	Send immediately
13	Sterility Testing	Biological Indicator for Autoclave	Biological indicator test material	Daily	Hospital Sultan Idris Shah, Serdang	3-5 days	Send immediately
		Total Parenteral Nutrition (TPN) 3-5 ml	Syringe	Daily	Hospital Sultan Idris Shah, Serdang	3-5 days	Send immediately

3.2 Immunology/Serology

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
1	Anti-Acetylcholine Receptor	Blood	Plain Gel Tube, 5 ml	By Batch	IMR	3 – 4 weeks	Autoimmune Request Form IMR/AIRC/Autoimmune/RF
2	Anti-CCP	Blood	Plain Gel Tube, 3 ml	By Batch	Hospital Selayang	3 – 4 weeks	PER PAT 301 FORM
3	Anti-Aquaporin 4	CSF	Sterile container, 5 ml	By Batch	IMR	3 – 4 weeks	Autoimmune Request Form IMR/AIRC/Autoimmune/RF
		Blood	Plain Gel Tube, 5 ml				
4	Anti-Double-Stranded DNA (dsDNA)	Blood	Plain Gel Tube, 3 ml	By Batch	Hospital Selayang	3 – 4 weeks	PER PAT 301 FORM
5	Anti-Glomerular Basement Membrane (GBM)	Blood	Plain Gel Tube Adult: 5 – 10 ml Paediatric: 3 – 5 ml	By Batch	Hospital Selayang	3 – 4 weeks	PER PAT 301 FORM
6	Anti-Neutrophil Cytoplasmic Ab (c-ANCA & p-ANCA)	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Selayang	3 – 4 weeks	PER PAT 301 FORM
7	Anti –N-Methyl-D-Aspartate Receptor (NMDAR) Encephalitis	Blood	Plain Gel Tube, 5 ml	By Batch	IMR	3 – 4 weeks	Autoimmune Request Form IMR/AIRC/Autoimmune/RF
		CSF	Sterile container 3-5 ml				
8	Antinuclear Ab (ANA)	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sultan Idris Shah, Serdang	1 - 2 weeks	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
9	Anti-Phospholipase A2 Receptor (Anti PLA2R)	Blood	Plain Gel Tube, 5 ml	By Batch	IMR	3 – 4 weeks	Autoimmune Request Form IMR/AIRC/Autoimmune/RF
10	Anti-Phospholipid Antibody	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Selayang	3 – 4 weeks	- Cardiolipin Antibodies IgG & IgM - Beta2 Glycoprotein Antibodies IgG & IgM PER PAT 301 FORM
11	Anti-Streptolysin 'O' Titre (ASOT)	Blood	Plain Gel Tube, 3 ml	By Batch	Hospital Sultan Idris Shah, Serdang	1 week	
12	Bruton Tyrosine Kinase (BTK) Protein/Gene	Blood	EDTA Tube, 10 ml	By Appointment	IMR	Min 3 months	Primary Immunodeficiency (PID) Request Form IMR/AIRC/PID/RF
13	Dihydrorhodamine Assay (DHR)	Blood	Lithium Heparin, 2 ml	By Batch	IMR	3 – 4 weeks	Primary Immunodeficiency (PID) Request Form IMR/AIRC/PID/RF
14	Eosinophilic Cationic Protein (ECP)	Serum	Plain Tube 3 ml	By batch	IMR	3 – 4 weeks	Allergy Request Form IMR/AIRC/ALLERGY/RF
15	Extractable Nuclear Ag (ENA)	Blood	Plain Gel Tube 5 ml	By Batch	Hospital Selayang	3 – 4 weeks	PER PAT 301 FORM
16	Gangliosides Antibodies	Blood	Plain Gel Tube, 5 ml	By Batch	IMR	3 – 4 weeks	Autoimmune Request Form IMR/AIRC/Autoimmune/RF
		CSF	Sterile container 3-5 ml				
17	HLA Typing for Disease Association per loci	Blood	EDTA Tube, 6ml	By Appointment	IMR	3 – 4 weeks	HLA Typing Test Request Form (Disease Association) IMR/AIRC/TI/RF-3

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
18	Human leukocyte antigens (HLA) Crossmatch (Complement Dependent Cytotoxicity)	Blood	Sodium heparin(donor) 18ml,	By Appointment	IMR	3 – 4 weeks	HLA Crossmatch Test Request Form (Living donor) IMR/AIRC/TI/RF-1
			Plain (Patient) 6ml				
19	Human leukocyte antigens (HLA) Crossmatch (Flow Cytometry)	Blood	Sodium heparin(donor) 18ml,	By Appointment	IMR	3 – 4 weeks	HLA Crossmatch Test Request Form (Living donor) IMR/AIRC/TI/RF-1
			Plain (Patient) 6ml				
20	HLA Antibody Test (PRA/DSA)	Blood	Plain 6ml	By Appointment	IMR	3 – 4 weeks	HLA Antibody Test Request Form IMR/AIRC/TI/RF-4
21	HLA Typing Class I (Loci A, B and C) - Low/medium resolution (SSO/SSP-PCR)	Blood	EDTA 6ml	By Appointment	IMR	3 – 4 weeks	HLA Typing Test Request Form IMR/AIRC/TI/RF-2
22	HLA Typing Class I and II (Loci A, B and DR) - HSCT: New case/Add donor for existing case	Blood	EDTA 6ml	By Appointment	IMR	3 – 4 weeks	HLA Typing Test Request Form IMR/AIRC/TI/RF-2
23	HLA Typing Class I and II (Loci A, B, C, DR and DQ) - High Resolution: HSCT: Confirmatory Typing (CT)/Cord blood / MSCR search	Blood	EDTA 6ml	By Appointment	IMR	3 – 4 weeks	HLA Typing Test Request Form IMR/AIRC/TI/RF-2
24	HLA Typing Class I and II (Loci A, B, C, DR and DQ): Solid Organ :New Case/Add donor for existing case;HSCT: Confirmation (Low Resolution)	Blood	EDTA 6ml	By Appointment	IMR	3 – 4 weeks	HLA Typing Test Request Form IMR/AIRC/TI/RF-2

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
25	HLA Typing Class II (Loci DR,DQ) - Low/medium resolution (SSO/SSP-PCR)	Blood	EDTA 6ml	By Appointment	IMR	3 – 4 weeks	HLA Typing Test Request Form IMR/AIRC/TI/RF-2
26	Legionella Antigen	Urine	Sterile Container, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
27	Leptospira Antibody IgM (Latex Agglutination)	Blood	Plain Gel Tube, 5 ml	Daily	Hospital Sultan Idris Shah, Serdang	1 day	
28	Lymphocyte Activation Test	Blood	EDTA Tube, 5 ml	By Appointment	IMR	3 – 4 weeks	By appointment and consultation only (A healthy control sample is required to assist with interpretation) Primary Immunodeficiency (PID) Request Form IMR/AIRC/PID/RF
29	Mycoplasma Ab	Blood	Plain Gel Tube, 3 ml	By Batch	Hospital Sultan Idris Shah, Serdang	1 week	
30	Myositis	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Selayang	3-4 weeks	By consultation only Specimen should be packed in ice. PER PAT 301 FORM
31	Paraneoplastic Neurologic Syndrome	Blood	Plain Gel Tube, 5 ml	By Batch	IMR	3 – 4 weeks	Autoimmune Request Form IMR/AIRC/Autoimmune/RF
		CSF	Sterile Container, 2-3 ml				
32	Skin Antibodies Panel	Blood	Plain Gel tube, 5 ml	By Batch	IMR	3 – 4 weeks	Autoimmune Request Form IMR/AIRC/Autoimmune/RF

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
33	Specific Ig E Test	Blood	Plain Gel Tube, 5 ml	By Batch	IMR	3 – 4 weeks	Allergy Request Form IMR/AIRC/ALLERGY/RF
34	Specific Liver Antibodies	Blood	Plain Gel Tube Adult : 5 – 10 ml Paediatric: 3 – 5 ml	By Batch	Hospital Selayang	3 – 4 weeks	PER PAT 301 FORM
35	T and B cells enumeration	Blood	EDTA Tube, 2ml	By Batch	IMR	3 – 4 weeks	Primary Immunodeficiency (PID) Request Form IMR/AIRC/PID/RF
36	Tissue Autoantibody Test	Blood	Plain Gel tube, 5 ml	By Batch	Hospital Selayang	3 – 4 weeks	• Anti-Mitochondrial Antibody (ANTIMITO) • Anti-Smooth Muscle Antibody (ASMA) • Anti-Liver Kidney Microsome Antibody (LKM) • Anti-Gastric Parietal Cell Antibodies (GASTRICAB) PER PAT 301 FORM
37	<i>Treponema pallidum</i> - (TPPA)	Blood	Plain Gel Tube, 3 ml	By Batch	Hospital Sultan Idris Shah, Serdang	1 week	
38	<i>Treponema pallidum</i> (RPR) - Screening	Blood	Plain Gel Tube, 3 ml	Daily	Hospital Sultan Idris Shah, Serdang	1 week	
39	Total IgE Test	Blood	Plain Gel Tube, 5 ml	By Batch	IMR	3 – 4 weeks	Allergy Request Form IMR/AIRC/ALLERGY/RF

3.3 Molecular

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
1	Adenovirus PCR	Throat swab/ Nasopharyngeal swab	Virus transport medium	By Batch	IMR	3 – 4 weeks	Virology Test Request Form IMR/IDRC/VIRO/ADMIN/53
		Organ Biopsy	Sterile leakproof containers containing VTM or sterile normal saline to keep tissue moist				
		Nasopharyngeal aspiration/ BAL/ Sputum/	Sterile container				
2	Bartonella PCR (Aerobic bacteria)	Blood	EDTA Tube 2 ml.	By Batch	IMR	3 – 4 weeks	By Consultation only Transportation at ambient temperature. If delayed keep at 2-8°C
		Tissue (Lymph node)	Sterile container				
3	BK Virus PCR	Blood	EDTA Tube, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
		Urine	Sterile Container 2-5 ml				
		CSF					
4	Bordetella pertussis PCR	Nasopharyngeal Swab	Sterile container 1-2 ml	By Batch	IMR	3 – 4 weeks	Bacteriology Request Form IMR/BACT/FORMS/SMIS/01
		Bacterial culture					
		Tracheal					

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
		aspirate					
		Nasopharyngeal aspirate					
5	Brucella PCR	Blood	EDTA Tube, 5 ml	By Batch	IMR	3 – 4 weeks	Brucellosis Laboratory Request Form IMR/IDRC/BACT/BRUCE/01
		Bacteria colony	sealed plate				
6	Cytomegalovirus Genome Detection	Blood	EDTA Tube, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
		CSF	Sterile Container 2-5 ml				
		Urine					
7	COVID-19 PCR	Nasopharyngeal swab	Viral Transport Medium (VTM)	Upon request	Hospital Sungai Buloh	2-3 days	Test request must be informed to Medical Officer Microbiology on call for approval. Specimen must be packed in Triple layer packaging and transported in ice. Specimen collection kit will be supplied by Pathology counter. Send immediately to Pathology counter once collected
		Oropharyngeal swab	Viral Transport Medium (VTM)				
		Tracheal aspirate	Sterile container				
		Nasopharyngeal aspirate	Sterile container				
8	Dengue PCR	Blood	Plain Tube, 2-4 ml	By Batch	IMR	3 – 4 weeks	Virology Test Request Form IMR/IDRC/VIRO/ADMIN/53

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
		CSF	Sterile container, 1-3 ml				
		Tissue	1.5cm ³ in a few drops of VTM Sterile container				
9	Enterovirus Genome Detection	Body Fluid	Sterile container	By Batch	IMR	3 – 4 weeks	Virology Test Request Form IMR/IDRC/VIRO/ADMIN/53
		CSF					
		BAL					
		Sputum					
		Tissue					
		Nasopharyngeal Aspirates					
		Stool					
		Vesicular Swab (Skin lesion)					
		Rectal Swab	Viral Transport Medium (VTM)				
		Throat Swab					
		Nasopharyngeal swab / Oropharyngeal swab					

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
10	Epstein Barr Virus Genome Detection	Blood	EDTA Tube, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
		BAL	Sterile container, 5ml				
		CSF	Sterile container, 0.5-2 ml				
11	Filariasis PCR	Blood	EDTA tube 5ml Blood on slides	By Batch	IMR	3 – 4 weeks	PER PAT 301 FORM
12	Fungal PCR	Blood	EDTA Tube, 3 ml	By Batch	IMR	3 – 4 weeks	Mycology Request Form IMR/IDRC/BACT/MYCO/01
		Body Fluid	Sterile container				
		CSF					
		Tissue					
13	Gastrointestinal Protozoa PCR (Blastocystis hominis, Cryptosporidium spp., Cyclospora cayetanensis, Dientamoeba fragilis, Entamoeba histolytica, Giardia lamblia)	Stool	Cary Blair transport media	By Batch	IKN	3-4 weeks	PER PAT 301 FORM
14	Hepatitis B Virus DNA (Viral Load)	Blood	EDTA Tube, 10 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM (With gastroenterologist stamp/signature)

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
15	HCV Viral Load GeneXpert	Serum	Plain Gel Tube 2 bottles of 5 ml	Upon request	Hospital Sultan Idris Shah, Serdang	2 weeks	Request from clinical microbiologist on call PER PAT 301 FORM (With gastroenterologist stamp/signature)
16	HCV Genotyping	Blood	EDTA Tube, 5 ml	By Batch	Hospital Kuala Lumpur	3 – 4 weeks	PER PAT 301 FORM (With gastroenterologist stamp/signature)
17	HIV drug resistance testing (Protease and Reverse Transcriptase / Integrase)	Blood	EDTA Tube, 10ml	Upon request	IMR	3 – 4 weeks	Virology Test Request Form IMR/IDRC/VIRO/ADMIN/53
18	HIV-1 RNA RT PCR for babies (0-18 months)	Blood	EDTA Tube, 5 ml	By Batch	IMR	3 – 4 weeks	Ujian PCR untuk HIV di kalangan bayi IMR/Viro/HIV/2
19	HIV RNA Viral Load	Blood	EDTA Tube, 10 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM (With any specialist stamp/signature)
20	HSV I & II DNA Genome Detection	Blood	EDTA Tube, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
		CSF	Sterile container 5 ml				
		Urine					
		Genital swab	VTM				
		Vesicle swab					
21	<i>Japanese encephalitis</i> PCR	Blood	Plain Gel Tube, 2-4 ml	By Batch	MKAK Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
		CSF	Sterile container, 1 ml				
22	JC Virus (JCV) PCR	Blood	EDTA Tube, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
		Urine	Sterile container				
		CSF	2-5ml				
23	Leishmaniasis PCR	Blood	EDTA Tube, 3 ml	By Batch	IMR	3 – 4 weeks	PER PAT 301 FORM
		Skin Scrapping / Tissue	Sterile container				
24	Leptospiral PCR	Blood	EDTA Tube, 3 ml	By Batch	IMR	3 – 4 weeks	Leptospirosis Laboratory Request Form IMR/IDRC/BACT/LEPTO/01
		CSF	Sterile container				
		Tissue					
		BAL					
25	Line Probe Assay (Mycobacterium spp.)	Sputum	Sterile container	By Batch	MKAK Sungai Buloh	3 – 4 weeks	Permohonan Ujian TB TBIS20C
26	Malaria PCR	Blood	EDTA tube 2-5 ml	By Batch	IMR	3 – 4 weeks	PER PAT 301 FORM
		Dried blood Spot (DBS) on filter paper	Slide mailer or seal plastic bag				
		Thick/thin blood					

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
		film (Giemsa stained)					
27	Meningoencephalitis pathogen Genome Detection	CSF	Sterile container	By Batch	Hospital Sungai Buloh	3 – 4 weeks	Test request must be informed to Clinical Microbiologist HSB for approval. PER PAT 301 FORM
28	MERS-Coronavirus Genome Detection	Sputum	Sterile Container	By Batch	Hospital Sungai Buloh	1 – 4 days	Test request must be informed to Medical Officer Microbiology on call for approval. Specimen must be packed in Triple layer packaging and transported in ice. Specimen collection kit will be supplied by Pathology counter. Requestor's name and phone number must be written in PER PAT 301 FORM Send immediately to Pathology counter once collected
		BAL					
		Nasopharyngeal aspirate					
		Tracheal aspirate					
		Swab	VTM				
29	Mycobacteria other than Tuberculosis (MOTT) PCR	Sputum	Sterile container	By Batch	IMR	3 – 4 weeks	TUBERCULOSIS LABORATORY REQUEST FORM - MOTT V 5.0 IMR/IDRC/BACT/TB/01
		Pus					
		Stool					
		Urine					
		CSF					
		Body Fluid					
30	Mycobacterium TB Genome Detection	Blood	Plain tube,, 5 ml	By Batch	MKAK Sungai Buloh	3 – 4 weeks	Permohonan Ujian TB (TBIS20C)
		Body Fluid	Sterile container				
		Bone					

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
		Bone Marrow					*Form must be signed by Medical Specialist
		Bronchoalveolar lavage					
		CSF					
		Pus					
		Sputum					
		Tissue					
		Tracheal Aspirate					
		Urine					
		Gastric lavage					
31	Respiratory Pathogen multiplex PCR	Nasopharyngeal swab	Universal Transport Medium	Upon request	Hospital Sultan Idris Shah, Serdang	1 day	Request from clinical microbiologist on call
32	SARS COV2 GeneXpert	Nasopharyngeal swab	Viral Transport Medium (VTM)	Upon request	Hospital Sultan Idris Shah, Serdang	1 day	Request from clinical microbiologist on call
33	TB Gene Xpert	Sputum	Sterile container	Upon Request	Hospital Sultan Idris Shah, Serdang	1 day	Borang Permohonan Ujian TB (TBIS20C) Request made to clinical microbiologist on call /for outsource sample for Clinician to request to specialist on call in MKAK
		CSF					
		Bronchoalveolar lavage					
		Tracheal aspirate					

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
		Gastric lavage					
		Tissue	Sterile container 3-5 ml	Upon Request	MKAK Sungai Buloh	3 – 4 weeks	
		Body Fluid					
34	Varicella Zoster DNA Detection	Blood	EDTA Tube, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
		CSF	Sterile container				
		Vesicle swab	VTM				
35	Zika Virus PCR	Amniotic Fluid	Sterile container	Upon request	IMR	3 – 4 weeks	Specimen should be packed in ice and send immediately. Based on clinical presentation - Require consultation Virology Test Request Form IMR/IDRC/VIRO/ADMIN/53
		CSF					
		Urine					
		Tissue	VTM/Sterile container with saline				
		Blood	EDTA Tube, 5 ml				
		Blood (Plasma) Serum Urine	- 2 bottles of 5 ml blood in EDTA Tube - 2 bottles of 5 ml blood in Plain Gel Tube Urine in sterile container				

3.4 Mycobacteriology

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
1	AFB Smear	Body Fluid / Pleural Fluid	Sterile container, 3 ml	Daily	Hospital Sultan Idris Shah, Serdang	24 hours	Send immediately
		Bronchoalveolar lavage					
		Gastric Lavage					
		Nasopharyngeal Aspirate					
		Tracheal Aspirate					
		Other Specimen					
		CSF	Sterile container, 1 ml				
		Sputum	Collect 3 consecutive early morning after rinsing mouth, (Fresh) sputum (3ml), not saliva aseptically into sterile container.				
2	Interferon gamma release assay (IGRA)	Blood	QuantiFERON-QTB Gold collection tubes 1 ml	By batch	MKAK Sungai Buloh	3-4 weeks	Test request must be informed to Medical Officer Microbiology on call for approval. Incubate tubes at collection site (upright at 37°C for 16-24 hours) then ship to NPHL at 4-27°C. Specimen collection kit will be supplied by Pathology counter. Send immediately to Pathology

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
							counter once collected. Borang Permohonan Ujian TB (TBIS20C)
3	Mycobacterium C&S	Blood	Blood culture bottle (Myco F lytic bottle)	By Batch	IPR	10 – 20 weeks	Send immediately Borang Permohonan Ujian TB (TBIS20C)
		Body Fluid	Sterile container, 5 ml				
		Bronchoalveolar lavage	Sterile container, 3 ml				
		Gastric Lavage					
		Pleural Fluid					
		Pus					
		Sputum					
		Tracheal Aspirate					
		CSF	Sterile container, 1-2 ml				
		Tissue	Sterile container Specify site of collection. Do not put in formalin.				

3.5 Mycology

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
1	Cryptococcal Antigen	CSF	Sterile container, 1 ml	Daily	Hospital Sultan Idris Shah, Serdang	24 hours	
		Serum	Plain Gel Tube, 5 ml				
2	Fungal Culture	Aqueous fluid	Sterile container, 3 - 5 ml	Daily	Hospital Sultan Idris Shah, Serdang	20 days	
		Body Fluid					
		Bronchioalveolar lavage (BAL)					
		Peritoneal Fluid					
		Pleural Fluid					
		Pus					
		Sputum					
		Vitreous Fluid					
		Blood	Adult: 5 – 10 ml Paediatric: 1 – 2 ml Inoculate into Myco F lytic bottle.				
		Corneal Scrapping	Scrape sample directly onto Sabouraud agar plate				
		CSF	Sterile container, 1 - 2 ml				

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
		Hair	Sterile container				
		Nails					
		Skin scraping					
		Tissue					
3	Aspergillus Galactomannan Antigen Detection	Blood	Plain Gel Tube, 3-5 ml	By batch	Hospital Sungai Buloh	3 - 4 weeks	PER PAT 301 FORM
		Bronchioalveolar Lavage (BAL)	Sterile container 3-5 ml				

3.6 Parasitology

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
1	Amoebiasis Serology	Blood	Plain Tube, EDTA tube 2 ml	By Batch	IMR	3-4 weeks	PER PAT 301 FORM
2	Blood Film for Malaria Parasites	Blood	Please provide both thin and thick blood smears for malaria identification and quantification.	Daily	Hospital Sultan Idris Shah, Serdang	EDTA: 4 hours Finger prick: 2 hours	Send immediately
3	Blood film for Microfilaria	Blood	Please provide thick blood smear taken at night (after 10 pm). Air-dried.	Daily	Hospital Sultan Idris Shah, Serdang	24 hours	Send when ready
4	Filariasis Serology	Blood	Plain Gel Tube, EDTA tube 2 ml	By Batch	IMR	3 – 4 weeks	PER PAT 301 FORM
5	Helminth Macroscopy	Stool	Sterile container	Daily	Hospital Sultan Idris Shah, Serdang	24 hours	
6	Leishmaniasis Antibody	Blood	Plain Gel Tube, EDTA tube 2 ml	By Batch	IMR	3 – 4 weeks	To send sample in ice PER PAT 301 FORM
7	Leishmaniasis Microscopy	Bone marrow film	Slide mailer	By Batch	IMR	3 – 4 weeks	To send sample in ice PER PAT 301 FORM
		Lymph biopsy film					

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
		Blood	EDTA				
8	Microsporidium	Stool	Sterile container	By Batch	IKN	3 – 4 weeks	PER PAT 301 FORM
9	Schistosomiasis serology	Blood	Plain Gel Tube, EDTA tube 2 ml	By Batch	IMR	3 – 4 weeks	To send sample in ice PER PAT 301 FORM
10	Stool for DMSO Stain (Cryptosporidium, Cyclospora spp, Isospora)	Stool	Sterile Container	By Batch	IKN	3 – 4 weeks	PER PAT 301 FORM
11	Stool Ova and Cyst	Stool	Sterile Container 3 ml	Daily	Hospital Sultan Idris Shah, Serdang	1 – 2 days	
12	Taeniasis/Cysticercosis serology	Serum	Plain Gel Tube 2 ml	By Batch	IMR	3-4 weeks	PER PAT 301 FORM
13	Toxocariasis Serology	Blood	Plain Gel Tube, EDTA tube 2 ml	By Batch	IMR	3 – 4 weeks	To send sample in ice PER PAT 301 FORM
14	<i>Trypanosomiasis</i> Microscopy	Whole blood in EDTA	EDTA 2.5 ml	By Batch	IMR	3 – 4 weeks	PER PAT 301 FORM
		Thick blood film	Thick blood film				
		Lymph node film	Lymph node film				

3.7 Virology

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
1	Anti HCV	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sultan Idris Shah, Serdang	3 - 5 days	
2	COVID-19 Ag	Nasopharyngeal swab	Falcon Tube	Upon request	Hospital Sultan Idris Shah, Serdang	1 day	Test request must be informed to Medical Officer Microbiology on call for approval. Specimen must be packed in Triple layer packaging and transported in ice. Specimen collection kit will be supplied by Pathology counter. Send immediately to Pathology counter once collected
3	Cytomegalovirus IgM	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sultan Idris Shah, Serdang	3 - 5 days	
4	Cytomegalovirus IgG	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sultan Idris Shah, Serdang	3 - 5 days	
5	Dengue Combo Test	Blood	Plain Gel Tube, 5 ml	Daily	Hospital Sultan Idris Shah, Serdang	1 day	1 hour if urgent request
6	Dengue IgM ELISA	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sultan Idris Shah, Serdang	5 - 7 days	
7	Epstein Barr Virus Capsid IgG	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
8	Epstein Barr Virus Capsid IgM	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
9	HBsAb	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sultan Idris Shah, Serdang	3 - 5 days	
10	HBsAg	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sultan Idris Shah, Serdang	3 - 5 days	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
11	Hepatitis A IgM (HAV IgM)	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
12	Hepatitis A Total	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sultan Idris Shah, Serdang	3 - 5 days	
13	Hepatitis B core Ab Total (HBc Ab Total)	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sultan Idris Shah, Serdang	3 - 5 days	
14	Hepatitis B core IgM (HBc IgM)	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
15	Hepatitis B e Ab (HBe Ab)	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sultan Idris Shah, Serdang	3 - 5 days	
16	Hepatitis B e Ag (HBe Ag)	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sultan Idris Shah, Serdang	3 - 5 days	
17	HIV Ag/Ab	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sultan Idris Shah, Serdang	3 - 5 days	
18	Japanese encephalitis Serology	Blood	Plain Gel Tube, 5 ml	By Batch	MKAK Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
		CSF	Sterile Container 1 ml				
19	Measles – IgG	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
20	Measles – IgM	Blood	Plain Gel Tube, 5 ml	By Batch	MKAK Sungai Buloh	3 – 4 weeks	
		Throat swab	VTM				

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
		Urine	Sterile container 10 ml of urine (Early morning first void)				Measles – Borang Permohonan dan Keputusan Ujian Makmal MSLF:01/2004
		Nasopharyngeal secretion	Sterile container 1-3 ml				
		Tracheal aspirate	Sterile container 1-3 ml				
21	Mumps – IgG	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
22	Mumps – IgM	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
23	Nipah IgM	CSF	Sterile Container	By Batch	IMR	3 – 4 weeks	Virology Test Request Form IMR/IDRC/VIRO/ADMIN/53
		Blood	Plain Gel Tube, 5 ml				
24	Nipah IgG	CSF	Sterile Container	By Batch	IMR	3 – 4 weeks	Virology Test Request Form IMR/IDRC/VIRO/ADMIN/53
		Blood	Plain Gel Tube, 5 ml				
25	Parvovirus B19 - IgG	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
26	Parvovirus B19 - IgM	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
27	Poliovirus	Stool	Sterile container	By Batch	IMR	3 – 4 weeks	AFP Case Investigation Form
28	Respiratory Virus Ag	Nasopharyngeal Aspirate	Sterile container	By Batch	Hospital Sultan Idris Shah, Serdang	1 day	
		Nasopharyngeal Swab	Sterile transport container				
29	Respiratory virus isolation and Identification (Influenza Virus A and B, Adenovirus, Respiratory Syncytial Virus, Parainfluenza Virus 1, 2, and 3, Human Metapneumovirus)	Nasal aspirate/ wash	Sterile container	By Batch	IMR	3 – 4 weeks	Virology Test Request Form IMR/IDRC/VIRO/ADMIN/53
		Nasopharyngeal aspirate/ wash	Sterile container				
		Nasopharyngeal swab	VTM				
		Throat/ Tonsillar/ Oropharyngeal swab	VTM				
		Sputum	Sterile container				
		Tracheal aspirate	Sterile container				
		Endotracheal aspirate	Sterile container				
		Bronchial wash	Sterile container				
		Bronchoalveolar lavage (BAL)	Sterile container				

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
		Tracheal/ Bronchial/ Lower airway/ Lung swab	VTM				
		Tracheal/ Bronchial/ Lung tissue	Sterile leakproof container containing VTM or sterile normal saline				
		Pleural fluid	Sterile container				
30	Rotavirus/Adenovirus	Stool	Sterile container	Daily	Hospital Sultan Idris Shah, Serdang	1 day	
31	Rubella – IgG	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sultan Idris Shah, Serdang	3 - 5 days	
32	Rubella – IgM	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sultan Idris Shah, Serdang	3 - 5 days	
33	Toxoplasma gondii IgG	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sultan Idris Shah, Serdang	3 - 5 days	
34	Toxoplasma gondii IgM	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sultan Idris Shah, Serdang	3 - 5 days	
35	Toxoplasma serology screening and confirmatory (for avidity testing)	Serum	Plain Gel Tube, 2 ml	By Batch	IMR	3-4 weeks	PER PAT 301 FORM
36	Varicella Zoster Virus - IgG	Blood	Plain Gel Tube, 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM
37	Varicella Zoster Virus - IgM	Blood	Plain Gel Tube 5 ml	By Batch	Hospital Sungai Buloh	3 – 4 weeks	PER PAT 301 FORM

4.0 ANATOMIC PATHOLOGY TEST

4.1 HISTOPATHOLOGY

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULED	PERFORM SITE	LTAT	REMARKS
1	Routine HPE - Biopsy specimens - Resected specimens - Tissue from autopsy specimen	Formalin* Fixed Tissue (*10% Neutral Buffered Formalin) (Tissue to Formalin ratio: 1:10)	Leak-proof, clear container	Office hour	Hospital Sultan Idris Shah, Serdang	Urgent small biopsy (not more than 3 containers and/or not require further levels, deeper sections or ancillary studies): 3 working days Routine specimen: Within 14 days (70%)	
2	Routine HPE (Oral Pathology)	Formalin* Fixed Tissue (*10% Neutral Buffered Formalin) (Tissue to Formalin ratio: 1:10)	Leak-proof, clear container	Office hour	Hospital Sultan Idris Shah, Serdang	Urgent small biopsy without ancillary study: 3 working days Routine specimen: Within 14 days (70%)	
3	Frozen Section	Fresh Tissue	Leak-proof, clear container	24 hours – Appointment via Pathologist in-charge at least one day prior to procedure	Hospital Sultan Idris Shah, Serdang	Frozen Section verbal report: Within 45 minutes upon receiving first uncomplicated specimen Paraffin section	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULED	PERFORM SITE	LTAT	REMARKS
						report: Within 14 days (70%)	
4	Renal Biopsy (Requiring Immunofluorescence Study)	1. Formalin* Fixed Tissue (*10% Neutral Buffered Formalin) (Tissue to Formalin ratio: 1:10)	Leak-proof, clear container	Office hour	Hospital Sultan Idris Shah, Serdang	Within 14 days (70%)	
		2. Fresh Tissue in phosphate buffer (Transport in ice)	Leak-proof, clear container				
5	Skin Biopsy (Requiring Immunofluorescence Study)	1. Formalin* Fixed Tissue (*10% Neutral Buffered Formalin) (Tissue to Formalin ratio: 1:10)	Leak-proof, clear container	Office hour	Hospital Sultan Idris Shah, Serdang	Within 14 days (70%)	
		2. Fresh Tissue in phosphate buffer (Transport in ice)	Leak-proof, clear container				
6	Muscle Biopsy (Requiring Enzyme Histochemical Study)	Fresh Tissue (Transport in ice)	Leak-proof, clear container	Office hour – Appointment with Pathologist in- charge of HKL	Histopathology Unit, Pathology Department, Hospital Kuala Lumpur (HKL) Transportation arrangement: Refer to Anatomic Pathology: Histopathology, para 4.3	***2 months following registration of specimen at Histopathology Unit, Pathology Department, HKL	

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULED	PERFORM SITE	LTAT	REMARKS
7	Rectal Biopsy (Requiring Enzyme Histochemical Study)	Fresh Tissue (Transport in ice)	Leak-proof, clear container	Office hour – Appointment with Pathologist in- charge of HKL	Histopathology Unit, Pathology Department, Hospital Kuala Lumpur (HKL) Transportation arrangement: Refer to Anatomic Pathology: Histopathology, para 4.3	***7 days following registration of specimen at Histopathology Unit, Pathology Department, HKL	
8	Histopathology: Molecular 1) Chromogenic In Situ Hybridization (CISH)	Paraffin block (FFPE)/ unstained slides	NA	(Office hour) / prior consultation	Histopathology Unit, Pathology Department, Hospital Kuala Lumpur (HKL) / Hospital Tunku Azizah)	2 months following registration of specimen at referral laboratory	- All requests must be in writing or sent via email.
9	Histopathology: Molecular 2) Fluorescence In Situ Hybridization (FISH)	Paraffin block (FFPE)/ unstained slides	NA	(Office hour) / prior consultation	Histopathology Unit, Pathology Department, Hospital Kuala Lumpur (HKL) / Hospital Tunku Azizah)	2 months following registration of specimen at referral laboratory	- All requests must be in writing or sent via email.

***Reference: Lab Turn Around Time of Histopathology Unit, Pathology Department, Hospital Kuala Lumpur

4.2 CYTOLOGY

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
1	Fine Needle Aspiration Cytology (FNAC)	Smear on slide	Minimum 4 smeared slides - 2 slides fixed in 95% ethyl alcohol at minimum of 30 minutes - 2 slides air dried	Office hours	Hospital Sultan Idris Shah, Serdang	Urgent: 3 working days Routine: 14 calendar days	
		Remaining aspirated material	Remaining material placed in cytofix solution (for cell block preparation and ancillary testing if needed)				
		Material for further ancillary testing	Additional aspirate is required and material placed in cytofix solution				
2	Gynaecological Pap smear	Conventional smear	Smeared fixed slide	Office hours	Hospital Sultan Idris Shah, Serdang	Routine 30 calendar days	
		Liquid Based Cytology (LBC)	LBC vial			Urgent 14 working days	
3	Non-gynaecological, body fluid	Cerebrospinal fluid	Sterile container (Volume as collected)	Office hours	Hospital Sultan Idris Shah, Serdang		

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
		Vitreous fluid	LBC vial	Vitreous fluid: by appointment		Urgent: 3 working days Routine: 14 calendar days	
		Other fluids (Cyst, Pericardial, Peritoneal, Pleural, Synovial)	Universal container or clean container (Volume as collected)				
		Urine	Sterile container (Volume as collected)				
4	Non-gynaecological, Brushing	Brushing	2 smeared slides fixed in 95% ethyl alcohol at minimum of 30 minutes	Office hours	Hospital Sultan Idris Shah, Serdang	Urgent: 3 working days Routine: 14 calendar days	
5	Non-gynaecological, Nipple discharge	Nipple discharge	2 smeared slides: • 1 slide fixed in 95% ethyl alcohol at minimum of 30 minutes • 1 slide air-dried	Office hours	Hospital Sultan Idris Shah, Serdang	Urgent: 3 working days Routine: 14 calendar days	
6	Non-gynaecological, Sputum and washing	Sputum and washing	Universal container (Volume as collected)	Office hours	Hospital Sultan Idris Shah, Serdang	Urgent: 3 working days Routine: 14 calendar days	

5.0 TRANSFUSION MEDICINE TEST

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
1	ABO Rh Grouping	Blood	EDTA tube 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	45 minutes	*single order
2	Antibody Screening	Blood	EDTA tube 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	2 hours	*single order
3	ABO Rh Grouping and Antibody screening	Blood	EDTA tube 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	2 hours	*group order
4	Coomb's test	Blood	EDTA tube 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	4 hours	
5	Group, Screen & Hold (GSH)	Blood	EDTA tube 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	2 hours	
6	GSH convert to GXM	No sample	-	24 hours	Hospital Sultan Idris Shah, Serdang	45 minutes	
7	Group and Crossmatching (GXM) - Routine	Blood	EDTA tube 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	2 hours	
8	Group and Crossmatching (GXM) - Urgent	Blood	EDTA tube 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	45 minutes	
9	Emergency Group dan Crossmatching (Saline Phase)	Blood	EDTA tube 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	30 minutes	
10	Safe O (Uncrossmatched Blood)	Blood	EDTA tube 3 ml	24 hours	Hospital Sultan Idris Shah, Serdang	5 minutes	* sample to be sent if available

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
11	Neonatal Specimen* Blood Group & Direct Coombs Test	Blood	EDTA tube, 500 µl infant blood	24 hours	Hospital Sultan Idris Shah, Serdang	2 hours	
12	Neonatal Transfusion* (less than 4 months) Crossmatch	Blood	EDTA tube 500 µl infant blood + 3 ml mother blood	24 hours	Hospital Sultan Idris Shah, Serdang	2 hours	
13	Antibody Identification	Blood	2 x EDTA tube 6 ml each	Office hours	Hospital Sultan Idris Shah, Serdang / PDN	14 working days	Complete PERPAT-301 form
14	(a) Investigation of Blood Transfusion Reaction – Post Transfusion 1	Blood	2 x EDTA tube 3ml each	Office hours	Hospital Sultan Idris Shah, Serdang	14 working days	*According to suspected type of transfusion reaction after consultation with medical officer/transfusion specialist
		*Blood	2 x Blood Culture Bottle (aerobe & anaerobe) 1 x Plain Tube for hemolytic workup (total and direct bilirubin, LDH, BUSE, creatinine) 1 x Sodium Citrate for coagulation profile 1 x EDTA for full blood picture)				

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
		*Urine	Urine, sample for hemoglobinuria				
		Blood	Empty blood bag				
15	(b) Investigation of Blood Transfusion Reaction – Post Transfusion 2	Blood	2 x EDTA tube 3 ml each	Office hours	Hospital Sultan Idris Shah, Serdang	14 working days	*According to suspected type of transfusion reaction after consultation with medical officer/transfusion specialist
		*Blood	1 x Plain Tube for hemolytic workup (total and direct bilirubin, LDH, BUSE, creatinine) 1 x Sodium Citrate for coagulation profile 1 x EDTA for full blood picture)				
		*Urine	Urine, sample for hemoglobinuria				
16	RBC Phenotyping	Blood	2 x EDTA tube 6 ml each	Office hours	Hospital Sultan Idris Shah, Serdang	14 working days	Complete PERPAT-301 form
17	Cold agglutinin	Blood	2 x EDTA tube 6 ml each	Office hours	Hospital Sultan Idris Shah, Serdang	14 working days	Complete PERPAT-301 form
18	Isohaemagglutinins	Blood	2 x EDTA tube 6 ml each	Office hours	Hospital Sultan Idris Shah, Serdang	14 working days	Complete PERPAT-301 form

NO	TEST	SPECIMEN TYPE	CONTAINER	SCHEDULE	PERFORM SITE	LTAT	REMARKS
19	Platelet Antibody Test	Blood	Refer Platelet Immunology Test Request PDN/IH/QP- 05/02,ver 02	Office hours	Pusat Darah Negara	14 working days	Complete PERPAT-301 form Platelet Immunology Test Request form PDN/IH/QP-05/02,ver 02

