Kementerian Kesihatan Malaysia

9th Edition

PATHOLOGY HANDBOOK

HOSPITAL PAKAR SULTANAH FATIMAH, MUAR

2025

FOREWORD

by Hospital Director

I would like to congratulate the Department of Pathology on successfully revising the HPSF Pathology Services Handbook 9th Edition, 2025. This essential, easy-to-use guide is now the official reference for all healthcare providers utilizing HPSF's pathology services. It clearly details available tests, required sample types/volumes, methods, and turnaround times, including well-elaborated instructions for special procedures. We trust this handbook will be an invaluable tool for clinicians, leading to optimal patient care in HPSF Muar.

DIRECTOR
HOSPITAL PAKAR SULTANAH FATIMAH, MUAR

FOREWORD

by Head of Pathology Department

The Department of Pathology in HPSF has always strived to deliver the best to our clients to achieve the department's vision and mission. Therefore, the Pathology Service Handbook is part of our on– going initiative to satisfy the needs of the clients by providing a clear, concise, comprehensive and informative guide on the tests performed in the laboratory and those outsourced to other reference laboratories. The book also explains regarding the details of the list of tests and specimen collection as well as the rejection criteria. Hopefully, this will guide the clinicians and clients on the intricacies of the testing and what they should do to obtain the optimum outcome. This latest edition was updated with a lot of effort from the editorial board and respective units. I hereby extend my heartiest appreciation and to congratulate all the committee members for their good works in completing the 9th edition of 2025 handbook to improve the quality of service in the Department of Pathology, HPSF

DR NORANIZAH WAGINO,
CONSULTANT PATHOLOGIST (ANATOMIC PATHOLOGY),
HEAD OF PATHOLOGY DEPARTMENT,
HOSPITAL PAKAR SULTANAH FAMAH, MUAR

PATHOLOGY SERVICE HANDBOOK 9TH EDITION, 2025

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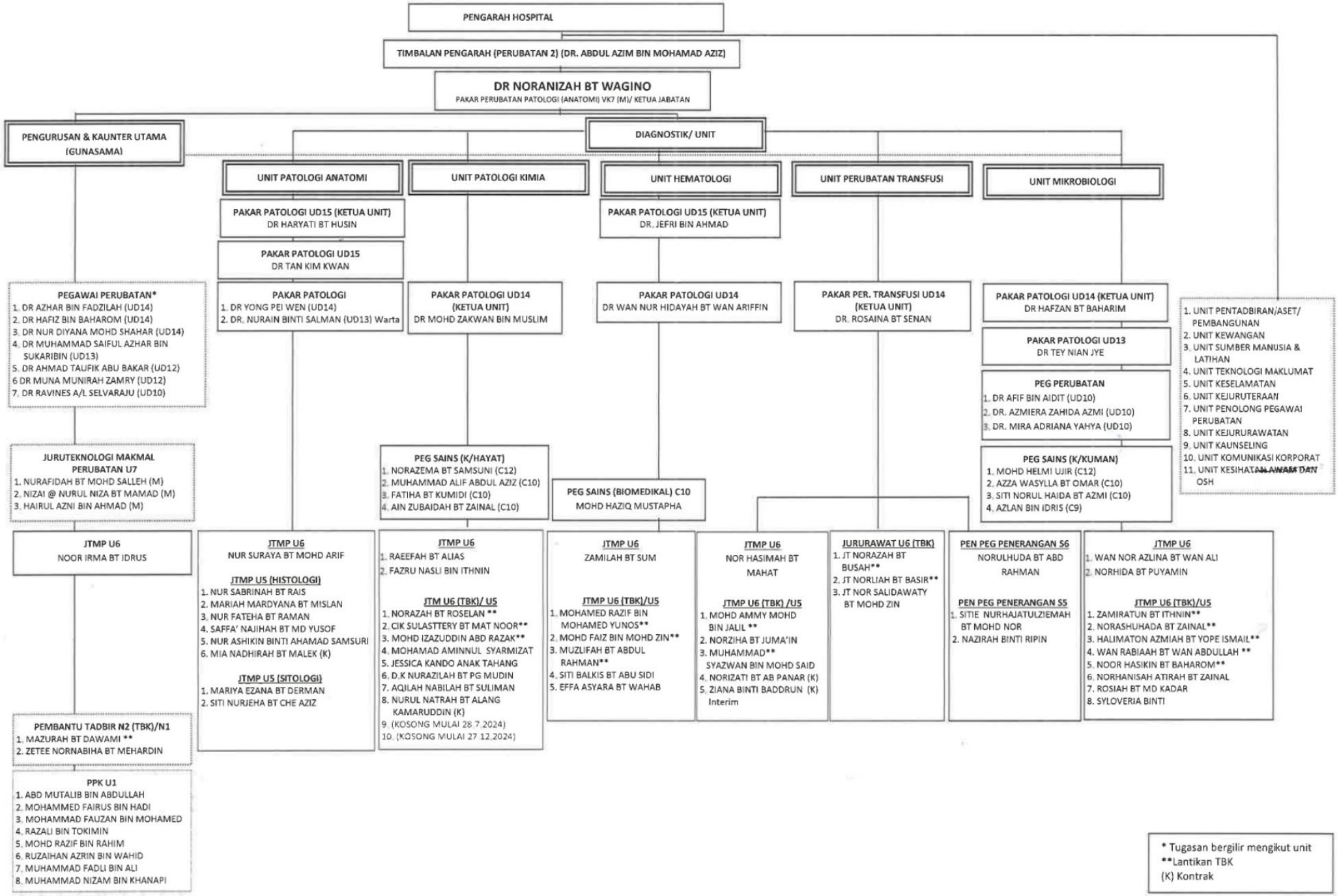
***TO ALL PAST AND PRESENT PERSONNEL OF THE PATHOLOGY DEPARTMENT THAT HAVE CONTRIBUTED DIRECTLY OR INDIRECTLY IN THE MAKING OF THIS HANDBOOK.**

CARTA ORGANISASI JABATAN PATOLOGI, HOSPITAL PAKAR SULTANAH FATIMAH MUAR



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HPSF 2025

GENERAL OPERATING POLICIES

GENERAL OPERATING POLICIES

LOCATION

The department of Pathology is situated at the ground floor of the diagnostic block besides the Radiology Department and CSSD.

FUNCTION

- The Department of Pathology provides diagnostic and consultancy services in the following disciplines of Pathology:
    - Chemical Pathology
    - Hematology
    - Anatomic Pathology (Histopathology)
    - Anatomic Pathology (Cytology)
    - Microbiology
    - Transfusion Medicine

- Apart from offering diagnostic services, the department also acts as a training centre for various levels and categories of staff including Medical Laboratory Technologies, Scientific Officers, students from institutes of higher learning, Medical Officers and Pathologists in various disciplines of pathology.

- Department of Pathology is also involved in clinical research and development in collaboration with other departments in Hospital Pakar Sultanah Fatimah, Muar, local universities and other agencies.

SERVICE HOURS

The Department of Pathology provides 24-hours service of Chemical Pathology, Hematology, Microbiology and Transfusion Medicine Laboratories.

Histopathology and Cytology laboratories only operate during office hours.

FUNCTIONAL UNIT	OFFICE HOURS	AFTER OFFICE HOURS
ANATOMIC PATHOLOGY (HISTOPATHOLOGY & CYTOLOGY)	**Monday to Thursday:** 8.00 AM – 1.00 PM 2.00 PM – 5.00 PM **Friday:** 8.00 AM – 12.15 PM 2.45 PM – 5.00 PM	-
CHEMICAL PATHOLOGY/ **HEMATOLOGY/** **TRANSFUSION MEDICINE/** **MICROBIOLOGY**	**Monday to Friday:** 8.00 AM - 5.00 PM	**Monday- Friday:** 5.00 PM-9.00 PM 9.00 PM-8.00 AM **Saturday, Sunday and Public holidays:** 8.00 AM - 8.00 PM 8.00 PM - 8.00 AM

The scheduled management personnel of the department are available for any consultation or assistance after office hours.

SCOPE OF SERVICE

The department provides the following services according to units:

1. **Chemical Pathology:** Biochemistry, Immunoassays, Specific Protein, Clinical Toxicology and Drug of Abuse Test

2. **Microbiology:** Bacteriology, Immunology, Serology, Mycology, Virology, Parasitology and Infection Control activities.

3. **Hematology:** Routine Hematology Test, Coagulation Profile, Special Hematology Test and ESR

4. **Anatomic Pathology (Histopathology):** Histopathological examination, frozen section, Histochemistry (special stain), Immunohistochemistry (IHC), Immunofluorescence Microscopy (IF). Histopathologists also involved in clinical autopsy.

5. **Anatomic Pathology (Cytology):** Gynecology (pap smear), non-gynecology (body fluid analysis), FNAC and seminal fluid analysis.

6. **Transfusion Medicine:** Responsible to provide compatible, safe packed cells and blood component for patient. It also organized blood donation campaign through mobile drives and walk-in donors and subsequently manage seroconvert and seropositive donor cases.

7. Act as a referral center for primary and secondary hospital in north Johor: Receiving samples from nearby government hospital or clinics.

PATHOLOGY LAB CONTACTS

UNIT/ ROOM	*NUMBER*
Head of Department	***340***
PA Office	***343***
MLT (U38/ U36 Pathology)	***366***
Pathology Counter	***465***
Chemical Pathology Unit	***466***
Head of Unit	449
Outsource	271
Immunoassay Section	352
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Science Officer Room	345
Hematology Laboratory	***298***
Head of Unit/ Science Officer	449
Hematologist	365
MLT U6	291
Microbiology Laboratory	***362***
Head of Unit/ Microbiologist	351
Science Officer C12	360
Microbiology Officer room/ MLT U6	359
Bacteriology Lab	362
Serology Lab	354/ 357
TB Lab	363
Anatomic Pathology Laboratory (Histopathology /Cytology)	***353/ 367***
Head of unit	344
Pathologic Anatomy Specialist UD15	365
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Medical officer	369
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Head of Unit	296
Medical officer in charge	294
Blood Donor counter	292
Public Relation officers (PRO)	290
MLT U7	293

INSTRUCTIONS FOR TEST REQUEST

SPECIMENS / SAMPLE

- All specimens collected from patients in the wards / clinic/ OT and Hospital Blood Collecting Centre are dispatched to the laboratory in the appropriate containers as specified.
- Proper identification of the specimen must be maintained. Every specimen container must be completely labelled. The information on the specimen container should have minimum of two identifiers e.g. patient's name and I.C number
- All specimen containers should be put into BIOHAZARD plastic bag before dispatching.
- All Medico-legal specimens must be collected under strict supervision and are properly sealed.
- All specimens shall be sent to the Centralized Pathology Counter (CPC) except for Transfusion Medicine, Histopathology and Cytology samples.
- All Histopathology and Cytology samples shall be sent to Anatomic Pathology Counter within office hour
- Only body fluid Cytology samples can be sent to the Centralized Pathology Counter (CPC) after office hour for storage and will be processed the next working day.

REQUEST FORM INFORMATION

- A standard laboratory request form (PER PAT 301) is used for all categories of Pathology tests under the Ministry of Health.
- In addition, specific form is used for special procedure or sent away specimen. Please refer to related individual unit for more information.
- All requests form must be filled completely with patient's particular, destination and accompanied by properly collected specimens (as per mentioned in details below)
- Combination of forms is allowed for routine Biochemistry tests.

STAT REQUEST

- This type of request basically means as immediate test need to be done as the result is required for immediate management of patient.
- Not all tests are available in STAT (related individual unit TAT list is kindly referred to)

URGENT REQUEST

- For tests that take longer processing time, e.g. 1 day or more, urgent request is allowed.
- Urgent request must be justified by clinical summary, diagnosis and reason for urgency. The word "URGENT" must be clearly or stamped preferably in red at the top on the right hand corner of the request form
- Some urgent request might need to be spoken through Medical Officer or Specialist oncall of the day for that individual unit.

SCHEDULING OF RECEIVING OF SPECIMEN

1. Inpatients:
   - Routine specimens from wards to reach the Pathology Department by the following times:
     i. Receipts of specimen from first collection are 08:30H
     ii. Receipts of specimen from second collections are 11:30H
     iii. Receipts of specimen from third collections are 14:30H and not exceed 15:30H for the non-urgent tests. (For the same day processing)

***However, any routine/ urgent requests can be sent to the laboratory as when required. (Please refer to the list of urgent tests)**

2. Outpatients (from Specialist Clinics):
   - Outpatient's specimens (from Specialist Clinics) shall be collected at Blood Collecting Centre on appointment.
     i. Receipts of specimen from first collection are 09:00H and not exceed 12:30H
     ii. Receipts of specimen from second collection are 14:00H and not exceed 16:00H

REJECTION OF SPECIMENS

Requests which do not fulfill the laboratory requirement will be rejected. Below are the common/primary rejection criteria:

1. Leaking specimens.
2. Wrong container
3. Name of test not provided.
4. No specimen received for the test requested.
5. Request with incomplete patient's particular:
   - Incomplete identity card (IC) number.
   - Name of the patient is not provided.
   - No ward/clinic written on the request form
6. Insufficient sample/specimen
7. The specimen is not suitable for analysis e.g. hemolysed blood sample.
8. Patient's information on the request form does not tally with that on the specimen bottle.

Refer to the next page for specific rejection criteria.

The ward or clinic staff will be notified if the specimen is rejected.

***kindly refer to respective unit for rejection criteria of specific test in**

KRITERIA PENOLAKAN SPESIMEN JABATAN PATOLOGI, HOSPITAL PAKAR SULTANAH FATIMAH,MUAR

SAMPEL	SAMPEL LISIS
	SAMPEL CLOTTED
	SAMPEL TIDAK CUKUP
	SAMPEL 'OVERFILLED'
	SUHU TIDAK SESUAI (NO COLD CHAIN)
	SAMPEL TIDAK LABEL
	SALAH BEKAS
	BEKAS KOSONG
	TIADA SAMPEL
	LEAKING
	SAMPEL 'LONG STANDING'
MAKLUMAT PESAKIT	MAKLUMAT TIDAK LENGKAP: TIADA NAMA
	TIADA NO. KAD PENGENALAN
	NO. KAD PENGENALAN TIDAK LENGKAP
	NO. KAD PENGENALAN TIDAK JELAS
	NAMA DAN NO. KAD PENGENALAN TIDAK SEPADAN
	MAKLUMAT TIDAK LENGKAP: TIADA UMUR/TARIKH LAHIR
	BORANG DAN SAMPEL TIDAK SEPADAN
MAKLUMAT DOKTOR	TIADA TANDATANGAN PAKAR
	TIADA NAMA/TANDATANGAN/ COP PEMOHON (DOKTOR)
SOURCE	WAD TIDAK DINYATAKAN
	WAD TIDAK JELAS
LOGISTIK	MASA PENGHANTARAN TIDAK SESUAI
	TIDAK MENGGUNAKAN BEG BIOHAZARD
DATA KLINIKAL	TIADA DIAGNOSIS/CLINICAL HISTORY
REQUEST	SALAH BORANG
	DOUBLE REQUEST
	UJIAN TIDAK DITAWARKAN
	REQUEST TIDAK DINYATAKAN
	REQUEST NOT INDICATED
TERCEMAR	QUERY CONTAMINATION
LAIN-LAIN	SAMPEL TIDAK SESUAI (SELAIN DIATAS)

Peratus penolakan spesimen : $\frac{\text{Jumlah penolakan yang dibuat}}{\text{Jumlah spesimen yang diterima}}$ X 100%

Sasaran: Kadar penolakan **<1.00 %** merujuk kepada piawaian yang ditetapkan oleh (MSQH 6th edition).

RESULTS/REPORTS

1. Positive routine test result from Microbiology unit will be placed in the designated pigeon hole available at the centralized Pathology Counter as soon as the results are ready. (Please refer to the turnaround time (TAT) for the individual test)
2. Routine Hematology & Routine/ STAT Chemical Pathology tests will not be printed as can be viewed from the ward enquiry system unless requested.
3. Full Blood Picture, Bone marrow aspirate and trephine biopsy, Cytology and Histopathology reports will be dispatched to respective clinics, wards or departments.
4. Please check the pigeonhole regularly.
5. Critical results notification will be informed to the ward by respective unit to clinical personnel in respective ward/clinic. Please refer to *Polisi Jabatan Patologi versi 4.0* for escalation procedure of critical result notification.
6. All Pathology investigations reports shall be promptly reviewed by clinicians.
7. Please communicate with the MLT or Officer in charge as soon as possible if the result is not dispatched/ released at the expected period.
8. Please refer to LTAT of individual test for expected time of release of test result.

SAFETY MEASURES

Strict safety measures are practiced according to the laboratory safety manual “Code Of Practice Of Prevention Of Infection And Accidents In The Pathology Services” OSHA Act 1994 (Act 514), MOH.

GUIDELINES ON SPECIMEN COLLECTION

INTRODUCTION

Pathology Department aims to provide quality services that are able to provide accurate and precise results for all tests. However, proper collection of specimen is one of the important factors, which can influence laboratory results. Thus, the guidelines provided below must be adhered to during collection of specimens.

REQUEST FORM

PER.PAT 301 form is used for all tests unless otherwise stated (refer to respective unit). All request forms must be legibly written. The completed forms shall be signed and stamped by a doctor.

The following information must be provided for every request:

- Patient's detail : Name, identity card (IC) number, sex and age.
- Source : Ward, clinic and name of hospital (if relevant).
- Patient's clinical summary : Relevant clinical summary including provisional medical diagnosis and treatment. Abbreviations are discouraged.
- Test details : Request must specify the test required.
- Sample : Date and time of sample collection. Type of samples and anatomical site (if relevant).
- Requester detail : Doctor's name, signature and official stamp.

Mark (√) at the appropriate box for the tests required. Tests which are not listed in the request form should be stated under the column OTHERS. For Histopathology, Microbiology and Virology the type of Sample should be stated under the appropriate column.

SAMPLE COLLECTION

- The samples should be properly collected in appropriate containers.
- The containers must be labeled with at least two identifiers (i.e. name of patient and patient's I.C number) and the name of test requested.
- The containers should be placed in biohazard plastic bags with the respective request forms stapled outside the bag.

TYPES OF CONTAINERS

Refer to list of tests for the guidelines and recommendation.

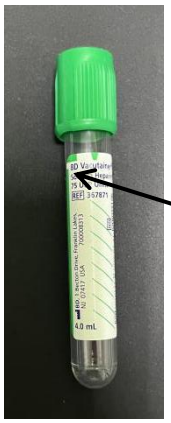
TRANSPORTATION OF SAMPLE

- The samples should be transported to the laboratory in appropriate time frame. Refer to the list of tests in pathology department.
- All samples should be sent to the laboratory together with a Despatch Book (or list) with acknowledgement from the laboratory staff.
- The time of samples received at the counter should be clocked in by the laboratory user and the samples will subsequently be attended by the laboratory staff for the URGENT tests to be carried out.

TYPE OF TUBES

Tubes for blood collection are supplied by Pathology Department.

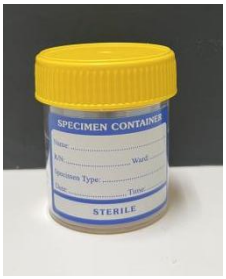
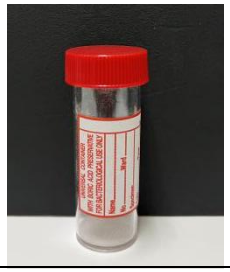
TYPE OF TUBES			
Blood Collection Tube	**Additives**	**Mix by Inverting**	**Common Use**
	Sodium Citrate 3.2% **Correct filling level**	**Note: Adequate sample volume is VERY IMPORTANT.** To be filled up to indicator line. **Invert tube gently 3-4 times** after collection.	**<u>Hematology:</u>** Coagulation test, D-Dimer, Fibrinogen, Mixing Test, Thrombophilia Testing, ADAM TS-13 Study.
	Plain tube without gel **Appropriate filling level**	**Invert tube gently 6-8 times** after collection.	**<u>Chemical Pathology:</u>** Therapeutic drug monitoring (TDM)
	Plain tube with gel **Appropriate filling level**	**Invert tube gently 8-10 times** after collection.	**<u>Chemical Pathology:</u>** Immunoassay & Special Protein (CRP, C3, C4, Rheumatoid factor) test. **<u>Microbiology:</u>** Serology test

TYPE OF TUBES			
Blood Collection Tube	**Additives**	**Mix by Inverting**	**Common Use**
	Lithium Heparin **Appropriate filling level**	**Invert tube gently 8-10 times** after collection.	**<u>Chemical Pathology:</u>** General Chemistry
	Sodium Heparin **Appropriate filling level**	**Invert tube gently 8-10 times** after collection.	**<u>Hematology:</u>** Cytogenetic
	EDTA **Correct filling level**	**Note: Adequate sample volume is VERY IMPORTANT.** **Invert tube gently 8-10 times** after collection.	**<u>Chemical Pathology:</u>** Ammonia, HbA1c, Everolimus, Tacrolimus, Cyclosporin, IPTH (in ice), ACTH (in ice) **<u>Hematology:</u>** Hematology test except coagulation **<u>Microbiology:</u>** Molecular test

<table>
<tr><th colspan="4">TYPE OF TUBES</th></tr>
<tr><th>Blood Collection Tube</th><th>Additives</th><th>Mix by Inverting</th><th>Common Use</th></tr>
<tr><td>  </td><td>Sodium Flouride
or
Potassium Oxalate

Appropriate filling level</td><td>Invert tube gently 8-10 times after collection.</td><td><u>Chemical Pathology:</u>
Glucose, Lactate</td></tr>
<tr><td colspan="4">PAEDIATRIC TUBES IN HPSF</td></tr>
<tr><td> 
EDTA</td><td> 
Lithium Heparin with gel</td><td> 
Plain tube with gel</td><td>Pediatric tube function are similar to adult tube.</td></tr>
</table>

TYPE OF CONTAINERS		
Image of Containers	**Container**	**Sample**
	Blood culture bottle for Anaerobic bacteria.	Blood
	Blood culture for bottle Aerobic bacteria.	Blood
	Blood culture bottle for mycobacteria, yeast and fungi.	Blood

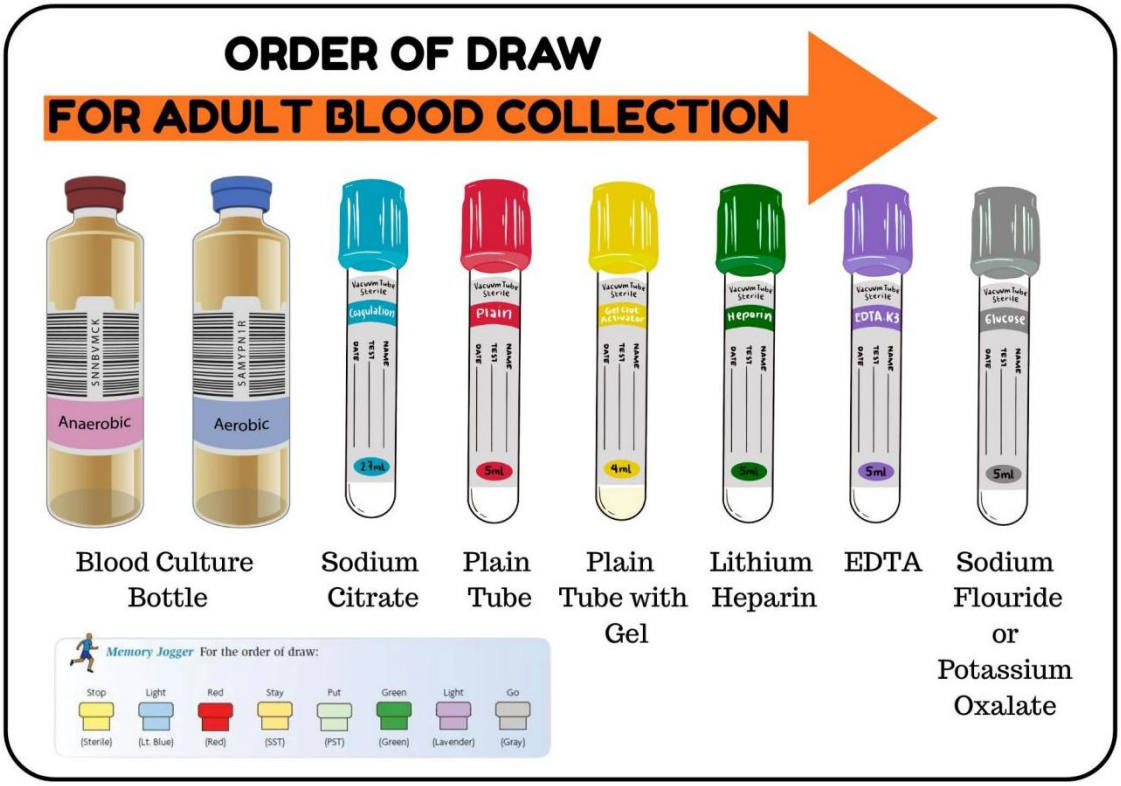
TYPE OF CONTAINERS		
Image of Containers	**Container**	**Sample**
	Blood culture bottle for isolation of aerobic microorganisms (mainly bacteria and yeast) from pediatric blood specimens .	Blood
	Universal Sterile container	Urine, body fluids
	Stool container	Stool
	Universal container with Boric Acid preservative for Urine Culture & Sensitivity	Urine
	Bijou bottle	CSF

TYPE OF CONTAINERS		
Image of Containers	**Container**	**Sample**
	24 hr urine container	24 hr urine collection
	Heparinized syringe	Blood Gases (ABG / VBG)
	Liquid based Cytology	Cervical pap smear
	Viral Transport Media (VTM) tube	Swab sample

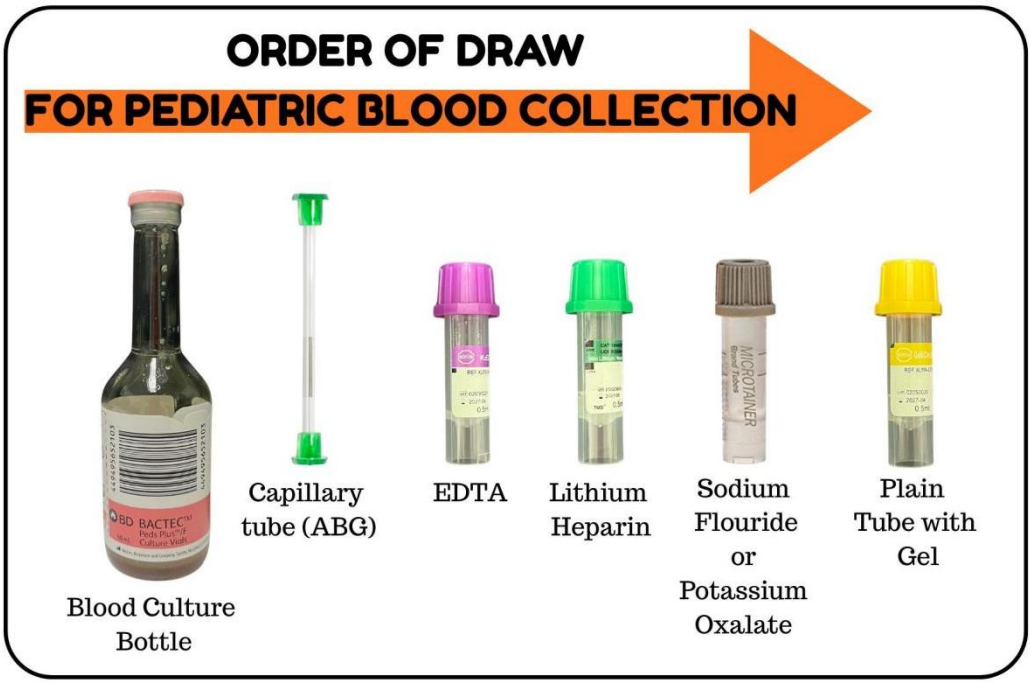
Table 1.1: Types of Tubes and Containers

*Sample collection procedure subject to type of tube, size and volume recommended by vendor.

ORDER OF DRAW



Picture 1.2: Order of Draw for Adult Blood Collection



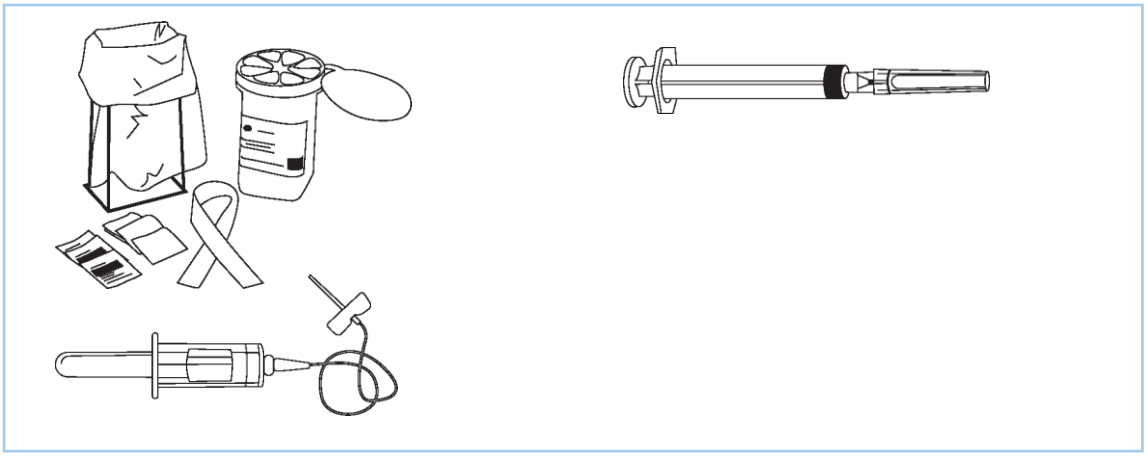
Picture 1.3: Order of Draw for Pediatric Blood Collection

BLOOD COLLECTION

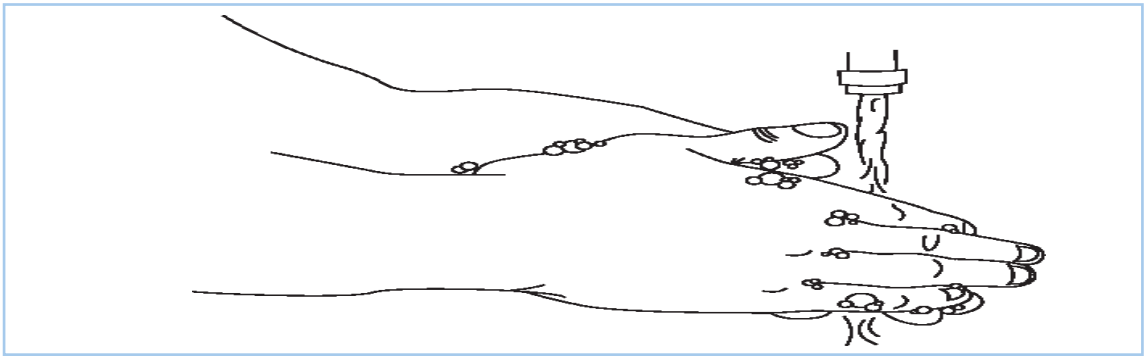
Before blood collection procedure (venipuncture),check the details and identity of the patient and label the blood tube(s) properly.

1. Preferable site of venipuncture is at the median cubital section of the antecubital fossa.
2. Patient should be in a resting state and has maintained the same position for at least 20 minutes to prevent hemoconcentration.
3. If patient is having intravenous drip infusion, the infusion should be stopped for at least 3 minutes before performing venipuncture on the other arm. These specimens are suitable to be tested for most of the analytes except for glucose and electrolytes contained in the infusion given.
4. Ask the patient to form a fist so that the veins are more prominent.
5. Put on well-fitting non sterile gloves.
6. Venipuncture site should be disinfect with 70% alcohol and let dry, apply hemostasis by tying tourniquet on the upper arm about 10-15 cm from the venipuncture site.
7. Anchor the vein by holding the patient's arm and placing a thumb below the venipuncture site.
8. Enter the vein swiftly at a 30-degree angle.
9. When blood taking is complete, free the tourniquet before removing needle from the puncture site and apply pressure on the puncture site to stop bleeding.
10. Send specimen immediately to Pathology Department for processing.

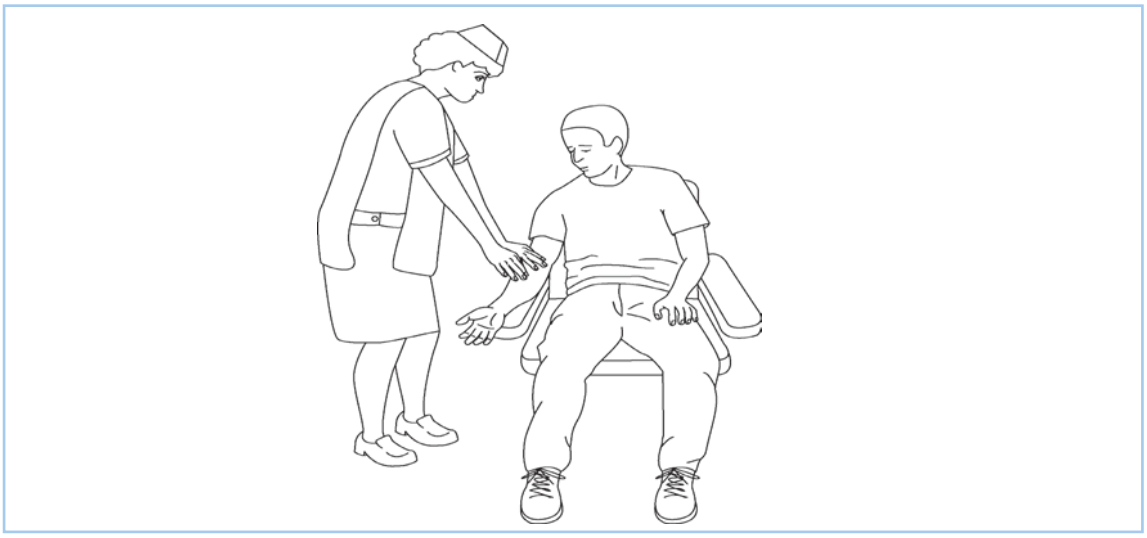
Illustrations for best practices in phlebotomy



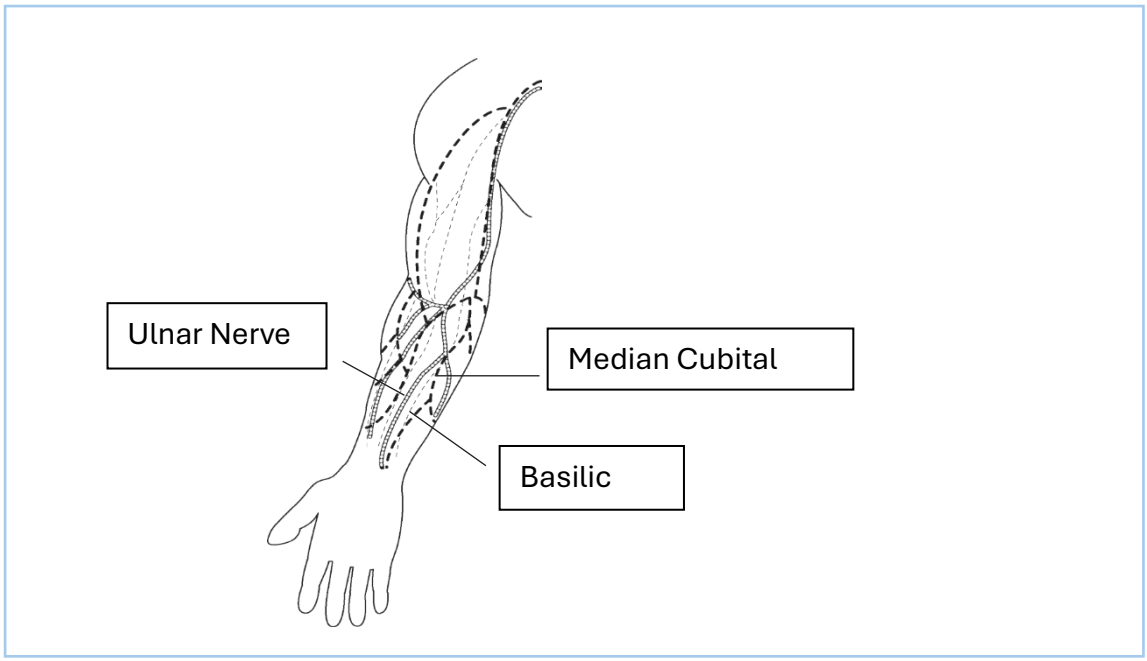
1. Assemble equipment and include needle and syringe or vacuum tube, depending on which is to be used.



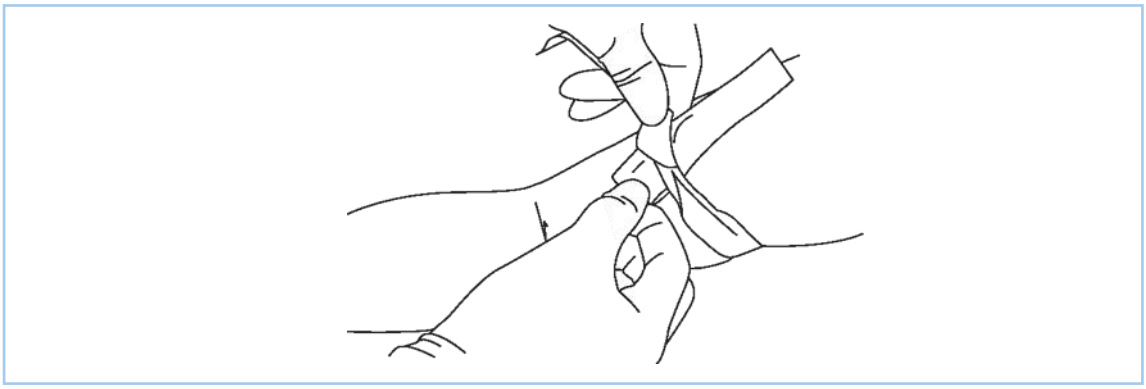
2. Perform hand hygiene (if using soap and water,dry hands with single used towels).



3.Identify and prepare the patient.

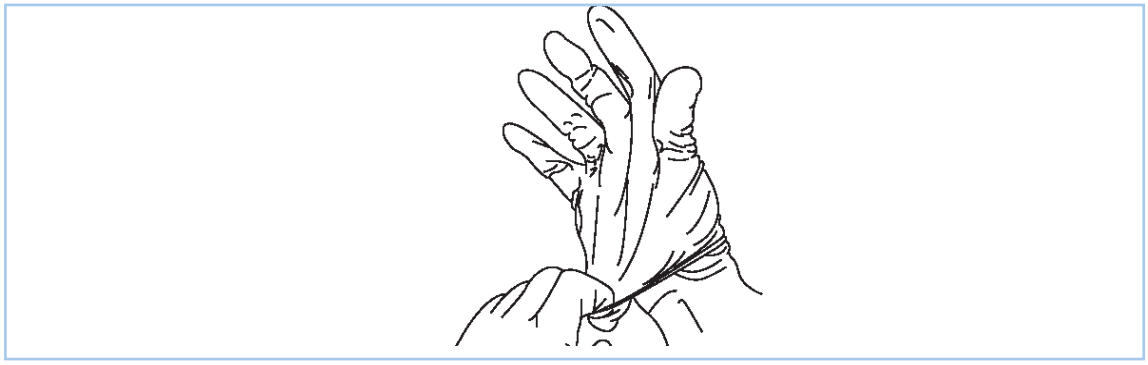


4. Select the site, preferably at the antecubital area (i.e. the bend of the elbow). Warming the arm with a hot pack, or hanging the hand down may make it easier to see the veins. Palpate the area to locate the anatomic landmarks. DO NOT touch the site once alcohol or other antiseptic has been applied.

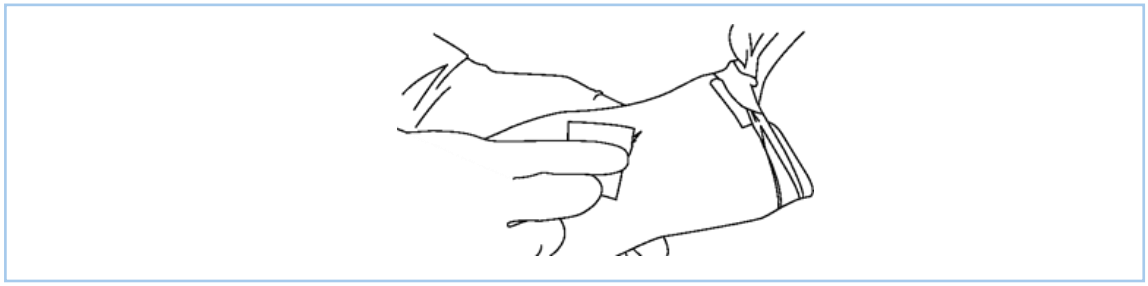


5. Apply a tourniquet, about 4–5 finger widthsabove the selected venipuncture site

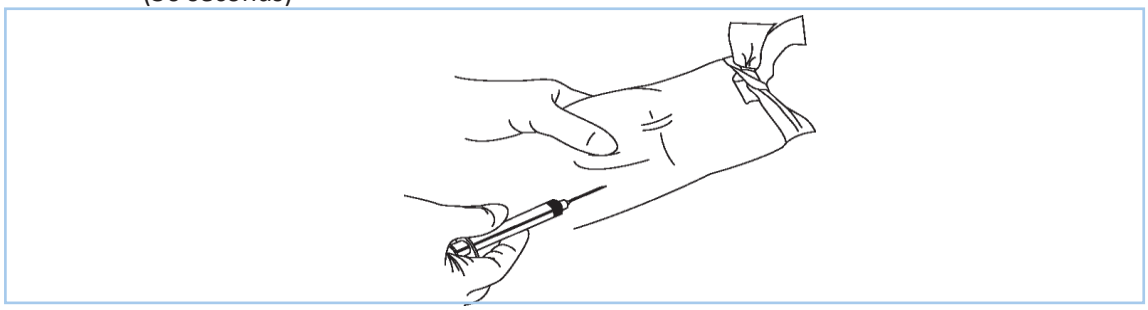
6. Ask the patient to form a fist so that the veins are more prominent.



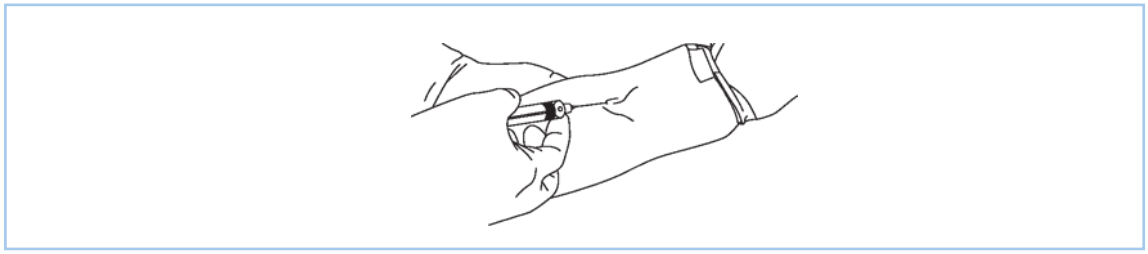
7. Put on well-fitting, non-sterile gloves.



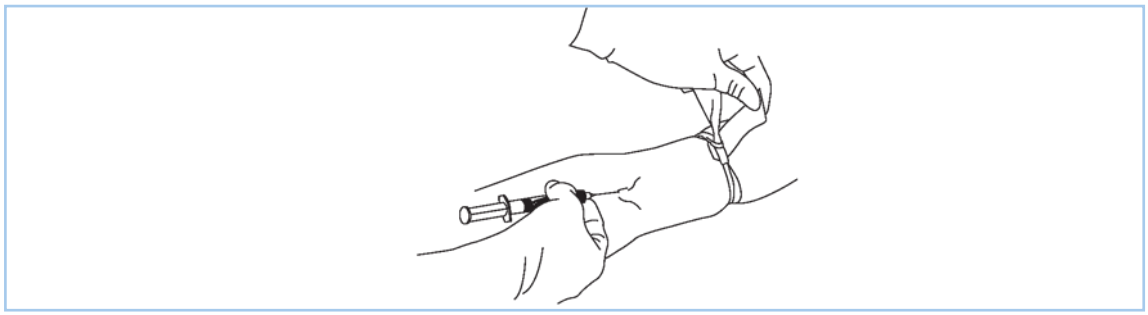
8. Disinfect the site using 70% isopropyl alcohol for 30 seconds and allow to dry completely (30 seconds)



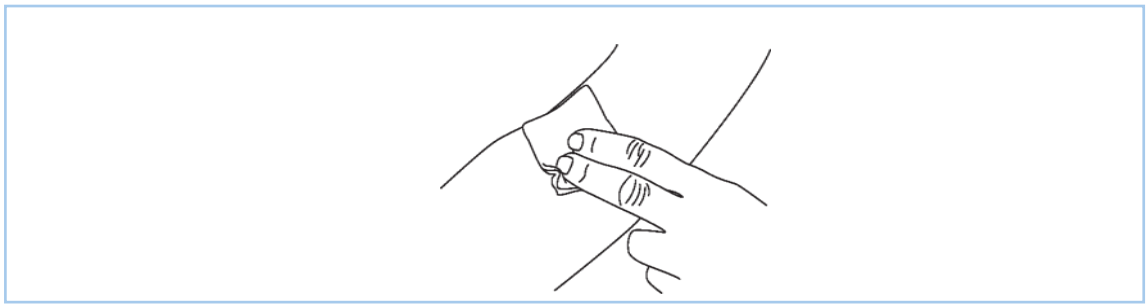
9. Anchor the vein by holding the patient's arm and placing a thumb below the venipuncture site.



10. Enter the vein swiftly at a 30 degree angle.

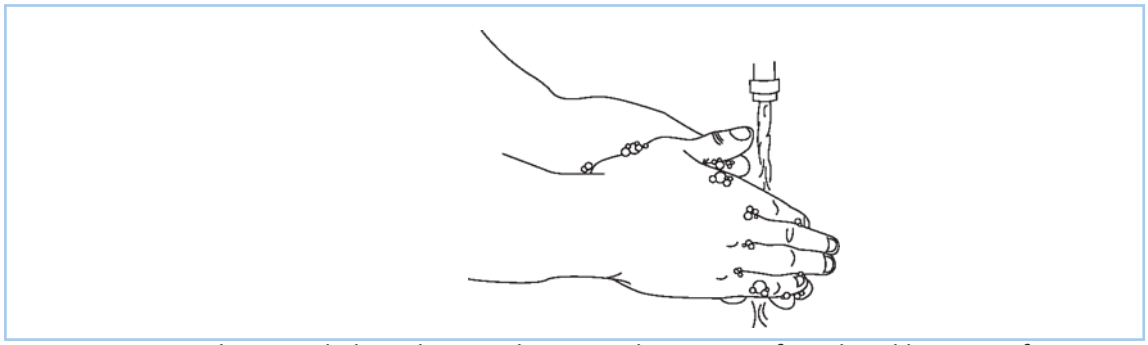


11. Once sufficient blood has been collected, release the tourniquet before withdrawing the needle.



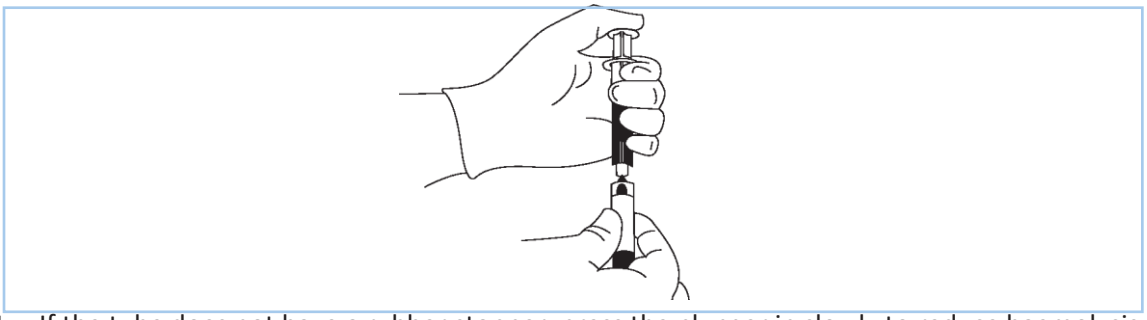
12. Withdraw the needle gently and then give the patient a clean gauze or dry cotton-wool ball to apply to the site with gentle pressure.

13. Discard the used needle and syringe or blood-sampling device into a puncture- resistant container. Discard sharps and broken glass into the sharps container. Place items that can drip blood or body fluids into the infectious waste.

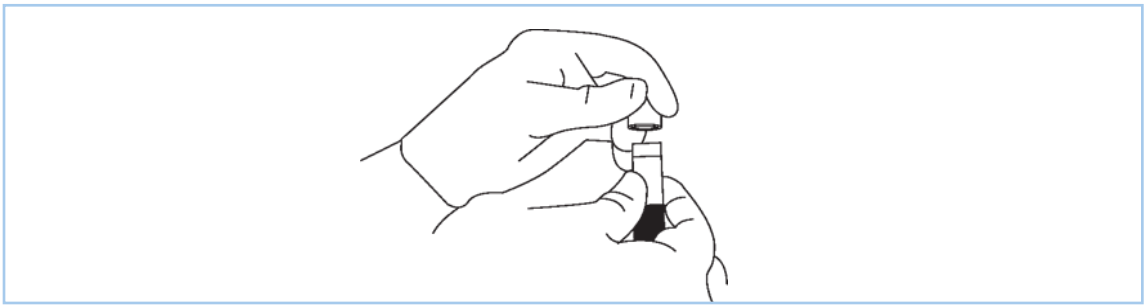


14. Remove gloves and place them in the general waste. Perform hand hygiene. If using soap and water, dry hands with single-use towels.

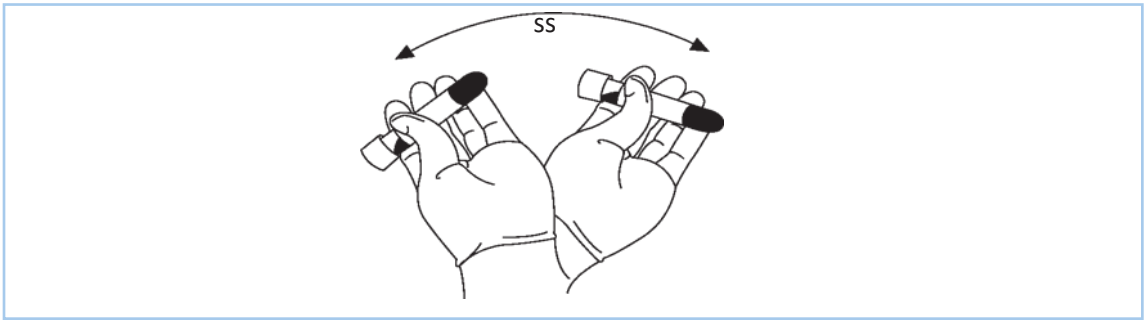
Filling Tubes



1. If the tube does not have a rubber stopper, press the plunger in slowly to reduce haemolysis (this is safer than removing the needle).



2. Place the stopper in the tube.



3. Following laboratory instructions, invert the sample gently to mix the additives with the blood before dispatch.

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MAIN PATHOLOGY COUNTER

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MAIN PATHOLOGY COUNTER

1) INTRODUCTION:

Main Pathology Counter is situated at the front side of the building and immediately after the Main Door. It operates 24 hours and function as a one stop center, services include receiving specimen, supplying specimen containers and kits to the wards and providing information to the public or customers. Pigeon hole for dispatching results are also placed here.

There are 3 other counters in Pathology Department, Hospital Pakar Sultanah Fatimah, Muar.

- **Pathology Anatomy Counter (office hour only)**
- **Transfusion Medicine (Laboratory) Counter (24 hours)**
- **Transfusion Medicine (Donor) Counter (office hour only)**

2) SERVICES:

RECEIVING SAMPLE

- All samples send to Pathology Department must be accompanied by laboratory form and recorded in Dispatch Book.
- Sender must print the time in lab form using time printer located in the counter before hand over all the specimens, form and dispatch book to lab staff.

SUPPLYING SPECIMEN CONTAINERS, BIOHAZARD PLASTIC BAG AND POCT ITEMS.

- The specimen containers and forms are supplied using “BORANG PERMOHONAN STOK (INDIVIDU KEPADA STOR)” (KEW. PS-8).
- The lab staff will receive the form from the wards / unit in the morning (0800H-1200H) on Monday and Friday.
- The containers and biohazard plastic bags are supplied to the wards/units in the afternoon.

LIST OF ITEM SUPPLY BY CENTRALIZED PATHOLOGY COUNTER

NO	ITEM	SCHEDULE OF INDENT
1	Vacutainer K2 EDTA 2ml (Adult)	Twice Weekly (Monday and Friday)
2	Vacutainer Lithium Heparin 4ml (Adult)	
3	Vacutainer SST II Advance(Gel with Clot Activator) 3.5ml (Adult)	
4	Vacutainer Buff. Na Citrate 1.8ml (Adult)	
5	Vacutainer NaF + EDTA for Glucose 2.0ml (Adult)	
6	Vacutainer Serum 4ml (Adult)- Clot Activator Without Gel	
7	Microtainer K2 EDTA (Paed)	
8	Microtainer Lithium Heparin (Paed)	
9	Microtainer Gel with Clot Activator (Paed)	
10	Sterile Container (Yellow Cap)	
11	Sterile Container with Boric Acid(Urine C&S)	
12	Sterile Container with Spoon (Stool Container)	
13	Container 120ml For HPE	
14	Aerobic Blood Culture Vial	
15	Anaerobic Blood Culture Vial	
16	Peds Blood Culture Vial	
17	Amies Charcoal Transport Medium	
18	Glass Slides	
19	Filter Paper For G6PD Blood Spot	
20	Plastic Bag Biohazard Large	
21	Plastic Bag Biohazard Small	
	POCT	
1	Urine Strip(Protein,Glucose,Ketone,pH,Blood)- 5parameter	
2	Urine Strip(Protein,Glucose)- 2 parameter	
3	Glucometer Strip	
4	Battery for Glucometer Analyser	
	Others	
1	24 Hours Urine Container	By Request with Complete Form.
2	Bijou Bottle For CSF	By Request (Spoken to Microbiology Staff)
3	Myco Blood Culture Vial	By Request When Needed
4	Virology Kits	

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CHEMICAL PATHOLOGY

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CHEMICAL PATHOLOGY

INTRODUCTION:

Chemical Pathology is also known as Clinical Biochemistry, Medical Biochemistry or Clinical Chemistry. The Chemical Pathology Unit provides diagnostic and consultations services for patient management to Hospital Pakar Sultanah Fatimah, Muar Johor. Our services cover analysis and interpretation of biochemical changes in body fluids for screening, diagnostics and monitoring of diseases.

SERVICES:

The Chemical Pathology Unit offers specialized biochemical testing. The list of services includes

1. STAT Test
2. Routine Biochemistry Test
3. Immunoassay (Endocrine, Metabolic and Tumour Marker)
4. Special Protein
5. Clinical Toxicology and Therapeutic Drug Monitoring
6. Drug of Abuse
7. Outsourced Tests

TEST CATEGORIES

Office Hour	After Office Hour	Batch Tests
All tests	All tests except batch tests.	• AFP, CEA, CA125, PSA (Monday). • Cortisol, Folate, FSH, LH, Progesterone, Prolactin, Vitamin B12 (Wednesday). • CRP (Sunday, Tuesday & Thursday). • C3 & C4 (Monday & Wednesday). • Drug of Abuse. • Hba1c (Sunday, Tuesday & Thursday). • Iron Profile • Lipid Profile • Urine Protein random/24 hours.

* Please note that, if test not listed but really required after office hour that may affect patient's management, kindly discuss with Chemical Pathologist/ Scientific Officer in charge.

STAT/URGENT TESTS

Short Turn Around Time Test (STAT) is a test that is ordered when patient's condition is critical, and immediate result are required to make life-saving decisions. It must be justified by clinical history, diagnosis and reasons of urgency. The turn-around time for STAT test will be monitored using Laboratory Turn Around Time (LTAT) that is defined as the time interval from specimen receipt at the laboratory until the result is reported.

Urgent test is defined as a test that need to be analyzed immediately due to its inherent instability to ensure the sample remain viable and the result is likely to influent clinical decision and management of a patient.

Routine Biochemistry tests under STAT/Urgent category is tests that offered 24 hours with Laboratory Turn Around Time (LTAT) is 90 minutes.

Immunoassay tests under STAT/Urgent category is tests that offered with Laboratory Turn Around Time (LTAT) 24 hours and must be requested by Medical Officer with justification of disease indication. Tests in this category are:

i. Thyroid Function Test (TSH, FT4)
ii. BHCG
iii. Ferritin
iv. Cortisol

List of Chemical Pathology STAT/Urgent Tests:

STAT Tests	Urgent Tests
Routine tests can be also requested as STAT if clinically indicated for example BUSE, Creatinine, Bilirubin, ALP, AST, ALT, Amylase, Bilirubin, Calcium, Cardiac Enzyme, Glucose, Magnesium, Phosphate.	Ammonia
hs Troponin I	Arterial blood gases
Beta HCG	CSF Biochemistry
Ferritin (TRO HLH)	CSF Lactate
Thyroid Function Test (TRO thyroid emergencies)	Urine Paraquat
Cortisol	Therapeutic Drug Monitoring (TRO toxicity)
Routine samples from Emergency Department	

OUTSOURCED TESTS

All outsourced samples should be sent to Pathology Main Counter during office hour on Monday to Friday at 8.00 am to 4.30 pm. Do not leave the samples unattended at the counter. We do not take any responsibility if the sample is lost. Transportation of outsourced samples to Johor Regions (Monday) and Selangor Regions (Wednesday). Transportation schedule will be changed if there is any Public Holiday.

CRITICAL RESULTS

Critical limits are boundaries of low and high laboratory test values beyond which may cause imminent danger to the patient and/or require immediate medical attention. Critical value results and toxicity levels will be notified to the requestor (doctors or pharmacists) **within 30 minutes after validation of result** by phone call and can be viewed through the LIS system.

Escalation procedure for laboratory personnel when a responsible person cannot be contacted after two attempts within 15 minutes:

***Critical results will be notified to medical officer on call of the respective department.**

Critical Values for Adult

Test	Critical Limit	
	Lower Limit	Upper Limit
Potassium	2.8 mmol/L	6.0 mmol/L
Sodium	125 mmol/L	155 mmol/L
Glucose	2.8 mmol/L	20.0 mmol/L
Calcium	1.5 mmol/L	3.0 mmol/L
Magnesium	0.41 mmol/L	2.0 mmol/L
Phosphate	0.32 mmol/L	2.87 mmol/L
Lactate	-	5.0 mmol/L
Creatinine Kinase	-	5000 U/L
pH	7.2	7.55
pO_2	7.8 kPa	-
pCO_2	-	9.3 kPa

Reference: Quick Guide for Improving Notification of Critical Laboratory Results in MOH Hospitals.

Critical Values for Pediatric

Test	Critical Limit	
	Lower Limit	Upper Limit
Potassium	2.8 mmol/L	6.0 mmol/L
Sodium	125 mmol/L	155 mmol/L
CSF-Glucose	1.6 mmol/L	-
Calcium	1.7 mmol/L	3.1 mmol/L
Magnesium	0.5 mmol/L	1.8 mmol/L
Phosphate	0.4 mmol/L	2.8 mmol/L
Lactate	-	3.0 mmol/L
pH	-	7.60
pO_2	5.85 kPa	16.2 kPa
pCO_2	2.6 kPa	9.1 kPa
Creatinine	-	330 umol/L
Ammonia	-	100 umol/L
Bilirubin-Neonate	-	300 umol/L
CSF-Protein	-	1.87 g/L
Urea	-	19.0 mmol/L
Uric Acid	-	500 umol/L

Reference: Quick Guide for Improving Notification of Critical Laboratory Results in MOH Hospitals.

GUIDELINES OF SPECIMEN COLLECTION AND TRANSPORTATION

1. General guideline for specimen collection and transportation

i. All specimens must be sent in the appropriate containers as usage of wrong containers will cause misleading results.
ii. Blood collected in plain tubes must never be shaken.
iii. Blood collected in anticoagulated tubes must be mixed gently and never shaken.
iv. It is recommended to take blood from seated patient before breakfast between 7 to 9am to avoid interference from food, diurnal variation and variations arising from body position.
v. There are several potential sampling errors which may contribute to the success or failure of the laboratory to provide the correct results to the clinician.
    - ***Blood sampling technique*** - Difficulty in obtaining a blood specimen may lead to haemolysis with consequent release of potassium, LDH, magnesium and other red cell constituents. Results for these analytes will be falsely elevated.
    - ***Prolonged stasis during venipuncture*** - Plasma water diffuses into the interstitial space and the plasma obtained will be concentrated. Proteins and protein-bound components of plasma such as calcium or thyroxine will be falsely elevated.
    - ***Insufficient specimen*** - Each biochemical analysis requires a certain volume of specimen to enable the test to be carried out. It may prove to be impossible for the laboratory to measure everything requested on a small volume specimen.
    - ***Errors in timing*** - The biggest error in the measurement of any analyte in a 24-hour urine specimen is collecting inaccurately timed volume of urine.
    - ***Inappropriate sampling site*** – Blood samples should not be taken 'downstream' from the intravenous drip.
    - ***Incorrect specimen storage*** – A blood sample stored overnight before being sent to the laboratory will show falsely high potassium, phosphate and red cell enzymes such as lactate dehydrogenase, because of leakage into the extracellular fluid from the cells.

2. Factors Affecting Biochemistry Test Results

There are many factors which 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. The table below indicates some common analytical factors which can cause an interference.

Factors influence	Analytes involved
1. After food ingestion	Glucose, triglycerides, iron, inorganic phosphate are present in elevated concentration in blood. Meals may produce an effect on laboratory results lasting over 12 hours.
2. Dietary habits	A high protein diet may increase the concentrations of plasma urea, uric acid and phosphorus. A high fat diet may increase the serum concentration of triglycerides.
3. Posture	Recumbent to an upright position, the concentration of substances such as total protein, enzymes and protein bound ions (e.g. calcium, iron) increase up to 8-10%. With prolonged bedrest, fluid retention occur and concentration of plasma protein, albumin and protein-bound constituent are decreased through dilution effect.
4. Diurnal Variation	Many constituents such as cortisol, iron, TSH etc. are subjected to cyclical variations. For example, serum cortisol may change by 50% from 8am to 4pm.
5. Drug	Morphine may increase increases the activity of amylase, lipase, ALT, AST, ALP, bilirubin, TSH, prolactin concentration.
6. Lifestyle	Smoking may increase cholesterol, triglyceride and LDL-C. Vitamin B12 level is reduced in smokers. Strenuous exercise will increase plasma lactate by 10 fold. Serum concentration of CK, urea, creatinine and thyroxine are higher in athletes than in untrained individual.
7. Prolonged tornique effect (>1 minute)	Prolonged tourniquet application may result in hemoconcentration and erroneously increased levels of protein. Constriction can affect calcium, lactate, electrolytes.
8. Delay in specimen processing	The most commonly affected analyte is potassium. However other analyte i.e phosphate, magnesium, calcium and LDH also can be affected.
9. Hemolysis	Hemolysis can badly affects potassium, bilirubin, phosphate, iron, magnesium, iron, AST, LDH, total protein, amylase.
10. Lipaemic	Lipaemia will affect plasma sodium, magnesium, glucose
11. Icteric	Icterus will affect cholesterol, lactate, total protein, urea, glucose, magnesium, ALP, amylase.
12. Contamination	Dilution effect - Collecting below or above IV line can lead to contamination or dilution of the specimen with IV fluid. Dilution can effect most analytes and also depending on the type of infusion can increase glucose, sodium and potassium levels. Wrong tube / order of draw - Avoid decanting blood from one tube to another. K +EDTA contamination will affect potassium, calcium, magnesium, ALP. Sodium fluoride/Potassium oxalate/ Sodium iodoacetate (sugar tube) contamination will affect amylase, LDH, ALP, sodium, potassium and chloride measurement.

3. Special requirement for specimen collection and transportation (internal and outsourcing test)

1. HIGH SENSITIVE TROPONIN I (HSTROPI)

i. Please inform Chemical Pathology Lab before sending the sample to the lab (ext. 466/352)
ii. Request by Medical Officer/Physician ONLY.
iii. Please provide adequate clinical history with diagnosis and time/date of specimen collection.
iv. Indication:
    a) ACS presentation with inconclusive ECG/cardiac enzyme.
    b) Non ACS presentation with inconclusive ECG/cardiac enzyme.
    c) Suspected ACS (Forensic cases).
v. Rejection criteria:
    a) Lysis sample.
    b) No clinical history and diagnosis stated.
    c) Not requested by Medical Officer/Specialist.

2. 24-HOUR URINE COLLECTION

i. The 24-hour urine bottle, which contains preservatives for the required test is available at the Centralized Pathology Counter and will be provided on request with the accompanying request form or note.
ii. On the day of collection, the first urine voided must be thrown away. Time of first urine voided is the start of the timing for the 24-hour collection.
iii. Collect the second and subsequent voided urine for 24 hours from timed start into the 24-hour urine bottle.
iv. At the end of 24 hours, the last urine voided is collected. For best result, refrigerate if possible.
v. Label the bottle as directed and send immediately to the laboratory.

3. CREATININE CLEARANCE TEST

i. A 24-hour urine collection is recommended.
ii. A careful and accurate 24-hour collection of urine is made.
iii. At the same time during the day (but not within 1-hour after large meal) a blood sample is taken for serum creatinine analysis.
iv. Blood and the whole 24-hour urinary collection are sent to the laboratory.

4. BLOOD GASES

i. Use a 2 ml disposable syringe.
ii. Rinse it with injection heparin.
iii. Draw 1 ml of arterial blood. Invert the syringe and remove all air bubbles inside the syringe.
iv. Use a red coloured lock stopper instead of needle to avoid exposure to air and to avoid blood sample leakage.
v. Mix well by rotating the syringe to prevent clotting.
vi. Put the syringe of blood in an ice bath.
vii. After the blood is drawn into the syringe, any air space or bubbles must be removed.
viii. The specimen must be kept embedded in crushed ice and sent immediately to the laboratory for analysis (at least within half an hour).
ix. Blood gas determination should be performed immediately. If it is not possible, the blood specimens collected can be placed in ice water for up to 3 hours.

5. LACTATE

i. Patient should be fasting and completely rested.
ii. A venous specimen is best drawn without torniquet or immediately after torniquet has been applied briefly.
iii. 2 ml of blood is collected in a container with flouride as anticoagulant (Potassium oxalate / Sodium flouride).
iv. Hemolysis may affect result.

6. HbA1c

i. 2 ml of blood is collected in the vacutainer with EDTA as anticoagulant.
ii. Test should be performed as a diagnostic and limited to monitoring of patients with Diabetes Mellitus (new request must exceed 90 days from the last date of analysis).
iii. All request form must be completely filled with relevant clinical history and must be signed by Specialist/Medical Officer.
iv. Repeated testing should be done only on a 3 monthly basis or longer as the HbA1c measurement is dependent on the lifespan of red cells in circulation.
v. <u>Rejection Criteria:</u>
    a. Lysis sample.
    b. Redundant sample (request within 90 days).
    c. Incomplete request form.
    d. No clinical/irrelevant clinical summary and no diagnosis stated.
    e. Not appropriate indication:
        - For screening purpose.
        - For diagnosis of DM (alternatively, can use other method such as FBS/RBS/OGTT)
        - Not requested by Specialist/Medical Officer.

7. ORAL GLUCOSE TOLERANCE TEST

i. The patient should take adequate carbohydrate intake (at least 150g).
ii. The patient should be fasting for a period of 8 to 12 hours before the test.
iii. After overnight fast, take fasting blood glucose at 0 hour.
iv. Give patient 75 g glucose solution to drink within 5 minutes.
v. The patient may read, listen to music, talk and do a quiet activity while waiting. He / She should not smoke, drink or eat.
vi. Repeat blood sampling for 2HPP blood glucose at 2nd hour after glucose load.

8. OVERNIGHT LOW DOSE DEXAMETHASONE SUPPRESSION TEST

i. Indication – to assess for adrenal hyperfunction
ii. Fasting not require.
iii. 1 mg of Dexamethasone to be given between 2300 and 2400.
iv. Collect serum cortisol between 0800 and 0900 the following morning.
v. Please fill up the request form with clinical summary and request test mentioned above.

9. LOW DOSE DEXAMETHASONE SUPPRESSION TEST

i. Indication – to assess for adrenal hyperfunction
ii. At 0900am on 1st of test, collect blood for serum cortisol (basal) and request test mentioned above.
iii. Immediately after sampling, give 0.5mg dexamethasone orally every 6 hours for 2 days (8 times).
iv. Collect blood for serum cortisol 6 hours after last dose of 0.5mg dexamethasone (0900) on 3rd day.
v. Please fill up the request form with clinical summary and request test mentioned above.

10. SHORT SYNACTHEN TEST

i. Indication – to assess adrenal hypofunction / adrenal insufficiency
ii. Collect blood sample for baseline cortisol level (0 minutes)
iii. Give 250 µg synthetic ACTH intramuscularly / intravenously
iv. Collect serum cortisol sample at 30 minutes and 60 minutes after injection.
v. Please fill up the request form with clinical summary and request test mentioned above.

11. URINE TOXICOLOGY FOR DRUGS / URINE FOR DRUG OF ABUSE

Type of request	Clinical	Medicolegal / Medical Checkup
Test Name	Urine Toxicology for Drugs	Urine for drug of abuse (please refer List of Drugs Offered)
Form to be used	Pathology PER-PAT 301	UPD 1 (Pindaan 2020) (3 copies)
Important Notes	The following information is essential : • Name: • NRIC number: • Sex: • Requestor Ward/Clinic: • Clinical Summary, Surgical Findings and Family History • Diagnosis • Detail of Application/Test required • Date & Time Specimen Collected • Requests must be sent to the Pathology Main Counter. If there is a requirement to test any drug testing that is not offered by the lab , please use Jabatan Kimia's form (Kimia 15 - Pin. 2/2016).	The following information is essential : • Name : • NRIC number: • Address: • Date of Birth: • Registration no: • Police report no: (if any) • Date of sample collection : • Specimen Collector Officer : Medical Assistant, Junior Medical Assistant, Nurse, Assistant Nurse, Rehabilitation Officer or Police Officer. • Requesting Officer: Qualified Medical Officer or Senior Police Rehabilitation Officer (Sergeant Level and above). • Dispatch Personnel: Authorised Personnel Note: 1. Name and Identity card number of the donor and other officers must be written or printed clearly. 2. Each request must specify the name of the test required. 3. Each specimen must be accompanied by 3 copies of request form. 4. Request forms must be signed by the Requesting Officer followed by an official departmental stamp.
Forms must be filled **COMPLETELY** to avoid rejection.		

i. Sample collection must follow the Guidelines for Drugs of Abuse in Urine, Version 2.0, Ministry of Health Malaysia, 2021.
ii. Specimen collection must be properly supervised. Collection sites should have suitable toilet facilities and are free from soap dispensers or cleansing agents.
iii. The urine specimen collected should be at least 30 ml.
iv. The person supervising the collection should ensure that freshly voided urine sample is obtained from the donor and no adulteration has occurred to the sample.
v. The containers must be securely closed and sealed with sealing wax.
vi. Labelling of containers should be made in front of the donor / suspect with the following information:
    - Donor's or Suspect's name and identity card number
    - Date and time of collection
    - Signature of donor
    - Drug test requested
vii. Collected specimens should be sent to the laboratory as soon as possible
viii. Specimens that cannot be sent on the same day should be stored at refrigerated temperatures or frozen if storage more than 3 days.

12. AMMONIA

i. A venous specimen is best drawn without torniquet or immediately after torniquet has been applied briefly.
ii. 2 ml of blood is collected in a container with EDTA as anticoagulant.
iii. Send the sample chilled in ice slurry/ ice pack to the laboratory immediately.

13. ALDOSTERONE RENIN RATIO (ARR)

i. This test is a screening for individual suspected primary hyperaldosteronism in hypertensive patients with spontaneous or diuretic-induced hypokalaemia
ii. Suggested candidates for screening:
    - Hypertension BP >140/90 mmHg resistant to three conventional antihypertensive drugs (including diuretic)
    - Hypertension with controlled BP <140/90mmHg on four or more antihypertensive drugs
    - Hypertension and spontaneous or diuretic-induced hypokalaemia
    - Hypertension and adrenal incidentaloma
    - Hypertension and sleep apnea
    - Hypertension and a family history of early onset hypertension or cerebrovascular accident at a young age (<40 year old)
    - All hypertensive first degree relatives of patient with primary hyperaldosteronism
    - Sustained blood pressure (BP) above 150/100 mmHg on each of three measurements obtained on different days

iii. Patient preparation:
    - Attempt to correct hypokalaemia – blood should be collected slowly with syringe and needle. Avoid fist clenching (wait at least 5 sec after tourniquet release to insert needle) and separate plasma from cells as soon as possible or within 2 hours of collection.

- Avoid hypokalaemia as it suppresses aldosterone secretion. Give potassium replacement sufficient to raise plasma potassium >4.0 mmol/L
- Subject should be normally hydrated and has adequate oral intake of sodium
- Drugs to avoid – spironolactone (stop at least 6 weeks), amiloride, triamterene, potassium-wasting diuretics, product derived from licorice root.
- If ARR testing is not diagnostic after withdrawing above agents and hypertension can be controlled with noninterfering medications, test again 2 weeks after withdrawing other medication – ACE inhibitors, ARB, methyldopa, clonidine, oral contraceptive, oral contraceptive pills.
- Drugs that do not interfere with renin-aldosterone axis include – Prazosine, Verapamil, Hydralazine and Terazosin.

iv. Sample collection:

- Collect midmorning after patient has been sitting, standing or walking for at least 2 hours and seated 5-15 minutes.
- Collect blood carefully to avoid stasis and hemolysis.
- Collect samples into 2 tubes of EDTA. Please use different tube for renin and aldosterone. Suggest collecting minimum 3 mL blood per sample.
- Please state patient's posture either supine OR upright.
  - Supine – Sample taken in the early morning before subject arises
  - Upright – Subject should be upright for ≥2 hours prior sampling
- Samples should be taken between 8 am to 10 am
- Maintain sample at room temperature (not in ice) during transportation to laboratory for centrifugation.
- Fill up PERPAT 301. Only single form is required for requesting ARR.
- Please fill up the request form with clinical summary, drug history and latest potassium (K) level. Endocrinologist / Specialist signature required.
  (Ref: Chemical Pathology Lab Hosp Putrajaya)
  Source: Funder et al. Guideline on Primary Aldosteronism J. Clin Endocrinol Metab 101: 1889 - 1916, 2016)

14. SALINE LOADING TEST

i. Indication – confirmatory test for primary hyperaldosteronism
ii. Patient is informed to fast overnight. Procedure start at 8am.
iii. Insert cannula and start an Intravenous infusion of normal saline 500 mL/hr for next 4 hours (2L normal saline over 4 hours) using infusion pump. Monitor BP/Hr.
iv. After completion of saline infusion, collect blood for aldosterone as Aldosterone post SLT.

(Ref: Chemical Pathology Lab Hosp Putrajaya)

15. METABOLIC DISEASE / INBORN ERROR OF METABOLISM

i. Metabolic screening will be done on 3 mm dried blood spot (DBS) using tendem mass spectrometry (refer to special procedure).
ii. If the metabolic screening is positive, blood and urine specimen are required for confirmatory tests.
iii. Use special form when requesting test.
iv. Please fill up important signs and result of the routine biochemistry test done at laboratory.

16. 24-HOUR URINE METANEPHRINES

i. Biochemical testing to screen for patient with Pheochromocytoma or Sympathetic Paraganglioma
ii. Suggested candidates for screening:
- Sign and symptoms of pheochromocytoma/paraganglioma (PPGLs) e.g headache, profuse sweating and palpitation.
- Resistant hypertension
- Paradoxical BP response to drugs, surgery or anaesthesia
- Incidentally discovered adrenal mass (with or without hypertension)
- Previous diagnosis of pheochromocytoma or paraganglioma
- Hereditary predisposition of pheochromocytoma or paraganglioma
- Syndromic feature indicating a pheochromocytoma-related hereditary syndrome

iii. Container: 24 hour urine container with 10 mL of 25% hydrochloric acid
iv. Patient preparation (avoid at least 1 week prior to specimen collection):
- Food to avoid – e.g chilies, nuts, caffeine, chocolate, eggplant, tomato, avocado, fruit juices, pineapple, banana.
- Drugs to avoid – e.g tricyclic antidepressants, levodopa, benzodiazepines, acetaminophen, aspirin, aminophylline, buspirone, quinidine, quinine, cocaine, labetalol, opiods, codeine, ethanol, ephedrine, promethazine, alcohol, metoclopramide, methyldopa, monoamine oxidase inhibitor, phenothiazine)
- Avoid stress and vigorous exercise

v. Specimen collection:
- Discard first voided urine and note the start date and time (e.g 22/05/2020, 8am).
- Collect all urine voided for 24 hours duration and mixed well every time added urine into the container.
- Do not void urine directly into the container. Please use the sterile container provided to avoid spillage.
- Keep the closed urine container in wet and dry area.
- At the end of the period, add the last voided sample to the container by emptying the bladder and note the finishing date and time (e.g 23/05/2020, 8am).
- Please fill up the request form with clinical summary and request test mentioned above. Specialist signature required.

vi. Rejection criteria

- No clear indication to test for urine metanephrines (e.g newly diagnosed hypertension)
- Total urine volume <750 ml
- Specimen pH >5
- Leaking specimens
- Urine volume and pH are not stated in PERPAT 301 form
- Minimum volume of the container received <3.5mL
- No specialist signature

(Ref: Chemical Pathology Lab Hosp Putrajaya)

Source: William F et al. Screening for Endocrine Hypertension: An Endocrine Society Scientific Statement 2017: Endocrine Reviews

17. Vitamin D

i. Indicated for testing for patient with planned treatment for:

- Osteoporosis or osteomalacia
- Malabsorption (e.g cystic fibrosis, short bowel syndrome, inflammatory bowel disease, untreated coeliac disease, bariatric surgery)
- Chronic renal failure and renal transplant recipients
- Rickets
- Exclusively breastfed babies in combination with at least one other risk factor
- Siblings of infants or children with Vitamin D deficiency

(Ref: Chemical Pathology Lab Hosp Putrajaya)

Source: RCPA Position Statement, Use and Interpretative of Vitamin D testing, review May 2023

18. IGF-1

i. Indications:

- Acromegaly - for diagnosis and follow up
- Evaluation of paediatric patient with short stature
- Patient with growth hormone replacement
- Dynamic testing

(Ref: Chemical Pathology Lab Hosp Putrajaya)

Methodology & Reference Ranges:

NO	ANALYTE	METHODOLOGY	REFERENCE RANGE
1	Alanine Transaminase (ALT)	Kinetic UV without P5P	Male (Adult): < 50 U/L Female (Adult): < 35 U/L Newborn/Infant: 13 – 45 U/L
2	Albumin	Bromocresol Green (BCG)	Adults: 35 – 52 g/L Newborn 0 – 4 day: 28 – 44 g/L
3	Alkaline Phosphatase (ALP)	PNPP, AMP buffer	Male (Adult) 43 - 115 U/L Female (Adult) 33 - 98 U/L
4	Amylase	ethylidene-G7PNP	Serum: 28 - 100 U/L Urine: Male: ≤ 490 U/L Female: ≤ 450 U/L
5	Ammonia	Enzymatic	18 – 72 umol/L
6	Aspartate Transaminase (AST)	Kinetic UV without P5P	Male (Adult): < 50 U/L Female (Adult): < 35 U/L Newborn (0d-30d): 25 – 75 U/L Infant (31d-1Yr): 15 – 60 U/L
7	Bilirubin (Direct)	Diazonium salt, 3,5 Dichlorophenyl diazonium tetrafluoroborate (DPD)	Adults and Children: ≤ 3.4 µmol/L
8	Bilirubin (Total)	Diazonium salt, 3,5-dichlorophenyldiazonium tetrafluoroborate (DPD)	Adults: 5 – 21 µmol/L Children: 0 – 1 day: 24 – 149 µmol/L 1 – 2 days: 58 – 197 µmol/L 3 – 5 days: 26 – 205 µmol/L
9	Body Fluid for Biochemistry (Protein, Glucose, LDH, Albumin). Other tests please specify eg. Amylase, pH, Cholesterol, Tg, Ceatinine		Methodology of analysis for body fluid is not validated. Thus, reference range is not available.
10	Blood Gases	Amperometric: pO2, Glu, Lactate Potentiometric: pH, PCO2, Na+, K+, Ca++ Conductivity: Hct	pH: 7.35 - 7.45 pCO2: 35 - 48 mmHg PO2: 83 - 108 mmHg Na+: 136 - 146 mmol/L K+: 3.5 - 4.5 mmol/L Ca++:1.15 - 1.5 mmol/L Glu: 3.3 - 5.3 mmol/L

Methodology & Reference Ranges:

NO	ANALYTE	METHODOLOGY	REFERENCE RANGE
			Lac: 0.5 - 2.2 mmol/L Hct: 35 to 51% HCO3: 18 - 23 mmol/L TCO2: 22 - 29 mmol/L BE: -2.0 - +3.0 mmol/L SO2: 95-98% THb: 11.7 - 17.4 g/dL
11	C3	Immunoturbidimetric	Adults and children: 0.9 – 1.8 g/L
12	C4	Immunoturbidimetric	Adults and children: 0.1 – 0.4 g/L
13	Calcium	Arsenazo III	Serum Adults: 2.20 – 2.65 mmol/L Children: (0 – 10 day): 1.90 – 2.60 mmol/L (10 day – 24 months): 2.25 – 2.75 mmol/L (2 – 12 year): 2.20 – 2.70 mmol/L Urine, 24H Female < 6.2 mmol/L Male < 7.5 mmol/L No reference range available for random urine.
14	Cholesterol, Total	Cholesterole oxidase, esterase, peroxidase CHO-POD	<5.2 mmol/L: desirable 5.2 - 6.2 mmol/L: borderline high ≥ 6.2 mmol/L : high
15	HDL-Cholesterol	Enzymatic	<1.03 mmol/L: Low (Major risk factor for CVD) ≥1.55 mmol/L: High (Negative risk factor for CVD) LDL-C (calculated): <2.6 mmol/L: optimal 2.6 - 3.3 mmol/L: near optimal 3.4 - 4.1 mmol/L: borderline high 4.1 - 4.9 mmol/L: high > 4.9 mmol/L: very high
16	Chloride	Indirect ISE	Adult Serum: 101 – 109 mmol/L Urine: 110 – 250 mmol/day No reference range available for random urine.
17	Creatinine	Kinetic Jaffé	Serum Male: 59 – 104 µmol/L Female: 45 – 84 µmol/L Neonate: 27 – 87 µmol/L

Methodology & Reference Ranges:

NO	ANALYTE	METHODOLOGY	REFERENCE RANGE
			Infant: 14 – 34 µmol/L Child: 23 – 68 µmol/L <u>Urine</u> Male: 124 - 230 umol/kg/d Female: 97 - 177 umol/kg/d
18	Creatinine Kinase (CK)	Kinetic UV	Male: ≤ 171 U/L Female: ≤ 145 U/L
19	C-Reactive Protein (CRP)	Latex Immunoturbidimetric	Normal application: < 5 mg/L
20	Glucose	Enzymatic UV (hexokinase)	<u>Fasting Blood Sugar (Adult)</u> <6.1 mmol/L : Normal 6.1 - 6.9 mmol/L : Impaired Fasting Glucose (IFG) ≥ 7.0 mmol/L : Diabetes Mellitus recommend OGTT for fasting glucose levels. <u>Random Blood Sugar (Adult)</u> <7.8 mmol/L : Normal 7.8 - 11.0 mmol/L : Pre-Diabetis ≥11.1 mmol/L : Diabetes Mellitus <u>Pregnant Woman</u> ≥5.1 mmol/L : Gestational Diabetes Mellitus <u>Pregnant Woman 2HPP:</u> ≥7.8 mmol/L <u>Children:</u> 3.3 - 5.6 mmol/L : Normal <u>CSF</u> Adult : 2.2 – 3.9 mmol/L Infant, Child : 3.3 - 4.5 mmol/L <u>Urine Glucose:</u> 0.1 - 0.8 mmol/L
21	Iron, Total	TPTZ [2,4,6-Tri-(2-pyridyl)-5-triazine]	<u>Serum</u> <u>Adult:</u> Male 70 – 180 µg/dL Female 60 – 180 µg/dL <u>Children:</u>

Methodology & Reference Ranges:

NO	ANALYTE	METHODOLOGY	REFERENCE RANGE
			Newborn 100 – 250 µg/dL Infant 40 – 100 µg/dL Child 50 – 120 µg/dL
22	Lactate	L-lactate to pyruvate	Plasma: 0.5 – 2.2 mmol/L CSF, neonate: 1.1 – 6.7 mmol/L CSF, 3 – 10 days old: 1.1 – 4.4 mmol/L CSF, >10 days old: 1.1 – 2.8 mmol/L CSF, adult : 1.1 – 2.4 mmol/L
23	Lactate Dehydrogenase	LDH catalyses the oxidation of lactate to pyruvate	Adult Male: < 248 U/L Female: < 247 U/L Children 0 – 4 day : 290 – 775 U/L 4 – 10 day : 545 – 2,000 U/L 10 day – 24 month : 180 – 430 U/L 24 month – 12 year : 110 – 295 U/L
24	Magnesium	Xylidyl blue	Serum Male : 0.73 – 1.06 mmol/L Female : 0.77 – 1.03 mmol/L Urine 24Hr urine: Adults 3 – 5 mmol/24 H No reference range available for random urine.
25	Phosphate, Inorganic	Phosphomolybdate method	Serum Adults: 0.81 – 1.45 mmol/L Children (0d-12 yrs): 1.29 – 2.26 mmol/L Urine 24Hr urine: Non-restricted diet: 12.9 – 42.0 mmol/d No reference range available for random urine.
26	Potassium	Indirect ISE	Serum Adult: 3.5 – 5.1 mmol/L Urine 24Hr urine: 25 – 125 mmol/day No reference range available for random urine.
27	Sodium	Indirect ISE	Serum Adult: 136 – 146 mmol/L

Methodology & Reference Ranges:

NO	ANALYTE	METHODOLOGY	REFERENCE RANGE
			Urine 24Hr urine: 40 – 220 mmol/day No reference range available for random urine.
28	Total Protein	Cupric ions in an alkaline solution react with proteins and polypeptides	Serum Adult: 66 – 83 g/L Children (1 - 18 y): 57 – 80 g/L Newborn (1 - 30 d): 41 – 63 g/L
29	Triglycerides	GPO-POD, Enzymatic	< 1.7 mmol/L: Normal 1.7 – 2.25 mmol/L: Borderline high 2.26 – 5.64 mmol/L: High ≥ 5.65 mmol/L: Very High
30	Unbinding Iron Capacity (UIBC)	Nitroso-PSAP	155 – 355 µg/dL Total Iron Binding Capacity (TIBC) (Calculated): 240-450 µg/dL
31	Urea	Enzymatic Urease	Serum Adult: 2.8 – 7.2 mmol/L Newborn: 1.4 – 4.3 mmol/L Infant/child: 1.8 – 6.4 mmol/L Urine 24Hr urine: 250 – 570 mmol/day
32	Uric Acid	Enzymatic Uricase	Serum Adult: Male: 208.3 – 428.4 µmol/L Female: 154.7 – 357.0 µmol/L Urine: 24Hr urine: 1488 – 4463 µmol/d
33	CSF / Urine Protein	Pyrogallol red is combined with molybdate to form a red complex	CSF Adults: 0.15 – 0.45 g/L Newborn <1month: 0.15 – 1.30 g/L Urine: 0.05-0.08 g/day
34	Urine Albumin		CSF 3 mo – 4y: 0 - 450 mg/L > 4 y: 100 - 300 mg/L Urine 24Hr urine:

Methodology & Reference Ranges:

NO	ANALYTE	METHODOLOGY	REFERENCE RANGE
			<30 mg/24h (Normal) 30 - 299 mg/24h (Moderately increased) ≥ 300 mg/24h (Clinical albuminuria) <u>Urine Albumin Creatinine Ratio (UACR):</u> <3 mg/mmol (Normal to mildly increased) 3-30 mg/mmol (Moderately increased) >30 mg/mmol (Severely increased)
35	Urine Biochemistry	Wavelength Reflectance Specific gravity: Reflective Index	Specific gravity: 1.000 - 1.040 pH: 5.0 – 9.0 Leukocytes: Negative Nitrite: Negative Protein: Negative Glucose: Negative Ketone: Negative Urobilinogen: Normal Bilirubin: Negative Color: Light Yellow
36	Urine Diastase	Ethylidene-G7PNP	Male: ≤490 U/L, Female: ≤450 U/L
37	Urine Paraquat	Manual chemical reaction	Positive / Negative
38	Urine Pregnancy Test	Labeled antibody-dye conjugate	Positive / Negative
39	Urine Protein 24 Hours	Pyrogallol red is combined with molybdate to form a red complex	Less than 0.20 g/day
40	Urine Protein Creatinine Ratio (UPCR)		<15 mg/mmol (Normal to mildly increased) 15-50 mg/mmol (Moderately increased) >50 mg/mmol (Severely increased)
IMMUNOASSAY TESTS			
41	Alpha Fetoprotein (AFP)	Two-site immunoenzymatic (“sandwich”) assay / CMIA	< 9 .0 ng/ml
42	BETA-HCG	Two-site immunoenzymatic (“sandwich”) assay/CMIA	Non-pregnant individuals low (≤11.6 mIU/mL)

Methodology & Reference Ranges:

NO	ANALYTE	METHODOLOGY	REFERENCE RANGE
43	Cancer Antigen 125	Two-site immunoenzymatic ("sandwich") assay/CMIA	< 35.0 U/mL
44	Carcinoembryonic Antigen (CEA)	Two-site immunoenzymatic "sandwich" assay/CMIA	< 3.0 ng/mL
45	Random Cortisol (Sample taken unspecified time)	Competitive binding immunoenzymatic assay/CMIA	
	AM Cortisol (Sample taken between 6AM to 9AM)	Competitive binding immunoenzymatic assay/CMIA	Serum AM cortisol: 185–624 nmol/L (state the time)
	PM Cortisol (Sample taken between 4PM to 6PM)	Competitive binding immunoenzymatic assay/CMIA	Serum PM cortisol: < 276 nmol/L (state the time)
	Cortisol for Overnight Dexamethasone Suppression Test (Cortisol-ODST)	Competitive binding immunoenzymatic assay/CMIA	Dexamethasone suppression test: <50 nmol/L
	Cortisol for Synacthen Test (Cortisol-Synacthen Test)	Competitive binding immunoenzymatic assay/CMIA	In a normal response, serum cortisol should rise to ≥500 nmol/L at 30 or 60 minutes after the injection. *Assay based
	24 hours Urine Cortisol	Competitive binding immunoenzymatic assay/CMIA	24H urine: 160-1112 nmol/24 hours
46	Ferritin	Two-site immunoenzymatic ("sandwich") assay/CMIA	Male: 23.9-336.2 ng/mL Female: 11.0-306.8 ng/mL
47	Folate	Competitive binding receptor assay/CMIA	Serum: 13.4 to 56.2 nmol/L
48	Follicle-Stimulating Hormone (FSH)	Two-step immunoenzymatic ("sandwich") assay/CMIA	Male: 1.27-19.26 mIU/mL Female Mid-Follicular Phase: 3.85-8.78 mIU/mL Mid-Cycle Peak: 4.54-22.51 mIU/mL Mid-Luteal Phase: 1.79-5.12 mIU/mL Post menopausal: 16.74-113.59 mIU/mL

Methodology & Reference Ranges:

NO	ANALYTE	METHODOLOGY	REFERENCE RANGE
49	Free T3	Competitive binding immunoenzymatic assay/CMIA	Adult: 3.8-6.0 pmol/L Paediatric: 0 – 1 year: 4.32 – 6.85 pmol/L 1 – 15 years: 3.98 – 6.19 pmol/L 15 – 19 years: 3.47 – 5.31 pmol/L (Female) 15 – 19 years: 3.81 – 5.67 pmol/L (Male) From Paediatric reference value distributions and covariate-stratified reference interval for 29 endocrine and special chemistry biomarkers on Beckman Coulter Immunoassay System: a CALIPER study healthy community (Clin Chem Lab Med, 2015).
50	Free T4	Two-step enzyme immunoassay/CMIA	Adult: 7.86-14.41 pmol/L Paediatric: 0 to < 20 days: 17.4 – 57.7 pmol/L 20 days to < 3 years: 9.52 – 17.8 pmol/L 3 to < 19 years: 7.85 – 13.6 pmol/L From Paediatric reference value distributions and covariate-stratified reference interval for 29 endocrine and special chemistry biomarkers on Beckman Coulter Immunoassay System: a CALIPER study healthy community (Clin Chem Lab Med, 2015). Cord Free T4: < 15 pmol/L (Management of Congenital Hypothyroidism, Paediatric Protocol, 4th edition, 2019)
51	Luteinizing Hormone (LH)	Two-step immunoenzymatic (“sandwich”) assay/CMIA	Male: 1.24-8.62 mIU/mL Female: Mid-Follicular Phase: 2.12-10.89 mIU/mL Mid-Cycle Peak: 19.18-103.03 mIU/mL Mid-Luteal Phase: 1.20-12.86 mIU/mL Post menopausal: 10.87-58.64 mIU/mL
52	Progesterone	Competitive binding immunoenzymatic assay/CMIA	Male: 0.44 – 6.55 nmol/L Female (Non pregnant): Mid – Follicular Phase: 0.99 – 4.83 nmol/L Mid – luteal Phase: 16.41 – 59.02 nmol/L Post menopausal: <0.25 – 2.48 nmol/L

Methodology & Reference Ranges:

NO	ANALYTE	METHODOLOGY	REFERENCE RANGE
53	Prolactin	One-step immunoenzymatic ("sandwich") assay/CMIA	Male: 56.05 – 278.77 mIU/L Female: Premenopausal (<50 years old): 70.91 – 567.09 mIU/L Postmenopausal (>50 years old): 58.17 – 416.99 mIU/L
54	Prostate Specific Antigen (PSA)	Two-site immunoenzymatic ("sandwich") assay/CMIA	Male: < 4.0 ng/mL
55	Thyroid Stimulating Hormone (TSH)	Two-site immunoenzymatic ("sandwich") assay/CMIA	Adult: 0.38 - 5.33 mIU/L Paediatric: 0 to < 12 years: 0.79 – 5.85 mIU/L 12 to < 19 years: 0.68 – 3.35 mIU/L From Paediatric reference value distributions and covariate-stratified reference interval for 29 endocrine and special chemistry biomarkers on Beckman Coulter Immunoassay System: a CALIPER study healthy community (Clin Chem Lab Med, 2015) Cord TSH: < 20 mIU/L (Management of Congenital Hypothyroidism, Paediatric Protocol, 4th edition, 2019)
56	Hs Troponin I	Two-step immunoenzymatic ("sandwich") assay/CMIA	<17.5 ng/L at 99th percentile URL
57	Vitamin B12	Competitive binding immunoenzymatic assay/CMIA	Normal: 180-914 pg/mL Indeterminate: 145 – 180 pg/mL Deficient: ≤145 pg/mL
THERAPEUTIC DRUG MONITORING (TDM) TESTS			
58	Acetaminophen/ Paracetamol	Homogeneous enzyme immunoassay	Refer to Rummack Metthew Nomogram. Unit µg/mL
59	Carbamazepine	Homogeneous enzyme immunoassay	4-12 µg/mL
60	Digoxin	Immunoinhibition	Chronic Heart Failure: 0.5 -0.9 ng/mL Atrial Fibrillation: 0.8 – 2.0 ng/mL

Methodology & Reference Ranges:

NO	ANALYTE	METHODOLOGY	REFERENCE RANGE
61	Gentamicin	Homogeneous enzyme immunoassay	**Adult:** Peak: 20-30 µg/mL Trough: <1 µg/mL **Paeds:** Peak: 5-12 µg/mL Trough: <1 µg/mL **Synergy:** Peak: 5-10 µg/mL Trough: <1 µg/mL
62	Phenytoin	Homogeneous enzyme immunoassay	10 - 20 µg/mL
63	Theophylline	Homogeneous enzyme immunoassay	Apnoea / Bradycardia: 5-10 µg/mL Asthma / COAD: 10-20 µg/mL
64	Valproic Acid	Homogeneous enzyme immunoassay	Epilepsy: 50–100 µg/mL Psychiatry Disorder: 50-125 µg/mL
65	Vancomycin	Homogeneous particle-enhanced turbidimetric Immunoassay	Peak: 25-40 µg/mL Trough: 10-15 µg/mL (Uncomplicated) Trough: 15-20 µg/mL (Complicated) Continuous Infusion: 15-25 µg/mL
66	Drug of Abuse (Morphine / Cannabis)	Screening: Homogenous Enzyme Immunoassay (EMIT) Confirmation: Thin layered Chromatography (TLC)	Detected / Not detected
67	Fecal Occult Blood	Immunochromatographic sandwich assay	Positive / Negative
68	HbA1c	High Performance Liquid Chromatography (HPLC)	<u>HbA1c level for Diagnosis of Diabetes Mellitus:</u> Normal: <5.6 % (38 mmol/mol) Pre-diabetes: 5.6 - 6.2% (38 - 44 mmol/mol) Diabetes: ≥6.3% (45 mmol/mol) HbA1c level for Monitoring of Diabetes Mellitus: *Target for control of DM: ≤6.5% (48 mmol/mol)

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3. Malaysia Clinical Practice Guideline, Management of Dyslipidemia, 4th edition, 2011.
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6. National Screening Program for Congenital Hypothyroidism, Ministry of Health, 2018.
7. Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease, KDIGO 2012.
8. Tietz Fundamental Clinical Chemistry, Sixth Edition

LIST OF IN-HOUSE CHEMICAL PATHOLOGY TESTS

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
1	Acetaminophen/ Paracetamol	Blood	Plain tube without gel	Adult: 3 ml, Paediatric: 0.5 - 1 ml	BORANG PHIS HPSF/PER-PAT-301	Monitoring: 4 hours Toxic: 2 hours	
2	Alanine Transaminase (ALT)	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours	
3	Albumin	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours	
4	Alkaline Phosphotase (ALP)	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours	
5	Alpha-Fetoprotein (AFP)	Blood	Plain tube with gel	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	5 working days	Requesting specialist's signature is required.
6	Ammonia	Blood	EDTA	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	STAT/urgent: 90 minutes	Send immediately in ice.
7	Amylase	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours, STAT/urgent: 90 minutes	
8	Aspartate Transaminase (AST)	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours, STAT/urgent: 90 minutes	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
9	Beta Human Chorionic Gonadotropin (BHCG)	Blood	Plain tube with gel	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	3 working days STAT/Urgent: within 24 hours	Please consult Pathologist Oncall on urgent request. Requesting specialist's signature is required.
10	Bilirubin, Direct	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours, STAT/urgent: 60 minutes	
11	Bilirubin, Total	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours, STAT/urgent: 60 minutes	
12	Blood Gases (pH, pO2, pCO2)	Blood	Pre - Heparinised syringe	1 ml	PER-PAT-301	STAT/urgent: 90 minutes	Send immediately in ice, mixed well using roller mixer or palm.
13	Body fluid for biochemistry (Protein, Glucose, LDH, Albumin) Other tests please specify eg. Amylase, pH, Cholesterol, Tg , Creatinine.	Ascitic, pleural, peritoneal, pericardial fluid & etc	Lithium heparin (Protein, LDH, Albumin) Fluoride oxalate (Glucose)	At least 5 ml	PER-PAT-301	1 working day, Urgent: 4 hours (Case by case basis, granted by Pathologist Oncall).	**Urgent Request**: Case by case basis, granted by Pathologist Oncall. Please inform Chemical Pathology Lab before sending the sample to the lab (ext 466). Please provide adequate clinical history with diagnosis and time/date of specimen collection.
14	Calcium, Corrected Calcium with albumin	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours, STAT/urgent: 90 minutes	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
15	Cancer Antigen 125 (CA 125)	Blood	Plain tube with gel	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	5 working days	Requesting specialist's signature is required.
16	Cannabis (Screening & Confirmation)	Urine	Urine container	30 ml	Borang Permintaan Ujian Pengesanan Dadah (UPD-1 pin 2020)/PERPAT 301	10 calendar days	Please use UPD-1 (pindaan 2020) for medicolegal case and PER-PAT 301 for clinical case.
17	Carbamazepine	Blood	Plain tube without gel	Adult: 3 ml, Paediatric: 0.5 - 1 ml	BORANG PHIS HPSF/PER-PAT-301	Monitoring: 4 hours Toxic: 2 hours	
18	Carcinoembryonic antigen (CEA)	Blood	Plain tube with gel	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	5 working days	Requesting specialist's signature is required.
19	Chloride	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours, STAT/urgent: 90 minutes	
20	Cholesterol, Total	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours	
21	Complement 3 (C3)	Blood	Plain tube with gel	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	3 working days	
22	Complement 4 (C4)	Blood	Plain tube with gel	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	3 working days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
23	Congenital Hypothyroidism Screening (cord TSH and FT4)	Cord Blood	Plain tube with gel	5 ml	Congenital hypothyroidism cord blood screening test form	3 working days	
24	Random Cortisol (Sample taken unspecified time)	Blood	Plain tube with gel	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	5 working days	Please state date and time of specimen collection – AM/PM/Dynamic Test. For urgent request please consult Chemical Pathologist. Request form to counter sign by Specialist.
	AM Cortisol (Sample taken between 6AM to 9AM)						
	PM Cortisol (Sample taken between 4PM to 6PM)						
	Cortisol for Overnight Dexamethasone Suppression Test (Cortisol-ODST)						
	Cortisol for Synacthen Test (Cortisol-Synacthen Test)						
	24 hours Urine Cortisol	Urine	24 hours urine container	Volume 24 hour urine ≥500ml, except for ESRF and paediatric case.			

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
25	C-Reactive Protein (CRP)	Blood	Plain tube with gel	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	1 working day	Urgent Request (5 hours): Case by case basis, granted by Pathologist/MO Oncall. Please inform Chemical Pathology Lab before sending the sample to the lab (ext 466). Please provide adequate clinical history with diagnosis and time/date of specimen collection.
26	Creatine Kinase (CK)	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours, STAT/urgent: 90 minutes	
27	Creatinine	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours, STAT/urgent: 90 minutes	Patients shall be advised to abstain from consuming any meat in the 12 hours before a blood test for serum creatinine as a protein meal can raise serum creatinine levels substantially and lead to low eGFR values.

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
28	Creatinine Clearance Test (serum creatinine and urine 24 hours)	Blood and urine	24 hours urine container with thymol & blood (lithium heparin)	24 hours urine and 3 ml blood	PER-PAT-301	1 working day	Blood and 24 hours urinary collection are sent to the Laboratory. Volume 24 hour urine must be ≥500ml, except for ESRF and pediatric case.
29	CSF for biochemistry (protein & glucose)	CSF	Sterile Bijou container / fluoride oxalate for glucose	3 ml	PER-PAT-301	STAT/urgent: 90 minutes	A blood sample (plasma glucose) should be send at the same time.
30	CSF for Lactate	CSF	Sterile Bijou container / fluoride oxalate	2 ml	PER-PAT-301	STAT/urgent: 90 minutes	Send immediately in ice / fresh sample.
31	Digoxin	Blood	Plain tube without gel	Adult: 3 ml, Paediatric: 0.5 - 1 ml	BORANG PHIS HPSF/PER-PAT-301	Monitoring: 4 hours Toxic: 2 hours	
32	Fecal Occult Blood	Feces	Stool container	Minimum 1 gram	PER-PAT-301	1 working day	
33	Ferritin	Blood	Plain tube with gel	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	3 working days STAT/Urgent: Within 24 hour	Please consult Pathologist Oncall on urgent request.
34	Folate	Blood	Plain tube with gel	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	5 working days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
35	Follicle-Stimulating Hormone (FSH)	Blood	Plain tube with gel	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	5 working days	Sample taken at day 2-5 of menses is preferable for fertility testing.
36	Free T3 (Tri-Iodothyronine)	Blood	Plain tube with gel	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	5 working days	
37	Free T4 (Free Thyroxine)	Blood	Plain tube with gel	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	3 working days STAT/Urgent: within 24 hours	Please consult Pathologist Oncall on urgent request.
38	Gentamicin	Blood	Plain tube without gel	Adult: 3 ml, Paediatric: 0.5 - 1 ml	BORANG PHIS HPSF/PER-PAT-301	Monitoring: 4 hours Toxic: 2 hours	
39	Glucose	Blood	Fluoride oxalate	2 ml	PER-PAT-301	4 hours, STAT/urgent: 90 minutes	
40	Glucose 2 hours Post Prandial (2HPP)	Blood	Fluoride oxalate	2 ml	PER-PAT-301	4 hours, STAT/urgent: 90 minutes	
41	Glucose Tolerance Test (GTT)	Blood	Fluoride oxalate	2 ml	PER-PAT-301	4 hours, STAT/urgent: 90 minutes	
42	HbA1c	Blood	EDTA	2 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	5 working days	
43	High Density Lipoprotein Cholesterol (HDL)	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
44	Iron, Total	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours	
45	Lactate	Blood	Fluoride oxalate	2 ml	PER-PAT-301	STAT/urgent: 90 minutes	Send immediately in ice / fresh sample.
46	Lactate Dehydrogenase (LDH)	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours, STAT/urgent: 90 minutes	
47	Luteinizing Hormone (LH)	Blood	Plain tube with gel	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	5 working days	Sample taken at day 2-5 of menses is preferable for fertility testing.
48	Magnesium	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours, STAT/urgent: 90 minutes	
49	Morphine (Screening & Confirmation)	Urine	Urine container	30 ml	Borang Permintaan Ujian Pengesanan Dadah (UPD-1 pin 2020)/PERPAT 301	10 calendar days	Please use UPD-1 (pindaan 2020) form for medicolegal case and PER-PAT 301 for clinical case.
50	Peritoneal Dialysate (Urea, Creatinine, Glucose)	Peritoneal Dialysate	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	1 working day	
51	Phenytoin	Blood	Plain tube without gel	Adult: 3 ml, Paediatric: 0.5 - 1 ml	BORANG PHIS HPSF/PER-PAT-301	Monitoring: 4 hours Toxic: 2 hours	
52	Phosphate, Inorganic	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours, STAT/urgent: 90 minutes	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
53	Potassium	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours, STAT/urgent: 90 minutes	
54	Progesterone	Blood	Plain tube with gel	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	5 working days	Sample taken at day 21 of menses is preferable for fertility testing.
55	Prolactin	Blood	Plain tube with gel	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	5 working days	
56	Prostate Specific Antigen, Total (PSA)	Blood	Plain tube with gel	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	5 working days	Requesting specialist's signature is required.
57	Protein, Total	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours	
58	Rheumatoid Factor	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours	
59	Sodium	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours, STAT/urgent: 90 minutes	
60	Theophylline	Blood	Plain tube without gel	Adult: 3 ml, Paediatric: 0.5 - 1 ml	BORANG PHIS HPSF/PER-PAT-301	Monitoring: 4 hours Toxic: 2 hours	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
61	Thyroid Stimulating Hormone (TSH)	Blood	Plain tube with gel	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	3 working days STAT/Urgent: within 24 hours	Please consult Pathologist Oncall on urgent request.
62	Triglyceride	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours	Calculated low density lipoprotein cholesterol (LDL) is not valid if Triglyceride >4.5 mmol/L
63	Troponin I, high sensitivity	Blood	Lithium heparin	Adult: 3 ml	PER-PAT 301	STAT/Urgent: 90 minutes	Shall be request by Medical officer and Physician.
64	Unsaturated Iron Binding Capacity (UIBC)	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours	
65	Urea	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours, STAT/urgent: 90 minutes	
66	Uric Acid	Blood	Lithium heparin	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	4 hours	
67	Urine Albumin	Urine	Urine container	10 ml	PER-PAT-301	1 working day	
68	Urine Albumin Creatinine Ratio (UACR)	Urine	Urine container	random urine, 10 ml	PER-PAT-301	1 working day	The first void urine in the morning shall be used for the measurement of ACR.
69	Urine Analysis (UFEME)	Urine	Urine container	10 ml	PER-PAT-301	4 hours	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
70	Urine Calcium Random / 24 hours	Urine	Urine container or 24 hours urine container with thymol/boric acid	Random: At least 10 ml, 24 hour: At least 500 ml	PER-PAT-301	1 working day	Volume 24 hour urine ≥500ml, except for ESRF and paediatric case. No reference range available for random urine.
71	Urine Creatinine Random / 24 hours	Urine	Urine container or 24 hours urine container with thymol/ boric acid	Random: At least 10 ml, 24 hour: At least 500 ml	PER-PAT-301	1 working day	Volume 24 hour urine ≥500ml, except for ESRF and paediatric case.
72	Urine Diastase	Urine	Urine container	10 ml	PER-PAT-301	4 hours	
73	Urine Electrolytes (Na,K, Cl)	Urine	Urine container	random urine, 10 ml	PER-PAT-301	4 hours	
74	Urine Magnesium Random / 24 hours	Urine	Urine container or 24 hours urine container with thymol/boric acid	Random: At least 10 ml, 24 hour: At least 500 ml	PER-PAT-301	1 working day	Volume 24 hour urine ≥500ml, except for ESRF and paediatric case. No reference range available for random urine.
75	Urine Paraquat	Urine	Urine container	At least 10 ml	PER-PAT-301	STAT/urgent: 90 minutes	
76	Urine Phosphate Random / 24 hours	Urine	Urine container or 24 hours urine container with thymol/boric acid	Random: At least 10 ml, 24 hour: At least 500 ml	PER-PAT-301	1 working day	Volume 24 hour urine ≥500ml, except for ESRF and paediatric case. No reference range available for random urine.

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
77	Urine Protein 24 hours	Urine	24 hours urine container with thymol/boric acid	24 hours urine at least 500 ml	PER-PAT-301	1 working day	Volume 24 hour urine ≥500ml, except for ESRF and paediatric case.
78	Urine Protein Creatinine Ratio (UPCR)	Urine	Urine container	Random urine, 10 ml	PER-PAT-301	1 working day	
79	Urine Urea	Urine	Urine container	10 ml	PER-PAT-301	4 hours	
80	Urine Uric Acid	Urine	Urine container	10 ml	PER-PAT-301	4 hours	
81	Valproic Acid	Blood	Plain tube without gel	Adult: 3 ml, Paediatric: 0.5 - 1 ml	BORANG PHIS HPSF/PER-PAT-301	Monitoring: 4 hours Toxic: 2 hours	
82	Vancomycin	Blood	Plain tube without gel	Adult: 3 ml, Paediatric: 0.5 - 1 ml	BORANG PHIS HPSF/PER-PAT-301	Monitoring: 4 hours Toxic: 2 hours	
83	Vitamin B12	Blood	Plain tube with gel	3 ml, mix gently Pediatric: 0.5 - 1 ml	PER-PAT-301	5 working days	

LIST OF CHEMICAL PATHOLOGY SEND-AWAY TESTS

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT REFFERAL LAB	REMARKS
1	α1-Acid Glycoprotein	Blood	Plain gel tube	5 ml	PERPAT 301	Hospital Ampang	7 days	
2	α2-Macroglobulin	Blood	Plain gel tube	6 ml	PERPAT 301	Hospital Ampang	7 days	
3	5-Hydroxy-Indole-Acetic Acid (5-HIAA) for Carcinoid Tumor	24 Hour Urine	24 Hour Urine Container with 10 ml of 25% HCL	Minimum Volume : 750 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	15 working days	•Protect sample from light • Transport FROZEN (Easily destroyed by heat & light)
4	17-Hydrxyprogesterone (17OHP)	Blood	Plain tube with gel	5 ml	PERPAT 301	Institut Endocrine, Hospital Putrajaya	21 days	Please follow protocol
5	24 Hr Urine Copper	Urine	24 Hour Urine Container without preservative	5 ml	PERPAT 301	Hospital Selayang	21 days	Physician / Specialist counter sign required
6	Acid Alpha-Glucosidase (POMPE)	Dried Blood Spot	Special filter paper.eg: PerkinElmer 226	4 circles of dried blood spot	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	30 days	
7	Acid or Chlorosive	Blood	Sodium Flouride tube	5 ml	Borang Permohonan bagi Pemeriksaan Forensik/ Toksikologi Jabatan	Jabatan Kimia, Melaka	30 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT REFFERAL LAB	REMARKS
					Kimia (Kimia 15-Pin.2/2016)			
8	Acylcarnitine & Amino Acids for IEM Screening (inclusive of Succinylacetone if required)	Dried Blood Spot	Blood Spot Filter Paper	4 circles of dried blood spot	Borang Permohonan Ujian IEM HTA (HTA/PAT/GEN/PK-01-03	HTA	30 days	
9	Adenocorticoid Hormone (ACTH)	Blood	K2 EDTA	5 ml	PERPAT 301	HKL	5 days	Send in cold box with ice
10	Adenosine Deaminase (ADA)	Pleural Fluid	Sterile container	3 ml	Borang Permohonan Ujian Makmal (Spesimen Klinikal) Makmal Kesihatan Awam (MKAK-BPU-U01/Rev2018)	MKAK Johor Bahru	7 days	Spesimen Stability within 48 hours
11	Alcohol	Blood	Sodium Flouride tube	5 ml	Borang Permohonan bagi Pemeriksaan Forensik/ Toksikologi Jabatan Kimia (Kimia 15-Pin.2/2016)	Jabatan Kimia, Melaka	30 days	
12	Aldosterone	Blood	K2 EDTA	5 ml	PERPAT 301	Institut Endocrin Hospital Putrajaya	30 days	Please follow protocol

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT REFFERAL LAB	REMARKS
13	Alpha 1 Antitrypsin Phenotyping	Blood	Plain tube with gel	5 ml	PERPAT 301	Hospital Ampang	20 days	
14	Amikacin	Blood	Plain tube without gel	5 ml	TDM FORM	HSAJB	5 dyas	
15	Amino Acids	Blood	Plain tube with gel	5 ml	IEM Request Form Unit Protein Khas (IMR.SDC.UPK.REQUEST FORM Version 3.0)	IMR	15 days	
16	Amino Acids	CSF	Bijou Bottle	1 ml	IEM Request Form Unit Protein Khas (IMR.SDC.UPK.REQUEST FORM Version 3.0)	IMR	15 days	Must send paired with plasma
17	Amino Acids	Urine	Sterile Container	20 ml	IEM Request Form Unit Protein Khas (IMR.SDC.UPK.REQUEST FORM Version 3.0)	IMR	15 days	By Consultation only
18	Amphetamine Type Stimulants (ATS), screening & confirmation	Urine	Sterile Container	30 ml	Borang Permintaan Ujian Dadah Dalam Air Kencing (UPD-1(PINDAAN 2020))	HSAJB	10 calendar days	
19	Anti Mullerian Hormone (AMH)	Blood	Plain tube with gel	5 ml	PERPAT 301	HKL	14 days	Request only by Gynae specialist
20	Anti Thyroglobulin (Anti Tg)	Blood	Plain tube with gel	5 ml	PERPAT 301	HSAJB	5 days	Counter Sign Specialist required

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT REFFERAL LAB	REMARKS
21	Anti Thyroid Peroxidase (Anti TPO)	Blood	Plain tube with gel	5 ml	PERPAT 301	HSAJB	5 days	Counter Sign Specialist required
22	Anti Thyroid Receptor Antibody (Trab)	Blood	Plain tube with gel	5 ml	PERPAT 301	HKL	10 days	Counter Sign Specialist required
23	Argininosuccinic Acid, (ASA)	Urine	Sterile Container	20 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	10 working days	Transport FROZEN
24	**Benzodiazepines** Alprazolam Alpha-Hydroxyalprazolam Alpha-Hydroxytriazolam 7-Aminoclonazepam 7-Aminoflunitrazepam 7-Aminonitrazepam 7-Aminonimetazepam Clonazepam Diazepam Flurazepam Flunitrazepam Lorazepam Midazolam Nimetazepam (Erimin 5) Nitrazepam Nordiazepam Oxazepam Temazepam)	Urine	Sterile Container	30 ml	PERPAT 301	HKL	6 weeks	Clinical Case

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT REFFERAL LAB	REMARKS
25	Beta 2 Microglobulin	Blood	Plain tube with gel	5 ml	PERPAT 301	Hospital Ampang	7 days	
26	Biogenic Amines, CSF - Neurotransmitter	CSF	Bijou Bottle	1 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	15 working days	• Protect sample from light • Transport FROZEN (Easily destroyed by heat & light)
27	Biogenic Amines	Urine	Sterile Container	30 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	15 working days	• Protect sample from light • Transport FROZEN (Easily destroyed by heat & light)
28	Biotinidase Enzyme Activity	Dried Blood Spot	Special filter paper.eg: PerkinElmer 226	4 circles of dried blood spot	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	30 days	
29	C- Peptide	Blood	Plain tube with gel	5 ml	PERPAT 301	HKL	5 days	
30	Cancer Antigen 15.3 (Ca 15.3)	Blood	Plain tube with gel	5 ml	PERPAT 301	HKL	5 days	Counter Sign Specialist required
31	Cancer Antigen 19.9 (Ca 19.9)	Blood	Plain tube with gel	5 ml	PERPAT 301	HSAJB	5 days	Counter Sign Specialist required
32	Carbon Monocside	Blood	Sodium Flouride tube	5 ml	Borang Permohonan bagi Pemeriksaan Forensik/Toksikolo	Jabatan Kimia, Melaka	30 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT REFFERAL LAB	REMARKS
					gi Jabatan Kimia (Kimia 15-Pin.2/2016)			
33	Carnitine Total & Free	Blood	Plain tube with gel	2 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	7 working days	Transport FROZEN
34	Carnitine, 24 Hour Urine	24 Hour Urine	24 Hour Urine Container	20 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	7 working days	By Consultation only
35	Cathinones	Urine	Sterile Container	30 ml	PERPAT 301	HKL	6 weeks	Clinical Case
36	Ceruloplasmin	Blood	Plain tube with gel	5 ml	PERPAT 301	HKL	5 days	
37	Cholinesterase	Blood	Plain tube	5 ml	PERPAT 301	HSAJB	5 days	
38	Copper	Blood	Plain tube without gel	5 ml	PERPAT 301	Hospital Selayang	21 days	Physician / Specialist counter sign required
39	Creatine & Guanidinoacetic Acid	Urine	Sterile Container	20 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	15 working days	Transport FROZEN
40	Creatine & Guanidinoacetic Acid	Dried Blood Spot	Special filter paper.eg: PerkinElmer 226	4 circles of dried blood spot	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	15 working days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT REFFERAL LAB	REMARKS
41	Creatine & Guanidinoacetic Acid	Blood	Plain tube with gel	1 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM -RQ_Version 7.0)	IMR	15 working days	
42	Cryoglobulin	Blood	Prepared by Hospital Ampang's laboratory	3 ml	PERPAT 301	Hospital Ampang	21 days	By appointment. Blood samples will be taken at Hospital Ampang only. Call Protein lab at ext 6216
43	Cyclosporin	Blood	K2 EDTA	5 ml	TDM FORM	HSAJB	5 days	
44	Cystine & Homocystine (Quantitative)	Random Urine	Sterile Container	2-5 ml	Borang Permohonan Ujian IEM HTA (HTA/PAT/GEN/PK-01-03)	HTA	14 days	By Appoiment only, Protect from light
45	Cystine & Homocystine, Urine	Urine	Sterile Container	2 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM -RQ_Version 7.0)	IMR	15 working days	Transport FROZEN
46	Cystine (Qualitative)	Random Urine	Sterile Container	2-5 ml	Borang Permohonan Ujian IEM HTA (HTA/PAT/GEN/PK-01-03)	HTA	14 days	By Appoiment only, Protect from light
47	Dehydroepiandrosterone (DHEAS)	Blood	Plain tube with gel	5 ml	PERPAT 301	HKL	5 days	
48	Delta-Amino Levulinic Acids (Delta-ALA)	Urine	Sterile Container	20 ml	IEM Request Form Unit Protein Khas (IMR.SDC.UPK.REQ	IMR	20 days	Protect from light

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT REFFERAL LAB	REMARKS
					UEST FORM Version 3.0)			
49	Drug Of Abuse	Blood	Sodium Flouride tube	5 ml	Borang Permohonan bagi Pemeriksaan Forensik/Toksikologi Jabatan Kimia (Kimia 15-Pin.2/2016)	Jabatan Kimia, Melaka	30 days	
50	Estradiol	Blood	Plain tube with gel	5 ml	PERPAT 301	HSAJB	5 days	
51	Everolimus	Blood	K2 EDTA	5 ml	PERPAT 301	Institut Urology & Nepherology HKL	Release on the same day of analysis	
52	Free Androgen Index : (1) Sex Hormone Binding Globulins (SHBG) (2) Testosterone	Blood	Plain tube with gel	5 ml	PERPAT 301	Institut Endocrine, Hospital Putrajaya	30 days	Testosterone result needs to be provided if Free Androgen Index (FAI) report is required
53	Free Light Chain Quantitation	Blood	Plain tube with gel	5 ml	PERPAT 301	Hospital Ampang	7 days	
54	Fructosamine	Blood	Plain tube with gel	5 ml	PERPAT 301	HOSPITAL AMPANG	7 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT REFFERAL LAB	REMARKS
55	Galactosemia Screening (TG & GALT)	Dried Blood Spot	Special filter paper.eg: PerkinElmer 226	4 circles of dried blood spot	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM -RQ_Version 7.0)	IMR	30 days	
56	Gamma Gt	Blood	Plain tube with gel	5 ml	PERPAT 301	HSAJB	5 days	
57	Growth Hormone (Somatotrophin)	Blood	Plain tube with gel	5 ml	PERPAT 301	Institut Endocrine, Hospital Putrajaya	15 days	
58	Haptoglobin	Blood	Plain tube with gel	5 ml	PERPAT 301	Hospital Ampang	7 days	
59	Homocysteine Total	Blood	Plain tube with gel	2 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM -RQ_Version 7.0)	IMR	15 working days	Transport FROZEN
60	Immunoglobulin (IgG, IgA, IgM)	Blood	Plain tube with gel	5 ml	PERPAT 301	HSAJB	5 days	Physician / Specialist counter sign required
61	Insulin	Blood	Plain tube with gel	5 ml	PERPAT 301	HKL	5 days	
62	Insulin Autoantibodies (IAA)	Blood	Plain tube with gel	5 ml	PERPAT 301	Unit Patologi Kimia Khas, Jabatan Patologi, HKL	14 working days	REQUEST ONLY BY SPECIALIST. Advised for IAA blood testing to be drawn BEFORE insulin therapy is

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT REFFERAL LAB	REMARKS
								initiated for the first time.
63	Insulin Like Growth Factor (IGF-1)	Blood	Plain tube with gel	5 ml	PERPAT 301	Institut Endocrine, Hospital Putrajaya	15 days	Please follow protocol
64	IPTH (Intact Paratyroid Hormone)	Blood	K2 EDTA	5 ml	PERPAT 301	HKL	7 days	Send in cold box with ice
65	**Ketamine Drugs** Ketamine Norketamine Dehydronorketamine	Urine	Sterile Container	30 ml	PERPAT 301	HKL	6 weeks	Clinical Case
66	Lead/Plumbum	Blood	K2 EDTA	5 ml	PERPAT 301	Hospital Selayang	21 days	Physician / Specialist counter sign required.
67	Lithium	Blood	Plain tube with gel	5 ml	PERPAT 301	Hospital Permai	2 days	
68	Lysine Metabolism Profile, Urine (P6C, Pipecolic Acid, AASA)	Urine	Sterile Container	20 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	15 working days	Transport FROZEN
69	Lysosomal Storage Disorders (LSD) Screening,	Dried Blood Spot	Special filter paper.eg: PerkinElmer 226	4 circles of dried blood spot	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	30 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT REFFERAL LAB	REMARKS
70	Lysosomal Storage Disorder Enzyme Assays	Blood	EDTA tube	6 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	25 working days	• Required consultation by geneticist. • Option maximum up to 2 diseases of enzyme. • Sample shall arrived IMR within 72 HOURS after collection. • DO NOT SPIN • DO NOT FREEZE • Keep and send chilled.
71	Metanephrines, 24 Hour	24 Hour Urine	24 Hour Urine Container with 10 mls of 25% HCL	Minimum Volume : 750 ml	PERPAT 301	Institut Endocrine, Hospital Putrajaya	30 days	Physician / Specialist counter sign required / Please follow protocol
72	Methanol	Blood	Sodium Fluoride	3 ml	PERPAT 301	MKAK Sg Buloh	7 working days	Physician / Specialist counter sign required
73	Methanol	Urine	Sodium Fluoride	3 ml	PERPAT 301	MKAK Sg Buloh	7 working days	Physician / Specialist counter sign required
74	Methaqualone	Urine	Sterile Container	30 ml	PERPAT 301	HKL	6 weeks	Clinical Case

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT REFFERAL LAB	REMARKS
75	Methotrexate	Blood	Plain tube without gel	5 ml	PERPAT 301	Hospital Melaka	Release on the same day of analysis	
76	**Mitragynine** Mitraginine 7-Hydroxymitragynine	Urine	Sterile Container	30 ml	PERPAT 301	HKL	6 weeks	Clinical Case
77	Mucopolysaccharides (GAGs / HRE)	Urine	Sterile Container	20 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	10 working days	Transport FROZEN
78	Mucopolysaccharidoses Enzyme Assays (MPS Type I, II, IIIa, IIIb, IVa, IVb, VI, VII, Multiple Sulfatase)	Blood	EDTA tube	6 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	25 working days	By Consultation only
79	Myoglobin	Blood	Plain tube with gel	5 ml	PERPAT 301	Hospital Ampang	7 days	
80	Myoglobin	Random Urine	Sterile Container	20 ml	PERPAT 301	Hospital Ampang	7 days	
81	Oligoclonal Band	Blood & CSF	Plain tube with gel & Bijou Bottle	5 ml	PERPAT 301	Hospital Ampang	21 days	CSF must paired with blood sample.
82	Oligosaccharide	Urine	Sterile Container	20 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	15 working days	Transport FROZEN

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT REFFERAL LAB	REMARKS
83	**Opioids** Methadone Fentanyl 6-Acetylmorphine (6am) Buprenorphine Dextromethorphan Hydrocodone Hydromorphone Meperidine (Pethidine) Oxycodone Oxymorphone Tramadol	Urine	Sterile Container	30 ml	PERPAT 301	HKL	6 weeks	Clinical Case
84	Organic Acids	Urine	Sterile Container	20 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	7 working days	Transport FROZEN (Organic acids easily destroyed by heat)
85	Organic Acids **(FORENSIC ONLY)**	Blood	Plain tube with gel	1 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	10 working days	By Consultation only. Transport FROZEN. Organic acids easily destroyed by heat.
86	Organic Acids, Vitreous Humour **(FORENSIC ONLY)**	Vitreous Humour	Plain tube	2 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	10 working days	By Consultation only. Transport FROZEN. Organic acids easily destroyed by heat.
87	Organic Acids; Urine (inclusive of	Random Urine	Sterile container	2-5 ml	Borang Permohonan Ujian IEM HTA	HTA	14 days	Physician / Specialist counter sign required

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT REFFERAL LAB	REMARKS
	Succinylacetone if required)				(HTA/PAT/GEN/PK-01-03)			
88	Orotic Acid	Urine	Sterile Container	20 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	7 working days	Transport FROZEN
89	Osmolality	Blood	Plain tube with gel	5 ml	PERPAT 301	HSAJB	5 days	
90	Osmolality	Urine	Sterile Container	20 ml	PERPAT 301	HSAJB	5 days	
91	**PANEL DIABETES ANTIBODIES** : Glutamic Acid Decarboxylase Antibody (Anti-GAD), Anti-Islet Antibody (ICA), Tyrosine Like Proteine Antibody (Anti-IA2)	Blood	Plain tube with gel	5 ml	PERPAT 301	Unit Patologi Kimia Khas, Jabatan Patologi, HKL	14 working days	Request only by Endocrinologist & Medical specialist
92	Peroxisomal Disorder Profile (VLCFA, Phytanic & Pristanic Acid)	Blood	Plain tube with gel	1 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	10 working days	
93	Pesticide	Blood	Sodium Flouride tube	5 ml	Borang Permohonan bagi Pemeriksaan Forensik/Toksikologi Jabatan Kimia	Jabatan Kimia, Melaka	30 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT REFFERAL LAB	REMARKS
					(Kimia 15-Pin.2/2016)			
94	Phenobarbital	Blood	Plain tube without gel	5 ml	TDM FORM	HSAJB	5 days	
95	Pipecolic Acid	Blood	Plain tube with gel	5 ml	IEM Request Form IMR/SDC/BC/FORM-RQ Version 7.0	IMR	15 days	
96	Plasma Amino Acid (Full profile, Maple Syrup Urine Disease (MSUD), Phenylketonuria (PKU)	Blood	Lithium Heparin tube	5 ml	Borang Permohonan Ujian IEM HTA (HTA/PAT/GEN/PK-01-03)	HTA	32 days	
97	Porphyria Profile	Urine	Sterile Container	20 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	15 working days	Protect from light
98	Procalcitonin (PCT)	Blood	Plain tube with gel	5 ml	PERPAT 301	Institut Kanser Negara	3 days	Compulsory to liaise with the person in charge from Pathology Department. IKN/Physician / Specialist counter sign required

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT REFFERAL LAB	REMARKS
99	Pterins, CSF - Neurotransmitter	CSF	Bijou Bottle	1 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	15 working days	Special tube (with preservative DTE & EDTA) provided by Biochemistry Unit, IMR • Protect sample from light • Transport FROZEN (Easily destroyed by heat & light)
100	Pterins, Urine - Neurotransmitter	Urine	Sterile Container	20 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	15 working days	• Protect sample from light • Transport FROZEN (Easily destroyed by heat & light).
101	Purine & Pyrimidine	Random Urine	Sterile Container	2-5 ml	Borang Permohonan Ujian IEM HTA (HTA/PAT/GEN/PK-01-03)	HTA	14 days	Send in cold box with ice
102	Renin	Blood	K2 EDTA	5 ml	PERPAT 301	Institut Endocrine, Hospital Putrajaya	30 days	Please follow protocol
103	Salicylate	Blood	Plain tube without gel	5 ml	PERPAT 301	Hospital Melaka	1 day	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT REFFERAL LAB	REMARKS
104	Saline Loading Test	Blood	K2 EDTA	5 ml	PERPAT 301	Institut Endocrine, Hospital Putrajaya	30 days	Please follow protocol
105	Salivary Cortisol	Saliva	Salivette tube	1.5 ml	PERPAT 301	Hospital Pulau Pinang	3 working days	Requested by Endocrinologist Specialist only. Minimum 2 samples taken at different days. Sample sent in ice. Please call HPSF lab for instruction for collection of saliva sample.
106	Serum Protein Electrophoresis	Blood	Plain tube with gel	5 ml	PERPAT 301	HKL	30 days	
107	Sialic Acid, Total & Free	Urine	Sterile Container	20 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	15 working days	Transport FROZEN
108	Sirolimus	Blood	K2 EDTA	5 ml	PERPAT 301	HTA	Release on the same day of analysis.	
109	S-Sulphocysteine	Urine	Sterile Container	20 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	15 days	Collect WITHOUT preservative

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT REFFERAL LAB	REMARKS
110	Succinylacetone, Urine	Urine	Sterile Container	20 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	15 working days	Transport FROZEN
111	Sugar & Polyols	Urine	Sterile Container	20 ml	IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)	IMR	15 working days	Transport FROZEN
112	Sulphite & Sulphocystine	Random Urine	Sterile Container	2-5 ml	Borang Permohonan Ujian IEM HTA (HTA/PAT/GEN/PK-01-03)	HTA	14 days	Send in cold box with ice
113	Synthetic Cathinones Mephedrone	Urine	Sterile Container	30 ml	PERPAT 301	HKL	6 weeks	Clinical Case
114	Tacrolimus	Blood	K2 EDTA	5 ml	TDM FORM	HSAJB	5 days	
115	**TDM for Antifungal** -Itraconazole -Posaconazole -Voriconazole -Flucytosine -Isavuconazole	Blood	Plain Tube Without Gel	3 ml	HKL Antifungal Therapeutic Drug Monitoring (TDM) Request Form (v2_June 2025)	HKL	1-3 working days Analysis day : Tuesday and Thursday only	Requestor: -Pakar Perubatan Penyakit Berjangkit -Pakar Anaestesiologi dan Rawatan Rapi -Pakar Hematologi *Send blood to Pathology Lab within 2 hours of collection for centrifugation.

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT REFFERAL LAB	REMARKS
116	Thyroglobulin (Tg)	Blood	Plain tube with gel	5 ml	PERPAT 301	HSAJB	5 days	Counter Sign Specialist required
117	Transferin	Blood	Plain tube with gel	5 ml	PERPAT 301	Hospital Ampang	7 days	
118	Urine Protein Electrophoresis	Random Urine	Sterile Container	20 ml	PERPAT 301	HKL	30 days	
119	Vitamin D	Blood	Plain tube with gel	5 ml	PERPAT 301	Institut Endocrine, Hospital Putrajaya	30 days	Please follow protocol
120	Zinc	Blood	Sodium Flouride tube	5 ml	Borang Permohonan bagi Pemeriksaan Forensik/Toksikologi Jabatan Kimia (Kimia 15-Pin.2/2016)	Jabatan Kimia, Melaka	30 days	

HPSF 2025

MICROBIOLOGY

362/354/357

MEDICAL MICROBIOLOGY

INTRODUCTION

Medical Microbiology Unit consists of Bacteriology, Serology, Virology, Immunology, Parasitology, Mycology and Mycobacteriology which specifically provides diagnostic services on infectious diseases caused by bacteria, fungi, parasites and viruses. Besides, diagnostic services are also provided to support non-infectious diseases such as autoimmune diseases, hypersensitivity disorders and immunodeficiency. Comprehensive services are provided either in-house or referred to other healthcare facilities under Ministry of Health Malaysia. Besides, this unit also involve in training of medical laboratory technician students and participate in research activities.

In addition, Medical Microbiology Unit works close collaboration with Infection Control Unit, Physician and Pharmacist for the prevention, control and management of hospital acquired infection and antimicrobial resistance.

SERVICES

The list of services offered by Microbiology Unit includes:

1. Diagnosis microbiological services, which include bacteriology, serology, virology, immunology, parasitology, mycology and mycobacteriology.
2. Consultation, technical and diagnostic supportive in the Hospital Infection Control Programme.
3. Provision of microbiologic studies of the hospital environment, outbreak management and sterility testing.
4. Microbiological investigations for medico-legal cases.

GENERAL GUIDELINE FOR SPECIMEN COLLECTION & REJECTION

1. General Guidelines For Specimen Collection And Handling In Microbiology

    i. The quality of laboratory results depends greatly on the proper collection and handling of the specimen as well as obtaining satisfactory material for examination.
    ii. The clinical specimen must be material from the actual infection site and must be collected with minimum contamination from adjacent tissues, organs or secretions.
    iii. A sufficient quantity of specimen must be obtained in order to perform the examination required.
    iv. Appropriate collection devices, specimen containers and culture media must be used to ensure optimal recovery of micro-organisms.
    v. Ideally, the specimen must be collected before the commencement of antibiotic therapy.
    vi. The specimen container must be properly labelled, placed in a biohazard plastic bag and accompanied by a completed laboratory request form.
    vii. Specimens are best transported immediately to the laboratory.

2. General Microbiology Specimen Rejection Criteria
   i. Sample culture and sensitivity request send without clinical history or diagnosis written on Per-Pat 301 request form.
   ii. No countersign specialist on lab request form for outsource test.
   iii. Do not use appropriate form, such as TBIS20C form for respective test.
   iv. Lab request form that is contaminated with patient specimen such as blood, urine. Etc.
   v. Serological sample that is icteric, lipemic, haemolysed or insufficient volume.
   vi. Serological sample repeat less than stipulated time interval, e.g.: Hepatitis B/C/HIV screening test repeated less than 3 months.

3. Specific Collection Guideline For Bacteriology Tests

- **Alert organism screening (CRE, VRE & MRSA)**
  a. Axilla / Inguinal swab for MRSA carrier screening
     1. Use swab pre-moistened with sterile saline.
     2. Rotate swab against the skin surface at axillary and inguinal fold.

  b. Nasal swab for MRSA carrier screening
     1. Use swab pre-moistened with sterile saline. Insert about 2cm into nares.
     2. Rotate swab against nasal mucosa.

  c. Rectal swab for VRE and CRE carrier screening
     1. Insert swab beyond anal sphincter. Swab must show faeces.
     2. Dip the swab into the transport medium

- **Blood catheter tip culture & sensitivity**
  1. Skin decontamination, careful aseptic removal mandatory.
  2. Cleanse skin around catheter site with alcohol
  3. Aseptically remove and clip 5-cm distal tip of catheter directly into sterile container.

- **Blood culture & sensitivity/Bone marrow aspirate (aerobic, anaerobic, mycobacterium and fungal culture)**
  1. Must be collected under aseptic technique.
  2. Disinfect venepuncture site by cleanse site with 2% chlorhexidine in 70% alcohol.
  3. Swab concentrically, starting at the site to puncture.
  4. Do not palpate disinfected site after cleansing
  5. Draw blood and inoculate into blood culture bottles. Make sure to disinfect rubber septum of blood culture bottle with 2% chlorhexidine in 70% alcohol before inoculation.
  6. Aspirate the optimal blood volume i.e. adult (8-10 ml), infant (1-2 ml), myco F/lytic bottle (1-5 ml)

  *For cases suspect of Catheter Related Blood Stream Infection (CRBSI), both central (one lumen) and peripheral sample shall be collected at the same time prior sending to the laboratory

  7. <u>Rejection Criteria:</u>
     - Blood culture and sensitivity that recently positive but repeated in less than 72 hours, except for cases like:
       i) Clinical worsening sepsis or not responding toward current antibiotic.
       ii) To monitor for clearance of organism include MSSA, MRSA or Candidemia.

- Patient demographic sticker pasted over blood culture bottle barcode that causes affect blood culture bottle registration in system.
- For cases suspect of Catheter Related Blood Stream Infection (CRBSI):
  i) Only sending central blood sample without peripheral blood sample.
  ii) Central and peripheral sample send at different time or date.
  iii) Sending more than one central sample for catheter with multiple lumens.

- **Body Fluid culture & sensitivity**
  1. Disinfect overlying skin with 2% chlorhexidine in 70% alcohol
  2. Obtain specimen via percutaneous needle aspiration or surgery

- **Cerebrospinal fluid (CSF) cell count, CSF for Cryptococcus (India Ink), CSF culture & sensitivity**
  1. Must be collected under aseptic technique.
  2. Send sample immediately to the lab
  3. Do not store in the refrigerator
  4. If only 1 tube of CSF is collected, submit it to microbiology lab first for culture to avoid contamination
  5. For CSF cell count, India ink, please alert Bacteriology lab (ext 362) before sending the sample. Sample after office hour must request from Pathologist oncall.

- **Eye/ Ear Swab C&S**
  a. Corneal scrapings:
     1. Obtain conjunctival swab specimens as described above.
     2. Instil 2 drops of local anaesthetic.
     3. Using sterile spatula, scrape ulcers or lesions, and inoculate scraping directly onto medium.
     4. Apply remaining material to clean glass slides for staining.

  b. Ear swab, inner:
     1. For intact eardrum, clean ear canal with soap solution, and collect fluid via syringe aspiration technique.
     2. For ruptured eardrum, collect fluid on flexible-shaft swab via auditory speculum.

  c. Eye swab/Conjunctiva:
     1. Sample both eyes with separate swab by rolling swab over each conjunctiva.
     2. Inoculate medium at time of collection.
     3. Smear swabs onto glass slide for staining

  *Collect 2 swabs if possible, especially for cases such as Ophthalmia Neonatorum or in cases where Corynebacterium diphtheriae is suspected. Put the swab in the Amies transport medium.

- **Genital swab and discharge culture & sensitivity**
  a. Endocervical swab
     1. This is the best specimen for the diagnosis of gonorrhoea and puerperal sepsis.
     2. Insert a sterile speculum lubricated with sterile normal saline into endocervical canal.
     3. Under direct vision, gently compress cervix with blade of speculum and use a rotating motion with swab, obtain exudates from endocervical glands.

b. High vaginal swab (HVS):
    1. For the diagnosis of candidiasis and other causes of vaginitis but NOT Gonorrhoea.
    2. Use a speculum without lubricant. Collect secretions from the mucosa high in the vaginal canal with sterile swab.

c. Urethral discharge (Male)
    1. Wipe the urethral with a sterile gauze or swab.
    2. Collect the exudates as per endocervical swab procedure with a sterile swab and inoculate in transport media.
    3. Spread some exudates in the middle of a slide, allow the smear to dry (if necessary).
    4. If discharge cannot be obtained by 'milking' the urethra, use a sterile swab to collect material from about 2 cm inside the urethra.

- **Pus aspirate/swab culture & sensitivity**
    a. Pus aspirate
        1. Using a sterile technique, aspirate the purulent material from the depths of the wound and transfer into a sterile container (expel the air inside the syringe before aspirate to keep viability of obligate anaerobe if presence).
        2. When little purulent material is available and cannot be obtained with a needle and syringe a sterile swab may be used.

    b. Pus swab
        1. Removed superficial debris by thorough irrigation and cleansing with non-bacteriostatic sterile saline.
        2. Gently roll swab over the surface of the wound approximately 5 times, focusing on area where there is evidence of pus or inflamed viable tissue.
        3. Swab is an inferior substitute and should be avoided, if sent, in an Amies Transport Medium.
        4. A dry swab may fail to yield organisms in smear and culture.
        5. Surface swabs of deeply infected lesions (eg: sinus tracts from osteomyelitis, pressure sores) usually grow surface contaminants like coliforms and Pseudomonas.
        6. <u>Rejection Criteria:</u>
            i. Dry swab (swab send without amies media)
            ii. Wound swab without specialist countersign.

- **Respiratory samples culture & sensitivity**
    a. Bronchial alveolar lavage, Bronchial wash, tracheal aspirate
        1. Place the specimen, which is obtained via bronchoscopy or tracheal suction into a sterile container.
        2. Send the specimen to the laboratory immediately.

    b. Nasopharyngeal swab
        1. Gently insert swab into posterior nasopharynx via nose
        2. rotate swab slowly for 5 second to absorb secretions.
        3. Remove swab;
        4. inoculate medium at bedside, or place swab in Amies transport medium.

c. Sputum
- Expectorated sputum (best to collect early morning)
  1. Collect specimen under direct supervision of nurse or physician.
  2. Have patient rinse or gargle with water.
  3. Instruct patient to cough deeply to produce lower respiratory specimen.
- Induced Sputum
  1. Have patient rinse mouth with water after brushing gums and tongue.
  2. With aid of nebulizer, have patient inhale about 25 ml of 3-10% sterile saline.
  3. Collect induced sputum into sterile container.

d. Throat swab
  1. Depress tongue with tongue depressor.
  2. Sample posterior pharynx, tonsils, and inflamed areas with sterile swab.
  3. Place swab in Amies transport medium.

- **Sterility testing**

a. Air sampling / Environmental swab / Expressed breast milk
  1. Only for outbreak management measures.
  2. To consult Infection Control Unit / Clinical Microbiologist.

b. Biological indicator
  1. To send in autoclaved Attest tube to assess the sterility of the autoclave process.

c. Total parenteral nutrition (TPN) solution sampling
  1. Inoculate prepared TPN solution on Nutrient agar using aseptic technique.

- **Stool culture & sensitivity (including Salmonella typhi & Vibrio cholera)**

1. Using a small spoon or a swab, collect a portion of faeces (about 1 g) avoid touching the environment surface.
2. Taking care to include material containing mucus, pus or blood if any is present.
3. Rectal swab can be taken to look for Salmonella *typhi* carrier in acute cases or if stool is not available. Insert swab beyond anal sphincter. Swab must show faeces. Dip the swab into the Selenite F transport medium.
4. <u>Rejection Criteria:</u>
   i. Well form, hard stool.

- **Tissue culture & sensitivity**

1. Cleanse the superficial area thoroughly with sterile saline, changing sponges/gauze with each application. Remove all superficial exudates.
2. Remove overlying debris with scalpel and swabs or sponges (debride).
3. Collect biopsy (3-4mm) or curette sample from base or advancing margin of lesion (leading edge of the lesion) where pathogen should be present, and colonizing organisms are less likely to occur.
4. Sample viable infected tissue, rather than superficial debris. Avoid necrotic area.
5. Put in sterile container with no- bacteriostatic saline on a gauze pad to keep moist.
6. Do not allow tissue to dry.
7. Submit as much tissue as possible.
8. <u>Rejection Criteria:</u>

i. Tissue sample in formalin or other fixative

- **Urine culture & sensitivity**

a. Indwelling catheter:
   1. Disinfect catheter collection port with 70% alcohol.
   2. Use needle and syringe to aseptically syringe out 5-10ml of urine and discard. Syringe out another 5-10ml of urine and transfer sample to sterile container.

b. Midstream urine
   1. Thoroughly clean urethral area (for female) or glans (for male) with soap and water.
   2. Rinse area with wet gauze pad.
   3. While holding labia apart (for female) or while holding foreskin retracted (for male), begin voiding.
   4. After several mls of urine have passed, collect midstream portion without stopping flow of urine in urine container with boric acid. Avoid the last part of urine.

c. Straight catheter
   1. Thoroughly clean urethral area with soap and water.
   2. Rinse area with a wet gauze pad.
   3. Aseptically insert catheter into bladder.
   4. Allow about 15 ml of urine to pass, then collect urine to be submitted in sterile container.

d. Suprapubic aspirate (SPA)
   1. Before SPA, the patient should force fluids until bladder is full.
   2. Shave and disinfect the suprapubic skin overlying the urinary bladder.
   3. Aspirate urine from the bladder by using a needle aspiration technique.
   4. Do not take urine sample from urine bag.
   5. Send the urine sample as soon as possible to the microbiology laboratory to avoid overgrowth of the bacteria.
   6. When immediate delivery to the laboratory is not possible, refrigerate the urine at 4-6^{o}c. When a delay in delivery of more than 2 hours is anticipated, use boric acid container. Do not refrigerate specimen containing boric acid.
   7. Rejection criteria:
      i. Urine sample in boric acid bottle with volume exceeding or below indicator level.

4. Specific Collection Guideline For Medicolegal Case Samples

1. Medicolegal cases tests include HVS culture & sensitivity, urethral swab culture & sensitivity, rapid plasma reagin, anti-HIV, HBsAg, anti-HBs and anti-HCV.
2. Specimen should be sealed and send directly to the microbiology laboratory.
3. Specimen should be sent to the laboratory by designated personnel.
4. Chain of custody should be maintained at all times and record book should accompany the samples.
5. Sample collection of various tests should follow the guidelines as of normal microbiological requirements and the specific headings are referred.

5. Specific Collection Guideline For Mycobacteriology Tests

1. Acid fast bacilli (AFB) for smear & culture
2. Respiratory secretions, urine, CSF, body fluids, pus aspirates and tissues are acceptable for smear.
3. For respiratory samples, please instruct the patients to rinse mouth with water before collecting sputum to clean up the remaining food particles in the oral cavity.
4. Rejection criteria:
   i. Gastric lavage for AFB smear testing from non-paediatric patient.
   ii. Stool and swabs sample send for acid fast bacilli stain.

6. Specific Collection Guideline For Mycology Tests

a. Hair for fungal culture
   1. With forceps, collect at least 10-12 affected hairs with bases of shafts intact. Place in sterile container.
   2. Nail for fungal culture
   3. Wipe nail with 70% alcohol with gauze, NOT cotton.
   4. Clip away generous portion of affected area and collect material or debris from under nail.
   5. Place material in sterile container.

b. Skin scrapping for fungal culture.
   1. Cleanse affected area with 70% alcohol.
   2. Gently scrape surface of skin at active margin of lesion. Do not draw blood.
   3. Place sample in sterile container.
   4. For scalp, collect scalp scales, if present. Along with scrapings of active borders of lesions.
   5. Use swab pre-moistened with sterile saline.

7. Specific Collection Guideline For Parasitology Tests

a. Blood Film for Malaria Parasite (BFMP)
   1. Clean new glass slides with absolute alcohol.
   2. Select the third finger from the thumb (big toe can be used for infants). Clean the finger with 70% alcohol swab. Dry the finger with cotton towel.
   3. With a sterile lancet, puncture the ball of the finger using quick rolling action.
   4. By applying gentle pressure to the finger, express the first drop of blood and wipe it away with dry cotton wool

   - **Thick blood film preparation**
     1. Apply gentle pressure to the finger and collect a single drop of blood on the surface of clean slide.
     2. Using the corner of another glass slide as a spreader, quickly spread the blood to make an even, thick film. The blood is spread in a circular motion with 3 – 6 movements and spread over about 5 cent coin in diameter.
     3. Label the slide with patient's registration number and date of collection with grease pencil.
     4. Place the blood film in a slide tray to air dry at room temperature.

- **Thin blood film preparation**

    1. With another gentle pressure to the finger collect a small drop of blood onto a new slide about 5 mm away from the edge of the slide.
    2. Rest the blood slide on a firm, flat surface. Use another slide as a spreader. Touch the drop of blood with a spreader and allow the blood to run along its edge. Keep the spreader at an angle of 30 – 45˚and in steady movement, firmly push the spreader forward to prepare a thin smear.
    3. Label the slide with patient's registration number and date of collection with grease pencil.
    4. Place the blood film in a slide tray to air dry at room temperature.

*For both thick and thin smear, a good smear is one that on drying still shows the hands of a watch place beneath it or one can read newsprint through it.
* A complete BFMP sample shall include 2.0ml blood sample in EDTA tube

b. Blood Film for Microfilaria Parasite (BFMF)
    1. Collect a big drop of blood by pricking a finger. Blood collection must be done after 10.00 pm.
    2. Make an oval thick blood film on a clean glass slide.
    3. Dry it in a horizontal position, taking care to protect it from dust and pests.
    4. Send immediately to the laboratory after the smear dried off.

c. Stool Ova and Cysts
    1. Collect faeces into a clean container with a tight-fitting lid to prevent accidental spillage and maintain moisture.
    2. The specimen should not be contaminated with water and urine.
    3. Place in the plastic bag, label properly, accompanied by a request form and send immediately.

8. Specific Collection Guideline For Serology, Virology & Immunology Tests

a. General serology, virology and immunology tests
    1. Draw 5.0 ml of blood into a plain gel tube without anticoagulants.
    2. Clot at ambient temperature.
    3. Despatch to the laboratory within 4 hours of collection for serum separation by centrifugation.
    *Haemolysed, icteric or lipemic specimens invalidate certain tests. If such specimens are received, the samples will be rejected to ensure that results are of clinical value.
    *For Qiastat rapid molecular respiratory test and HBsAg/Anti-HIV/Anti-HCV rapid tests **MUST REQUEST** from pathologist oncall.

b. COVID-19 Antigen Rapid Test (COVID-19 RTK)
    1. Nasopharyngeal swab are collected using plain flocked swab.
    2. The RTK kit box should be obtained from laboratory counter.
    3. All the samples should be sent immediately in 2-8^{o}C after collection to the medical microbiology laboratory.

c. Qiastat Rapid Molecular Respiratory Panel
    1. Nasopharyngeal swabs are collected using plain flocked swab (request from serology laboratory EXT: 357/354) or nasopharyngeal aspirate are collected and placed in a sterile container.
    2. **Test should be request from Clinical microbiologist.**
    3. The virological kit box should be obtained from serology laboratory (EXT: 357/354).
    4. All the samples should be sent immediately in 2-8°C after collection to the medical microbiology laboratory.

d. Respiratory Viral Screening Influenza A, B, RSV, Adeno Combo Test
    2. Nasopharyngeal swabs are collected using plain flocked swab (request from serology laboratory EXT: 357/354) or nasopharyngeal aspirate are collected and placed in a sterile container.
    3. The virological kit box should be obtained from pathology laboratory main counter.
    4. All the samples should be sent immediately in 2-8°C after collection to the medical microbiology laboratory.

e. Stool for Clostridium difficile antigen/toxin test & stool for Rotavirus/Adenovirus antigen test
    1. Collect 3-5 mls of loose/watery faeces into a sterile screw-capped plastic container.
    2. If the faeces is liquid, the container may be filled to one-third full (excessive amount will result in spillage when opened).
    3. Formed faeces & rectal swabs will be rejected.

LIST OF MICROBIOLOGY IN-HOUSE TESTS

NO	TEST	SPECIMEN TYPE	TUBE/CONTAINER	VOLUME	REQUEST FORM	TAT	REMARKS
1	Acid Fast Bacilli Direct Smear	Sputum, Body Fluid, Tissue, Gastric lavage (for Paediatric patient only)	Sterile container	5.0-10.0 ml	Borang Permohonan Ujian Tibi TBIS 20C	1 day	
2	Alert organism screening (CRE & VRE)	Rectal swab	Amies Transport Medium with Charcoal	NA	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	Test ordered only by Infection Control Staffs
3	Alert organism screening (MRSA)	Nasal swab	Amies Transport Medium with Charcoal	NA	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	
4	Anti-Streptolysin O Titre (ASOT)	Blood	Plain gel tube	5.0 ml	PER-PAT 301	1 working day	
5	Blood & bone marrow culture & sensitivity/Bone marrow aspiration (For Fungal Pathogen)	Blood	Myco/F lytic bottle	Blood: 1.0-5.0 ml, BMA: 1.0-2.0ml	PER-PAT 301	14 days if no growth.	Preliminary results i.e. Gram stain from positive blood culture bottle will be informed immediately once blood culture bottle detected growth.
6	Blood catheter tip culture & sensitivity	5cm of blood catheter tip	Sterile container	5 cm	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	
7	Blood culture & sensitivity/Bone marrow aspiration (For aerobic & anaerobic bacteria)	Blood	Blood culture vials: Plus Aerobic/F, Peads Plus/F, Anaerobic vial	Adult: 8.0-10.0 ml; Infant: 1.0-2.0 ml; BMA: 1.0-2.0ml	PER-PAT 301	5 days if no growth. 3 days if pure growth of non-fastidious organism	Preliminary results i.e. Gram stain from positive blood culture bottle will be informed immediately once blood culture bottle detected growth.

NO	TEST	SPECIMEN TYPE	TUBE/CONTAINER	VOLUME	REQUEST FORM	TAT	REMARKS
8	Blood culture & sensitivity/Bone marrow aspiration (For Mycobacterium)	Blood	Myco/F lytic bottle	Blood: 1.0-5.0 ml, BMA: 1.0-2.0ml	PER-PAT 301	42 days if no growth.	Preliminary results i.e. Gram stain from positive blood culture bottle will be informed immediately once blood culture bottle detected growth.
9	Blood Film For Malaria Parasite (BFMP)	Blood	Dried thick & thin blood smears on slide EDTA	10 cent size 2.0 ml	PER-PAT 301	2 hours verbal report	
10	Blood Film For Microfilaria Parasite (BFMF)	Blood	Dried thick blood smear on slide EDTA	Oval shape 2.0 ml	PER-PAT 301	6 hours verbal report	
11	Body fluid culture & sensitivity	Pericardial, Peritoneal, Pleural, Synovial Fluid	Sterile container	at least 1.0 ml	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	
12	Cerebral spinal fluid culture & sensitivity	Cerebral spinal fluid	Bijou bottle	10 drops	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	
13	Cerebral spinal fluid Full Examination & Microscopy Examination (FEME): Cell count, Indian Ink, Bacterial Antigen Test	Cerebral spinal fluid	Bijou bottle	10 drops	PER-PAT 301	1 hour	Test request granted by pathologist oncall
14	Clostridium difficile Antigen & Toxin Test	Fresh stool	Sterile container	50 mg	PER-PAT 301	24 hours	

NO	TEST	SPECIMEN TYPE	TUBE/CONTAINER	VOLUME	REQUEST FORM	TAT	REMARKS
15	Corynebacterium diptheriae culture & sensitivity	Nasopharyngeal swab/ throat swab Nasopharyngeal aspirate	Swab in Amies with charcoal transport medium Sterile container	N/A 1-3 ml	PER-PAT 301		
16	COVID-19 Antigen Rapid Test	Nasopharyngeal swab	Falcon tube	NA	PER-PAT 301	2-4 hours	Tripple layer packaging, transport in ice
17	Dengue IgM/IgG Rapid Test	Blood	Plain gel tube	5.0 ml	PER-PAT 301	1 hour verbal report	
18	Dengue NS1 Antigen Rapid Test	Blood	Plain gel tube	5.0 ml	PER-PAT 301	1 hour verbal report	
19	Eye & ear swab culture & sensitivity	Eye/ear swab	Amies Transport Medium with Charcoal	NA	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	
20	Fungal culture	Hair, Nail, Skin scrapping, Pus, Tissue, Cerebral spinal fluid, Body fluid	Sterile container	For Pus and Body fluid at least 1.0 ml	PER-PAT 301	14 days if no growth.	
21	GENEXPERT MTB/RIF ULTRA	Sputum, Tissue, Pus, Body fluid except pleural fluid, BAL	Universal container with ice and cold box	Sputum, bone and fluid : > 1ml, CSF minimal 0.1ml	TB TBIS 20C	1 working day	Test request granted by Microbiologist/Chest Respiratory HSAJB
22	Genital discharge swab for Gonorrhoea	Endocervical swab/Urethral swab	Amies Transport Medium with Charcoal	NA	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	
23	Genital swab culture & sensitivity	High vaginal swab (HVS)	Amies Transport Medium with Charcoal	NA	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	

NO	TEST	SPECIMEN TYPE	TUBE/CONTAINER	VOLUME	REQUEST FORM	TAT	REMARKS
24	Hepatitis B core Total Antibody (Anti-HBcTotal) Serology Test (CMIA)	Blood	Plain gel tube	5.0 ml	PER-PAT 301	3-5 working days	
25	Hepatitis B surface Antibody (Anti-HBs) Serology (CMIA)	Blood	Plain gel tube	5.0 ml	PER-PAT 301	3-5 working days	
26	Hepatitis B surface Antigen (HBsAg) Rapid Test	Blood	Plain gel tube	5.0 ml	PER-PAT 301	1 hour verbal report	Test request granted by pathologist oncall
27	Hepatitis B surface Antigen (HBsAg) Serology (CMIA)	Blood	Plain gel tube	5.0 ml	PER-PAT 301	3-5 working days	
28	Hepatitis C antibody Rapid Test	Blood	Plain gel tube	5.0 ml	PER-PAT 301	1 hour verbal report	Test request granted by pathologist oncall
29	Hepatitis C antibody Serology (CMIA)	Blood	Plain gel tube	5.0 ml	PER-PAT 301	3-5 working days	
30	HIV Antigen/Antibody (HIV Ag/Ab) Serology Test (CMIA)	Blood	Plain gel tube	5.0 ml	PER-PAT 301	3-5 working days	
31	HIV antigen/antibody Combo Rapid Test	Blood	Plain gel tube	5.0 ml	PER-PAT 301	1 hour verbal report	Test request granted by pathologist oncall

NO	TEST	SPECIMEN TYPE	TUBE/CONTAINER	VOLUME	REQUEST FORM	TAT	REMARKS
32	Leptospirosis IgM Test	Blood	Plain gel tube	5.0 ml	PER-PAT 301 & MKAK Laboratory Request Form MKAK-BPU-U01	1 working day	Leptospirosis IgM positive and inconclusive will be sent to MKAK for microagglutination test (MAT). Leptospira IgM can be negative at early stage of infection. Please send another blood specimen after 14 days or prior discharge to repeat test if clinically indicated.
33	Mycobacterium culture & sensitivity	Sputum, Body Fluid, Tissue, Gastric lavage (for Paediatric patient only)	Sterile container	5.0-10.0 ml	Borang Permohonan Ujian Tibi TBIS 20C	8 weeks	
34	Mycobacterium leprae (Leprosy)	Slit Skin Smear (SSS)	Smear from lesions	2 slide- air dry fix smear	LIS 102A	2 working days	Smear done by skin clinic
35	Mycoplasma pneumoniae Serology Test	Blood	Plain gel tube	5.0 ml	PER-PAT 301	3-5 working days	
36	Pus aspirate culture & sensitivity	Pus aspirate	Sterile container	3.0 ml	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	
37	Pus swab culture & sensitivity	Pus swab	Amies Transport Medium with Charcoal	NA	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	

NO	TEST	SPECIMEN TYPE	TUBE/CONTAINER	VOLUME	REQUEST FORM	TAT	REMARKS
38	QIASTAT Rapid Molecular Respiratory Panel	Nasopharyngeal swab/Nasopharyngeal aspirate	UTM for NPS, sterile container for aspirate (NPA)	at least 1.0 ml for ETT aspirate	PER-PAT 301	1 working day	Need to discuss with Clinical Microbiologist before request
39	Rapid Plasma Reagin (RPR)	Blood	Plain gel tube	5.0 ml	PER-PAT 301	3-5 working days	
40	Respiratory virus screening Influenza A, B, RSV, Adeno Combo Test	Nasopharyngeal swab/Nasopharyngeal aspirate	Falcon tube (for NPS) /sterile container (NPA)	NA	PER-PAT 301		
41	Rotavirus/Adenovirus Antigen Detection	Fresh stool	Sterile container	50 mg	PER-PAT 301	24 hours	
42	Sputum culture & sensitivity	Sputum	Sterile container	at least 1.0 ml	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	
43	Sterility test (Air sampling)	Inoculated Blood agar & Sabaroud Dextrose Agar	Agar plate	NA	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	Test ordered only by Infection Control Staffs
44	Sterility test (Biological indicator)	Biological indicator	NA	NA	PER-PAT 301	24 hours	
45	Sterility test (Environmental swabs for outbreak investigation)	Swab	Amies Transport Medium with Charcoal	NA	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	Test ordered only by Infection Control Staffs
46	Sterility test (Expressed breast milk)	Expressed Breast Milk	Sterile container	at least 1.0 ml	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	Need to discuss with Clinical Microbiologist before request
47	Sterility test (TPN)	Inoculated Nutrient Agar)	Agar plate	NA	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	
48	Stool culture & sensitivity	Soft/Watery Fresh Stool	Stool container with scoop	1g	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	

NO	TEST	SPECIMEN TYPE	TUBE/CONTAINER	VOLUME	REQUEST FORM	TAT	REMARKS
49	Stool for Salmonella typhi	Fresh stool	Stool container with scoop	1g	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	
50	Stool for Vibrio cholerae	Watery Stool	Stool container with scoop	1g	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	
51	Stool ova & cyst	Soft/Watery Fresh Stool	Stool container with scoop	1g	PER-PAT 301	3 days	
52	Syphilis Rapid Test kit (trepanomal test)	Blood	Plain gel tube	5.0 ml	PER-PAT 301	1 hour verbal report	Test request granted by pathologist oncall
53	Throat swab for culture & sensitivity	Throat swab	Amies Transport Medium with Charcoal	NA	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	
54	Tissue culture & sensitivity	Tissue	Sterile container	NA	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	For small tissue specimen, to add several drops of sterile normal saline to keep moist
55	Tracheal aspirate, bronchial alveolar lavage, bronchial wash, nasopharyngeal aspirate culture & sensitivity	Tracheal aspirate, bronchial alveolar lavage, bronchial wash	Sterile container	at least 1.0 ml	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	
56	Treponema pallidum Particle Agglutination (TPPA)	Blood	Plain gel tube	5.0 ml	PER-PAT 301	3-5 working days	
57	Urine culture & sensitivity	Urine	Boric acid container	5.0-10.0 ml	PER-PAT 301	2-5 days if pure growth of non-fastidious organism	Please state the time of specimen collection.

LIST OF MICROBIOLOGY SEND AWAY TESTS

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
1	(1,3)- Beta-D-Glucan Antigen	Blood	Plain gel tube	5.0 ml	PER-PAT 301	Hospital Sungai Buloh	5 days	
2	Acanthamoeba spp. PCR	Corneal scraping, Contact lens, Contact lens suspension, Cerebrospinal fluid	Sterile container air tight or contact lens storage	NA	PER-PAT 301	Parasitology unit, IMR	10 days	Medium in container: sterile distilled water or saline
3	Acanthamoeba spp./Naegleria spp microscopy	Corneal scraping, Contact lens, Contact lens suspension, Cerebrospinal fluid	Sterile container, air tight or contact lens storage	NA	PER-PAT 301	Parasitology unit, IMR	3 days	By Appointment at least 3 days before the sample is taken. Medium in container: sterile distilled water or saline.
4	Acute Flaccid Paralysis workout (Polio Virus and Non-Polio Enterovirus)	Fresh stool (prefered)(to collect within 14 days of onset, 2 adequate sample to collect in 24-48hrs apart)	i)Stool: Sterile container	i) Stool: >5gm (thumb size)	Acute Flaccid Paralysis Case Investigation Form	Virology unit, IMR	14-28 days	For age >15 years old require consultation
5	Allergy test (Specific IgE)	Blood	Plain gel tube	5.0 ml	IMR Allergy request form	Allergy unit, IMR	10 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
6	Allergy test (Total IgE)	Blood	Plain gel tube	5.0 ml	IMR Allergy request form	Allergy unit, IMR	10 days	
7	Amoebiasis Serology	Blood	Plain gel tube, EDTA tube	2.0 ml	PER-PAT 301	Parasitology unit, IMR	5 days	
8	Anti B2-Glycoprotein antibody (IgG & IgM)	Blood CSF	Plain gel tube	3.0 - 5.0 ml	PER-PAT 301	HSAJB	10-14 working days	
9	Anti Cardiolipin Antibody (IgG & IgM)	Blood	Plain gel tube	3.0 - 5.0 ml	PER-PAT 301	HSAJB	10-14 working days	
10	Anti Intrinsic Factor Antibody	Blood	Plain gel tube	5.0 ml	PER-PAT 301	Microbiology unit, Hospital Selayang	30 days	
11	Anti-Acetylcholine Receptor Antibody (ACR)	Blood	Plain gel tube	5.0 ml	Autoimmune request form	Autoimmune unit, IMR	21 days	
12	Anti-Aquaporin 4 (AQ4)	Blood, CSF	Plain gel tube, Bijou bottle	5.0 ml	Autoimmune request form	Autoimmune unit, IMR	10 days	
13	Anti-Cyclic Citrullinated Peptide (CCP/ACPA)	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSAJB	10-14 days	
14	Anti-Fungal Susceptibility Testing	Pure yeast isolates	Fungal culture	NA	IMR Bacteriology fungal form	Bacteriology unit, IMR	20 days	
15	Anti-Ganglioside Antibodies (GA) Panel: Anti-GM1, Anti-GM2,	Blood, CSF	Plain gel tube Bijou bottle	5.0 ml 1.0 ml	Autoimmune request form	Autoimmune unit, IMR	14 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
	Anti-GM3, Anti-GM4, Anti-GD1a, Anti-GD1b, Anti-GD2, Anti-GD3, Anti-GT 1a, Anti-GT 1b, Anti-GQ1b							
16	Anti-Glomerular Basement Membrane (GBM)	Blood	Plain gel tube	5.0 ml	Autoimmune request form	Autoimmune unit, IMR	10 days	
17	Anti-Muscle-Specific Kinase (MuSK) Antibody	Blood	Plain gel tube	3.0 - 5.0 ml	Autoimmune request form	Autoimmune unit, IMR	21 days	send in ice
18	Anti-Myelin oligohendrocyte glycoprotein (MOG) Antibody	Blood	Plain gel tube	3.0 - 5.0 ml	Autoimmune request form	Autoimmune unit, IMR	10 working days	send in ice
19	Anti-neutrophil cytoplasmic antibodies (ANCA): P-anca, C-anca	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSAJB	10-14 working days	
20	Anti-N-Methyl-D-Aspartate Receptor (NMDAR) Encephalitis	Blood, CSF	Plain gel tube Bijou bottle	5.0 ml	Autoimmune request form	Autoimmune unit, IMR	7 days	
21	Antinuclear antibody (ANA)	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSAJB	10-14 days	
22	Aspergillus Galactomannan Antigen	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSI, Johor Bahru	2 days	
23	Bartonella henselae IgG & IgM	Blood	Plain gel tube	5.0 ml	PER-PAT 301	Hospital Sungai Buloh	5 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
24	Bartonella PCR	EDTA blood , Tissue (Lymph node)	EDTA Sterile container	2.0 ml	Bartonella Request form (IMR/BACT /FORMS/B ART/01)	Bacteriology unit, IMR	5 days	By consultation with IMR Specialist Dr Siti Roszilawati/ Dr Wan Norazanin 03-33628358/ 03-33628935 / 03-33627464
25	Bartonella quintana IgG & IgM	Blood	Plain gel tube	5.0 ml	PER-PAT 301	Hospital Sungai Buloh	5 days	
26	BK Virus PCR	Blood	EDTA tube	1.5 ml	PER-PAT 301	HSAJB	3- 5 working days	
27	BK Virus PCR	CSF, urine	CSF: Bijou bottle urine: sterile container	CSF: 1ml, urine: 5.0 ml	PER-PAT 301	Microbiology unit, Hospital Sungai Buloh	2- 5 days	
28	Bordetella pertussis PCR	Nasopharyngeal aspirate nasopharyngeal swabs	Sterile container sterile container with saline (NPS)	2.0 ml	IMR Bacteriolog y Request Form	Bacteriology unit, IMR	3 days	
29	Borrelia burdorfri/ Lyme's serology (IgG & IgM)	Blood	Plain gel tube	5.0 ml	PER-PAT 301	Serology unit, Hospital Sungai Buloh	2-7 days	
30	Brucella PCR	Blood	3 EDTA tubes	2.0 ml each tubes	Brucellosis Laboratory Request Form	Bacteriology unit, IMR	5	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
					(IMR/IDRC/BACT/BRUCE/02)			
31	Brucella serology (contact/ lab worker)	Blood	Plain gel tube	5.0 ml	MKAK-BPUU01/Rev2018	MKAK Sungai Buloh	NA	
32	Brucella Serology ELISA (screening patient) -Brucellacapt (Confirmation)	Blood	Plain gel tube	5.0 ml	Brucellosis Laboratory Request Form (IMR/IDRC/BACT/BRUCE/02)	Bacteriology unit, IMR	10 days	
33	Bruton tyrosine kinase (BTK) Genetic detection	Fresh blood in room temperature (without ice)	3EDTA tube	10.0 ml	Primary Immunodeficiency (PID) Request Form	PID unit, IMR and consent form	90 days	1. By appointment only 2. A mother's blood is required to assist with interpretation. 3. Screening result MUST show Absence or less than 2% CD19+ B cells and Low serum antibodies, reduced BTK protein expression 4. Please inform Lab upon sending sample.

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
34	Bruton tyrosine kinase (BTK) Protein detection	Fresh blood in room temperature (without ice)	EDTA tube	2 mL of fresh blood each from patient, mother and unrelated healthy control	Primary Immunodeficiency (PID) Request Form	PID unit, IMR	10 days	1. By appointment only 2. A mother's blood is required to assist with interpretation. 3. Screening result MUST show Absence or less than 2% CD19+ B cells and Low serum antibodies, reduced BTK protein expression 4. Please inform Lab upon sending sample.
35	Chikungunya PCR	Blood	Plain gel tube/ EDTA	5.0 ml	Virology test request form	Virology unit, IMR	1-10 days	
36	Chikungunya serology (IgM & IgG)	Blood	Plain gel tube	5.0 ml	PER-PAT 301	Hospital Sungai Buloh	2-3 days	
37	Coeliac Antibodies Panel: Anti-Endomysium, Anti Gliadin, Anti Tissue Transglutaminase	Blood	Plain gel tube	5.0 ml	Autoimmune request form	Autoimmune unit, IMR	21 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
38	Corynebacterium Diphtheriae PCR for Toxin Detection	Pure isolate culture	Blood agar	NA	MKAK-BPU-U01/Rev2018	MKAK Sungai Buloh	7 days	For contact cases only
39	COVID-19 Conventional PCR	Combined OPS/NPS, ETT aspirate	Swab: VTM; ETT aspirate: Sterile container	ETT aspirate: 2.0 - 5.0 ml	PER-PAT 301	HSAJB	24 hours	
40	Coxiella burnetii phase ii IgG & IgM	Blood	Plain gel tube	5.0 ml	PER-PAT 301	Hospital Sungai Buloh	2-3 days	
41	Cryptococcal antigen	Blood CSF	Plain gel tube bijou bottle	5.0 ml	PER-PAT 301	HSAJB	2 days	
42	CSF for VDRL	CSF	Bijou bottle	1.0 ml	PER-PAT 301	Serology unit, Hospital Sultan Ismail (HSIJB)	7 days	
43	Cytokines (IL-6): IL-1 beta, IL-6,IL-8 & TNF alpha	Blood	Plain gel tube	5.0 ml	Autoimmune request form	Autoimmune unit, IMR	21 days	For appointment only, please contact Dr Fatimah: 016-3807873 / 03-3362 8879
44	Cytomegalovirus (CMV) DNA PCR/ Viral load	Blood	EDTA	1.5 ml	PER-PAT 301	HSAJB	3-5 working days	
45	Cytomegalovirus (CMV) IgG/IgM serology	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSAJB	3 working days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
46	Cytomegalovirus (CMV) PCR	Urine	Sterile container	5.0 ml	PER-PAT 301	Microbiology unit, Hospital Sungai Buloh	2-5 days	
47	Cytomegalovirus Isolation	i) Urine. ii) Cerebrospinal Fluid (CSF). iii) Broncholalveolar lavage (BAL). iv) Tissue. v) Pericardial Fluid	i) Urine/ CSF/ BAL/ Pericardial fluid: Sterile leakproof container. ii) Tissue biopsy/ autopsy: Sterile leakproof container containing VTM or sterile normal saline to keep tissue moist.	) Urine/ CSF/BAL/ Pericardial fluid: 1-3 ml. ii) Tissue biopsy/ autopsy: About 1.5 cm cubes of various parts of affected organs	Virology test request form	Virology unit, IMR	14-35 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
48	Dengue PCR	Blood~~,~~ CSF, Organ biopsy	Blood: Plain gel tube, CSF: Bijou bottle Organ biopsy: Sterile leakproof container containing VTM or sterile normal saline to keep tissue moist	Blood: 5 ml; CSF: 1ml Organ biopsy: About 1.5 cm cubes from various parts of affected organs	Virology test request form	Virology unit, IMR	7 days	Only for severe dengue cases and ICU patient
49	Dengue PCR	Blood	Plain gel tube	5.0 ml	Laboratory Request Form For Dengue And Flavivirus	MKAJB	5 days	1) Only for severe dengue cases and ICU patient
50	Dengue serology IgM/ IgG ELISA	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSAJB	1-3 days	
51	Dengue Serotype Surveillance	Blood	Plain gel tube	5.0 ml	Laboratory request form for Dengue and Flavivirus MKAK-BPU-D02	MKAJB	7 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
					(rev_Nov_2015)			
52	Dimethylsulfoxide (DMSO) stain for Cryptosporidium spp., Cyclospora spp, and Isospora spp.) and Gram chromotrope (GC) Stain for Microsporidium spp.)	Fresh stool sample	Sterile container	5 g	PER-PAT 301	Institut Kanser Negara	3 working days	(Sampel perlu sampai ke IKN dalam masa 24- 48 jam pada suhu bilik)
53	Double Stranded DNA (dsDNA) Test	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSA JB	10-14 working days	
54	Ebstein Barr Virus (EBV) PCR	Blood	EDTA tube	1.5 ml	PER-PAT 301	HSAJB	3-5 Working days	
55	Ebstein Barr Virus (EBV) PCR	CSF, BAL	CSF: Bijou bottle, BAL: sterile container	~~Blood: 5 ml;~~ CSF: 1ml, BAL: 5.0 ml	PER-PAT 301	Microbiology unit, Hospital Sungai Buloh	3-5 working days	
56	Ebstein Barr Virus (EBV) serology	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSAJB	3 working days	
57	Echovirus 11 RT-qPCR	Throat swab Nasopharyngeal swab/ oropharyngeal swab	Throat swab Nasopharyngeal/oropharyngeal swab/ rectal swab	CSF: 1.0 ml	Virology test request FORM	Virology unit, IMR	1- 10 days	By consultation with IMR Specialist

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
		Rectal swab, Stool CSF	:Dacron swab/nylon swab in VTM stool in Sterile container CSF in Bijou bottle					
58	Enterovirus isolation	i) ARS: Refer to Respiratory Virus Isolation for specimen types. ii)Herpangina/HFMD: Culture Not Done (refer to Enterovirus RT-qPCR). iii) Acute Hemorrhagic Conjunctivitis: Conjunctival swab. iv) Myocarditis/ Pericarditis: Throat swab; Rectal Swab; Stool; Pericardial fluid;Endomyocardial biopsy; Heart tissue. v) Acute	i) Respiratory specimens: Refer to Respiratory Virus Isolation. ii) Swab specimens: Sterile leakproof vial containing 2-3 ml of VTM. iii) Pericardial fluid/ CSF/ Stool: Sterile leakproof container. iv) Tissue biopsy/ autopsy: Sterile leakproof container containing	i)Respiratory specimens: Refer to Respiratory Virus Isolation. ii) Swab specimens: Sterile plastic-shafted polyester swab in VTM. iii)Pericardial fluid/ CSF: 1-3 ml. iv) Stool: >5 g (thumb size). v)Tissue biopsy/ autopsy: About 1.5 cm	Virology test request form	Virology unit, IMR	14-28 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
		Neurological Syndrome: Throat swab; Rectal swab; Stool; CSF; Brain tissue.	VTM or sterile normal saline to keep tissue moist.	cubes of various parts of affected organs.				
59	Enterovirus PCR for HFMD	Rectal swab/mouth ulcer swab/ vesicle swab/ fresh stool	Swabs: VTM, Stool: Sterile container	Stool: 5g	Borang Permohonan Ujian HFMD	MKAJB	14	Only send 1 type of sample based on clinical priority
60	Enterovirus qRT-PCR (Inclusive of Pan-Entero, EV71 & CA16)	CSF NPS/NPA/OPS/Throat swab, rectal swab, BAL, sputum, stool, biopsy, pericardial fluid	Bijou bottle, VTM Sterile container	1.0 ml NA NA	Virology test request form	Virology unit, IMR	1- 10 days	
61	Eosinophil Cationic Protein (ECP)	Blood	Plain gel tube	3.0 ml	IMR Allergy request form	Allergy unit, IMR	30 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
62	Extractable nuclear antigen (ENA) - Anti Sm - Anti-U1 RNP - Anti-SSA/ Ro - Anti-SSB/ La - Anti-Jo 1 - Anti-Scl – 70 - Anti-Centromere	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSAJB	3-5 working days	For ANA positive (speckled pattern only)
63	Filariasis Micoscopy	Blood	EDTA tube / Thick blood film	2.5 ml	PER-PAT 301	Parasitology unit, IMR	3 days	Blood taken between 10pm-12am
64	Filariasis PCR	Blood	EDTA tube	2.5 ml	PER-PAT 301	Parasitology unit, IMR	7 days	Blood taken between 10pm-12am
65	Filariasis Serology	Blood	Plain gel tube	5.0 ml	PER-PAT 301	Parasitology unit, IMR	1 day	
66	Fungal identification	Pure isolate Tissue	Fungal Tissue block/ ribbon (reported out by HPE)	NA	IMR Bacteriology fungal form	Bacteriology unit, IMR	40 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
67	Fungal PCR	Fresh clinical specimens : i. Blood ii.Blood in blood culture vial iii. CSF and other sterile body fluids, skin/tissue biopsies	i. Blood in EDTA/Plain tube ii. Blood culture bottle iii. Tissue and other body fluids in sterile container.	2 ml blood; other samples as much as possible	IMR Mycology request form(IMR/IDRC/BACT/MYCO/01)	Bacteriology unit, IMR	14 days	Sample from sterile site only.
68	Gastrointestinal-Protozoa PCR A Multiplex PCR for identification of : -Blastocystis hominis -Cryptosporidium spp, -Cyclospora cayetanensis -Dientamoeba fragilis -Entamoeba histolytica -Giardia lamblia	Stool	Sterile container (penutup kuning) In icebox	NA	PER-PAT 301	Institut Kanser Negara	5 working days	1) To inform MO Microbiology (IKN) prior sending to the laboratory. 2) Transport in 2-8ºC (within2 days) or in -20ºC (in 1month)
69	Helminth microscopy & culture	Fresh stool	Sterile container	5g	PER-PAT 301	Parasitology unit, IMR	5 days	
70	Hepatitis A antibody	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSAJB	3-5 working days	
71	Hepatitis B (HBV) DNA Viral Load	Blood	3 EDTA tubes	2.0 ml each tubes	PER-PAT 301	HSAJB	2-4 weeks	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
72	Hepatitis B virus envelope Antibody(HBeAb)/ Hepatitis B virus envelope Antigen(HBeAg)/ Hepatitis B virus core total antibody (HBcAb)/ Hepatitis B virus core IgM (HBc IgM)	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSAJB	3-5 working days	
72	Hepatitis B virus surface Antigen (HBs Ag) Confirmatory	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSAJB	3-5 working days	
74	Hepatitis C core antigen (HCVcAg)	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSNI	3-5 working days	A reflex test for Hepatitis C virus antibody reactive sample.
75	Hepatitis C Viral Genotyping	Blood	3 EDTA tubes	2.0 ml	PER-PAT 301	Virology unit, HKL	30 days	1) Criteria of sample: i. HCV viral load minimum 1000 IU/mL or Hepatitis C core Antigen positive ii. Relevant clinical history (i.e Liver cirrhosis) 2) Request form signed by

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
								Gastroenterologist/ Medical specialist
76	Hepatitis C virus (RNA) Viral load	Blood	3 EDTA tubes	2.0 ml each tubes	PER-PAT 301	HSAJB	2-4 weeks	
77	Hepatitis E and Hepatitis D IgM	Blood	Plain gel tube / EDTA tube	1.0 - 3.0 ml	IMR Virology form	Virology unit, IMR	7 days	1) Acute Gastrointestinal Syndrome Acute Jaundice Syndrome 2) Case by consultation. Please consult virologist IMR upon request, 03-33628960/03-33628114
78	Herpes simplex virus (HSV 1&2) serology	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSAJB	5 working days	
79	Herpes simplex virus PCR	Blood CSF Vesicle for STI	3 EDTA tubes Bijou bottle Vesicle in VTM	3.0 ml 1.0 ml	PER-PAT 301	Virology unit, HKL	7 days	
80	Herpes Virus Isolation (herpes Simplex 1& 2)	i) Nasopharyngeal swab. ii) Throat swab. iii) Tissues: Brain, Heart, Lungs. iv) Rectal swab. v) Aspirates: Tracheal aspirate (TA), Endotracheal	i) CSF/ Vesicular fluid/ TA/ ETA/ BW/ BAL/ Pericardial fluid: Sterile leakproof container. ii) Corneal/ Conjunctival/	i) CSF/ BW/ BAL/ Pericardial fluid: 1-3ml. ii) Corneal/ Conjunctival/ Lesion scrapings: transfer to 2-3 mlVTM.	IMR Virology form	Virology unit, IMR	14-28 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
		aspirate (ETA), Pericardial aspirate. vi) Vesicular swab/scraping. vii) Eye swab, lacrimal tears. viii) Cerebrospinal fluid (CSF). ix) Bronchoalveolar lavage (BAL). x) Bronchial washing (BW). **N.B. Consultation is required for the testing of tissue specimens other than brain, heart, and lungs.	Lesion scrapings: Sterile leakproof vial. iii) Swab specimens: Sterile leakproof vial containing 2-3 ml of VTM. iv) Lacrimal tears: Sterile leakproof container. v) Tissue biopsy/ autopsy: Sterile leakproof container containing VTM or sterile normal saline to keep tissue moist.	iii) Swab specimens: Sterile plastic-shafted polyester swab in VTM iv) Lacrimal tears: 10-20 ul. v) Vesicular fluid: in 1-2 ml VTM vi) TA/ ETA: 1-3 ml of aspirate. vii) Tissue biopsy/ autopsy: About 1.5 cm cubes of various parts of affected organs				
81	HIV confirmation for neonate (0-18 months)	Blood	3 EDTA tubes	2.5 ml	Borang Ujian Polymerase Chain Reaction	Virology unit, IMR	1-5 working days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
					(PCR) Untuk Human Immunodeficiency Virus (HIV) Di Kalangan Bayi			
82	HIV Drug Resistance Test	Blood	3 EDTA tubes	5.0 ml	HIV Genotyping Resistance Typing Form	Virology unit, IMR	40 working days	
83	HIV RNA Viral Load/ PCR	Blood	3 EDTA tubes	5.0 ml	PER-PAT 301	HSAJB	2-4 weeks	
84	HIV-1 confirmatory PCR	Blood	3 EDTA tubes	3.0 ml each	PER-PAT 301	HSAJB	2-4 weeks	
85	HLA Antibody Test (PRA/DSA)	Blood	Plain tube	6.0 ml	(HLA Antibody request form(PRA/ DSA) IMR/AIRC/TI/RF-4	Transplantation immunology unit, IMR	20 days	1) Test by appointment only. Please call HLA unit IMR at 03-33628382/8383 for appointment 2) To inform Serology Lab HPSF (Ext 354/357) once get appointment and to inform lab on the day of sending specimen.

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
86	HLA Crossmatch (Complement Dependent Cytotoxicity) or (Flow Cytometry)	Fresh blood in room temperature (without ice)	Donor: whole blood in sodium heparin tube; Patient: whole blood in plain tube	sodium heparin tube: 18.0 ml; Plain tube: 6.0ml	HLA Crossmatch Test Request Form (Living Donor); HLA Crossmatch Test Request Form (Deceased Donor Donor)	Transplantation immunology unit, IMR	10 days	1) Test by appointment only. Please call HLA unit IMR at 03-33628382/8383 for appointment 2) To inform Serology Lab HPSF (Ext 354/357) once get appointment and to inform lab on the day of sending specimen.
87	HLA Typing for Disease Association per loci	Blood	2 EDTA	6.0 ml	(HLA Typing test request form(Disease association), IMR/AIRC/TI/RF-3	Transplantation immunology unit, IMR	10 days	1) Test by appointment only. Please call HLA unit IMR at 03-33628382/8383 for appointment 2) To inform Serology Lab HPSF (Ext 354/357) once get appointment and to inform lab on the day of sending spesimen.

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
88	HLA Typing 1) Class I (Loci A, B and C) - Low/medium resolution (SSO/SSPPCR) 2) Class I and II (Loci A, B and DR) - HSCT:New case/Add donor for existing case 3) Class I and II (Loci A, B, C, DR and DQ) -High Resolution:HSCT:Confirmatory Typing (CT)/Cord blood / MSCR search 4) Class I and II (Loci A, B, C, DR and DQ):Solid Organ :New Case/Add donor for existing case;HSCT: Confirmation (Low Resolution) 5) Class II(Loci DR,DQ) - Low/medium resolution (SSO/SSPPCR)	Fresh blood in room temperature (without ice)	EDTA tube	6.0 ml	HLA Typing Test Request Form; HLA Typing Test Request Form (Disease Association)	Transplantation immunology unit, IMR	10 days	1) Test by appointment only. Please call HLA unit IMR at 03-33628382/8383 for appointment 2) To inform Serology Lab HPSF (Ext 354/357) once get appointment and to inform lab on the day of sending spesimen.
89	Human Papilomavirus (HPV) DNA PCR	Cervix	Flexible flocked swab	NA	PER-PAT 301	Institut Kanser Negara	14 days	Test indication: To detect HPV genotypes associated with cervical dysplasia and malignancy in

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
								clinically indicated cases: 1) Abnormal Pap smear or LBC results (eg; Atypical; Squamous Cells of Undetermined Significance (ASCUS), Low-Grade Squamous Intraepithelial Lesion (LSIL) 2) Follow up post treatment for CIN2/3 or cervical cancer 3) Investigation of cervical lesions on clinical examination.
90	Human T-cell lymphotropic virus (HTLV I & II Antibody) (ELISA)	Blood	Plain gel tube	2.0 ml	PER-PAT 301	Hospital Kuala Lumpur (HKL)	7 days	
91	Hydatid disease/Echinococcosis Serology	Blood	Plain gel tube/ EDTA (Sample in ice)	2.0 ml	PER-PAT 301	Parasitology unit, IMR	5 days	
92	Immunoglobulin G subclasses (IgG1, IgG2, IgG3, IgG4)	Blood	Plain gel tube	2.0 - 3.0 ml	PID request form latest version 6.0	PID unit, IMR	21 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
93	Influenza A & B/H1N1 detection (PCR)	Nasal swab, Throat swab	VTM	NA	PER-PAT 301	HSAJB	1-3 working days	
94	Interferon Gamma Release Assay (IGRA)	Blood	Special tubes	0.8-1.2ml per tube	TBIS 20A	MKAJB		To get referral through Klinik Sejahtera HPSF for healthcare worker For patient, to request through microbiologist for the collection of IGRA tubes
95	Japanese encephalitis Virus (JEV) Serology	Blood	Plain gel tube	5.0 ml	MKAK-BPU-U01/Rev2018	MKAK Sungai Buloh	5 working days	
96	Japanese Encephalitis, JE RT-qPCR	Blood CSF	Plain gel tube / 3 EDTA tubes Bijou bottle	5.0 ml 1.0 ml	Virology test request form	Virology unit, IMR	10 days	
97	JC Virus (Human polyomavirus 2) PCR	CSF	Bijou bottle	1.0 ml	PER-PAT 301	Hospital Sungai Buloh	2-5 days	
98	Legionella pneumophila Antigen	Urine	Sterile container	5.0 ml	PER-PAT 301	HSAJB	1-3 working days	
99	Leishmaniasis Microscopy	Blood	EDTA tube	2.5 ml	PER-PAT 301	Parasitology unit, IMR	3 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
100	Leishmaniasis PCR	Blood skin scrapping/ tissue	EDTA tube Sterile container	2.5 ml	PER-PAT 301	Parasitology unit, IMR	7 days	Send sample in ice
101	Leishmaniasis Serology	Blood	Plain gel tube	5.0 ml	PER-PAT 301	Parasitology unit, IMR	5 days	
102	Leptospira Culture	Blood	EDTA/ Heparin tubes	5.0 ml	Leptospirosis Laboratory Request Form (IMR/IDRC/ BACT/LEPTO/01)	Bacteriology unit, IMR	21 days	Send whole blood at room temperature. DO NOT FREEZE OR CHILL THE SAMPLE. Sampling should be done during acute febrile stage before antibiotic treatment.
103	Leptospiral MAT	Blood	Plain gel tube	5.0 ml	MKAJB LEPTOSPIROSIS REQUEST FORM (D/WS/01-016)	MKAJB	21 days	
104	Leptospiral PCR	Blood in EDTA, Sterile body fluids, CSF, bronchial lavage, Tissue biopsies/post mortem samples. Urine*	Blood in EDTA; other samples in sterile container	2.0 ml	Leptospirosis Laboratory Request Form	Bacteriology unit, IMR	5 days	1) For better sensitivity, blood samplings should be taken during acute febrile stage prior to antibiotic treatment. 2) *Test for urine sample is by consultation

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
								ONLY(Please call IMR at 03-33628960)
105	Malaria PCR	Tissue sample	Sterile container	NA	PER-PAT 301	Parasitology unit, IMR	7 days	
106	Malaria PCR	Blood	EDTA tube	2.5 ml	PER-PAT 301	MKA JB	7	
107	MDR detection by Line probe assay (LPA)	Sputum, pleural fluid, bronchial aspirate	Sterile container	3-5 ml	Borang Permohonan Ujian Tibi TBIS 20C	MKAK Sungai Buloh	7 working days	For TB smear positive case only
108	Measles PCR and/or Rubella PCR	Urine, Nasopharyngeal aspirate, throat swab	Urine: Sterile container NPA: Sterile container; Throat swab: VTM	Urine: 10 ml; NPA: 1 ml	Measles &Rubella/Congenital rubellasyndrome (CRS)-Borangpermohonan ujian makmal (MSLF: 02/Rev2024)	MKA JB	7 working days	1) Specimen should be collected within 5 days from onset of illness. 2) Respiratory secretion should be taken 1-7 days of rash onset. 3) A brief concise hisory of illness and physical findings is required especially the date of onset of illness and the date of specimen collection.
109	Measles Serology IgG	Blood	Plain gel tube	5.0 ml	PER-PAT 301	Hospital Sungai Buloh	2-3 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
110	Measles Serology IgM	Blood	Plain gel tube	5.0 ml	Measles &Rubella/Congenital rubella syndrome (CRS)- Borang permohonan ujian makmal (MSLF: 02/Rev2024)	MKAJB	5 working days	
111	Melioidosis Serology (Detection of Burkholderia pseudomallei IgM)	Blood	Plain gel tube	5.0 ml	IMR Bacteriology Request Form	Bacteriology unit, IMR	5 days	
112	Meningoencephalitis Multiplex PCR Panel (QIASTAT) Virus: Enterovirus, HSV1, HSV 2, Human parechovirus, Human Herpes virus 6, Varicella zoster virus) Bacteria: Streptococcus pnemonia, Neisseria meningitidis, Streptococcus	CSF	Bijou bottle	1 ml	PER-PAT 301	Unit Mikrobiologi HSA JB	24-48 hours	To request to Clinical Microbiologist and to Inform lab first

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
	agalactiae, Listeria monocytogenes, Haemophilus influenza, E.coli K1, Streptococcus pyogenes, Mycoplasma pneumoniae. Yeast: Cryptococcus neoformans/ gatii)							
113	MERS-COV PCR	Sputum, ETT aspirate, BAL, Combined Nasopharyngeal &Oropharyngeal swab	Sterile container Dacron Swab in VTM	2.0 - 5.0 ml NA	PER-PAT 301	HSAJB	1-2 working days	Please consult on-call patologist upon request
114	MERS-COV PCR	Organ biopsy	Sterile containers containing VTM or sterile normal saline to keep tissue moist	About 1.5 cm cubes from various parts of affected organs.	IMR Virology request form	Virology unit, IMR	1- 10 days	By Consultation only. Please call 03-33628960/ 03-33628114
115	Monkey pox PCR	i)Lesion Fluid Aspirate ii) Lesion Fluid Swab iii)Lesion Roof iv)Scab/Crust v) Tonsillar Tissue Swab	Sterile container, Dacron swab	1.5- 2.0ml	MKA form	MKA JB	1 - 5 days	To request to Clinical Microbiologist and to Inform lab first

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
		vi)Nasopharngeal Swab						
116	Mumps Virus Serology (IgG, IgM)	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSAJB	5 working days	
117	Mycobacterium leprae PCR	Skin incision/ punch biopsy	Sterile container	Minimum 4 mm x 12 mm skin incision or minimum 5 mm punch biopsy	Borang permohonan ujian kusta LIS102C (MKAK)	MKAK Sungai Buloh	7 days	
118	Mycobacterium leprae viability & Drug sensitivity test	Slit skin smear	Sterile container	NA	Mycobacterium leprae Viability & Drug Sensitivity Test Request Form	MKAK Sungai Buloh	31 days	
119	Mycobacterium other than Tuberculosis (MOTT)	Sputum, pus, tissue, stool, FFPE block, urine, CSF, other body fluid.	Sterile container	For CSF and other body fluid 1-2mls	TB/MOTT Request Form (IMR/IDRC/ BACT/TB/01)	Bacteriology unit, IMR	10 days	
120	Myositis antibody panel (autoimmune inflammatory myopathies panel)	Blood	Plain gel tube	Adult 5.0 ml paeds: 1.5-2.0 ml	PER-PAT 301	Hospital Selayang	40 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
	(Mi-2α, Mi-2β, TIF1Ɣ, MDA5, NXP2, SAE, Ku, PM-Scl100, PMScl75, Jo-1, SRP, PL-12, EJ, OJ and Ro-52)							
121	Nipah Virus Antibody	Blood CSF	Plain gel tube/ EDTA Bijou bottle	5.0 ml 1.0 ml	Virology test request form	Virology unit, IMR	1-10 days	
122	Paraneoplastic Neurological Syndrome (PNS) Panel: Anti-Amphiphysin, Anti-Ma, Anti-Yo, Anti-Ri, Anti-Hu, Anti-CV2	Blood CSF	Plain gel tube Bijou bottle	5.0 ml	Autoimmune request form	Autoimmune unit, IMR	14 days	
123	Parvovirus B19 PCR	Bone marrow aspirate Blood CSF	Sterile container Plain tube Bijou bottle	1.0-3.0 ml	MKAK-BPU-U01/Rev2018	MKAK Sungai Buloh	7 days	
124	Parvovirus IgG/IgM serology	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSAJB	5 working days	
125	Phospholipase A2 Receptor antibody (PLA2R)	Blood	Plain gel tube	5.0 ml	Autoimmune request form	Autoimmune unit, IMR	21 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
126	PID SCREENING: Dihydrorhodamine test (DHR)	Fresh blood in room temperature (without ice)	Lithium heparin tube	2 mL of fresh blood each from patient and unrelated healthy person	Primary Immunodeficiency (PID) Request Form	PID unit, IMR	10 days	1) By appointment only. Please call 03-33628386 for appointment. 2) To inform Serology Lab HPSF (Ext 354/357) once get appointment and to inform lab on the day of sending specimen.
127	PID SCREENING: Lymphocyte Proliferation Assay/Lymphocyte Transformation Test/ Lymphocyte activation test (LAT)	Fresh blood in room temperature (without ice)	EDTA	5 mL of fresh blood each from patient and unrelated healthy control	Primary Immunodeficiency (PID) Request Form	PID unit, IMR	10 days	1) By appointment only. Please call 03-33628386 for appointment. 2) To inform Serology Lab HPSF (Ext 354/357) once get appointment and to inform lab on the day of sending specimen.
128	PID SCREENING: Lymphocyte subset enumeration (TBNK)	Fresh blood in room temperature (without ice)	EDTA tube	2.0 ml	Primary Immunodefi-ciency (PID) Request Form	PID unit, IMR	5 days	1) By appointment only. Please call 03-33628386 for appointment. 2) To inform Serology Lab HPSF (Ext 354/357) once get appointment.

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
129	Pneumocystis jirovecii Genome Detection (PCR)	Induced Sputum; BAL	Sterile container	5.0 ml	PER-PAT 301	Hospital Sungai Buloh	2-5 working days	
130	Pneumocystis *jirovecii* pneumonia (PCP) Immunofluorescent Test	Induced Sputum; BAL, bronchial wash	Sterile container	2.0-5.0 ml	PER-PAT 301	HSAJB	5 working days	
131	Respiratory virus isolation and identification (Influenza A and B, Adenovirus, Respiratory Syncytial virus, Para influenza virus 1,2,3 and Human metapneumovirus	i) Nasal aspirate/ wash. (NA/NW) ii)Nasopharyngeal aspirate/ wash. (NPA/NPW) iii) NPS iv) Throat/ Tonsillar/ Oropharyngeal swab. v) Sputum. vi) Tracheal aspirate. (TA) vii) Endotracheal aspirate. (ETA) viii) Bronchial wash. (BW) ix) BAL x) Tracheal/ Bronchial/ Lower airway/ Lung swab. xi) Tracheal/	i) NA/ NW/ NPA/ NPW/ Sputum/ TA/ ETA/ BW/ BAL/ Pleural fluid: Sterile leakproof container. ii) Swab specimens: Sterile leakproof vial containing 2-3 ml of VTM. iii) Tissue biopsy/ autopsy: Sterile leakproof container containing VTM or sterile normal saline	i) NA/ NW/ NPA/ NPW/ TA/ ETA: 1-3ml of aspirate or wash. ii) Sputum/ BW/ BAL/ Pleural Fluid: 1-3ml. iii) Swab specimens: Sterile plastic shafted polyester swab in VTM. iv) Tissue biopsy/ autopsy: About 1.5 cm cubes from various parts	IMR Virology form	Virology unit, IMR	14-28 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
		Bronchial/ Lung tissue. xii) Pleural fluid. **Only respiratory specimens are accepted.	to keep tissue moist.	of affected organs.				
132	Rickettsia (Scrub Typhus) serology	Blood	Plain gel tube	5.0 ml	PER-PAT 301	Hospital Sultan Ismail (HSIJB)	5 working days	
133	Rickettsia PCR (Scrub typhus / murine typhus / tick typhus)	Blood Tissue (eschar biopsy) Eschar swab	Blood in EDTA; Tissue (eschar) in sterile container Eschar swab dacron swab in VTM	5.0 ml	Rickettsia Request Form (IMR/IDRC/ BACT/RICK/ 02)	Bacteriology unit, IMR	5 days	
134	Rubella IgG/IgM serology	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSAJB	3 working days	
135	SARS-CoV-2 RTqPCR	CSF Pleural fluid Lung/heart/brain tissue	Bijou bottle Sterile container Tissue: sterile leakproof vial containing 2-3 ml of VTM	CSF: 1 ml Pleural fluid: 1- 3 ml	Imr virology test request form	Virology unit, IMR	1 - 10 days	
136	Schistosomiasis Serology	Blood	Plain gel tube / EDTA tube	5.0 ml	PER-PAT 301	Parasitology unit, IMR	5 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
137	Sexually-Transamitted Disease (STD) Panel Real Time PCR (Chlamydia trachomatis, Neisseria gonorrhoea, Mycoplasma genitalium, Ureaplasma urealyticum, Ureaplasma parvum, Mycoplasma hominis).	First catch Urine	Sterile container	>20ml	PER-PAT 301	HSAJB	7 -14 working days	Need to request to Dermatology specialist (gate keeper) Prior to urine sampling, patients should not urinate for at least 1 hour and should not clean the genital area.
138	Skin Antibodies Panel: Anti-BP 180, Anti-BP-230, Anti-Desmoglein 1 & Anti-Desmoglein 3	Blood	Plain gel tube	5.0 ml	Autoimmune request form	Autoimmune unit, IMR	14 days	
139	Soluble CD25 (sCD25)	Blood	Plain gel tube	2.0 - 3.0 ml	PID request form latest version 6.0	PID Unit, IMR	21 working days	By appointment only. Please call 03-3362 8386/ 03-3362 7412/ 03-3362 7406/ 03-3362 7746/03-3362 7747//03-3362 8815
140	Specific Liver Antibodies (SLA) Panel: Anti-AMA-M2, M2 3E/BPO, Sp100, PML, gp210, LKM1, LC-1, SLA/LP, Ro-52	Blood	Plain gel tube	5.0 ml	Autoimmune request form	Autoimmune unit, IMR	14 days	Compulsory to have Tissue antibodies result prior to send for this test (To attach result with request form)
141	Taeniasis/Cysticercosis Serology	Blood	Plain gel tube	5.0 ml	PER-PAT 301	Parasitology unit, IMR	5 days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
142	TB identification & Antibiotic Susceptibility Test	Sputum,Sterile fluid, Tissue, Pus, Blood BAL	Sterile container	3.0 ml	Borang Permohonan Ujian Tibi TBIS 20C	MKAK Sungai Buloh	31 days	
143	TB liquid (Bactec) culture	Sputum/body fluid/tissue/pus	Sterile container	5.0 ml	PER-PAT 301	HSAJB	Liquid media culture MGIT Myco F Lytic- 42days, Solid media(LJ) - 8 weeks	
144	TB PCR	Sputum, bronchial wash, body fluids, Blood	Sterile container Plain tube	at least 5.0 ml 5.0 ml	Borang Permohonan Ujian Tibi TBIS 20C	MKAK Sungai Buloh	7 working days	
145	TB targeted NGS for drug susceptibility test	Culture Sputum (AFB positive or GeneXpert positive : high/moderate)	Sterile container		TB NGS Laboratory request form	IMR Bacteriology unit	4 weeks	Kes TB yang tidak responsif terhadap rawatan selama 3 bulan. Kes perlu dirujuk kepada Pakar perunding respiratori IMR (03-40232966 ext 107/ 013-3401564)

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
146	Tissue Antibodies (TA) Panel: Anti-Gastric Parietal Cell Antibody (APC), Anti-Mitochondrial Antibodies (AMA), Anti-Smooth Muscle (ASMA), Anti Liver Kidney Microsomal (LKM)	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSAJB	10-14 working days	
147	TORCHES SCREENING (toxoplasma, rubella, cytomegalovirus, HSV)	Blood	Plain gel tube	5.0 ml	TORCHES Programme Form	HSAJB	5 working days	
148	Toxocariasis Serology	Blood	Plain gel tube	5.0 ml	PER-PAT 301	Parasitology unit, IMR	5 days	
149	Toxoplasma serology	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSAJB	1-3 working days	
150	Trichinellosis Serology	Blood	Plain gel tube / EDTA tube	5.0 ml	PER-PAT 301	Parasitology unit, IMR	5 days	
151	Trypanosomiasis Microscopy	Blood	EDTA tube	2.5 ml	PER-PAT 301	Parasitology unit, IMR	3 days	
152	Tryptase test	Blood	Plain gel tube	5.0 ml	IMR Allergy request form	Allergy unit, IMR	14 days	
153	Varicella zoster (VZV) PCR	Blood, CSF Vesicle for STI	Blood: 3 EDTA tube, CSF: Bijou bottle Dacron swab	Blood: 5 ml; CSF: 1ml	PER-PAT 301	Virology unit, HKL	7 working days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERRAL LAB	LTAT REFERRAL LAB	REMARKS
155	Varicella Zoster Virus (VZV) IgG/IgM serology	Blood	Plain gel tube	5.0 ml	PER-PAT 301	HSAJB	5 working days	
155	ZIKA Virus PCR	Blood Urine	Plain gel tube Sterile container	3.0 -5.0 ml 5.0- 10 ml	PER-PAT 301	HSAJB	1-3 working days	Blood sample MUST sent together with urine sample.

HPSF 2025

HEMATOLOGY
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HEMATOLOGY

INTRODUCTION

Haematology Laboratory HPSF Muar provides routine and specialized hematological test for in-patients and out-patients in HPSF Muar. The laboratory also receives hematology samples from others government hospital and health clinics in Muar and Tangkak.

LIST OF SERVICES

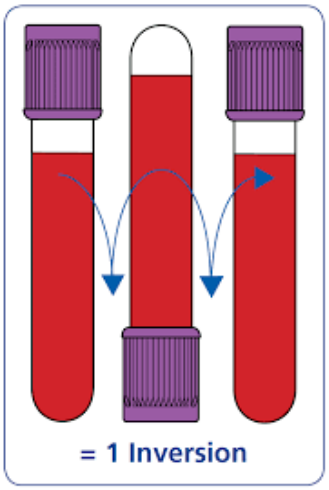
The hematology laboratory services are divided into four sections as in the table below:

No.	Section	Test involved
1	Full blood count	FBC, Reticulocytes, Smear review
2	Hemostasis	Prothrombin, Activated Partial Prothrombin Time, Fibrinogen, D-dimer, Mixing test
3	PBF/BMA	Full blood picture (FBP), Bone marrow aspirate, Kleihauer test, Peritoneal fluid for manual white blood cells differential count
4	Manual	G6PD screening (Fluorescent Spot Test), ESR

FBC, Reticulocytes, FBP, Prothrombin time, Activated Partial Prothrombin Time, Fibrinogen and D dimer can be requested as urgent test or routine. While other tests are analysed by batches or by appointment only.

SPECIAL INSTRUCTION ON SPECIMEN COLLECTION

1. Full blood count, Reticulocytes, Full blood picture, Kleihauer test
   - Please gently mix blood sample **8 to 10 inversion** (Refer to figure below) to ensure adequate mixture between blood sample and anticoagulant in order to prevent blood clot.



2. Full blood picture, Prothrombin Time, Activated Partial Prothrombin Time, Fibrinogen, D dimer, mixing test
   - Sample must arrive to Haematology laboratory **within 4 hours from time sample collection**.
   - This is to prevent morphology changes on peripheral blood film and falsely prolonged coagulation profile.

3. Coagulation Profile – Sample Collection Guidelines
   i. Specimen Tube
      - Blood must be collected into a citrate-based anticoagulant tube (3.2% sodium citrate).
      - *Sodium citrate* preserves the plasma sample by inhibiting protease activity and minimizing platelet activation.

   ii. Order of Draw
      - Collect the coagulation sample before drawing other test samples to avoid cross contamination. Please refer to Table 1.2
      - Blood must not be transferred from one tube to another, even between identical citrate tubes.
      - This can lead to excess anticoagulant and plasma dilution, compromising test accuracy.
      - Note: Contamination with EDTA can falsely prolong PT and APTT.

   iii. **Tube Filling Requirements**:
      - The tube must be filled precisely to the indicated mark.
      - The required blood-to-anticoagulant ratio is 9:1.
      - Under-filling may cause significant sample dilution and falsely prolonged clotting times

   iv. **Mixing of Sample**:
      - Gently invert the tube to ensure proper mixing (3 to 4 end-over-end tube inversions)- this prevents clot formation and inaccurate (falsely prolonged) results.
      - Avoid vigorous shaking, which may cause in-vitro hemolysis, spurious clotting activation and falsely shortened clotting times.

   v. **Needle Selection**:
      - Avoid needles that are too small (risk of hemolysis) or too large (risk of sample activation or clotting).

   vi. **Line Collections** (Arterial/Venous):
      - If using a line, flush thoroughly and discard the first 5mls (or 6× dead space volume) before drawing the sample.
      - Note: Heparin contamination prolonged clotting times (especially APTT) and reduced fibrinogen level.
      - Best practice: Use direct venipuncture to avoid contamination by saline or heparin.

   vii. Special Hematocrit Considerations:
      - For patients with hematocrit >55%, contact the hematology laboratory prior to collection.
      - Adjustment of the anticoagulant volume may be required to maintain the correct plasma-to-anticoagulant ratio.

   viii. Transport & Stability:
      - Samples should be sent to the laboratory as soon as possible - test should be completed within 4hours of collection

- Maintain at room temperature (avoid refrigeration or high temperatures during transport).

4. Technical consideration in Bone Marrow Aspirate and Trephine biopsy:

   i. The posterior superior iliac crest is the most employed site for reasons of safety, decreased risk of pain, and accessibility. Bilateral side is preferred for staging, case suspecting of Hodgkin lymphoma, sarcoma etc.
   ii. Dry tap (i.e., failure to obtain a specimen during the aspiration sampling process) is most commonly due to technical problems such as misalignment of the needle; other conditions that should be considered and may contribute to the decision of obtaining a biopsy are recent radiation therapy exposure, aplastic anaemia, myelofibrosis, and bone-infiltrating neoplasm.
   iii. The desired biopsy sampling size should initially be greater than 1.5 cm, **preferably 2-3 cm in length** (paediatric samples may be as small as 0.5 cm); such a size will allow evaluation of five or six intertrabecular spaces, which is considered sufficient sampling for a diagnosis
   iv. For bone marrow aspirate, the depth of the penetration should not extend beyond an initial 1 cm. A 20-ml syringe is used, and approximately 0.3 ml of bone marrow is aspirated. Aspirating more than 0.3 ml risks diluting the sample with peripheral blood and thus is not recommended (Refer to figure below).
   v. If additional marrow is needed for ancillary studies, subsequent specimens are obtained by attaching a separate syringe and collecting 5 ml at a time for immunophenotyping, cytogenetic or molecular tests.

FACTOR THAT MAY INFLUENCE THE HAEMATOLOGY TESTING

No.	Factors influence	Test to be Affected
1.	Prolonged tourniquet effect (>1 minute)	Prolonged tourniquet application may increase risk of clot formation, which is unsuitable for most haematological testing. It may lead to activation of platelet which may cause falsely reduced Platelet count and activation of coagulation factors which may lead to a falsely prolonged PT & APTT and inaccurate Fibrinogen and D-Dimer.
2.	Drugs	i. FBC: NSAID may cause interference in platelet function which eventually to a lower Platelet Count and some antibiotics, chemotherapy drugs and immunosuppressive drugs may cause a lower WBC count. ii. Coagulation Test: a) Lipoglycopeptide antibacterial drugs such as Oritavancin and Telavancin may interfere with PT, APTT and D-Dimer. b) Estrogen therapy in males and Oral Contraceptives administration in female may cause decrease in APTT c) Diphenylhydantoin, heparin, warfarin, naloxone, therapeutic doses of hirudin or other direct thrombin inhibitor (DTI) and radiographic agent administration may cause a prolonged APTT d) Dextran 40 above 1,800 mg/dL may affect the D-Dimer assay e) DTI may affect the fibrinogen assay.
3.	Delay in specimen transport to the laboratory	Delays in specimen transport to the laboratory may cause storage changes to the blood cell which may produce an inaccurate RBC indices parameter in FBC. It may also cause degradation of coagulation factors which may cause inaccurate Fibrinogen, D-Dimer and prolonged PT and APTT.
4.	Hemolysis	Haemolysis may lead to falsely low HGB, falsely low HCT, inaccurate RBC indices (MCV, MCH, MCHC), falsely high PLT, falsely increase Reticulocyte count, inaccurate D-Dimer and falsely prolonged PT, APTT, Fibrinogen.
5.	Lipaemic	Lipaemia will lead to the falsely low MCV, falsely high MCHC, inaccurate D-Dimer, inaccurate Fibrinogen and falsely prolonged PT, APTT.
6.	Icteric	Icterus sample may cause a falsely low MCV, falsely high MCHC, inaccurate D-Dimer, inaccurate Fibrinogen and falsely prolonged PT, INR, APTT.
7.	Contamination	Dilution effect - Collecting below or above IV line can lead to contamination or dilution of the specimen with IV fluid. Dilution may cause most FBC results to be falsely reduced in count and coagulation tests to be prolonged and inaccurate Wrong tube / order of draw - Avoid decanting blood from one tube to another. Lithium Heparin contamination will cause the WBC to be clumping and false thrombocytopenia in FBC test and falsely prolonged APTT for APTT test.

TRANSPORTATION:

i. All specimen containers for each patient should be put in one biohazard plastic bag.
ii. For **outsource test**, the biohazard bag should be stapled together with the accompanied request form.

REFERENCE RANGE

i. Full Blood count (Adult):

Parameter	Reference Range (Male)	Reference Range (Female)
TRBC (10^6/µL)	4.50 – 5.50	3.80 – 4.80
HGB (g/dL)	13.0 – 17.0	12.0 – 15.0
PCV (%)	40.0 – 50.0	36.0 – 46.0
MCV (fL)	83.0 – 101.0	
MCH (pg)	27.0 – 32.0	
MCHC (g/dL)	31.5 – 34.5	
RDW-SD	39.0 – 46.0	
RDW-CV (%)	11.6 – 14.0	
Platelet Count (10^3/µL)	150 – 410	
MPV (fL)	8.9 – 11.9	
TWBC (10^3/µL)	4.00 – 10.00	
Neutrophil %	40.0 – 80.0	
Immature Granulocytes %	0.10 – 0.60	
Eosinophil %	1.0 – 6.0	
Basophil %	<2.0	
Lymphocyte %	20.0 – 40.0	
Monocyte %	2.0 – 10.0	
Neutrophil # (10^3/µL)	2.00 – 7.00	
Immature Granulocytes (10^9/µL)	0.00 – 0.04	
Eosinophil # (10^3/µL)	0.02 – 0.50	
Basophil # (10^3/µL)	0.02 – 0.10	
Lymphocyte# (10^3/µL)	1.00 – 3.00	
Monocyte # (10^3/µL)	0.20 – 1.00	
Immature platelet fraction (IPF) %	1.0 – 7.3	

ii. Reticulocyte (Adult):

Parameter	Reference Range
Reticulocyte %	0.50 – 2.50
Reticulocyte #	0.050 – 0.100

iii. Full blood count (Paediatric):

Parameter	Reference Range									
	1 Day	**3 Day**	**7 Day**	**14 Day**	**1 Month**	**3 Month**	**6 Month**	**2 Years**	**6 Years**	**12 Years**
TRBC (10^6/µL)	4.00 – 6.00	4.00 – 6.60	3.90 – 6.30	3.60 – 6.20	3.00 – 5.40	3.10 – 4.30	4.10 – 5.30	3.90 – 5.10	4.00 – 5.20	4.00 – 5.20
HGB (g/dL)	14.0 – 22.0	15.0 – 21.0	17.1 – 17.9	16.1 – 16.9	11.5 – 16.5	9.4 – 13.0	11.1 – 14.1	11.1 – 14.1	11.0 – 14.0	11.5 – 15.5
PCV (%)	45.0 – 75.0	45.0 – 67.0	42.0 – 66.0	31.0 – 71.0	33.0 – 53.0	28.0 – 42.0	30.0 – 40.0	30.0 – 38.0	34.0 – 40.0	35.0 – 45.0
MCV (fL)	100.0 – 120.0	92.0 – 118.0	88.0 – 126.0	86.0 – 124.0	92.0 – 116.0	87.0 – 103.0	68.0 – 84.0	72.0 – 84.0	75.0 – 87.0	77.0 – 95.0
MCH (pg)	31.0 – 37.0	31.0 – 37.0	31.0 – 37.0	31.0 - 37.0	30.0 – 36.0	27.0 – 33.0	24.0 – 30.0	25.0 – 29.0	24.0 – 30.0	25.0 – 33.0
MCHC (g/dL)	30.0 – 36.0	29.0 – 37.0	28.0 – 38.0	28.0 – 38.0	29.0 – 37.0	28.5 – 35.5	30.0 – 36.0	32.0 – 36.0	31.0 – 37.0	31.0 – 37.0
RDW-SD	39.0 – 46.0									
RDW-CV (%)	11.6 – 14.0									
Platelet Count (10^3/µL)	100 – 450	210 – 500	160 – 500	170 – 500	200 – 500	210 – 650	200 – 550	200 – 550	200 – 490	170 – 450
MPV (fL)	8.9 – 11.9									
TWBC (10^3/µL)	10.00 – 26.00	7.00 – 23.00	6.00 – 22.00	6.00 – 22.00	5.00 – 19.00	5.00 – 15.00	6.00 – 18.00	6.00 – 17.00	5.00 – 15.00	5.00 – 13.00
Neutrophil %	40.0 – 80.0									
Eosinophil %	1.0 – 6.0									
Basophil %	<2.0									
Lymphocyte %	20.0 – 40.0									
Monocyte %	2.0 – 10.0									
Neutrophil # (10^3/µL)	4.00 – 14.00	3.00 – 5.00	3.00 – 6.00	3.00 – 7.00	3.00 – 9.00	1.00 – 5.00	1.00 – 6.00	1.00 – 7.00	1.50 – 8.00	2.00 – 8.00
Eosinophil # (10^3/µL)	0.10 – 1.00	0.10 – 2.00	0.10 – 0.80	0.10 – 0.90	0.20 – 1.00	0.10 – 1.00	0.10 – 1.00	0.10 – 1.00	0.10 – 1.00	0.10 – 1.00
Basophil # (10^3/µL)	0.02 – 0.10									
Lymphocyte# (10^3/µL)	3.00 – 8.00	2.00 – 8.00	3.00 – 9.00	3.00 – 9.00	3.00 – 16.00	4.00 – 10.00	4.00 – 12.00	3.50 – 11.00	6.00 – 9.00	1.00 – 5.00
Monocyte # (10^3/µL)	0.50 – 2.00	0.50 – 0.10	0.10 – 1.70	0.10 – 1.70	0.30 – 1.00	0.40 – 1.20	0.20 – 1.20	0.20 – 1.00	0.20 – 1.00	0.20 – 1.00

iv. Critical result for Full Blood Count (FBC) test that needs notification:

Parameter	Critical value			
	Adult		Pediatrics	
	Low limit	High limit	Low limit	High limit
Haemoglobin	< 6.0 g/dL	> 19.0 g/dL	< 8.0 g/dL	> 20.0 g/dL
Haematocrit	< 20%	> 60%	< 25%	> 40%
Platelet	< 20 X 10^3/uL	> 1000 X 10^3/uL	< 50 X 10^3/uL	> 1000 X 10^3/uL
TWBC	Not applicable		< 2.0 X 10^3/uL	> 50 X 10^3/uL

v. Reticulocytes (Paediatric):

Parameter	Reference Range									
	1 Day	3 Day	7 Day	14 Day	1 Month	3 Month	6 Month	2 Years	6 Years	12 Years
RET %	0.50 – 2.50									
RET #	0.120 – 0.400	0.050 – 0.350	0.050 – 0.100	0.050 – 0.100	0.020 – 0.050	0.030 – 0.050	0.040 – 0.010	0.030 – 0.100	0.030 – 0.100	0.030 – 0.100

***Newborn **can be presented** with higher reticulocytes % up to 7% (term baby) and 11% (preterm baby)*

vi. Other test reference ranges:

Test	Reference ranges
Prothrombin Time	9.2-11.6 seconds
Activated Partial Thrombin Time	24.1-34.4 seconds
Fibrinogen	1.8 – 3.5g/L
D Dimer	<0.5 µg/ml
ESR	General reference range: 4-20 mm/hr Male reference range: 4-14 mm/hr Female reference range: 6-20 mm/hr
G6PD screening	-
Full blood picture	-
Bone marrow aspirate	-
Kleihauer test	-
Mixing Test	-

7) REFERENCES:

a) Dacie and Lewis Practical Haematology: 12th Edition 2017
b) https://emedicine.medscape.com/article/207575
c) Manual Prosedur Teknikal Ujian Hematologi Rutin: MPT-HPSF-PAT-HM-1
d) Manual Prosedur Teknikal Ujian Hematologi Khas: MPT-HPSF-PAT-HM-2
e) Pre-analytical Variables in Coagulation Testing Associated with Diagnostic Errors in Hemostasis, Emmanuel et al, 2012
f) Instruction for Use (IFU): Dade Innovin, Dade Actin FS, Dade Thrombin, Innovance D-Dimer
g) Sysmex XN Interpretation guide

LIST OF HEMATOLOGY IN-HOUSE TESTS

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
1	Activated Partial Prothrombin Time (APTT)	Plasma	Sodium Citrate	1.8 ml - 2.7 ml according to brand of tube (Collect until indicated mark)	PER-PAT 301	Routine: 4 hours Stat :1 hour	Sample must be sent within 4 hours prior to sample collection
2	Bone Marrow Aspiration (BMA)	Marrow	Bone marrow direct smeared onto slide	10 slides	PER-PAT 301	Routine: 7 days Urgent: 3 days	-Consultation and grant from Hematopathologist required. -Once approved, kindly inform Haematology lab -Specialist signature on the request forms is required.
3	Coagulation Profile [Prothrombin Time (PT), Activated Partial Prothrombin Time (APTT) and International Normalised Ratio (INR)]	Plasma	Sodium Citrate	1.8 ml - 2.7 ml according to brand of tube (Collect until indicated mark)	PER-PAT 301	Routine: 4 hours Stat: 1 hour	Sample must be sent within 4 hours prior to sample collection
4	D-Dimer (Quantitative)	Plasma	Sodium Citrate	1.8 ml - 2.7 ml according to brand of tube (Collect until indicated mark)	PER-PAT 301	Routine: 4 hours Stat: 1 hour	-Sample must be send within 2 hours prior to sample collection -Grant from Pathologist general on call is required

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
5	Erythrocyte Sedimentation Rate (ESR)	Blood	EDTA	2 ml – 3 ml	PER-PAT 301	24 hours	-Any request should be sent separately from other test (Sample must be accompanied with a request form) -Sample must be send within 4 hours prior to sample collection
6	Fibrinogen	Plasma	Sodium Citrate	1.8 ml - 2.7 ml according to brand of tube (Collect until indicated mark)	PER-PAT 301	Routine: 4 hours	-Sample must be send within 2 hours prior to sample collection -Grant from Pathologist general on call is required
7	Full Blood Count (FBC)	Blood	EDTA	2 ml – 3 ml	PER-PAT 301	Routine: 4 hours Stat: 45 minutes	Sample must be sent within 4 hours prior to sample collection
8	Full Blood Picture (FBP)	Blood	EDTA	2 ml – 3 ml	PER-PAT 301	Routine: 7 days Urgent: 24 Hours	-Sample must be send within 4 hours after sample collection -Request form must provide relevant clinical history, date and time of sample collection -Urgent request needs grant from Medical Officer in charge of PBF/on call.
9	G6PD (Qualitative)	Blood spot	Blood spot on filter paper	NA	PER-PAT 301	6 hours	-Blood spot need to be properly dried before sent to lab
10	Kleihauer test	Blood	EDTA	2.0ml - 3.0ml	PER-PAT 301	24 hours	-Test only offered during office hour. -Grant from Hematopathologist is required.

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
							-Specimen must be collected from baby's mother. -Please arrange and provide cord blood sample (for positive control) as well.
11	Mixing Test	Plasma	Sodium Citrate	1.8ml - 2.7ml according to brand of tube (Collect until indicated mark) x (2 tubes)	PER-PAT 301	24 hours	- To call Hematopathologist for appointment -Sample must be send within 2 hours of sample collection -Test only offered during office hour.
12	Prothrombin Time (PT) and International Normalised Ratio (INR)	Plasma	Sodium Citrate	1.8ml - 2.7ml according to brand of tube (Collect until indicated mark)	PER-PAT 301	Routine: 4 hours Stat: 1 hour	Sample must be sent within 4 hours prior to sample collection
13	Reticulocyte Count	Blood	EDTA	2ml - 3ml	PER-PAT 301	Routine: 4 hours Stat: 1 hour	EDTA Paediatrics tube is available for paediatrics patient
* Any discrepancies or inquiry regarding sample requirement or test offered, please call Hematology Laboratory at ext. 298.							

LIST OF HEMATOLOGY SEND AWAY TESTS

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERENCE LAB	LTAT	REMARKS
1	Acute Myeloid Leukaemia Mutation Studies	Blood/Bone marrow	EDTA	2.5 - 5ml	Molecular Analysis for haemato-oncology request form (Version 3.0)	CaRC IMR, NIH	30 working days	Newly diagnosed Acute Myeloid Leukaemia case only
2	ADAMTS 13 study	Blood	Sodium Citrate	Collect until indicated mark x 3 tube	Hospital Ampang Special Hematology Lab Requisition Form.	Hospital Ampang	6 weeks	Deliver tubes immediately to the laboratory at room temperature.
3	Alagille Syndrome (JAG-1) -Deletion/Duplication	Blood	EDTA	2-5 ml	IMR/SDC/UMD/REQUEST FORM	IMR	5 months	By appointment / consultation only
4	Anti Xa	Blood	Sodium Citrate	Collect until indicated mark x 2 tube	Hospital Ampang Special Hematology Lab Requisition Form.	Hospital Ampang	2 weeks	-Requester to arrange appointment with MRKH, Hospital Ampang -Deliver tubes immediately to the laboratory at room temperature.

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERENCE LAB	LTAT	REMARKS
5	Array comparative genomic hybridization (CGH Microarray)	Blood	EDTA	6.0 ml	Borang Permohonan Ujian Molecular HTA/PAT/GEN /PK-01-02	Molecular genetic Lab Hospital Tunku Azizah	3-6 months	Granted by Hospital Tunku Azizah
6	BCR/ABL Qualitative (For suspected CML only)	Blood/Bone marrow (Before starting therapy)	EDTA	PB: min 10 ml B<: 1-2 ml	Hospital Ampang Special Hematology Lab Requisition form.	Hospital Ampang	4 weeks	Suspected Chronic Myeloid Leukaemia case
7	BCR:ABL1 Qualitative Diagnostic Analysis	Blood/Bone marrow	EDTA	2.5 - 5ml	Molecular Analysis for haemato-oncology request form (Version 3.0)	CaRC IMR, NIH	7 working days	Suspected Chronic Myeloid Leukaemia at diagnosis
8	BCR:ABL 1 Kinase Domain Mutation Analysis	Blood/Bone marrow	EDTA	2.5 - 5ml	Molecular Analysis for haemato-oncology request form (Version 3.0)	CaRC IMR, NIH	30 working days	Chronic Myeloid Leukaemia case on TKI

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERENCE LAB	LTAT	REMARKS
9	CD20 Enumeration	Blood	EDTA	2.0 ml x 2 tubes	PER-PAT 301	Hospital Sultanah Aminah	2 weeks	-Please contact Haematopathologist On-Call HSA for appointment. -Transport samples within 4 hours of blood collection with ice pack (20-25°C). Avoid direct contact with ice.
10	CD4 / CD8 enumeration	Blood	EDTA	3 ml	PER-PAT 301	Hospital Sultanah Aminah	5 days	-Request form must include the following information: a) Date of latest CD4 / CD8 count b) Date of specimen taken c) Date of HAART treatment started -Need to book appointment via MOPC HPSF Muar before sending sample to lab hematology -Need fresh sample, please send sample to hematology lab on Wednesday latest by 4.00 pm
11	Constitutional Conventional Cytogenetics	Blood	Lithium Heparin	3-5 ml Storage: 2-8 degrees	Borang Permohonan Ujian Cytogenetic	Hospital Tunku Azizah	Urgent: 10 working days	-Test should be requested by specialist only.

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERENCE LAB	LTAT	REMARKS
					HTA/PAT/GEN /PK-01-01		Routine: 30-60 days	-Need to get appointment from Genetic lab, HTAKL for urgent request -Need fresh sample and to call Hematology lab, before sending sample.
12	DNA Analysis for Alpha Globin gene, Beta Globin gene and hemoglobinopathies (Hb E, Hb C and Hb S only)	Blood	EDTA	Adult: 2.5ml Pediatrics: 0.5 ml	DNA analysis for thalassemia syndrome & hemoglobinopathies	HKL	90 days	All request form must be accompanied with latest FBC (within 3 months) and detailed Hb analysis result
13	DNA Analysis for Thalassemia syndromes, hemoglobinopathies and further testing for Alpha and Beta Globin gene.	Blood	EDTA	Adult: 2.5ml Infant: 0.5ml	DNA analysis for thalassemia syndromes and hemoglobinopathies	CaRC IMR, NIH	120 working days	-For pediatrics patient: All request form must be accompanied with latest (within 3 months) FBC and detailed Hb analysis result of patient and parents. -Adult patient: All request form must be accompanied with latest FBC (within 3 months) and detailed Hb analysis result
14	DNA for extraction & storage	Blood	EDTA	6 ml	Borang Permohonan Ujian Molecular	Molecular genetic Lab Hospital	For storage purpose	Need grant/appointment from molecular genetic laboratory, HTAKL

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERENCE LAB	LTAT	REMARKS
					HTA/PAT/GEN /PK-01-02	Tunku Azizah		
15	Duchenne Muscular Dystrophy (DMD)	Blood	EDTA	6.0 ml Storage: 2-8 degrees	Borang Permohonan Ujian Molecular HTA/PAT/GEN /PK-01-02	Molecular genetic Lab Hospital Tunku Azizah	3-6 months	-Test should be requested by specialist only. -Need fresh sample and to call Hematology lab, before sending sample.
16	Factor II/ Factor V/Factor VII/ Factor X /Factor XI/Factor XII/Factor XIII Activity Assay	Blood	Sodium Citrate	Collect until indicated mark (2 tube for each Factor)	PER-PAT 301	Hospital Tunku Azizah	21 days	-To write detailed clinical history in request form
17	Factor IX Assay	Blood	Sodium Citrate	Collect until indicated mark x 2 tube	PER-PAT 301	Hospital Sultanah Aminah	Urgent: 1-3 days Routine: 4 weeks	-Must write date and time sample taken/ Transfusion date/pre or post factor sample). -Please contact Haematopathologist HSAJB On-Call for urgent case
18	Factor VIII Assay	Blood	Sodium Citrate	Collect until indicated mark x 2 tube	PER-PAT 301	Hospital Sultanah Aminah	Urgent: 1-3 days Routine: 4 weeks	-Must write date and time sample taken/ Transfusion date/pre or post factor sample).

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERENCE LAB	LTAT	REMARKS
								-Please contact Haematopathologist HSAJB On-Call for urgent case
19	Factor VIII/Factor IX Inhibitor Assay	Blood (Plasma)	Sodium Citrate	Collect until indicated mark x 4 tube	PER-PAT 301	Hospital Sultanah Aminah	Urgent: 1-3 days Routine: 4 weeks	-Please contact Haematopathologist HSAJB On-Call for urgent case
20	Floating Harbor Syndrome (SRCAP)-Hotspots	Blood	EDTA	2-5 ml	IMR/SDC/UMD/REQUEST FORM	IMR	5 months	By appointment / consultation only
21	Fragile X Syndrome (FRAXA) FMR1 Disorders (Fragile X Syndrome, FXTAS, FXPOI, FXAND) (CGG Repeat Analysis – FMR1)	Blood	EDTA	2-5 ml	IMR/SDC/UMD/REQUEST FORM	IMR	5 months	By Consultation only
22	G6PD Quantitative Assay	Blood	EDTA	2ml	PER-PAT 301	Hospital Melaka	7 days	-Reticulocytes count shall be <5% (neonate), <2.5% (pediatrics & adult) -To call Hematology lab HPSF before sending sample
23	Genetic disorders	Blood	EDTA	6.0 ml Storage: 2-8 degrees	Borang Permohonan Ujian Cytogenetic	Hospital Tunku Azizah	3-6 months	Kindly contact Genetic lab for further information prior sending sample

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERENCE LAB	LTAT	REMARKS
					HTA/PAT/GEN /PK-01-01			
24	Hemato-Oncology Conventional Cytogenetics	Bone marrow (First aspirate)	Sodium Heparin	3-5 ml	Borang Permohonan Ujian Cytogenetic	Hospital Tunku Azizah	Urgent: 10 working days	Request form must be complete and signed by specialist
25	Hemato-Oncology Conventional Cytogenetics (CLL Only)	Peripheral blood (CLL only)		Storage: 2-8 degrees	HTA/PAT/GEN /PK-01-01		Routine: 30-60 days	Sample must reach HTA Genetic Laboratory within 48 hours after sample collection in an ice-packed container. Reflex testing: Haemato-oncology molecular cytogenetic fluorescence in situ hybridization (FISH) if indicated.
26	Hemophilia A & B genetic testing	Blood	EDTA	3 ml	Hemophilia Genetic Testing Request Form	CaRC IMR, NIH	60 working days	-Shall have a copy of the factor assay test result and factor inhibitor test result -Family tree need to be included.
27	Hemoglobin Analysis	Blood	EDTA	3 ml	PER-PAT 301	Hospital Sultanah Aminah	28 days	-Must write latest Iron profile and serum Ferritin results if patient anemic. -Shall include index case details (Name, ID No.,

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERENCE LAB	LTAT	REMARKS
								Diagnosis, relationship with index case) if for cascade screening
28	Immunophenotyping (IPT)	Bone marrow/ blood	EDTA	6.0 ml BM-1 direct smear/1 MGG stained smear PB- 1 Leishman-stained slide	PER-PAT 301	Hospital Sultanah Aminah	5 working days (All urgent reports - Verbal report within 24 hours)	For peripheral blood sample - please consult Hematopathologist in charge / oncall before sending sample.
29	Immunophenotyping-Double Negative T cells	Blood	EDTA	2.0 ml x 2 tubes	PER-PAT 301	Hospital Tunku Azizah	21 days	-Inform Hematology lab before sending sample. -Needs fresh sample (within 24 hours) -Transport at RT (20-24°C), within 48 hours of collection.
30	Immunophenotyping for Paroxysmal Nocturnal Hemoglobinuria (PNH)	Blood	EDTA	2.0 ml x 2 tubes	PER-PAT 301	Hospital Tunku Azizah	21 days	-Inform Hematology lab before sending sample. -Needs fresh sample (within 24 hours)

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERENCE LAB	LTAT	REMARKS
31	Inherited Thrombophilia screening panel (Protein C, Protein S, Antithrombin & APCR)	Blood	Sodium Citrate	Collect until indicated mark x 3 (pediatrics), 4 tubes (adult)	PER-PAT 301	Hospital Tunku Azizah	6 weeks	Must follow Guideline for Thrombophilia Testing
32	JAK 2/Calreticulin	Blood/ Bone marrow	EDTA	PB: 5.0 ml BM:1-2 ml	Hospital Ampang Special Hematology Lab Requisition Form.	Hospital Ampang	8 weeks	Referral lab will proceed for Calreticulin if JAK2V617F mutation negative
33	Leukaemia Translocation Study	Bone marrow/ Blood	EDTA Sample must be accompanied with unstained bone marrow slide	2.5 - 5ml	Molecular Analysis for haemato-oncology request form (Version 3.0)	CaRC IMR, NIH	7 working days	For Acute leukemia case at diagnosis or relapse only
34	Lupus Anticoagulant	Blood	Sodium Citrate	Collect until indicated mark x 5 tubes	PER-PAT 301	Hospital Sultanah Aminah	4 weeks	Please adhere the Checklist for Thrombophilia testing in the Appendix (HSAJB/PAT-18/VER3.0/2022)
35	**MELAS** (Mitochondrial Encephalomyopathy, Lactate Acidosis and	Blood	EDTA	2-5 ml	IMR/SDC/UMD/REQUEST FORM	IMR	5 months	By appointment / consultation only

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERENCE LAB	LTAT	REMARKS
	Stroke-like Episode) - Full panel							
36	Molecular Quantitation of Major BCR-ABL1 (p210) for Chronic Myeloid Leukaemia (CML) Patients	Blood/Bone marrow	EDTA	2 ml x 3 tubes	PER-PAT 301	Hospital Sultanah Aminah	7 days	Chronic Myeloid Leukaemia case (Follow up only).
37	Minor BCL-ABL (By Quantitative RT-PCR)	Bone marrow aspirate	EDTA	4 ml	Hospital Ampang Special Hematology Lab Requisition Form.	Hospital Ampang	7 weeks	Chronic Myeloid Leukaemia case (Follow up only)
38	Noonan Syndrome (PTPN11)	Blood	EDTA	2-5 ml	IMR/SDC/UMD/REQUEST FORM	IMR	5 months	By appointment / consultation only
39	Osmotic Fragility Test (OFT)	Blood	Lithium Heparin EDTA	4.0 ml 2 tube	PER-PAT 301	Hospital Sultanah Aminah	2 weeks	-Any request should be granted by Hematopathologist On-call HSAJB and get appointment from the Hematology laboratory HSAJB.

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERENCE LAB	LTAT	REMARKS
								-Deliver sample immediately to the laboratory at room temperature. - Sample should not exceed 4 hours after blood taking.
40	PDGFRA/B for Hypereosinophilia cases	Bone marrow/Blood	Sodium heparin	BM: 2 tube Blood: 4 tubes	Hospital Ampang Special Hematology Lab Requisition.	Unit Genetic Hospital Ampang	18 days	Need grant by MRKH, Hospital Ampang
41	Prader Willi Syndrome (SNRPN)	Blood	EDTA	2-5 ml	IMR/SDC/UMD/REQUEST FORM	IMR	5 months	By appointment / consultation only
42	SCN1A-Related Seizure Disorders (SCN1A)	Blood	EDTA	2-5 ml	IMR/SDC/UMD/REQUEST FORM	IMR	5 months	By appointment / consultation only
43	Serum erythropoietin	Blood	Gel Tube	5.0 ml Serum (min 1.5 ml)	Hospital Ampang Special Hematology Lab Requisition Form.	MRKH, Hospital Ampang	MDS: 8 weeks MPN & PRV: 12 weeks	Deliver tubes immediately to the laboratory at room temperature.

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	REFERENCE LAB	LTAT	REMARKS
44	Spinal Muscular Atrophy (SMA) Sequencing	Blood	EDTA	2-5 ml	IMR/SDC/UMD/REQUEST FORM	IMR	5 months	By appointment / consultation only
45	Spinocerebellar Ataxia (SCA) - Full Panel (CAG Repeat Analysis - SCA1, SCA2, SCA3, SCA6, SCA7)	Blood	EDTA	2-5 ml	IMR/SDC/UMD/REQUEST FORM	IMR	6 months	By appointment / consultation only
46	Molecular Red Cells Membrane Disorder (Southeast Asian Ovalocytosis)	Blood	EDTA	Adult- 3 ml, Pediatrics – 1 ml	PER-PAT 301 with consent form	Hospital Sultanah Bahiyah Kedah	6 weeks	-Need grant by Hemapathologist -Sample accepted every Monday and Tuesday only before 4:00 PM -FBP report must be submitted together with FBC parameters (dated within the last 3 months)
47	Von Willebrand Factor (VWF) Profile	Blood	Sodium Citrate	Collect until indicated mark x 3 tubes	PER-PAT 301	Hospital Tunku Azizah	4 weeks	-

HPSF 2025

ANATOMIC PATHOLOGY (HISTOPATHOLOGY) 353

ANATOMIC PATHOLOGY (HISTOPATHOLOGY)

INTRODUCTION:

This division is concerned with diagnosis through macroscopic and microscopic examination of tissue. This includes the assessment of specimens removed at surgery, or at non – surgical biopsy procedures and the investigation of disease at autopsy.

The unit received surgical specimen from Hospital Pakar Sultanah Fatimah Muar, Hospital Sultanah Nora Ismail, Batu Pahat, Hospital Segamat and Hospital Tangkak.
HPSF Histopathology service operates during office hour.

OUT-OF-HOURS SERVICE:

1. A Pathologist is rostered for on call to cater for frozen section, transplant and clinical autopsy services as well as surgical pathology consultation.
2. He / she can be contacted through the hospital operator.
3. All samples for routine histopathological examination taken after office hours should be fixed in 10% neutral buffered formalin (10% NBF) in the respective ward or OT room and kept at room temperature.
4. The sample should then be dispatched to the Anatomic Pathology Counter during operating working hours.

LIST OF SERVICES:

1. Histopathological examination of:
    a. Surgically removed small tissue/biopsy
    b. Surgically removed large tissue or hollow organ
    c. Intraoperative Frozen tissue
2. Histochemistry and Immunohistochemistry test
3. Immunoflourescence (IF) study for renal and skin biopsy
4. Clinical autopsy

REQUEST FOR HISTOPATHOLOGY SERVICES

1. General Routine Histopathology

i. Each set of specimens from a patient must be accompanied with 2 copies of request forms (PER PAT 301). Accurate patient details and history are essential as well as the name of doctor's in charged. The date and time of specimen collection must be written on the request form.
ii. If there is more than one sample sent for same patient, fill up only one set of carbonized request form and clearly itemized each type of sample sent in the form.
iii. Specimens are to be placed in the correct sized container and sealed with plastic specimen bags.
iv. If an **URGENT** report is required, please state in the request form.

2. Frozen sections

i. Frozen sections are available during office hour.
ii. All requests for frozen section examination must be preceded by appointment and discussion with the pathologist on call at least 24 hours before operation.
iii. Fill in the fresh frozen section request form {MK-HPSF-PAT-AP 07/1 (1.1.2020)} which is available in the Anatomic Pathology unit.
iv. The fresh specimen must be sent by medical officer. Verbal results will only be given to MEDICALLY QUALIFIED staff.
v. Frozen sections are not provided on infectious specimens (e.g. TB or HIV)
vi. Please informed the lab if planned frozen section is canceled.

3. Clinical autopsy

Clinical autopsy is performed to ascertain the cause of death in non-medicolegal cases. The following procedures should be followed:

i. The requesting doctor and pathologist shall obtain written consent from the next of kin using Borang kebenaran untuk pemeriksaan post mortem klinikal (HPSF/FOR/004).
ii. In cases where the next of kin is not available, the Hospital Director and one of the medical specialist will have to give their consent.
iii. In cases of a foreigner where the next of kin is not available, consent from their respective embassy officer is required.
iv. The requesting clinician shall communicate directly with the pathologist on call. Clinical autopsy is usually performed during office hour.
v. The requesting clinician/ representative must be present during the autopsy.
vi. The pathologist may liaise and request the Forensic Medical Officer to assist the autopsy procedure.
vii. In reffered cases from other hospital (HSNI and Segamat), pathologist can request assistance from forensic Medical Officer in that hospital to perform the autopsy. The Medical Officer shall record the autopsy findings. However the HPE and the final autopsy report shall be validated by Pathologist in charge.
viii. The final autopsy report shall be available within 3 months upon request form relatives/ next of kin.

SPECIMEN COLLECTION

1. Most routine histology specimen (HPE) should be submitted in adequate 10% neutral buffered formalin (NBF) sufficient to cover the specimen using an appropriate sized container.
2. The volume of formalin used is at least 20 times the specimen to be fixed (ratio of NBF volume to tissue volume of 20:1). Fixation must be done without delay and with least amount of handling.
3. Specimen should be checked by clinical staff to make sure that the formalin is filled in the container.
4. When possible, big specimens should not be incised to allow proper orientation and gross description by the pathologist except for mastectomy specimen from other hospitals. The mastectomy specimen should be serially sliced longitudinally to allow adequate fixation.
5. Specimen which requires orientation or assessment for surgical margins must be marked or tagged accordingly by sutures/staples. The orientation must be clearly indicated in the accompanying request form.
6. Specimen must be labeled properly with patient's details and type of specimen. Do not stick the label on the lid of the container.
7. Specimen for frozen sections, immunofluorescence test (renal biopsy, skin, soft tissue dental) must be sent fresh without fixative with ice pack into ice box and put in a closed container with phosphate buffer saline to prevent drying. The phosphate buffer saline is provided by the Anatomic Pathology Unit.
    i. Skin samples are wrapped in saline soaked gauze and place in a universal container with full patient details label attached. The skin samples must include the dermal-epidermal junction (DEJ) for tests to be performed.
    ii. Renal samples are placed in saline solution in a universal container with full patient details label attached. Renal samples must include the portion of a kidney containing glomeruli.
8. Specimen for frozen section (intraoperative) must be sent fresh without fixative with ice pack into ice box

TRANSPORTATION:

1. All samples and request form must be delivered directly to the Anatomic Pathology Counter. Ring the bell at the counter for MLT's attention and wait until the MLT receives the specimen.
2. Do not leave the specimens unattended at the counter. We do not take any responsibility if the specimen is lost.

TURN AROUND TIME FOR HISTOPATHOLOGY REPORTS

Histopathological processing takes variable times depending on the type and size of specimens and the need for extra special stains.

Specimens	Lab Turn Around Time (LTAT)
Urgent biopsy	3 working days
Non urgent biopsy	14 calendar days
Urgent and non-urgent specimen	14 calendar days

*Please note that LTAT of urgent biopsy does not include cases that need ancillary test or subjects of referrals. Any inquiries about the requested case should be made to pathologist/ medical officer reporting the cases.

DISPATCHING RESULT

1. All HPE reports are available both in hard copy and in LIS system (Lab Information System).
2. For Hospital Pakar Sultanah Fatimah Muar, the hard copy is dispatched to respective clinics. Some of the clinics can view the results via ward enquiry system. This system can only be logged in by authorized personnel who is appointed by the department.
3. For other hospitals, the printed reports will be delivered to the respective hospital's personnel when they send the specimen to the unit. Ward enquiry system is also available in the Pathology Department of Hospital Batu Pahat, Hospital Segamat & Hospital Tangkak

NOTIFICATION OF ANATOMICAL PATHOLOGY CRITICAL FINDINGS

Any critical findings as listed below will be informed to the clinician immediately after the report is ready.

Test	Clinical Findings
Unexpected or discrepant findings	• Unexpected malignancy • Wrong organ removed
Reports of infections	• Bacteria in heart valves or bone arrow • Organisms in an immune-compromised patient such as AFB ,fungi ,viral, protozoa • Organisms in cerebrospinal fluid(CSF) • Unusual organisms or organism 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 rejection
Cases that have immediate clinical consequences	• Fat in an endometrial curettage • Mesothelial cells in a heart biopsy • Fat in snare colon biopsy specimens

CLINICAL PATHOLOGICAL CONFERENCE (CPC)/ MULTIDISPLINARY TEAM (MDT) MEETING

1. CPC is available and the schedule for each department is arranged in the beginning of the year.
2. Clinical/ surgical representative shall inform and give the lists of cases and the reason of discussion to the medical officer's incharge or Head of Unit at least 1 week before the schedule.
3. The medical officers's incharge will co-ordinate if any changes in the date or cases occur.
4. Online MDT from other hospital are also available for patient's management. The clinical team can approach the Pathologist who reported the case for presentation of microscopic findings.

SPECIAL SPECIMEN/ CONSUMABLES REQUEST

~~1.~~ Request for Paraffin Blocks / Unstained sections / Slides
   a. All specimens sent to/ officially received by Anatomic Pathology Unit as well as diagnostic material from these specimens such as paraffin blocks and slides are the property of Pathology Department.
   b. Clinicians are allowed to request for diagnostic material e.g. unstained slides for diagnostic purpose. The requesting clinician must contact directly to the pathologist in charge of the case.
   c. The following procedure must be followed:
      i. The requesting clinician needs to fill up ~~a~~ form PERMOHONAN PEMINJAMAN/ PENGAMBILAN BAHAN DIAGNOSTIK UNIT HISTOPATOLOGI (PK-HPSF-PAT-AP-03/02) This form is available at the Anatomic Pathology Counter.
      ii. The completed form (2 copies) shall be submitted to the unit and the material can be taken within 3 working days upon submission of the form.
      iii. The paraffin block and stained slides must be returned to the unit within 1 month.

2. Request for Tissue/ specimen From Anatomic Pathology Unit
   a. The pathology department allows patient to take their tissues, organs or limbs following these regulatory procedures:
      i. The patient or next of kin must make a request and fill up ~~a~~ form PERMOHONAN PENGAMBILAN SPESIMEN form (2 copies). This form is available at the Anatomic Pathology Counter.
      ii. The completed form shall be submitted to the Anatomic Pathology Unit
      iii. The tissue/sample is released after the specimen is being examined by the Pathologist and adequate sampling has been taken for reporting.
      iv. The tissue/ specimen is usually kept for 1 to 3 months after the report is validated before it is disposed.

3. Request for microscopic Images for publication
   a. The requesting doctor shall communicate directly with the pathologist in charge of the case.
   b. Write an official letter requesting the image, with the attention to the pathologist in charge.
   c. The image will be sent through email or the softcopy of the images can be provided to the requestor if a pen drive is provided.

4. Consumables available
   a. Specimen pots/ containers are provided for Hospital Pakar Sultanah Fatimah Operating Theatre. Contact the laboratory (ext. 353) in advance and quote

sizes of container required. Operating theatre should then arrange to collect the requested container at a time mutually convenient with the laboratory.

b. 10% Neutral buffered formalin for tissue fixation is also provided by Anatomic Pathology Unit.
c. Phosphate buffer saline (PBS) for immunofluorescence frozen section is prepared and provided by the unit before the procedure is taken place. Contact the laboratory for assistance (ext. 353).

SEND AWAY SPECIMEN

SAMPLE	APPOINMENT	HOSPITAL
Oral and dental specimen (HPE)	No	HSAJB/NIH
Muscle biopsy (fresh)	Yes	HKL

1. **Oral And Dental Soft Tissues Specimen**
   a. Soft tissues specimen from Oral and Maxillofacial department will be sent to oral pathologist in HSAJB or NIH (as requested by OMFS).
   b. Write in the form if the case needs to be reported by general histopathologist in HPSF Muar.
   c. Please call EXT 353 for any URGENT cases that require attention.
   d. For send away specimen, Anatomic Pathology Unit will send the specimen via the hospital transport. The HPE report will be dispatched to the clinic once we received it.

2. **Muscle Biopsy**
   a. Site of specimen
   - Identify the appropriate muscle to biopsy. Discuss with pathologist if necessary. (Usually the biceps or quadriceps muscle would suffice in most cases)

   b. Size of specimen
   - For open biopsy, remove at least one good cylinder of muscle measuring 0.5 x 1 cm, the smaller diameter being the cross section of the muscle.

   c. Nature of specimen
   - For optimal processing, muscle must be sent fresh. Put muscle into dry clean bottle/ container. If possible wrap muscle in aluminium foil but this is not absolutely necessary. Do not put onto gauze or tie muscle to stretch it. Do not put into saline or formalin.
   - (In cases where sending fresh muscle poses insurmountable problems, you should put muscle into formalin, recognizing that fixed tissue is limited in its diagnostic possibilities.
   - A request form (PER-PAT 301) must accompany the specimen with clinical summary and relevant investigation or blood test.

   d. Contact
   - Contact HKL (Histo. Lab) telephone no. 0326155603 for appointment.
   - Provide the name and contact number of the requesting doctor.
   - Informed them the approximate time of specimen arrival.

e. Transport

- After confirmation with HKL Lab, requesting doctor should arranged for hospital transport on the appointed day.

f. Packing

- Pack the sample (fresh tissue) into the ice box with adequate ice (Note: usually not more than 2 pack of ice). The ward PPK should bring the sample and the request form to the Anatomic Pathology Lab HKL

g. Result

- The Anatomic Pathology Lab of HPSF will receive the result from HKL. The result will be dispatched to the respective clinic

LIST OF HISTOPATHOLOGY IN-HOUSE TESTS

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
1	Histochemistry stain	Surgical resected specimen / tissue paraffin block / cell block	Plain container with 10% formalin/ tissue paraffin block	As collected	PER-PAT 301		
2	Histopathology Examination (HPE)	Surgical resected specimen	Plain container with 10% formalin	As collected	PER-PAT 301	**Urgent Biopsy without ancillary test:** 3 working days **with ancillary test:** 14 calender days **Non Urgent Biopsy & Medium to Complex Specimen:** 14 calender days	
3	Histopathology Examination (HPE) - Block	Tissue cassette /parrafin block	Tissue cassette	As collected	PER-PAT 301	**Urgent Biopsy without ancillary test:** 3 working days **with ancillary test:** 14 calender days **Non Urgent Biopsy & Medium to Complex Specimen:** 14 calender days	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
4	Immunoflourese nce test	Fresh tissue (renal / skin/ Soft tissue dental)	Plain container with PBS into the ice box with ice pack	As collected	PER-PAT 301	14 Calendar day	
5	Intraoperative Frozen section	Fresh tissue	Universal container into the ice box with ice pack	As collected	PER-PAT 301	30 minute after receiving sample	Depends on number of specimen
6	Immunohistoche mistry stain	Surgical resected specimen / tissue paraffin block / cell block	Plain container with 10% formalin/ tissue paraffin block	As collected	PER-PAT 301		

LIST OF HISTOPATHOLOGY SEND-AWAY TESTS

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME/ SLIDE	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT	REMARKS
IMMUNOHISTOCHEMISTRY								
1.	AFP	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	
2.	BETA CATENIN	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	
3.	BHCG	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	
4.	C1Q	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	
5.	C3	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	
6.	C4D	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME/ SLIDE	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT	REMARKS
7.	CD 19	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	
8.	CK 19	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) And Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	
9.	DS-40	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	
10.	EBV	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	
11.	GLYPICAN 3	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	
12.	HEPAR 1	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	
13.	HHV-8	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME/ SLIDE	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT	REMARKS
14.	Ig A	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	
15.	MUC	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	
16.	OCT	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	
17.	OCT 314	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	
18.	PLAP	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	
19.	SV40	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	
20.	STAT-6	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME/ SLIDE	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT	REMARKS
21.	TLE 1	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	
22.	WARTHIN STARY	5X UNSTAINED SLIDES	NA	5 slides	Request Form For Immunohistochemistry (IHC) and Histochemistry Test	Patologi Anatomi HKL	14 Calendar day	
MOLECULAR TESTING								
FISH TESTING								
23.	HER 2	1 PARAFFIN BLOCK, 1 H&E SLIDE, 1 Her-2 SLIDE	NA	NA	Referral Letter	Patologi Anatomi HKL	14 Calendar day	Reflex testing when IHC HER 2 test is equivocal (2+)
NEUROPATHOLOGY								
24.	1p19q	1 COPY PATIENT HPE REPORT, 1 H&E SLIDE, 1 PARAFFIN BLOCK	NA	NA	REQUEST FORM FOR MOLECULAR TESTING	Molecular Histopathology HKL	30-90 calendar day	
25.	MYCN	1 COPY PATIENT HPE REPORT, 1 H&E SLIDE,1 PARAFFIN BLOCK	NA	NA	Request Form For Molecular Testing	Molecular Histopathology HKL	30-90 Calendar day	
SOFT TISSUE TUMOUR								

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME/ SLIDE	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT	REMARKS
26.	CDK4	1 COPY PATIENT HPE REPORT, 1 H&E SLIDE, 1 PARAFFIN BLOCK	NA	NA	REQUEST FORM FOR MOLECULAR TESTING	Molecular Histopathology HKL	30-90 calendar day	
27.	EWSR1	1 COPY PATIENT HPE REPORT, 1 H&E SLIDE, 1 PARAFFIN BLOCK	NA	NA	REQUEST FORM FOR MOLECULAR TESTING	Molecular Histopathology HKL	30-90 calendar day	
28.	MDM2	1 COPY PATIENT HPE REPORT, 1 H&E SLIDE, 1 PARAFFIN BLOCK	NA	NA	REQUEST FORM FOR MOLECULAR TESTING	Molecular Histopathology HKL	30-90 calendar day	
29.	SS18	1 COPY PATIENT HPE REPORT, 1 H&E SLIDE, 1 PARAFFIN BLOCK	NA	NA	REQUEST FORM FOR MOLECULAR TESTING	Molecular Histopathology HKL	30-90 calendar day	
LYMPHOMA								
30.	CMYC	1 COPY PATIENT HPE REPORT, 1 H&E SLIDE, 1 PARAFFIN BLOCK	NA	NA	REQUEST FORM FOR MOLECULAR TESTING	Molecular Histopathology HKL	30-90 calendar day	
PCR AND SEQEUNCING TEST								
31.	ALK, ROS1	5X UNSTAINED SLIDES	NA	5 slides of biopsied tissue cut at 5mm thickness	BORANG PERMOHONAN UJIAN SITOGENETIK (HTA/PAT/GEN/PK-01-01)	Molecular Genetic Lab Hospital Tunku Azizah	30-90 calendar day	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME/ SLIDE	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT	REMARKS
32.	BRAF	1 COPY PATIENT HPE REPORT, 1 H&E SLIDE, 1 PARAFFIN BLOCK	NA	NA	REQUEST FORM FOR MOLECULAR TESTING	Molecular Histopathology HKL	30 calendar day	
33.	Breast/ Ovarian gene panel	5X UNSTAINED SLIDES	NA	5 slides of biopsied tissue cut at 5mm thickness	BORANG PERMOHONAN UJIAN MOLEKULAR (HTA/PAT/GEN/PK-01-02)	Molecular Genetic Lab Hospital Tunku Azizah	30-90 calendar day	
34.	Colorectal/ gastric cancer gene panel	5X UNSTAINED SLIDES	NA	5 slides of biopsied tissue cut at 5mm thickness	BORANG PERMOHONAN UJIAN MOLEKULAR (HTA/PAT/GEN/PK-01-02)	Molecular Genetic Lab Hospital Tunku Azizah	30-90 calendar day	
35.	EGFR	5X UNSTAINED SLIDES	NA	5 slides of biopsied tissue cut at 5mm thickness	BORANG PERMOHONAN UJIAN MOLEKULAR (HTA/PAT/GEN/PK-01-02)	Molecular Genetic Lab Hospital Tunku Azizah	30 calendar day	
36.	Fungal PCR	TISSUE RIBBON	STERILE CONTAINER	5-10 ribbon tissue	MYCOLOGY REQUEST FORM(IMR/IDRC/BACT/MYCO/01	IMR (NIH)	30 calendar day	
37.	IDH1/2	1 COPY PATIENT HPE REPORT, 1 H&E SLIDE, 1 PARAFFIN BLOCK	NA	NA	REQUEST FORM FOR MOLECULAR TESTING	Molecular Histopathology HKL	30-90 calendar day	
38.	KRAS	5X UNSTAINED SLIDES	NA	5 slides of biopsied tissue cut	BORANG PERMOHONAN UJIAN MOLEKULAR	Molecular Genetic Lab	90 calendar day	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME/ SLIDE	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT	REMARKS
				at 5mm thickness	(HTA/PAT/GEN/PK-01-02)	Hospital Tunku Azizah		
39.	KRAS (Sequencing)	1 COPY PATIENT HPE REPORT, 1 H&E SLIDE, 1 PARAFFIN BLOCK	NA	NA	REQUEST FORM FOR MOLECULAR TESTING	Molecular Histopathology HKL	30-90 calendar day	
40.	Leptospirosis PCR	TISSUE RIBBON	STERILE CONTAINER	5-10 ribbon tissue	IMR/IDRC/BACT/LEPTO/01	IMR (KL)	30 Calendar day	
41.	Lung cancer gene panel	5X UNSTAINED SLIDES	NA	5 slides of biopsied tissue cut at 5mm thickness	BORANG PERMOHONAN UJIAN MOLEKULAR (HTA/PAT/GEN/PK-01-02)	Molecular Genetic Lab Hospital Tunku Azizah	30-90 calendar day	
42.	MGMT	1 COPY PATIENT HPE REPORT, 1 H&E SLIDE, 1 PARAFFIN BLOCK	NA	NA	REQUEST FORM FOR MOLECULAR TESTING	Molecular Histopathology HKL	30-90 calendar day	
43.	MSI testing	5X UNSTAINED SLIDES	NA	5 slides of biopsied tissue cut at 5mm thickness	BORANG PERMOHONAN UJIAN MOLEKULAR (HTA/PAT/GEN/PK-01-02)	Molecular Genetic Lab Hospital Tunku Azizah	30-90 calendar day	
44.	MTB PCR	TISSUE RIBBON	STERILE CONTAINER	5-10 ribbon tissue	BACTERIOLOGY REQUEST FORM (LAMPIRAN 1)	IMR (NIH)	30 calendar day	

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME/ SLIDE	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT	REMARKS
45.	Muscle biopsy	FRESH TISSUE	NA	0.5 x 1mm	PERPAT 301	Patologi Anatomi HKL	30 calendar day	By appointment
46.	RAS Extension	1 COPY PATIENT HPE REPORT, 1 H&E SLIDE, 1 PARAFFIN BLOCK	NA	NA	REQUEST FORM FOR MOLECULAR TESTING	Molecular Histopathology HKL	30-90 calendar day	
47.	**SOFT TISSUE DENTAL FOR HPE**	Surgical resected specimen	plain container with 10% formalin	NA	PERPAT 301	HSAJB/NIH	**Urgent & Simple specimen without ancillary test:** 5 working days **Non Urgent & Medium to Complex Specimen:** 14 working days	

HPSF 2025

ANATOMIC PATHOLOGY (CYTOLOGY) 367

ANATOMIC PATHOLOGY (CYTOLOGY)

INTRODUCTION

Cytology is a discipline that involves the morphological study of cells. It is divided into exfoliative and aspiration cytology.

1. Exfoliative cytology involves examination of specimens which contain exfoliated cells. It is divided into:
   i. Gynecological pap smear
   ii. Non-gynecological (body fluid – peritoneal fluid, pleural fluid, cerebrospinal fluid), urine, respiratory samples, cysts fluid)
2. Aspiration of cytology involves examination of cells obtained by fine needle aspiration.
3. Seminal fluid analysis is used to evaluate male fertility.

Cytology service of HPSF operates during office hour.

SERVICE AFTER OFFICE HOUR

1. No sample for cytological examination is processed after office hour.
2. Sample collected outside officer hours should be refrigerated at 2°C - 8°C before dispatched to the cytology laboratory the next day. Refrigeration helps preserving the cell.
3. DO NOT FREEZE the sample.

SUBMISSION OF SPECIMENS

1. Diagnostics specimens must be accompanied by **2 copies of request form**. All specimens must be labeled with patient's name together with I/C number and specimen type. The request form should clearly state the patient's details such as patient's name, identification number, ward, type of specimen, date and time of sample and relevant clinical data.
2. The request form without doctor's signature, name and stamp chop will be rejected.
3. Exfoliative cytology specimen received after office hour should be submitted to the Pathology Department main counter for refrigerated at 2-8℃ and will be processed later during office hour.
4. For serous effusions, a minimal volume of 50 to 75ml is advised to diminish the potential false negative and optimize the test sensitivity.

TRANSPORTATION

1. Specimens are to be placed in the correct container and sealed with plastic specimen bag.
2. All cytology specimens should be sent to Anatomic Pathology Services Counter during office hour on Monday to Friday.
3. Ring the bell for MLT's attention and wait until the MLT receives the specimen. Do not leave the specimens unattended at the counter.

*We do not take any responsibility if the specimen is lost.

GYNAECOLOGICAL CYTOLOGY

Gynaecological cytology is a field of pathology concerned with the investigation of disorders of the female genital tract. To obtain an ideal pap smear specimen, the following guidelines have been established by the Clinical and Laboratory Standard Institute:

Patient instructions:

1. Schedule the examination 2 weeks after first day of the last menstrual period. (It is preferred to avoid contamination during menses because blood may obscure significant findings)
2. Do not use vaginal medication, vaginal contraceptives, or douches for 48 hours before the procedure
3. Intercourse is not recommended the night before the procedure.

Specimen collections:

1. Specimens should be obtained after a **Non-Lubricated** speculum is inserted (moistened only with warm water if needed).
2. Excess mucus or other discharge should be removed gently with ring forceps holding a folded gauze pad.
3. The sample should be obtained before the application of acetic acid or Lugol iodine.
4. An optimal sample includes cells from the ectocervix and endocervix (squamo-columnar junction).
5. *For conventional pap smear method:*
    - The cervical spatula is placed at the external os and rotated at least 360 degrees, lightly scrapping the squamo-columnar junction.
6. For liquid based cytology pap smear method:
    - Collect the sample with Cervex-Brush insert into the endocervical canal. Rotate the brush 5 times in clockwise direction

* The Cervex-Brush should not be used on patients after first 10 weeks of pregnancy.

Smears/ Sample Preparation:

a. For conventional pap smear method:
    1. Label glass slide with patient's name and identification number on the frosted end.
    2. Smear the material onto a clean labelled glass slide about as thick as blood film.
    3. Immediately place the slide in 95% alcohol, for at least 15 minutes. If one or more than 1 slide is to be placed in the same container, ensure that they are not placed face to face.
    4. Send the slide directly to the Cytology Unit through Anatomic Pathology Service Counter

b. For liquid based cytology pap smear method:
    1. Insert the brush head into the larger opening of the vial. Use inner edge of the vial to pull off the brush head.
    2. Drop the detached brush head into the larger opening of the vial. Do not touch the brush head while detaching.
    3. Place cap on vial and tighten.
    4. Label the vial with patient’s name, IC number, sample type and date of collection.
    5. Send the vial to Cytology unit through Anatomic Pathology Service Counter for processing.

FINE NEEDLE ASPIRATION CYTOLOGY

The Free hand/ palpation guided FNAC Clinic is conducted by Pathology Medical Officer/ Pathologist. twice a week in the Surgical Outpatient Clinic Department.

- Thursday (10.00 am – 1.00 pm)
- Friday (10.00 am – 12.15 pm)

On-site URGENT FNAC is available during office hour. Please contact medical officer incharge/ Pathologist on call Cytology.
Ultrasound guided FNAC is done every Tuesday and Wednesday (2pm-5pm) in Radiology Department conducted by Radiology Medical officer/ Radiologist. Cytotechnologist will present at site for smears preparation and ROSE (Rapid onset evaluation).

1. For palpation guided FNA, contact the Cytology Laboratory (Ext 367) for an appointment. Give patient's details, contact number and site of aspiration as well as name of requested personnel.
2. Lesions suitable for FNAC must be localized and clearly defined by clinical examination or by any available radiological imaging technique.
3. Vascular lesion and bleeding disorder are contraindicated for FNAC.
4. The request form should be filled legibly, complete with patient information, relevant clinical history, clinical examinations and provisional diagnosis.
5. When there is more than one lump, please state which lump/s to be aspirated. The clinician requesting the FNAC should write his/her name clearly on the request form, so that he/she would be able to be contacted if there is any query.
6. A written consent from the patient should be obtained by the attending doctor doing the FNAC.

SEMINAL FLUID ANALYSIS

1. A seminal fluid analysis is used to evaluate male fertility. The test should be performed on a minimum of 2 samples at least seven days apart over a period of 2 to 3 months because sperm count and semen consistency will vary from day to day and some conditions can temporarily affect sperm level.
2. Please call the cytology laboratory for an appointment (Ext 367). The seminal fluid analysis is performed on every Tuesday morning.
3. Clinician/ clinic staff should explain and instruct the patient to follow the seminal fluid collection guideline. This is to ensure the specimen is optimal for the analysis.
4. Please state the time of collection at the container provided and send the specimen immediately or within 1 hour after collection to the Anatomic Pathology Services Counter.
5. The analysis of seminal fluid takes about 1 hour. Please ensure that the specimen reached the laboratory not later than 8.30 a.m.
6. Inform the laboratory if the appointment is cancelled.

TURN AROUND TIME FOR CYTOLOGY REPORTS

Specimens	Lab Turn Around Time (LTAT)
Gynae Papsmear	14 calendar days
Urgent non gynae and CSF	3 working days
Urgent FNAC	3 working days
Non urgent FNAC and non gynae	14 calendar days

*Please note that LTAT of specimens does not include cases that need cell block, ancillary test or subjects of referrals. Any inquiries about the requested case should be made to pathologist/ medical officer reporting the cases.

DISPATCHING RESULT

1. All cytology reports are available both in hard copy and in LIS system (Lab Information System).
2. For Hospital Pakar Sultanah Fatimah Muar, the hard copy is dispatched to respective clinics. Some of the clinics can view the results via ward enquiry system. This system can only be logged in by authorized personnel who is appointed by the department.
3. For other hospitals, the printed reports will be delivered to the respective hospital's personnel when they send the specimen to the unit. Ward enquiry system is also availabe in the Pathology Department of Hospital Batu Pahat and Hospital Segamat.

LIST OF CYTOLOGY IN-HOUSE TESTS

NO	TEST	SPECIMEN TYPE	TUBE/CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
1	Ascites fluid for cytology	Ascites fluid	Sterile specimen container	As collected	PER PAT 301 (Duplicated form)	Non urgent: 14 working days / Urgent: 3 working days	Send immediately. If delayed is anticipated fix 20ml of specimen with equal volume of 50% ethyl alcohol & refrigerate at 4°c
2	Bronchial alveolar lavage (BAL) for cytology	BAL fluid	Sterile specimen container	As collected	PER PAT 301 (Duplicated form)	Non urgent: 14 working days / Urgent: 3 working days	Send immediately. If delayed is anticipated fix 20ml of specimen with equal volume of 50% ethyl alcohol & refrigerate at 4°c
3	Bronchial brushing for cytology	Bronchial fluid	Place smeared slides in a closed container containing 95% ethyl alcohol (minimum 30 minutes)	As collected	PER PAT 301 (Duplicated form)	Non urgent: 14 working days / Urgent: 3 working days	Minimum 2 slides.
4	Bronchial washing for cytology	Bronchial fluid	Sterile specimen container	As collected	PER PAT 301 (Duplicated form)	Non urgent: 14 working days / Urgent: 3 working days	Send immediately. If delayed is anticipated fix 20ml of specimen with equal volume of 50% ethyl alcohol & refrigerate at 4°c
5	Cerebrospinal fluid (CSF) for cytology	Cerebrospinal fluid (CSF)	Sterile bijou bottle	As collected	PER PAT 301 (Duplicated form)	Non urgent: 14 working days / Urgent: 3 working days	Send immediately. If delay is anticipated, keep refrigerated at 4ºC

NO	TEST	SPECIMEN TYPE	TUBE/CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
6	Cystic fluid for cytology	Cystic fluid	Sterile specimen container	As collected	PER PAT 301 (Duplicated form)	Non urgent: 14 working days / Urgent: 3 working days	Send immediately. If delayed is anticipated fix 20ml of specimen with equal volume of 50% ethyl alcohol & refrigerate at 4°c.
7	Eye fluids for cytology	Eye fluid	Sterile bijou bottle	As collected	PER PAT 301 (Duplicated form)	Non urgent: 14 working days / Urgent: 3 working days	Send immediately. If delay is anticipated, keep refrigerated at 4ºC
8	Fine Needle Aspiration for cytology (FNAC)	Breast, thyroid, salivary glands, lymph node, other superficial lumps or palpable lumps. Deep seated masses or non palpable lump (with radiological imaging guided)	Send patient to surgical clinic (SOPD)/ utrasound room/ CT room	Direct smear	PER PAT 301 (Duplicated form)	Non urgent: 14 working days / Urgent: 3 working days	FNA done by appointment, FNAC with radiological imaging guided to call radiology department.
9	Nipple discharge for cytology	Nipple discharge	Placed smeared slides in clean container that contained 95% ethyl alcohol.	As collected	PER PAT 301 (Duplicated form)	Non urgent: 14 working days / Urgent: 3 working days	Minimum 2 slides.

NO	TEST	SPECIMEN TYPE	TUBE/CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
10	Pap smear - Liquid based for cytology (LBC)	Cervical/ Vagina smear	BD SurePath Vial	As collected	PS 1/98 (Pindaan 2019)	Non urgent / Urgent: 14 working days.	Detached brush head in BD Surepath vial.
11	Pap smear - Conventional	Cervical/ Vagina smear	Slides	As collected	PS 1/98 (Pindaan 2019)	Non urgent / Urgent: 14 working days.	Fixed slide with 95% alcohol.
12	Percardial fluid for cytology	Pericardial fluid	Sterile specimen container	As collected	PER PAT 301 (Duplicated form)	Non urgent: 14 working days / Urgent: 3 working days	Send immediately. If delayed is anticipated fix 20ml of specimen with equal volume of 50% ethyl alcohol & refrigerate at 4°c
13	Peritoneal fluid for cytology	Peritoneal fluid	Sterile specimen container	As collected	PER PAT 301 (Duplicated form)	Non urgent: 14 working days / Urgent: 3 working days	Send immediately. If delayed is anticipated fix 20ml of specimen with equal volume of 50% ethyl alcohol & refrigerate at 4°c
14	Pleural for cytology	Pleural fluid	Sterile specimen container	As collected	PER PAT 301 (Duplicated form)	Non urgent: 14 working days / Urgent: 3 working days	Send immediately. If delayed is anticipated fix 20ml of specimen with equal volume of 50% ethyl alcohol & refrigerate at 4°c
15	Seminal fluid analisis (SFA)	Seminal fluid	Sterile specimen container	As collected	PER PAT 301 (Duplicated form)	Non urgent / Urgent: 14 working days.	Send early morning and within 1 hour after collection. SFA need by appoinment (Every Tuesday)
16	Sputum for cytology	Sputum	Sterile specimen container	As collected	PER PAT 301 (Duplicated form)	Non urgent: 14 working days / Urgent: 3 working days	Fresh morning specimen produces from deep cough (minimum of 3 samples over 3 consecutive days). Send fresh sample immediately

NO	TEST	SPECIMEN TYPE	TUBE/CONTAINER	VOLUME	REQUEST FORM	LTAT	REMARKS
17	Synovial fluid for cytology	Synovial fluid	Sterile specimen container	As collected	PER PAT 301 (Duplicated form)	Non urgent: 14 working days / Urgent: 3 working days	Send immediately. If delayed is anticipated fix 20ml of specimen with equal volume of 50% ethyl alcohol & refrigerate at 4°c
18	Urine for cytology	Urine	Sterile specimen container	As collected	PER PAT 301 (Duplicated form)	Non urgent: 14 working days / Urgent: 3 working days	Send immediately. 50-100ml freshly voided urine preferable mid-morning. (Avoid urine as cells are too degenerate for microscopy)
19	Vitreous fluid for cytology	Vitreous fluid	Sterile specimen container	As collected	PER PAT 301 (Duplicated form)	Non urgent: 14 working days / Urgent: 3 working days	Send immediately. If delay is anticipated, keep refrigerated at 4ºC

LIST OF CYTOLOGY SEND AWAY TESTS

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	LTAT	REMARKS
1	EGFR test	Cell block	NA	5 slides of biopsied tissue cut at 5mm thickness	BORANG PERMOHONAN UJIAN MOLEKULAR (HTA/PAT/GEN/PK-01-02)	Molecular Genetic Lab Hospital Tunku Azizah	30 Calendar day	
2	Pap smear - Liquid based for cytology (LBC)	Cervical/ Vagina smear	BD SurePath Vial	As collected	PS 1/98 (Pindaan 2019)	Hospital Pakar Sultanah Aminah Johor Bahru (HSAJB)	14 Calendar day	Send away for processing only

HPSF 2025

TRANSFUSION MEDICINE

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TRANSFUSION MEDICINE

INTRODUCTION:

The Transfusion Medicine Unit in Department of Pathology, HPSF provides supportive services, mainly supplying blood and blood components to the patients in Hospital Pakar Sultanah Fatimah, as well as other private and government hospitals in the region. With an increase in blood needs, the involvement of the public as voluntary non remunerated blood donors are important in maintaining a sufficient level of blood supply. Unit's main objective is to provide adequate, safe and quality blood and blood product to the patient needs.

SERVICES:

Involved in processes of :

1. Blood donor procurement activity
2. Promotional of blood donation activity
3. Recruitment and maintaining blood donor
4. Processing whole blood into different blood component
5. Inventory management of blood and blood product
6. Immunohaematology laboratory (crossmatching lab)

TESTS DONE IN TRANSFUSION MEDICINE LABORATORY

TEST	REQUIRED FORM	SPECIMEN	CONTAINER	COLLECTION	LTAT
ABO & RhD GROUPING	PER-PAT 301	Blood	K2 EDTA	2 ml	24 hours (working days). Sample during weekend / Public Holiday will be proceed on next working day.
GXM (Group & Crossmatch)	PPDK 5-Pin1/97 or PER-SS-BT 105 (Pind.1/2016)	Blood	K2 EDTA	2ml	Refer to TAT & Requirements For Blood & Blood Component Requests
GSH (Group, Screen & Hold)	PPDK 5-Pin1/97 or PER-SS-BT 105 (Pind.1/2016)	Blood	K2 EDTA	2 ml	2 hours. GSH will be kept for 48 hours unless for special cases after granted by TMS
Coombs Test	PER-PAT 301	Blood	K2 EDTA	2 ml	3 working days (If urgent, consult with TMS in charge)
Transfusion Reaction Tests	BTS/TR/2/2016	Refer to the attached protocol	Refer to the attached protocol	Refer to the attached protocol	Acute haemolytic = 3 working days Non haemolytic / Others =10 working days
Anti ABO titre	PER-PAT 301	Blood	K2 EDTA	6ml	7 working days

NOTE :

The **Blood Transfusion Request Form PER-SS-BT 105 (Pind. 1/2016)** must be filled up **COMPLETELY, CLEARLY** AND **CORRECTLY** :

1. **Patient's Name, Identification No., RN (Hospital Registration No.), Ward**
2. Diagnosis & Indication For Transfusion
3. The Consultant / Physician
4. The number of units of blood / blood components requested
5. The time the blood / blood components are required
6. **The requesting doctor's Name, Signature & Stamp**
7. **No discrepancy of data** between the form and the label of the sample

Protocol For Blood Transfusion Reaction Investigations

NO.	TEST	REQUIRED FORM	SPECIMEN	CONTAINER	COLLECTION
1.	PBF (Only for case suspected haemolytic transfusion reaction/ severe transfusion reaction/ requested by TMS)	PER-PAT 301	Blood	K2 EDTA	2 ml
2.	Immunohematology test (Repeat of Blood Grouping, Crossmatching, antibody screening and Coombs test)	PER-PAT 301	Blood	K2 EDTA	10 ml
3.	UFEME (Only for case suspected haemolytic transfusion reaction/ severe transfusion reaction/ requested by TMS)	PER-PAT 301	Urine	Sterile Container	Minimum 10 ml
4.	Blood bag which is suspected to cause the reaction (Together with the administration set without the IV needle, the attached IV solution & all related forms and labels)	BTS/TR/2/2016	Please ensure sterility of the blood/ component to ensure a reliable culture result		
5.	Blood C&S (from patient and blood bag) - only for case suspected bacterial contamination	PER-PAT 301	Blood	C&S bottle	Minimum 15ML

1. For Post Transfusion Sample **1** (immediately after reaction) : Send sample for investigation **No 2 only** EXCEPT for case suspected of haemolytic transfusion reaction or bacterial contamination

2. For Post Transfusion Sample **2** (**24 hrs** after reaction) : (Only for case suspected haemolytic transfusion reaction / severe transfusion reaction / requested by TMS)

***SEND ALL THE SAMPLES AND FORMS TO THE BLOOD BANK COUNTER**

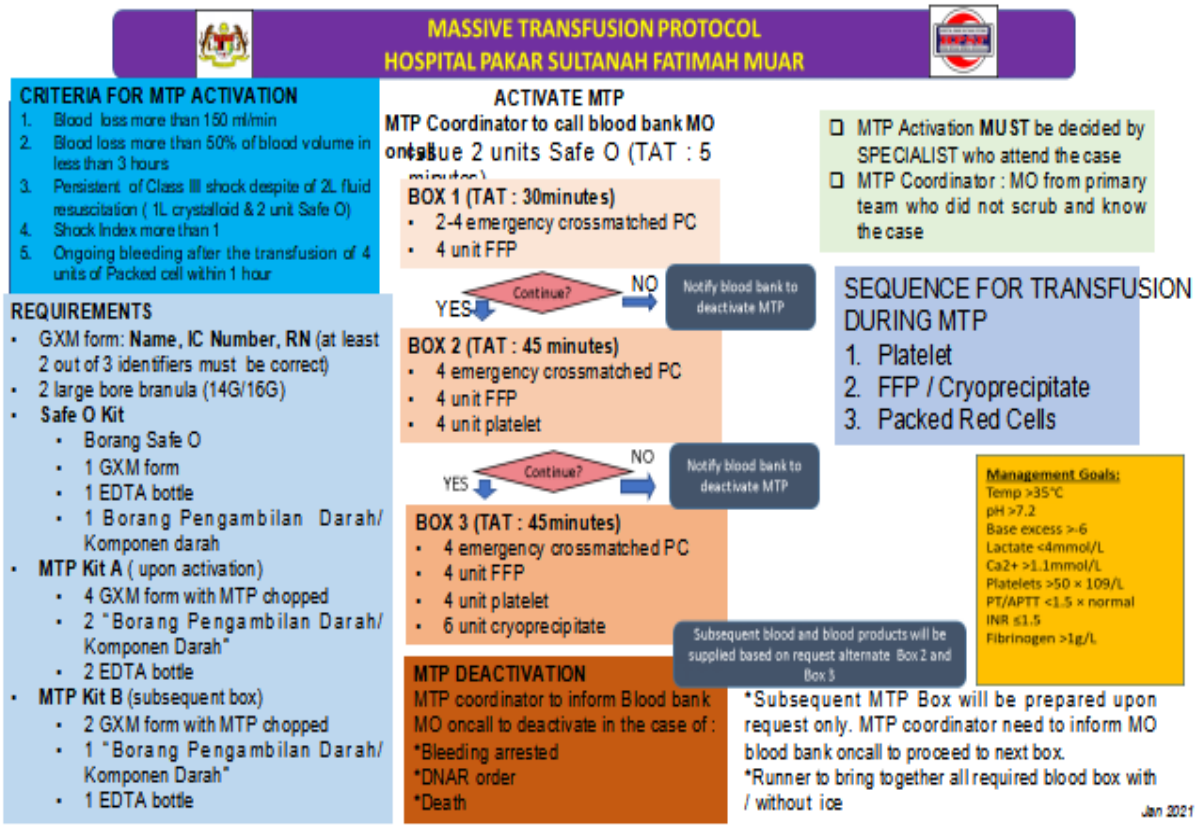
MAXIMUM SURGICAL BLOOD ORDERING SCHEDULE
HOSPITAL PAKAR SULTANAH FATIMAH MUAR

GENERAL SURGERY	
GSH	**GXM**
Inguinal hernia repair	**4 pints**
Hiatus hernia repair (abdominal)	Abdominal perineal resection/ Anterior resection
Mastectomy	Whipple's procedure
Cholecystectomy	**3 pints**
Thyroidectomy	Hepatectomy
(Hemithyroidectomy /	**2 pints**
Total thyroidectomy)	Gastrectomy
Small bowel resection	Laporotomy of perforated viscus
Laporotomy	Splenectomy
Varicose vein	**Others**
Colostomy closure	Hemicolectomy 1-2 pints*
	Intra-abdominal injury 2-4 pints*
OBSTETRIC & GYNAECOLOGY	
GSH	**GXM**
LSCS	**2 pints**
Suction& curettage/ D&C	LSCS for placenta previa
Hysterectomy	Molar pregnancy
TAHBSO	Laporotomy for ectopic pregnancy
Laparoscopic cystectomy	Hysterectomy for severe endometriosis
Myomectomy	Hysterectomy- Wertheim
Laporotomy	
ORTHOPAEDIC	
GSH	**GXM**
Amputation above and below knee	**2 pints**
Arthroscopic repair	Total hip replacement
Open reduction internal fixation	Total knee replacement*
Bone grafting	Revision of THR/TKR
Orthopaedic wound debridement under GA	Resection of bone tumour*
Hemiarthroplasty	Plating femur
Dynamic hip screw	Proximal femoral nailing
Discectomy	**Others**
	Spinal fusion 2-4 pints*
OTORHINOLARYNGOLOGY (ORL)	
GSH	**GXM**
Laryngectomy	**2 pints**
Parotidectomy	Neck dissection
Submandibulectomy	Maxillectomy
	Mandibulectomy
	Glossectomy

TURN AROUND TIME AND REQUIREMENT FOR BLOOD & BLOOD COMPONENT REQUEST

	SAFE O (PACKED CELLS GROUP O)	EMERGENCY SALINE GXM	ROUTINE BLOOD REQUEST	GSH	PLATELET/FFP/ CRYOPRECIPITATE
LTAT (calculated from the time sample REACH to laboratory)	In urgent case, Safe O (Packed cells group O unmatched) will be given STAT.	30 minutes	Office hours: 3-4 hours After office hours (only in selected case): 4 hours Special case (semi urgent case, with grant): 2 hours	3-4 hours *Positive antibody screening (new case or old case, alert MO blood bank)	30 minute *for FFP and cryo, need time for thawing
CODE	No need	Need code, have to call MO blood bank on call	Need code, have to call MO blood bank on call	No need code (GSH request screening done by MO)	Need code, have to call MO blood bank on call
Duration blood keep in blood bank	-	24 hours	24 hours	48 hours (duration sample keep for XM if needed)	Not applicable (Once request must transfuse)
Special requirement	DR to 'run for blood'	DR to 'run for blood'	Different code for different scenarios	According to MSBOS	Need separate GXM form from PC request. No need sample if known blood group.

PROCEDURE FOR MASSIVE TRANSFUSION PROTOCOL



LIST OF TRANSFUSION MEDICINE TESTS

NO	TEST	SPECIMEN TYPE	TUBE/CONTAINER	VOLUME	REQUEST FORM	REMARKS
1	ABO & RhD Grouping	Blood	K2 EDTA	2-3 ml	PER PAT 301	N/A
5	ABO Antibody Titre	Blood	K2 EDTA	2-3 ml	PER PAT 301	Need grant from TMS
4	Coomb's Test	Blood	K2 EDTA	2-3 ml	PER PAT 301	N/A
3	Group and Crossmatching	Blood	K2 EDTA	2-3 ml	PER-SS-BT 105 (Pind. 1/2016)	Need code from MO
2	Group, Screen and Hold	Blood	K2 EDTA	2-3 ml	PER-SS-BT 105 (Pind. 1/2016)	N/A

LIST OF TRANSFUSION MEDICINE SEND AWAY TESTS

NO	TEST	SPECIMEN TYPE	TUBE/ CONTAINER	VOLUME	REQUEST FORM	EXTERNAL REFERRAL LAB	REMARKS
1	Antibody identification	Blood	K2 EDTA & Plain Tube	10 ml	PER PAT with or without GXM	**HSAJB / PDN**	N/A
2	Investigation for TRALI	Blood	K2EDTA Tube &Plain Tube / Gel Separator tube	12 ml for donor & recipient	PDN/HI/QP-02/11 & PDN/HI/QP-02/12	**PDN**	Form need to be downloaded from PDN Website. Need to spoken to TMS oncall PDN
3	Platelet Immunology Test	Blood	K2 EDTA & Plain Tube	10 ml	PDN/IH/QP05/02	**PDN**	Form need to be downloaded from PDN Website. Need to spoken to TMS oncall PDN
4	RBC / Platelet Genotyping	Blood	EDTA, non gel tube :	2-4mL	PDN-Immunohematology Test Request form PDN/IH/QP-05/01	**PDN**	Form need to be downloaded from PDN Website. Need to spoken to TMS oncall PDN
5	Red Cell Phenotyping	Blood	K2 EDTA & Plain Tube	10 ml	PER PAT	**HSAJB / PDN**	N/A

ANNEX I

REQUEST FORMS

GENERAL

1. PER-PAT 301

CHEMICAL PATHOLOGY

1. IEM Request Form Biochemistry Unit (IMR/SDC/BC/FORM-RQ_Version 7.0)
2. IEM Request Form Unit Protein Khas (IMR.SDC.UPK.REQUEST FORM Version 3.0)
3. IEM Request Form Molecular Diagnostics Unit (IMR/SDC/UMD/REQUEST FORM Version 9.5)
4. HKL Antifungal Therapeutic Drug Monitoring (TDM) Request Form (v2_June 2025)
5. Borang Permohonan Ujian IEM Hospital Tunku Azizah (HTA/PAT/GEN/PK-01-03)
6. Borang Permohonan Ujian Makmal (Spesimen Klinikal) Makmal Kesihatan Awam (MKAK-BPU-U01/Rev2018)
7. Borang Permintaan Ujian Dadah Dalam Air Kencing (UPD-1(PINDAAN 2020))
8. Borang Permohonan bagi Pemeriksaan Forensik/Toksikologi Jabatan Kimia (Kimia 15-Pin.2/2016)

MICROBIOLOGY

1. HSAJB TORCHES Request Form
2. IMR Acute Flaccid Paralysis (AFP) Case Investigation Form
3. IMR Autoimmune Request Form
4. IMR Bacteriology Request Form
5. IMR Brucellosis Laboratory Request Form (For Serology & PCR)
6. IMR HIV Genotyping Resistance Testing
7. IMR HLA Antibody Test Request Form (PRA.DSA)
8. IMR HLA Crossmatch Test Request Form (Living Donor)
9. IMR HLA Typing Test Request Form (Disease Association)
10. IMR HLA Typing Test Request Form
11. IMR Leptospirosis Laboratory Request Form (For Leptospira PCR)
12. IMR PID-Request-Form-4.0
13. IMR Ujian HIV PCR Di Kalangan Bayi
14. MKA Borang permohonan dan keputusan ujian makmal measles
15. MKA Borang permohonan Ujian HFMD
16. MKA Borang permohonan ujian tibi
17. MKA Laboratory Request Form BPU-2018v1 (For leptospira serology & MAT)
18. MKA Laboratory Request Form for Dengue AND Flavivirus
19. MKA Mycobacterium leprae viability drug sensitivity test request form
20. IMR Virology Request Form
21. Rickettsia request form
22. IMR Mycology Request Form
23. IMR Allergy Form

HEMATOLOGY

1. Cytogenetic Request Form
2. MOLECULAR-FORM-V6.2-updated-on-7 June 2024
3. Specialized Hematology AMPANG request form Ver01-2016_12-Jan-2016
4. Molekular Leukimia
5. Molekular Hemofilia
6. Thalasemia DNA Request
7. Molecular Test Request Form
8. Consent Form South East Asian Ovalocytosis

HISTOPATHOLOGY & CYTOLOGY

1. 20180312 CYTOLOGY FORM
2. Borang Peminjaman Slaid Dan Blok Unit Histopatologi
3. Fresh Frozen Section Request Form

TRANSFUSION MEDICINE

1. BTS/TR/2016
2. MOLECULAR-FORM-V6.2-updated-on-2nd-Jan-2018

All request forms are accessible via the link below:
https://jknjohor.moh.gov.my/hpsf/borang/

or scan this QR

HPSF 2025

ANNEX II
COMPLAINTS

HANDLING OF COMPLAINTS AT PATHOLOGY DEPARTMENT HPSF MUAR

INTRODUCTION

A complaint is a dissatisfaction statement of customer or public with actions, policies, practices and services delivery by the Department of Pathology that are felt to be unfair, non-compliant with existing laws and/or regulations including misconduct, malpractice, misuse power and mismanagement.

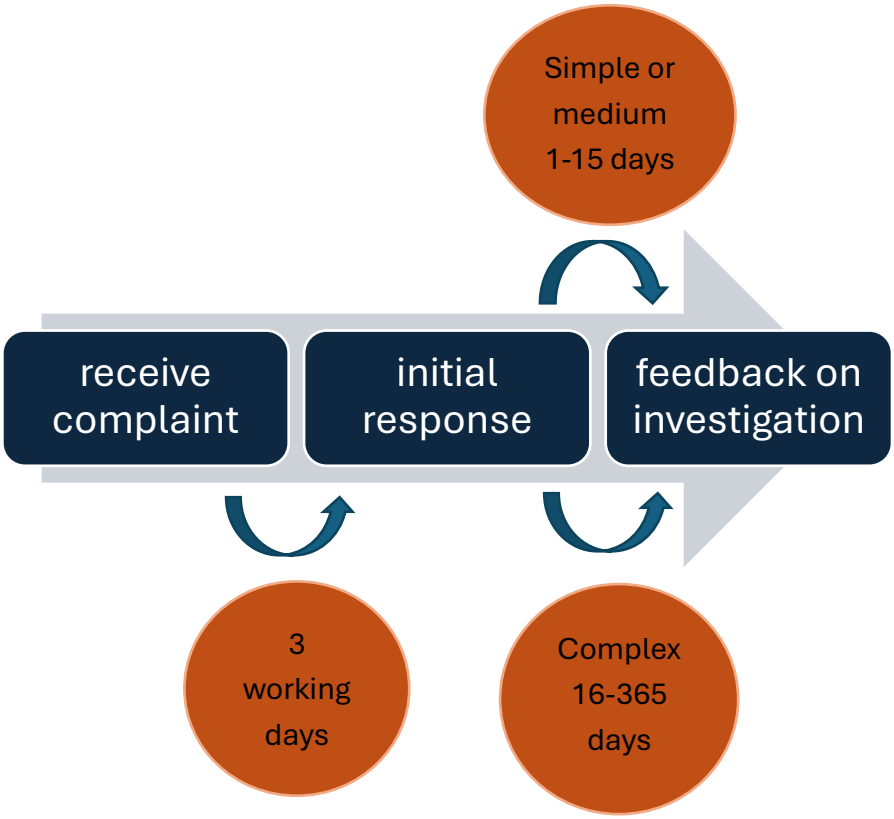
The source of receiving complaints is through:

1. SiSPAA (Public Complaint Management System)
2. Official letter and cover letter
3. Email and fax
4. Present in person
5. Telephone
6. Suggestion/complaint box
7. Mass media (print media/ electronic/ online)
8. Social media (Facebook, Twitter, Youtube, Instagram)
9. Bureau of Public Complaint

COMPLAINT HANDLING PROCEDURE

NO	PROCEDURE	REMARKS
1.	MAKE A COMPLAINT	• Customers can channel complaints related to the Pathology Department through the source mentioned above. • Make sure the details of the complainant and the description of the complaint are complete. • Complaints will not be investigated if the information provided is incomplete.
2.	INITIAL RESPONSE	• An initial response will be given to the complainant within 3 working days.
3.	INVESTIGATION	• Complaint investigation is carried out. • Complaints will be determined as well-founded or unfounded. • Complaints will be investigated within a specified time period based on the category of complaint (Please refer to chart). • Corrective, improvement and preventive actions are implemented.
4.	RESULT OF INVESTIGATION	5. The result of the investigation is informed to the complainant.

SUMMARY



SUGGESTIONS AND COMMENTS

The Department of Pathology welcomes any suggestions, views and comments from all parties to improve the quality of our services. Complaints, suggestions or views can also be channelled through the Google Form application that has been provided by scanning the following QR Code:

Google Form address:

https://docs.google.com/forms/d/e/1FAIpQLSfDj0UGIw2Iz-I4_kZkva84tqoVjB_8Ndnta4YjWxRmfQeqtA/viewform