KEMENTERIAN KESIHATAN MALAYSIA

Pathology Services Handbook

2nd Edition

2025

Institut Kanser Negara

Putrajaya

FOREWORD

DIRECTOR OF INSTITUT KANSER NEGARA

All praise to His glory grace, I cordially welcome the 2nd edition of the IKN Pathology Service Handbook. This milestone marks the highest commitment and effort by the Pathology Department, Institut Kanser Negara (IKN) in providing excellent services to its clients.

This also signifies the importance of reliable pathology services in aiding clinicians to make the correct diagnosis for timely and apt treatment.

I would like to congratulate Dr. Suhaila binti Md Hanapiah, the Head of Pathology Department, IKN, the editorial team and all contributors for their commendable efforts in revising and updating this handbook. This handbook shall serve as a reference in providing quality and safe pathology services for our staff and patients. We, at IKN shall continue to embrace and accomplish the highest standard of pathology services at all time.

Thank you.

Dr. Nur Aslina binti Bahakodin
Director
Institut Kanser Negara, Putrajaya

FOREWORD

HEAD OF PATHOLOGY DEPARTMENT

This handbook was written with a lot of hard work and dedication from the Pathology Editorial Board. I would like to congratulate and extend my appreciation to all committee members in the successful development and publication of this handbook, contingently showing our enthusiasm to improve the quality of services in the Pathology Department of Institut Kanser Negara, Putrajaya.

All efforts have been taken to ensure that information provided in this handbook is current and accurate at the time of issued. All medical personnel should use this manual as a guide for individual testing based on the clinical findings.

We are determined to provide a responsive service to our patients and clinicians while concentrating on improving our customer focus by adding value to everything we do. We always welcome comments, suggestions and encourage discussions on how we can improve our services to assist clinicians and patients in line with MS ISO 15189 and MSQH standards.

Should amendments be required to any section of this manual and impacting the service, the laboratory will promptly advise you.

Thank you.

Dr. Suhaila binti Md. Hanapiah,
Head of Pathology Department
Institut Kanser Negara, Putrajaya

PATHOLOGY SERVICES HANDBOOK 2025

2nd EDITION

EDITORIAL BOARD

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VISION

To provide a comprehensive and high quality diagnostic service, which is innovative, efficient and cost effective in information and technology based environment.

MISSION

To work together as a team to provide an efficient, reliable and high quality service towards achieving excellence in patients' healthcare, delivered in a caring and friendly environment.

OBJECTIVE

The department strives to achieve the following objectives:

3.1 To provide medical laboratory services including testing and consultative services in Chemical Pathology, Microbiology and Serology, Haematology, Anatomical Pathology and Transfusion Medicine Services;

3.2 To provide training in technical and analytical skills to the laboratory personnel and staff of the institute and other hospitals, clinics, institution of higher learning and other government agencies;

3.3 To conduct researches as well as collaborations with other agencies in the development of medical research; and

3.4 To provide blood and blood products

CLIENT CHARTER

- To provide high quality, fast and customer friendly diagnostic services.
- Each customer will be treated professionally, ethically and when needed, to provide explanation regarding relevant pathology services.
- All test results shall be treated with strict confidentiality.

GENERAL OPERATING PROCEDURE

1.1 Introduction

The Pathology Department is one of the Clinical Support Services available in the Institut Kanser Negara (IKN). It provides medical laboratory diagnostic and consultative assistance to the entire clinical services.

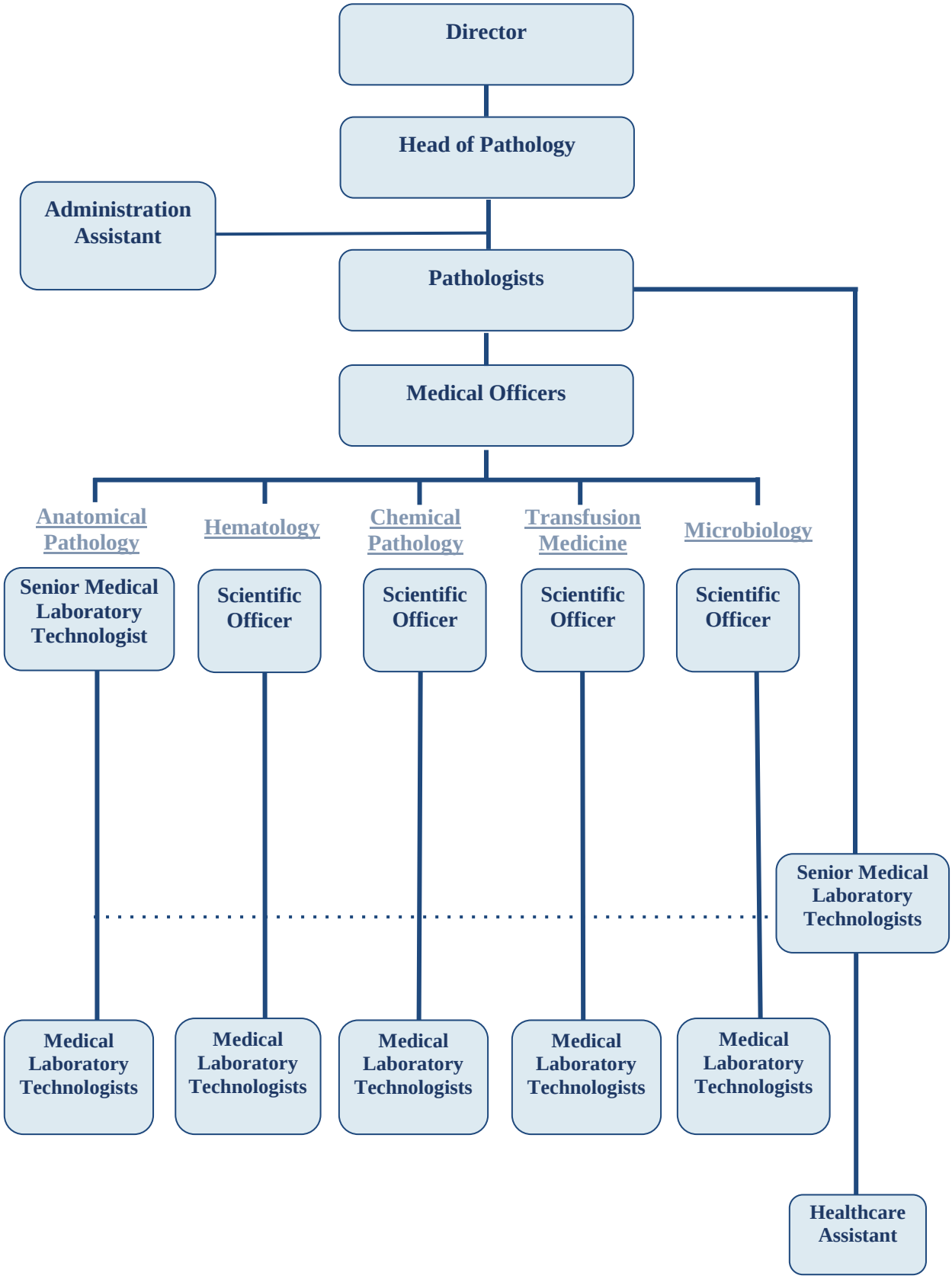
1.2 Location

Pathology Department, Level 4, Institut Kanser Negara.

1.3 Service Hours

<table>
<tr><th>OFFICE HOURS</th><th colspan="2">AFTER OFFICE HOURS</th></tr>
<tr><td rowspan="3">Monday – Friday
8.00 am – 5.00 pm</td><td>Monday – Friday</td><td>5.00 pm – 8.00 am</td></tr>
<tr><td>Saturday - Sunday</td><td rowspan="2">24 hours</td></tr>
<tr><td>Public Holidays</td></tr>
</table>

1.4 Organization Chart



1.5 Scope of Services

1.5.1 The Pathology Department provides the following services:

UNIT	SCOPE
Chemical Pathology	Routine Chemistry, Immunoassay, Special Chemistry (Tumour Marker), Blood Gas Analysis & Body Fluid Analysis
Haematology	General Haematology & Coagulation Test
Microbiology	Bacteriology, Serology, Immunology, Virology, Parasitology & Mycology
Transfusion Medicine	Immunohaematology & Supply of Blood and Blood Products
Anatomical Pathology	Specimens referred to Hospital Putrajaya, Hospital Kuala Lumpur, Hospital Tuanku Azizah & Institute of Medical Research

1.5.2 The lists of tests offered by Pathology Department include tests that are referred to the following sites:

(a) Hospital Putrajaya(HPj)
(b) Hospital Kuala Lumpur(HKL)
(c) Hospital Sultan Idris Shah
(d) Hospital Sungai Buloh
(e) Hospital Ampang
(f) Hospital Tunku Azizah(HTA)
(g) Pusat Darah Negara (PDN)
(h) Institute of Medical Research (IMR)
(i) Institute of Medical Respiratory (IPR)
(j) Jabatan Kimia Malaysia
(k) Makmal Kesihatan Awam Sungai Buloh (MKAK)

1.5.3 For the list of referred test and location, please refer **List of Referred Tests** page.

1.6 Advisory Services

The Pathology Department provides users with the following services and information:

i) Advises on the choice of examinations and use of the services, including required type of specimen, clinical indications and limitations of examination procedures, and the frequency of requesting the examination;

ii) Advises on individual clinical cases;

iii) Provides interpretation of the results of examinations;

iv) Promotes the effective utilization of laboratory services; and

v) Consultation on scientific and logistic matters

Note:

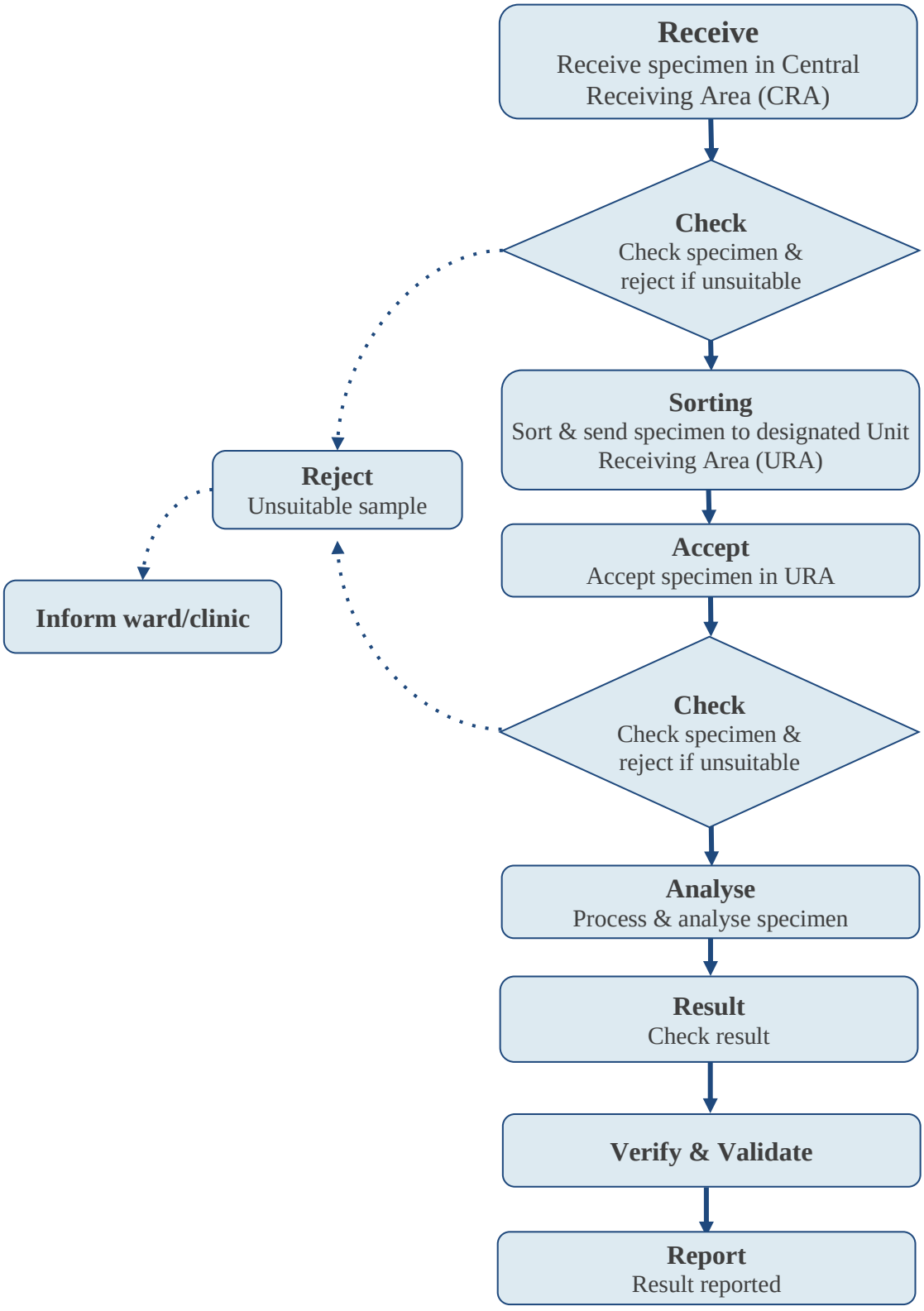
For further information, please contact the appropriate personnel:

- Head of Department – ext. 5458
- Clinical Microbiologist – ext. 4115
- Chemical Pathologist – ext. 4114

1.7 Communication

LOCATION	EXTENSION	DIRECT LINE
General Number		03-88925555
Head of Department	5458	03-88925458
Office	4129	
Senior MLT	4130	
Medical Officer	4128	
Receiving Counter	4104	
Chemical Pathology		
Chemical Pathologist	4114	
Scientific Officer	4126/ 4127/ 4111/ 4109	
Laboratory	4120/ 4121/ 4123/ 4124	
Haematology		
Scientific Officer	4113	
Laboratory	4118/4283	
Transfusion Medicine		
Scientific Officer	4106	
Laboratory	4125/4119	
Anatomical Pathology		
Senior MLT	4107	
Laboratory	4122	
Microbiology		
Clinical Microbiologist	4115	
Scientific Officer	4108/4110/4127	
Serology Laboratory	4117	
Bacteriology Laboratory	4116	
Molecular Laboratory	4131	

1.8 General Workflow



1.9 Test Request Procedure

1.9.1 Internal Requests

i) All tests shall be requested through the Hospital Information System (HIS);

ii) Patient's diagnosis and clinical history shall be entered in the HIS to enable proper result interpretation and explanation;

iii) Fasting status and medication status shall be stated if relevant; and

iv) Any additional verbal requests using existing primary samples shall be followed by a new request order with details of requester, date and time. The request shall be made within 2 hours after report validated. Acceptance of these requests are subjected to sample stability or according to unit criteria. Any query regarding the test requests shall be answered promptly.

v) Any test not conducted by the Pathology Department will be outsourced. All requests shall be accompanied by request forms which can either be printed from HIS or manually filled up using a hard copy form.

vi) The specimen, along with the completed request form, must be sent to the Pathology Department. The specimens will then be forwarded to the appropriate referral laboratories. Refer to the list of referred tests.

1.9.2 External Requests

i) All requests shall be accompanied with a request form stating relevant information regarding:
   (a) Patient's details
   (b) Clinical history
   (c) Provisional diagnosis
   (d) Treatment given (if relevant)

ii) All requests shall be signed and stamped by the requested doctor. Please refer to the specific requirement for each test (where relevant).

1.9.3 Test Ordering during System Offline (Downtime)

i) System offline (downtime) refers to a situation where the HIS is used to order laboratory tests or the Laboratory Information System (LIS) is unable to perform LIS-assisted lab processes. During this time, all samples must be ordered, registered, processed, and results are validated manually.

ii) All requests shall be made using PER-PAT 301 form.

iii) All samples shall be manually labelled with two (2) identifiers (Patient's Name, IC or MRN) and name of test requested.

iv) The details of the samples along with the requested test name must be recorded in the Borang Penghantaran Spesimen and sent to the lab immediately.

v) It is recommended to prioritize and send only urgent samples.

vi) Results will be provided in hard copy formats, and the requestor is required to collect the reports at the lab's pigeonhole.

Note:

- Please anticipate delays in turnaround time (TAT) as all processes are being carried out manually.
- Tracing during downtime is not encouraged, as all staff will be focused on manual work processes.

1.10 Guideline for Sample Collection

1.10.1 Prior to sample collection, the identity of the patient (Name/IC Number/MRN) shall be verified.

1.10.2 Date and time of sample collections shall be stated when relevant.

1.10.3 All specimens shall be collected using the correct container according to the test requested (Refer to Type of Blood Tubes/ Containers).

1.10.4 Venous blood is the preferred blood for collection.

1.10.5 To guarantee consistent and accurate results, it is essential to adhere strictly to the required blood volume for the specified test, or fill the blood up to the marked line on the label of each individual container.

1.10.6 Strict aseptic technique shall be practiced when performing blood collection for culture and sensitivity testing.

1.10.7 To prevent haemolysis, the following steps shall be considered;

i) Avoid collecting blood from areas with haematoma; the site of collection shall be allowed to air dry after cleansing with 70% alcohol;

ii) Ensure smooth venepuncture and steady flow of blood into the syringe; and

iii) Do not force blood through needle while transferring blood into collection tube.

iv) Draw of blood shall be done in the correct order beginning with blood culture and followed by other routine blood collection tubes **(refer to section 1.11: Table Order of Draw).**

v) After the blood is drawn, gently invert the tube several times to mix the blood. Do not mix vigorously.

1.11 Order of Draw

When collecting multiple specimens, blood collection tubes shall be filled and drawn in the following order:

Order of Draw	Tubes/ Container		Mix by Inverting
1		Blood Culture Bottle Aerobe Anaerobe Myco F Lytic	Mix with swirling method
2		Citrate Tube	3 – 4 times
3		SST / Plain Tube (With/ Without Gel)	5 times
4		HeparinTube	8 – 10 times
5		EDTA	8 – 10 times
6		Fluoride Tube	8 – 10 times

1.12 Type of Blood Tube/ Container

Tube/ Container	Tube/Container Description	Common Test	Special Instructions
	Serum Separator Tube (SST) / Plain Tube with Gel	**Chemical Pathology:** Tumour Markers, Hormones, Anaemic Profile, Therapeutic Drug Monitoring (TDM) **Medical Microbiology:** Serology test	Mix sample gently by inversion 5 times
	Lithium Heparin	**Chemical Pathology:** Routine Chemistry, Troponin	Mix sample gently by inversion 8 - 10 times
	Serum/ Plain Tube without Gel	**Transfusion Medicine:** Antibody identification	Mix sample gently by inversion 5 times
	Fluoride Tube	**Chemical Pathology:** Fasting Glucose, 2HPP	Mix sample gently by inversion 8 - 10 times
	Sodium Citrate 3.2%	**Haematology:** PT/INR, APTT, DIVC, Fibrinogen, D-Dimer, Platelet in Trisodium Citrate	Mix sample gently by inversion 3 - 4 times

Tube/ Container	Tube/Container Description	Common Test	Special Instructions
	K2 EDTA	**Chemical Pathology:** HbA1c, Ammonia, iPTH, Renin **Haematology:** FBC, FBP, Reticulocyte count, Hb Analysis **Transfusion Medicine:** Blood ABO grouping, GSH, GXM Antibody Identification, Coombs Test	Mix sample gently by inversion 8 - 10 times
	Heparinized Syringe	**Chemical Pathology:** Arterial & Venous Blood Gases	Mix well
	Blood Culture Bottle (Aerobic/ Anaerobic)	**Medical Microbiology:** Blood Culture & Sensitivity (C&S)	Mix with swirling method
	Myco F Lytic Bottle	**Medical Microbiology:** Blood for Fungal/ Blood for *Mycobacterium*	Mix with swirling method
	Viral Transport Media (VTM) with Dacron Swab	**Medical Microbiology:** Viral isolation, PCR eg: H1N1, Mers-CoV, adenovirus etc.	

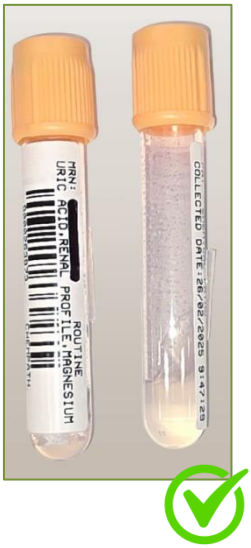
Tube/ Container	Tube/Container Description	Common Test	Special Instructions
	Cotton swab with Amies Transport Media	**Medical Microbiology:** Culture & Sensitivity - swab from endocervical, pus, tissue, throat	
	Bijou bottle	**Chemical Pathology:** CSF & other body fluids biochemistry test **Medical Microbiology:** CSF & other body fluids culture	
	Sterile container	**Chemical Pathology:** Urine Analysis, UFEME, UPT, Body Fluid Biochemistry Test **Medical Microbiology:** Culture & Sensitivity for urine/ pus aspirate/ body fluid/ tissue TB Culture & Sensitivity **Histopathology & Cytology:** Small tissues/biopsy FNAC specimen	Add 10% formalin
	24hrs Urine Container	**Chemical Pathology:** 24 hrs urine chemistry	

Tube/ Container	Tube/Container Description	Common Test	Special Instructions
	Stool container	**Chemical Pathology:** Stool Occult Blood **Medical Microbiology:** Stool C & S, Stool for Ova & Cyst, Stool for Parasite	
	Disposable Specimen Container	**Histopathology & Cytology:** Surgical specimen for Histopathological Examination (HPE)	Add 10% formalin (ratio of 1:10)

1.13 Specimen Labelling

Proper labelling of blood tubes/ specimen containers is crucial to avoid errors, prevent misidentification, and ensure the accuracy and reliability of test results.

As to ensure accurate identification and prevent errors, specimens shall be labelled as follow:

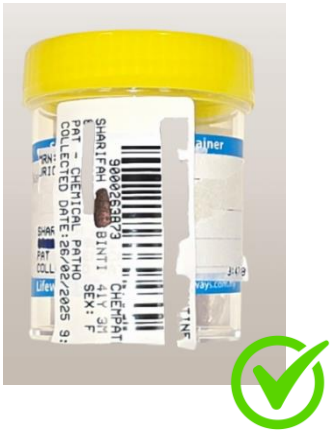
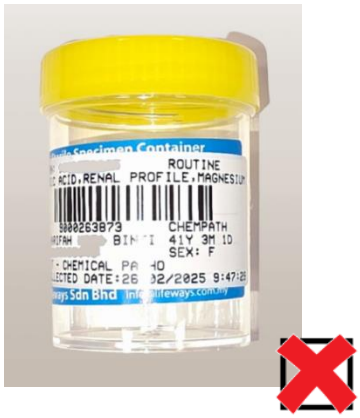
Tube/ Container	Description
Blood tube 	• The label shall be placed around the circumference of the tube, leaving enough space between the label, the top rim (cap) and the bottom of tube. • The label shall be in **VERTICAL** orientation. • Place the label **without obstructing the clear side** of tube as this area is used to view the level of blood in the tube. • The label shall be properly aligned and placed flat against the surface. **Avoid wrinkling or folding** as this could distort the barcode's readability. • Ensure the label printed clearly with adequate ink distribution. Unclear label with barcode distortion will result in incomplete information and failed to be scanned by the automated analyser.

Label obstructed the clear side

Horizontal orientation

Label placed too low

Misaligned label

Tube/ Container	Description
Urine Container	• The label shall be placed in **VERTICAL** orientation. • The label shall be properly aligned without obstructing the lid of the container.  
Culture & Sensitivity (C&S) Bottle	• The label shall be placed in VERTICAL orientation. • Each bottle has its own unique barcode. Therefore, **DO NOT OVERLAP** the barcode on the bottle.   Label placed overlapped the bottle's barcode

Tube/ Container	Description
Histopathological Specimen Container	Require **TWO (2) labels** for each container: 1. HIS-generated specimen barcode; and 2. Manual label which shall include details as follow: • Name, • MRN & IC No • Number of specimen • Specimen type • Date & Time 

1.14 Handling & Transportation of Samples

1.14.1 All specimens containers shall be placed in a biohazard plastic bag and attached with the respective request form (where applicable). For URGENT request, the specimens shall be placed in an urgent biohazard plastic (red labelled).

1.14.2 After collection, specimens shall be sent immediately to the laboratory via porter or pneumatic tube system.

1.14.3 Please note that ONLY blood tubes are permitted to be sent via pneumatic tube.

1.14.4 Other specimens such as urine, body fluid, cerebrospinal fluid (CSF), tissues/ biopsies SHALL NOT be sent through pneumatic tube.

1.15 Acceptance Criteria

All specimens that meet the specific criteria for the requested examination will be accepted for testing.

1.16 Rejection Criteria

1.16.1 Samples that do not meet the criteria for the requested examination shall be rejected. The requestor shall be notified if the sample is rejected.

1.16.2 Rejected samples shall be discarded.

1.16.3 General rejection criteria are as follow:

a) Wrong test ordered
b) Duplicated order
c) Wrong container
d) Empty container
e) Incomplete request form
f) No request form
g) Clotted sample
h) Sample not in ice
i) Improper barcode labelling
j) Test not offered
k) Haemolysed sample
l) Insufficient sample
m) Sample not labelled
n) Specimen leakage
o) Wrong container/ Wrong tube
p) Overfilled sample
q) Sample unsuitable for analysis
r) Contaminated specimen
s) No requesting Dr's name/ not clear
t) Lipaemic blood

1.17 Reporting of Results

1.17.1 All laboratory results shall be reported in HIS (internal requests) or sent to the registered email address (external requests).

1.17.2 The laboratory indicates in the examination report when a compromised clinically critical or irreplaceable sample is accepted and advises caution when interpreting results that can be affected.

1.17.3 Preliminary results for positive blood culture (gram stain, identification & sensitivity) shall be reported in HIS and informed verbally.

1.17.4 For any inquiries regarding results/ preliminary results, kindly call the respective unit (refer to section 1.7: Laboratory Directory).

1.18 Critical Results Notification

1.18.1 All critical results shall be notified to the requestor/ respective ward/clinic immediately once the results are ready. For further information of test involved, please refer to **1.19: List of Critical Results**.

1.18.2 Critical Result Notification Policy:

i) Only medical practitioners (Medical Officer/ Specialist), Assistant Medical Officers and Staff Nurses shall be the authorized recipients.

ii) Results shall be informed to the test requestor or any of the authorized recipients at the location specified in the form/ order request.

iii) If the location is not specified, the laboratory staffs shall identify the location of order from LIS or HIS.

iv) The first person who receives the notification from the lab shall accept and take the call even though the patient is not under his/ her care. The same shall apply in the event the patient has been transferred to another location.

v) It shall be the responsibility of the recipients to escalate the results to the respective ward.

1.19 List of Critical Results

A. Chemical Pathology

Lower Critical Limit	Analyte	Upper Critical Limit
2.8 mmol/L	Potassium	6.0 mmol/L
125 mmol/L	Sodium	155 mmol/L
2.8 mmol/L	Glucose	20 mmol/L
1.5 mmol/L	Calcium	3.0 mmol/L
0.41 mmol/L	Magnesium	2.0 mmol/L
0.32 mmol/L	Phosphate	2.87 mmol/L
7.2	pH	7.55
7.8 kPa (58mmHg)	pO2	-
-	pCO2	9.3 kPa (70mmHg)
-	Creatine Kinase	5000 U/L

B. Haematology

Lower Critical Limit	Analyte	Upper Critical Limit
6.0 g/dL	Haemoglobin	19.0 g/dL
0.2	Hematocrit	0.6
20 x 10^3/microL	Platelet	1000 x 10^3/ microl
-	INR (Ratio)	>5
-	PT (sec)	>2.5 upper limit
-	APTT (sec)	80 sec or >2x upper reference range

C. Microbiology

Test	Critical Findings
Cerebrospinal C&S	Microscopy result Positive culture result
Cerebrospinal fluid antigen detection	Positive rapid antigen detection
Blood culture	Gram stain from positive bottle
Acid fast bacilli	First (1st) positive smear result
Malaria Parasite on blood film	Presence of malaria parasite
Stool culture	*Salmonella typhi*, *Vibrio cholera*, Shigella
Blood & Sterile specimen only	ESBLs producer organism, MRSA, Multi-resistant organism(MRO), VRE, VRSA
Antigen detection	*Legionella spp*
Pernasal swab/ Throat swab	*Bordetella pertussis*, *Corynebacterium diphtheriae*
MTB genexpert	Positive MTB

1.20 Customer Feedback

We welcome any compliment, query, comment, suggestion or complaint regarding our services. Do not hesitate to give us your feedback by scanning the QR code below:

Our team shall review all feedback fairly, and we aim to respond to your inquiries, feedback or suggestions in a timely response within 2 – 4 weeks.

CHEMICAL PATHOLOGY

2 CHEMICAL PATHOLOGY

2.1 Test Instructions

2.1.1 Blood Gases Analysis

1. Use a 1 ml disposable heparinized syringe.

2. Draw 1 ml of arterial blood. Invert the syringe and remove all air bubbles inside the syringe.

3. Discard the needle to prevent needle stick injury incidence and recap with special stopper provided to avoid specimen exposure to air.

4. Mix well by rolling the syringe between palms to prevent clotting.

5. Put the syringe of blood in biohazard specimen bag, then put in slurry ice bath and send immediately to the lab.

Notes:

i) After the blood is drawn into the syringe, any air space or bubbles shall be removed.

ii) This specimen shall be kept embedded in crushed ice and sent immediately for analysis within 30 min. Any specimen exceeding this time frame shall be rejected.

iii) This specimen shall NOT be sent by pneumatic tube.

2.1.2 24-hour Urine Collection

1. The 24-hour urine bottle is available at the laboratory counter (CRA).

2. On the day of collection, the first urine shall be voided and discarded. **Time of first urine voided marked as start time** for the 24-hour collection.

3. Void urine into another clean container before pouring into the 24-hour urine container provided.

4. At the end of 24-hour, the last urine voided shall be collected.

5. Label the container with the date and time when collection started and completed.

6. Send the urine sample immediately to the laboratory. If delay is expected, refrigerate the sample to preserve its integrity.

2.1.3 24-hour Urine Metanephrine

1. Obtain a 24-hour urine container with 10 ml of 25% HCl (preservative) from the laboratory.

   Note: It is important for the requesting physician to advise the patient NOT to discard the preservative and to handle with caution.

2. Patient's preparation before the procedure:

   (a) Abstain from taking food that will increase catecholamines concentration few days before urine collection such as:
      i) All beverages containing coffee, Nescafe, tea or cocoa;
      ii) Banana, pineapple, watermelon, avocado, tomato, kiwi, eggplant and fruit juices; and
      iii) Food containing vanilla and nuts.

   (b) Stop medications which shall alter the metabolism of catecholamine at least ONE week prior to urine sampling which shall include Antipsychotics, Sympathomimetic drugs, Levodopa, Monoamine oxidase inhibitors, Alpha-2 blockers and Beta blockers, Tricyclic antidepressants and recreational drugs.

   (c) Advice patient to avoid stress, vigorous exercise and smoking prior to and during urine collection.

3. Kindly refer to **2.1.2: 24-hour Urine Collection** for the collection procedure.

2.1.4 Ammonia

1. Please inform the laboratory at least two (2) hours prior to blood collection as this is an outsource test.

2. A venous specimen is best drawn without a tourniquet or immediately after the tourniquet has been applied briefly.

3. If the tourniquet has been applied extended amount of time, it shall be removed and allow blood to be circulating for at least two (2) minutes before the venipuncture is performed.

4. Collect 2 mL of blood in a container with EDTA as anticoagulant.

5. Send sample chilled in ice slurry to the laboratory within 1 hour of collection.

2.1.5 Procalcitonin

1. The requester shall liaise with the person in charge from Pathology Department, Institut Kanser Negara before sending the request.

2. Please include the patient's clinical history.

3. At least 4 mL of blood in PLAIN TUBE shall be required for analysis.

4. Send the specimen to the laboratory immediately within 24 hours, keeping the samples below 8°C all the time by using ice packs.

5. For external specimens:
   i) Fill-up the PER.PATH 301 Forms completely by including the patient's clinical history;
   ii) Separate the serum immediately and promptly store the sample at -20°C;
   iii) Avoid grossly haemolyzed or grossly lipemic samples;
   iv) Avoid repeated freezing and thawing; and
   v) Keep the samples below 8°C all the time by using ice packs during the transportation process.

2.1.6 Glucose Tolerance Test (GTT)

1. Prior to the test, patient shall be on a diet containing no less than 200g carbohydrate.

2. Fast the patient overnight.

3. Collect fasting blood specimen.

4. Give patient 75g glucose in 250 – 300 ml water and drink within 5 minutes.

5. Collect second blood specimen after exactly two (2) hours of glucose consumption.

Notes:

i) HbA1c is the preferred test for diabetes screening. However GTT shall only be performed when HbA1c is unreliable (haemolytic conditions or haemoglobinopathies).
ii) Do not perform this test when patient is acutely unwell.
iii) The glucose solution for this test shall be obtained from the pharmacy.

2.1.7 Synacthen Test

1. Patient preparation shall be on the following:

i) Ask the patient to bring all their medications, including over the counter medications and creams and check whether they have any recent joint injection;

ii) Usual medications may be taken on the morning of the tests, but individual taking inhaled steroids, topical creams, nasal steroids, inhalers and oral steroids shall be drawn to the attention of the referring consultants to assess whether to proceed for the test; and

iii) Patients taking more than 7.5mg Prednisolone or equivalent are highly likely to be adrenally suppressed; hence the test may not be appropriate or even necessary.

2. Procedure of collection shall be on the following:

i) Take blood sample for baseline cortisol level (0 min) at 0900 am; Give 250 microgram Cosyntropin/Synacthen (synthetic ACTH) intramuscularly or intravenously;

ii) Take blood samples at 30 min and 60 min after injection for cortisol level and label samples and fill in the request forms accordingly; and

iii) Send samples and request forms to the Main Reception Counter of the Pathology Department after informing the laboratory through phone call prior to sending.

HAEMATOLOGY

3 HAEMATOLOGY

3.1 Test Instructions

3.1.1 Haemostasis Test

Example: Prothrombin Time (PT), Activated Partial Thrombin Time (APTT), D-Dimer, DIVC Screening, Factor Assay & Factor Inhibitor, etc.

1. Collect blood directly from the peripheral vein.

Notes:

- If an IV line is present, the sample site selected shall be distant from the line to avoid contamination.
- Extended tourniquet application might produce unnecessary venous stasis or in-vitro haemolysis.

2. Transfer blood into the tube until the vacuum is exhausted and the blood flow reaches the minimum fill indicator;

Notes:

- A discard tube (without additives) shall be drawn first when using butterfly systems or other IV catheter devices because the air volume contained in the tubing partially fills the vacuum tube, leading to insufficient filling of the tube.
- Contamination is possible if coagulation tubes are drawn following an additive tube like certain serum collection tubes containing clot activators. Anticoagulant like heparin will also effect on the results by inhibiting thrombin and thromboplastin.

Notes:

- Vigorous shaking, vortex or agitation of blood samples shall be avoided in order to prevent haemolysis or spurious platelet and factor activation that may result in shortened clotting times or false elevation of clotting factor activity in specimen tests (e.g. factor VII).
- Send sample to the lab at ambient temperature (15–25 °C) within the first hour after collection.

3.1.2 Bone Marrow aspiration (BMA)

1. Appointment Scheduling

An appointment shall be made through any Medical Officer (MO) from the Pathology Department at least three (3) working days before the procedure. This ensures adequate time for arrangement of the lab technologist for the procedure and to acquire special tubes from the Referral Lab for specific tests.

2. Request Forms

Complete two (2) copies of all the required request forms before the procedure.

3. Preparation and Specimen Collection

i) Ward shall ensure that all required preparations are in place before the procedure start to avoid delay in transporting the specimen to the Referral Lab.

ii) The BMA specimens shall be transported as soon as possible to ensure fresh specimens reach the Referral Lab before 12.00 noon on the same day of collection.

iii) On the day of procedure, the lab technologist shall be at the procedure room to prepare smears from bone marrow sample on the slides.

iv) The slides for BMA smears shall be prepared by the lab technologist.

v) Containers for other tests shall be prepared by the ward. Example:
   (a) Universal container with 10% formalin: trephine biopsy
   (b) EDTA Tube: Immunophenotyping/ Molecular Study
   (c) Blood Culture bottles: Bone Marrow culture

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3.1.3 Platelet in Trisodium Citrate

This test shall ONLY be requested through Laboratory suggestion or if patient has history of platelet clumping written in the FBC/FBP results.

1. Collect blood directly from the peripheral vein.

   Note:

   - If an IV line is present, the sample site selected shall be distant from the line to avoid contamination.
   - Extended tourniquet application might produce unnecessary venous stasis or in-vitro haemolysis.

2. Transfer blood into the tubes until the vacuum is exhausted and blood flow reaches the minimum fill indicator.

   Note:

   - The anticoagulant in the tube has a dilution effect that may influence the results. So, it is important to ensure blood volume reaches up to the minimum fill indicator.
   - A discard tube (without additives) must be first drawn when using butterfly systems or other IV catheter devices because the air volume contained in the tubing partially fills the vacuum tube, leading to insufficient filling of the tube with citrate.

3.2 Factors Affecting Test Results

3.2.1 Incorrect Ratio of Blood to Anticoagulant

Blood tubes with under filled or overfilled volume cause incorrect ratio of blood to anticoagulant. This sample condition may **falsely shorten or prolonged the coagulation test results**.

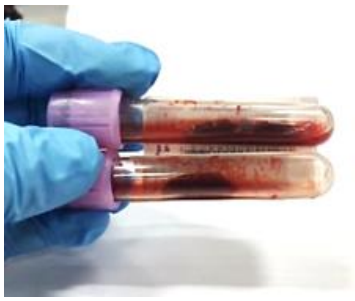
Note:

Minimum Fill Indicator represents the minimum volume of blood required for appropriate analysis.

3.2.2 Clotted Sample

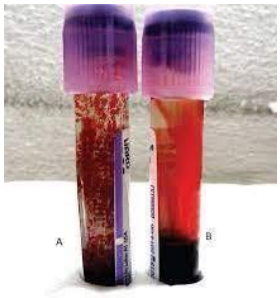
Improper phlebotomy technique may cause the release of thrombin to initiate the clotting pathway which involves the platelet and leads to platelet clumps.

Clotted sample may cause falsely low results especially for platelet count.



3.2.3 Agglutinate Sample

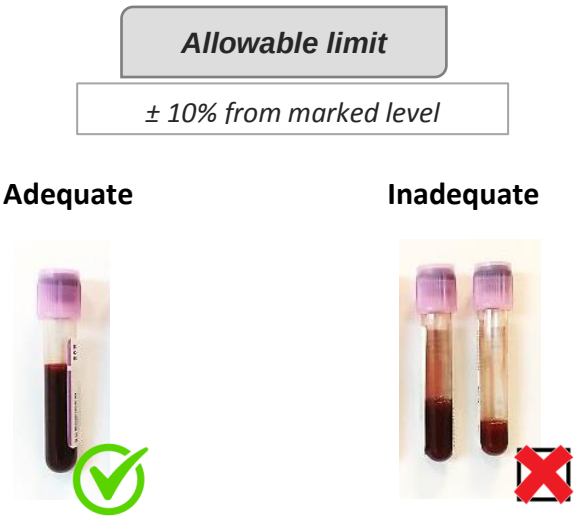
Sample with presence of agglutinated RBC are not suitable for analysis. Sample will be incubated at 37°C and analyzed depending on the level of agglutination.



3.2.4 Inadequate Sample

Inadequate sample volume collected in EDTA tube results in incorrect ratio of sample to anticoagulant (EDTA). The excess EDTA causes RBC to shrink which consequently reduce the mean cell volume and haematocrit.

Additionally, low sample volume can prevent the analyser aspirating a sufficient amount of blood, leading to falsely low cell counts.



3.2.5 Diluted Sample

Dilution effect caused by sampling proximal to IV drip causes falsely low cell count especially for red blood cells (RBC) and haemoglobin.

MEDICAL MICROBIOLOGY

4 MEDICAL MICROBIOLOGY

4.1 Introduction

The Microbiology Unit, IKN provides the following services:

4.1.1 Diagnostic microbiological services comprising of bacteriology, serology, parasitology, immunology, molecular and mycology tests of clinical specimens;

4.1.2 Participation in the hospital wide infection control and antibiotics stewardship activities related to surveillance, control and prevention of nosocomial infections;

4.1.3 Provision of the microbiologic studies of the hospital environment and sterility testing;

4.1.4 Consultative services to clinicians and other healthcare providers, contribution to the development of relevant policy, clinical care guidelines and hospital infection and antibiotics control related documentation or activity; and

4.1.5 Training and reference centre for special stain in parasitology and Gastrointestinal Protozoa PCR test.

4.2 Specimen Collection for Culture & Sensitivity (C & S) Test

4.2.1 Blood

1. An automated blood culture system with different types of bottles according to age and tests is available.

2. The blood culture bottle can be obtained from the laboratory.

3. The volume of aspirates shall be the following:
   (a) Adult: 8 – 10 mL into each Aerobic and anaerobic culture bottle
   (b) Paediatric: 2 – 3 mL into a single blood culture bottle for paediatric
   (c) For Fungal culture: 3 – 5 mL into Myco/F Lytic Bottle (to be incubated up to 30 days)
   (d) For Mycobacterium Culture: 3 – 5 mL into Myco F lytic Bottle (to be incubated up to 42 days)

4. Procedure for collection:
   i) Disinfect culture bottle by applying 70% alcohol swab to rubber stoppers & wait for 1 minute.

   ii) Disinfect the venepuncture site with 2% chlorhexidine in 70% alcohol antiseptic by swabbing concentrically, starting at the center of the skin.

   iii) Allow the disinfectant to dry and do not palpate vein at this point.

   iv) Collect the blood into each bottle.

Notes:

- *Infective endocarditis:*
  At least two (2) sets of blood culture (each containing aerobic and anaerobic bottles) shall be taken from separate venipuncture site.

- *Fever of unknown origin:*
  2-4 sets from separate sites. In the suspicion of catheter related bacteraemia, blood shall be drawn from both the line and peripheral vein and submitted concurrently.

- *Catheter- related bloodstream infection (CRBSI):*
  Blood shall be drawn from both the line and peripheral vein. All samples shall be taken at the same setting and labelled accordingly.

4.2.2 Bone Marrow Aspirate

1. Prepare puncture site as for surgical incision.

2. Collect 1 – 2 ml of aspirates and inoculate directly into the appropriate culture bottles.

4.2.3 Catheter tips/ Intravenous

1. Cleanse the skin around the catheter site with 2% chlorhexidine in 70% alcohol.

2. Aseptically remove catheter & clip 5 cm of distal tip directly into a sterile container.

3. Transport immediately to lab to prevent drying.

Note:
Do not culture Foley catheter, since growth represents distal urethral microbiota.

4.2.4 Genital samples

A. High Vaginal Swab

This is suitable for the diagnosis of candidiasis and other causes of vaginitis but not for gonorrhoea in the female.

1. Using a sterile speculum lubricated with sterile normal saline and not antiseptic cream, swab either from posterior fornix or the lateral wall of the vagina.

2. Inoculate the swab into Amies with charcoal transport media and send the specimen to the laboratory as soon as possible.

B. Endocervical Swab

This is the best specimen for the diagnosis of gonorrhoea and puerperal sepsis.

1. Under direct vision, gently compress cervix with blades of speculum and use a rotating motion with swab, obtain exudates from the endocervical canal.

2. Inoculate the swab into Amies transport median inoculate the swab into Amies with charcoal transport media.

C. Urethral Discharge (Male)

1. Wipe the urethral with a sterile gauze or swab.

2. Collect the exudate with a sterile swab and inoculate into Amies with charcoal transport media.

3. If discharge cannot be obtained by 'milking" the urethra, use a sterile swab to collect material from about 2 cm inside the urethra.

4. Place the swab into Amies with charcoal transport media.

D. Urethral Discharge (Female)

1. Clean the area and insert the swab 2 – 4 cm into the endourethra.

2. Gently rotate the swab, leave it in place for 1 to 2 seconds, and withdraw it.

3. Place the swab into Amies with the charcoal transport media.

4.2.5 Pus Swab

Swab is an inferior substitute, and shall be sent in an Amies transport medium.

Note:

The swab may not represent the disease condition; therefore aspirate/tissue samples are preferred.

4.2.6 Pus Aspirate

1. Clean and decontaminate the area as much as possible with water and disinfectant.

2. Using a sterile disposable needle and syringe, aspirate the purulent material from the depths of the wound and transfers the contents into a sterile container.

Note:
Drainage fluids for culture should never be collected from the bag due to organism overgrowth in fluids sample that are not freshly collected and the concern about contamination by skin and other normal microbiata in the area being drained.

4.2.7 Tissue

1. Keep specimen moist with saline.

2. Send all tissues for culture in sterile containers and do not add formalin to the specimens.

3. For suspected anaerobic organism, use anaerobic transport medium/vial e.g. Thioglycollate broth.

Note:

- Dry specimens may fail to yield organisms in smear and culture.
- Surface/superficial swabs of deeply infected lesions e.g. sinus tracts from osteomyelitis and pressure sores usually grow surface contaminants like coliforms and pseudomonads.
- Specimen in formalin-filled container is NOT ACCEPTABLE.

4.2.8 Urine

A. Midstream Urine

1. Whenever possible, obtain early-morning specimens.

2. A clean catch sample is collected after external genital skin cleansing.

B. Catheterized Urine

(a) Indwelling catheter

1. Clean catheter collection port with 70% alcohol.

2. Sample from sampling port using needle and syringe.

3. Collect urine through the catheter port.

4. Do not collect the urine from urine bag.

(b) Straight catheterization (in-out)

Skin cleansing and aseptic technique prior to catheterization.

4.2.9 Suprapubic Aspiration (SPA) or Cystoscopy Procedure

1. Before SPA, it is recommended for patient to force fluids until bladder is full.

2. Urine shall be collected in a sterile container.

3. Send immediately (within 2 hours of collection) to the laboratory at room temperature. When immediate delivery to the laboratory is not possible, refrigerate the urine at 2–8˚C.

Note:
Foley catheter: Do not culture, since growth represents distal urethral microbiota.

4.2.10 Upper Respiratory Tract

A. Nasal

1. Insert a swab (pre-moistened with sterile saline) approximately 1–2 cm into the nares.

2. Then, rotate the swab against the nasal mucosa.

B. Nasopharynx

1. A special per nasal swab mounted on a soft flexible wire shall be passed through the nostril and along the floor of the nasal cavity into the nasopharynx, rotate for a few seconds and withdraw it.

2. Place the swab in the Amies Charcoal Transport Media and send immediately for processing.

3. For PCR testing:
   (a) Use Dacron or Rayon and place the swab into the Viral Transport Media (VTM).
   (b) Do not use cotton swab to take a sample for PCR as it may inhibits the test.

C. Nasopharyngeal Aspirate

1. Gently pass a sterile catheter through one nostril as far as the nasopharynx.

2. Attach a sterile syringe to the catheter and aspirate the specimen of mucopus.

3. Then put into a sterile container and send immediately to the laboratory.

D. Throat of Pharynx

1. Depress tongue with a tongue depressor.

2. Then, sample the posterior pharynx, tonsils, & inflamed areas with a sterile swab.

4.2.11 Lower Respiratory Tract

A. Bronchoalveolar Lavage, Fluid, Brush Sample or Washing, Endotracheal Aspirate/ Lung Aspirate or Biopsy

1. Place the specimen into a sterile container.

2. Send the specimen to the laboratory immediately.

Note:

- Tracheostomy is followed by colonization within 24 hours of insertion of the tube.
- Results shall be correlated with clinical findings such as fever or infiltration on chest radiograph.

B. Sputum, Expectorated

1. Advice the patient to rinse mouth or gargle with water to remove excess members of the oral microbiota.

2. Then instruct the patient to cough deeply to produce a lower respiratory specimen. Instruct the patient not to expectorate saliva/postnasal discharge into container.

3. Collect the expectorated sputum specimen in a sterile container.

C. Sputum, Induced

1. Advice the patient to rinse mouth with water after brushing gums & tongue.

2. Using an ultrasonic nebulizer, get the patient to inhale approximately 20 to 30 ml of 3% NaCl.

3. Collect the induced sputum specimens in a sterile container.

Notes:
Delay in transport of lower respiratory sample of more than 2 hour without refrigeration may compromise the culture result as it decreases the ability to recover fastidious pathogens, such as *S. pneumonia* and *H.influenza* and/or the overgrowth of upper respiratory microflora.

4.2.12 Cerebrospinal Fulid (CSF)

1. Collect 0.5–1 ml of fluid into each leak-proof sterile container which can be obtained from laboratory.

2. For CSF shunt infection, sampling of CSF shunt/drain and drain components is highly recommended (under aseptic procedure).

Notes:
(a) Send immediately to Lab at room temperature.
(b) DO NOT STORE IN A REFRIGERATOR, as the organisms causing meningitis are usually very sensitive to cold.
(c) Avoid sending the first tube for culture/direct smear (highest potential for contamination with skin flora.

4.2.13 Ear

A. External Ear/ Middle Ear Swab

1. For otitis externa, vigorous swabbing shall be required since surface swabbing may miss pathogen.

2. Then, place the swab in the Amies Charcoal Transport Media.

B. Aspirate Fluids for Otitis Media

1. Fluid can be obtained via the following:
   (a) Tympanocentesis aspiration; or
   (b) Mini-tipped swab of fluid draining from the middle ear cavity in patients with myringotomy tubes or otorrhea

2. Collect the specimen in a sterile container.

4.2.14 Eyes

A. Conjuctiva

1. Sample both eyes with individual swabs (pre-moistened with sterile saline) by rolling over each conjunctiva.

2. Swabs are acceptable only for the eyelids, lid margin, conjunctiva and samples from the superficial lacrimal system.

3. Place the swab in the Amies Charcoal Transport Media.

Notes:

- If possible, sample both conjunctiva, even if only one is infected, to determine indigenous microbiota.
- The uninfected eye can serve as a control to compare with the agents isolated from the infected eye.

B. Corneal Scraping

1. Using a sterile spatula, scrape ulcers or lesions and inoculate directly onto the medium (Blood agar, Chocolate agar, Mac-Conkey agar & Sabouraud Dextrose Agar) which can be obtained from the laboratory.

2. Perform bedside prepared smear for Gram stain and Potassium hydroxide (KOH) by rubbing material from the spatula onto an area measuring 1 to 2 cm of slide

Notes:
Scraping for virus isolation and *Acanthamoeba* detection shall be collected and submitted in a sterile container.

C. Aqueous/ Vitreous Fluid Aspirates

1. In the case of endophthalmitis, please ensure to collect the specimen aseptically in a sterile tube.

2. If a small volume of fluid is collected, kindly collect the culture media (Blood agar, Chocolate agar, Mac-Conkey agar and Sabouraud Dextrose Agar) from the lab and immediately inoculate onto it.

D. Other Eye Specimen

1. Other eye specimen (e.g. contact lens and solution) shall be sent in a sterile container.

4.2.15 Stool

A. If faeces are available:

1. Using a small spoon or swab, collect a portion of faeces (about 1 gm), preferably to include material containing mucus, pus or blood if any present.

2. Place the spoon or swab with faeces into a sterile universal container and screw on the cap tightly.

3. If the faeces is in liquid form, fill only up to one third of the container (excessive amount will cause spillage).

4. Sent it promptly for processing. Prolonged storage will cause the drop in pH which will inhibit the growth of most Shigella spp. and some Salmonella spp.

B. If faeces are not available, a rectal swab may be taken but this provides a less satisfactory specimen.

1. Insert a sterile swab into the anus beyond the anal sphincter.

2. Rotate the swab to ensure contact with faecal material within the rectum and place it at once in the appropriate transport media. A satisfactory rectal swab is one which shows some faecal staining.

3. If stool is collected in a sterile bedpan, it must not be contaminated with urine or residual soap or disinfectant.

Notes:

Delay in transportation/Prolonged storage will cause the drop in pH which will inhibit the growth of most Shigella spp. and some Salmonella spp

4.2.16 Skin, Nails & Hair

1. Clean the cutaneous and scalp lesions with 70% alcohol before sampling. This step enhances the likelihood of detecting fungus during microscopic examination and helps minimize the risk of bacterial contamination in cultures.

2. Prior cleaning is especially important if ointments, creams, or powders have been applied to the lesion. Skin, nail, and hair samples should be collected on folded paper squares or directly onto an agar plate (collected from the lab).

3. The procedure for sampling is as follows:

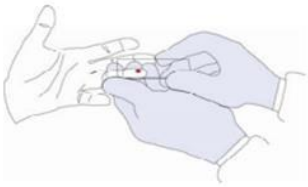
   (a) Skin

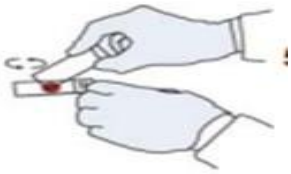
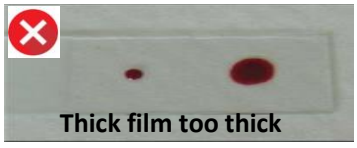
   Material should be collected from cutaneous lesions by scraping outwards from the margin of the lesions using the edge of the glass microscope slide or a blunt scalpel.

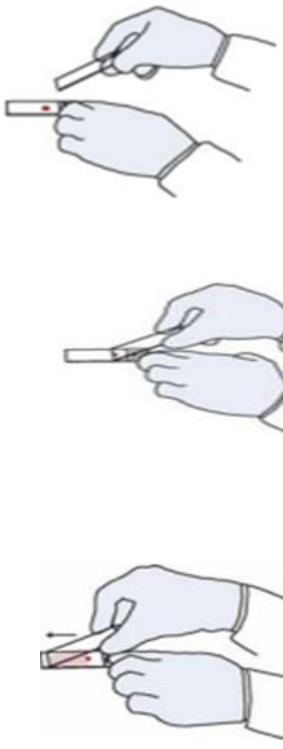
   (b) Nail
   - Nail specimens should be taken from any discoloured, dystrophic, or brittle areas of the nail.
   - The specimen should be cut as far back as possible from the nail's edge and should include the full thickness of the nail.

   (c) Hair
   - Specimens from the scalp should include hair roots, the contents of plugged follicles and skin scales.
   - Hair should be plucked from the scalp with forceps or the scalp is brushed with a plastic hairbrush and collected onto an agar plate (collected from the lab).

4.3 Procedure for Blood Film Malaria Parasite (BFMP) Test

A. Patient Preparation	
i. Clean new glass slides with alcohol. ii. Sample can be obtained from finger prick or venous blood. iii. For finger prick, select the third finger from the thumb (big toe can be used for infants). Clean the finger with cotton wool soaked in 70% alcohol. Dry the finger with cotton towel. iv. With a sterile lancet, puncture the ball of the finger using a quick rolling action. v. By applying gentle pressure to the finger, express the first drop of blood and wipe it away with dry cotton wool.	 

B. How to prepare thick blood film	
i. Label the slide with patient's name, registration number and date of collection on the frosted end. ii. Collect a single drop of blood on the surface of clean slide. iii. Using the corner of another glass slide, spread the blood in a circular motion with 3-6 movements, to spread over 20 mm diameter. iv. Allow the slide to air dry. Place the blood film in slide holder and send to the laboratory. Notes: To assess the right thickness, one should be able to read newsprint through it.	   

C. How to prepare thin blood film	
i. Label the slide with patient's name, registration number and date of collection on the frosted end. ii. Collect another small drop of blood on to a new slide about 5 mm away from the edge of the slide. iii. Place the blood slide on a firm, flat surface. Use another slide as a spreader. Touch the drop of blood with the spreader and allow the blood to run along its edge. iv. Keep the spreader at an angle of 30-45° and with steady movement, firmly push the spreader forward to prepare a thin smear. v. Allow the slide to air dry. Place the blood film in slide holder and send to the laboratory.	

4.4 Specimen Collection for Serological Tests

4.4.1 Serological tests comprises of bacteriology, virology, parasitology and immunology.

4.4.2 Method of collection:

A. Blood

1. Draw 3-5 ml of blood into a Plain Gel Tube without anticoagulant.

2. Leave it to clot at ambient temperature.

3. Despatch to the laboratory within 4 hours of collection for serum separation by centrifugation.

Notes:
Sample repeated less than stipulated time interval e.g: Hepatitis B/C, HIV screening test repeated less than 6 months without clear indication will be rejected.

B. CSF

CSF specimens (3 – 4 ml) should be collected in a sterile container.

Notes:
Blood stained specimens are invalidate for certain tests. If such specimens are received, the samples will be rejected to assure that results are of clinical value.

C. Urine

Urine specimens should be collected in a sterile container for antigen test.

4.5 Specimen Collection for Molecular Tests

4.5.1 Viral Genome Detection using Polymerase Chain Reaction (PCR) Method

A. Blood

1. Collect 3 – 5 ml of blood into EDTA tube.
2. Send directly to laboratory within 4 hours after collection.

B. CSF

1. Collect minimum of 0.3 ml of CSF into a sterile Bijou bottle.
2. Pack in ice for transport.
3. Send directly to laboratory within 2 hours after sample is taken.

C. Tissue Biopsy

1. If possible, sample should consist of both the middle and the edge sections of the tissue.
2. Small sample size of a minimum 0.3 cm is appropriate.
3. Place tissue in an empty sterile container and do not add formalin into the specimen.
4. Send directly to laboratory within 2 hours after sample is taken.

D. Ocular specimens

1. Specimens from patients with suspected infection of cornea (ocular fluids) should be collected properly.

2. Take a minimum of 0.3 ml of sample.

3. Place specimen into an empty sterile Bijou bottle.

4. Send directly to Virology Lab within 2 hours after collection.

E. Vesicles fluids

1. Collect a minimum of 0.3 ml of sample using a sterile needle by puncturing the lesion.

2. Place specimen into an empty sterile Bijou bottle.

3. Send directly to laboratory in ice within 2 hours after collection.

F. Bone Marrow

1. Collect a minimum of 0.3 ml of the aspirated sample.

2. Place specimen into an empty sterile Bijou bottle.

3. Send directly to laboratory within 2 hours after collection.

G. Respiratory specimen

1. Nasopharyngeal / Oropharyngeal swab to be sent in Viral Transport Medium (VTM), packed in ice using triple layer packaging and sent to lab immediately. Ensure the temperature is maintained between 2 – 8°C throughout transportation.

2. Sputum / Tracheal aspirate needs to be sent in a sterile container, packed with ice using triple layer packaging and sent to lab immediately. Ensure the temperature is maintained between 2 – 8°C throughout transportation.

H. Cervical specimens (HPV DNA PCR)

1. Cervical specimens for high-risk HPV testing can be collected using liquid-based cytology (LBC) media. Accepted LBC media include ThinPrep® PreservCyt® Solution (Hologic, Inc.) and SurePath™ Preservative Fluid (BD).

2. Cervical samples may also be collected using a flexible FLOQSwab® made of polyethylene or nylon.

3. All specimens should be transported at room temperature and dispatched to the laboratory as soon as possible following collection.(Should not exceed 14 days after collection).

4. This test is intended for the detection of high-risk human papillomavirus (HPV) genotypes that are associated with cervical dysplasia and malignancy in clinically indicated in cases of:

   a) Abnormal Pap smear or LBC results [e.g., Atypical Squamous Cells of Undetermined Significance (ASCUS), Low-Grade Squamous Intraepithelial Lesion (LSIL)]
   b) Follow-up post-treatment for CIN2/3 or cervical cancer
   c) Investigation of cervical lesions on clinical examination

5. Sample will be rejected if it exceeds 14 days from the date of collection.

I. Stool specimen (GI PROTOZOA PCR & GI HELMINTH PCR)

1. Collect stool specimens as soon after onset of symptoms as possible.

2. Place stool specimen in leak-proof container, without preservative/media **OR** transport stool in Cary-Blair transport media (commercial).

3. Specimens should be transported as soon as possible at indicated temperatures:

   a) Temperature : 2 – 8°C (Duration: 2 days); or
   b) Temperature: -20°C (Duration: 1 month)

   **Duration: The time period from specimen collection to test including specimen storage and transport prior to the test.*

4. Sample will be rejected if doesn't meet the indicated temperature upon arrival.

4.5.2 HIV RNA, HCV RNA & HBV DNA Genome Detection

(Quantitative assay by PCR Method)

1. Collect 2mls of blood into two (2) EDTA tube

2. Sample should reach the laboratory within 2 hours upon collection in an ice box (2 – 8^{o}C).

4.6 Specimen Collection for Viral Isolation

A. Blood

1. Sample should be taken as early as possible.

2. Collect aseptically 5 – 10 ml of blood (3 – 5 ml for children).

3. Transport the sample to the lab in ice (2 – 8^{o}C) as soon as possible.

B. Brain Tissue for Viral Diagnosis

1. Remove in portions, sized at about 1.5 cm cube, of various parts of the brain and the upper spinal cord with as little contamination as possible.

2. Place tissue in a sterile container and transport in ice as soon as possible.

C. CSF

1. Aseptically collect 1 – 3 ml into a sterile container.

2. Keep the specimen chilled at all times.

D. Vesicular lesion

1. Unroof a fresh vesicular lesion using sterile needle and swab the base of the vesicle with a sterile swab (preferably a rayon or Dacron plastic shafted swab) to obtain cells for sampling.

2. Place swab lesion into VTM bottle.

3. Send directly to laboratory in ice within 2 hours after collection.

E. Conjunctival scraping

1. Collect the scraping in a screw-capped test tube containing Viral Transport Media (VTM), which is available in the lab.

2. Keep it chilled at all times.

F. Eye swab

1. Firmly rub the lesion with a sterile swab, which has been moistened with nutrient broth, or sterile distilled water.

2. Put the swab in a screw-capped test tube containing Viral Transport Media (VTM), which is available in the laboratory.

   Note: DO NOT moisten swab with normal saline.

G. Throat swab

1. Put the patient in a sitting position. Ask the patient to tilt their head slightly and open their mouth.

2. Use **sterile Dacron or rayon swab** with a plastic shaft. **DO NOT** use calcium alginate or cotton swabs or ones with wooden stick.

3. Depress the tongue with tongue depressor. Use a sweeping motion to swab the posterior pharyngeal wall and tonsillar pillars. Have the subject say “aah” to elevate the uvula.

4. Avoid swabbing the soft palate and do not touch the tongue with the swab tip (N.B. This procedure can induce the gag reflex).

5. Place the swab immediately into a Viral Transport Media (VTM) and break the applicator stick off near the tip to permit tightening of the cap.

6. Transport on wet ice

H. Nasopharyngeal swab

A flexible shafted swab is essential for sampling. **DO NOT** use rigid shafted swab.

1. Insert a flexible, fine shafted polyester swab into the nostril until the back of the nasopharynx.

2. Swab should be slid straight into the nostril with the patient's head tilted slightly back.

3. The swab is inserted by following the base of the nostril towards the auditory pit and it needs to be inserted at least 5 – 6 cm in adults to ensure that it reaches the posterior pharynx.

4. Leave the swab in place for a few seconds. Withdraw by slow rotation. Use a different swab for the other nostril.

5. Put the tip of swab into the vial containing VTM and break the applicator stick. Close the vial and seal.

I. Nasopharyngeal aspirate (NPA)

1. Patient must sit comfortably, with their head tilted slightly backward. Instill 1 – 1.5 mls of sterile, physiological saline (pH 7.0) solution into one nostril.

2. Fill a 3 cc syringe with 2 – 3 ml of saline. Insert the syringe into the nostril parallel to the palate. Flush in and out a few times.

3. Aspirate the nasopharyngeal secretion and collect the specimen in a sterile container. Transport on wet ice.

4. If nasopharyngeal wash is not feasible, please proceed with a throat swab.

ANATOMICAL PATHOLOGY

5 ANATOMICAL PATHOLOGY

5.1 Histopathology

5.1.1 Introduction

Hispathology Unit receives specimens for histopathological examination (HPE) of tissues that were obtained during surgical procedures or clinical autopsies. All the specimens are sent to referral labs for examination and assessment. Sampling technique, specimen handling and relevant clinical information provided by clinicians significantly influences interpretation of the examined tissues.

Types of specimens received:

1. Surgically removed small tissue/biopsy
2. Surgically removed large tissue or hollow organ
3. Frozen sections
4. Tissue block (paraffin embedded tissue) and/or slides

5.1.2 Test Request

A. General Routine Histopathology

(a) All histopathological tests shall be requested through HIS.

(b) Specimens must be accompanied with a completely filled PER-PAT 301 form that includes relevant clinical information, type and anatomical site of the specimen.

(c) A request of multiple specimens from one patient only requires one request form and the anatomical site of each specimen must be written clearly. For example: 1- Terminal Ileum, 2- Caecum, 3- Ascending Colon, 4- Transverse Colon,5- Descending Colon, 6- Sigmoid, 7- Rectum.

(d) The information on specimen containers and the request form should be identical and clearly written.

(e) For urgent requests, please state URGENT in HIS and at the upper right hand corner of the PER-PAT 301 request form.

B. Frozen Sections

(a) All requests for frozen section examination require appointment and discussion with the Pathologist on-call in Hospital Putrajaya at least 48 hours before the operation.

(b) Please inform the Histology Unit at extension 4122 when:

i) The patient is wheeled into the operating room; and

ii) If the frozen section examination is cancelled.

(c) Specimen must be sent fresh without fixative solutions in a leak-proof container or saline-moistened gauze to prevent drying.

(d) All cases scheduled for frozen section examination are best placed first in the operating list in order for it to be done during normal working hours.

C. Specialised Histopathology Requests

(a) Certain cases might require further studies or second opinion by Pathologist e.g. molecular testing, special stains, immunohistochemistry (IHC), etc.

(b) For any specialised test that are performed in different referral laboratories,, send a completely-filled request form with the barcode label to laboratory after consulting the Pathologist in Hospital Putrajaya.

(c) One (1) tissue block and/or five (5) – ten (10) unstained slides together with HPE report(s) of the patient shall be requested by the Medical Officer in-charge if the specimen was processed at a different laboratory.

(d) All tests shall be requested through HIS and must be accompanied by either the PER-PAT 301 form or other specified forms.

5.1.3 Specimen Collection

(a) Specimen containers and formalin are supplied by the Pathology Department.

(b) All HPE specimens must be fixed in 10% buffered formalin with at least 10 times the volume of the specimen (1:10).

(c) All specimens should be placed in suitable sized containers for proper fixation and to avoid distortion of the tissue.

(d) Specimen must be labelled properly with a written label (patient details, type of specimen and anatomical site) and a barcode label. DO NOT stick the barcode label on the lid of the container or on the written label.

(e) Mark the surgical margin for large tissues or hollow organ for orientation purposes as well as for cases that require confirmation of the adequacy of surgical excision. The margins of the specimen must be marked or tagged accordingly by sutures and stated clearly in the order instruction in HIS and PER-PAT 301.

(f) Specimens from different anatomical sites should be sent in separate containers, properly labelled and must be clearly stated in the Order Instruction in HIS and PER-PAT 301.

(g) Specimen for frozen sections should be sent in a clean container without fixative solutions.

5.1.4 Dispatch and Transportation of Specimen

(a) Specimen for routine histopathological examination should be sent directly to the laboratory. The specimens then will be sent to the referral laboratories.

(b) Specimens for frozen sections shall be sent immediately by requestor to the Histopathology Unit at Hospital Putrajaya after removal. Before sending, the requestor is required to register the specimen at our laboratory.

5.1.5 Histopathology Reports

(a) Reports will be available within Total Turnaround Time (TTAT) as listed in the List of Tests. It might take longer for cases that require further studies or a second opinion.

(b) All verified reports from Hospital Putrajaya can be viewed in HIS.

(c) Enquiry of reports from Hospital Putrajaya should be made directly to Pathologist in-charge by the requestor.

(d) Scanned reports from other referral laboratory can be viewed in HIS after validation is done.

(e) Result of frozen section will be immediately communicated to the Specialist or the Medical Officer in-charge via phone call.

Note:

All surgically removed tissues shall be submitted for HPE except traumatic or diabetic amputation of the lower and upper limbs.

5.2 Cytopathology

5.2.1 Introduction

Cytopathology is a discipline that studies the morphology of cells that includes exfoliative cytology and aspiration cytology. Exfoliative cytology involves specimen containing desquamated cells obtained from sputum, cervico-vaginal smear and body fluid from numerous sites. Aspiration cytology involves examination of cells obtained from tissue by aspiration through a fine needle. All cytology tests are sent to referral laboratories.

i) Gynaecological cytology – conventional and liquid based
ii) Non-gynaecological cytology – body fluid, sputum, nipple discharge, bronchial lavage, brushing, washing and others
iii) Fine needle aspiration cytology (FNAC)

5.2.2 Test Requests

(a) All cytology tests are requested through HIS.

(b) Request for non-gynaecological cytology and FNAC must be accompanied with PER-PAT 301 form.

(c) Request for gynaecological cytology must be accompanied with a completed PS 2 / 2007 form.

5.2.3 Specimen Containers

(a) Body fluid should be placed in a clean universal leak - proof container without preservative and correctly labelled with the printed barcode label.

(b) Slides (e.g. conventional Pap smear, FNAC, brushing and nipple discharge) should be placed in barcode-labelled slide mailer.

(c) Patient's name and MRN should be written on the frosted end of the slide.

5.2.4 Specimen Collection

All specimens shall be collected and submitted to the Cytology Unit in the appropriate container with/without fixative solution according to the procedure as soon as possible.

A. Conventional Gynaecological Cytology

1. DO NOT use lubricant on the speculum.

2. Place cervical spatula at the external os and rotate through 360 degrees, lightly scraping the squamocolumnar junction.

3. Smear the material onto a clean, labelled glass slide about as thick as a blood film.

4. Fix the slide immediately by immersing it in 95% alcohol for at least 30 minutes to prevent air drying artifacts.

5. Air-dry the fixed slide and place in the slide mailer.

6. If more than one slide is to be placed in the same slide mailer, ensure the slides are not placed face to face.

B. Liquid Based Gynaecological Cytology

1. Specimen collection is based on manufacturer recommendation.

2. Specimen kit is provided by the Pathology laboratory.

C. Sputum

1. Instruct the patient to spit all the saliva from the mouth immediately after he wakes up in the morning.

2. Patient should then cough deeply and collect the resulting sputum in the supplied container.

D. Urine

1. Patient should void and discard the first morning specimen.

2. Collect the next voided urine and send immediately to the Cytology Unit.

3. DO NOT send overnight urine as most cells in the sample have degenerated.

E. Body Fluid (pleural fluid, peritoneal fluid, pericardial fluid, CSF, etc.) and Washing Cytology

Specimens are collected in a clean container and dispatched immediately to the Cytology Unit.

F. Brushing (Bronchial Brushing, CBD brushing, etc.)

1. Smear the material onto a clean slide as thick as blood film and immediately place the slides in 95% alcohol at least for 30 minutes.

2. Air-dry the smear.

3. If more than one slide, ensure the slides are not placed face to face in the slide mailer.

G. Fine Needle Aspiration (FNA) Cytology

1. An appointment with the laboratory should be made three (3) days before the FNA procedure by Medical Officer/Specialist in- charge.

2. If more than one lump or swelling present, the clinician shall indicate which lump(s) or swelling(s) is to be aspirated.

3. Please contact Cytology staff for any request of urgent FNA at extension 4122.

4. Examples of indications for FNA:
   (a) Breast cancer cases to confirm diagnosis.
   (b) Suspicious lesions to exclude breast cancer.
   (c) Solitary cold nodule in thyroid gland.
   (d) Suspicious lesions such as salivary gland tumours and lymph nodes.

   Note:

   - Breast and thyroid cyst may be aspirated by the surgeon and material sent for cytological examination.
   - FNA is not indicated in multinodular goitre or diffuse goitre.
   - Vascular lesions or those of vascular origin are not suitable for FNA.
   - FNA for deep-seated lesions are performed with radiological guidance.

5.2.5 Dispatch of Specimen

(a) All specimens will be sent to the referral laboratories during office hours and before 2.00 pm on Saturday (non-public holiday) for Hospital Putrajaya.

(b) All non-gynaecological specimens (except FNA) received after office hours will be kept at 2 - 8°C and sent out on the next working day.

(c) DO NOT FREEZE SPECIMEN.

5.2.6 Cytology Reports

(a) Reports are available within Total Turnaround Time (TTAT) as listed in List of Tests and it might take longer for cases that require further studies or second opinion.

(b) All verified reports from Hospital Putrajaya can be viewed in HIS.

(c) Enquiry of reports from Hospital Putrajaya should be made directly to the Pathologist in-charge by requestor.

(d) Scanned reports from other referral laboratory can be viewed in HIS after validation.

5.3 Packaging for Histopathological/ Cytology Specimens

5.3.1 Additional requirements apply to the transportation of formalin-fixed tissues, as they are typically not regarded as infectious specimens due to biological inactivation. The risk of these materials posing an infectious disease threat is extremely low. However, to minimize any potential risk, they must be packaged to prevent the release of liquids during transit.

5.3.2 The following precautions should be observed:

(a) Limit the amount of 10% formalin to no more than one liter per shipping container.

(b) If more than one liter of 10% formalin is necessary, the specimens should be transported by land. Measures should be taken to prevent formalin spillage.

(c) Do not use biohazard plastic bags as primary containers for tissues preserved with liquid preservatives.

(d) Use non-breakable primary containers with leak-proof seals, reinforced with Parafilm or sealing tape.

(e) Ensure primary containers are packaged with sufficient absorbent material to contain any leaks, and place them in a secondary container, such as a larger plastic container or a sturdy sealed plastic bag.

(f) Microscopic slides should be packed and labelled with their identification number, and securely wrapped and cushioned to prevent breakage during transportation.

(g) Paraffin blocks should be packed, labelled with the surgical number and transported in a properly labelled box or plastic bag. Do not wrap them in gauze. Since paraffin blocks can melt in hot climates, proper packaging is essential to ensure their safe transportation.

TRANSFUSION MEDICINE

6 TRANSFUSION MEDICINE

6.1 Introduction

Transfusion Medicine Unit is responsible to provide transfusion services to patients in Institut Kanser Negara. Guidelines and standard procedures for test request and administration of blood and blood products in elective and emergency situation are outlined in this handbook.

6.2 Test Request

6.2.1 Test shall be requested through HIS and manually using a specified form.

6.2.2 The request form should be filled with relevant information and sent with specimen. List of request forms to be used are as follows:

Test	Form
• Group, Screen & Hold (GSH) • Group & Cross match (GXM)	Borang Permohonan Transfusi Darah (PER-SS-BT 105 Pind. 1/2016)
Blood Products Request (Platelet Concentrate, Fresh Frozen Plasma, Cryoprecipitate)	Borang Permohonan Transfusi Darah (PER-SS-BT 105 Pind. 1/2016)
Investigation of Transfusion Reaction	i) Request for Transfusion Reaction Investigation (BTS/TR/2/2016) ii) Reporting for Transfusion Related Adverse Event (BTS/HV/3/2016)
Antibody Identification	i) Borang Permohonan Transfusi Darah (PER-SS-BT 105 Pind. 1/2016) ii) Borang PER-PAT-301

6.3 Type of Request

6.3.1 Group, Screen and Hold (GSH) Protocol

(a) A Group, Screen and Hold (GSH) protocol consists of **blood grouping (ABO), Rhesus D typing and antibody screening** with patient's plasma.

(b) GSH protocol is recommended in circumstances where the likelihood of blood usage is minimal and should be used accordingly, based on the established Maximum Surgical Blood Order Schedule (MSBOS).

(c) Plasma is retained for **48 HOURS** in blood bank in the event that cross-matching blood is required at a later stage. If blood is required following a GSH, blood would be made available on time.

(d) AFTER 48 HOURS the request for cross-matching must be sent with a **NEW** blood sample.

6.3.2 Group and Cross-matching (GXM)

(a) A Group and Cross-matching (GXM) protocol consists of blood ABO & Rhesus D grouping, antibody screening and cross-matching of patient's sample with the donor unit (blood bags) for compatibility.

(b) GXM should be requested for cases with high certainty for transfusion at that time.

(c) Cross-matched blood units will be reserved for 48 hours.

Note:

- In the event of positive antibody or an incompatible cross-match that cannot be resolved in our lab, the sample will be sent to Hospital Sultan Idris Shah (HSIS) Serdang/ Pusat Darah Negara (PDN) for antibody identification and supply of blood.

- The clinicians shall be informed regarding the situation. Urgency of the blood requirement shall be discussed and communicated with the Pathology Medical Officer/ Specialist on-call for necessary arrangements.

6.3.3 Request for Platelet

(a) Platelets should be obtained from Pusat Darah Negara (PDN) or Hospital Sultan Idris Shah (HSIS) upon request.

(b) The requestor must contact the Pathology MO on-call to make the request.

(c) Group-specific platelet will be issued, EXCEPT in emergency situations or urgent transfusions where group O Rh positive platelets may be issued after discussion and consent of clinicians.

6.4 Transfusion in Special Circumstances

6.4.1 Emergency Cross-Match

(a) Request shall be made by clinicians, accompanied by a phone call to the blood bank staff to expedite the process.

(b) The clinician in charge shall send sample directly to blood bank and wait for the blood to be ready.

(c) The group-specific blood that is compatible after immediate spin and after 5 minutes of incubation at room temperature will be issued within 30 minutes.

(d) Full cross-matching will then be continued. If any incompatibilities are detected during this phase, the clinician in-charge will be immediately informed to stop the transfusion.

6.4.2 Uncrossmatched Group O RhD Positive Packed Cells (Safe O)

(a) Decision to transfuse Safe O shall ONLY be made after the clinician has carefully assessed the patient's condition and established the urgency for immediate blood transfusion.

(b) The requesting clinicians shall clearly state the reasons for the transfusion in the request form.

(c) Sample of the patient's blood (3 - 5 ml in EDTA tube) shall be taken BEFORE the transfusion of Safe O for the purpose of determining the patient's actual blood group and subsequent management.

(d) Blood sample and empty Safe O bags shall be sent to Blood Bank immediately after transfusion has been completed

6.4.3 Massive Transfusion Protocol (MTP)

(a) The decision of MTP activation shall be made by the attending clinician.

(b) A representative shall be assigned as the MTP co-ordinator.

(c) Activation of MTP shall be informed immediately to the blood bank and to the Pathology medical officer (MO) on- call by the MTP co-ordinator.

(d) MTP co-ordinator shall provide the details of required blood product(s) and other relevant information.

(e) 10 ml of blood sample in EDTA tube, completed Borang Permohonan Transfusi (3 copies) and Slip Pengambilan Darah (3 copies) are required.

(f) Platelet will be available upon request to the Pathology medical officer on-call as soon as possible. Platelet shall be obtained from PDN/ HSIS and may take a longer time to be made available.

(g) MTP termination shall be notified immediately. Further details of the procedure are outline in **Appendix 1 - Massive Transfusion Protocol, Institut Kanser Negara.**

6.5 Specimen Collection

Procedure of specimen collection is outlined in **Garis Panduan Transfusi Darah.** Please refer to I:\PERKHIDMATAN KLINIKAL\IKN_K6 PATOLOGI\TRANSFUSION MEDICINE POLICY IKN

6.5.1 Blood samples for request of Red Cells (GSH/GXM)

i) 3 - 5 ml of blood sample in EDTA tube

ii) If the patient requires repeated transfusions during the present admission, a new blood sample & request form is needed for each request.

6.5.2 Blood samples for request of Blood Components (other than red cells)

i) 3 - 5 ml of blood sample in EDTA tube

ii) For patient who have previous blood grouping or transfusion records (within 3 months) at the hospital blood bank, a new blood sample need NOT accompany the request for blood components.

6.5.3 Blood samples for Antibody Identification

HSIS : 3 – 5 ml of blood in EDTA tube (x 2 tubes) & plain tube (x 2 tubes)
PDN : 3 – 5 ml of blood sample in EDTA tube (x 3 tubes)

6.5.4 Samples for Investigation of Transfusion Reaction

(a) Post 1 :
   i) 3 – 5 ml of blood sample in EDTA tube (x 2 tubes)
   ii) 3 – 5 ml of blood sample in lithium heparin tube
   iii) 20 ml of urine sample
   iv) Remaining blood bag with its contents and tubing set

(b) Post 2 (after 24 hours):
   i) 3 – 5 ml of blood sample in EDTA tube
   ii) 20 ml of urine sample

6.6 Handling and Transport of Blood/ Blood Products

i) The authorized ward personnel shall fill up 'Slip Pengambilan Darah' (IKN/PAT/062) to collect blood and/or blood products for transfusion from the laboratory.

ii) At the point of blood and/or blood products issuance, patient's information on 'Slip Pengambilan Darah', request form, blood bags label and PPDK1 card shall be matched and verified.

iii) The date and time of issue and collection shall be recorded.

iv) Blood and/or blood products should be transported and stored in the appropriate container at the suitable temperature and condition at all times before the transfusion. Please refer to the following table for further information.

	Red Cells	**Platelet**	**Fresh Frozen Plasma/ Cryoprecipitate**
Collection	Blood box **WITH** ice	Blood box **WITHOUT** ice	Blood box **WITH** ice
Use	As soon as possible (after reaching the ward)	Transfuse immediately	Transfuse Immediately
Storage	2°C to 6°C	**DO NOT** store in fridge **SHOULD NOT** be stored or kept in the wards	**SHOULD NOT** be stored or kept in the wards

v) UNUSED blood and/or blood products should be RETURNED IMMEDIATELY to the laboratory.

vi) USED blood bags should be returned to the laboratory for disposal. The ward shall be responsible to return used blood bags with the completed compatibility card within 24 hours.

6.7 Investigation of Transfusion Reactions

i) Transfusion shall be stopped immediately if an adverse transfusion reaction is detected or suspected. The treating clinician shall immediately assess and stabilize the patient. Proper management shall be carried out depending on the type and severity of the reaction.

ii) All transfusion reactions shall be investigated and reported.

iii) The treating clinician shall send a request for transfusion reaction investigation and fill up the following forms:
   (a) Request Form for Transfusion Reaction Investigation (BTS/TR/2/2016)
   (b) Reporting Form for Transfusion-Related Adverse (BTS/HV/3/2016)

iv) Collect and send the specimens for investigation.

Note:
Forms are available in the *Public Folder > Perkhidmatan Klinikal > Patologi > Borang Transfusi*

LIST OF IN-HOUSE TESTS

7 LIST OF IN-HOUSE TESTS

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERENCE RANGE (UNIT)	LTAT
Acid Fast Bacilli Direct Smear For Sputum	AFB	Microbiology	Sputum	Collect 3 consecutive early morning sputum aseptically	-	24 Hours
Acid Fast Bacilli Direct Smear For Non Sputum	AFBNS	Microbiology	Non Sputum	Sterile container. Please specify site of collection	-	24 Hours
Air Sampling	CSAIR	Microbiology	Not applicable	Please call for appointment	-	3 working days
Alanine Transaminase	ALT	Chemical Pathology	Blood	4 mL in Heparin Tube	Male : < 45 (U/L) Female : < 34 (U/L)	3 hours
Albumin	ALB	Chemical Pathology	Blood	4 mL in Heparin Tube	35 - 52 (g/L)	3 hours
Alkaline Phosphatase	ALP	Chemical Pathology	Blood	4 mL in Heparin Tube	Male : 53 - 128 (U/L) Female : 42 - 98 (U/L)	3 hours
Alpha - Fetoprotein (AFP)	AFP	Chemical Pathology	Blood	4 mL in Heparin Tube	< 6.72 (IU/mL)	3 working days
Amylase	AMY	Chemical Pathology	Blood	4 mL in Heparin Tube	28 – 100 (U/L)	3 hours
Antibody To Hepatitis B Surface Antigen	AHBS	Microbiology	Blood	3 – 5 mL in SST Tube	-	4 working days
Antibody To Hepatitis C Virus	AHCV	Microbiology	Blood	3 – 5 mL in SST Tube	-	4 working days
Antibody/Antigen To HIV	AHIV	Microbiology	Blood	3 – 5 mL in SST Tube	-	4 working days

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERENCE RANGE (UNIT)	LTAT
Aspartate Transaminase	AST	Chemical Pathology	Blood	4 mL in Heparin Tube	Male : < 35 (U/L) Female : < 31 (U/L)	3 hours
Aspirate FEME	ASPF	Microbiology	Aspirate	3 – 5 mL in sterile container	-	1 working day
Beta Human Chorionic Gonadotrophin	BHCG	Chemical Pathology	Blood	3 – 5 mL in SST Tube	< 5 (mU/mL)	Routine: 3 working days STAT : 3 Hours
Blood Group & Rhesus Typing	ABD	Transfusion Medicine	Blood	3 mL in EDTA Tube	-	2 hours
Body Fluid For C&S	BODY_ FLUID	Microbiology	Body Fluid	3 – 4 mL in sterile container	-	3 – 5 working days
Bronchoalveolar Lavage For C & S	BAL	Microbiology	Broncho-alveolar Lavage	Sterile Container	-	3 – 5 working days
Calcium	CA	Chemical Pathology	Blood	4 mL in Heparin Tube	2.15 – 2.55 (mmol/L)	Routine: 3 Hours STAT: 1 hour
Calcium (24 hour urine)	UCA	Chemical Pathology	Urine 24-hours	24-hours urine container	2.5 – 7.5 (mmol/24H)	1 working day
Cancer Antigen 12-5	CA125	Chemical Pathology	Blood	3 – 5 mL in SST Tube	< 35 (U/mL)	3 working days
Cancer Antigen 15-3	CA153	Chemical Pathology	Blood	3 – 5 mL in SST Tube	< 32.4 (U/mL)	3 working days
Cancer Antigen 19-9	CA19-9	Chemical Pathology	Blood	3 – 5 mL in SST Tube	< 37 (U/mL)	3 working days
Carcinoembryonic Antigen (CEA)	CEA	Chemical Pathology	Blood	3 – 5 mL in SST Tube	< 5 (ng/mL)	3 working days

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERENCE RANGE (UNIT)	LTAT
Blood Group & Rhesus Typing	ABD	Transfusion Medicine	Blood	3 mL in EDTA Tube	-	2 hours
Body Fluid For C&S	BODY_ FLUID	Microbiology	Body Fluid	3 – 4 mL in sterile container	-	3 – 5 working days
Bronchoalveolar Lavage For C & S	BAL	Microbiology	Broncho-alveolar Lavage	Sterile Container	-	3 – 5 working days
Calcium	CA	Chemical Pathology	Blood	4 mL in Heparin Tube	2.15 – 2.55 (mmol/L)	Routine: 3 Hours STAT: 1 hour
Calcium (24 hour urine)	UCA	Chemical Pathology	Urine 24-hours	24-hours urine container	2.5 – 7.5 (mmol/24H)	1 working day
Cancer Antigen 12-5	CA125	Chemical Pathology	Blood	3 – 5 mL in SST Tube	< 35 (U/mL)	3 working days
Cancer Antigen 15-3	CA153	Chemical Pathology	Blood	3 – 5 mL in SST Tube	< 32.4 (U/mL)	3 working days
Cancer Antigen 19-9	CA19-9	Chemical Pathology	Blood	3 – 5 mL in SST Tube	< 37 (U/mL)	3 working days
Catheter Tip For C & S	CATHETER	Microbiology	Catheter Tip	Sterile Container		3 – 5 working days
Cerebrospinal Fluid For C&S	CSFC	Microbiology	CSF	3 mL in sterile container		3 – 5 working days
Chloride	CL	Chemical Pathology	Blood	4 mL in Heparin Tube	98 – 107 (mmol/L)	STAT: 1 hour Routine: 3 hours
Chloride (24 hour urine)	UCL	Chemical Pathology	Urine	24 hour urine container	110 – 250 (mmol/24H)	1 working day
Chloride (random urine)	UCLR	Chemical Pathology	Urine	10 mL urine in sterile container	50 -150 (mmol/L)	1 working day
Cholesterol, Total	CHOL	Chemical Pathology	Blood	3 – 5 mL in SST Tube	< 5.2 (mmol/L)	3 hours
Coombs Test	DIDCT	Transfusion Medicine	Blood	3 mL in EDTA Tube		2 hours

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERENCE RANGE (UNIT)	LTAT
Covid -19 PCR	NCORV	Microbiology	Nasopharyngeal /Oropharyngeal Swab	Viral Transport Media	-	48 hours
Covid-19 Rapid Test	COVRAP	Microbiology	Nasopharyngeal /Oropharyngeal Swab	Swab	-	24 hours
C-Reactive Protein	CRP	Chemical Pathology	Blood	3 – 5 mL in SST Tube	<5 (mg/L)	3 hours
Creatine Kinase	CK	Chemical Pathology	Blood	4 mL in Heparin Tube	Male : 46 – 171 (U/L) Female : 34 – 145 (U/L)	STAT: 1 hour Routine: 3 Hours
Creatinine	CR	Chemical Pathology	Blood	4 mL in Heparin Tube	Male : 80 – 115 Female : 53 – 97 (umol/L)	STAT: 1 hour Routine: 3 Hours
Creatinine (24 hour urine)	UCR	Chemical Pathology	Urine	24 hour urine container	9 -18 (mmol/24H)	1 working day
Creatinine clearance	UCCL	Chemical Pathology	Blood	4 mL in Heparin Tube	-	1 working day
			Urine	10 mL urine in sterile container		
Cryoprecipitate	CRYO	Transfusion Medicine	Blood	3 mL in EDTA Tube	-	1 hour
Dengue IgG & IgM	SDEN	Microbiology	Blood	3 – 5 mL in SST Tube	-	1 working day
Dengue NS1 Ag	SDNS1	Microbiology	Blood	3 – 5 mL in SST Tube	-	1 working day
Diastase/Amylase (Urine)		Chemical Pathology	Urine	10 mL urine in sterile container	16 – 491 (U/L)	1 working day

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERENCE RANGE (UNIT)	LTAT
Ear Swab For C&S	EAR	Microbiology	Ear Swab	Amies Swab	-	3 – 5 working days
Eye Swab For C&S	EYE	Microbiology	Eye Swab	Amies Swab	-	3 – 5 working days
Fresh Frozen Plasma	FFP	Transfusion Medicine	Blood	3 mL in EDTA Tube	-	1 hour
Full Blood Count (FBC)	FBC	Haematology	Blood	2 – 3 mL in EDTA Tube	-	STAT: 45 min Routine: 3 hours
Full Blood Picture (FBP)	FBP	Haematology	Blood	2 – 3 mL in EDTA Tube	WBC: 4.0 – 10.0 x 10^9 /L RBC: 4.5 – 5.5 x 10^{12} /L (male) 3.8 – 4.8 x 10^{12} /L (female) HGB: 13.0 – 17.0 g/dL (male) 12.0 – 15.0 g/dL (female) HCT: 40.0 – 50.0% (male), 36.0 – 46.0 % (female) PLT: 150 – 400 10^9 /L	STAT: 24 hours Please request through Medical Officer On-Call with adequate clinical history Routine: 7 working days
Fungal Scraping KOH 10%	FUNGAL SCRAP	Microbiology	Scrapping	Sterile Container	-	1 Day

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERENCE RANGE (UNIT)	LTAT
Genital Swab For C&S	GENITAL	Microbiology	Genital Swab	Amies Swab	-	3 – 5 working days
Globulin (calculated)	GLOB	Chemical Pathology	Not applicable	Not Applicable	22 – 34 (g/L)	3 hours
Glucose - Fasting	FBS	Chemical Pathology	Blood	2.5 mL in Fluoride Tube	3.9 – 6.0 (mmol/L)	STAT: 1 hour Routine: 3 Hours
Glucose - Random	RBS	Chemical Pathology	Blood	2.5 mL in Fluoride Tube	-	STAT: 1 hour Routine: 3 Hours
GI Protozoa PCR	GIPRO PCR	Microbiology	Stool	Sterile Container	-	5 working days
GI Helminth PCR	GIHEL PCR	Microbiology	Stool	Sterile Container	-	5 working days
HPV DNA PCR	HPVDNA	Microbiology	Cervical Swab	Flocked Swab or in liquid-based cytology media	-	7-14 working days
Helminth Culture	HEL CUL	Microbiology	Stool	Sterile container (specimen to reach lab within 24hr at room temperature	-	14 days
Hepatitis B Surface Antigen	HBSAG	Microbiology	Blood	3 – 5 mL in SST Tube	-	4 working days
High Density Lipoprotein Cholesterol	HDL	Chemical Pathology	Blood	3 – 5 mL in SST Tube	>1.0 (mmol/L)	3 hours
High Vaginal Swab For C&S	HVS	Microbiology	High Vaginal Swab	Amies Swab	-	3 – 5 working days
Lactate Dehydrogenase	LDHI2	Chemical Pathology	Blood	4 mL in Heparin Tube	< 250 (U/L)	3 hours
Leishmania Spp. (Giemsa Stain)	LEISH	Microbiology	Stool	Size of green pea or 5 grams in stool container	-	2 working days
Magnesium	MG	Chemical Pathology	Blood	4 mL in Heparin Tube	0.66 – 1.07 (mmol/L)	3 hours

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERENCE RANGE (UNIT)	LTAT
Magnesium (24 hour urine)	UMG	Chemical Pathology	24-hours Urine	24 hour urine container	3 - 5 (mmol/24H)	1 working day
Magnesium (random urine)	UMGR	Chemical Pathology	Urine	10 mL urine in sterile container	-	1 working day
Nasal Swab For C&S	NASAL	Microbiology	Nasal Swab	Amies Swab	-	3 – 5 working days
Nasopharyngeal Aspirate C & S	CSNPA	Microbiology	Nasopharyngeal Aspirate	3 – 4 mL in sterile container	-	3 – 5 working days
Packed Cells	RBC	Transfusion Medicine	Blood	3 mL in EDTA Tube	-	Urgent: - 30min Routine: - 2 hours
Phosphate	PHOS	Chemical Pathology	Blood	4 mL in Heparin Tube	0.81 – 1.45 (mmol/L)	3 hours
Phosphate (24 hour urine)	UPHOS	Chemical Pathology	24-hours urine	24 hour urine container	12.9 – 42 (mmol/24H)	1 working day
Phosphate (random urine)	URPHOS	Chemical Pathology	Urine	10 mL urine in sterile container	Male : 1.6 – 61 Female : 2.3 – 48 (mmol/L)	1 working day
Platelet	PLT	Transfusion Medicine	Blood	3 mL in EDTA Tube	-	1 day
Platelet – Trisodium Citrate	PLTCLUMP	Haematology	Blood	1.8 mL in 3.2% Citrate Tube	-	STAT: 45 min Routine: 3 Hours
Potassium	K	Chemical Pathology	Blood	4 mL in Heparin Tube	3.5 – 5.1 (mmol/L)	STAT:1 Hour Routine: 3 Hours
Potassium (24-hour urine)	UPOT	Chemical Pathology	24-hours urine	24 hour urine container	25 -125 (mmol/24H)	1 working day
Procalcitonin	PCTN	Chemical Pathology	Blood	3 – 5 mL in SST Tube	<0.05 (ng/mL)	3 working day
Prostate Specific Antigen, Total	PSA	Chemical Pathology	Blood	3 – 5 mL in SST Tube	<4 (ng/mL)	3 working days
Protein (24 hour urine)	TPU	Chemical Pathology	24-hours urine	24 hour urine container	50 – 80 (mg/24H)	1 working day

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERENCE RANGE (UNIT)	LTAT
Protein, Total	TP	Chemical Pathology	Blood	4 mL in Heparin Tube	64 – 83 (g/L)	3 hours
Prothrombin time (PT) & Activated Partial Thrombin Time (APTT)	PT/PTT	Haematology	Blood	1.8mL in 3.2% Citrate Tube	PT: 9.1-12.5 sec APTT: 25.1 – 36.5 sec	STAT:1 Hour Routine: 3 Hours
Pus Swab For C&S	PUS	Microbiology	Pus	Amies Swab	-	3 – 5 working days
Reticulocyte	RETICP	Haematology	Blood	2 – 3 mL in EDTA Tube	-	STAT:1 Hour Routine: 3 Hours
Skin Swab For C&S	SKIN	Microbiology	Skin Swab	Amies Swab	-	3 – 5 working days
Sodium	NA	Chemical Pathology	Blood	4 mL in Heparin Tube	136 – 145 (mmol/L)	STAT:1 Hour Routine: 3 Hours
Sodium (random urine)	UNAR	Chemical Pathology	Urine	10 mL urine in sterile container	20 -400 (mmol/L)	1 working day
Sputum For C&S	SPUTUM	Microbiology	Sputum	1 – 3 mL sputum in sterile container	-	3 – 5 working days
Sterility C&S	CSSTR	Microbiology	Not Applicable	Not Applicable	-	7 working days
Stool For C & S	STOOL	Microbiology	Stool	Size of green pea or 5 grams in stool container	-	3 – 5 working days
Stool For *Clostridium Difficile* Toxin	STCLDT	Microbiology	Stool	Size of green pea or 5 grams in stool container	-	2 working days
Stool For Occult Blood	STOCB	Chemical Pathology	Stool	Size of green pea or 5 grams in stool container	Negative	1 working day
Stool For Ova And Cyst	SOVACYST	Microbiology	Stool	Size of green pea or 5 grams in stool container	-	2 working days

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERENCE RANGE (UNIT)	LTAT
Stool For Microsporidium (Gram Chromotrope Stain)	GC	Microbiology	Stool	Sterile Container	-	3 working days
Stool For Cryptosporidium, Cyclospora and Isospora (DMSO stain)	DMSO	Microbiology	Stool	Sterile Container	-	3 working days
Throat Swab For C&S	THROAT	Microbiology	Throat Swab	Amies Swab	-	3 – 5 working days
Thyroid Stimulating Hormone	TSH	Chemical Pathology	Blood	3 – 5 mL in SST Tube	0.4 - 4.2 (mU/L)	1 working day
Thyroxine (Free T4)	FT4	Chemical Pathology	Blood	3 – 5 mL in SST Tube	9 – 19 (pmol/L)	1 working day
Tissue C&S	CSTIS	Microbiology	Tissue	Not Applicable	-	3 – 5 working days
Tracheal Aspirate For C & S	TRACHEAL	Microbiology	Tracheal Aspirate	3 – 5 mL in sterile container	-	3 – 5 working days
Trichomonas Vaginalis Microscopy	TRVA	Microbiology	Genital Related	Glass Slide	-	2 working days
Triglycerides	TRIG	Chemical Pathology	Blood	3 – 5 mL in SST Tube	<1.7 (mmol/L)	3 hours
Urea	BUN	Chemical Pathology	Blood	4 mL in Heparin Tube	2.1 – 7.1 (mmol/L)	STAT:1 Hour Routine: 3 Hours
Urea (24 hour urine)	UUREA	Chemical Pathology	24-hours urine	24-hour urine container	NA	1 working day
Urea (random urine)	UUREAR	Chemical Pathology	Urine	10 mL urine in sterile container	6.1 -712.2 (mmol/L)	1 working day
Uric Acid	UA	Chemical Pathology	Blood	4 mL in Heparin Tube	Male : 210 – 420 Female : 150 – 350 (umol/L)	3 hours

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERENCE RANGE (UNIT)	LTAT
Uric Acid (24 hour urine)	UUA	Chemical Pathology	24-hours urine	24-hour urine container	1.48 -4.43 (mmol/24H)	1 working day
Uric Acid (random urine)	UUAR	Chemical Pathology	Urine	10 mL urine in sterile container	NA	1 working day
Respiratory Viruses Antigen	RESVANT	Microbiology	Nasopharyngeal Swab	Swab	-	1 working day
Urine For C & S	URINE	Microbiology	Urine	3 – 5 mL urine in sterile container	Cell count WBC: 0-10 (cells/mm3) RBC: <15 (cells /mm3)	3 – 5 working days
Urine Pregnancy Test	UPT	Chemical Pathology	Urine	10 mL urine in sterile container	Negative	STAT : 1 hour

LIST OF REFERRED TESTS

8 LIST OF REFERRED TESTS

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERRED CENTRE (LTAT)
17-OH Progesterone	17OH	Chemical Pathology	Serum	5 mL in SST Tube	Hospital Putrajaya (30 days)
Acanthamoeba sp. Microscopy	ACAN	Microbiology	Corneal scraping, contact lens, contact lens solution, CSF	Sterile container	IMR (3 days)
Acetylcholine - Receptor Antibody	IARA	Microbiology	Serum	3 mL in SST Tube Send immediately to lab	IMR (21 working days)
Acid Fast Bacilli For Culture	AFBC	Microbiology	Sputum, Tissue, CSF Pus ,Body fluids	Sterile Container	IPR (9 weeks)
Adenovirus PCR Qualitative	MADEN	Microbiology	Serum	3 mL in SST Tube	Hospital Sg. Buloh (14 – 28 days)
Adrenocortico-tropic Hormone (ACTH)	ACTH	Chemical Pathology	Serum	3 mL in EDTA Tube Send in slurry ice	Hospital Kuala Lumpur (5 working days)
Aldosterone	ALDO	Chemical Pathology	Plasma/ Serum	4 mL in EDTA/ SST Tube	Hospital Putrajaya (30 days)
Allergy Testing (Screening)	IATS	Microbiology	Serum	3 mL in SST Tube	IMR (10 days)
Allergy Testing (Specific)	IATSP	Microbiology	Serum	3 mL in SST Tube	IMR (10 days)
Alpha-1 Antitrypsin	TRY	Chemical Pathology	Serum	3 – 5 mL in SST Tube	Hospital Ampang (7 days)
Ammonia	NH3	Chemical Pathology	Plasma	3 mL in EDTA Tube Send in slurry ice within 1 hour	Hospital Putrajaya (1 day)
Androstenedione	AND0	Chemical Pathology	Serum	5 mL in SST tube	Hospital Putrajaya (15 days)
Antibody Identification	AB01	Transfusion Medicine	Plasma	3 mL in EDTA Tube (3 tubes)	HSIS, Serdang (10 working days)
Antibody To Hepatitis A Virus IgM	AHAVM	Microbiology	Serum	3 mL in SST Tube	Hospital Kuala Lumpur (1 – 2 working days)
Antibody To Hepatitis B Envelope	AHBE	Microbiology	Serum	3 mL in SST Tube	Hospital Putrajaya (1 – 2 working days)
Anti-Cardiolipin (IgG/IgM)	IACGM	Microbiology	Serum	3 mL in SST Tube Send immediately to lab	Hospital Kuala Lumpur (14 working days)

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERRED CENTRE (LTAT)
Anti – Cyclic Citrullinated Peptides (CCP)	ICCP	Microbiology	Serum	3 mL in SST Tube	Hospital Kuala Lumpur (14 working days)
Anti-DSDNA	IDNA	Microbiology	Serum	3 mL in SST Tube	Hospital Kuala Lumpur (14 working days)
Anti-ENA Screening	IENA	Microbiology	Serum	3 mL in SST Tube	Hospital Kuala Lumpur (14 working days)
Anti-Gastric Parietal Cell	IAGPC	Microbiology	Serum	3 mL in SST Tube Send immediately to lab	Hospital Selayang (12 working days)
Anti-GAD Antibodies	ANTIGAD	Microbiology	Serum	3 mL in SST Tube Send immediately to lab	IMR (14 working days)
Anti-Glomerular Baseline Antibody	IAGB	Microbiology	Serum	3 mL in SST Tube Send immediately to lab	IMR (10 working days)
Anti-Islet Antibodies	ANTIISLET	Microbiology	Serum	3 mL in SST Tube Send immediately to lab	IMR (14 working days)
Anti-Liver Kidney Microsome	IALKM	Microbiology	Serum	3 mL in SST Tube Send immediately to lab	Hospital Selayang (30 working days)
Anti-M2 Antibody	IM2AB	Microbiology	Serum	3 mL in SST Tube	IMR (14 working days)
Anti-Mitochondrial Antibody	AMA	Microbiology	Serum	5 mL in SST Tube Send immediately to lab	Hospital Selayang (30 working days)
Anti-Neutrophil Cytoplasmic Antibody	ANCA	Microbiology	Serum	5 mL in SST Tube Send immediately to lab	Hospital Kuala Lumpur (14 working days)
Anti-Nuclear Antibody	ANA	Microbiology	Serum	3 mL in SST Tube Send immediately to lab	Hospital Kuala Lumpur (3 working days)
Anti-Platelet IgG Antibody	ANTPL	Transfusion Medicine	Blood	3 mL in EDTA Tube (4 tubes) and 3 mL in Plain tube (4 tubes)	PDN (10 working days)
Anti-Smooth Muscle Antibody	ASMA	Microbiology	Serum	3 mL in SST Tube Send immediately to lab	Hospital Selayang (30 working days)
Anti-Thyroglobulin Antibody	ATG	Chemical Pathology	Serum	5 mL in SST Tube	Hospital Putrajaya (15days)
Anti-Thyroid Peroxidase Antibody	ATPO	Microbiology	Serum	5 mL in SST Tube	Hospital Putrajaya (15 working days)

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERRED CENTRE (LTAT)
Aspergillus Galactomannan Antigen (Ag)	ASPERGILLUS	Microbiology	Serum	3 mL in SST Tube	Hospital Sg. Buloh (2 – 7 days)
			Bronchioalveolar lavage (BAL)	BAL in sterile container	
Anti Thyroid Peroxidase Antibody	ATOPP	Chemical Pathology	Serum	5 mL in SST Tube	Hospital Putrajaya (7 days)
Beta-D Glucan (1,3)	BDGAG	Microbiology	Blood	3ml in SST Tube	Hospital Sg. Buloh (5 working days)
BK Virus DNA PCR	MBKV	Microbiology	Serum	3 mL in SST Tube	Hospital Kuala Lumpur (7 working days)
Bone Marrow Aspirates (BMA) (Haemato- oncology Cytogenetic)	BMACY	Hematology	Bone Marrow Aspirate	5 mL in Heparin Tube	By appointment only (call ext.4128) Hospital Tunku Azizah (30-90 days)
Bone Marrow Aspiration (BMA)	BMASP	Hematology	Bone Marrow Aspirate	Bone Marrow smears	By appointment only (call ext.4128) Hospital Putrajaya (7 days)
Bordetella Pertussis (PCR)	MBPCR	Microbiology	Naso-pharyngeal aspirates, naso-pharyngeal swabs	1 – 2 mL in sterile or Dacron swab with charcoal media **DO NOT** use calcium alginate or cotton swab. Transport nasopharyngeal aspirates in ice	IMR (3 working days)
Borrelia Serology	SBORR	Microbiology	Blood	5 mL in SST Tube	Hospital Sg. Buloh (5 working days)
Brucella PCR	MBRUC	Microbiology	Blood	5 mL in EDTA Tube Transport at 2 – 8°C	IMR (4 working days)
Carbamazepine	TCAR	Chemical Pathology	Blood	3 mL in SST Tube Send with TDM Request Form	Hospital Putrajaya (6 hours)
CD4/ CD8 or T&B Cell Enumeration	CD4_8	Hematology	Blood	2 – 3 mL in EDTA Tube	Hospital Tunku Azizah (7 days)
Ceruloplasmin	CAER	Chemical Pathology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (2 working days)
Chikungunya Serology IgG	CHIKG	Microbiology	Blood	3 mL in SST Tube	MKAK (2 – 7 days)
Chikungunya Serology IgM	CHIKM	Microbiology	Blood	3 mL in SST Tube	MKAK (2 – 7 days)

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERRED CENTRE (LTAT)
Cholinesterase	CHE	Chemical Pathology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (1 working day)
CMV (Viral Culture)	VCCMV	Microbiology	Bronchio-alveolar lavage (BAL), CSF, Pericardial fluid, Tissue	1 – 3 mL BAL/ CSF/ Pericardial fluid in sterile container Tissue in VTM	IMR (14 – 35 days)
CMV PCR (Quantitative)	MCMQN	Microbiology	Blood	3 mL in SST Tube	Hospital Sg. Buloh (2 – 5 days)
CMV PCR (Qualitative)	MCMQL	Microbiology	Blood	3 mL in SST Tube	Hospital Sg. Buloh (2 – 5 days)
CMV Serology IgG	CMVG	Microbiology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (5 working days)
CMV Serology IgM	CMVM	Microbiology	Blood	3 mL in SST Tube	Hospital Putrajaya (3 working days)
Complement C3/C4	IC3C4	Chemical Pathology	Blood	3 mL in SST Tube	Hospital Putrajaya (1 day)
Cortisol	CAM	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (7 days)
C-peptide	CPEP	Chemical Pathology	Blood	5 mL in SST Tube (Fasting sample)	Hospital Kuala Lumpur (5 working days)
Chromosome Analysis-CLL only (Haemato-oncology Cytogenetic)	CHROM	Hematology	Blood	3 – 5 mL in Heparin Tube	By appointment only (call ext.4128) Hospital Tunku Azizah (30-90 days)
D-Dimer	DIMER	Hematology	Blood	1.8 mL in 3.2% Trisodium Citrate Tube Send immediately within 2 hours after collection	Hospital Putrajaya (2 hours)
Dehydroxyepi-endrosteron Sulphate (DHEA-S)	DHEAS-SO4	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (15 days)
Dengue Serology (IgG/IgM)	SDEN	Microbiology	Blood	5 mL in SST Tube If first specimen is negative, repeat after 3 – 5 days	Hospital Putrajaya (7 working days)
Diabetes Mellitus Autoantibodies	IDMA	Microbiology	Blood	3 mL in SST Tube	IMR (10 working days)

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERRED CENTRE (LTAT)
DIVC Screening Test	DIVCSCR	Hematology	Blood	2 – 3 mL in EDTA Tube and 1.8 mL in 3.2% Trisodium Citrate Tube Send immediately within 2 hours after collection	Hospital Putrajaya (2 hours)
DNA Analysis For Alpha Thalassemia	DNA-A	Hematology	Blood	2 – 3 mL in EDTA Tube	Hospital Kuala Lumpur (16 weeks)
DNA Analysis For Beta Thalassemia	DNA-B	Hematology	Blood	2 – 3 mL in EDTA Tube	Hospital Kuala Lumpur (16 weeks)
EBV DNA PCR (Quantitative)	MEBQN	Microbiology	Blood	3 mL in EDTA Tube (2 tubes) Send with PERPAT form	Hospital Sg. Buloh (2 – 5 days)
EBV DNA PCR (Qualitative)	MEBQL	Microbiology	Blood	3 mL in EDTA Tube (2 tubes) Send with PERPAT form	Hospital Sg. Buloh (2 – 5 days)
Echinococcosis Antibody	SECH	Microbiology	Blood	3 mL in SST Tube	IMR (5 working days)
EGFR	EGFRM	Anatomical Pathology	Tissue block or unstained slide	1 Tissue block/ 5 – 10 unstained slides Send with HPE Report & Molecular Testing Request Form	Hospital Tunku Azizah (14 - 30 working days)
Entamoeba Histolytica Antibody	SENHI	Microbiology	Blood	3 mL in SST Tube	IMR (5 days)
Enterovirus Isolation	VCENV	Microbiology	Throat/ Nasopharyngeal swab, Vesicular swab	Throat/ nasopharyngeal/ vesicular swab in VTM	IMR (14 – 28 days)
			CSF	Sterile container	
			Pericardial fluid,	Sterile container	
			Stool	Sterile container	
			Tissue	Tissue in VTM or sterile normal saline	

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERRED CENTRE (LTAT)
Enterovirus PCR	MENV	Microbiology	Blood	3 mL in SST Tube	IMR (1 – 10 days)
Epstein Barr Virus Serology IgG	EBVCIGG	Microbiology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (7 working days)
Epstein Barr Virus Serology IgM	EBVCIGM	Microbiology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (3 working days)
Erythrocyte Sedimentation Rate (ESR)	ESR	Hematology	Blood	2 – 3 mL in EDTA Tube	Hospital Putrajaya (3 hours)
Estradiol	EST	Chemical Pathology	Blood	3 mL in SST Tube	Hospital Putrajaya (7 days)
Free T3	FT3	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (7 days)
Ferritin	FER	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (7 days)
Fertility 1 (LH,FSH & Estradiol)	FE1	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (7 days)
Fertility 2 (LH, FSH, Estradiol & Prolactin)	FE2	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (7 days)
Fibrinogen	FIBRIN	Hematology	Blood	1.8 mL in 3.2% Trisodium Citrate Tube Send immediately within 2 hours after collection	Hospital Putrajaya (2 hours)
Folate	FOL	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (14 days)
Frozen section	FS	Anatomical Pathology	Fresh tissue without fixative	Send in clear leak-proof container or saline-moistened gauze	Hospital Putrajaya (30 minutes without full report)
Follicle- stimulating Hormone (FSH)	FSH	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (7 days)
G6PD Enzyme Quantitative Assay	G6PD QUANTI-TATIVE	Hematology	Blood	2 – 3ml in EDTA Tube	By appointment with Pathologist HTA for adult case Hospital Tunku Azizah (20 days)
Gamma – glutamyl-transferase (GGT)	GGT	Chemical Pathology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (1 day)
Glucose-6-Phospate Dehydrogenase	G6PD	Hematology	Blood	2 – 3 mL in EDTA Tube	Hospital Putrajaya (1 day)

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERRED CENTRE (LTAT)
Growth Hormone (GH)	GH	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (15 days)
Gynae Pap Smear – Liquid Based	GPS	Anatomical Pathology	Cervical broom rinsed in thin-prep kit fixative	Thin-prep kit	Hospital Kuala Lumpur (30 calendar days)
H1N1	MH1N1	Microbiology	Throat/ Naso-pharyngeal/ Nasal Swab	Dacron Swab in 2 – 3 mL VTM in ice	Hospital Kuala Lumpur (3 working days)
Haptoglobin	HAPTO	Chemical Pathology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (2 working days)
HbA1c (Glycosylated Haemoglobin)	HBA1C	Chemical Pathology	Blood	3 mL in EDTA Tube	Hospital Putrajaya (2 – 3 days)
HBV DNA PCR	MBDNA	Microbiology	Blood	2 mL in EDTA Tube Send in ice	Hospital Kuala Lumpur (7 working days)
HCV RNA PCR	MCRNA	Microbiology	Blood	2 mL in EDTA Tube Send in ice	Hospital Kuala Lumpur (7 working days)
Hemoglobin (Hb) Analysis	HBANA	Hematology	Blood	2 – 3 mL in EDTA Tube	HSIS, Serdang (6 weeks)
Hemoglobin (Hb) Electrophoresis	HBELECT	Hematology	Blood	2 – 3 mL in EDTA Tube Note: Hb Analysis has been reported	HSIS, Serdang
Hepatitis A Virus (IgM/IgG)	SHAV	Microbiology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (5 working days)
Hepatitis B Core IgM	AHBCM	Microbiology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (5 working days)
Hepatitis B Core Total	AHBCT	Microbiology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (5 working days)
Hepatitis B Envelope Antigen	HBEAG	Microbiology	Blood	3 mL in SST Tube	Hospital Putrajaya (2 working days)
HER2	HER2	Anatomical Pathology	Tissue block / unstained slides	Tissue blocks / 1 H&E slide & 5 – 10 unstained slides Send with HPE Report & PER-PATH 301 Form	Hospital Kuala Lumpur (3 months)
Herpes Simplex Virus 1 And 2 IgG	HSVG	Microbiology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (7 working days)

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERRED CENTRE (LTAT)
Herpes Simplex Virus 1 And 2 IgM	HSVM	Microbiology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (7 working days)
HIV (PA)	IHIVC	Microbiology	Blood	3 mL in SST Tube	Hospital Putrajaya (3 days)
HIV RNA PCR Viral Load	MHIVL	Microbiology	Blood	2 mL in EDTA Tube Send in ice	Hospital Kuala Lumpur (2 working days)
HLA Ab Detection/ Screening	IHLAB	Microbiology	Blood	3 mL in SST Tube	IMR (20 days)
HLA Typing (Class I And II)	IHLAT	Microbiology	Blood	3 mL in SST Tube	IMR (10 days)
Immunoglobulin G, A and M	GAM	Chemical Pathology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (5 working days)
Insulin	INS	Chemical Pathology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (5 working days)
Insulin Like Growth Factor	IGF-1	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (15 days)
Iron	IP	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (14 days)
Japanese Encephalitis IgM	JEM	Microbiology	Blood	3 mL in SST Tube	MKAK (5 working days)
KRAS	KRAS	Anatomical Pathology	Tissue block or unstained slide	1 Tissue block/ 5 – 10 unstained slides Send with HPE Report & Molecular Testing Request Form	Hospital Tunku Azizah (30 working days)
Lactate	LACT	Chemical Pathology	Blood	2 mL in Fluoride Tube Send in slurry ice within 1 hour	Hospital Putrajaya (1 day)
Legionella (IgG/IGM)	IFLEG	Microbiology	Blood	3 mL in SST Tube	MKAK (5 working days)
Legionella Urinary Antigen	LUAG	Microbiology	Urine	5 mL urine in sterile container	Hospital Putrajaya (3 working days)
Leishmania Spp. Serology	SLEIS	Microbiology	Blood	3 mL in SST Tube	IMR (5 working days)
Leptospira IgM	SLEPM	Microbiology	Blood	3 mL in SST Tube	Hospital Putrajaya (2 working days)

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERRED CENTRE (LTAT)
Leukemia Translocation Studies	LEUTS	Hematology	Bone Marrow/ Peripheral blood	1 x 2 mL BMA in EDTA tube/ 2 x 2 mL blood in EDTA The sample must be accompanied with a copy of the FBC result, BMA report and Immuno-phenotyping report	IMR (7 days)
Immuno-phenotyping for Leukaemia/ Immuno-phenotyping for Lymphoma	IPT	Hematology	Bone Marrow	2 mL BMA in EDTA tube (2 tubes)	Call for appointment within 3 working days before the procedure. Hospital Tunku Azizah (21 days)
			or		
			Blood	2 mL in EDTA Tube	
Lupus Anticoagulant	LUPUS	Hematology	Blood	1.8 mL in 3.2% Trisodium Citrate Tube (4 tubes) Send immediately after phlebotomy	By appointment with Pathologist, Hospital Tunku Azizah (6 weeks)
Luteinizing Hormone (LH)	LH	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (7 days)
Measles IgG	MIGG	Microbiology	Blood	5 mL in SST Tube	Hospital Sg. Buloh (7 working days)
Measles IgM	MIGM	Microbiology	Blood	3 mL in SST Tube	MKAK (14 working days)
Measles PCR	MEAPCR	Microbiology	Throat swab	Throat swab in VTM	MKAK (14 working days)
			or		
			Tracheal aspirate (TAS) / Naso-pharyngeal aspirate (NPA)	Sterile container	
			or		
			Urine	Sterile container	
			Note: Respiratory sample taken within 1 – 7 days of onset. Send sample in ice.		

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERRED CENTRE (LTAT)
Measles Virus Isolation	VCMEA	Microbiology	Throat swab	Throat swab in VTM	MKAK (30 working days)
			or		
			Tracheal aspirate (TAS) / Naso-pharyngeal aspirate (NPA)	Sterile container	
			or		
			Urine	Sterile container	
			Note: Respiratory sample taken within 1 – 7 days of onset.		
Meningitis panel (QIA-stat-Dx)	MEN PANEL	Microbiology	CSF	1 mL in Sterile container	By appointment and request verified by Clinical Microbiologist Hospital Kuala Lumpur (1 working day)
Melioidosis Serology	SMELI	Microbiology	Blood	3 mL in SST Tube	IMR (5 days)
Microfilaria Serology	SFIL	Microbiology	Blood	3 mL in SST Tube	IMR (1 day)
Microsatellite Instability Testing	MSI	Anatomical Pathology	Tissue block / unstained slides	Tissue block/ Unstained Slides Send with HPE Report & Molecular Testing Request Form	Hospital Tunku Azizah (14 – 30 working days)
Mixing Test	MIX	Hematology	Blood	1.8 mL in 3.2% Trisodium Citrate Tube (3 tubes) Send immediately after phlebotomy.	Hospital Putrajaya (24 hours)
Molecular Testing (e.g. ALK, cancer gene panel)	MOLECUL-AR	Anatomical Pathology	Tissue block / unstained slides	1 Tissue block/ 5 – 10 unstained slides Send with HPE Report & Molecular Testing Request Form	Appointment with HKL/ HTA Pathologist for test request Hospital Tunku Azizah (14 – 30 working days)
Mumps IgM	MUIGM	Microbiology	Blood	3 mL in SST Tube	Hospital Sg Buloh (7 working days)
Mumps IgG	MUIGG	Microbiology	Blood	3 mL in SST Tube	Hospital Sg Buloh (7 working days)

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERRED CENTRE (LTAT)
Mutation Study (JAK2 V 617 F)	JAK2	Hematology	Blood / Bone Marrow Aspirate (BMA)	5 mL blood in EDTA tube / 2 mL BMA	By appointment with Pathologist Hospital Ampang (8 weeks)
Mycobacterium PCR	MMTB	Microbiology	Blood	3 mL in EDTA Tube	IMR (5 working days)
			or		
			Aspirates/ Body Fluid/ CSF/ Pus/ Stool/ Urine/ FFPE Block	1 – 2 mL in sterile container Send immediately	
			or		
			Sputum	Ideally collect 3 consecutive specimens. A single well collected specimen is adequate	
Naegleria Fowleri	NAELLERIA	Microbiology	CSF	Sterile container	IMR (3 days)
Nipah Virus	NIPAHV	Microbiology	Blood	3ml in SST Tube/ 3ml in EDTA Tube	IMR (1 – 10 days)
			or		
			CSF	Sterile container	
Non gynae: Fine Needle Aspirate (FNA)	NGACF	Anatomical Pathology	Fine Needle Aspirate	Alcohol fixed and air-dried slides Sample for cell block in 95% alcohol	Hospital Putrajaya **Urgent:** 7 working days **Routine:** 30 working days
Non gynae: Nipple discharge	NGNIPPLE	Anatomical Pathology	Direct smear	Smear in clean slide	Hospital Putrajaya **Urgent:** 3 working days **Routine:** 14 working days
Non gynae: Bronchial Brushing	NGBB	Anatomical Pathology	Bronchial Brushing	Send in sterile container or alcohol fixed slide. Send immediately within 4 hours or keep at 2 – 8° C after office hour Refer specimen collection for brushing.	Hospital Putrajaya **Urgent:** 3 working days **Routine:** 14 working days
Non gynae: Bronchial Lavage	NGBL	Anatomical Pathology	Bronchial Lavage		
Non gynae: CSF	NGCSF	Anatomical Pathology	CSF		

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERRED CENTRE (LTAT)
Non gynae: Pericardial Fluid	NGPTF	Anatomical Pathology	Peritoneal Fluid	Send in sterile container or alcohol fixed slide. Send immediately within 4 hours or keep at 2 – 8° C after office hour Refer specimen collection for brushing.	Hospital Putrajaya **Urgent:** 3 working days **Routine:** 14 working days
Non gynae: Peritoneal Fluid	NGPCF	Anatomical Pathology	Pericardial Fluid		
Non gynae: Pleural Fluid	NGPLF	Anatomical Pathology	Pleural Fluid		
Non gynae: Sputum	NGSP	Anatomical Pathology	Sputum		
Non gynae: Synovial Fluid	NGSYNF	Anatomical Pathology	Synovial Fluid		
Non-gynae: Others	NGO	Anatomical Pathology	-		
Osmolality – Serum	SOSMO	Chemical Pathology	Blood	3 – 5 mL in SST Tube	1 working day
Osmolality – Urine	UOSMO	Chemical Pathology	Urine	10 mL urine in sterile container	1 working day
Paracetamol	TPCRD	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (1hours)
Parvo Virus IgG	PVIGG	Microbiology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (7 working days)
Parvo Virus IgM	PVIGM	Microbiology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (3 working days)
Parathyroid Hormone (PTH 1 - 84)	IPTH	Chemical Pathology	Blood	3 mL in EDTA Tube/ plain tube	Hospital Kuala Lumpur (5 working days)
Phenobarbitone	TPBPR & TPBRD	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (1 day)
Phenytoin	TPYPR & TPYRD	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (1 day)
Progesterone	PROG	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (7 days)
Prolactin	PROC	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (7 days)
Renin	RENIN	Chemical Pathology	Blood	3 mL in EDTA Tube Send in ice slurry	Hospital Putrajaya (30 days)
Rheumatoid Arthritis Factor	RF	Chemical Pathology	Blood	3 – 5 mL in SST Tube	Hospital Putrajaya (5 working days)
RPR	RPR	Microbiology	Blood	3 – 5 mL in SST Tube	Hospital Putrajaya (5 working days)
Rotavirus Antigen	ROTAVIRUS	Microbiology	Stool	Sterile container	Hospital Putrajaya (1 working day)

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERRED CENTRE (LTAT)
Rubella IgG	RIGG	Microbiology	Blood	3 mL in SST Tube	Hospital Putrajaya (7 working days)
Salicylate	TSLPR & TSLRD	Chemical Pathology	Blood	3 mL in SST Tube	Hospital Putrajaya (1 day)
Schistosomiasis Serology	SSHIS	Microbiology	Blood	3 mL in SST Tube	IMR (5 working days)
Second Opinion – Hospital Putrajaya	BNSHPJ	Anatomical Pathology	Stained Slide	Stained Slide	Hospital Putrajaya (14 – 30 working days)
Second Opinion – HSIS, Serdang/ Hospital Kuala Lumpur	BNS	Anatomical Pathology	Stained slide	Stained slide	Hospital Serdang/ Hospital Kuala Lumpur (14 - 30 working days)
Serology – Rubella IgM	RIGM	Microbiology	Blood	3 mL in SST Tube	Hospital Putrajaya (3 working days)
Serology - Varicella Zoster IgG	VZIGG	Microbiology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (7 working days)
Serology - Varicella Zoster IgM	VZIGM	Microbiology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (3 working days)
Serum Protein Electrophoresis (SPE)	SELEC	Chemical Pathology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (15 working days)
Sex Hormone Binding Globulin (SHBG)	SHBG	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (15 days)
Specific Liver Antibodies (Anti-Ama, M2, M2-3/ BPO, SP100, PML, GP210, LKM1, LC-1, SLA / LP, RO-52)	ISLAB	Microbiology	Blood	3 mL in SST Tube	IMR (10 working days)
Stool For Acute Flaccid Paralysis	VCPOL	Microbiology	Stool	Stool container	IMR (14 calendar days)
Surgical biopsy – Large	SBBHPJ	Anatomical Pathology	Tissue	Specimen shall be fixed with 10% buffered formalin (ratio of 1:10) in appropriate specimen container size State the type of specimen with manual label and send with PER-PAT 301 Form	Hospital Putrajaya (14 calendar days)

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERRED CENTRE (LTAT)
Surgical biopsy – Small	SBSHPJ	Anatomical Pathology	Tissue	Specimen shall be fixed with 10% buffered formalin (ratio of 1:10) in appropriate specimen container size State the type of specimen with manual label and send with PER-PAT 301 Form	Hospital Putrajaya (14 calendar days)
TB GENEXPERT	TBGXPERT	Microbiology	Sputum/ Tracheal aspirate (TAS)/ Broncho-alveolar lavage (BAL)/ CSF	Sterile container Please send MTB C&S together with TB GeneXpert request	Request shall be verified by ID Team/ Clinical Microbiologist. Hospital Putrajaya (2 working days)
Testosterone	TESTO	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (15 days)
Theophylline	TTHPR/ THRD/ TTHS1/ TTHS2	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (6 hours)
Inherited Thrombophilia Screening (Protein C, Free Protein S, Antithrombin, APCR) Screening	THROMBO	Hematology	Blood	1.8 mL in 3.2% Trisodium Citrate Tube (4 tubes) Send immediately after phlebotomy. Requires appointment with Pathology MO	By appointment only with Pathologist Hospital Tunku Azizah (6 weeks)
Thyroglobulin	TG	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (15 days)
Thyroid Stimulating Hormone Receptor		Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (10 days)
Total Iron Binding Capacity (TIBC)	IP	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (14 days)
Toxocara Antibody	STOXC	Microbiology	Blood	3 mL in SST Tube	IMR (5 days)
Toxoplasma IgG	TOIGGI	Microbiology	Blood	3 mL in SST Tube	Hospital Kuala Lumpur (7 working days)

TEST NAME	TEST CODE	UNIT	SPECIMEN TYPE	SPECIMEN COLLECTION	REFERRED CENTRE (LTAT)
Transferrin	TRANS	Chemical Pathology	Blood	3 mL in SST Tube	Hospital Ampang (7 days)
Troponin-I	TROP	Chemical Pathology	Blood	3mL in Heparin Tube	Hospital Putrajaya (1 hour)
Urine 5-HIAA (Hydroxy-indole-acetic acid) 24 hours	U5HIA	Chemical Pathology	24-hours Urine	24 hour urine in container added with 10 mL of 25% HCl	IMR (15 days)
Urine Metanephrine	UME	Chemical Pathology	24-hours Urine	24 hour urine container added with 10 mL of 25% HCl	Hospital Putrajaya (30 working days)
Urine Microalbumin (Random)	UALB	Chemical Pathology	Urine	10 mL of first morning urine in urine container	Hospital Putrajaya (2 - 3 days)
Urine Protein Electrophoresis	UELEC	Chemical Pathology	Urine	24 hour urine in container Pair with serum Refrigerate after collection at 2-8°C. Must reach lab not more than 7 days	Hospital Kuala Lumpur (15 working days)
Urine Myoglobin	RMY	Chemical Pathology	Urine	10 mL urine in container contains 200mg of sodium bicarbonate (final concentration 2%)	Hospital Ampang (7 working days)
Valproic Acid	TVARD 7 TVAPR	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (15 working days)
VDRL CSF	SVDCS	Microbiology	CSF	Indicated if past history of syphilis(serum TPPA positive)	Hospital Kuala Lumpur (7 working days)
Viral Culture	VICUL	Microbiology			IMR (28 working days)
Vitamin B2	VITD	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (14 days)
Vitamin D	VITD	Chemical Pathology	Blood	5 mL in SST Tube	Hospital Putrajaya (30 days)
VZV DNA PCR Qualitative	MVZQL	Microbiology	Blood	3 mL in EDTA Tube	Hospital Sg. Buloh (7 working days)
			CSF	Sterile container	

APPENDIX 1

MASSIVE TRANSFUSION PROTOCOL (MTP)
INSTITUT KANSER NEGARA