DEPARTMENT OF PATHOLOGY
HOSPITAL TENGKU AMPUAN RAHIMAH
Jalan Langat, 41200 Klang, Selangor

LAB USER MANUAL

5TH 2024 EDITION

Department of Pathology
Hospital Tengku Ampuan Rahimah

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It is updated on at least an annual basis. Please refer to the Hospital Tengku Ampuan Rahimah website for the most recent version.

Links to the external websites are beyond the Department of Pathology, HTAR control. Access might be affected due to any upgrading/maintenance work at the respective sites.

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FOREWORD.

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

The new edition of the Lab. User Manual will serve as a guide for doctors, and nurses in the proper methods to be adopted in the collection of specimens for laboratory investigations. I wish to extend my sincere thanks to all the staff who have worked so hard to put this issue together. We hope for this Lab. User Manual will meet your needs by providing useful and up-to-date laboratory information. We welcome your feedback and suggestions so that together we will provide the best care to our patients. Thank you

DR. SELVAMALAR SELVARAJAN
Hospital Director
Hospital Tengku Ampuan Rahimah
Selangor Darul Ehsan

The Department of Pathology, Hospital Tengku Ampuan Rahimah is committed to providing high-quality and efficient medical laboratory services including diagnostic and consulting services. Thus, this laboratory user manual provides brief, clear and useful information which will allow our client to make use of our services. Ensuring quality at the pre-analytical phase is a mandatory prerequisite towards achieving overall quality in our services.

The department is on–going efforts of reviewing, updating and improving the contents of the Lab. User Manual are to ensure accurate and clear information is communicated as well as making the Lab. User Manual as a user-friendly guideline. I believe healthcare providers will continue to support our department by providing their honest comments and feedback to further improve the quality of our services.

Finally, I congratulate all editorial board members for their remarkable efforts and invaluable contributions towards the improvement and revision of this Lab. User Manual. Thank you for your willingness to serve and for your commitment to excellence.

DR. ZAINURA ANITA BINTI ZAINAL ABIDIN
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VISION & MISSION.

VISION OF HOSPITAL TENGKU AMPUAN RAHIMAH

To be leading organization in providing innovative and holistic healthcare

MISSION OF HOSPITAL TENGKU AMPUAN RAHIMAH

To meet the needs and expectation of shareholders through quality, professional and caring services

VISION OF THE DEPARTMENT OF PATHOLOGY

Establishing the clinical diagnostic services that are comprehensive, accurate and quality while promoting academic development and research in the field of pathology

MISSION OF THE DEPARTMENT OF PATHOLOGY

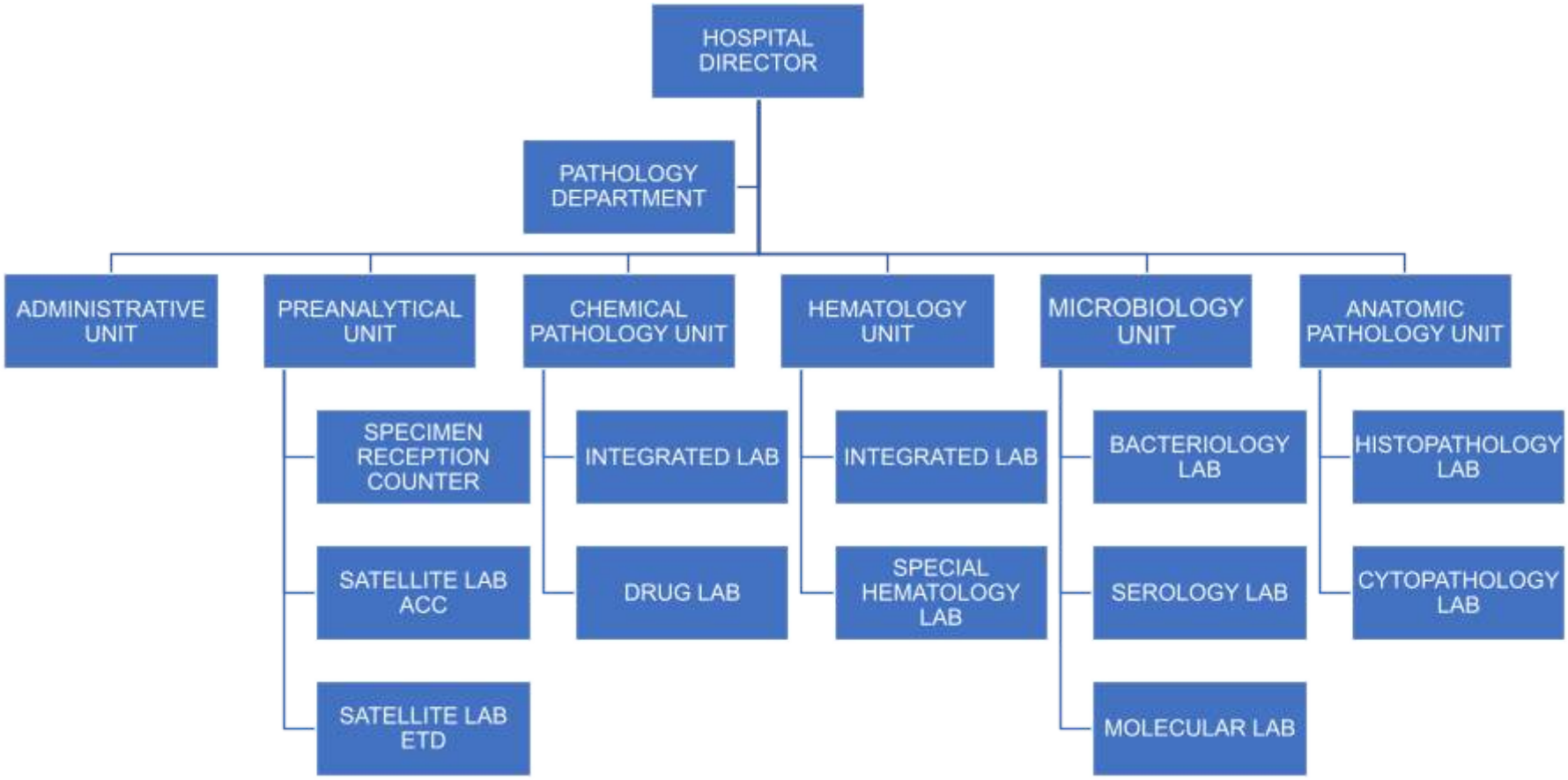
Responsible for providing clinical diagnostic services that are efficient, fast and accurate through quality service and ethical conduct, use of latest technology and professional personnel to meet the needs and expectations of all customers

CUSTOMER CHARTER PATHOLOGY

Provide quality diagnostic services, fast, accurate and customer friendly.

ORGANIZATION CHART.

ORGANIZATION CHART OF THE DEPARTMENT Of PATHOLOGY, TENGKU AMPUAN RAHIMAH HOSPITAL



CONTACT NUMBERS.

CONTACT NUMBERS.

DEPARTMENT OF PATHOLOGY	EXTENSION
ADMINISTRATIVE UNIT	
Head of Department	1453
Medical Lab Technologist U38/40	1382
Personal Assistant / General Office	1362
PREANALYTICAL UNIT	
Head of Unit	1454
Specimen Reception Counter / Outsource Section	1369
Satellite Lab at Ambulatory Care Centre (ACC)	6219
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ANATOMICAL PATHOLOGY UNIT	
Head of Unit	1270
Pathologist	1358 / 1270
Medical Officer	1240 / 1279
Scientific Officer	1429
Medical Lab Technologist U32	1357 / 1356
Histopathology Laboratory	1357
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CHEMICAL PATHOLOGY UNIT	
Head of Unit	1454
Pathologist	1454
Scientific Officer	1372 / 1361
Medical Lab Technologist U32	1424
Chemical Pathology Laboratory (CPL)	1360

DEPARTMENT OF PATHOLOGY	EXTENSION
Drug Lab	1449
HAEMATOLOGY UNIT	
Head of unit	1444
Pathologist	1444 / 1358
Medical Officer	1240 / 1279
Scientific Officer	1429
Medical Lab Technologist U32	1370
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MICROBIOLOGY UNIT	
Head of Unit	1454
Pathologist	1454
Scientific Officer	1365
Medical Lab Technologist U32	1367
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Serology Laboratory	1451

GENERAL OPERATION.

GENERAL OPERATING POLICIES.

1. INTRODUCTION

The Department of Pathology provides comprehensive laboratory services for Hospital Tengku Ampuan Rahimah (HTAR), Klang and acts as a referral Pathology service center for government and private hospitals and clinics within its vicinity. The department is accredited with ISO 15189 and 9001.

2. LOCATION

The Department of Pathology is located on the ground floor of the main building of Hospital Tengku Ampuan Rahimah, Jalan Langat, Klang, Selangor.

3. ORGANIZATIONAL STRUCTURE

The department is divided into 5 units. Please refer to the attached organization chart.

4. OBJECTIVES

4.1. To provide diagnostic and consultancy services in the field of Chemical Pathology, Microbiology and Serology, Histopathology, Cytopathology, Hematology to all clinical departments at Hospital Tengku Ampuan Rahimah, clinical laboratories of other government and private hospitals and health clinics within its vicinity.

4.2. To provide technical and analytical training for personnel and staff of Hospital Tengku Ampuan Rahimah, other government hospitals and trainees or students from other institutes.

4.3. To provide advisory and consultancy services to Hospital Director, State Health Director and Ministry of Health in matters related to the Pathology services.

4.4. To conduct and assist research and development in the Pathology and other relevant clinical fields.

5. SERVICE HOURS

5.1. All laboratories in this department operate during normal working hours.

5.2. Certain tests in Chemical Pathology, Hematology and Microbiology are offered 24 hours. These services are provided by Integrated Laboratory in the Pathology Department and Satellite Laboratory in the Emergency and Trauma Department.

5.3. There are two satellite laboratories, one situated at the Ambulatory Care Centre (open Monday to Friday from 8 am to 1 pm, closed on Saturdays, Sundays, and public holidays) and another at the Emergency and Trauma Department (open 24 hours)

5.4. Specimens which need to be sent to other testing laboratories such as Institute Medical Research (IMR), National Blood Centre (NBC/PDN) and Hospital Kuala Lumpur (HKL) are sent out every working day at 9.00 am. The specimens should be last received at the counter by 8.45 am to facilitate the delivery.

5.5. There are pathologists and medical officers on 24 hours call duty each day. The contact numbers are provided in the monthly call roster.

6. TYPE OF SERVICES

6.1. Urgent – Tests under urgent requests which are vital for patient immediate management will be given priority and processed immediately within the stipulated turnaround time (TAT).

6.2. Routine – Routine tests are processed within the requirement of the turnaround time (TAT)

7. SERVICES FOR PRIVATE HOSPITAL /LABORATORY

7.1. Requests for tests and services from private hospitals and clinics are attended post approval by the Head of Department.

7.2. All requests are charged according to the current Fee Ordinance and must be paid prior to analysis.

8. QUALITY ASSURANCE

The following Quality Assurance programs are carried out in the department:

8.1. Recognized External Quality Assurance Schemes.

8.2. Internal quality control monitoring

8.3. National Indicator Approach

8.4. Customer Satisfaction Survey

8.5. Regular Internal Audit MS ISO 15189 and MS ISO 9001

8.6. Key Performance Index

8.7. Hospital Performance Indicator for Accountability

8.8. Malaysian Patient Safety Goal

9. TRAINING PROGRAMME

9.1. Departmental / Unit Continuous Medical Education (CME) sessions including Journal Club.

9.2. Interdepartmental and inter-hospital Clinical-Pathological Conference sessions.

9.3. Regular in-house training for staff and trainees are held at department and unit level.

9.4. Staff are regularly sent to participate in external training programmes.

9.5. Orientation programme is conducted for all new staff and trainee

10. SAFETY AND HEALTH OF STAFF

Strict safety measures are implemented according to the laboratory safety manual. HTAR has established a worker Safety and Health Committee, as required by National Institute for Occupational Safety and Health (NIOSH)

11. CUSTOMER COMPLAINT & FEEDBACK

Users are welcome to give feedback or complaints to help improve the quality of our service. Please scan the QR code or click to the link address.

Kerajaan Malaysia - Kementerian Kesihatan Malaysia (spab.gov.my)

12. GUIDELINES FOR THE SAFE TRANSPORT OF CLINICAL SPECIMENS AND INFECTIOUS SUBSTANCES IN MALAYSIA 2023 (MOH/P/PAK/528.23(GU)-e,)

13. UNCERTAINTY OF MEASUREMENTS

13.1. Biochemical tests are subject to a degree of uncertainty in their measurement. This may be due to a variety of factors including: Biological variation within individuals Analytical measurement imprecision Pre–analytical factors

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

14. CONSENT

14.1. All procedures carried out on a patient need the informed consent of the patient.

14.2. For most routine procedures, consent can be inferred when the patient presents himself or herself with a request form and willingly submits to the collecting procedure e.g. venipuncture. Patients in a hospital bed should normally be given the opportunity to refuse.

14.3. Special procedures, including more invasive procedures, or those with an increased risk of complications to the procedure will need a more detailed explanation and, in some cases, written consent.

14.4. In emergency situations, consent might not be possible; under these circumstances it is acceptable to carry out necessary procedures, provided they are in the patient's best interest.

PREANALYTICAL REQUIREMENT.

PREANALYTICAL REQUIREMENT

1. INTRODUCTION

Majority of laboratory requests are received at the Main Reception Counter which operates 24 hours. Laboratory requests for Anatomical Pathology examination, Drug of Abuse testing and Microbiological Molecular testing are received at the respective laboratories during office hours. The Main Reception Counter will sort laboratory requests and perform rejection when necessary.

2. REQUEST FORM

2.1. A standard laboratory request form (PER-PAT 301) is used for all categories of tests, unless stated otherwise. Refer to the chapters on the list of tests and request forms.

2.2. Each request form must be sent according to the test required

2.3. All request forms must be filled in completely and accompanied by properly collected specimens. The request form must be filled legibly and completely with the following information:

2.3.1. Patient's name–as stated in identification card (IC)/passport
2.3.2. Full IC number for Malaysian (12 digits) *
2.3.3. Registration number (RN)
2.3.4. Age
2.3.5. Race and Gender
2.3.6. Ward/ Clinic/ Name of Hospital
2.3.7. Relevant clinical history, diagnosis and treatment
2.3.8. Test required
2.3.9. Type of specimen and anatomic site (if relevant)
2.3.10. Date and time of specimen collection
2.3.11. Name of the requesting doctor
2.3.12. Signature and stamp of the requesting doctor

***Note:**

- Passport number should be used for non-Malaysian patient
- *Nombor tentera* or *nombor polis* can be used when necessary
- Twin babies must be stated clearly on the request form and specimen
- MyKid IC number is encouraged to be used for pediatric patients. In cases where MyKid is not available, the mother's IC/ Passport number must be used. However, it must be stated clearly on the request form
- HTAR number can only be used when IC/Passport number is not available

3. SPECIMEN

3.1. Specimens should be collected from patients in the ward or clinic and properly labeled. Each specimen must be labeled with at least 2 identifiers which include the following information; and the information must tally with the form:

3.1.1. Patient's name AND

3.1.2. Full IC number (12 digits) / Passport number / Registered Number (RN)/ HTAR number

3.2. Specimen containers shall be placed in biohazard plastic bags and stapled to the respective request form.

3.3. To ensure consistent and accurate results follow strictly the volume of blood required for the type of test specified on the label or fill the blood sample up to mark on the tube.

3.4. To prevent hemolysis:

- Use proper needle gauge size
- If use vacutainer tubes, do not remove the cap
- Fill the blood sample up to mark on the tube
- Avoid vigorous mixing
- Send the specimen to the laboratory as soon as possible.

3.5. Avoid clot formation by:

3.5.1. Ensuring the smooth venipuncture and steady flow of blood into the syringe.

3.5.2. Introducing the blood in the anticoagulated tube up to the mark as soon as the blood has been drawn.

3.5.3. Immediately mix gently by inverting the tube at least 5–10 times.

4. TYPE OF CONTAINERS

The specimen should be sent to the laboratory in the appropriate container as specified. Refer to the chapters on specimen containers, list of offered and referred tests.

5. TRANSPORTATION

All laboratory requests should be dispatched to the laboratory as soon as possible in the appropriate medium as specified. Refer to the chapters on the list of offered and referred tests.

6. REJECTION

Laboratory requests which do not fulfill the laboratory requirement will be rejected. Rejection can be done either through laboratory information systems (LIS) or manually using rejection slip. Reasons for rejection can be classified into primary and secondary rejection, example as follows:

6.1. Primary rejection

- Duplicate test request
- Empty container
- Empty request form
- Incomplete patient's identifiers on specimen label
- Leaking specimen from container
- Mislabeled specimen
- Patient's identification number is not provided
- Patient's identification on the request form/specimen label is illegible
- Patient's identification on the request form and specimen label does not tally
- Request form has no requester signed and stamped
- Request form has no specialist approval (signed and stamped)
- Request form is received without specimen
- Requested test less than the specified interval
- Syringe is not capped with stopper
- Test is temporarily suspended
- Specimen is received without request form
- Specimen is not transported in ice
- Specimen in syringe with needle attached
- Test not offered
- Test not indicated
- Test request is not stated/ specified
- Unlabeled specimen
- Wrong container
- Wrong specimen sent

6.2. Secondary rejection (will be determined by respective units)

- Aged specimen
- Clotted specimen
- Grossly hemolyzed specimen
- Hemorrhagic specimen
- Icteric specimen
- Insufficient specimen
- Lipemic specimen
- Mucoid specimen
- Possible specimen contamination
- Purulent specimen
- Wrong sampling time

6.3. Specific rejection criteria

Please refer to the **Table 1: List of offered tests**

CRITICAL RESULT IN PATHOLOGY DEPARTMENT.

CRITICAL RESULTS IN PATHOLOGY DEPARTMENT

1. Critical Results in Pathology department

1.1. Laboratory results can be viewed through lab viewer terminals which are available in the clinics and wards.

1.2. Printed reports will be dispatched into respective pigeon holes (if applicable).

1.3. Reports for positive HIV are sealed in envelopes and to be collected from the serology laboratory.

1.4. Critical results will be notified to the requesting ward or doctor accordingly for first time result/current admission (inpatient) via bed watcher or phone . Please refer to the respective unit for a list of critical values/results.

2. Critical limit for Chemical Pathology Unit

Analytes		Lower critical limit		Upper critical limit	
	Adult	Paediatric	Neonate	Adult	Paediatric
Total bilirubin			≥300 umol/l		
Potassium	≤ 2.8mmol/l	≤ 2.8mmol/l		≥6.0mmol/l	≥6.0mmol/l
Sodium	≤125mmol/l	≤125mmol/l		≥155mmol/l	≥155mmol/l
Calcium	≤1.5 mmol/l	1.7mmol/l		≥3.0mmol/l	≥3.1mmol/l
Ammonia					≥100mmol/l

3. Critical limit for Hematology Unit

Analytes		Lower critical limit		Upper critical limit		
	Adult	Paediatric	Neonate	Adult	Paediatric	Neonate
Haemoglobin	6.0g/dl	7.0g/dl	8.0g/dl	19.0g/dl	20.0g/dl	22.0g/dl
Haematocrit	20%	20%	25%	60%l	40%	70%
Platelet	20 x 10^3/µl	50 x 10^3/µl		1000 x 10^3/µl	1000 x 10^3/µl	
White blood cell		2.0 x 10^3/µl			50 x 10^3/µl	

4. Critical findings for Microbiology Unit

Cerebrospinal fluid microscopy (Gram stain & Cell Count)	Microscopy result (normal or abnormal)
Cerebrospinal fluid India Ink stain	Positive stain
Cerebrospinal fluid Cryptococcal antigen	Positive antigen detection
Blood culture	Positive result from Gram stain
Acid fast bacilli	Positive smear result (new case)
Malaria parasite on blood film	Presence of malaria parasite
Stool culture	Salmonella typhi, Vibrio cholerae, Shigella
Any type of culture/test	ESBL producer organism, MRSA, VRSA CRE, VRE, Multi-Resistant Organism (MRO), N.meningitidis
Throat swab/ Nasopharyngeal aspirate	Corynebacterium diphtheriae, Bordatella pertussis
Toxin/Antigen detection	Positive C.difficile Toxin/Antigen detection
GeneXpert MTB/RiF	MTB detected

5. Critical findings for Anatomical Pathology.

Unexpected or discrepancy findings	● Unexpected malignancy ● Wrong organ removed
Reports of infections	● Bacteria in heart valves or bone marrow ● Organisms in an immune-compromised patient such as AFB, fungi, viral, protozoa ● Organisms in cerebrospinal fluid (CSF) ● Unusual organisms or organism in unusual sites e.g. Amoeba in the eye.
Reports on critically ill patients requiring immediate therapy	● Crescents in greater than 50% of glomeruli in a renal biopsy specimen ● Transplant rejections
Cases that have immediate clinical consequences	● Fat in an endometrial curettage ● Mesothelial cells in a heart biopsy ● Fat in snare colon biopsy specimens.

6. Critical findings for Cytology

Unexpected of discrepant findings	Unexpected malignancy
Reports of infections	Organisms in an immune-compromised patient such as AFB, fungi, viral, protozoa.
Pap smear	High grade lesion for asymptomatic women.

SPECIMEN CONTAINER.

1. SPECIMEN CONTAINERS

1.1. "Company XYZ's logo/picture/likeness is used for illustrative purposes only and does not imply endorsement or affiliation with our services."

1.2. Details of the type and volume of sample required for a particular assay are given in the **Table 1: List of offered tests.**

Tube / Container	Sample/ Tube Description	Common Use
	Sterile Universal Container	**Chemical Pathology:** Urine and body fluid for biochemistry tests **Microbiology:** Urine, body fluid, stool and tissue culture **Haematology:** Trephine biopsy Body fluid for haematology **Histopathology:** Small biopsy (add 10% formalin) **Cytology**: FNAC, Non-Gynaecology and Seminal Fluid Analysis specimen
	24 Hour Urine Container	**Chemical Pathology:** 24-hour urine biochemistry tests
	3.8% Sodium Citrate	**Haematology:** ESR

Tube / Container	Sample/ Tube Description	Common Use
	Disposable Specimen Container	**Histopathology:** Big biopsy/ surgical specimen (add 10% formalin)
	Amies Transport Media	**Microbiology:** Swab for culture (High vaginal swab, eye, ear, nasal swab etc)
	Liquid Based Cytology Vial	**Cytology:** Pap smear sample
	Viral Transport Media (VTM)	**Microbiology:** Swab for viral PCR (throat, nasopharyngeal,oropharyngeal or rectal swab)
	Universal Transport Media (UTM)	**Microbiology:** Swab for Respiratory Pathogen PCR (nasopharyngeal swab)

Tube / Container	Sample/ Tube Description	Common Use
	Sterile swab stick (Copan swab)	**Microbiology** Swab for rapid respiratory virus, COVID-19 antigen rapid test
	Paediatric Blood Culture Bottle	**Microbiology:** Blood culture for paediatric
	Anaerobic/Aerobic Blood culture bottle	**Microbiology:** Blood culture for adult
	Myco/F Lytic Blood Culture Bottle	**Microbiology:** Fungal and Mycobacterium

Tube / Container	Sample/ Tube Description	Common Use
	Sterile CSF Tube	**Chemical Pathology:** CSF biochemistry tests **Microbiology:** CSF **Haematology** CSF for IPT
	Tissue Cassette	**Histopathology:** Grossed autopsy specimen (add 10% formalin)
	Glass slide	**Cytology:** Conventional Pap Smear, Cytology smear (Fixed in 95% ethyl alcohol)

2. ORDER OF DRAW

Blood Culture Vial

ESR Tube

Coagulation Tube

Plain Tube

Heparin Tube

EDTA Tube

Sodium Fluoride Tube

COLOUR CODE	TUBE TYPE	ORDER OF DRAW	NO. OF INVERSIONS AFTER BLOOD COLLECTION	USAGE
	Blood Culture	• In adult patients, both anaerobic and aerobic bottles must be filled adequately. • In pediatric patient, use pediatric bottle • If using needle and syringe - inoculate Anaerobic bottle first followed by Aerobic bottle • If using a butterfly set - recommended sequence of draw is to inoculate Aerobic bottle first followed by Anaerobic bottle (to prevent introduction of gasses e.g. oxygen into the anaerobic bottle)	2 - 3 (Do not shake)	For blood culture & sensitivity
	ESR 3.2% Sodium citrate	• Use 3.2% sodium citrate anticoagulant	8-10	**HEMATOLOGY** ESR

COLOUR CODE	TUBE TYPE	ORDER OF DRAW	NO. OF INVERSIONS AFTER BLOOD COLLECTION	USAGE
	Coagulation Tube 3.2% Sodium citrate	• Use 3.2% sodium citrate anticoagulant. The citrate stops blood clotting by removing calcium from the sample, which is essential for coagulation. • Routine coagulation should be sampled first in order to avoid clot activator. • Clotting action must be inhibited ASAP, otherwise might get a false result. • If the sample has already clotted no further clot formation can be produced and it can cause prolonged results, therefore it may appear the patient has been over anticoagulated and treatment may be stopped.	5 - 10	**HEMATOLOGY** PT, INR, APTT, Fibrinogen, D-Dimer, Mixing test, all coagulant factor assay (for example: Factor VIII assay, Factor IX assay) and Factor inhibitor assay FBC - for special conditions.
	Plain Tube with gel	• The yellow tube contains a disc of gel in the bottom of the tube. When centrifuged this gel disc rises up the tube and forms an impenetrable layer between the cells and serum. • This layer means that potential problems caused by the serum being in contact with the cells for too long are virtually eliminated.	5 - 10	**CHEMICAL PATHOLOGY** Urea, Creatinine, Sodium, Potassium, Chloride, Mg, Ca, PO4, Uric acid, Total Protein, Albumin, Total Bilirubin, ALT, AST, GGT, CK, LDH, Amylase, Cholesterol, Triglyceride, HDL, LDL (calculated) , C3, C4, Rheumatoid factor, Interleukin 6, CRP,Procalcitonin, Ethanol, Cholinesterase ,Salicylate, Acetaminophen, TSH, FT4, FT3, Cord Blood TSH, Cortisol, Iron, TIBC, Vitamin B12, Folate, Ferritin, PSA, CEA, AFP, BhCG, Ca125,CA19-9, LH, FSH, Estradiol, Progesterone, Prolactin, Testosterone,Troponin, Vitamin D,Amikacin, Gentamicin, Vancomycin, Valproic Acid, Phenytoin,

COLOUR CODE	TUBE TYPE	ORDER OF DRAW	NO. OF INVERSIONS AFTER BLOOD COLLECTION	USAGE
				Carbamazepine, Digoxin, Phenobarbitone, Theophylline. **MICROBIOLOGY** HIV, Hep B, Hep C, Dengue serology, RPR/TPPA, ASOT, Mycoplasma, ANA/ dsDNA, ENA,TORCH, Leptospira
	Lithium Heparin	• Lithium Heparin is anticoagulant- stops blood clotting by a different method to citrate. It actually inhibits the natural clotting process. • It is important for tests when serum is not suitable. This is not common but useful for when cells need to be separated off quickly and not wait for the natural clotting mechanism • If the heparin tube was sampled before the serum, you could have elevated lithium results, which may interfere within TFT enzymes, it also interferes with calcium method. If the heparin tube was sampled before the coagulation sample, there is a risk of false coagulation results.	5 - 10	**HEMATOLOGY** Osmotic Fragility Test FBC - for special conditions. **CHEMICAL PATHOLOGY** Suspected pseudo hyperkalemia

COLOUR CODE	TUBE TYPE	ORDER OF DRAW	NO. OF INVERSIONS AFTER BLOOD COLLECTION	USAGE
	K2EDTA	• EDTA tubes contain Potassium, which stops blood clotting by binding Calcium (which is essential for the clotting mechanism). • If this sample was taken before the serum sample we could see (a) High or very high levels of K^+ (b) low or very low levels of calcium (Ca^{2+}) (c) low levels of ALP, CK and ALT It is therefore very important that the serum sample is not contaminated with EDTA as it renders the sample virtually unusable or it may give dangerously misleading results.	5 - 10	**HAEMATOLOGY** Full Blood Count, Full Blood Picture, G6PD enzyme quantitation, Hb analysis for thalassemia screening, Sickling test, CD4/CD8, BCR ABL **CHEMICAL PATHOLOGY** HbA1c,Ammonia, IPTH **MICROBIOLOGY** HIV-1 RNA viral load, HCV RNA viral load, HBV DNA viral load
	Sodium Fluoride/ Potassium Oxalate	• This tube contains Sodium fluoride and functions as an anticoagulant and preservative. • If this sample is taken before the serum sample, it may become contaminated and give incorrect results.	5 - 10	**CHEMICAL PATHOLOGY** Glucose, Lactate **HAEMATOLOGY** FBC - for special condition.

The Color coding of vacutainer may vary. The blood should be collected in the following order to prevent sample contamination

This contamination produces spurious and invalid results.

a. Avoid haemolysis, drip contamination and prolonged venous constriction.
b. Ensure thorough and instant mixing of blood with anticoagulant (heparin, or potassium EDTA) for plasma specimens.
c. Do not transfer bloods from one tube to another tube e.g.: EDTA to plain tube.
d. Send specimens to the laboratory immediately after the blood has been drawn.

CHEMICAL PATHOLOGY.

CHEMICAL PATHOLOGY

1. INTRODUCTION

Chemical Pathology Unit runs general pathology tests, endocrinology tests, anaemia tests, therapeutic drug monitoring, drug of abuse, special protein, tumour markers on body fluids such as blood, urine, cerebrospinal fluid, synovial fluid, and peritoneal fluid for the purpose of diagnostic and patient management.

2. SERVICE PROVIDED

2.1. Type of diagnostic services offered. Please refer to the **Table 1: List of offered tests.**

2.2. Routine Tests: All routine test requests will be processed and the results will be released as stated in the list of offered tests.

2.3. Urgent Tests: All urgent test requests will be processed immediately upon receiving the specimens and the results will be available as stated in the list of offered tests. All urgent requests should indicate URGENT clearly on the request form and the diagnosis should be indicated. The service is offered 24 hours every day.

3. REQUEST FORM

3.1. Only 1 copy of laboratory request forms (PER-PAT301) is required for all tests in the Chemical Pathology lab except for therapeutic drug monitoring (2 copies). Original Therapeutic Drug Monitoring (TDM) form needs to be dispatched to the Pharmacy Unit and carbon copy to the Pathology Lab.

4. SPECIMEN COLLECTION AND HANDLING

4.1. URINE FOR DRUG DETECTION

Tests offered are Screening and Confirmatory tests for Cannabis and Morphine for both legal and clinical cases. Please ensure all items below are available:

4.1.1. Fill in the request form “Borang Permintaan Pengesanan Dadah Dalam Urin” in 2 copies for legal cases. 1 copy of PERPAT 301 request form for clinical toxicology cases.

4.1.2. A minimum of 30ml of urine is required for each subject/suspect.

4.1.3. The container must be sealed appropriately.

4.1.4. Name, IC number, date and time specimen collected in the request form and container label must be tally.

4.2. 24-HOUR URINE COLLECTION

4.2.1. The 24-hour urine bottle which contains preservatives for the required test is available at the Main Reception Counter and provided on request, with accompanying request form.

4.2.2. On the day of collection, discard the first voided urine and record the time start and date on the container.

4.2.3. Collect the second and subsequent voided urine into the 24-hour urine bottle.

4.2.4. Do not void urine directly into the 24-hour urine container. Please use another clean container for urine collection to avoid acid injury or spillage.

4.2.5. At the end of 24-hour, the last urine voided is collected. Record the finishing time and date on the container. For best results, refrigerate if possible.

4.2.6. Send immediately to the laboratory

4.3. 24-HOUR METANEPHRINE

4.3.1. Please refer to the above procedure on 24-hour urine collection. Please note that 10 mL of 25% HCL preservatives has been added into the urine bottle to preserve the analyte.

4.3.2. Drugs to avoid: alpha-methyldopa, salicylates, lithium, tetracycline, erythromycin, aminophylline and insulin for at least 48 hours before collecting urine as a specimen.

4.3.3. Subjects should avoid activities that can cause stress and vigorous exercise.

4.3.4. Subject should abstain from the following food;

4.3.4.1. Drinks containing caffeine

4.3.4.2. Fruits containing citrus

4.3.4.3. Foods containing vanilla

4.4. CREATININE CLEARANCE

4.4.1. Collect 24-hour urine specimen

4.4.2. Take blood samples on the same day for blood creatinine.

4.4.3. Send 24-hour urine samples and blood samples to the lab.

4.4.4. The urine volume is measured and hence the minute volume (V) is calculated:

$$\text{Volume (V)} = \frac{\text{Urine total volume in ml}}{\qquad\qquad}$$

$$\frac{}{\text{Time of collection in minutes}}$$

4.4.5. The creatinine concentrations of urine (U) and plasma (P), are determined.

$$\text{Creatinine Clearance(ml/min)} = \frac{\text{U(µmol/l) x V(ml/min)}}{\text{P (µmol/l)}}$$

4.5. BLOOD GASES SAMPLES

Procedure of collection

4.5.1. Indicate time of arterial or venous puncture in the request form.

4.5.2. Use a 1 ml disposable syringe.

4.5.3. Rinse it with heparin (5,000 units per ml) and expel excess heparin-solution from the syringe.

4.5.4. Draw 1 ml of blood.

4.5.5. Place the syringe upright and remove all air bubbles inside the syringe.

4.5.6. Remove the needle and cap with stopper to avoid specimen exposure to air

4.5.7. Mix well by gently inverting the syringe 3-4 times to prevent clotting and discard the blood clots from the syringe if present.

4.5.8. Put the specimen in a plastic bag (to prevent direct contact with ice) and keep the specimen in ice

4.5.9. Send the specimen immediately for analysis (within 30 minutes)

4.6. ORAL GLUCOSE TOLERANCE TEST

4.6.1. Procedure of collection

4.6.2. Fast the patient overnight

4.6.3. 8.00 am: Collect fasting blood samples for glucose.

4.6.4. Give the patient 75g (anhydrous) oral glucose dissolved in 250 to 300 ml water and drink within 5 minutes. For children, the recommended glucose dose is 1.75g/kg body weight up to a maximum of 75g anhydrous glucose.

4.6.5. 10.00 am: Collect blood sample at 2-hour postprandial

5. RECEIVING OF SPECIMEN & OPERATION HOUR

5.1. All specimens will be received at the Main Reception Counter on a 24 hours basis except for drug of abuse specimens.

5.2. Drug of abuse specimens need to be dispatched to the Drug of Abuse Laboratory receiving counter during office hours only.

6. REPORTING AND DESPATCHING OF RESULT

6.1. Test results will be validated by Chemical Pathologists, Medical Officers and/or Scientific Officers. In case these officers are not present, Medical Laboratory Technologists (MLT) are authorized to validate the result after all quality requirements have been fulfilled.

6.2. Reference ranges will be provided with the results.

6.3. Results can be viewed in the laboratory information system (LIS).

7. SUPPLIES

Container that needs to be collected at the main reception counter upon request.

7.1. 24-hour urine container

7.2. Lithium Heparin tube for plasma specimen collection

7.3. Dried blood spot paper

8. OTHERS

8.1. Please refer table below for sharing tube

Tests that can be combined		Tube
Troponin Albumin ALP ALT Amylase AST Calcium Chloride Cholesterol Complement 3 Complement 4 Rheumatoid Factor Total Bilirubin Total Protein Triglycerides Uric Acid Creatine Kinase Creatinine	CRP Direct Bilirubin GGT HDL LDH Magnesium Phosphate Potassium Sodium Urea Salicylate Cholinesterase BhCG (for ectopic pregnancy) *Glucose	Plain Tube with Gel (Yellow) Sodium Fluoride Tube (Grey) *Bagi Sampel Glucose

Tests that can be combined		Tube
AFP BHcG (Rutin) CA-125 CA19-9 CEA TPSA Prolactin	Iron TIBC Ferritin Folate Vitamin B12 FSH LH Estradiol Progesterone Testosterone	Plain Tube with Gel (Yellow)
TSH FT4 FT3 Cortisol		Plain Tube with Gel (Yellow)

Test that cannot be combined	Tube
Lactate	Sodium Fluoride
Blood Gases	Heparinized syringe
Ammonia	EDTA tube
IPTH	EDTA tube
Ethanol	Plain tube with gel (yellow)
Acetaminophen	Plain tube with gel (yellow)
Therapeutic Drug Monitoring	Plain tube with gel (yellow)
Vitamin D	Plain tube with gel (yellow)
Procalcitonin	Plain tube with gel (yellow)
Interleukin 6	Plain tube with gel (yellow)

ANATOMICAL PATHOLOGY.

HISTOPATHOLOGY

1. INTRODUCTION

Histopathology service is concerned with diagnosis by macroscopic and microscopic examination of tissue. This includes the histological assessment of surgical or non-surgical tissue and also investigation of disease at clinical autopsy. In each case the diagnostic histology examination is part of the clinical investigation of the patient and cannot be performed satisfactorily in isolation. The quality of Histopathology interpretation and diagnosis may depend upon the clinical information written on the request form.

2. SERVICE PROVIDED

2.1. Surgical Pathology

2.2. Histology examination Routine H&E

2.3. Histochemistry

2.4. Immunohistochemistry

2.5. Immunofluorescence

2.6. Frozen section

2.7. Autopsy specimen

3. REQUEST FORM

3.1. All specimens are to be accompanied by a completed request PER-PAT 301 form (duplicate) for following test:

3.1.1. Routine Histopathology Examination,

3.1.2. Renal Biopsy,

3.1.3. Skin Biopsy and

3.1.4. Clinical/ Forensic autopsy specimen.

3.2. For URGENT request, please mark on the request form “URGENT” in the right upper hand corner of the request form

3.3. Fill the form completely with clearly written name of doctor in-charge (especially the specialist in-charge) so he/she could be contacted if there is any enquiry.

3.4. Clearly indicate the ward/ clinic/ hospital where the report should be sent back.

3.5. Make sure the name and IC number of the patient is the same in the request form, specimen container and in the patient records.

3.6. Specimens must be itemized in the request form accordingly if more than one specimen container is submitted per request form.

3.7. For assessment of surgical excision in malignant neoplasm, the margins must be marked accordingly by sutures and accompanied by diagram in the request form by the doctor in-charge.

3.8. **Frozen section**

3.8.1. All Frozen section cases must be preceded by appointment and discussion with a surgical pathologist on call at least 3 days before the operation.

3.8.2. Request form for frozen section (PATH/HI/FORM-2) is available at the Histopathology Laboratory and website.

3.8.3. Frozen section specimens are to be accompanied by a completed request PER-PAT 301 form (duplicate)

4. SPECIMEN COLLECTION AND HANDLING

4.1. ROUTINE SURGICAL SPECIMEN FOR HISTOPATHOLOGY EXAMINATION

4.1.1. All specimens for routine histological examination are to be fixed in the 10% Neutral Buffered Formalin (NBF) in a suitable leak-proof container.

4.1.2. The volume of the formalin is at least 10 times the size of the specimen to make sure the specimen is well fixed.

4.1.3. DO NOT PUT large specimens in small containers as this would prevent proper fixation of the tissue and also distort the specimen.

4.1.4. All specimens should have the same identification as that written on the request forms.

4.1.5. For cases where surgical margins are of importance, the margins must be indicated by sutures on the specimen or diagrammatically indicated in the request form.

4.1.6. Trephine biopsy specimens should be fixed in the 10% Neutral Buffered Formalin (NBF).

4.2. FROZEN SECTION

4.2.1. Frozen section can only be requested by the specialist treating the patient by appointment with the pathologist on-call.

4.2.2. Fill the request form (PATH/HI/FORM-2) and bring it to the Histopathology laboratory to confirm date / estimated time arrival and to discuss with the Pathologist on call for at least 3 days or at the discretion of the pathologist.

4.2.3. All cases scheduled for frozen section examination are best placed first in the operating list.

4.2.4. Please inform the laboratory at extension: 1357 when:

4.2.4.1. The patient is wheeled into the operation room

4.2.4.2. The frozen section specimen is on the way to the laboratory

4.2.4.3. The frozen section examination is canceled.

4.2.5. The tissues for the frozen section are to be sent **fresh without formalin** or in gauze moistened by normal saline to prevent drying.

4.2.6. The specimen must be sent immediately to the laboratory with the request form by doctor.

4.2.7. Write the contact number of the surgeon on the request form. The results of the frozen section will be immediately informed to the surgeon via phone or a written report will be dispatched to the doctor who brought the specimen to the laboratory.

4.2.8. Cases are generally reported within LTAT mentioned in **Table 1: List of offered tests**, unless the cases need further studies, second opinion, etc.

4.3. RENAL BIOPSY

4.3.1. General principle

4.3.1.1. Obtain at least 2 good cores that are 10 mm long (glomeruli needed)

4.3.1.2. Do separate a core of renal biopsy in respective fixative & container.

4.3.1.3. All specimens should have the same identification as that written on the request forms.

4.3.1.4. Request form: Please refer Histopathology section 3.1

4.3.2. Transfer the renal biopsy cores into their respective fixative/preservative solutions

4.3.3. Specific Collection Guidelines

A. **Renal biopsy EM**

A.1. Do the EM piece(s) first (should go into formalin within 5 minutes)- OPTIONAL TEST

A.2. Prior arrangement with the Pathologist concerned is preferred for renal biopsy EM.

A.3. Obtain Glutaraldehyde from HTAR Histo Lab prior to taking the sample.

A.4. Rinse with phosphate buffer saline (PBS) solution to remove the blood,

A.5. Cut into 1-2mm thick

A.6. Fix within glutaraldehyde at room temperature for at least 3 hours.

A.7. Keep in the dark at 4^0C

A.8. Send a sample to HTAR in a cool box (4^0C).

A.9. Please ensure there is no direct sunlight and no heat exposure to the sample in glutaraldehyde.

A.10. Do not freeze

B. **Renal biopsy (HPE) for the LM piece(s) next**

B.1. Immerse the specimen in the 10% Neutral Buffered Formalin solution.

B.2. Label the Universal sterile container

C. **Renal biopsy Immunofluorescence (IF)-last**

C.1. The fresh tissue can be moistened with normal saline or PBS (phosphate buffer solution)

C.2. As an option to PBS is Michel transport medium can be used but pls inform Histopathology laboratory and state on PER-PAT 301 form. (There is another protocol for lab staff to handle

C.3. IF biopsy sample: need to be sent fresh within same day or within 24 hours

C.4. put on filter paper (optional)

C.5. do not take sample a day before long weekend or Friday to avoid sample being autolyzed

C.6. if taken during the day but unable to send to HTAR the same day, can keep the sample in the fridge (2-8 ^{0}C) and pls send ASAP the next day in a cool box (4^0C).

C.7. Do not freeze.

C.8. These samples should not touch formalin because that can result in artifactual autofluorescence

4.4. **SKIN BIOPSY**

4.4.1. **General principle**

4.4.1.1. Obtain 2 skin biopsy specimens.

4.4.1.2. Do separate a biopsy in respective fixative & container

4.4.1.3. Request form: Please refer Histopathology section 3.1

4.4.1.4. Criteria for clarification: Please refer Histopathology section

4.4.2. Transfer the skin biopsy into their respective fixative/preservative solutions

4.4.3. **Specific Collection Guidelines**

A. **Skin biopsy (HPE) for the LM** A.1.1. Immerse the specimen in the 10% Neutral Buffered Formalin solution. A.1.2. Label the Universal sterile container
B. **Skin biopsy Immunofluorescence (IF)-last** B.1. The fresh tissue can be moistened with normal saline or PBS (phosphate buffer solution) B.2. IF biopsy sample: need to be sent fresh within same day or within 24 hours B.3. put on filter paper (optional) B.4. do not take sample a day before long weekend or Friday to avoid sample being autolysed B.5. if taken during the day but unable to send it to HTAR the same day, can keep the sample in the fridge (2-8 ^{0}C) and pls send it ASAP the next day in a cool box (4^{0}C). B.6. Do not freeze. B.7. These samples should not touch formalin because that can result in artifactual autofluorescence

4.5. **CLINICAL AUTOPSY/ POST-MORTEM**

4.5.1. The post-mortem is conducted to ascertain the cause of death and study the effect of treatment in clinical (non-medico legal) cases.

4.5.2. The following procedures should be followed

4.5.2.1. The requesting clinician will first obtain written consent from the next of kin by completing the "Consent Form of Clinical Post-Mortem Examination".

4.5.2.2. Requests should then be communicated directly to the pathologist on call or Medical Officer.

4.5.2.3. Clinical summary and case notes are prepared and made available to Pathologists on duty.

4.5.2.4. The requesting clinician should be present during the autopsy.

4.5.3. Report will be available within 8 weeks after completion of post-mortem.

4.5.4. Indication for clinical post-mortem was referring to "Garis Panduan Bedah Siasat Mayat di Hospital-hospital di Kementerian Kesihatan Malaysia, Surat Pekeliling Ketua Pengarah Kesihatan Bil 17/2008.

4.6. **FORENSIC AUTOPSY**

4.6.1. Specimens that had been grossed and put in the cassette should be sent to the laboratory together with the request form PER-PAT 301.

4.6.2. All specimens are to be fixed in the 10% Neutral Buffered Formalin (NBF) in a suitable leak-proof container.

4.6.3. The volume of the formalin is at least 10 times the size of the specimen to make sure the specimen is well fixed.

4.6.4. Specimen to be sent personally by the staff of the Forensic Department to the laboratory

4.7. **DISPATCH OF SPECIMENS**

4.7.1. Specimens for routine histological examination can only be dispatched to the Histopathology Laboratory during office hours by the medical personnel from a particular ward/clinic/operation room in HTAR or from another hospital.

4.7.2. Specimens for frozen sections are dispatched immediately to the Histopathology Laboratory by the (at least) House Officer involved in the operation procedure.

4.7.3. Please be careful to not contaminate the outside of the transport bags, paperwork or box when handling.

4.8. **IMPORTANT SAFETY TIP**

4.8.1. Expired fixatives should be disposed of through an organized waste management system.

4.8.2. The fixatives are toxic aldehydes and proper caution should be observed (gloves, protective eyewear) when handling these solutions.

4.9. **CRITERIA FOR CLARIFICATION**

4.9.1. For certain requests that do not fulfill the unit's requirements, the requester shall be contacted to rectify the request by filling in the clarification form (to be provided by the laboratory staff).

4.9.2. Specimen will be with-held if any discrepancy as stated in clarification criteria (PATH/HI/FORM-9).

4.9.3. The specimen will only be processed following satisfactory corrective actions.

4.9.4. Correction should be done by responsible ward/ clinic staff as soon as possible.

4.9.5. The request will be rejected if after the clarification done the test was not offered.

4.9.6. In event the sample is precious, the sample will be taken back by the requestor for further action.

4.9.7. List of clarification criteria for Histopathology test.

Clarification criteria (PATH/HI/FORM-9).
No IC number on request form or specimen container.
No name on request form or specimen container.
Information on request form and specimen do not match/ tally.
Label on the specimen container is not clear.
HPE specimen was not in 10% Neutral Buffered Formalin/ wrong preservative.
Specimens sent for the frozen section or Immunofluorescence are not fresh tissue.
No client stated (ward/clinic/hospital).
Test is not indicated.
Tests are not offered.
No clinical history provided.
No doctor signature and/ or stamp name on request form.

Sample leaking.
Writing is not legible.

5. RECEIVING OF SPECIMEN & OPERATION HOUR

5.1. **Operation Hour**

5.1.1. Routine HPE

5.1.1.1. Specimens for routine histological examination should be sent directly to the histopathology laboratory during office hours.

5.1.1.2. All Samples for routine histopathological examination taken after office hours should be fixed in10% neutral buffered formalin (10% NBF) in the respective ward or OT room and kept at room temperature.

5.1.2. **Frozen section**

5.1.2.1. Specimens for frozen should be sent immediately upon removal to the laboratory by a doctor.

5.1.3. **Renal biopsy & Skin biopsy Immunofluorescence (IF)**

5.1.3.1. Renal biopsy and skin biopsy for Immunofluorescence (IF)test.

5.1.3.2. Sent immediately upon removal to the lab

5.1.3.3. Do not take sample a day before long weekend or Friday to avoid sample being autolyzed

5.1.3.4. If taken during the day but unable to send it to Histopathology Laboratory HTAR in the same day, keep the sample in the fridge (2-8^{0}C) and pls send ASAP the next day in a cool box (4^{0}C). Do not freeze.

5.1.4. **Autopsy**

5.1.4.1. Autopsy specimens can be sent by forensic staff to the Histopathology receiving counter.

5.2. The Histopathology receiving counter is available at:

Monday to Friday	8.00am to 4.30pm
Saturday	8.00am to 11.30am
Public holiday	Next working day

Note: Specimens should be fixed in the usual manner and dispatched to the laboratory.

5.3. **SERVICE AFTER OFFICE HOUR**

5.3.1. Frozen sections are not available after office hours except for transplant cases.

5.3.2. Clinical post mortem can be requested to the pathologist on call.

6. REPORTING AND DESPATCHING OF RESULT

6.1. It is the responsibility of the healthcare professional who requests a laboratory test to ensure that the result is reviewed and appropriate action taken.

6.2. Majority of laboratory reports (except for referred tests) can be viewed through lab viewer terminals which are available in the clinics and wards.

6.3. Lab Turnaround Time (LTAT) of HPE: Refer to the **Table 1: List of offered tests**

6.4. **COLLECTION OF REPORTS**

6.4.1. Printed histopathology reports will be put in envelopes and will be collected from the Histopathology laboratory by the clinic / ward person in-charge (if applicable).

6.5. **ENQUIRY OF RESULTS**

6.5.1. The histopathology report number (HPE number) and enquiry about the status of the report can be obtained by calling extension 1357 or can be viewed via LIS

6.5.2. Enquiry of the diagnosis of the case report over the phone is DISCOURAGED

6.5.3. The requesting doctors are welcome to discuss their cases directly with the reporting Pathologist.

7. SUPPLIES

7.1. Specimen containers

7.1.1. For in-house customers, indent the specimen container from Farmasi Bekalan.

7.1.2. For external customers, indent from respective centers.

No.	Reagent	Tests
1	PBS tablet	Renal and skin IF test only

2	10% Neutral Buffered Formalin	Renal biopsy only
3	Glutaraldehyde	Renal biopsy EM only

7.2. Request forms

7.2.1. For in-house customer, indent PER PAT 301 request form from Jabatan Patologi (ext.: 1382)

7.2.2. For external customers, indent from respective centers.

7.2.3. For special tests (e.g.: Cytogenetic, Molecular test), request form can be retrieved from respective websites.

8. OTHERS SERVICES

8.1. **TAKING OUT TISSUE FROM HISTOPATHOLOGY UNIT**

8.1.1. All specimens (tissue) sent to and officially received by Histopathology Laboratory will be kept in the unit for up to 3 months after the official report is released.

8.1.2. The Histopathology Unit allows the patient to take their tissue, organ or limb back upon request. Please follow this procedure:

8.1.2.1. The patient or next of kin must make a formal request by filling up a form Borang Tuntutan Organ HPE (PATH/HI/FORM- 6)

8.1.2.2. This form is available in Histopathology Laboratory

8.1.2.3. The completed form should be submitted to Histopathology Laboratory

8.1.2.4. The tissue is released only after the specimen has been reported by the Pathologist.

8.2. **REQUEST TO OBTAIN MICROSCOPIC IMAGE FROM HISTOPATHOLOGY UNIT**

8.2.1. Microscopic images are not archived as routine but images can be provided upon request.

8.2.2. A request shall be made or endorsed by a specialist.

8.2.3. The requesting doctor should communicate directly with the Pathologist concerned.

8.2.4. A request shall be made by filling up a form Application for Histopathology Image (PATH/HI/FORM-8) which is available at the Histopathology Laboratory.

8.2.5. The completed form should be submitted to the Histopathology Laboratory.

8.2.6. The microscopic histopathology images will be available within 2 to 4 weeks upon submission of the form. Only soft copy of the images is provided and the

requester should provide USB before collecting the images from the unit. The images can be emailed to the requester.

CYTOPATHOLOGY

1. INTRODUCTION

Cytopathology is a discipline that involves the morphologic study of cells. It is divided into two broad categories i.e. exfoliative cytology and aspiration cytopathology. Exfoliative cytology involves examination of specimens which contain exfoliated cells. The usual specimens received are cervical smears, sputum, urine, pleural effusion, peritoneal fluid and washing of various sites. Aspiration cytology involves examination of cells that are obtained by fine needle aspiration and brushing.

2. SERVICE PROVIDED

2.1. Gynecological specimen

2.1.1. Conventional (Smear)

2.1.2. Liquid Based Cytology (Pap smear)

2.2. Non-gynecological specimen

2.2.1. Body Fluid (i.e. Pleural, peritoneal, pericardial fluid)

2.2.2. Sputum

2.2.3. Urine

2.2.4. Brushing/lavage

2.3. Fine needle aspiration cytology (FNAC)

2.4. Seminal fluid analysis

3. REQUEST FORMS

3.1. Pap smear request form (PS 1/98 Pindaan 2007 or PS 1/98 Pindaan 2020) for gynecology specimens in duplicate (2) copies.

3.2. PER-PAT 301 request form for the other routine cytological examination in duplicate (2) copies.

3.3. If urgent results are required, please indicate by marking “URGENT” over the upper right corner of the request form.

3.4. The request form must be completely filled, including the relevant clinical information to avoid rejection of specimens.

3.5. Fill the form with clearly written name of doctor in charge (Medical doctor), signature and stamp of the requesting doctor.

4. SPECIMEN COLLECTION AND HANDLING

4.1. Gynecology specimen (Pap smear)

4.1.1. Do not use lubricant on the speculum

4.1.2. No douching or sexual intercourse prior to specimen collecting.

4.2. Conventional

4.2.1. Label a clean glass slide with patient's name and IC number with pencil on the frosted end

4.2.2. Place cervical spatula at the external OS and rotate through 360 degrees, lightly scraping the squamous – columnar junction (TZ zone).

4.2.3. Smear the material onto a clean labeled frosted-end glass slide, thinly and evenly

4.2.4. Immediately place the slide in 95 % alcohol for 30 minutes or use alcohol spray.

4.2.5. If more than one slide is to be placed in the same container, ensure that they are not placed face to face.

4.2.6. Send the smear together in a slide mailer with completed form.

4.3. Liquid based cytology

4.3.1. Insert broom-type sampling device (rover's cervix brush) into endocervical canal.

4.3.2. Rotate broom five times in clockwise direction (360° rotation).

4.3.3. Drop detachable head of device into vial.

4.3.4. Place the cap on the vial and tighten it.

4.3.5. Send vial to the lab for processing.

4.3.6. Record the patient's name and IC number on the vial.

4.3.7. Send the vial and completed request form in a biohazard bag to the laboratory.

4.3.8. Advice to send the vial as soon as possible or within two weeks.

4.4. Non-Gynecology specimen

4.4.1. **All Non-Gynecology specimen:**

4.4.1.1. Specimens are collected in clean dry universal leak-proof containers and properly labeled.

4.4.1.2. Send immediately to the laboratory within office hours.

4.4.1.3. If delay in transportation to the laboratory is unavoidable, keep refrigerated at 2^0C to 8^0C (72 hours) and send immediately to the laboratory on the next morning working day.

4.4.1.4. Cerebrospinal fluid (CSF) samples for Cytology, please send fresh specimens (10ml recommended, minimum of 2-3mls required) be sent to the laboratory as soon as possible. Ideally within 2 hours of collection.

4.4.2. **Nipple discharge**

4.4.2.1. Make an imprint smear. Place the labeled slides (at least 2 slides) onto the nipple.

4.4.2.2. One slide is fixed in 95 % alcohol and label 'FIXED'.

4.4.2.3. The other slide is dried in air and label 'DRY / MGG'

4.4.3. **Sputum**

4.4.3.1. Sample must be collected on three (3) consecutive days.

4.4.3.2. Instruct the patient to empty the mouth of all saliva immediately after he wakes up in the morning.

4.4.3.3. The patient should then cough deeply and collect the resulting sputum in the container supplied.

4.4.3.4. The Sample must be sent immediately to the cytology laboratory.

4.4.3.5. DO NOT forget to collect a similar Sample on the next two days.

4.4.3.6. The Sample container should be labeled according to the day the Sample is collected.

4.4.3.7. For sputum Sample submitted as smears;

4.4.3.8. Label two clean glass slides for each patient with name and IC number.

4.4.3.9. Prepare smears as thick as blood film and immediately place the slides in 95% alcohol for at least30 minutes or use spray fixative.

4.4.3.10. Air-dry the smears.

4.4.3.11. Ensure the slides are not placed face to face in the slide mailer.

4.4.3.12. Sample sent exceeding 12pm or more than one hour from time collection will be reject

4.4.4. **Urine**

4.4.4.1. The patient should void and discard the first morning sample.

4.4.4.2. The patient should drink as much water as possible for the next 1 and ½ hours, discard all urine passed during the time, empty the bladder at the end of the two hours period and discard.

4.4.4.3. Collect the urine passed during the next half-hour and send it immediately to the laboratory

4.5. Fine Needle Aspiration Cytology (FNAC)

FNAC services	Remarks
FNAC clinic	a. The FNAC clinic is conducted twice a week at the SOPD Clinic on appointment basis. b. Tuesday and Friday (9.00 am to 12.00 noon) c. Appointment given by Cytology Lab. (ext.: 1356) d. To ensure the quality of the FNAC, the number of cases is limited to 15 per session. e. Consent for FNAC/ COVID 19 is the responsibility of the doctor attending to the case.
Ultrasound Guided FNAC	a. Ultrasound guided FNAC is conducted three times a week at the Radiology Department. b. Monday, Wednesday and Thursday (2.00 pm to 4.00pm) c. Appointment given by Radiology Department. d. Consent for FNAC/ COVID 19 is the responsibility of the doctor attending to the case
Mobile FNAC to ward	a. Appointment from wards and other clinics, the clinician may call directly to the cytology laboratory for the appointment. b. For urgent unstable and pediatric cases, please consult the pathologist. c. Appointment given by Cytology Lab. (ext.: 1356) d. Consent for FNAC/ COVID 19 is the responsibility of the doctor attending to the case
Others	a. For district/cluster hospitals running their own FNAC procedure, they can send slides to the laboratory together with PER PATH 301 form. b. Consent for FNAC/ COVID 19 is the responsibility of the doctor attending to the case.

FNAC services	Remarks
	c. If more than one slide is to be placed in the same slide mailer, ensure that they are not placed face to face

4.6. Seminal Fluid Analysis (SFA)

4.6.1. The appointment day is only on every working day of TUESDAY and THURSDAY.

4.6.2. Maximum number of appointments on each day is 5 appointments.

4.6.3. On the appointment day, at about 8.00 am, collect the whole amount of your semen into the container given.

4.6.4. Deliver the sample together with a request form to the laboratory as soon as possible before 9.00 am.

4.6.5. All the SFA samples need to be sent to the Pathology Main Receiving Counter within ONE hour after the sample is collected. Sample needs to keep near to body temperature (under the clothes for instance or in the armpit).

4.6.6. Sample must reach the lab within 1 hour of collection. Sample that arrive beyond that, high possibility being rejected.

4.6.7. Please hand in the sample to the counter staff. (sample delivery by other people is not acceptable).

4.6.8. If the patient is unable to come on the appointment day, please inform the laboratory by contacting us at 03-33757000 ext1369 for a change of appointment date.

4.6.9. Abstinence days recommended by WHO standard are 2 to 7 days. Abstinence day may reflect on the result on counting as well as morphology of spermatozoa. This may not reflect the actual patient conditions.

5. RECEIVING OF SPECIMEN & OPERATION HOUR

5.1. All specimens for cytological examination should be sent directly to the laboratory specimen counter.

5.2. All specimens must arrive at the laboratory at: Monday to Friday: 8.00 am to 5.00 pm (Working day)

5.3. No Sample for cytological examination is processed after office hours.

5.4. If samples **except pap smear** are collected after office hours, it must be kept in the refrigerator at 2-8°C and sent to the lab the next working morning so that it can be processed on the same day.

5.5. Refrigeration helps preserve the cell.

5.6. DO NOT FREEZE the Sample.

5.7. The LTAT calculates based on the date and time to reach the cytology counter on the next working day.

5.8. CSF is considering as an urgent and precious sample

6. REPORTING AND DESPATCHING OF RESULT

6.1. Majorities of laboratory reports (except for referred tests) can be viewed through lab viewer terminals which are available in the clinics and wards.

6.2. Printed reports will be collected at Cytology laboratory by the respective wards/ clinic person in-charge (if applicable)

6.3. Lab Turnaround Time (LTAT): Refer to **Table 1: List of offered tests.**

7. SUPPLIES

7.1. Specimen containers

7.1.1. For in-house customers, indent the specimen container from Farmasi Bekalan.

7.1.2. For external customers, indent from respective centers.

No.	Reagent	Tests	Location
1	Set of Liquid based cytology kit	PAP smear (LBC)	Cytology Lab. (Please request 2 weeks before)

7.2. Request forms

7.2.1. For in-house customer, indent PER PAT 301 and Pap smear request form (PS 1/98 Pindaan 2007 or PS 1/98 Pindaan 2020) request form from Jabatan Patologi (ext.: 1382)

7.2.2. For external customers, indent from respective centers.

8. OTHERS

NA

HEMATOLOGY.

HEMATOLOGY

1. INTRODUCTION

Hematology unit, Hospital Tengku Ampuan Rahimah (HTAR), Klang provides diagnostic services for routine tests (24 hours) and specialized tests (during office hours). We offer consultations in laboratory hematology for HTAR, district hospitals and health clinics (under HTAR supervision) in Selangor.

2. SERVICE PROVIDED

Test offered

2.1. **Tests offered for 24 hours:**

2.1.1. FBC, routine coagulation tests, ESR, G6PD screening

2.2. **Tests provided during office hours:**

2.2.1. Specialized coagulation tests, FBP, HB analysis, CD4/CD8, Bone marrow aspiration/trephine, BCR ABL Quantification, body fluid for automated cell count, Kleihauer, NAP score, sickling test, urine hemosiderin

2.3. Please refer to the **Table 1: List of offered tests** for details.

2.4. Consultation by MO/Specialist is available upon request.

2.5. Technical visit to district hospitals and health clinics under HTAR supervision.

2.6. Technical consultation for POCT customer and procurement

3. REQUEST FORM

3.1. Only 1 copy of laboratory request forms (PER-PAT301) is required for all tests in Hematology except for Full Blood Picture test (2 copies).

3.2. The request form must be completely filled, including the relevant clinical information, clearly written name of doctor in charge (Medical doctor), signature and stamp of the requesting doctor to avoid rejection of specimens.

3.3. Write date and time taken on the request form for coagulation test request.

3.4. **For urgent requests:**

3.4.1. For FBC and coagulation tests, please indicate by marking “URGENT” on the request form.

3.4.2. For urgent FBP requests, please call the Medical Officer on-call for approval.

3.4.3. Please ensure the request form is completely filled with diagnosis and indication for urgent requests.

3.4.4. For urgent FBC, only 2 samples are allowed per reception.

3.5. If sending samples for special consideration, e.g.: FBC in sodium citrate tube, please state clearly on the request form.

4. SPECIMEN COLLECTION AND HANDLING

4.1. General

4.1.1. Venous blood specimens are preferred.

4.1.1.1. To ensure consistent and accurate results, strictly follow the volume of blood required for the type of test specified or fill blood till the mark on the label.

4.1.1.2. Specimen collected must be properly labeled

4.1.1.3. Specimen container or blood collection tube must be placed in a biohazard plastic bag with the request form (where applicable) inserted into the pocket of the plastic bag.

4.1.2. To prevent hemolysis and clotted blood sample:

4.1.2.1. Avoid collecting blood from an area of hematoma.

4.1.2.2. The site of collection should be allowed to air dry after cleansing with 70% isopropyl or ethyl alcohol.

4.1.2.3. Advisable to use at least 21G needle size.

4.1.2.4. Ensure smooth venipuncture and steady flow of blood into the syringe.

4.1.2.5. Do not force blood through a needle while transferring blood into a collection tube.

4.1.2.6. Immediately and gently mix the blood collection tube by inverting several times. Do not mix vigorously.

4.1.2.7. Do not freeze the blood sample.

4.1.3. Draw of blood should be in a correct order beginning with blood culture followed by other routine blood collection tubes (Refer to page 37)

4.1.4. Specimens must be dispatched immediately to the Main Receiving Counter in an appropriate container or blood collection tube as specified and according to transport requirements for the test.

4.2. Method of collection

4.2.1. **Blood collection.**

4.2.1.1. Blood samples must be collected directly from the venous access.

4.2.1.2. Avoid sampling from intravenous line or arterial access.

4.2.1.3. Avoid taking blood samples from the same side of the intravenous line.

4.2.1.4. For coagulation test requests, do not apply tight and prolonged tourniquets.

4.2.1.5. Advisable to use at least 21G needle size.

4.2.1.6. Avoid drop method blood collection.

4.2.1.7. Immediately and gently mix the blood collection tube by inverting several times. Do not mix vigorously.

4.2.2. **For Bone Marrow Aspiration Trephine (BMAT) ± Cytogenetic, Molecular and Immunophenotyping:**

4.2.2.1. Appointment must be made one day earlier before the procedure. The Medical Officer in charge must write patient identification in the appointment book at Specialized Hematology Lab (ext.: 1359). No appointment shall be made on Friday and public holiday.

4.2.2.2. On the appointment date, doctor and patient must be ready for the procedure by 8 AM, laboratory technologist will be at the procedure room to prepare smears from the aspirated bone marrow performed by the doctor in charge.

4.2.2.3. The slides will be taken back to the hematology laboratory by the technologist for staining.

4.2.2.4. Specimens for bone marrow trephine biopsy will be sent to Histopathology lab in 10% buffered formalin.

4.2.2.5. Specimens for Immunophenotyping, Cytogenetic and DNA study will be sent to the referral Centre as requested by the doctor in charge.

4.2.2.6. All the tubes and request forms must be ready before starting the procedure. Request forms and tubes must be labeled at the bedside by the doctor in charge before the procedure.

4.2.2.7. 4 tubes of peripheral blood sample must be taken before the procedure.

4.2.2.8. The Medical Officer in-charge must prepare the complete request form before the procedure.

4.2.3. For NAP score request, appointment must be made at least one day before the procedure. MLT in-charge will perform finger prick and smear on the patient at the bedside on the appointment date.

4.2.4. For BCR ABL quantification requests, samples must be sent to the Main Receiving Counter during office hours Monday-Thursday.

4.2.5. Outsource/referred specimens will be dispatched out to the respective referral Centre by 9.00 am during working days. Specimens must reach the laboratory before 9 am.

5. RECEIVING OF SPECIMEN & OPERATION HOUR

5.1. All specimens should be sent in a separate biohazard plastic attached to the respective PER PAT 301 form to the Main Receiving Counter, Department of Pathology as soon as possible in an appropriate container or blood collection tube as specified and according to transport requirements for the test.

5.2. **SERVICE AFTER OFFICE HOURS AND PUBLIC HOLIDAY**

5.2.1. All tests that are available in the Routine Hematology laboratory can be requested as usual.

5.2.2. Tests done in Specialized Hematology laboratory are only offered during office hours.

5.2.3. Please contact the lab (ext.: 1370) for further information of sample reception during long public holidays.

6. REPORTING AND DESPATCHING OF RESULTS

6.1. Results can be viewed through laboratory information system (LIS).

6.2. For certain locations without access to the LIS, results will be emailed accordingly.

6.3. Hardcopy results will be made available upon request.

7. SUPPLIES

7.1. **Specimen containers**

7.1.1. For in-house customers, indent the specimen container from Farmasi Bekalan.

7.1.2. For external customers, indent from respective centers.

7.2. **Request forms**

7.2.1. For in-house customer, indent PER PAT 301 request form from Jabatan Patologi (ext.: 1382)

7.2.2. For external customers, indent from respective centers.

7.2.3. For special tests (e.g.: Cytogenetic, Molecular test), request form can be retrieved from respective websites.

7.3. Please refer to the **Table 1: List of offered tests** for details of specimen containers and request forms.

8. OTHERS

8.1. If there is an urgent FBP/ Kleihauer test required, the request will be screened by the Pathology Medical Officer on-call. The requesting doctor must call the MO on-call to get permission.

8.2. For FBP requests from external customers, if samples cannot be sent within 4 hours to the Main Receiving Counter, Jabatan Patologi HTAR, smears must be done and fixed by the respective requesting Centre and to be sent together with the FBC result.

8.3. For HB analysis test requests, smears must be done and fixed by the respective requesting Centre and to be sent together with the FBC result.

8.4. For specialized hematology tests (e.g.: NAP score, Bone Marrow Aspirate/trephine) appointment shall be made at least one day before the procedure.

8.5. For Osmotic Fragility Test (OFT), Medical Officer in-charge must contact the referral lab for appointment (HKL, ext:6549).

MICROBIOLOGY.

MICROBIOLOGY

1. INTRODUCTION

Medical microbiology is one of the most essential components in Pathology services. Knowledge and services in this area is vital for the clinical management of infection. Microbiology unit is particularly involved in isolation or establishing the causative organism as well as monitoring and screening of disease. It also indirectly provides guidelines on antibiotic usage management and the control of healthcare associated infection.

2. SERVICE PROVIDED

The unit provides services as the followings;

2.1. Diagnostic Microbiology services which comprise of Bacteriology, Virology, Serology, Immunology, Mycology and Parasitology

2.2. Participation in hospital wide infection control activities related to surveillance, control and prevention of healthcare associated infections.

2.3. Provision of microbiology studies of the hospital environment and sterility testing.

3. REQUEST FORM

3.1. Specimens must come with the designated request form i.e. PER PAT 301.

3.2. Two (2) copies of laboratory request forms are required for all tests

3.3. The information required on the form is to be filled and completed by the requesting doctor.

3.4. Specimen requirements should follow the general guidelines as outlined.

4. SPECIMEN COLLECTION AND HANDLING

4.1. General Guidelines

4.1.1. The quality of laboratory results depends greatly on the proper collection and handling of the specimen as well as obtaining satisfactory material for examination.

4.1.2. Specimens must be taken from the actual infection site with minimum contamination from adjacent tissues, organs or secretions.

4.1.3. A sufficient quality of specimen must be obtained in order to perform the examination required.

4.1.4. Appropriate collection devices, specimen containers and culture media must be used to ensure optimal recovery of microorganisms.

4.1.5. Specimens should be obtained before the commencement of antimicrobial therapy.

4.1.6. The specimen container must be properly labeled and capped, placed in a biohazard plastic bag and accompanied by a completed laboratory request form.

4.1.7. Specimens are best transported immediately to the laboratory.

4.2. Specific Collection Guidelines

4.2.1. Bacteriology

A. Blood Cultures

A.1. An automated blood culture system with different types of bottles according to age used:

Adults:	Aerobic and anaerobic culture bottle Volume: 8 – 10 mls into each bottle
Pediatric:	A single blood culture bottle Volume: 1 - 3 mls
Fungal C&S :	Myco/F Lytic bottle Volume: 1 - 5mls
TB blood culture:	Myco/F Lytic bottle Volume: 1 - 5 mls

A.2. Method of collection:

A.2.1. Before venepuncture, the skin must be carefully disinfected with 2% chlorhexidine gluconate in 70% alcohol antiseptic.

A.2.2. Allow time for drying and do not touch the cleaned area thereafter except with sterile gloves

A.2.3. Clean the top of the bottle with alcohol

A.2.4. Perform venepuncture and inoculate adequate volume of blood into each bottle

A.2.5. The volume of the blood is more critical than the number of cultures

A.2.6. Invert (do not shake) inoculated blood culture bottle 2-3 times

A.2.7. Do not store specimens in the refrigerator

Note: In the suspicion of catheter-related bacteraemia, paired blood drawn from catheter lumen and peripheral vein are indicated.

B. Cerebrospinal Fluid (CSF)

B.1. Collect 3 – 4 mls of CSF into sterile CSF tube

B.2. Send the specimen immediately to the laboratory.

B.3. Do not keep the sample in the refrigerator (for culture & sensitivity testing).

C. Genital samples High Vaginal swabs

C.1. Indicated in cases suspected of candidiasis and other causes of vaginitis.

C.2. Use sterile speculum lubricated with sterile normal saline and swab either from the posterior fornix or the lateral wall of vagina.

C.3. Inoculate the swab into Amies transport media.

D. Endocervical swab

D.1. A suitable specimen for the diagnosis of gonorrhea and puerperal sepsis.

D.2. Under direct vision, gently compress the cervix with blades of speculum and use a rotating motion with a swab, obtaining exudates from the endocervical canal.

D.3. Inoculate the swab into Amies transport media.

E. Urethral discharge (Male)

E.1. Wipe the urethra with a sterile gauze or swab.

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

E.3. Place the swab into Amies transport media.

Note: Do not refrigerate swabs.

F. Pus / Swabs / Tissue (i.e., eye swab, ear swab)

F.1. Clean with sterile water or disinfect with mild alcohol antiseptic over the skin area.

F.2. Send pus (if available) in a sterile universal container

F.3. Swab is an inferior substitute, and should be sent in an Amies transport media.

F.4. Send all tissues for culture in a sterile container. Sterile saline can be added to prevent drying. Do not add formalin to the specimen.

G. Respiratory specimens

G.1. Sputum

G.1.1. Collect the sputum early in the morning, after a deep cough or after a session of physiotherapy.

G.1.2. Ask the patient to cough deeply and spit directly into a sterile universal container.

G.1.3. The material expectorated should be secretions from the bronchi and not saliva.

G.1.4. If delay is anticipated, keep the sample in a refrigerator.

G.2. Nasal Swab

G.2.1. This commonly done for screening of MRSA carriage

G.2.2. Moisten swab with sterile saline

G.2.3. Swab both the anterior nares and insert the swab in to the nose and gently rotate against the nasal mucosa

G.3. Pernasal/ Nasopharyngeal swab

G.3.1. This is especially useful for the diagnosis of whooping cough (Test to order is Bordetella pertussis PCR)

G.3.2. Moisten the tip of soft flexible wire swab with sterile saline

G.3.3. Gently insert it into one of the nares and along the floor of the nasal cavity into the nasopharynx, rotates it and withdraws

G.3.4. Replace it in the carrier tube/bag and send it immediately for processing.

G.4. Throat swab

G.4.1. Ask the patient to open his mouth widely. Gently depress the tongue with a tongue depressor and rub the sterile swab over the tonsillar areas and the mucosa on the posterior pharyngeal wall behind the uvula.

G.4.2. Gently turn the swab so that its whole surface comes in contact with the inflamed mucosa or lesion.

G.4.3. Avoid touching the oral mucosa or tongue with the swab.

G.4.4. Place the swab in Amies transport media immediately.

G.5. Tracheal aspirate

G.5.1. Send it to the laboratory in a mucus extractor (if it is used).

G.5.2. If taken manually, flushed the tube using sterile water and put into a wide mouthed sterile container.

G.6. Bronchial alveolar lavage (BAL) / brushings / biopsies

G.6.1. Place the specimen which is obtained via bronchoscopy into a sterile container.

G.6.2. Send the specimen to the laboratory immediately.

G.7. Swabs from mouth, gums and oral cavity

G.7.1. Rinse mouth with water before sampling

G.7.2. Using a sterile swab, rub into areas of exudation or inflammation and place into Amies transport media.

H. Stool

H.1. Collect faeces into a sterile / clean wide-mouth screw-capped plastic container.

H.2. If the faeces are liquid, the container may be filled to one third full (excessive amount will result in spillage when opened)

H.3. Enrichment medium i.e.,Alkaline Peptone Water for Vibrio and Selenite F for Salmonella can be obtained from the laboratory for bedside inoculation.

H.4. Send specimens to the laboratory immediately.

Note:

- Rectal swab is a poor second-best alternative to faeces. If it is not possible to obtain faeces, collect a specimen by inserting a cotton swab into rectum.
- For stool clearance culture in cases of typhoid, stool should only be sent upon completion of therapy.

I. Urine culture

I.1. (Midstream urine)

I.1.1. Male patients

I.1.1.1. Withdraw the prepuce and cleanse the glands penis with soapy water thoroughly rinse with water.

I.1.1.2. Pass the first stream of urine to flush out the bacteria from the urethra, then collect the midstream portion in a sterile universal container and close it tightly.

I.1.2. Female patients

I.1.2.1. Clean the periurethral area and perineum with soapy water and thoroughly rinse with water.

I.1.2.2. Hold the labia apart during voiding and pass the first stream of urine.

I.1.2.3. Collect the midstream portion in a sterile container and close it tightly.

Note: When culture for tubercle (TB) bacilli is required, collect at least 50 ml of early morning midstream urine of 3 consecutive mornings into a sterile container.

I.2. Catheterized urine

I.2.1. Culturing a urinary catheter should be taken by aseptic puncture of the catheter conduit and syringe out into a sterile container.

I.2.2. Urine from catheter bags is unsuitable for culture.

Note: Culturing urinary catheter tips is a waste of time because the catheter tips are invariably contaminated with urethral organisms.

I.3. Bladder urine samples

I.3.1. This is obtained via suprapubic aspiration or cystoscopically.

I.3.2. Urine is collected in a sterile container.

Note: Specimens should be kept with ice if unable to reach the lab within one hour after collection.

J. Serous fluid

J.1. Collect 3–5mls serous fluid into a sterile container for the examination of microscopy and bacterial culture.

J.2. Send the specimen immediately to the laboratory.

J.3. Do not keep samples in the refrigerator (for bacterial culture & sensitivity testing).

4.2.2 Mycology

A. Skin, nails and hair

Clean cutaneous and scalp lesions with 70% alcohol prior to sampling as this will improve the chances of detecting fungus on microscopic examination, as well as reducing the likelihood of bacterial contamination of cultures. Prior cleaning is essential if ointments, creams or powders have been applied to the lesion. Skin, nails and hair specimens should be collected into folded squares of coloured paper, sterile container or directly onto an agar plate.

A.1. Skin

A.1.1. Material should be collected from cutaneous lesions by scraping outwards from the margin of the lesion with the edge of a glass microscope slide or a blunt scalpel.

A.2. Hair

A.2.1. Specimens from the scalp should include hair roots, the contents of plugged follicles and skin scales.

A.2.2. Hairs should be plucked from the scalp with forceps or the scalp is brushed with a plastic hairbrush and collected onto agar plate.

A.3 Nails

A.3.1. Nail specimens should be taken from any discolored, dystrophic or brittle parts of the nail.

A.3.2. Specimens should be cut as far back as possible from the edge of the nail and should include the full thickness of the nail.

B. Ear

B.1. Scraping of material from the ear canal is to be preferred, although swabs can also be used.

C. Ocular specimens

C.1. Material from patients with suspected fungal infection of the cornea (keratomycosis) should be collected by scrapping the ulcer. The entire base of the ulcer, as well as the edges, should be scrapped. (Swabs are not suitable for sampling corneal lesions).

C.2. The material is collected directly on agar plates for culture and to glass slides for microscopic examination.

D. Blood

D.1. Blood culture for fungal is collected in the same manner as for blood culture for bacteria using a manufacturer fungal bottle.

D.2. The request for fungal culture should be written clearly on the request form.

E. Cerebrospinal fluid

E.1. CSF specimens (3 – 5 ml) should be collected in a sterile container for microscopy and culture.

F. Bone marrow

F.1. This specimen is helpful for making the diagnosis of deep fungal infections, including histoplasmosis and cryptococcosis.

F.2. 3–5 mls of aspirated material should be collected and transferred into the blood culture bottle.

G. Pus

G.1. Pus from undrained subcutaneous abscesses or sinus

G.2. In mycetoma, if the crust at the opening of the sinus tracts is lifted, grains can often be found in the pus underneath, and should be sent for culture.

H. Tissue

H.1. If possible, material should be obtained from both the middle and edge of the lesions.

H.2. Small cutaneous, subcutaneous or mucosal lesions can often be excised completely.

H.3. Tissue specimens should be placed in a sterile container without formalin.

4.2.3 Parasitology

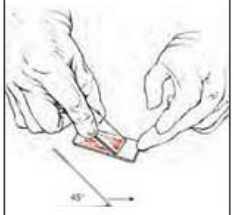
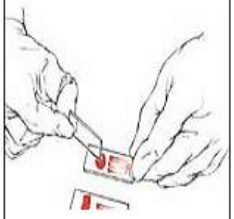
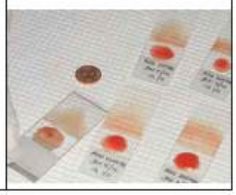
A. Preparation of Blood Film Malaria Parasite (BFMP)

A.1. Microscopic examination of both thick and thin film remains the gold standard for confirmation of malaria.

A.2. Two types of blood film/smears prepared on a single slide should be sent to the laboratory which are the THICK FILM and THIN FILM SLIDES.

A.3. **Blood Collection for BFMP (Thick and Thin film)**

FLOW CHART	DESCRIPTION OF ACTIVITY	ILLUSTRATION
1. Label the slide with the patient's details and record in the register. ↓ 2–3. Wearing latex gloves, clean the third finger from the thumb with 70% ethanol or an alcohol swab. Let the finger dry in air. ↓ 4. Prick the finger with a new, sterile lancet. ↓ 5–6. Express the first drop of blood and wipe it off with dry cotton. ↓ 7. Express and touch the blood with the slide to collect a small drop of blood, and use it to make the thin film. ↓	1. Label the frosted end of the glass slide with the patient's details, and document in record form or a malaria register. See SOP 06: Labelling malaria blood films. 2. Wearing protective latex gloves, select the third finger from the thumb of the non-dominant hand (or big toe for infants, not the heel). Do not use the thumb for either children or adults. 3. Hold the patient's hand, palm facing upwards, and clean the selected finger with a piece of cotton soaked lightly in 70% ethanol or alcohol swab. Use firm strokes to remove dirt and oil from the ball of the finger and to stimulate blood circulation. Make sure the finger is warm by applying gentle massage if required. Let the alcohol dry from the finger. 4. Using a new, sterile lancet and a quick rolling action, puncture the centre of the ball of the finger or toe. 5. Apply gentle pressure to the finger (or toe), and express the first drop of blood. 6. Wipe the first drop of blood off with dry cotton, making sure that no cotton strands remain on the finger that might stick to the blood. 7. Working quickly and handling the slides only by the edges, collect blood by applying gentle pressure to the finger and touching the slide to the blood; collect a single small drop of blood on the middle of the slide for the thin film.	 

FLOW CHART	DESCRIPTION OF ACTIVITY	ILLUSTRATION
8. Collect two or three more small drops of blood, and use them to make the thick film. ↓ 9. Wipe the remaining blood from the finger. ↓ 10. Place the slide with the blood facing up on a flat surface. ↓ 11–13. Using a clean "spreader" slide, make the thin film by pushing forwards the one drop of blood in a smooth, continuous motion. ↓ 14. With the corner of the "spreader", make the thick film by swirling the three drops of blood together to form a circle. ↓ 15. Air-dry in a horizontal position. A slide dryer may be used if rapid drying is required.	8. Apply further gentle pressure to express more blood, and collect two or three drops on the slide about 1 cm from the drop intended for the thin film. 9. Wipe the remaining blood from the finger with clean, dry cotton. 10. Do not pause between applying and spreading the drops. Prepare the blood films with the slide lying on a flat surface. 11. **To prepare the thin film**, place the edge of a clean "spreader" slide at 45° in front of the blood drop intended for the thin film. 12. Slowly pull the "spreader" back until it touches the drop of blood and the blood spreads along the edge of the "spreader". 13. Rapidly push the "spreader" forwards (away from the centre) in a smooth, continuous motion, until the spreader leaves a "feathery" end for the thin film. 14. With the corner of the same "spreader" used for making the thin film, **make the thick film** by swirling the three drops of blood together forming a circle of about 1 cm in diameter size. Do not stir the blood. A circular or rectangular film can be made by three to six quick strokes with the corner of the spreader. 15. After preparing the thin and thick blood films, allow them to dry in air in a horizontal position on a slide tray. If rapid drying is required, dry the films with low heat from a hair-dryer for 5 s, at a distance of 30 cm. Do not place the slides too close to the dryer, as the films might become heat fixed.	   

B. PROCEDURE NOTES

B.1. The thick film should be dried flat and be protected from dust and flies.

B.2. Do not use a ballpoint or gel pen to label slides, as the ink will spread when the film is fixed.

*Adapted from WHO guideline MM–*SOP–05A: COLLECTION OF FINGER-PRICK BLOOD AND PREPARATION OF THICK AND THIN BLOOD FILMS.*

4.2.4 Specimens for serological tests

A. These comprise the test of immunology, serology and virology. Methods of blood collection:

A.1.1. Draw 3 – 5 mL of blood into a plain tube without anticoagulants

A.1.2. Leave clot at ambient temperature.

A.1.3. Dispatch to the laboratory within 4 hours after collection of blood for serum separation by centrifugation.

Note: Haemolysed, icteric or lipemic specimens invalidate certain tests. If such specimens are received, the sample will be rejected to assure that results are of clinical value.

5. RECEIVING OF SPECIMEN & OPERATION HOUR

5.1. All specimens will be received at the Main Reception Counter except for specimens for molecular testing which will be received at the Molecular Laboratory counter.

5.2. Specimens sent for bacteriology, parasitology and mycology will be processed as usual on weekends and public holidays from 8:00 a.m. until 5:00 p.m. Virology tests for organ transplant and needle prick injury cases are offered 24 hours.

6. REPORTING AND DESPATCHING OF RESULT

6.1. Pathologists, Medical Officers and Scientific Officers will validate all results during office hours. Results for all tests will be released based on the turn-around time for the test requested. CSF and corneal scraping microscopy results will be released as a preliminary report on the same day and informed by phone.

6.2. The validated results will be viewed at the assigned terminal. Positive results of HIV tests will be placed in sealed envelopes and should be collected from the Serology laboratory.

7. SUPPLIES

7.1. The supply of containers such as blood culture bottles, Alkaline peptone water (APW), and Selenite F broth can be collected from the Bacteriology laboratory. Copan swabs and Viral / Universal Transport Media (VTM/UTM) can be collected from the Molecular laboratory.

8. OTHERS

NA

SATELLITE LABORATORIES.

SATELLITE LABORATORY AT EMERGENCY AND TRAUMA DEPARTMENT

1. INTRODUCTION

Pathology Satellite Laboratory at Emergency and Trauma Department, Hospital Tengku Ampuan Rahimah, Klang provides a basic diagnostic service for Emergency and Trauma Department to ensure early results can be delivered for immediate patient care.

2. SERVICE PROVIDED

2.1. Full Blood Count (FBC)
2.2. Blood Gases
2.3. Urine Biochemistry (Dipstick) 11 parameter
2.4. Urine Pregnancy Test
2.5. Dengue Combo Rapid Test
2.6. Methaemoglobin
2.7. Malaria Rapid Test

3. REQUEST FORM AND SPECIMEN

3.1. Specimens must come with one copy of a designated request form, PER-PAT 301.
3.2. The information required on the form is to be filled and completed by the requesting doctor.
3.3. Specimen requirements should follow the general guidelines as outlined.

4. SPECIMEN COLLECTION AND HANDLING

4.1. Blood Gases Sample

1.1.1. Procedure of collection

1.1.1.1. Indicate time of arterial or venous puncture in the request form.
1.1.1.2. Use a 1 ml disposable syringe.
1.1.1.3. Rinse it by sucking heparin (5,000 units per ml) into the syringe and expel excess heparin-solution from the syringe.
1.1.1.4. Draw 1 ml of blood. (Bubble, needle, remove clot, refer to Table 1)
1.1.1.5. Place the syringe upright and remove all air bubbles inside the syringe.
1.1.1.6. Discard the needle. DO NOT leave needles attached to
1.1.1.7. prevent needle stick injury incidence
1.1.1.8. recap with stopper to avoid specimen exposure to air

1.1.1.9. Mix well by gently inverting the syringe 3-4 times to prevent clotting and discard the blood clots from the syringe if present.

1.1.1.10. Put the syringe in a plastic bag and keep the syringe in ice (No direct contact with ice)

1.1.1.11. Sent the specimen immediately for analysis (within 30 minutes)

1.2. For methaemoglobin test:

1.2.1. For external sample (outside HTAR): venous blood in lithium heparin tube

1.2.2. For internal sample: venous blood in heparinized syringe

1.2.3. Transport in ice (No direct contact with ice)

1.3. For other tests, refer **Table 1: List of offered tests**

5. RECEIVING OF SPECIMEN & OPERATION HOUR

5.1. All specimens will be received at the Satellite Lab Counter.

5.2. The Satellite Lab at the Emergency and Trauma Department operates 24 hours every day.

6. REPORTING AND DESPATCHING OF RESULT

6.1. FBC and blood gases results can be viewed at the client's designated computer according to the respective lab viewer.

6.2. Other test results can be obtained at the designated zone pigeon hole located at the Satellite Lab Counter.

7. SUPPLIES

NA

8. OTHERS

NA

SATELLITE LABORATORY AT AMBULATORY CARE CENTRE

1. INTRODUCTION

Pathology Satellite Laboratory at Ambulatory Care Centre, Hospital Tengku Ampuan Rahimah, Klang runs a basic and simple routine test mainly for Obstetrics and Gynaecology Department and Klinik Warga Kerja, and also cater request from Surgical, Orthopaedic and Paediatric Clinic to ensure immediate patient care can be carried out by the clinician.

2. SERVICE PROVIDED

2.1. Urine Biochemistry (Dipstick) 2 parameters

2.2. Urine Biochemistry (Dipstick) 11 parameters

3. REQUEST FORM AND SPECIMEN

3.1. Specimens must come with one copy of a designated request form, PER-PAT 301.

3.2. The information required on the form is to be filled and completed by the requesting doctor.

3.3. Specimen requirements should follow the general guidelines as outlined.

4. SPECIMEN COLLECTION AND HANDLING

4.1. Refer **Table 1: List of offered tests**.

5. RECEIVING OF SPECIMEN & OPERATION HOUR

5.1. All specimens will be received at the Satellite Lab Counter.

5.2. The operation hour is from 8am until 1pm from Monday to Friday and closed during weekend, state and public holidays.

6. REPORTING AND DESPATCHING OF RESULT

6.1. Results can be obtained at the Satellite Lab Counter

7. SUPPLIES

NA

8. OTHERS

NA

POINT OF CARE TESTING (POCT).

POINT OF CARE TESTING (POCT)

1. INTRODUCTION

POCT is a term used to describe laboratory testing performed by non-laboratory staff outside the main laboratory. These range from disposable hand-held strip readers to desktop analysers. The purpose of POCT is to provide rapid laboratory test results to facilitate immediate patient management decisions and improved quality of patient care

2. LIST OF POCT AND LOCATION

ANALYTES	INSTRUMENT	LOCATION
Basic blood gas, electrolytes, Lactate, Glucose	GEM PREMIER 3500	Medical – Wad 8C, 6F Anaes – Wad 4C, 5C, GOT, ICU Kencana A, ICU Kencana B
Basic blood gas, electrolytes, Lactate, Glucose, Co-oximetry	GEM PREMIER 5000	Pediatric – NICU, PICU
Glucose, Ketone	CARESENS DUAL METER	Wards and clinic
Urine Pregnancy Test	-	O&G, Psychiatric
Urine Protein/Albumin	-	O&G
Urine Ketone	-	O&G
Urine pH	-	Wad 6F
Opiates, Cannabis, Methamphetamine, Amphetamine	WONDFO 4 in 1 DOA	Psychiatric ward & clinic
Opiates, Cannabis, Methamphetamine, Amphetamine, MDMA, Ketamine, Methadone, Buprenorphine, Benzodiazepine, Synthetic Cannabinoid (Spice/K2)	WONDFO 10 in 1 DOA	Emergency department
INR	XPRECIA SIEMENS	Phlebotomy Unit
HIV/Hepatitis B/Hepatitis C rapid test	-	Hemodialysis Unit Labor room (HIV only)
Covid-19 antigen rapid test	-	Wards and clinics
Syphilis antibody rapid test	-	O&G

3. SUPPLIES

3.1. Glucometer/ketone meter replacement & consumables

3.1.1. Glucose strip, ketone strip, internal quality control solution, battery can be collected at Unit Pengurusan, Jabatan Patologi.

3.2. Covid-19 antigen rapid test can be collected at the Molecular Laboratory, Jabatan Patologi.

LIST OF OFFERED TESTS.

LIST OF REFERRED TESTS.

2. Table 2: List of referred tests

REQUEST FORM.

1. LIST OF REQUEST FORM TO BE USED FOR IN-HOUSE TESTS.
2. LIST OF REQUEST FORM TO BE USED FOR OUTSOURCE TESTS

HOSPITAL TENGKU AMPUAN RAHIMAH KLANG