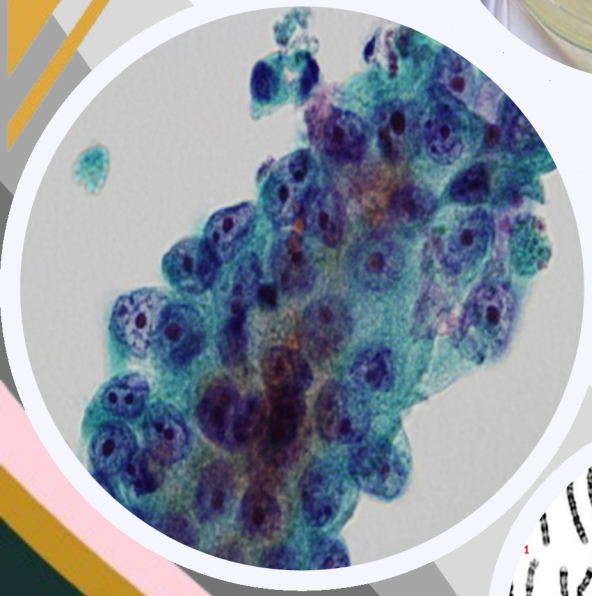

PANDUAN PERKHIDMATAN MAKMAL

GUIDELINES OF LABORATORY SERVICES

JABATAN PERKHIDMATAN MAKMAL DIAGNOSTIK
DEPARTMENT OF DIAGNOSTIC LABORATORY SERVICES
HOSPITAL CANSELOR TUANKU MUHRIZ,
UNIVERSITI KEBANGSAAN MALAYSIA
KAMPUS KUALA LUMPUR

VERSION 2025

SIRIM ACB QMS 01 · SIRIM 0074 · SIRIM IQNET · ilac-MRA · STANDARDS MALAYSIA ACCREDITED SAMM 481 · MSQH ACCREDITED HOSPITAL

CONTENTS

1.0 PREFACE

Department of Diagnostic Laboratory Services is a medical laboratory under Hospital Canselor Tuanku Muhriz, Universiti Kebangsaan Malaysia. We perform our testing using the standard methodology to produce a reliable and quality results including clinical interpretation for customer. Laboratory is not directly involved in taking the consent of the patient, it is the agreement between the doctors and patients. All laboratory staff responsible to maintain the patient confidentiality.

We valued our customers and would like to extent our deepest gratitude to all customers for your continued support. We are looking forward for further opportunities to deliver the best services to you and we welcome complaint to continuously improve our services. Shall you have any enquiries, do not hesitate to contact us for further information and advise.

CONTACT US

Department of Diagnostic Laboratory Services
Hospital Canselor Tuanku Muhriz
Universiti Kebangsaan Malaysia
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FEEDBACK CHANNEL

Appreciation | Complaint | Suggestion

SCAN HERE

HCTM WEBSITE

https://hctm.ukm.my/hubungi-kami/

2.0 MESSAGE FROM HEAD OF DEPARTMENT

Bismillahirrahmanirrahim,

Alhamdulillah, all praise to Allah s.w.t for His Grace and Mercy, our department has been successfully updated the Laboratory Manual Guidelines (Panduan Perkhidmatan Makmal, PPM). This guide represents an outcome of thoughtful collaboration, careful planning, and a shared commitment in improving the way we manage and communicate our laboratory requests.

The digital guideline is user-friendly and readily available online via our department official website: https://hctm.ukm.my/makmal/

In an environment where accuracy, clarity, and efficiency are critical, this guide will serve as an essential and practical reference for both new and experienced users, ensuring that our processes remain smooth, standardized, and effective.

Special thanks to the committed team of authors and staffs, whose support and encouragement made this updated version possible. Thank you all for being part of this achievement. Let's continue to strive for excellence together.

Sincerely,

DR MUNIRAH MD MANSOR
HEAD
DEPARTMENT OF DIAGNOSTICS LABORATORY SERVICES (JPMD)
HOSPITAL CANSELOR TUANKU MUHRIZ
UNIVERSITI KEBANGSAAN MALAYSIA

3.0 Acknowledgement

The completion of this Laboratory Manual Guidelines / *PPM* could have been possible without the participation and assistance of many people whose names may not all be enumerated. Their contributions are sincerely appreciated and gratefully acknowledged.

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~ Special thanks to All JPMD Staff who contributed in the publication of this book ~

4.0 Service Unit at JPMD, HCTM

OFFICE HOUR
8.00 AM – 5.00 PM

UNIT	EXT	LOCATION	UNIT	EXT	LOCATION
Bacteriology Unit	5480 / 5481	Basement	**Media Preparation Unit**	5485	Basement
Blood Bank Unit	5454	G Floor	**Molecular Biology Unit**	5853	Basement
Chemical Pathology Unit	5451 / 5560	Basement	**Molecular Genetics Unit**	5823	2nd Floor
Culture Tissue Unit	5483	Basement	**Mycology Unit**	5484	Basement
Cytogenetic Unit	5813 / 5824	Basement	**Phlebotomy Unit**	7253/ 7254	G Floor
Cytopathology Unit	5466	Basement	**Stem Cell Transplant Unit**	6752/ 5475	2nd Floor
Forensic & Mortuary	5445	Basement	**Specialized Haemostasis Unit**	6767	2nd Floor
Haematology Unit	5834	Basement	**Virology Serology Unit**	5482	Basement
Histopathology Unit	5464 / 5805	Basement			
Immunology Unit	5482	Basement			

AFTER OFFICE HOUR
5.00 PM – 8.00 AM

UNIT	EXT	LOCATION	UNIT	EXT	LOCATION
Blood Bank Unit	5454	G Floor	**Haematology Unit**	5834	Basement
Chemical Pathology Unit	5451 / 5560	Basement	**Microbiology Lab**	5480	Basement
Forensic & Mortuary	019 - 3235631	Basement	**Microbiology Oncall**	018-7878488	Basement

5.0 Types of Collection Tubes/Container

A. BLOOD COLLECTION TUBES

Order of Draw	Type of Tube	Volume	Inversion
1 (Blood Culture)		Adult: 8-10 ml Paeds: 3-5 ml	
2 (Sodium Citrate)		2.0 ml	3-4
3 (Plain Tube)		5.0 ml	5
4 (Plain Tube with Gel)		5.0 ml	5
5 (Lithium Heparin)		4.0 ml	8
6 (EDTA)		3.0 ml	8
7 (Oxalate Fluoride)		2.0 ml	8

B. OTHERS TUBES/CONTAINER

Tube/Container	Type of Tube	Volume	Inversion
Sodium Heparin		4.0 ml	8
Viral Transport Medium		NA	NA
Glass slide		NA	NA
Sterile/Urine Container			NA
Swab Transport Medium			NA
Liquid Based Cytology			NA

6.0 Pre-Analytical Handling Guidelines

Phlebotomy Section

INTRODUCTION:

The Phlebotomy Section is one of the laboratories in the JPMD that provides blood collection procedures .

LOCATION : Ground Floor, Clinical Building of Hospital Canselor Tuanku Muhriz.

PROCESS	REJECTION CRITERIA	OPERATION HOURS	NOTES
1. Acceptance of Test Request Forms That Are Complete And Meet The Rejection Criteria	The request for blood collection will be rejected if: 1. No patient identification sticker 2. No clinical diagnosis 3. No test selected 4. No signature and stamping from requested doctor 5. Location (ward/clinic) not clearly stated 6. The payment status (Free/Paid) stamping is not clear 7. Wrong patient identification on request form 8. Wrong request form 9. Urine and blood test request forms are not separated	7.30 am – 4.30 pm Monday to Friday except Public Holiday	All test request form which not fulfill the acceptance criteria will be rejected and will be returned to the patient. This rejected form must be corrected by the clinics. Patients need to return back to Phlebotomy section (BPD) with corrected form for blood collection procedure.
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES			
1. Patients are advisable to refer to the Phlebotomist to obtain an explanation of a suitable time for blood taking procedure. 2. The phlebotomist also will assist the patient/clinic/ ward to ensure the requested tests are offered by the laboratories.			

7.1 Cytopathology Unit

INTRODUCTION:

Cytopathology Unit is one of the laboratories in JPMD that provide microscopic services and studies on the cell morphology in diagnosing pathological disease.

The services include Gynae cytology test (conventional and Liquid based cytology), Non Gynae cytology test, and Fine Needle Aspiration Cytology (FNAC).

We offer the service of collection specimens by performing FNAC procedure in FNAC Clinic and FNAC mobile.

Besides that, we also provide molecular testing in detecting Human Papillomavirus (HPV DNA) in cervical sampling.

LOCATION : Basement, Clinical Building, Hospital Canselor Tuanku Muhriz.

REQUEST FORM : HCTM/JKIK/PMD(RP)18/17 (Pin. 1/2024)

CONTACT NUMBER : 03-9145 5466/6424/6425

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
PAP01 Gynae Cytology (Conventional)	Smeared slide and PAP stain	 Glass slide	1 slide	8:00 am - 5:00 pm Monday-Friday	14 working days	1. Cytospray will be provided by Cytopathology Lab (Ext: 5466). (upon request) 2. Please send sample to the lab together with the dispatch book. **DO NOT USE PNEUMATIC TUBE.**

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
PAP02 **Gynae Cytology (Liquid Based Cytology (LBC))**	Liquid based cytology and PAP stain	 Vial of Liquid Based Cytology	1 vial	8:00 am - 5:00 pm Monday-Friday	14 working days	1. Make sure the vial is tightly sealed to prevent spillage. 2. Vial and Cytobrush will be provided by Cytology Lab (Ext: 5466). (only one cytobrush will be provided for one vial) 3. Please send to the lab together with the dispatch book. **DO NOT USE PNEUMATIC TUBE.**
PAP03 **HPV DNA TEST**	Real Time PCR	 Liquid Based Cytology (Thin Prep Pap Test)	1 vial	8:00 am - 5:00 pm Monday-Friday	14 working days	1. Make sure the vial is tightly sealed to prevent spillage. 2. Vial and Cytobrush will be provided by Cytology Lab (Ext: 5466). (only one cytobrush will be provided for one vial) 3. Please send to the lab together with the dispatch book. **DO NOT USE PNEUMATIC TUBE.**

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

Gynae Cytology Test

Please **provide patient's LMP** and **avoid collection during menstrual period**.

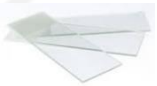
PAP 01 Gynae Cytology (Conventional)

1. Use Cytobrush to collect the specimen.
2. Spray and fix immediately with the Cytospray.
3. Hold the spray container 8-12 inches away from the slide to avoid 'blasting' the cells.
4. Label the slide properly with patient's details, type of specimen, date and time taken.

PAP 02 Gynae Cytology (Liquid Based Cytology (LBC)) & PAP 03 HPV DNA Test

1. Use Cytobrush to collect the specimen.
2. Rinsed the broom head into the container of PreservCyt solution.
3. Label the vial properly with patient's detail, type of specimen, date and time taken.
4. If there is request to add on HPV DNA test for Gynae Cytology (LBC) (within 4 weeks of sample receiving), please communicate with the lab for tracing the sample and submit a new request form.

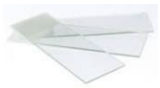
TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
NG01 **Non-Gynae Cytology** Sample : Body effusion: a. Pleural Fluid b. Peritoneal Fluid c. Pericardial Fluid	Cytospin, PAP and MGG stain	 Sterile Plain Container (Yellow Cap)	20 - 50 ml	8:00 am - 5:00 pm Monday-Friday If there is a delay in delivering the specimen, please keep it in the refrigerator at 4°C Note: **DO NOT FREEZE**	7 working days	1. The samples should be submitted as soon as possible to the lab together with the dispatch book. 2. Delay in receipt can lead to deterioration of specimens. **DO NOT USE PNEUMATIC TUBE.**
NG01 **Non-Gynae Cytology** Sample: Cerebrospinal Fluid (CSF)	Cytospin, PAP and MGG stain	 Sterile Plain Container (Yellow Cap)	As collected		3 working days	
NG01 **Non-Gynae Cytology** Sample : Urine - Voided - Instrumented / Catheter - Bladder washing - Not specified	Cytospin, PAP and MGG stain	 Sterile Plain Container (Yellow Cap)	30 - 50 ml		7 working days	

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
NG01 **Non-Gynae Cytology** <u>Sample :</u> Respiratory:- a. Sputum b. Bronchial washing (BW) c. Bronchoalveolar lavage (BAL) d. Bronchial Brushing (BB)	Cytospin/smearing PAP stain	**SPUTUM, BAL** and **BW:**  Sterile Plain Container (Yellow Cap) **BB:** Glass slide 	**SPUTUM:** At least 1 ml **BAL and BW:** 20 - 50 ml **BB:** Minimum 2 slides (both are sprayed with Cytospray of fixed with 95% ethanol).	8:00 am - 5:00 pm Monday-Friday If there is a delay in delivering the specimen, please keep it in the refrigerator at 4°C. Note: **DO NOT FREEZE**	7 working days	1. The samples should be submitted as soon as possible to the lab together with the dispatch book. 2. Delay in receipt can lead to deterioration of specimens. **DO NOT USE PNEUMATIC TUBE**.
NG01 **Non-Gynae Cytology** <u>Sample:</u> Others: a. Vitreous Fluid b. Common Bile Duct c. Synovial Fluid d. Cyst e. Pus f. Tzanck Smear	**Others:** Cytospin, PAP and MGG stain **Tzanck Smear:** Smeared slide, PAP and MGG stain	 **Others:** Sterile Plain Container (Yellow Cap) **Tzanck Smear:** Glass slide 	**Others:** 10 – 50 ml **Vitreous fluid:** As collected **Tzanck Smear:** At least 2 slides Please call Ext: 5466 to request fixative solution before sample collection		7 working days	

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

NG 01 Non Gynae Cytology

1. Do **NOT MIX** samples with Formalin for all fluids collected.
2. Urine - An adequate urine sample is the second voided in the morning, minimum 30ml. Please specify method of collection (eg. voided urine, instrumented etc.)
3. Sputum - Specimen needs to be taken early in the morning before the patient has eaten.
4. Bronchial Brushing (BB) - Spray the smear with Cytospray.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
Fine Needle Aspirations (FNAC) **FNA 01 - Report Only** **FNA 02 - with procedure at FNAC Clinic**	A procedure in which cells aspirate from a particular body region using a fine needle.	 Glass slide Or  Sterile Plain Container (Yellow Cap)	1. Minimum 2 air-dried slides and 2 alcohol - Fixed prepared. 2. Large volumes of specimens (eg cyst fluid) should be kept in sterile plain containers.	**FNAC Clinic: (at Surgery Clinic, G Floor)** 9:30am - 12:30pm Wednesday to Thursday 9:15am -12:15pm Friday Or **By appointment:** Everyday 9:00am - 4:00pm (for ward, radiology, endoscopy, UKMSC, HPKK etc). Please call 5466	7 working days	1. Laboratory personnel will assist radiologist or surgeon during specimen collection. Please call Cytology Lab at Ext 5466. 2. The samples should be submitted as soon as possible to the lab together with the dispatch book. **DO NOT USE PNEUMATIC TUBE.**

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

CONSENT FORM from the patient is needed before performing Fine Needle Aspiration (FNAC) procedure.

FNA 01 (Report Only) – samples collections done by Surgeon or Doctor in ward/ clinic/ OT/ US room.

1. Label the slides or container with patients's detail, type of specimen, date and time taken.
2. At least 4 smears are directly prepared on the glass slides.
3. Immediately fix 2 slides with 95% alcohol or Cytospray and another 2 slides air-drying.
4. If fluid is extracted in a large quantity, please fill into a sterile container.

FNA 02 (with procedure at FNAC Clinic) – samples collection by Pathology Medical Officer or Specialist.

1. Pathology Medical Officer will perform the FNAC procedure during FNAC Clinic or by request from the ward.
2. Call 5466 to set an appointment.

For pediatric patients (12 and below), please call 5466 for assistance. A Pediatrician or Medical Officer must accompany the patient during the procedure and a proper sedation should be given.

REJECTION CRITERIA

REQUEST FORM (HCTM/JKIK/PMD(RP)18/17 (Pin. 1/2024)) - WHITE

The request form must be completed with: -

1. Patient's registration number (MRN).
2. Patient's name.
3. Identification Number (I/C) or Passport.
4. Gender, Age & Ethnic.
5. Type of sample.
6. Type of test.
7. Clinical History/ Clinical Diagnosis
8. Location (ward/clinic/ hospital).
9. Doctor's name, stamp and MMC number.
10. Doctor's contact number (h/p or Ext ward/Clinic).
11. Date and time sample taken.

SPECIMEN CONTAINER

Container is clearly labelled with: -

1. Patient's registration number (MRN).
2. Patients' name.
3. Type of specimen.
4. Date and time of collection.

Others rejection criteria:

1. Specimen without request form.
2. Request form without specimen.
3. Wrong request form/ test unavailable/ wrong specimen.
4. Specimen that send through Pneumatic tube.
5. Specimen spillage.

Laboratory personnel will notify the requester by phone call and LIS.

FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION

1. All specimen container MUST be sterile to avoid contamination.
   Reuse container MUST NOT be used.
2. Cytology specimen easily degraded, therefore, please send to the laboratory immediately.
   If NOT, please keep in the refrigerator.

No	Type of Specimen	Specimen Stability (From time of collection to processing)	
		Room Temperature	Refrigerator (T = 2 – 8˚C)
1.	Body Fluids (Pleural, Peritoneal and Pericardial Fluids)	48 hours	4 days (= 96 hours)
2.	Cerebrospinal Fluid	2-5 hours	24 hours
3.	Bronchial lavage / washing	6 hours	24 hours
4.	Synovial Fluid	6 hours	24 hours
5.	Urine	2 hours	24 hours
6.	Liquid based cytology (ThinPrep)	6 weeks	6 weeks
7.	HPV DNA	90 days	90 days

3. Clinical history is compulsory for result interpretation.
4. Specimen from patient COVID-19 must be send to lab before 4.00 pm following safety guidelines.

7.2 Cytogenetics Unit

Introduction:

Cytogenetic Unit offers karyotyping and Fluorescence In Situ Hybridization (FISH) tests using peripheral blood and bone marrow samples.

Below is the list of indications that suitable for cytogenetics test in our laboratory:

A) Indications for Cytogenetic Analysis (Constitutional)

- Postnatal, childhood growth and development
  - Perinatal/newborn: Birth defects, malformations, dysmorphisms, ambiguous genitalia
  - Growth: failure to thrive, growth delay, short stature
  - Developmental delay (fine and gross motor, speech)
  - Cognitive: intellectual disability, learning disability
  - Neurological: hypotonia, seizures, ataxia
  - Behavioral: autism, OCD, psychiatric illness
- Adolescent, adult sexual development and fertility
  - Amenorrhea, primary or secondary ovarian failure, premature menopause
  - Azoospermia, oligospermia, hypogonadism
  - History of infertility or spontaneous abortions
  - Birth of a child with a chromosomal abnormality

Type of Specimen: Peripheral blood

B) Indications for Cytogenetic Analysis (Cancer)

- Hematologic oncology
  - – Myeloid diseases: AML, CML, MDS, MPNs
  - – Lymphoid diseases: ALL, CLL, NHL, PCNs/MM
- Bone marrow transplant
- Other areas of oncology (solid tumors)

Type of Specimen: Bone marrow aspirate and peripheral blood

LOCATION : Basement, Clinical Building, Hospital Canselor Tuanku Muhriz.

REQUEST FORM :

i. Borang Permohonan Ujian Unit Sitogenetik Khusus (Post-natal): HCTM/JKIK/PMD(RP)19/17 (Pin. 1/2024) (Tarikh Kuatkuasa : 15/07/2024)

ii. Borang Permohonan Ujian Unit Sitogenetik Khusus (Kanser/ Onkologi): HCTM/JKIK/PMD(RP)20/17 (Pin. 1/2024) (Tarikh Kuatkuasa : 15/07/2024)

CONTACT NUMBER : 03-9145 5813 / 5824

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume, etc)	OPERATION HOURS	TAT	NOTES
Routine Karyotype Postnatal (Blood)	Karyotyping	 Sodium/ Lithium Heparin without gel (to be obtained from the laboratory)	Minimum 2 ml for adults and 1 ml for infants	Monday - Friday 8:00 am - 4:30 pm except Public Holiday.	28 days	**Specimen Receiving Time:** **Monday-Tuesday** **8:00 am – 1:00 pm** **2:00 pm – 3:00 pm** Kindly be informed that **no specimen will be accepted on Wednesday-Friday**. Any **urgent cases**; please **call the laboratory ext 5813/ 5824** to discuss for arrangement
Routine Karyotype Cancer/ Oncology (Bone Marrow/ Blood)	Karyotyping	 Sodium/ Lithium Heparin without gel (to be obtained from the laboratory) Specimens should be obtained from the first or second aspirate.	Minimum 3 ml		21 days	**Specimen Receiving time:** **Monday-Thursday** **8:00 am – 1:00 pm** **2:00 pm – 3:00 pm** Kindly be informed that **no specimen will be accepted on Friday** or **if the next day is Public Holiday.** Any **urgent cases**; please **call the laboratory ext 5813/ 5824** to discuss for arrangement. **Friday** **8:00 am - 12.15 pm** **(urgent cases only)**

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume, etc)	OPERATION HOURS	TAT	NOTES
Molecular Cytogenetics **Postnatal FISH Blood***	Fluorescence in situ hybridization (*FISH*)	 Sodium/ Lithium Heparin without gel (to be obtained from the laboratory)	Minimum 2ml for adults and 1 ml for infants	Monday - Friday 8:00 am - 4:30 pm except Public Holiday.	10 working days	**Specimen Receiving Time:** **Monday-Tuesday** **8:00 am – 1:00 pm** **2:00 pm – 3:00 pm** Kindly be informed that **no specimen will be accepted on Wednesday-Friday**. Any **urgent cases**; please **call the laboratory ext 5813/ 5824** to discuss for arrangement
Molecular Cytogenetics **Cancer/ Oncology FISH Bone Marrow***	Fluorescence in situ hybridization (FISH)	 Bone marrow – Sodium/ Lithium Heparin without gel (to be obtained from the laboratory) Specimens should be obtained from the first or second aspirate.	Minimum 3 ml Transport in room temperature (transport immediately within 24 hours)		10 working days	**Specimen Receiving time:** **Monday-Thursday** **8:00 am – 1:00 pm** **2:00 pm – 3:00 pm** Kindly be informed that **no specimen will be accepted on Friday** or **if the next day is Public Holiday.** Any **urgent cases**; please **call the laboratory ext 5813/ 5824** to discuss for arrangement. **Friday** **8:00 am - 12.15 pm** **(urgent cases only)**

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

Bone marrow/blood for cancer/oncology and molecular cytogenetics

1. Please call the laboratory at least one (1) week before sending a specimen. Kindly be informed that no specimen will be accepted if the following day is a public holiday or non-working day (except for urgent cases; please call the laboratory to discuss for arrangement).
2. Please send your staff to collect the sodium heparin tube (without gel) from the laboratory. Use the collection tube provided only. Other preservatives may not produce adequate results. Fill in the request form completely. Kindly inform the laboratory that a specimen will be coming on the day itself.
3. For bone marrow samples, obtain the specimen from the first or second aspirate. Draw 3 ml specimen and immediately add specimen to the sodium heparin tube (without gel). Cap tightly and mixed well by inverting the tube gently.
4. For blood samples, draw 2-4 ml peripheral blood aseptically and immediately add specimen to the sodium heparin tube (without gel). Cap tightly and mixed well by inverting the tube gently.
5. Keep specimen cool at room temperature. Do not freeze the specimen. Deliver to the laboratory immediately.
6. Unused sodium heparin tube (without gel) should be returned to the laboratory immediately.
7. Please address all specimens to:

UNIT SITOGENETIK
Jabatan Perkhidmatan Makmal Diagnostik
Hospital Canselor Tuanku Muhriz
Jalan Yaacob Latif, Bandar Tun Razak
56000 Cheras, Kuala Lumpur, MALAYSIA
Tel: 603-9145 5555 ext: 5824, 5813 Fax: 603-9145 6579

* **List Of Fluorescence In Situ Hybridization (FISH) Probes**

Bil.	FISH Probe
1	BCR/ABL Dual Color, Dual Fusion Translocation Probe
2	MLL Dual Color, Break Apart Rearrangement Probe
3	LSI ETV6 (TEL)/RUNX1 (AML1) ES Dual Color Translocation Probe
4	LSI TCF3/PBX1 Dual Color Dual Fusion Probes
5	PML/RARA Dual Color,Dual Fusion Translocation Probe
6	CBFB Break Apart Fish Probe Kit
7	RUNX/RUNX1T1 DF FISH Probe Kit
8	CSF1R/D5S23, D5S721 FISH Probe
9	EGR1/D5S23, D5S721 Dual Color Probe
10	D7S522 / CEP7 FISH Probe
11	D13S319/13Q14.3 FISH Probe Kit
12	TP53/CEP 17 FISH Probe Kit
13	IGH Dual Color Break Apart Rearrangement Probe
14	IGH/FGFR3 Dual Fusion Fish Probe Kit
15	IGH/MAF Dual Fusion FISH Probe Kit
16	P53 / LSI ATM and LSI D13S319 / LSI 13Q34 / CEP 12

Bil.	FISH Probe
17	4Q12 Tri-Color Rearrange FISH Probe Kit
18	PDGFRB Break Apart FISH Probe Kit
19	SRY/CEP X FISH Probe Kit
20	LSI XQ13.2 (XIST) Spectrum Orange Probe
21	LSI 13 (RB1) 13Q14 Spectrum Orange Probe
22	CEP 18 (D18Z1) Spectrum Green Probe
23	LSI 21 Spectrum Orange
24	CEP X (DXZ1) Spectrum Green
25	CEP Y (DYZ1) Spectrum Aqua
26	Prader-Willi/ Angelman Region Probe - SNRP/CEP 15/PML
27	Prader-Willi/ Angelman Region Probe – LSI GABRB3
28	Prader-Willi/ Angelman Region Probe - D15S10/CEP 15/PML
29	Prader-Willi/ Angelman Region Probe – LSI D15S11
30	LSI D22S75 (N25 REGION) SO/LSI ARSA SGN Probe
31	DIGEORGE Region Probe – LSI TUPLE
32	Williams Region Probe - ELN/D7S486, D7S522 FISH Probe

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
1. Incomplete form -Patient's details are incomplete -Test request could not be confirmed -No Medical Officer's name and signature -No date and time specimen collected -No wards and clinics location 2. Specimen is sent in wrong tube/ container 3. Label (Name, MRN, IC/Number Passport) on tube is different from label on the request form 4. Clotted/ lysed specimen 5. Specimen is sent without appointment 6. Insufficient specimen volume to perform testing 7. Specimen is sent without request form / request form is sent without specimen 8. Specimen incompatibility 9. Test requested is not offered by Cytogenetic unit 10. Specimen spills during transportation 11. Specimen is sent without using the tube/transport medium which is supplied by laboratory	DISCLAIMERS: 1. Although every effort is made, a successful culture cannot be guaranteed and a repeat specimen may be required. 2. The FISH markers are locus specific and only identify abnormalities for the regions within the loci tested. 3. Full culture results generally detect both numerical and structural abnormalities of all the chromosomes (46). 4. A normal result does not exclude micro chromosome abnormalities and other congenital abnormalities that may occur. 5. Reflex or confirmatory testing, if required, will be performed, reported and billed unless indicated otherwise.

7.3 Histopathology Unit

INTRODUCTION:
Histopathology Unit is one of the laboratories in JPMD that provide services in diagnosis and study of diseases of the tissues and involves examining tissues under a microscope.

LOCATION : Basement, Clinical Building, Hospital Canselor Tuanku Muhriz.

REQUEST FORM : HCTM/JKIK/PMD(RP) 17/17 (Pin. 1/2024)

CONTACT NUMBER: 03 -9145 5464/ 5805/ 5850

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT	NOTES
Hematoxylin & Eosin examination for all type of specimens (small and large surgical specimens)	Hematoxylin & Eosin Staining	Place specimen in a proper specimen container with 10% buffered formalin.	The volume of formalin should be 10x the volume of specimen	Monday - Friday 8.00am - 4.45pm	Surgical Biopsy (large) = 30 working days Surgical Biopsy (small) = 21 working days Urgent specimen = 7 working days	
Fresh specimen for frozen section	Rapid Hematoxylin & Eosin Staining	Place fresh specimen in a proper specimen container without 10% buffered formalin or any other fixatives	-	Monday - Friday 8.00am - 4.45pm	Verbal report of frozen section = 30 Minute/ 1 tissue block H&E Staining (Paraffin Section) = 14 working days	Specimen must be sent fresh. Appointment for frozen section must be made at least one day before surgery. Please inform MO/ Pathologist in-charge (ext: 5850) the time specimen is expected to arrive at the histopathology laboratory

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT	NOTES
Renal, skin biopsy or other tissues for immunofluorescence study	Manual staining	Place fresh specimen on filter paper moistened with phosphate buffered saline (PBS) in a covered petri dish	-	Monday – Friday 8.00am – 4.45pm	Renal and skin biopsy or other tissues = 21 working days	
Enzyme acetylcholinesterase study for rectal biopsy in diagnosis of Hirschsprung's disease	Manual staining	Wrap fresh specimen in gauze moistened with normal saline in specimen container	-	Monday – Friday 8.00am – 4.45pm	Rectal biopsy (for Hirchsprung's disease) = 14 working days	
Special Stain	Automated staining using Dako Pro Link	Not applicable	3 µm tissue thickness on charge slide	Monday – Friday 8.00am – 4.45pm	3 working days	Request by pathologist only
Immunohistochemistry Stain	Automated staining using Ventana Ultra	Not applicable	3 µm tissue thickness on charge slide	Monday – Friday 8.00am – 4.45pm	3 working days	Request by pathologist only
In-Situ Hybridization Staining	Automated staining using Ventana Ultra	Not applicable	3 µm tissue thickness on charge slide	Monday – Friday 8.00am – 4.45pm	3 working days	Request by pathologist only

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
Fluorescence In Situ Hybridization (FISH)	Manual staining	Not applicable	3 µm tissue thickness on charge slide	Monday – Friday 8.00am – 4.45pm	Urgent = 7 working days Routine = 10 working days	Request by pathologist only

LIST OF SPECIAL STAINS	
1.	AFB Stain
2.	Alcian Blue Pas Hematoxylin Stain
3.	Congo Red Stain
4.	Elastic Stain
5.	Grocott's Methenamine Silver
6.	Gram Yellow
7.	Iron Stain
8.	Jones' Basement Membrane Stain
9.	Masson's Trichrome Stain
10.	Mucicarmine Stain
11.	Periodic Acid Schiff
12.	Reticulin-Nuclear Fast Red Stain
13.	Warthin-Starry Stain
14.	Giemsa Staining

LIST OF PRIMARY ANTIBODY							
1.	ACTH	29.	CD 34	57.	GFAP	85.	PLAP
2.	AFP	30.	CD 43	58.	Glycophorin C	86.	PR
3.	ALK-1	31.	CD 56	59.	Glypican 3	87.	Prolactin
4.	ATRX	32.	CD 57	60.	H3K27me3	88.	PSA
5.	B-Catenin	33.	CD 61	61.	hCG	89.	P504S / AMACR
6.	BCL 2	34.	CD 68	62.	hGH	90.	p16
7.	BCL 6	35.	CD 79a	63.	Her2	91.	p40
8.	BOB-1	36.	CD 99 / MIC 2	64.	Hepatocyte	92.	p53
9.	C4d	37.	CD 117	65.	HMB45	93.	p57
10.	CA 125	38.	CD 138	66.	IDH-1	94.	p63
11.	CA19-9	39.	CEA	67.	INI-1	95.	SATB 2
12.	Calcitonin	40.	Chromogranin A	68.	Kappa	96.	SOX 11
13.	Calretinin	41.	CK 5/6	69.	Ki-67	97.	S100
14.	CD 1a	42.	CK 7	70.	Lambda (IHC & ISH)	98.	SMA
15.	CD 2	43.	CK 19	71.	LCA	99.	Synaptophysin
16.	CD 3	44.	CK 20	72.	LH	100.	SV40
17.	CD 4	45.	CK AE1/AE3	73.	Melan-A	101.	TdT
18.	CD 5	46.	CK HMW	74.	MPO	102.	Thyroglobulin
19.	CD 7	47.	CMV	75.	MUM-1	103.	TIA-1
20.	CD 8	48.	c-Myc	76.	Myogenin	104.	TSH
21.	CD 10	49.	Cyclin D1	77.	Myoglobin	105.	TTF-1
22.	CD 11c	50.	Desmin	78.	Napsin A	106.	WT-1
23.	CD 15	51.	DOG-1	79.	NF		
24.	CD 20	52.	Ecadherin	80.	NKX 3.1		
25.	CD 21	53.	EMA	81.	NSE		
26.	CD 23	54.	ER	82.	OCT-2		
27.	CD 30	55.	FSH	83.	PAX-5		
28.	CD 31	56.	GATA 3	84.	PD-1		

MOLECULAR STAINING	
A. IN SITU HYBRIDIZATION	
1.	Eber ISH
2.	Kappa ISH
3.	Lambda ISH
4.	Her2 DDISH
B. FLUORESCENCE IN SITU HYBRIDIZATION (FISH)	
1.	MYC
2.	BCL2
3.	BCL6
4.	MALT1
5.	IGH
6.	EWSR1
7.	SS18
8.	MDM
9.	N-MYC
10.	1p19q
11.	CDKN2A

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REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
1. Incomplete form ● No patient's MRN and name ● No patient's identification number (I/C) or Passport ● No gender, age and race ● No type of specimen ● No type of test ● No clinical history and current diagnosis ● No location (ward/clinic/ hospital). ● No Doctor's name, stamp and MMC number ● No Doctor's contact number (h/p or Ext ward/Clinic ● No date and time sample taken 2. Incomplete specimen container labeling ● No patient's registration number (MRN). ● No patient's name ● No type of specimen 3. Label (Name, MRN and type of specimen) on specimen container is different from label on the request form 4. Specimen not suitable for testing (Example specimen blood and fluid) 5. Specimen is sent without request form/ request form is sent without specimen **Laboratory personnel will notify the requester by phone call and LIS. The customer needs to retrieved specimen together with the request form on the same day the specimen is rejected. Amendment should be made before resubmission of specimen to Histopathology Laboratory**	1. Specimen sent in wrong fixative not in 10% Neutral Buffered Formalin. 2. The volume of formalin not 10x the volume of specimen 3. Specimen sent without fixative. 4. Large specimen put in small containers, this would prevent proper fixation of the specimen.

7.4 Haematology Unit

INTRODUCTION

The Haematology Unit provides routine and specialized hematological tests for in-patients and out-patients in HCTM. We also receive haematology samples from government and private hospitals.

Our 24-hour service routine tests are provided for FBC, Reticulocytes, PT INR, APTT, Thrombin Time, Fibrinogen, and D dimer, while other tests are run by batches or by appointment.

LOCATION : Basement, Clinical Building, Hospital Canselor Tuanku Muhriz.

REQUEST FORM : HCTM/JKIK/PMD(RP)11/17 (Pin. 1/2024)

CONTACT NUMBER : 03-9145 5834

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
Full Blood Count (FBC)	- Sheath flow DC detection method - Flow cytometry method using semiconductor laser - SLS-Hemoglobin method	 Adult 3.0 ml K_2EDTA  Pediatric MAP Microtube K_2EDTA 1.0 mg (purple cap)	Adult 2 ml Whole blood Pediatric 0.5ml Whole blood	24 hours	1 hour 30 minutes (*URGENT-all request from ED/ request by a call from ward/clinic)	1. Collect blood in an EDTA tube and fill up to the mark as instructed. 2. Mix gently by inverting 6-10 times. Tubes inversions prevent clotting. 3. Cap tube tightly. 4. Please follow 'Order of Draw' during collection to prevent cross-contamination between the tubes and anticoagulant. 5. Please send the specimen immediately or at least 30 minutes after blood collection at room temperature. 6. Specimens must be tested within 4 hours after blood collection.
FBC/ Reticulocyte Count	Flow cytometry method using semiconductor laser				4 hours 30 minutes (*URGENT-all request from ED/ request by a call from ward/clinic)	

Hematological Values for Normal Adults

Parameters	Range (Male)	Range (Female)	Unit
White Blood Cell Count	4.0 – 10.0		$X10^9/l$
Red Blood Cell Count	4.5 – 5.5	3.8 – 4.8	$X10^{12}/l$
Haemoglobin Concentration	13.0 – 17.0	12.0 – 15.0	g/dl
Haematocrit	0.40 – 0.50	0.36 – 0.46	l/l
	40 - 50	36 - 46	%
Mean Cell Volume	83 - 101		fl
Mean Cell Haemoglobin	27 - 32		pg
Mean Cell Haemoglobin Concentration	31.5 – 34.5		g/dl
Red Cell Distribution Width	11.6 – 14.0		%
Reticulocyte Count	50 – 100		$X10^9/l$
	0.5 – 2.5		%
Neutrophils	2.0 – 7.0		$X10^9/l$
	40 - 80		%
Lymphocytes	1.0 – 3.0		$X10^9/l$
	20 - 40		%
Monocytes	0.2 – 1.0		$X10^9/l$
	2 - 10		%

Hematological Values for Normal Infants and Normal Children

Parameters	Range				
	Birth	1 Month	1 Year	6-12 Years	Unit
White Blood Cell Count	10 – 26	5 – 19	6 -16	5 - 13	$X10^9/l$
Red Blood Cell Count	5 – 7	3 – 5.4	3.9 – 5.1	4.0 – 5.2	$X10^{12}/l$
Haemoglobin Concentration	14 – 22	11.5 – 16.5	11.5 -13.1	11.5 – 15.5	g/dl
Haematocrit	45 – 75	33 – 53	30 – 38	35 – 45	%
Mean Cell Volume	100 – 120	92 – 116	72 - 84	73 -95	fl
Mean Cell Haemoglobin	31 – 37	30 – 36	25 - 29	25 -33	pg
Mean Cell Haemoglobin Concentration	30 – 36	29 -37	32 - 36	31 -37	g/dl
Reticulocyte Count	120 – 400	20 – 60	30 - 100	30 - 100	$X10^9/l$
Neutrophils	4 – 14	3 – 9	1 - 7	2 - 8	$X10^9/l$
Lymphocytes	3 – 8	3 – 16	3.5 - 11	1 - 5	$X10^9/l$
Monocytes	0.5 – 2	0.3 – 1	0.2 – 1.0	0.2 – 1.0	$X10^9/l$
Eosinophils	0.1 – 1	0.2 – 1	0.1- 1	0.1 --1	$X10^9/l$
Platelets Count	100 – 450	200 – 500	200 - 550	170 -450	$X10^9/l$

Reference: Dacie and Lewis Practical Haematology, Twelfth Edition

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
Full Blood Picture (FBP) FBP (+Retic)	Sliding and staining method	 Adult 3 ml K_2EDTA or  Pediatric MAP Microtube K_2EDTA 1.0 mg	Adult 2 ml Whole blood Pediatric 0.5 ml Whole blood	8.00 am - 5.00 pm (Working days)	4 working days 1 day (URGENT)	1. Please refer to **Guidelines For FBP Request (ANNEX1).** 2. Oncall 'MO' must be informed if this FBP test is needed after office hours. 3. The specimen is stable for 24 hours at room temperature. 4. Add test for FBP within 4 hours after blood collection.

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

ANNEX 1

GUIDELINES FOR FBP REQUEST

Purpose

The purpose of this guideline is to reduce the number of unnecessary full blood picture (FBP) requests. According to the standard operating procedure (SOP) of examination peripheral blood smears, every FBP report must be completed within 3 days. However, if the number of FBP is high, the FBP report for urgent or important cases will be delayed and this will affect the management of the patient. A shorter turnaround time for the FBP report will improve the quality of patient care and will also help to reduce hospital stays. Requests for unnecessary FBP will cause an increase in workload, and affect the quality of the FBP slides and laboratory expenditure.

Indication for FBP

Requests for FBP must be based on certain criteria. Below are guidelines that can be used before ordering FBP.

1. Flagging of blood cells indices as shown by FBC examples:
   a) Abnormally high white cell > 50 x 10^9/L, to look for evidence of acute leukemia or myeloproliferative disorder.
   b) Low white cell count < 2 x 10^9/L.
   c) Abnormality of the differential counts eg: severe neutropenia, absolute lymphocytosis, monocytosis etc
   d) Low platelet count < 50 x 10^9/L (to ensure not due to false thrombocytopenia such as EDTA induced platelet clumps or platelet satellitism).
   e) Very high platelet count > 1000 x 10^9/L.
   f) Severe anemia, hemoglobin < 5g/dl, to look for evidence of hemolysis or iron/ folate deficiency.
   * **However if the patient is hospitalized and FBC is flagged almost every day, daily FBP is not indicated. In this case a FBP can be sent probably twice a week**.

2. Based on patient history or clinical findings examples:
   a) Acute leukaemia
   b) Hemolytic anemia
   c) Microangiopathic hemolytic anemia (MAHA)/ Fragmentation syndrome.
   d) Family screening for thalassemia

3. For clinic follow-up of known hematological disorder cases eg: ALL, CML. If warded patients, probably just send it twice a week.

4. For assessment/screening examples:
   a) IT ratio in NICU/premature neonates
   b) Vacuolated lymphocytes in suspected metabolic disorder patient/baby.

FBP is not indicated in the following:
1. Healthy patient with normal blood cell indices planned for elective procedures/operations eg. cataract for operation.
2. Medical check-up if blood cell indices are normal. (Exceptional to annual staff medical check-up)
3. Requests of daily FBP for hospitalized patients.
4. Sample post-transfusion unless it is a transfusion reaction or the case is indicated and has been discussed with the Medical Officer in charge/ Hematologist.
   * **However if FBP is really needed clinically, please state reasons and what to look for or you may call the medical officer in charge at ext 5918.**

References

1. Brain B 2005. Current Concepts: Diagnosis from the blood smear. *N Engl J Med,* 353(5): 498 - 507.
2. Abramson N 2004. Inside blood: a picture (in the microscope) is worth a thousand words. *Blood; 103: 367-8.*
3. Bain B 2001. Detecting erroneous blood counts. *Blood cells: A practical guide, third edition, Blackwell Science: p 155 – 174.*
4. Lewis SM, Bain B, Bates I 2001. Blood cell morphology in health and disease. *Practical hematology, ninth edition. Churchill Livingstone: p 65 – 100.*
5. Barnes PW, McFadden, Machin SJ, Simson E. 2005. The International Consensus Group for Haematology Review: Suggested Criteria for Action Following Automated CBC and WBC Differential Analysis. *Laboratory Haematology*, 11:83-90.

Please refer Test Request Procedure (ANNEX 3) for more detailed information

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	REFERANCE RANGE	TAT (Working Day)	NOTES
PT	-Viscosity-based detection system (Mechanical Clot Detection)	 Adult 2.7 ml Sodium Citrate or  Pediatric 1.8 ml Sodium Citrate	Adult 2.7ml in 3.2% Sodium Citrate (Full draw) Pediatric 1.8ml in 3.2% Sodium Citrate (Full draw)	24 hours	11.6 -14.9 sec	1 hour 30 minutes (*URGENT-all request from ED/ request by a call from ward/clinic)	1. Please refer to **Guidelines For Coagulation Profile Request (Pre-analytical Guidelines for Routine & Special Coagulation Testing) (ANNEX 2).** 2. Collect 1.8mPediatricric) or 2.7ml (Adult) of blood in a Sodium Citrate container or **full draw till to the mark** as instructed. 3. Cap tube tightly. 4. Please send the specimen immediately or at least 30 minutes after blood collection. 5. The time of blood withdrawal must be stated on the request form. 6. Specimen must be tested within **4 hours after blood collection.** **7.** For **heparin therapy (for the requested APTT test), the specimen must be tested within 2 hours.** 8. The specimen is stable at room temperature for 4 hours (from the withdrawal time).
APTT					30.3 -46.5 sec		
FIB					2.0 – 4.0 g/L		
TT					14.5 – 18.8 sec		
D DIMER	Photometric Method and Latex Immunoassay				< 0.50 ug/ml		
DIVC Screening (consist of PT, APTT, Fib, TT & D Dimer)	-				-	1 hour (URGENT for all request DIVC)	

ANNEX 2

PRE-ANALYTICAL GUIDELINES FOR ROUTINE & SPECIAL COAGULATION TESTING

1. **Proper Blood Taking**
   a) The best samples come from the evacuated tube system (ETS).
      - 19 to 22 gauge needle (**smaller or bigger needle may cause hemolysis**)

   If ETS is not possible:
   b) Syringe method.
      - <20 mL syringe
      - Transfer blood to citrate tube immediately (≤ one minute)
      - **ALERT: The syringe method has greater potential for hemolysis and platelet activation leading to hemolyzed or clotted** sample
      - Hemolysis may cause **falsely shortened clotting times**

   c) Vascular access device
      - If drawing from a central line, flush with 10 – 20 mL saline before collection.
      - If drawing from a saline lock, discard the first 5 – 10 mL.
      - **ALERT: This method may have the potential for sample dilution or contamination**

   d) Avoid prolonged tourniquet use
      - This leads to the activation of platelet and clotting factors and a **shortened result**

   e) Avoid "digging" to find the vein
      - This leads to the activation of clotting factors and **clotted sample**

   f) Excessive stress & vigorous fist clenching
      - This leads to increased FVIII & vWF and **shortened result**

2. **Correct Anti-coagulant**
      - 3.2% trisodium citrate (Citrate: binds to calcium and prevents the clotting of blood

   a) Ensure the tube is filled to the mark of the tube, regardless of tube size (i.e. 2.7 or 1.8 mL)
      - All tubes are designed to collect blood at 9:1 ratio; 9 parts blood to 1 part anticoagulant
        - <90% fill is UNACCEPTABLE and WILL BE REJECTED
      - **Underfilled tubes lead to prolonged clotting times** (i.e. PT, APTT)
      - NEVER combine two underfilled tubes to make one filled tube.

   b) The volume of citrate need to be adjusted for the patient with a high hematocrit level (>55%), using the calculation below:

      X= [(100-PCV)/ (595-PCV)] Vol

      Example: If the patient's hematocrit is 60%, how to prepare the correct citrate for 2.7ml of Whole blood?

      X= [(100-60)/ (595-60)] 2.7ml = 0.2 ml* → (* 0.2ml anti-coagulant trisodium citrate is needed for 2.7ml whole blood)

3. **Avoid Clotted sample**
   a) Mix anticoagulant with whole blood promptly and thoroughly
      - gently invert the tube 4-5 times after filling, do not shake
      - the micro clot may lead to a shortened result
      - large clot causes coagulation factors due to consumption and may lead to the prolonged result
   b) Sodium citrate chelates out calcium from the patient's blood, which is required for clot formation
      - If the sample is not mixed well, the anticoagulant cannot remove calcium and the sample will clot
      - Digging around for vein can cause factors to activate – not enough sodium citrate to overcome that and the sample will clot
      - If the sample is collected properly, calcium is permanently removed. The sample will not clot over time.

4. **Avoid sample contamination**
   a) When drawing blood through a catheter: avoid heparin contamination (eg: heparinized HD, Heparin injection)

Additional information

Transportation & Timing Guidelines for Routine & Special Coagulation Testing

a) Send samples at ROOM TEMPERATURE.
   - ALERT: Sending samples on ice will activate the sample and lead to **shortened clotting times** (i.e. PT)
b) Samples should be sent within one hour of collection.

IMPORTANT

- Sample quality is an irrecusable condition for coagulation testing, as the analysis of unsuitable specimens might lead to unreliable test results and thereby jeopardize both clinical decision-making and patient safety.
- According to the CLSI, specimens that must be rejected include: those with problems of correct identification; clotted, frankly contaminated or hemolyzed; referred to the laboratory in the wrong container, or with an inappropriate blood-to-additive ratio.
- In all such cases, another properly recollected sample is necessary for performing reliable testing.

DISCLAIMER

- PT & APTT Test in JPMD HCTM uses the mechanical clot method, which is not interfered with by the lipaemic/icteric and mildly haemolysed sample.
- For polycythaemic samples, adjustment ratio of an anticoagulant: sample will be prepared according to hematocrit level. For such cases, please call the lab at ext 5198 for consultation before sending sample

REFERENCES

1. Quality Standards for Sample Collection in Coagulation Testing, Lippi *et al* 2012.
2. Haemostasis Made Easy, Dato' Dr Azizon Othman 2018.
3. Effects of hemolysis, icterus, and lipaemia on coagulation test as performed on Stago STA-Compact Max Analyser, A.Wooley *et al* 2016.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	REFERANCE RANGE	TAT (Working Day)	NOTES
G6PD Screening	Fluorescence Polarization	 Adult 3 ml K_2EDTA or  Pediatric MAP Microtube K_2EDTA 1.0 mg	Adult 2 ml Whole blood Neonates 2 ml Cord blood Pediatric 0.5 ml Whole blood	8.00 am - 5.00 pm (Working days) 8.00 am - 5.00 pm (Weekend/ Public holiday)	Normal Minimal activity Deficient	1 day	1. Information on DOB, gender, and age is **COMPULSORY**. 2. The specimen is stable for 24 hours at room temperature.
ESR	Westergren	 ESR Vacuum Tube (Sodium citrate 3.8%)	1.28 ml Whole blood	8.00 am - 4.00 pm (Working days)	1.0 – 15.0 mm/ hr (male) 1.0 – 20.0 mm/ hr (female)	1 day	1. Collect 1.28 ml blood in a ESR vacuum tube (Sodium Citrate 3.8%) or **full draw till to the mark** as instructed. 2. Please send the specimen immediately or at least 30 minutes after blood collection. 3. The time of withdrawal of blood must be stated on the request form. **4. Specimens must be tested within 4 hours after blood collection.** 5. The specimen is stable at room temperature for 4 hours (from the withdrawal time). **6. The last sample received time is 4.00 pm.**

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
Haemoglobin Analysis	HPLC and Capillaries Electrophoresis	 Adult 3 ml K_2EDTA	2 ml Whole blood	8.00 am - 5.00 pm (Working days – **Thursday only**)	10 working days	1. **Appointment** must be made with the Hematology Lab at least one day before the procedure. 2. Please complete the full details (Name, MRN/IC Number) of family members for family screening. 3. Please **perform an iron study/ ferritin**. Hemoglobin analysis cannot be performed without the serum iron status. 4. Please state the transfusion status for the past 3 months. 5. The specimen is stable for 24 hours at room temperature.

REFERENCE VALUES FOR HEMOGLOBIN ANALYSIS

METHODS	PARAMETERS (Hb)	RANGE (%)
Capillary Electrophoresis	A2	2.2-3.3
	F	0.0-0.5
HPLC	A2	2.4 -3.4
	F	< 1.0

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	REFERANCE RANGE	TAT (Working Day)	NOTES
Cryoglobulin Test	Precipitation	 Adult 3 ml K_2EDTA or  Plain tube without gel	2 ml x 2 tubes Whole blood 2 ml x 2 tubes Whole blood	8.00 am - 5.00 pm (Working days)	Negative or No percipitation	3 working days	1. **Appointment** must be made with the Hematology Lab at least one day before the procedure 2. Send the specimen immediately at 37ºC before 12.00 pm. 3. Send specimen for 2 consecutive working days 4. Specimen stable for 8 hours at 37ºC
Osmotic Fragility Test	Spectrofotometry (% lysis in different concentration of NaCl)	 Lithium heparin	2 ml Whole blood	8.00 am - 5.00 pm (Working days)	The standard curve is not shifted	3 working days	1. **Appointment** must be made with the Hematology Lab at least one day before the procedure 2. The specimen must reach the Hematology Lab before 10.00 am. 3. The specimen is stable for 24 hours at room temperature 4. A normal specimen (as normal control) must be sent together with the patient specimen
Kleihauer Test	Sliding and staining Method	 Adult 3 ml K_2EDTA	2 ml Whole blood	8.00 am - 5.00 pm (Working days)	Fetus Cell Negative Positive	2 working days	1. Specimen must be collected from the baby's mother 2. The specimen is stable for 24 hours at room temperature

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	REFERANCE RANGE	TAT (Working Day)	NOTES
Bone Marrow Aspirate	Sliding and staining Method	 Slide smearing (fresh)	Bone marrow	8.30 am – 12.00 pm (Monday - Thursday) 8.30 am – 11.00 am (Friday)	NA	5 working days 3 working days (URGENT)	1. Please perform the BMA procedure before the end of operation hour (except for special cases, exceed operation hour, cancel or postpone procedure - please contact the MO/ Haematologist in charge). 2. **Appointment** must be made with the Hematology Lab at least one day before the procedure. 3. If no appointment, lab staff will refer to the MO/ Hematologist in charge (For New Cases of Acute Leukemia only).
Urine Hemosiderin	Slide smearing	 Urine container	Urine (Fresh)	8.00 am - 5.00 pm (Working days)	Negative Positive	2 working days	1. **Appointment** must be made with the Hematology Lab at least one day before the procedure. 2. Please send the specimen immediately or at least one hour after urine collection.
Neutrophil Alkaline Phosphatase (NAP) Score	Sliding and staining Method	 Adult 3 ml K_2EDTA	Slide smearing (fresh)	8.00 am - 5.00 pm (Working days)	35-100 neu	1 working day	1. **Appointment** must be made with the Hematology Lab at least one day before the procedure. 2. The specimen is stable for 24 hours at room temperature. 3. The specimen must reach the Haematology Lab before 10.00 am.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	REFERANCE RANGE	TAT (Working Day)	NOTES
Leukemia and Lymphoma Immunophenotyping	Flow Cytometry	 Adult 3 ml K_2EDTA	3ml x 3 tubes Whole blood/ bone marrow	8.00 am - 5.00 pm (Working days)	NA	5 working days	1. **Appointment** must be made with the Hematology Lab at least one day before the procedure.
PNH Investigation	Flow Cytometry	 Adult 3 ml K_2EDTA	3ml Whole blood	8.00 am - 5.00 pm (Working days)	Detected Not Detected	7 working days	1. **Appointment** must be made with the Hematology Lab at least one day before the procedure 2. Specimens must reach the Hematology Lab before 11.00 am. 3. The specimen is stable for 24 hours at room temperature.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
Lymphocyte Subset	Flow Cytometry (Trucount tube)	 Adult 3 ml K_2EDTA	3ml Whole blood	8.00 am - 5.00 pm (Working days)	2 working days	1. **Appointment** must be made with the Hematology Lab at least one day before the procedure. **2. Specimens must reach the Hematology Lab before 11.00 am.** 3. The specimen is stable for 24 hours at room temperature.
CD4/CD8	Flow Cytometry (Trucount tube)	 Adult 3 ml K_2EDTA	3ml Whole blood	8.00 am - 5.00 pm (Working days- **Tuesday Only)**	2 working days	**1. Specimens must reach the Hematology Lab before 11.00 am.** 2. The specimen is stable for 24 hours at room temperature

REFERENCE VALUES FOR CD4/CD8 AND LYMPHOCYTE SUBSET

Parameter	Range (Adult)	Unit
CD4	401-1451	cell/µl
CD8	243-1206	cell/µl
CD3	796-2679	cell/µl
CD19	133-714	cell/µl
CD16 + CD56	115-1009	cell/µl
CD4/CD8 Ratio	0.69- 2.83 ratio	ratio

Reference:Clinical and Diagnostic Laboratory Immunology, Jan 2004, p. 168-173

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
The specimen will not be accepted and rejected for testing if: 1. Specimen clotted 2. Specimen lysed 3. Discrepancy of details between the request form and specimen 4. Using the wrong request form or no form provided 5. Using the wrong tube or specimen 6. Using expired tube 7. Specimens received in the laboratory for more than 4 hours after blood collection – for FBC, Retic, Coagulation & ESR test. 8. The service is not offered in the Hematology Unit. 9. Incomplete form (Ensure requests are filled with date, time & location (for critical and urgent tests), test request, name/signature & doctor's stamp, and clinical summary/diagnosis) 10. Insufficient specimen for testing (minimum 2 ml or by volume set on the tube).	**Please refer to notes.**

ANNEX 3

TEST REQUEST PROCEDURE

GENERAL RULE

1. All test requests must include relevant clinical history and diagnosis.
2. Please ensure that the test request is appropriate with the working diagnosis.

<table>
<tr><th>No.</th><th>Test</th><th>Indication</th><th>Description</th><th>Requester</th><th>Source/Rationale</th></tr>
<tr><td colspan="6">Routine Test</td></tr>
<tr><td>1.</td><td>Full Blood Count (FBC) and reticulocyte count</td><td>Interval repeat within 24 hours would be indicated on clinical grounds if there were a significant change in that patient's condition. A clinical or diagnostic summary should be completed.</td><td>● As stated in Specimen Handling Guidelines
Unit: Hematologi</td><td>HO/ MO/ Specialist</td><td>● Consensus opinion of the relevant expert working group.</td></tr>
<tr><td>2.</td><td>Coagulation Test

-PT/INR
-APTT
-DIVC
-D Dimer
-Fibrinogen
-TT</td><td>1. Indication test for PT / INR / APTT is for cases with a risk of bleeding/ bleeding disorder or patients treated with anticoagulation medicines.

2. PT / INR / APTT is not a routine test.

<table><tr><th>Indication</th><th>Test</th></tr><tr><td>Warfarin Therapy Control</td><td>PT, INR</td></tr><tr><td>Heparin Therapy Control</td><td>APTT</td></tr><tr><td>DIVC Screen</td><td>PT, APTT</td></tr><tr><td>Liver Biopsy</td><td>PT, APTT</td></tr><tr><td>Pre-operative cases</td><td>PT, APTT</td></tr></table></td><td>● Applications with no clinical indication and incomplete forms will be rejected.

● If the results are abnormal or if there are any doubts, the attending doctor should consult the Pathologist/ MO. Full coagulation studies will then be arranged if indicated.</td><td>HO/ MO/ Specialist</td><td>● Consensus opinion of the relevant expert working group.</td></tr>
<tr><td>3.</td><td>G6PD Screening</td><td>Newborn screening for G6PD deficiency is performed routinely in Malaysia because of our high disease prevalence.</td><td>● Samples sent after office hours (weekdays), testing will be conducted on the following day.

● Samples sent on weekends and public holidays must be sent before 12pm. Samples sent after 12pm, testing will be conducted on the following day.</td><td>HO/ MO/ Specialist</td><td>● Guideline G6PD Screening in newborn. http://www.my.health.gov.my/en/g6pd-screeningscreening-newborn/</td></tr>
</table>

	Specialised Test				
4.	**Full Blood Picture (FBP)**	1. Relevant clinical history must be included in the request form. 2. If the patient is hospitalized and FBC is flagged almost everyday, daily FBP is not indicated. In this case FBP can be sent twice a week.	• As stated in Specimen Handling Guidelines Unit: Hematologi	HO/ MO/ Specialist	• Guidelines for FBP request in Panduan Perkhidmatan Makmal JPMD.
5.	**G6PD Enzyme Level**	Indication for G6PD Enzyme Level : a) Discrepancy cases b) Female patients with intermediate enzyme activity	• The limitation for G6PD Enzyme Level is acute hemolysis & reticulocytosis because it can cause false normal results in a G6PD deficient patient. Suggest to repeat the test 3 months later when reticulocyte count back to normal/hemolysis resolves. • Tests carried out in 'batches'. • The stability of sample is 3 days at 2-8^{0}C	HO/ MO/ Specialist	• Guideline G6PD Screening in newborn. http://www.my.health.gov.my/en/g6pd-screeningscreening-newborn/
6.	**Hemoglobin Analysis Screening test**	1. Request for Hemoglobin Analysis Screening without clinical information and FBP report will be rejected. 2. All patients with MCH < 27pg should be screened for thalassemia. 3. For cases other than this must be justified with relevant clinical history (iron/ ferritin study must be performed for cases of hypochromic anemia with Hb <11g / dl). 4. Repeat testing is not indicated.	• As stated in Specimen Handling Guidelines Unit: Hematologi	HO/ MO/ Specialist	• Management Of Transfusion Dependent Thalassaemia: Quick Reference For Health Care Providers http://www.moh.gov.my/penerbitan/CPG2017/4657.pdf
7.	**Bone Marrow Aspirate (BMA)**	Relevant clinical history must be included in the request form.	• BMA procedure is by appointment at least a day before.	Specialist	• ICSH guidelines for the standardization of bone marrow specimens and reports. Int. Jnl. Lab. Hem. 2008, 30, 349–364

8.	**Leukemia and Lymphoma Immunophenotyping**	Request for immunophenotyping must be clinically indicated and relevant clinical history.	• As stated in Specimen Handling Guidelines Unit: Hematologi	Specialist	• Guidelines on the use of multicolor flow cytometry in the diagnosis of hematological neoplasma. British Journal of Haematology, 2014,165,455-488
9.	**Paroxysmal Nocturnal Hemoglobinuria (PNH)**	Request for PNH must be clinically indicated and relevant clinical history.	• As stated in Specimen Handling Guidelines Unit: Hematologi	HO/ MO/ Specialist	• Consensus opinion of the relevant expert working group.
10.	**CD4CD8 & Lymphocytes Subset**	Relevant clinical history must be included in the request form.	• Request for CD4CD8 test only on Tuesday (working hours). • Appointment for Lymphocytes Subset test must be made at least a day before.	HO/ MO/ Specialist	• Consensus opinion of the relevant expert working group. •

7.5 Chemical Pathology Unit

INTRODUCTION

Chemical Pathology is a discipline that analyzes chemical components in the human body through blood, urine, and other body fluid tests to aid in disease diagnosis. Tests offered include blood chemistry, liver and kidney function, lipid, electrolyte, and metabolic tests. Its importance lies in early disease detection, monitoring treatment effectiveness, and improving diagnostic accuracy. Thus, chemical pathology plays a crucial role in ensuring better and more accurate healthcare..

LOCATION : Basement, Clinical Building, Hospital Canselor Tuanku Muhriz.

REQUEST FORM :

- HCTM/JKIK/PMD(RP)07/17 (Pin. 1/2024)
- HCTM/JKIK/PMD(RP)08/17 (Pin. 1/2024)
- HCTM/JKIK/PMD(RP)09/17 (Pin. 1/2024)
- HCTM/JKIK/PMD(RP)10/17 (Pin. 1/2024)
- HCTM/JKIK/PMD(RP)11/17 (Pin. 1/2024)

CONTACT NUMBER : 03-9145 5451 / 5560

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT	OPERATION HOURS	REFERENCE RANGE	UNIT	TAT (WORKING DAY)	NOTES
BLOOD AND BODY FLUID								
AMMONIA	Glutamate Dehydrogenase	Lithium Heparin, EDTA	2.5 mL	8 am – 5 pm	18 – 72	µmol/L	1 hrs	Sample sent **in ice** within **15 minutes**
AMYLASE	Enzymatic CNPG3 Substrate	Plain Tube	2.5 mL	24 hrs	25 – 125	U/L	4 hrs 1 hrs (Urgent)	
CRP	Immunoturbidimetric	Plain Tube	2.5 mL	24 hrs	≤ 0.5	mg/dL	4 hrs	
CALCIUM	Arsenazo III	Plain Tube	2.5 mL	24 hrs	2.10 – 2.55	mmol/L	4 hrs 1 hrs (Urgent)	
CHLORIDE	Ion-selective electrode diluted (Indirect)	Plain Tube	2.5 mL	8 am – 5 pm	98 – 107	mmol/L	4 hrs	
FRUCTOSAMINE	Colorimetric NBT/Formazan	Plain Tube	2.5 mL	8 am – 5 pm	205 – 285	µmol/L	4 hrs	
GGT	L-Gamma-glutamyl-3-carboxy-4-nitroanilide Substrate	Plain Tube	2.5 mL	8 am – 5 pm	Male : 12 – 64 Female : 9 – 36	U/L	4 hrs	
LACTATE	Lactate to Pyruvate	Sodium Fluoride Potassium Oxalate	2.5 mL	8 am – 5 pm	0.5 – 2.2	mmol/L	1 hr	
LDH	Lactate to Pyruvate	Plain Tube	2.5 mL	8 am – 5 pm	125 – 220	U/L	4 hrs	
URIC ACID	Uricase	Plain Tube	2.5 mL	24 hrs	Male: 210 – 420 Female: 150 – 350	µmol/L	4 hrs	
OSMOLALITY (SERUM)	Freezing Point Depression	Plain Tube	2.5 mL	24 hrs	275 – 295	mOsm/kg	4 hrs 1 hrs (Urgent)	
ABG	pH and pCO_2: Potentiometric pO_2: Amperometric sO_2: Oximetry	Heparinized syringe	1 mL	24 hrs	pH :7.35 - 7.45 pCO_2 : 35 - 48 pO_2 : 83 - 108 Std Bicarb: 18 - 23 Base excess: -2 - +3 O2 saturated: 95 - 98	nil mm/Hg mm/Hg mmol/L mmol/L %	30 minutes	*Please refer to the instructions for preparation and collection activities.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT	OPERATION HOURS	REFERENCE RANGE	UNIT	TAT (WORKING DAY)	NOTES
BONE PROFILE								
CALCIUM	Arsenazo III	Plain Tube	2.5 mL	24 hrs	2.10 –2.55	mmol/L	4 hrs 1 hrs (Urgent)	
MAGNESIUM	Enzymatic	Plain Tube	2.5 mL	24 hrs	0.66 – 1.07	mmol/L	4 hrs 1 hrs (Urgent)	
PHOSPHATE	Phosphomolybdate	Plain Tube	2.5 mL	24 hrs	0.74 – 1.52	mmol/L	4 hrs 1 hrs (Urgent)	
CSF PROFILE								
TOTAL PROTEIN	Biuret	Bijou Bottle/ Universal Container	1 mL	24 hrs	150 – 400	mg/L	4 hrs 1 hrs (Urgent)	
GLUCOSE	Enzymatic (Hexokinase/G6PDH)	Bijou Bottle/ Universal Container	1 mL	24 hrs	2.2 – 3.9	mmol/L	4 hrs 1 hrs (Urgent)	
CARDIAC PROFILE								
CREATINE KINASE	NAC (N-acetyl-L-cysteine)	Plain Tube	2.5 mL	24 hrs	Male : 30 – 200 Female : 29 – 168	U/L	4 hrs 1 hrs (Urgent)	
CKMB	2 Step CMIA	Plain Tube	2.5 mL	24 hrs	Male : < 5.2 Female : <3.1	ng/mL	1 hr	
TROP-I	2 Step CMIA	Plain Tube	2.5 mL	24 hrs	Male: <34.2 Female: <15.6	pg/mL	1 hr	
NT-PROBNP	2 Step CMIA	Plain Tube	2.5 mL	8 am – 5 pm	<125	pg/mL	3 days	
IRON PROFILE								
IRON	Ferene	Plain Tube	2.5 mL	8 am – 5 pm	Male : 11.6 – 31.3 Female : 9.0 – 30.4	µmol/L	4 hrs	
TIBC	Calculated	-	-	8 am – 5 pm	Male : 24 – 74.3 Female : 21.5 – 85.9	µmol/L	4 hrs	
TRANSFERRIN	Immunoturbidimetric	Plain Tube	2.5 mL	8 am – 5 pm	Male : 1.74 – 3.64 Female : 1.8 – 3.82	g/L	4 hrs	
SATURATED TRANSFERRIN	Calculated	-	-	8 am – 5 pm	Male ; 20 - 50 Female : 15 - 50	%	4 hrs	
LIPID PROFILE / FASTING SERUM LIPID								
CHOLESTEROLE	Enzymatic	Plain Tube	2.5 mL	24 hrs	Child <4.4 Adult <5.18	mmol/L	4 hrs	Fasting
HDL – CHOL	Accelerator Selective Detergent	Plain Tube	2.5 mL	24 hrs	Major Risk: <1.04 Negative Risk: ≥1.55	mmol/L	4 hrs	Fasting
LDL – CHOL	Calculated	Plain Tube	2.5 mL	24 hrs	<3.8	mmol/L	4 hrs	Fasting
TRIGLYCERIDE	Glycerol Phosphate Oxidase	Plain Tube	2.5 mL	24 hrs	<1.7	mmol/L	4 hrs	Fasting

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT	OPERATION HOURS	REFERENCE RANGE	UNIT	TAT (WORKING DAY)	NOTES
LIVER FUNCTION TEST								
TOTAL PROTEIN	Biuret	Plain Tube	2.5 mL	24 hrs	64 – 83	g/L	4 hrs	
ALBUMIN	Colorimetric (Bromcresol Purple)	Plain Tube	2.5 mL	24 hrs	0 to 4 days : 28 - 44 4 days to 14 years : 38- 54 Adult : 35 – 50 >60 years : 34-48	g/L	4 hrs	
BILIRUBIN TOTAL	Diazonium Salt	Plain Tube	2.5 mL	24 hrs	3.4 – 20.5	µmol/L	4 hrs	
ALP	Para-nitrophenyl Phosphate	Plain Tube	2.5 mL	24 hrs	40– 150	U/L	4 hrs	
ALT	Enzymatic NADH without P5P	Plain Tube	2.5 mL	24 hrs	0 - 55	U/L	4 hrs	
AST	Enzymatic NADH without P5P	Plain Tube	2.5 mL	24 hrs	5–34	U/L	4 hrs	
FIB-4	Calculated	LFT – Plain Tube FBC - EDTA	2.5 mL	24 hrs	<1.3 : low risk 1.3 – 2.67 : Intermediate Risk >2.67 : High Risk	Not Related	4 hrs	Calculated from **LFT** dan **FBC**
RENAL PROFILE								
POTASSIUM (K)	Ion-selective electrode diluted (Indirect)	Plain Tube	2.5 mL	24 hrs	3.5 – 5.1	mmol/L	4 hrs 1 hrs (Urgent)	
SODIUM (NA)	Ion-selective electrode diluted (Indirect)	Plain Tube	2.5 mL	24 hrs	136 – 145	mmol/L	4 hrs 1 hrs (Urgent)	
UREA	Urease	Plain Tube	2.5 mL	24 hrs	Male : 3.2 – 7.4 Female : 2.5 – 6.7	µmol/L	4 hrs 1 hrs (Urgent)	
CREATININE	Enzymatic	Plain Tube	2.5 mL	24 hrs	Male : 64 - 104 Female : 49 - 90	µmol/L	4 hrs 1 hrs (Urgent)	
SERUM BILIRUBIN								
BILIRUBIN TOTAL	Diazonium Salt	Plain Tube	2.5 mL	24 hrs	3.4 – 20.5	µmol/L	4 hrs	
BILIRUBIN DIRECT	Diazo Reaction	Plain Tube	2.5 mL	24 hrs	0 – 8.6	µmol/L	4 hrs	
BLOOD GLUCOSE								
FASTING BLOOD SUGAR (FBS)	Enzymatic (Hexokinase/G6PDH)	Sodium Fluoride/ Potassium Oxalate	2.5 mL	24 hrs	4.1 – 5.6	mmol/L	4 hrs 1 hrs (Urgent)	Fasting
RANDOM BLOOD SUGAR (RBS)	Enzymatic (Hexokinase/G6PDH)	Sodium Fluoride/ Potassium Oxalate	2.5 mL	24 hrs	≤ 5.5	mmol/L	4 hrs 1 hrs (Urgent)	Minimum **2 hours after** taking food/drink

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

Pneumatic tube usage

1. Only blood samples (with form) should be sent using a pneumatic tube.
2. Please ensure that those tube are cap tightly before deliver to any destination
3. Sample such as **CSF, Body fluid and Urine** are **PROHIBITED** to be sent using pneumatic tubes (can cause spillage of sample and rejection of specimen) and can be send by hand to laboratory.
4. Sample also should be separated based on laboratory and send directly to the designated laboratory.

Blood Gases

1. Use a **1ml** disposable syringe **(usage of insulin syringe will lead to sample rejection)**
2. Rinse it with injection heparin
3. Draw 1 ml of arterial blood. Invert the syringe and remove all air bubble or air space inside the syringe
4. Cover the **syringe with stopper** and mix well by rotating the syringe to prevent clotting
5. Put the syringe inside biohazard plastic bag which is filled with crushed ice (The syringe must be embedded in to slurry ice)
6. Send the specimen to the lab within 30 minutes.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT	OPERATION HOURS	REFERENCE RANGE	UNIT	TAT (WORKING DAY)	NOTES
RANDOM URIN BIOCHEMISTRY								
ALBUMIN	Immunoturbidimetric	Urine container	Minimum 20 mL	8 am – 5 pm	< 30	mg/L	4 hrs	
AMYLASE	Enzymatic (CNPG3 Substrate)	Urine container	Minimum 20 mL	8 am – 5 pm	-	U/L	4 hrs	
CREATININE	Enzymatic	Urine container	Minimum 20 mL	8 am – 5 pm	Male : 5.1 – 14.2 Female : 3.9 – 9.4	mmol/L	4 hrs	
GLUCOSE	Enzymatic Hexokinase G6PDH	Urine container	Minimum 20 mL	8 am – 5 pm	0.1 – 0.8	mmol/L	4 hrs	
TOTAL PROTEIN	Biuret	Urine container	Minimum 20 mL	8 am – 5 pm	10 – 140	mg/L	4 hrs	
OSMOLALITY URINE	Freezing Point Depression	Urine container	Minimum 20 mL	24 hrs	50 – 1200	mOsm/kg	4 hrs	
URINE PROTEIN CREATININE INDEX (PCI)	Calculated	-	-	8 am – 5 pm	<0.02	g/mmol creatinine	4 hrs	
URINE ALBUMIN CREATININE RATIO (ALB:CREA)	Calculated	Urine container	Minimum 20 mL	8 am – 5 pm	Male : <2.5 Female : <3.5	mg/mmol	4 hrs	

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

Random urine (Preferably midstream urine)

Please sent random urine sample within 4 hours prior to collection. Sample will be rejected if the urine sample received after 4 hours of collection

For Male

1. Wash hands thoroughly before taking the urine
2. Retract the foreskin and clean the tip of the penis with antiseptic
3. Dry the penis with clean dry gauze
4. Void a small amount of urine into the toilet or bedpan.
5. Without interrupting the flow, catch about 30ml of urine in a sterile container
6. Void any excess urine into the toilet or bedpan.

For Female

1. Wash hands thoroughly before taking the urine
2. Clean the perineal area with antiseptic
3. Dry the perineal area with clean dry gauze
4. Void a small amount of urine into the toilet or bedpan.
5. Without interrupting the flow, catch about 30ml of urine in a sterile container
6. Void any excess urine into the toilet or bedpan.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT	OPERATION HOURS	REFERENCE RANGE	UNIT	TAT (WORKING DAY)	NOTES
24 HOUR URIN BIOCHEMISTRY								
ALBUMIN	Immunoturbidimetric	24 hr urine container	Minimum 20 mL	8 am – 5 pm	< 30	mg/24Hrs	4 hrs	
AMYLASE	Enzymatic (CNPG3 Substrate)	24 hr urine container	Minimum 20 mL	8 am – 5 pm	1 – 17	U/ hr	4 hrs	
CALCIUM	Arsenazo III	24 hr urine container	Minimum 20 mL	8 am – 5 pm	2.5 -7.5	mmol/24Hrs	4 hrs	
CHLORIDE	Ion-selective electrode diluted (Indirect)	24 hr urine container	Minimum 20 mL	8 am – 5 pm	110 – 250	mmol/24Hrs	4 hrs	
CREATININE	Enzymatic	24 hr urine container	Minimum 20 mL	8 am – 5 pm	M : 7.7 – 21.3 F : 5.9 – 14.1	mmol/24Hrs	4 hrs	
24 HOURS CREATININE CLEARANCE	Enzymatic	24 hr urine container	Minimum 20 mL	8 am – 5 pm	Male : 61 - 147 Female : 59 – 151	mL/min	4 hrs	Plain tube for serum creatinine test should be send together
CORTISOL	2 Step CMIA	24 hr urine container	Minimum 20 mL	8 am – 5 pm	11.8 - 486	nmol/L	3 days	
GLUCOSE	Enzymatic Hexokinase G6PDH	24 hr urine container	Minimum 20 mL	8 am – 5 pm	2.8	mmol/24hrs	4 hrs	
MAGNESIUM	Enzymatic	24 hr urine container	Minimum 20 mL	8 am – 5 pm	3.0 - 5.0	mmol/24hrs	4 hrs	
POTASSIUM	Ion-selective electrode diluted (Indirect)	24 hr urine container	Minimum 20 mL	8 am – 5 pm	24 – 125	mmol/24hrs	4 hrs	
SODIUM	Ion-selective electrode diluted (Indirect)	24 hr urine container	Minimum 20 mL	8 am – 5 pm	40 – 220	mmol/24hrs	4 hrs	
PHOSPHORUS	Phosphomolybdate	24 hr urine container	Minimum 20 mL	8 am – 5 pm	12.9 – 42.0	mmol/24hrs	4 hrs	With acid preservatives
TOTAL PROTEIN	Biuret	24 hr urine container	Minimum 20 mL	8 am – 5 pm	50 – 80	mg/24Hrs	4 hrs	
UREA	Urease	24 hr urine container	Minimum 20 mL	8 am – 5 pm	428 – 714	mmol/24hrs	4 hrs	
URIC ACID	Uricase	24 hr urine container	Minimum 20 mL	8 am – 5 pm	1.48 – 4.43	mmol/24hrs	4 hrs	

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

24hrs Urine

1. Use a urine container to collect 24hr urine. You may need more than one container
2. Make sure each container is labelled properly
3. Start the 24-hr urine test in the morning after you wake up by urinating directly into the toilet. **Do not collect this urine**
4. After your first urinate, write the date and time on your storage container
5. Start collecting from the second urinate until 24 hours
6. Exactly 24 hours after you started the test, urinate one last time and place the urine in your storage container
7. This is the end of the sample collection
8. Close the lid tightly and send the specimen to the lab

Note : During the collection, keep the specimen in the fridge / in a cooler)
For 24 hr urine catecholamine and phosphate, request the preservative from the lab

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT	OPERATION HOURS	REFERENCE RANGE	UNIT	TAT (WORKING DAY)	NOTES
IMMUNOASSAYS								
AFP	2 Step CMIA	Plain Tube	2.5mL	8 am – 5 pm	0.00 – 8.78	ng/mL	3 days	
B- HCG	2 Step CMIA	Plain Tube	2.5mL	24 hrs	**Female :** Non-pregnant : < 5.0 Early Pregnant: 5 - 25 Pregnant: *1 – 10 weeks: up to 231,000 *11 – 15 weeks: up to 234,990 *16 – 22 weeks: up to 50,064 *23 – 40 weeks: up to 49,413	mIU/mL	3 days 24 hrs (Urgent)	
VITAMIN B12	2 Step CMIA	Plain Tube	2.5mL	8 am – 5 pm	138 - 652	pmol/L	3 days	
CA 19-9	2 Step CMIA	Plain Tube	2.5mL	8 am – 5 pm	0 - 37	U/mL	3 days	
CA 125	2 Step CMIA	Plain Tube	2.5mL	8 am – 5 pm	0 - 35	U/mL	3 days	
CEA	2 Step CMIA	Plain Tube	2.5mL	8 am – 5 pm	0 - 5	ng/mL	3 days	
CORTISOL	1 Step CMIA	Plain Tube	2.5mL	24 hrs	**AM** (before 10am): 101.2 –535.2 **Mid Night** (After 5pm): 80.0 – 447.3 **Random** : None	nmol/L	3 days 24 hrs (Urgent)	
ESTRADIOL	1 Step CMIA	Plain Tube	2.5mL	8 am – 5 pm	**Male**: 40.37 – 161.48 **Female**: Follicular Phases: 77.07 – 921.17 Mid Cycle Phases: 139.46 – 2381.83 Luteal Phases: 77.07 – 1145.04 Post Menopausal: Not on HRP 36.7 – 102.76 On HRP 36.7 – 528.48	pmol/L	3 days	

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT	OPERATION HOURS	REFERENCE RANGE	UNIT	TAT (WORKING DAY)	NOTES
FERRITIN	2 Step CMIA	Plain Tube	2.5mL	8 am – 5 pm	Male: 21.81-274.66 Female: 4.63 - 204	µg/L	3 days	
FOLATE	2 Step CMIA	Plain Tube	2.5mL	8 am – 5 pm	7 – 46.4	nmol/L	3 days	
FSH	2 Step CMIA	Plain Tube	2.5mL	8 am – 5 pm	**Male**: 0.95 – 11.95 **Female**: Follicular Phase: 3.03 – 8.08 Mid Cycle Phase: 2.55 – 16.69 Luteal Phase: 1.38 – 5.47 Post-Menopausal: 26.72 – 133.41	UI/L	3 days	
FT3	2 Step CMIA	Plain Tube	2.5mL	8 am – 5 pm	2.43 – 6.01	pmol/L	3 days	
FT4	2 Step CMIA	Plain Tube	2.5mL	24 hrs	9.01 – 19.05	pmol/L	3 days 24 hrs (Urgent)	
LH	2 Step CMIA	Plain Tube	2.5mL	8 am – 5 pm	**Male**: 0.57 – 12.07 **Female**: Follicular Phase: 1.80 – 11.78 Mid Cycle Phase: 7.59 – 89.08 Luteal Phase: 0.56 – 89.08 Post-Menopausal: 5.16 - 61.99	UI/L	3 days	
PROGESTERONE	1 Step CMIA	Plain Tube	2.5mL	8 am – 5 pm	**Male**: <0.32 – 0.64 **Female**: Follicular Phase: <0.32 – 0.95 Luteal Phase: 3.82 – 50.56 Post menopause: <0.32 – 0.95 Pregnant: *1st Trimester: 8.90 – 468.41 *2nd Trimester: 71.55 – 303.05 *3rd Trimester: 88.72 – 771.15	nmol/L	3 days	

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT	OPERATION HOURS	REFERENCE RANGE	UNIT	TAT (WORKING DAY)	NOTES
PROCALCITONIN	2 Step CMIA	Plain Tube	2.5mL	8 am – 5 pm	Normal value : < 0.05 Minor or no significant systemic inflammatory response. < 0.5	ng/mL	1 days	
PROLACTIN	2 Step CMIA	Plain Tube	2.5mL	8 am – 5 pm	Male: 3.46 – 19.40 Female: 5.18 – 26.53	µg/L	3 days	
TSH	2 Step CMIA	Plain Tube	2.5mL	24 hrs	0.35 – 4.94 Cord Blood: *Normal: <21 *Equivocal: 25-60 *High: >60	uIU/mL	3 days 24 hrs (Urgent)	
TOTAL PSA	2 Step CMIA	Plain Tube	2.5mL	8 am – 5 pm	< 4.0	ng/mL	3 days	
FREE PSA	2 Step CMIA	Plain Tube	2.5mL	8 am – 5 pm	< 0.5	ng/mL	3 days	
IMMUNOSUPRESSANT DRUGS								
CYCLOSPORINE	2 Step CMIA	EDTA	2.5mL	8 am – 5 pm	**C0:** < 6mth after Transplant: 250 - 350 > 6mth after Transplant: 100 250 (renal transplant) **C2:** < 6mth after Transplant: 800-1200 > 6mth after Transplant: 500-800 (renal transplant) **Toxic:** **C0** > 400	ng/ml	2 days	Please consult with HCTM PPUKM Department of Pharmacy for further enquiry.
TACROLIMUS	1 Step CMIA	EDTA	2.5mL	8 am – 5 pm	5 – 20	ng/ml	3 days	

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

Immunoassay Testing

1. Specimens for **immunoassay** testing should **not be shared** together **with** other **biochemistry** testing.
2. Adequate sample should be provided at least 2 mL for each tube.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT	OPERATION HOURS	REFERENCE RANGE	UNIT	TAT (WORKING DAY)	NOTES
THERAPEUTIC DRUG MONITORING								
ACETAMINOPHEN	Enzymatic (Acyl Amidohydrolase)	Plain Tube	2.5mL	24 hrs	Refer Rumack Matthew Nomogram (Level must be taken within 4-24 hours post ingestion)[1]	µmol/L	1 days 4 hrs (Urgent)	
BENZODIAZEPINE	Enzyme Immunoassay	Plain Tube	2.5mL	24 hrs	Depend on usage of drug	µmol/L	1 days 4 hrs (Urgent)	
SALICYLATE	Enzymatic / Colorimetric	Plain Tube	2.5mL	24 hrs	Rheumatic fever[1]:1.81-2.89 Anti inflammatory[1]: 1.09-2.17	mmol/L	1 days 4 hrs (Urgent)	
AMIKACIN	Particle-enhanced turbidimetric inhibition immunoassay (PETINIA)	Plain Tube	2.5mL	8 am – 5 pm	Once Daily Dosing[2]: **Peak**: 51.2-85.32 **Trough:**< 4.36 Multiple daily dosing[2]: **Peak:** 34.2-51.2 **Trough**: <17	µmol/L	2 days	
LITHIUM	Colorimetric	Plain Tube	2.5mL	8 am – 5 pm	**Trough 12 h post dose**[8] 0.60 – 1.2 **Toxic** >1.5	mmol/L	4 hrs	
CARBAMAZEPINE	Particle-enhanced turbidimetric inhibition immunoassay (PETINIA)	Plain Tube	2.5mL	8 am – 5 pm	17 – 51	µmol/L	2 days	
DIGOXIN	Particle-enhanced turbidimetric inhibition immunoassay (PETINIA)	Plain Tube	2.5mL	8 am – 5 pm	Pre level: CHF: Up to 1.28 AF < 2.6 Toxic: >2.6	nmol/L	2 days	
GENTAMICIN	Particle-enhanced turbidimetric inhibition immunoassay (PETINIA)	Plain Tube	2.5mL	8 am – 5 pm	**Once Daily Dosing:** **Peak:** Mild to Moderate Infection: 25.1-31.4 Severe infection in critically ill: 33.5-41.8 **Trough**:< 4.2 **Multiple daily dosing/synergy in endocarditis:**	µmol/L	2 days	

					Strep/enterococci **Peak**: 6.3-10.46 **Trough**: <2.1 Staphylococci **Peak**:10.46-20.92 **Trough:** <4.2			
PHENOBARBITAL	Particle-enhanced turbidimetric inhibition immunoassay (PETINIA)	Plain Tube	2.5mL	8 am – 5 pm	65 – 172	µmol/L	2 days	
PHENYTOIN	Enzyme Immunoassay	Plain Tube	2.5mL	8 am – 5 pm	39.6 – 79.2	µmol/L	2 days	
THEOPHYLLINE	Enzyme Immunoassay	Plain Tube	2.5mL	8 am – 5 pm	Therapeutic: 55-100 Elderly: 27.75-55	µmol/L	2 days	
VALPROIC ACID	Particle-enhanced turbidimetric inhibition immunoassay (PETINIA)	Plain Tube	2.5mL	8 am – 5 pm	Therapeutic : 346.5 – 693	µmol/L	2 days	
VANCOMYCIN	Particle-enhanced turbidimetric inhibition immunoassay (PETINIA)	Plain Tube	2.5mL	8 am – 5 pm	**Peak**: <27.6 **Trough**: Non complicated infection: 6.9-10.3 Endocarditis, osteomyelitis, meningitis, HAP, bacteremia: 10.3-13.8 *trough level is usually done to access efficacy Continuous Vancomycin Infusion Usual Target Range: 12 – 17 For Deep Seated Severe Infection: Up to 19	µmol/L	2 days	

References:

1) Micromedex (R) Healthcare series 2016
2) A.H. Thomson, West Glasgow Hospital NHS Trust
3) Yancy CW, Jessup M, Bozkurt B, et al. American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines. 2013 ACCF/AHA guideline for the management of heart failure: a report of the American College of Cardiology Foundation/American Heart Association Task Force on practice guidelines. Circulation. 2013;128(16):e240-e327. [PubMed 23741058]
4) 2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS
5) Nicolau et al, Antimicrob Agents Chemother 39:650-655,1995
6) Graham JC and Gould FK, 2012, 'Role of aminoglycosides in the treatment of bacterial endocarditis', p437-444, Journal of Antimicrobial Chemotherapy
7) John Hopkins Medicine, n.d., 'Endocarditis' pp 62-67, Antibiotic Guidelines 2014-20151
8) Clinical Practice Guidelines (CPG) Management of Bipolar Disorder in Adults 2014
9) Basic Clin Pharmacokinetics 3rd edition
10) Liu C, Bayer A, Cosgrove SE, et al, "Clinical Practice Guidelines by the Infectious Diseases Society of America for the Treatment of Methicillin-Resistant Staphylococcus Aureus Infections in Adults and Children: Executive Summary," Clin Infect Dis, 2011, 52(3):285-92. [PubMed 21217178]
11) Rybak M, Lomaestro B, Rotschafer JC, et al, "Therapeutic Monitoring of Vancomycin in Adult Patients: A Consensus Review of the American Society of Health-System Pharmacists, the Infectious Diseases Society of America, and the Society of Infectious Diseases Pharmacists," Am J Health-Syst Pharm, 2009, 66(1):82-98. [PubMed 19106348]
12) American Thoracic Society and Infectious Diseases Society of America, "Guidelines for the Management of Adults With Hospital-Acquired, Ventilator-Associated, and Healthcare-Associated Pneumonia," Am J Respir Crit Care Med, 2005, 171(4):388-416. [PubMed 15699079]

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT	OPERATION HOURS	REFERENCE RANGE	UNIT	TAT (WORKING DAY)	NOTES
OTHER BIOCHEMISTRY TEST								
HBA1C	Capillary Electrophoresis	EDTA	2.5 mL	8 am – 5 pm	< 5.7% < 39	% mmol/mol	3 days	
PROTEIN ELECTROPHORESIS	EP: Agarose gel electrophoresis IFE: Immunoprecipitation on agarose gel	Serum: Plain tube Urine: Sterile urine container	Blood: Minimum 2.5mL Urine: minimum 20mL	8 am – 5 pm	-	-	EP: 10 days IFE:15 days	**Blood and urine** should be **sent together**
URINE PREGNANCY TEST	Test Strip	Sterile urine container	Minimum 20 mL	8 am – 5 pm	Positive/ Negative	-	4 hrs	
UFEME	Test Strip	Sterile urine container	Minimum 20 mL	8 am – 5 pm	Colour: Straw – Dark Yellow Clarity: Clear Specific Gravity: 1.020 – 1.030 pH: 5 – 6.5 Leucocyte: Negative Nitrite: Negative Protein: Negative Glucose: Negative Ketone: Negative Uribilinogen: Normal Bilirubin: Negative Blood: Negative Microscopic Erythrocyte: 0 – 1 Leucocyte: 1 – 5 Squamous Epithelial: 0 – 15 Bacteria: NIL Yeast: NIL Hyaline Cast: 0 – 5	Leucocyte/µL - g/L mmol/L mmol/L µmol/L µmol/L Erythrocye/µL /HPF /HPF /HPF /HPF /HPF /HPF	4 hrs	

REJECTION CRITERIA

1. Label spesimen pada tiub tidak sama dengan borang :
   i. Nama
   ii. MRN / No. KP / No. Pasport
   iii. Lain-lain catatan (cth: Masa spesimen diambil)
2. Borang tidak lengkap:
   i. Tiada Nama
   ii. Tiada MRN/ No. KP / No. Pasport
   iii. Tiada Nama Doktor / Tandatangan / Cop
   iv. Tiada tarikh dan masa spesimen diambil (Urin FEME & ABG)
   v. Tiada permintaan ujian
3. Guna tiub / bekas spesimen yang salah untuk ujian yang diminta
4. Spesimen lewat diterima atau bukan dalam waktu perkhidmatan
5. Cara hantaran yang tidak sesuai
   (Contoh: penggunaan sistem tiub pneumatik bagi sampel urin dan cecair badan dan spesimen ABG tanpa ais)
6. Sifat sampel bertukar beku (clotted)
   (Contoh : ABG, HbA1c, Ammonia, Lactate dan ESR)
7. Tiada spesimen yang diterima
8. Spesimen terkeluar atau tumpah
9. Spesimen dihantar tanpa borang permohonan ujian
10. Spesimen hemolisis
11. Diagnosa tidak bertepatan dengan ujian yang diminta / ujian yang diminta tiada indikasi klinikal
    (Contoh : Elektroforesis Protin)
12. Sifat spesimen yang dihantar tidak sesuai untuk pengujian / spesimen yang dihantar tidak sesuai untuk pengujian (Contoh : Spesimen cecair badan terlalu likat)
13. Spesimen tidak mencukupi untuk keperluan pengujian
14. Penambahan ujian berlainan panel dengan pengujian sebelumnya
15. Penambahan ujian kali kedua atau penambahan ujian selepas 4 jam dari permintaan pertama
16. Permintaan ujian atau penambahan ujian yang sama dengan ujian sebelumnya
17. Spesimen yang diterima melebihi tempoh daripada masa pengambilan
    (Contoh : UFEME – lebih dari 4 jam)
18. Isipadu spesimen melebihi aras yang ditetapkan
19. Isipadu spesimen kurang dari aras yang ditetapkan
20. Permintaan ujian biokimia dan immunoasai dihantar dalam satu tiub
21. Terima tiub / bekas tanpa spesimen
22. Terdapat ruang udara di dalam picagari spesimen ABG
23. Pengulangan ujian elektroforesis kurang dari tempoh yang ditetapkan
24. Permintaan ujian tidak ditawarkan di makmal ini
25. Spesimen kontaminasi
26. Penolakan spesimen yang dipohon oleh pelanggan kerana dikhuatiri :
    i. Spesimen adalah milik pesakit lain atau
    ii. Spesimen telah dilabel dengan identiti pesakit lain

Hemolysis, icterus and lipemic sample as well as certain medication may interfere with the testing of analytes. Please refer to laboratory personnel for further inquiry (ext: 5560)

FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION

Please refer to the respective NOTES

TEST REQUEST PROCEDURE IN JPMD, PPUKM

UNIT: CHEMICAL PATHOLOGY

GENERAL RULE:

1. **All test request must include relevant clinical history and diagnosis.**
2. Please ensure that the test request is appropriate with the working diagnosis.
3. Should there be any deviation from the Clinical Practice Guideline (CPG) / other guideline due to special circumstances, the attending doctors are required to discuss with Chemical Pathology MO/ Chemical Pathologist on call to avoid any rejection of request and it is a case by case basis.

No.	Test	Indication	Description	Requester	Source/Rationale
	Routine Test				
1.	Renal profile (RP)	1. Renal profile includes sodium, potassium, urea and creatinine. 2. Request for serum **chloride** must be stated if clinically indicated. **(Individual test).** 3. **ONLY** renal profile being offered during oncall.		HO/ MO/ Specialist	• Consensus opinion of the relevant expert working group. • Clinical Knowledge Summary. • Hypertension-not diabetic. NICE, 2014. • Guidelines and Audit Implementation Network. Hyponatremia in Adults. GAIN, 2010. • UK Renal Association. Clinical Practice Guideline, Acute Kidney Injury, 5th Edition. Renal Association: Hampshire, 2011.
2.	Liver function test (LFT)	1. **LFT** consist of **Total protein, Albumin, ALT, ALP, AST, Total bilirubin** and **FIB-4** 2. **NO LFT** offer after 10 pm except from Emergency Department and ICU/CCU/HDU.		HO/ MO/ Specialist	• Smellie S, Galloway M, McNulty S. Primary Care and Laboratory Medicine, Frequently Asked Questions. London: ACB Venture Publications, 2011. • Consensus opinion of the relevant expert working group.
3.	Calcium, magnesium, and phosphate	1. **WILL NOT BE OFFERED** as routine test for **MEDICAL CHECK-UP** or as **SCREENING** with **no clear justification**. 2. Relevant diagnosis is a **MUST**.		HO/ MO/ Specialist	• Consensus opinion of the relevant expert working group.

No.	Test	Indication	Description	Requester	Source/Rationale
4.	Serum and urine osmolality	1. Clear/ relevant indication and diagnosis. 2. Test offered 24 hours.		HO/ MO/ Specialist	• Consensus opinion of the relevant expert working group.
	Specialised Test				
5.	HbA1c	1. Diabetes patient with good glycaemic control (HbA1c < 7.0-7.5%) the interval for retesting is 6 months. 2. For poor glycaemic control (HbA1c> 7.5 % the interval for retesting is 3 months. 3. Not indicated during acute illness. 4. This suggestion **NOT** subjected for GDM and Paeds population.	• Test will only be run thrice weekly i.e. Mon, Wed and Fri • TAT: 3 working days	HO/ MO/ Specialist	• Consensus opinion of the relevant expert working group. • Malaysian CPG 2017 Management of type 2 DM
6.	Anemia profile	1. Ferritin based strategy.	• Ferritin < normal range (according to age and gender) - test for iron and Transferrin is not done. • Ferritin within normal range – Iron and Transferrin as a reflect testing. • Ferritin > normal range (according to age and gender), iron and Transferrin is not done unless in a case of: - (i)TRO functional anemia (ii)TRO primary haemachromatosis • **Ferritin: batching, requests will be subjected to screening; TAT – 3 days UIB** • Beta Thalassemia: 3 monthly with appropriate clinical indication.	HO/ MO/ Specialist	• Consensus opinion of the relevant expert working group.

No.	Test	Indication	Description	Requester	Source/Rationale
		2. Full Iron studies (Ferritin, Iron, Transferrin)	• ESRD on CAPD/HD minimal retesting is 6 months. Shorter interval required relevant clinical justification. • IVI Supplementation • Test request is not relevant for patient with history of recent blood transfusion		
7.	Vitamin B12 and Folate	1. Clear/relevant indication and diagnosis. 2. **Not for patients with established IDA** 3. Screening of the request by SO/MO	• The analysis in batching; TAT 3 working days	HO/ MO/ Specialist	• Consensus opinion of the relevant expert working group.
8.	Thyroid function test (TFT)	1. Every TFT request **MUST** include relevant clinical history and diagnosis. 2. **PLEASE AVOID** request for TFT in critically ill patient without relevant justification.	• Suggested Protocol for TFT: Please refer **Appendix A**	MO/ Specialist	• National minimum retesting intervals in pathology: A final report detailing consensus recommendations for minimum retesting intervals for use in pathology. • The Royal College of Pathologists, www.rcpath.org. • The Association for Clinical Biochemistry and Laboratory Medicine, www.acb.org.uk • The Institute of Biomedical Science, www.ibms.org • Penang Hospital Consensus

No.	Test	Indication	Description	Requester	Source/Rationale
9.	**Tumour marker** PSA CEA CA 125 HCG AFP CA 19-9	1. **ONLY** request by **SPECIALIST** with clear/relevant indication and diagnosis. 2. **ONLY** for monitoring of tumour progress. 3. **NOT** for screening/ medical check-up. 4. CA-125 is not offered for male patient and PSA is not offered for female patient. 5. Indication for multiple markers: ● Clear justification in situation of multiple masses in the abdomen or bone metastases. ● Limit only 4 tumour markers at one time. ● Tumour marker test must be specified. ● Written request for 'Tumour markers' in the request form will be rejected.	• The test offered during weekdays (office hours).	Specialist	• The National Academy of Clinical Biochemistry. • Laboratory Medicine Practice Guidelines use of Tumour Markers in Clinical Practice .Quality Requirements. Clin. Chem. 2008; 54: 1935-1939 • Penang Hospital Consensus
10.	Cardiac marker	1. Test request must be from **ED/CCU/CRW/HDW/ ALL ICU** and requester are MO or ED Physician/Cardio MO/Cardiologist/ Anaest with appropriate clinical history. 2. Request of cardiac marker from other ward must call Chemical Pathology MO oncall for permission (clinically indicated). 3. **Patients with established Dx of ACS: Not for monitoring with hs-Trop I.** 4. **CK-MB only indicated in pts with re-infarction and rhabdomyolysis.** **LDH: No longer cardiac marker.**	• As the test offered is high sensitivity Troponin I- the suggested interval is 0 hr, 3 hrs, and 6 hrs onset chest pain.	MO/ Specialist	• Hamm CW, Bassand JP, Agewall S, Bax J, Boersma E, Bueno H et al. ESC Guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation. Eur Heart J 2011; 32:2999–3054. • Hospital Tengku Ampuan Afzan Consensus

No.	Test	Indication	Description	Requester	Source/Rationale
11.	**Special hormone** FSH LH Prolactin Progesterone Estradiol Cortisol	1. **ONLY** request by **MO/SPECIALIST** with clear/relevant indication and diagnosis. 2. Request from HO is **NOT ACCEPTED**. 3. For fertility hormone request, LMP should be provided. 4. For cortisol, request **MUST** include: ● Relevant clinical history suggesting of eg: Cushing syndrome or TRO Primary Adrenal Insufficiency (PAI). ● Only request by **SPECIALIST/ MO-COUNTERSIGN BY SPECIALIST.** ● Random cortisol is not offered. If there is indication eg: (to exclude hypocortisolism), please contact Chemical Pathology MO oncall.	• Please document time of sample taken for AM and PM cortisol. • Limitation for cortisol test: Please justify before sending the request. • False elevation in pregnancy, contraceptives pill users, estrogen therapy patient, and patient with prednisolone, 6-a-methylprednisolone/ prednisone, metyrapon treatment. • For patients on prednisolone treatment, treatment should stopped 48 hours before cortisol measurement.	MO/ Specialist	• Goodman NF, Cobin RH, Ginzburg SB, Katz IA, Woode DE. American Association of Clinical Endocrinologists medical guidelines for clinical practice for the diagnosis and treatment of menopause. Endocr Pract. 2011; 17(Suppl 6):1–25. • NICE. Fertility problems: assessment and treatment. NICE, 2013. www.nice.org.uk/guidance/cg156 • Melmed S, Casanueva FF, Hoffman AR, Kleinberg DL, Montori VM, Schlechte JA et al. Diagnosis and treatment of hyperprolactinemia: an Endocrine Society clinical practice guideline. J Clin Endocrinol Metab 2011; 96:273–288. • Stefan R. Bornstein , Bruno Allolio, Wiebke Arlt, Andreas Barthel, Andrew Don-Wauchope, Gary D. Hammer, Eystein S. Husebye, Deborah P. Merke, M. Hassan Murad, Constantine A. Stratakis, and David J. Torpy. Diagnosis and Treatment of Primary Adrenal Insufficiency: An Endocrine Society Clinical Practice Guideline. J Clin Endocrinol Metab 101: 364 – 389, 2016. • Lynnette K. Nieman, Beverly M. K. Biller, James W. Findling, John Newell-Price, Martin O. Savage,Paul M. Stewart, and Victor M. Montori. The Diagnosis

No.	Test	Indication	Description	Requester	Source/Rationale
					of Cushing's Syndrome: An Endocrine Society Clinical Practice Guideline. J Clin Endocrinol Metab 93: 1526 – 1540, 2008.
12.	Clinical toxicology	1. Should provide relevant clinical history and diagnosis. 2. Only serum for acetaminophen, salicylate and benzodiazepine are offered 24 hours.		MO/ Specialist	• Consensus opinion of the relevant expert working group.
13.	Protein electrophoresis	1. Clear/ Relevant indication/ diagnosis pointing to multiple myeloma/ paraprotein related problem. 2. **MUST** provide other relevant investigation eg: FBP, ESR, Ca, BM Aspiration finding. 3. Not for screening in patients with CKD as sFLC is not offered by JPMD.	• Minimal retesting interval is 21 days.	Specialist / MO-countersign by Specialist	• National minimum retesting intervals in pathology: A final report detailing consensus recommendations for minimum retesting intervals for use in pathology. The Royal College of Pathologists, www.rcpath.org • The Association for Clinical Biochemistry and Laboratory Medicine, www.acb.org.uk • The Institute of Biomedical Science, www.ibms.org • The National Academy of Clinical Biochemistry: Laboratory Medicine Practice Guidelines use of Tumour Markers in Clinical Practice .Quality Requirements. Clin Chem 2008; 54: 1935-1939
14.	Procalcitonin	1. Clear/ Relevant indication/ diagnosis is a MUST. 2. Test request must be from **HDU**/ **ALL ICU.** **3. Other ward/ clinic: if there is indication (eg: patient with prolong fever) please contact Chemical Pathology MO oncall.** 4. Retesting – 24 hours	• CRP is recommended as first line screening for sepsis.	Specialist / MO-countersign by Specialist	• Hochreiter et al, Crit Care 2009;13:R83 • Seguela et al, Cardiology in the Young 2011; 21: 392-399

No.	Test	Indication	Description	Requester	Source/Rationale
Urine Test					
15.	UFEME	1. Clear/ relevant indication and diagnosis. 2. Only offer during office hour. 3. Weekend: Only offer on Saturday up to 12 noon.		HO/ MO/ Specialist	• Consensus opinion of the relevant expert working group.
16.	24-hrs urine testing	1. Please ensure the correct collection methods. 2. Volume < 500 mls will be rejected except in case of paediatric patient/ CKD.		HO/ MO/ Specialist	• Consensus opinion of the relevant expert working group.

Appendix A

No.	Clinical Condition	First line TFT offered
1.	TRO primary Hyperthyroidism	TSH, FT4
2.	TRO primary Hypothyroidism	TSH, FT4
3.	Known case of primary Hypothyroidism on thyroxine replacement.	TSH, FT4
4.	Congenital Hypothyroidism (> 12 years old)	TSH, FT4
5.	Primary Hyperthyroidism in remission	TSH, FT4
6.	Post thyroidectomy	TSH, FT4
7.	Post RAI not on treatment	TSH, FT4
8.	Known case of primary hyperthyroidism on anti-thyroid treatment	TSH, FT4
9.	Post RAI on anti-thyroid medication or uncertain status	TSH, FT4
10.	Thyroid carcinoma follow-up	TSH, FT4
11.	All pregnant lady (screening and known thyroid disorders)	TSH, FT4
12.	All peadiatric patients <12 years	TSH, FT4
13.	TRO central hypothyroidism	FT4
14.	Known case of central hypothyroidism	FT4
15.	Known case of T3 toxicosis on treatment	TSH, FT4, FT3

Reflect testing

Applicable for patient with:

a. If TSH result is abnormal < 0.270 mIU/L or > 4.200 mIU/L = FT4 will be provided.

b. If TSH < 0.01 mIU/L and a normal FT4 = FT3 will be provide

7.6 Blood Bank Unit

INTRODUCTION:

The Blood Bank Unit provides safe blood and blood component supply services to patients. This unit conducts compatibility testing for blood and blood components and identifies patient antibodies.

LOCATION : Ground Floor, Clinical building, Hospital Canselor Tuanku Muhriz

REQUEST FORM:

i. HCTM/JKIK/PMD (RP) 17/16 (Pin. 1/2024) - Transfusion Request Form
ii. HCTM/JKIK/PMD/B01 (Pin. 1/2024) - Blood/Blood Product Transfusion Checklist
iii. HCTM/RP 295 (Pin 2/2020) - Blood Bank Request Form
iv. HCTM/RP 200/2007 (Pin. 1/2020) - *Slip Pengambilan Darah Packed Cell/WB/LPRBC Tabung Darah HCTM*
v. HCTM/RP 201/2007 (Pin. 1/2020) - *Slip Pengambilan Komponen Darah Tabung Darah HCTM*
vi. HCTM/JPMD/BB/B-06 (Pin-01) - Report of Reaction to Blood or Plasma

CONTACT NUMBER : 03-9145 5454

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
GROUP, SCREEN & CROSSMATCH (GXM) FOR : - **RED CELLS** - **WHOLE BLOOD** - **LEUCODEPLETED RED CELLS (FILTERED RED CELLSS)** - **WASHED RED CELLS** - **IRRADIATED RED CELLS**							❖ To call Blood Bank Medical Officer (MO) to obtain code during: - Low blood stocks/request of ≥ 2 units of red cells. - Request of whole blood, Leucodepleted Red Cells, washed Red Cells or special blood group eg. Rh D negative red cells.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
	Tube / Gel Card	 EDTA 6 ml	1 tube x 6ml	24 hours for emergency cases. Planned operation (2 days before operation)	n.a.	3 hours	❖ For cases with **special blood groups** eg. Rh D Neg or rare antibodies, a GXM **request** has to be made at least **1 week before** the operation ❖ **Please transfuse as soon as possible** ❖ **Please return the blood bag immediately to the Blood Bank if not used.** ❖ For dertimination of blood supply quantity, please refer to the guidelines of Maximum Surgical Blood Order Schedule for Elective Surgery (MSBOS) at the Diagnostic Laboratory Services Department website : https://hctm.ukm.my/makmal/ (Select the section *Panduan* > *Panduan Transfusi darah dan komponen darah* > Maximum Surgical Blood Order Schedule (MSBOS) for elective Surgery)
GROUP SCREEN AND HOLD (GSH)	Tube / Gel Card	 EDTA 6 ml	1 tube x 6ml	24 hours	n.a.	3 hours	❖ Please contact the blood bank counter for any requests to convert to GXM (applicable to one unit red cell conversion) ❖ In case of low stock/request of ≥ 2 units of red cells, the conversion shall be made through phone calls to the Blood Bank MO to obtain the code.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
BLOOD COMPONENT - **PLATELET** - **FRESH FROZEN PLASMA (FFP)** - **CRYOPRECIPITATE (CRYO)**		 EDTA 6 ml	For new cases with no ABO & Rh D blood group, EDTA 3.5 ml needs to be sent to check the blood group	24 hours **Request needs to be made only when transfusion is required	n.a.	15 - 30 minutes	❖ Please contact Blood Bank MO to obtain the code for each blood component request. ❖ **Please transfuse as soon as possible.** ❖ **If not used, please return blood components immediately to the Blood Bank, together with a justification letter.** ❖ **The thawing of FFP and CRYO depends on the number of units requested.**
UNCROSSMATCHED GROUP O RED CELLS (UCO)	Tube / Gel Card	 EDTA 6 ml	1 tube x 6ml	24 hours	n.a.	30 minutes	❖ 3 locations store UCO for the immediate usage of patients at those locations only: - Emergency Department (ED) - Labour Room - Hospital Pakar Kanak-Kanak (HPKK)- request to be made by the clinician through the Department of Diagnostic Laboratory Services HPKK ❖ For other locations that require UCO, please contact Blood Bank MO/Specialist for UCO supply. (Maximum 2 units only) ❖ A blood sample shall be taken before the transfusion of UCO to determine the patient's actual blood group and for subsequent management. ❖ Usage of UCO is prioritized in emergencies such as: - Massive hemorrhage - Severe trauma cases

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
							- and other clinically justified cases after obtaining approval from Blood Bank MO/Specialist ❖ The requesting clinician must take full responsibility for the use of UCO. ❖ The doctor or staff from the ward should be standby at the Blood Bank with an ice box.
EMERGENCY CROSSMATCH (RED CELLS)	Tube / Gel Card	 EDTA 6 ml	1 tube x 6mll	24 hours	n.a.	30 minutes	❖ The choice of red cells for transfusion in cases of life-threatening bleeding depends on the urgency of the transfusion and the time available. ❖ If the blood is required within 30 minutes, units of blood found to be compatible at immediate spin will be issued. ❖ Blood Bank shall complete the compatibility testing and antibody screening of the units of blood issued at 37 degrees Celcius and in the AHG phase. Any incompatibility detected will be immediately informed to the clinician concerned for appropriate action. ❖ The requesting clinician must take full responsibility for using emergency crossmatched blood. ❖ All emergency requests should be accompanied by a phone call to the Blood Bank MO/Specialist to facilitate the process. ❖ The doctor or staff from the ward should be standby at the Blood Bank with an ice box.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
MASSIVE TRANSFUSION PROTOCOL (MTP)	Tube / Gel Card	 EDTA 6 ml	1 tube x 6ml	24 hours	n.a.	**a.s.a.p.**	❖ Please contact Blood Bank MO/specialist to activate MTP ❖ Suggested criteria for MTP activation are: ☐ **Adult :** a. A loss of one blood volume (70mls/kg or ~ 5 liters) within 24 hours b. A loss of 50% blood volume within 3 hours c. A rate of loss of 150 ml/min ☐ **Children :** a. A loss of ≥ 80mls/kg in the first 24 hours b. A loss of ≥ 40mls/kg within 3 hours ❖ Please refer to the MTP guidelines on the Diagnostic Laboratory Services Department website: https://hctm.ukm.my/makmal/ (Select the section *Panduan* > *Panduan Transfusi darah dan komponen darah* > Massive Transfusion Protocol (MTP)

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
ABO/RH &DIRECT COOMBS FOR NEWBORN	Tube / Gel Card	 EDTA 6 ml	1 tube x 3.5 ml	24 hours	n.a.	4 hours	
TRANSFUSION REACTION			2 tube x 6 ml		n.a.	15 days	❖ Please bring along the blood bag classified as a transfusion reaction.
BLOOD GROUPING			1 tube x 3.5 ml	8.00 am - 4.00 pm (Office hours)	n.a.	4 hours	❖ Office hours (Samples from clinics until 6 pm)
DIRECT AND INDIRECT COOMBS			1 tube x 6ml		n.a.	4 hours	
RHESUS / RBC PHENOTYPING			1 tube x 6ml		n.a.	15 days	
ANTIBODY IDENTIFICATION			2 tube x 6 ml		n.a.		
ISOHAEMAGGLUTININ TITRE					n.a.		❖ Please contact the blood bank to schedule a testing appointment.
COLD AGGLUTININ TITRE					n.a.		
ANTI-D TITRE					n.a.		

REJECTION CRITERIA	FACTORS KNOWN TO AFFECT EXAMINATION PERFORMANCES/RESULT INTERPRETATION SIGNIFICANTLY
1. The patient's ID sticker overlapped with another patient's ID sticker. 2. Incomplete request form. - The patient's information is incomplete (no name, MRN, diagnosis, reason for transfusion, and others) - Request information is incomplete (quantity of blood required is not stated, date and time the sample was taken is not stated, and others) - No name, signature, official stamp, or initials of the Medical Officer 3. The patient's information on the request form and specimen tube does not tally. 4. GXM requested more than 2 days in advance (e.g. Blood needed on 25/02/2020, GXM sent on 22/02/2020 – GXM reject) 5. The request was received after office hours (for certain tests). 6. Repeated request. 7. The sample was stored overnight. 8. The sample received unlabelled. 9. Insufficient sample. 10. Spilled sample. 11. Wrong specimen tube. 12. Haemolysed sample. 13. Clotted sample. 14. No initial at specimen tube 15. The initial of the medical personnel who takes and labels the specimen tube is different from the test form. 16. Other reasons (no request form, wrong request form, test requested is not done in the blood bank, no blood sample, patient's name not written in capital block).	Errors during the patient sampling process can lead to mistakes in the provision of safe blood supplies to patients. For example, if the patient information on the sample and the test form do not match, it is possible that the sample was taken from another patient. If a patient who genuinely needs a blood supply has blood type O positive, but the ward sends the wrong specimen with a blood type other than O positive, it can cause complications for the patient and may even lead to **death.**

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

To obtain guidelines related to the supply of blood and blood components that have been developed and approved by the Hospital Transfusion Committee, Hospital Canselor Tuanku Muhriz (HCTM), you can refer to the website provided by the Department of Diagnostic Laboratory Services, HCTM. This document contains detailed information about relevant procedures and guidelines. You can access the document through the following link:

https://hctm.ukm.my/makmal/ (Select the section *Panduan* > *Panduan Transfusi darah dan komponen darah*)

The guidelines on blood and blood components transfusion involved are as follows:

1. Written consent
2. Recall and Look Back
3. Overnight Transfusion
4. Haemovigilance Program
5. Massive Transfusion Protocol (MTP)
6. Indication for Irradiated Cellular Blood Product
7. Maximum Surgical Blood Order Schedule (MSBOS) for elective Surgery
8. SOP for Collection of Blood Specimens by Venepuncture

7.7 Specialized Hemostasis Unit

INTRODUCTION
The Specialized Haemostasis Unit, offers diagnostic services for bleeding and thrombotic disorders. All samples or tests shall be discussed with the Medical Officer (MO) or Haemotologist prior to collection. Diagnostic services are available from Monday to Friday and within office hours.

LOCATION
Located on Level 2 of the Clinical Block, HCTM

REQUEST FORM
HCTM/JKIK/PMD(RP)14/17 (Pin. 1/2024)

CONTACT NUMBER
For appointments or inquiries 03-91456767

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	REFERENCE RANGE	TAT (Working Day)	NOTES
THROMBOPHILIA PANEL							
Protein C Activity	Chromogenic	 Sodium Citrate Tube 2.7 ml	1 tube X 2.7 ml in 3.2% Sodium Citrate (Full draw)	8.00AM – 4.30 PM Monday to Friday except Public Holiday	71 – 156 %	25 WORKING DAYS	1. Please contact the MO (ext: 6767) before submitting the request. 2. Fill blood exactly to the marked level/ volume indicated on the specimen container to preserve its integrity for testing. 3. Specimen shall reach the lab **within 4 hours** of venipuncture. Diagnostic services are available Monday to Friday, during office hours only.
Protein S Activity	Clotting				67 – 148 %		
Anti Thrombin III Activity	Chromogenic				86 – 117 %		
Activated Protein C Resistance (APCR)	Clotting				120 - 300 sec.		

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	REFERENCE RANGE	TAT (Working Day)	NOTES
SPECIAL COAGULATION							
Factor VIII Assay	Clotting	 Sodium Citrate Tube 2.7 ml	1 tube x 2.7 ml in 3.2% Sodium Citrate (Full draw)	8.00AM – 4.30 PM Monday to Friday except Public Holiday	50 – 193 %	15 WORKING DAYS	1. Please contact the MO (ext: 6767) before submitting the request 2. Fill blood exactly to the marked level / volume indicated on the specimen container to preserve its integrity for testing. 3. Specimens shall reach the lab **within 4 hours** of venipuncture. Diagnostic services are available Monday to Friday, during office hours only.
Factor IX Assay					67 – 173 %		
Factor XIII Screening Test	Clotting	 Sodium Citrate Tube 2.7 ml			N/A		
Heparin Induced Thrombocytopenia (HIT)	Lateral Flow Immunoassay	 Sodium Citrate Tube 2.7 ml		**BY APPOINTMENT ONLY** 8.00 AM – 4.00 PM Monday to Friday except Public Holiday	N/A	24 HOURS	1. Kindly make an appointment by calling MO (ext: 6767) before submitting the request 2. Specimen shall reach the lab **within 2 hours** of venipuncture. Diagnostic services are available Monday to Friday, during office hours only.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	REFERENCE RANGE	TAT (Working Day)	NOTES
ANTI – Xa Assay (Low Molecular Weight Heparin)	Chromogenic	 Sodium Citrate Tube 2.7 ml	1 tube x 2.7 ml in 3.2% Sodium Citrate (Full draw)	**BY APPOINTMENT ONLY** 8.00 AM – 4.00 PM Monday to Friday except Public Holiday	N/A	24 HOURS	1. Kindly make an appointment by calling one day prior at ext.: 6767 2. Please **draw blood after 4 hours of taking** the anticoagulant. 3. Specimen shall reach the lab **within 1 hour** of venipuncture. Diagnostic services are available Monday to Friday, during office hours only.
INHIBITOR ASSAY							
Factor VIII Inhibitor	Clotting	 Sodium Citrate Tube 2.7 ml	3 tubes x 2.7 ml in 3.2% Sodium Citrate (Full draw)	8.00 AM – 4.30 PM Monday to Friday except for Public Holiday	N/A	15 WORKING DAYS	1. Please contact the MO (ext: 6767) before submitting the request 2. Fill blood exactly to the marked level / volume indicated on the specimen container to preserve its integrity for testing. 3. Specimens shall reach the lab **within 4 hours** of venipuncture. Diagnostic services are available Monday to Friday, during office hours only.
Factor IX Inhibitor							
Inhibitor Screening	Clotting	 Sodium Citrate Tube 2.7 ml	2 tubes x 2.7 ml in 3.2% Sodium Citrate (Full draw)				

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	REFERENCE RANGE	TAT (Working Day)	NOTES
ANTIPHOSPHOLIPID SCREENING (APLS)							
Anti Cardiolipin IgG	Fluorescence Enzyme Immunoassay	 Sodium Citrate Tube 2.7 ml	1 tube x 2.7 ml in 3.2% Sodium Citrate (Full draw)	8.00AM – 4.30 PM Monday to Friday except Public Holiday	<10 GPL-U/ml	25 WORKING DAYS	1. Please contact the MO (ext: 6767) before submitting the request 2. Fill blood exactly to the marked level / volume indicated on the specimen container to preserve its integrity for testing. 3. Specimens shall reach the lab **within 4 hours** of venipuncture. Diagnostic services are available Monday to Friday, during office hours only.
Anti Cardiolipin IgM					<10 GPL-U/ml		
Anti Beta 2 Glycoprotein 1 IgG					<7 U/ml		
Anti Beta 2 Glycoprotein 1 IgM					<7 U/ml		
LUPUS ANTICOAGULANT TEST PANEL							
PTT-LA (screen)	Clotting	 Sodium Citrate Tube 2.7 ml	2 tubes x 2.7 ml in 3.2% Sodium Citrate (Full draw)	8.00AM – 4.30 PM Monday to Friday except Public Holiday	31.2 - 54.4 sec		
STACLOT-LA (confirm)					< 8.0 sec.		
DRVVT (screen)					28.5 - 48.4 sec		
DRVVT (confirm)					27.6 - 39.0 sec		

<table>
<tr><th>TEST</th><th>METHOD</th><th>SPECIMEN CONTAINER</th><th>SPECIMEN REQUIREMENT (Volume , etc)</th><th>OPERATION HOURS</th><th>REFERENCE RANGE</th><th>TAT (Working Day)</th><th>NOTES</th></tr>
<tr><td colspan="8">PLATELET FUNCTION INVESTIGATION</td></tr>
<tr><td>Clot Retraction</td><td>Clotting</td><td colspan="3" rowspan="2"></td><td>Normal: > 40%</td><td rowspan="12">20 WORKING DAYS</td><td rowspan="12">1. Kindly make an appointment by calling MO (ext: 6767) before submitting the request.
2. Patients need to bring along a healthy relative or friend as a 'sample control.'
3. Patient and control shall stop taking any medications for at least 7 days (the period is calculated from the last time the medication was taken) before the blood test. Refer list of medications/ vitamins/ foods to avoid
4. Please inform the attending doctor about the medications being taken and their dosages if there are any medications that cannot be discontinued for the test.
5. Both the patient and 'sample control' shall fast for at least 8 hours before the blood is drawn. The suggested last meal time is 11:00 PM. The patient may drink plain water during this fasting period.</td></tr>
<tr><td>Blood Grouping</td><td>Antigen/ antibody</td><td>N/A</td></tr>
<tr><td colspan="6">PLATELET AGGREGATION TEST (Whole Blood)</td></tr>
<tr><td>ADP 5 uM</td><td rowspan="6">Impedance</td><td rowspan="6">1. Patient:
 
Sodium Citrate Tube
2.7 ml

2. Control:
 
Sodium Citrate Tube
2.7 ml</td><td rowspan="6">4 tubes x 2.7 ml in 3.2% Sodium Citrate (Full draw) for each patient and control sample.</td><td rowspan="6">BY APPOINTMENT ONLY

8.00AM – 4.30 PM

Monday to Friday except Public Holiday</td><td>5 - 26 ohm</td></tr>
<tr><td>ADP 10 uM</td><td>6 - 33 ohm</td></tr>
<tr><td>Collagen 1 ug/ml</td><td>12 - 33 ohm</td></tr>
<tr><td>Collagen 5 ug/ml</td><td>11 - 42 ohm</td></tr>
<tr><td>Arachidonic Acid 0.5 mM</td><td>7 - 29 ohm</td></tr>
<tr><td>Ristocetin 1.0 mg/ml</td><td>>5 ohm,
< 70 sec lag time</td></tr>
</table>

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	REFERENCE RANGE	TAT (Working Day)	NOTES
PLATELET AGGREGATION TEST (Platelet Rich Plasma)						20 WORKING DAYS	6. The patient shall bring the PAT and FBP application forms with the paid stamp or free stamp on the day of the appointment. 7. Specimens shall reach the lab **within 1 hour** of venipuncture. Diagnostic services are available Monday to Friday, during office hours only.
ADP 5 uM	Optical	1. Patient:  Sodium Citrate Tube 2.7 ml 2. Control:  Sodium Citrate Tube 2.7 ml	5 tubes x 2.7 ml in 3.2% Sodium Citrate (Full draw) for **each patient and control** samples.	**BY APPOINTMENT ONLY** 8.00AM – 2.00 PM Monday to Friday except Public Holiday	69 - 88 %		
ADP 10 uM					71 - 88 %		
Collagen 2 ug/ml					70 - 94 %		
Arachidonic Acid 0.5 mM					74 - 99 %		
Ristocetin 1.25 mg/ml					87 - 102 %		
Thrombin 1 Unit					> 0.5 nmole		

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	REFERENCE RANGE	TAT (Working Day)	NOTES
VWD SCREENING TEST PANEL							
Von Willebrand Factor Antigen	Elisa	 Sodium Citrate Tube 2.7 ml	2 tubes x 2.7 ml in 3.2% Sodium Citrate (Full draw)	8.00AM – 4.30PM Monday to Friday except for Public Holiday	50 – 110 %	20 WORKING DAYS	1. Please contact the MO (ext: 6767) before submitting the request. 2. Fill blood exactly to the marked level/ volume indicated on the specimen container to preserve its integrity for testing. 3. Specimens shall reach the lab **within 3 hours** of venipuncture. Diagnostic services are available Monday to Friday, during office hours only.
Collagen Binding Assay					40 –181 %		
Ristocetin Cofactor Assay	Turbidimetric				50 – 200%		

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
Specimen will not be accepted and rejected for testing if: a. Specimen lysed b. Discrepancy of details between the request form and specimen c. Using the wrong request form or no form provided d. Using the wrong tube or specimen e. Specimens received in the laboratory after the specified time from blood collection f. The service is not offered in the Specialized Hemostasis Unit. g. Sending test specimens not within the designated service operation hours (after 4.30pm). h. Test requests are made without an appointment (For HIT, Anti Xa, and Platelet Aggregation Test). i. Incomplete form (Ensure requests are filled with date, time & location (for critical and urgent tests), test request, name/signature & doctor's stamp, and clinical summary/diagnosis) j. Insufficient specimen for testing (minimum 2.7ml or by volume set on the tube). k. Patients were on treatment 'anticoagulant' such as warfarin, heparin, etc. (for Lupus Anticoagulant, Protein C, Protein S, APCR, and ATIII test). l. Acute Phase i) Acute Phase of Thrombosis Thrombophilia (PS, PC, ATIII & APCR) in general, thrombophilia testing should be delayed for at least 6 weeks to allow acute-phase reactant proteins to return to baseline.) ii) Acute Phase of Infection/ Inflammation	**THE INDICATION OF TESTS FOR ANTIPHOSPHOLIPID SYNDROME (APLS) – LA/ ACL/ β2-GP1.** Definition of APLS: *APS is present if at least one of the clinical criteria and one of the laboratory criteria are met.* **Clinical criteria** 1. Vascular thrombosis – one or more clinical episodes of arterial, venous, or small vessel thrombosis. 2. Pregnancy morbidity a. One or more unexplained deaths of a morphologically normal fetus at or beyond the 10th week of gestation. b. One or more pre-term births of a morphologically normal neonate before the 34th week of gestation because of: i. eclampsia or severe pre-eclampsia or ii. recognized features of placental insufficiency c. Three or more unexplained consecutive spontaneous miscarriages before the 10th week of gestation, with maternal anatomic or hormonal abnormalities and paternal and maternal chromosomal causes excluded. **Laboratory criteria** 1. LA present in plasma, on two or more occasions at least 12 weeks apart 2. aCL antibody of IgG and/or IgM isotype, present in medium or high titre, on two or more occasions at least 12 weeks apart 3. Anti-β2-glycoprotein I antibody of IgG and/or IgM isotype, present on two or more occasions at least 12 weeks apart.

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
LA can be rejected if CRP >10 PS, PC, ATIII, APCR, ACL & B2GP1 can be accepted even CRP >10 m. Duplicate requests (samples received within TAT). n. Frozen specimen. o. Receiving specimens from outside the UKMMC laboratory in the form of: i) Frozen plasma samples were shipped without ice box and ice pack / dry p. Request a test that is not related to the patient's diagnosis.	**UKMMC GUIDELINE FOR THE INDICATION OF TESTS FOR ANTIPHOSPHOLIPID SYNDROME (APLS) – LA/ ACL/ β2-GP1.** The indications should include all the above clinical criteria and may be additional criteria not listed above but felt important by the clinicians. **Suspicion for APLS in patients with;** 1. Unprovoked proximal DVT or PE after stopping anticoagulation. (The presence of APLS indicates increase risk of recurrence favouring long-term anticoagulation) 2. Young adults (<50 years) with ischaemic stroke. (The presence of APL indicates increased risk of recurrence, anticoagulation with warfarin should be considered) 3. Women with recurrent pregnancy loss (≥3 pregnancy losses) at any stage of gestation (maternal anatomic/hormonal abnormalities and paternal and maternal chromosomal causes MUST BE excluded). 4. SLE patient who is pregnant. *Note:-* ● *1,2 and 3 as recommended by the British Committee for Standards in Haematology (BCSH). Reference: BJH Guideline 2012. Guidelines on the investigation and management of antiphospholipid syndrome (Revised guideline 2012 from previous guideline in 2000).* ● *4 as recommended by the Nephrology team UKMMC based on our local policy.*

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

SPECIMEN COLLECTION GUIDELINES

1. For hemostasis tests, venous blood samples should be obtained by clean venepuncture at a site away from an intravenous line.
2. During blood collection, use light pressure using a tourniquet and avoid prolonged application (if possible < 1 minute). Avoid slow-flowing draws and/ or traumatic venipunctures (as a guideline, 19-21 gauge needles)
3. Use citrated-based anticoagulant tube 109mM, 3.2% (Sodium Citrate). Tubes should be adequately filled (to the mark noted on the tube).
4. The sample should be mixed thoroughly with the anticoagulant by inverting the blood container several times (as a guideline, 6 inversions).
5. The container must be brought to the lab as soon as possible and processed/ tested within 3 hours after blood sampling.

TEST REQUEST PROCEDURE

No.	Test	Indication	Description	Requester	Source/Rationale
Specialised Test					
A.	**Special Coagulation**				
1.	Factor VIII Assay	1. Specific assays of individual clotting factors are used to: ● Diagnose deficiencies of one or more coagulation factors in patients with suspected inherited or acquired bleeding disorders. ● Investigate the cause of a prolonged PT or APTT. 2. Monitor the factor levels in patients given specific factor replacement therapy		MO/ Specialist	Consensus opinion of the relevant expert working group.
2.	Factor IX Assay				
3.	Factor VIII Inhibitor	For patients with existing inhibitors, changes in inhibitor titre during tolerization can also be monitored	To quantitate inhibitors (antibodies) to coagulation factor VIII / IX. Factor VIII / IX inhibitors are antibodies that bind to, and neutralize the pro-coagulant plasma protein Factor VIII / IX. They can be allo-antibodies, as in people with Haemophilia A, or auto-antibodies in non-haemophiliac people		
4.	Factor IX Inhibitor				

No.	Test	Indication	Description	Requester	Source/Rationale
5.	Factor XIII Screening Test	The test is used in the investigation of a bleeding disorder.	Although the prevalence of congenital factor XIII deficiencies has not been accurately assessed, they are not infrequent.		
6.	Inhibitor Screening	The mixing test is used in the initial investigation of a prolonged APTT.	The mixing test differentiates between the presence of time-dependent inhibitors or other inhibitors.		
7.	Platelet Aggregation Test	To detect the presence of anti-platelet drugs such as aspirin.	Platelet aggregation studies are used to detect inherited and acquired defects of platelet function and von Willebrand factor.		

No.	Test	Indication	Description	Requester	Source/Rationale
8.	Von Willebrand Disease (VWF Antigen + Collagen Binding Assay + Ristocetin Cofactor Assay + Factor VIII)	Relevant clinical history must be included in the request form	- Von Willebrand Disease (VWD) is the most common inherited bleeding disorder. It results from quantitative deficiencies and/or qualitative defects in the von Willebrand factor. Measurement of VWF:Ag is one of a panel of tests used to diagnose von Willebrand disease. - The collagen binding activity assay is one component of a von Willebrand screen. When interpreted in conjunction with the VWF antigen, Ristocetin assay and FVIII, the VWF:CB assists in the detection of, and subtyping, of von Willebrand disease (VWD). - The Ristocetin cofactor assay is one component of a von Willebrand screen. When interpreted in conjunction with the VWF antigen, collagen binding assay and FVIII, the Ristocetin cofactor assay assists in the detection of, and subtyping of, von Willebrand disease (VWD).	MO/ Specialist	Consensus opinion of the relevant expert working group.

No.	Test	Indication	Description	Requester	Source/Rationale
B.	**Thrombophilia**				
9.	Protein C Activity	1. Detection of reduced functional Protein C / Protein S / ATIII. 2. Relevant clinical history must be included in the request form.	Protein C / Protein S / ATIII requests are ordered individually or as part of a thrombophilia screen.	MO/ Specialist	Consensus opinion of the relevant expert working group.
10.	Protein S Activity				
11.	Anti Thrombin III Activity				
12.	Activated Protein C Resistance (APCR)	This clotting-based test is used to screen for the presence of the Factor V Leiden mutation. If the result of the clotting suggests FVL is present, it is recommended that the DNA test be performed for confirmation, and to determine zygosity.	This assay is used for all APC resistance requests ordered individually or as part of a thrombophilia screen.		

No.	Test	Indication	Description	Requester	Source/Rationale
C.	**Anti Phospholipid Screening (APLS)**				
13.	Anti Cardiolipin IgM	APLS is present if at least one of the criteria is met. i. Vascular thrombosis ii. Pregnancy morbidity iii. If aCL antibody of IgG and/or IgM isotype, is present in medium or high titre, repeated test request must be at least 12 weeks apart iv. If the Anti-β2-glycoprotein I antibody of IgG and/ or IgM isotype, present on two or more occasions, repeated test requests must be at least 12 weeks apart v. If LA is present in plasma, there must be 12 weeks interval before the next test request. a. ***For APLS repeat test after 12 weeks must be countersigned by a specialist before sending a request form to the lab.	Refer Panduan Perkhidmatan Makmal JPMD	MO/ Specialist	· UKMMC Guideline based on our local policy. · Recommended by the British Committee for Standards in Haematology (BCSH). Reference: BJH Guideline 2012. · Guidelines on the investigation and management of antiphospholipid syndrome (Revised guideline 2012 from previous guideline in 2000). · As recommended by the Nephrology team UKMMC is based on our local policy.
14.	Anti Cardiolipin IgG				
15.	Anti Beta 2 Glycoprotein 1 IgG				
16.	Anti Beta 2 Glycoprotein 1 IgM				
17.	Lupus Anticoagulant Test Panel				

No.	Test	Indication	Description	Requester	Source/Rationale
D.	**Heparin**				
18.	Anti Xa Assay-Low Molecular Weight Heparin (LMWH)	A low molecular weight heparin (Clexane) is given to anticoagulate patients at risk of thrombosis.	The APTT is relatively insensitive to plasma LMWH, the quantitative determination of plasma heparin requires measurement of its anti-Xa activity. The majority of patients receiving LMWH do not require monitoring, unless a complicating factor, such as renal impairment makes the response to a given dose unpredictable.	MO/ Specialist	Consensus opinion of the relevant expert working group.
19.	Heparin Induced Thrombocytopenia (HIT)	The test reveals detectable antibodies to the heparin-PF4 complex.	Between 1-5% of patients receiving heparin will develop Type II heparin-induced thrombocytopenia (HIT), due to the production of antibodies against a complex consisting of heparin and platelet factor 4 (PF4). This leads to a significant drop in platelet count and the risk of thromboembolic complications.	MO/ Specialist	Consensus opinion of the relevant expert working group.

7.8 Stem Cell Transplant Unit

INTRODUCTION:

The Stem Cell Transplant Unit offers comprehensive stem cell and related testing services, including procedures such as stem cell harvesting, CD34+/CD3+ cell counting, cryopreservation, and infusion. UTSS also provides specialized tests i.e. Erythropoietin (EPO) Immunoassay and Beta-2-Microglobulin (B2M). Operating hours are from Monday to Friday, 8:00 AM to 5:00 PM, excluding public holidays. Certain procedures may be performed outside regular hours with special approval.

LOCATION : Second Floor, Clinical Block, Hospital Canselor Tuanku Muhriz

REQUEST FORM:

i. HCTM/JKIK/PMD (RP) 13/17 (Pin. 1/2024) - Stem Cell Transplant Request Form (*Borang Permohonan Ujian Transplantasi Sel Stem)*

CONTACT NUMBER : 03-9145 6752

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE & UNIT	TAT (Working Day)	NOTES
CD34⁺ CELL COUNT	**Flow Cytometry**	 EDTA 3 ml	**1 tube** (Minimum **1ml** Fresh Peripheral Blood/ Cord Blood/ Apheresis Product)	**8.00 am – 5.00 pm (Monday to Friday except public holiday)** (The test will be run after office hour / weekend/ public holiday if requested by Clinical Haematologist and approved by Pathologist)	**cells/ul** (Peripheral Blood) **cells x10⁶/kgBW** (apheresis product) ❖ Target total PBSC CD34⁺ doses for collection: **≥ 5-8x10⁶ CD34⁺cells /kgBW**	**24 Hours** (Working Day)	❖ The specimens are accepted only on the date of appointment. ❖ The specimen will be collected early morning for CD34 pre-count for determination of PBSC harvesting and better yield of stem cell product.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE & UNIT	TAT (Working Day)	NOTES
CD3+ CELL COUNT	**Flow Cytometry**	 EDTA 3 ml	**1 tube** (Minimum **1ml** Donor Lymphocyte Product)		**cells/ul** (Donor lymphocyte product)	**24 Hours** (Working Day)	❖ The targeted amount of PBSC $CD34^+$ or CD3+ cells should be stated in the harvesting protocol and the dose must be disease dependent.
PERIPHERAL BLOOD STEM CELL HARVESTING	**APHERESIS**	**PATIENT/ DONOR**	**--**	**8.00 am – 5.00 pm (Monday to Friday except public holiday)** ❖ Start of harvesting will only be done during office hours, as scheduled in the protocol (except for certain circumstances of the patient, but with the agreement from lab and ward).	**NA**	**NA**	❖ Appointments should be made at least one week before the procedure.
LYMPHOCYTE COLLECTION	**APHERESIS**	**DONOR**	**--**		**NA**	**NA**	
STEM CELL & DONOR LYMPHOCYTE CRYOPRESERVATION	**CRYOPRESERVATION**		**APHERESIS STEM CELL OR LYMPHOCYTE PRODUCTS**	**8.00 am – 5.00 pm (Monday to Friday except public holiday)**	**NA**	**24 Hours**	❖ Cryopreserved stem cells and donor lymphocytes will be transferred to Pusat Terapi Sel (PTS) after the patients have passed away.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE & UNIT	TAT (Working Day)	NOTES
							❖ PTS will store the products according to patients/donors preferences as stated in the consent form (discard/ research purposes/ stored with fee).
CD34^{+} CELL SELECTION	**PURIFICATION**		**APHERESIS STEM CELL PRODUCTS**	**8.00 am – 5.00 pm (Monday to Friday except public holiday)** (The procedure will be run after office hour / weekend/ public holiday only if requested by Clinical Haematologist and approved by Pathologist)	**NA**	**NA**	❖ Appointments should be made at least one week before the procedure.
STEM CELL TRANSPLANT	**INFUSION**	**PATIENT**	**-**	**8.00 am – 5.00 pm (Monday to Friday except public holiday)**	**NA**	**NA**	
LYMPHOCYTE INFUSION	**INFUSION**	**PATIENT**	**-**		**NA**	**NA**	
AUTOLOGOUS BLOOD DONATION	**VENIPUNCTURE**	**PATIENT / DONOR**	**-**		**NA**	**NA**	❖ These procedures require discussion between the clinician and pathologist

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE & UNIT	TAT (Working Day)	NOTES
LEUKOREDUCTION	**APHERESIS**	**PATIENT**	**-**	**8.00 am – 5.00 pm (Monday to Friday except public holiday)**	**NA**	**NA**	❖ These procedures require discussion between the clinician and pathologist
PLATELET APHERESIS	**APHERESIS**	**DONOR**	**-**		**NA**	**NA**	
GRANULOCYTE COLLECTION	**APHERESIS**	**DONOR**	**-**		**NA**	**NA**	
ERYTHROPOIETIN IMMUNOASSAY	**ELISA**	 Plain Tube with Gel 3.5 ml	**2 tubes** (Minimum **1ml** Serum each)		**1.1- 23.3 mU/ml**	**7 WORKING DAYS**	❖ Specimens from outside of HCTM should be stored and transported with ice packs.
BETA - 2 - MICROGLOBULIN	**ELISA**	 Plain Tube with Gel 3.5 ml	**1 tube** (Minimum **1ml** Serum)		**0.9 - 3.0 µg/ml**		**Send To Referral Lab / Hospital**

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
1. Incomplete request form; must include: a. Two unique identifications (name and identity card/passport or MRN) b. Date and time of specimen taking c. Test requested d. Applicant information: name/signature and stamp 2. Wrong request form 3. No specimen or insufficient specimen volume 4. Wrong specimen container 5. Specimen is not secured and spills during transportation 6. Lysed specimen 7. Clotted specimen 8. Specimen sent outside of service operation hours/weekend/public holidays 9. Unavailable or incorrect labeling of specimen tube with patient information 10. Requests for tests are repeated within a turnaround time period.	1. Haemolysed sample 2. Lipaemic sample 3. Icteric sample 4. Bacterially contaminated sample Errors during the patient sampling process can lead to mistakes in determining apheresis procedure and clinical decisions for patients. This can lead to errors in result interpretation and wrong dosage of cells expressing the surface antigen CD34 (CD34+). Patient's lives will be at risk if the wrong dosage of PBSC infusion which can lead to graft versus host diseases (GVHD) or poor engraftment following transplantation.

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

1) ERYTHROPOIETIN

- ✔ It is highly recommended that the specimen is collected between 7.30 am to 12.00 noon because diurnal variation of erythropoietin has been reported (Wide *et al*, 1981 and Cahan *et al*,1992).
- ✔ Collect the peripheral blood without anticoagulant and allow blood to clot between 2-8ºC if possible. It has been reported that serum samples clotted at room temperature (22-28ºC) may decrease EPO value about 30% as compared to clotting on ice (Goldwasser and Sherwood 1981).
- ✔ After collection, the serum should be promptly separated, preferably in a refrigerated centrifuge
- ✔ Serum samples may be stored up to 24 hours at 2-8ºC

2) PBSC TRANSPLANTATION PROCEDURE

PATIENT/DONOR CRITERIA FOR APHERESIS PROCEDURE

i. Consent obtained from patient/donor
ii. Stable vital signs eg; blood pressure, heart rate, respiratory rate, and body temperature
iii. Good 'venous access'
iv. To start the initiation of PBSC collection when;
    a. WBC count in peripheral blood >3.0x10^9/L
    b. Peripheral $CD34^+$ cell count >15/uL (>10/uL for poor mobilizer)
v. For allogeneic PBSC harvesting and Platelet Apheresis
    a) The age of the donor must be between 18-60 years old. Informed written consent must be obtained from parent/guardian for donors age below 18 years old
    b) Platelet count ≥ 150 x 10^9 /L
    c) Donor in good condition
    d) The donor is healthy and not on medication. There is no history of genetic disorder eg bleeding disorder
    e) The donor should have a good rest and enough sleep, at least 5 hours before apheresis
    f) Haemoglobin level ≥ 9 g/dl
    g) There should be 2 weeks gap between the platelet apheresis
    h) Stem cell collection is to be carried out at days 4-5 after the given growth factor (GCSF)
    i) Blood priming is needed for a patient or donor with a body weight of less than 25 kg – preferably autologous blood.
    j) For allogeneic PBSC harvesting, the femoral catheter preferably to be inserted a day before the tentative date of harvesting
vi. For autologous PBSC harvesting and leukapheresis
    a) The requirements for autologous PBSC harvesting and leukapheresis are similar to item iv (allogeneic PBSC harvesting) except for Hemoglobin and platelet count
    b) Platelet count ≥ 40 x 10^9 /L
    c) Hemoglobin ≥ 8.0 g/dl
    d) Peripheral blood CD 34+ count ≥ 15 cells per µl (>10/uL for poor mobilizer)

REFERENCES

i. Cahan C, Decker MJ, Arnold JL, Washington LH, Veldhuis JD, Goldwasser E, Strohl KP. ***Diurnal Variations in serum erythropoietin levels in healthy subject and sleep apnea patients***. J Appl Physio 1992;72:2112-7
ii. Duong et al. ***Peripheral Blood Progenitor Cell Mobilization for Autologous and Allogeneic Hematopoietic Cell Transplantation: Guideline from the American Society of Blood and Marrow Transplantation***. Biology of Blood and Marrow Transplantation 20(2014) 1262-1273
iii. Goldwasser E and Sherwood JB. ***Annotation, Radioimmunoassay of Erythropoietin***. Br J Haematol 1981;48:359-63
iv. Wide L, Bengtsson C, Birgegard G. ***Circadian Rhythm of Erythropoietin in Human Serum***. Br J Haematol 1989; 72:85-90

7.9 Molecular Genetics Unit

INTRODUCTION :
Molecular Genetics Unit offers genetic cancer diagnostic services for diagnosis, prognostication and treatment monitoring. The testing services offered are Alpha Thalassemia Genotype, Beta Thalassemia Genotype, Jak2 V617F Mutation, Reverse Transcriptase PCR BCR-ABL (qualitative) and STR Chimerism.

LOCATION : Second Floor, Clinical Block, Hospital Canselor Tuanku Muhriz

REQUEST FORM: HCTM/JKIK/PMD(RP)12/17 (Pin.1/2024)

CONTACT NUMBER: 039145 EXT 5823/ 8274

GENERAL RULE:

1. All tests requested must include relevant clinical history and diagnosis.
2. All requested samples must be **consented by patients** (refer to the page 2 of the request form)
3. All requested samples must be from Medical Officers/ Pathologists.
4. Please ensure that the test request is appropriate to the working diagnosis.
5. All the tests are run in batches

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
Chimerism Studies for Allogeneic Transplant (STR)	Short Tandem Repeat	 EDTA 3 ml	1 tube (Minimum 3 ml of fresh peripheral blood)	Monday - Friday (8am-5pm) Specimens must reach the Molecular Lab. within : AM - 12.30pm PM - 4.30pm	-	30	**Indication** 1. Donor and recipient who undergo stem cell transplantation (pre-transplant samples should send samples together) 2. Repeated samples (post transplant) within a period of 1 month, 3 month, 6 month & 12 month.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
BCR-ABL	Reverse Transcriptase PCR-Qualitative	 EDTA 3 ml	1 tube (Minimum 3 ml of fresh peripheral blood/ bone marrow aspirate)	Monday - Friday (8am-5pm) Specimens must reach the Molecular Lab. within : AM - 12.30pm PM - 4.30pm	-	15	**Indication** 1. All new cases of acute leukaemia and Myeloproliferative Neoplasms. 2. Repeated samples that are positive with BCR-ABL at diagnosis. 3. All relapse cases of acute leukaemia. 4. Repeated and negative known cases will be rejected. Suggestion for : ● Acute Lymphoid Leukemia ● Acute Myeloid Leukemia ● Chronic Eosinophilic Leukemia ● Chronic Myeloid Leukemia ● Chronic Myeloid Monocytic Leukemia ● Chronic Neutrophilic Leukemia ● Essential Thrombocytosis ● Juvenile Myeloid Monocytic Leukemia ● Myelodysplastic Syndrome ● Myeloproliferative Neoplasms ● Myelofibrosis ● Mastocytosis ● Polycythaemia Rubra Vera
Alpha Thalassaemia Genotype	Multiplex PCR 1. Single gene deletion: (- α $^{3.7}$) 2. Single gene deletion: (- α $^{4.2}$) 3. Single gene deletion : (- α $^{20.5}$) 4. Two gene deletion: (- - ^{SEA}) 5. Two gene deletion: (- - ^{FIL}) 6. Two gene deletion: (- - ^{MED}) 7. Two gene deletion: (- - ^{THAI}) 8. Non-deletion: Initiation codon (ATG□ A-G)	 EDTA 3 ml	1 tube (Minimum 3 ml of fresh peripheral blood)	Monday - Friday (8am-5pm) Specimens must reach the Molecular Lab. within :	-	30	**Indication** 1. Patients with thalassaemic red cell parameters (Serum Iron, TIBC, and Hb Analysis are normal). 2. Require family history information for family screening cases 3. Please request FBC test, Serum Iron and TIBC, and Hemoglobin Analysis before sending a sample for the Thalassaemia Genotype test.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
	9. Non-deletion: Codon 30 (ΔGAG) 10. Non-deletion: Codon 35 (TCC□CCC) 11. Non-deletion: Codon 59 (GGC□GAC) 12. Non-deletion: Codon 125 (CTG□CCG) / Hb Quong Sze 13. Non-deletion: Termination Codon (TAA□CAA) / Hb Constant Spring	Plain sterile container and fully covered with aluminium foil. (protect from light)	Minimum 10 ml of fresh CVS/ Amniotic fluids	AM - 12.30pm PM - 4.30pm		3	Appointment for prenatal diagnosis before sending a sample to the lab.
Beta Thalassaemia Genotype	Multiplex GAP-PCR (Deletion) 1. δβ-Siriraj I 2. 3.5kb deletion 3. β° Filipino 4. SEA 5. HPFH-6 deletion 6. Hb Lepore 7. 619 bp deletion 8. δβ° Thai MARMS-PCR (Mutation) 1. IVS 1-5 (G-C) 2. codon 41/42 (-TTCT) 3. Cd 17 (A-T) 4. Cd 26 (G-A) 5. IVS 1-1 (G-T) 6. Cd 8/9 (+G) 7. -28 (A-G) 8. Cd 71/72 (+A) 9. IVS 1-1 (G-A) 10. Cd 43 (G-T) 11. Cd 16 (-C) 12. Poly A (A-G)	 EDTA 3 ml	1 tube (Minimum 3 ml of fresh peripheral blood)	Monday - Friday (8am-5pm) Specimens must reach the Molecular Lab. within : AM - 12.30pm PM - 4.30pm	-	30	**Indication** 1. Require family history information for family screening cases 2. Please request FBC test, Serum Iron and TIBC and Hemoglobin Analysis before sending a sample for Thalassaemia Genotype test.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
	13. -88 (C-T) 14. Initiation codon (ATG-AGG) 15. Cd 15 (G-A) 16. -29 (A-G) 17. '-86 (C-G) 18. Cd 19 (A-G) 19. Cap+1 (A-C) 20. IVS 2-654 (C-T)						
JAK2 V617F Mutation	ARMS PCR	 EDTA 3 ml	1 tube (Minimum 3 ml of fresh peripheral blood)	Monday - Friday (8am-5pm) Specimens must reach the Molecular Lab. within : AM - 12.30pm PM - 4.30pm	-	30	**Indication** 1. All new cases of Myeloproliferative Neoplasms (MPN). 2. This test is for screening only. 3. Repeated & negative known cases will be rejected. Suggestion for : ● Bone Marrow Disorder ● Polycythemia Vera ● Essential Thrombocytopenia ● Primary Myelofibrosis ● Chronic Eosinophilic Leukemia ● Chronic Neutrophilic Leukemia ● Myelodysplastic Syndromes ● Chronic Myeloid Leukemia

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
1. Request form not complete 2. No consent taken from patients (please refer to the page 2 of the request form) 3. Specimen not labeled 4. Wrong tube 5. Label at tube different from request form 6. Insufficient 7. Empty tube 8. No request form 9. Repeated request without clinical significant (test requested within a short period of time) 10. Not indicated cases (please refer to the Notes/ Request Form (page 2) for each test before sending samples)	NA

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES
NA

7.10 Bacteriology Unit

INTRODUCTION	:	Bacteriology Unit provides the identification of bacteria and antimicrobial susceptibility testing. The laboratory play a crucial role in identifying bacteria that cause infections in humans. Antimicrobial susceptibility testing is a laboratory procedure to identify which antimicrobial is effective for individual patients. On a larger scale, the testing aids in evaluating treatment services provided by hospital to control and prevent infectious diseases.
LOCATION	:	Level Basement, Gugusan Mikrobiologi, Blok Pendidikan, Hospital Canselor Tuanku Muhriz.
REQUEST FORM	:	HCTM/JKIK/PMD(RP) 01/17 (Pin. 1/2024)
CONTACT NUMBER	:	03-9145 5480

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
1. Blood Culture (periheral/ central)	Microscopy Culture & Sensitivity Identification * refer insert/manual of Blood Culture System	Blood culture bottle	Blood bottle aerob & anaerob: 8-10ml Blood bottle paed : 0.5-5 ml Mycobacteria : 1-5 ml	Daily	8 days (Except PUO/IE cases, 18 days)	Send the specimen to the laboratory **WITHOUT UNDUE DELAY.** **DO NOT** store blood culture bottle in the **refrigerator.** **DO NOT** use **expired** blood culture bottle. **DO NOT** send the blood culture bottle **by pneumatic tube.**

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

a. Blood culture is required when bacteraemia (septicaemia) is suspected. Whenever possible blood should be collected before antimicrobial treatment has started.
b. Collect the blood as the temperature begins to rise. Always collect blood from peripheral vein except when 'catheter related' blood stream infection is suspected, whereby both peripheral and catheter blood should be drawn concurrently with same volume.
c. Aseptic technique is used for venipuncture.
d. Disinfect the skin starting from the center to periphery in concentric motion with antiseptic agent.
e. Allow time for drying and do not touch the cleaned area except with sterile glove.
f. Perform venipuncture.
g. Remove the cap of culture bottles, wipe the top part with alcohol and allow drying.
h. Inoculate adequate volume of blood into each bottle.
i. Gently invert inoculated blood culture bottle 2 to 3 times.
j. Label each bottle with patient's name and identification number. Label should not block the existing barcode (on the bottle).

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
2. Cerebrospinal Fluid (CSF) Culture	Macroscopy Microscopy Culture & Sensitivity Identification	Sterile screw-capped containers	1-3 ml	Daily	5 days	**Do not store CSF specimen in the refrigerator.** **Transport specimen** to laboratory **WITHOUT UNDUE DELAY**.
3. Bacterial Antigen Detection in CSF	Latex Agglutination	Sterile screw-capped containers	1-3 ml	Daily	1 day	
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES						
a. CSF must be collected aseptically to prevent organisms from being introduced into the central nervous system. An experienced medical officer should perform the procedure. The steps involved are not described in this document. b. The specimen obtained is collected in sterile screw-capped containers.						

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
4.Bile Culture	Macroscopy Microscopy Culture & Sensitivity Identification	Sterile screw-capped container	Not applicable	Daily	5 days	**Transport specimen** to laboratory **WITHOUT UNDUE DELAY**.
5.Synovial Fluid Culture	Macroscopy Microscopy Culture & Sensitivity Identification	Sterile screw-capped container	Not applicable	Daily	5 days	**Transport specimen** to laboratory **WITHOUT UNDUE DELAY**.
6.Pleural Fluid Culture	Macroscopy Microscopy Culture & Sensitivity Identification	Sterile screw-capped container	Not applicable	Daily	5 days	**Transport specimen** to laboratory **WITHOUT UNDUE DELAY**.
7.Pericardial Fluid Culture	Macroscopy Microscopy Culture & Sensitivity Identification	Sterile screw-capped container	Not applicable	Daily	5 days	**Transport specimen** to laboratory **WITHOUT UNDUE DELAY**.

8. Peritoneal/ ascites Fluid Culture	Macroscopy Microscopy Culture & Sensitivity Identification	Sterile screw-capped container	Not applicable	Daily	5 days	**Transport specimen** to laboratory **WITHOUT UNDUE DELAY**.
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES						
a. The steps involved are not described in this document. An experienced medical officer should perform the procedure. b. The specimen obtained is collected in sterile screw-capped containers.						

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
9. Throat Swab Culture	Culture & Sensitivity Identification	Swab transport medium	Not applicable	Daily	5 days	**If diphtheria is suspected**, please indicate in request form as "***Corynebacterium diphtheria*** **culture**"
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES						
a. Hold the tongue down with a depressor. b. Use a strong light source to locate areas of inflammation and exudates in the posterior pharynx and the tonsils. c. Swab the affected area using sterile cotton swab. Do not contaminate with saliva. d. Insert swab into transport medium. e. It is dangerous to swab the throat of a child with acute *Haemophilus* epiglottitis because this may trigger sudden airway obstruction. Blood culture should be collected instead.						

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
10. Nasal Swab Culture	Culture & Sensitivity Identification	Swab transport medium	Not applicable	Daily	5 days	**For suspected carrier** of ***Haemophilus influenzae, Neisseria meningitidis, Staphylococcus aureus and Streptococcus pyogenes.***
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES						
a. Insert and rotate swab into both nostrils. b. Withdraw and insert swab into transport medium.						

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
11. Nasopharyngeal/ pernasal Swab *(Bordetella pertussis)*	Culture & Sensitivity Identification	Swab transport medium/ Amies transport medium with charcoal (flexible-wire calcium alginate-tipped)	Not applicable	Daily	18 days	Please **request swab and transport medium** from **Microbiology Reception Counter**. **Send specimen** to laboratory **WITHOUT UNDUE DELAY**.
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES						
a. These specimens are used for the isolation of *Bordetella pertussis*. b. Carefully insert a flexible-wire calcium alginate-tipped swab horizontally to the back of the nose. If obstruction is encountered withdraw the swab and reinsert it through the other nostril. c. Withdraw the swab again and insert swab into transport medium.						

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
12. Tracheal Aspirate Culture*	Microscopy Culture & Sensitivity Identification	Sterile container	Not applicable	Daily	5 days	
13. Bronchoalveolar Lavage (BAL) Culture**	Microscopy Culture & Sensitivity Identification	Sterile container	Not applicable	Daily	5 days	Please remove the tubing on specimen trap before sending to laboratory.
14. Gastric aspirate Culture	Microscopy Culture & Sensitivity Identification	Sterile container	Not applicable	Daily	5 days	
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES						
a. * An experienced health care personnel should perform the procedure. The steps involved are not described in this document. b. ** An experienced medical officer should perform the procedure. The steps involved are not described in this document.						

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
15. Sputum Culture	Microscopy Culture & Sensitivity Identification	Sterile container	Not applicable	Daily	5 days	Do not send saliva.
16. Nasopharyngeal Aspirate (NPA) Culture	Microscopy Culture & Sensitivity Identification	Sterile container	Not applicable	Daily	5 days	
17. Mycoplasma/ Ureaplasma Identification	Hydrolysis Reaction	Sterile container	Not applicable	Daily	5 days	Specimen: NPA

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

a. Sputum is best collected in the morning soon after the patient wakes and before any mouthwash is used. The specimen must be sputum, not saliva or post-nasal discharge.
b. Give the patient a wide-necked, leak-proof sterile container, and request patient to cough deeply to produce sputum.
c. When pulmonary tuberculosis is suspected, up to three consecutive specimens (on different days) may be needed for Acid Fast Bacilli (AFB) detection.
d. When it is not possible to obtain sputum from children with suspected pneumonia, NPA can be obtained by aspiration of mucopus in nasopharynx.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
18. Urine Culture	Macroscopy, Microscopy Culture & Sensitivity Identification	Strew capped sterile container	About half of the sterile container	Daily	5 days	**Label type of specimen as urine on the container.** **State the TIME** of collection on the container. **Send the specimen within 2 hours** of collection. **If not possible, refrigerate the urine at 4 to 8 ºC prior to sending. Transportation requirement :** in **ice pack** to maintain the stability
19. *Streptococcus pneumoniae* Antigen Detection	Immunochromatographic	Screw capped sterile container	About half of the sterile container	Daily	1 day	Urine specimen.

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

a. Explain to the patient the need to collect 'clean-catch' urine with as little contamination as possible.
b. Give the patient a sterile container and request urine about half volume of the sterile container. Renal failure patients and young children may not possible to collect more than a few milliliters of urine.
c. Clean genitalia with water. Do not use soap or antiseptic fluid.
d. Open the cap of the urine container aseptically.
e. Void a small volume of urine (eg 100 ml), then 'clean-catch' the midstream urine into the container.
f. Close the urine container tightly.
g. When renal tuberculosis is suspected send three consecutive first morning urine (on different days). Do not submit 24h-urine collection for mycobacterial culture.
h. Suprapubic aspiration (SPA) is useful in paediatrics patients when 'clean-catch' urine specimens are difficult to obtain. The steps involved are not described in this document. An experienced medical officer should perform the procedure.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
20. Faeces Culture	Macroscopy Culture & Sensitivity Identification	Sterile container	About 1 g	Daily	5 days	
21. *Clostridium Difficile* Culture	Culture & Sensitivity Identification	Sterile container	About 1 g	Daily	5 days	
22. *Clostridium Difficile* Toxin	Immunochromatographic	Sterile container	About 1 g	Daily	1 day	
23. Stool Occult Blood	Immunochromatographic	Sterile container	About 1 g	Daily	1 day	
24. Rotavirus Antigen Detection	Immunochromatographic	Sterile container	About 1 g	Daily	1 day	

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

a. Faeces should be collected during the acute stage of diarrhoea.
b. Inform patient to avoid contaminating the faeces with urine.
c. Transfer about 1 gram of the specimen that contains mucus, pus or blood into the container.
d. When it is not possible to obtain faeces, collect rectal specimen using sterile swab.
e. Insert swab into rectum for about 10 seconds. Avoid contamination of specimen with bacteria from anal skin. Insert swab into transport medium.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
25. Ear Swab Culture	Microscopy Culture & Sensitivity Identification	Swab transport medium	Not applicable	Daily	5 days	
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES						
a. No antibiotics or other therapeutic agents should have been in the aural region for about three hours prior to sampling the area as this may inhibit the growth of organisms. b. Place a sterile swab into the outer ear and gently rotate to collect the secretions/ purulent discharge. c. Place swab in transport medium. d. For deeper ear swabbing a speculum may be used. Experienced medical staff should undertake this procedure as damage to the eardrum may occur.						

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
26. Eye Culture	Microscopy Culture & Sensitivity Identification	Swab transport medium/ sterile container	Not applicable	Daily	5 days	
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES						
a. If pus or discharge is present, use a sterile swab to clean the area. b. Do not scrape the conjunctiva while cleaning the eye (s). c. Discard the cleaning swab. d. If both eye are affected, swab the least-affected eye first or collect separate specimens on each eye. e. Thoroughly swab the lower, then the upper conjunctiva two to three times each. f. Insert swab into transport medium.						

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
27. Vagina Swab Culture	Microscopy Culture & Sensitivity Identification	Swab transport medium	Not applicable	Daily	5 days	HVS is **suitable for candidiasis** and **bacterial vaginosis.**
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES						
a. Moisten sterile vaginal speculum with sterile warm water. b. Insert the speculum into vagina. c. Swab the posterior fornix or the lateral wall of vagina with a sterile cotton swab. d. Insert swab into transport medium. e. For the detection of clue cells in suspected cases of bacterial vaginosis (BV), make a smear of the vaginal discharge on a glass slide by gently rolling the swab on the slide. Do not label patient's sticker at the smear area. f. Allow the slide to air-dry before sending it to lab.						

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
28. Cervix swab	Microscopy Culture & Sensitivity Identification	Swab transport medium	Not applicable	Daily	5 days	
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES						
a. Moisten sterile vaginal speculum with sterile warm water. b. Do not lubricate the speculum with antiseptic cream or gel. c. Insert the speculum into vagina. d. Cleanse the cervix using a swab moistened with sterile normal saline. e. Pass a sterile cotton swab into the endocervical canal and gently rotate the swab against the endocervical wall to obtain the specimen. f. Insert swab into transport medium.						

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
29. Urethral Swab	Microscopy Culture & Sensitivity Identification	Swab transport medium	Not applicable	Daily	5 days	For male patient.
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES						
a. Cleanse around the urethral opening using sterile cotton swab moistened with sterile normal saline. b. Gently massage the urethra from above downwards. c. Collect a sample of discharge using sterile swab. d. Insert swab into transport medium.						

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
30. Intrauterine Contraceptive Device (IUCD) Culture	Microscopy Culture & Sensitivity Identification	Sterile container	Not applicable	Daily	5 days	For **suspected** cases of **endometritis**.
31. Catheter Tip Culture (EVD/CVL)	Culture & Sensitivity Identification	Sterile container	Not applicable	Daily	5 days	Submit catheter tip only if there are sign of infection. For ventricular-peritoneal shunts, peritoneal or spinal fluid is preferred to the catheter tip.
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES						
Not Applicable.						

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
32. Corneal Scraping for Microscopy Examination	Gram stain	Slide	Not applicable	Daily	1 day	
33. Corneal Scraping Culture	Microscopy Culture & Sensitivity Identification	Inoculated plate	Not applicable	Daily	5 days	
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES						
a. Under local anaesthesia, scrape multiple areas of ulceration and suppuration with a sterile Kimura spatula. b. Do not touch the eyelashes. c. Directly inoculate the scrapped material on culture plates.						

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
34. Abscess/ Pus Culture	Microscopy Culture & Sensitivity Identification	Sterile container/ swab transport medium	About 5 ml (pus)	Daily	5 days	
35. Bone Culture	Microscopy Culture & Sensitivity Identification	Sterile container	Not applicable	Daily	5 days	
36. Tissue	Microscopy Culture & Sensitivity Identification	Sterile container	Not applicable	Daily	5 days	

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

a. When collecting pus from abscesses, wounds or other sites, special care should be taken to avoid contaminating the specimen with commensal organisms from the skin.
b. Wound specimen should be collected before antiseptic dressing is applied.
c. Pus from an abscess is best collected at the time the abscess is incised and drained.
d. For open wounds and tissue specimen, cleanse the superficial area thoroughly with sterile saline. Remove all superficial exudates prior to collection. Sample from base or advancing margin of lesion.
e. Collect swabs only when tissue or aspirate cannot be obtained.
f. For pus, aspirate the deepest portion of the lesion or exudates with a syringe and needle, aseptically.
g. For acute osteomyelitis, pus obtained from direct aspiration at surgery gives the best results. Swabs of pus are discouraged. Blood cultures should always be taken.
h. For chronic osteomyelitis, the best material for culture is granulation tissue or pus from the infected bone. Wound swabs from the discharging sinus are of limited value. Blood cultures are not helpful.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
37. Acid Fast Bacilli (AFB) Stain	Auramine Stain	Sterile container/ Swab transport medium	Refer to the above information	Daily	1 day	

38. Mycobacterial Culture	Culture & Sensitivity Microscopy Identification	Sterile container/ Blood culture bottle for mycobacterium culture	Refer to the above information	Weekdays	10 weeks	
39. Gram Stain	Microscopic Identification	Swab transport medium/ sterile container/ slide	NOT APPLICABLE	Daily	1 day	
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES						
Not Applicable.						

BACTERIOLOGY REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
1. Incomplete request form : a) No RN/ IC No./ Passport No. b) No type of specimen. c) No type of test. d) No name of Medical Officer (MO). e) No location of ward/clinic. f) No date/time of specimen. 2. Unlabelled specimens : a) No RN/ IC No./ Passport No. b) No name of patient c) No type of specimen 3. Discrepancy between patient identification on requisition and specimen container label. 4. Specimen source or type not stated. 5. Request form being sent without accompanying specimen, vice-versa. 6. Tests that are not offered in routine services. 7. Improper or nonsterile container. 8. Leaking container. 9. Specimen placed in wrong container. 10. Duplicate request. 11. No date and time of collection stated for urine culture. 12. Specimen exceeding 24 hours of collection. 13. Specimen send in formalin. 14. Saliva or post-nasal discharge specimen for sputum culture. 15. Sputum specimen with < 25 WBC, > 10 epithelial cells/lpf. 16. More than one specimen of urine, stool, sputum, wound or routine throat specimen submitted on the same day from the same source. 17. Only one swab submitted with multiple request for various organisma (bacteria, AFB, fungi, virus, ureoplasmas, etc.) 18. Do not send urine, blood culture and other specimens in glass container using pneumatic tube. ***Please send one request form per test.**	**Please refer notes.**

7.11 Mycology Unit

INTRODUCTION	:	Our mycology laboratory specializes in fungal diagnostics, including the identification of fungi and antifungal susceptibility testing for species such as Candida. We also offer serological fungal screening. Our lab plays a critical role in accurately diagnosing and treating fungal infections, leading to improved patient outcomes and more targeted therapies.
LOCATION	:	Level Basement, Gugusan Mikrobiologi, Blok Pendidikan, Hospital Canselor Tuanku Muhriz.
REQUEST FORM	:	HCTM/JKIK/PMD(RP) 03/17 (Pin. 1/2024)
CONTACT NUMBER	:	03-91455484

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
1. Aspergillus Antigen (Galactomannan)	ELISA	 Plain tube for blood  sterile container for BAL	Blood Adult: 4 ml Paed: 1-2 ml BAL 1-3 ml	8.00am – 5.00pm (Office hours)	14 working days	**<u>Stability of samples:</u>** serum: Room temp: 2 hours 2ºC -8ºC: 1 week -20 ºC -80ºC: > 1 year BAL: -20 ºC -80ºC: up to 5 months 2ºC -8ºC: 24 hours only
2. Candida Antigen		 Plain tube for blood	Blood Adult: 4 ml (The performance of this test has not been evaluated with neonatal or pediatric serum/plasma samples)			

3. Cryptococcus Antigen	Lateral Flow Assay (LFA)	 Plain tube for blood  Sterile container for CSF	Blood Adult: 4 ml Paed: 1-2 ml CSF minimum 0.5 ml	8.00am – 5.00pm (Office hours) 24 hours ONLY for CSF	2 working days for blood 1 working day for CSF	**<u>Stability of samples:</u>** serum / CSF: Room temp: 2 hours 2ºC -8ºC: up to 72 hours -20 ºC -80ºC: > 1 year
4. Fungal Culture (other than blood)	• Culture on various mycological isolation media • Sensitivity • Identification	 Sterile Petri dish only	1. Dermatological samples: (skin,nail and hair)	8.00am – 5.00pm (Office hours)	30 working days	**<u>Stability of samples:</u>** 2ºC -8ºC: 1 week Room temp:24 hours • **DO NOT** collect n put the specimen inside **paper** or on the **slide** • **DO NOT** put scalpel blade/ scraper together in a Petri dish.

		 Tracheal Culture Bottle  sterile container for Tracheal aspirate n NPA  Sterile container	2. Respiratory samples: (BAL, sputum, Tracheal aspirate, NPA)			**Stability of samples:** 2ºC -8ºC: 1 week Room temp:24 hours
		 Sterile container	3. Pus and exudate 4. Body fluids 5. Tissue biopsy 6. Urine 7. CSF			**Stability of samples:** 2ºC -8ºC: 1 week Room temp:24 hours ● **DO NOT** send tissue biopsy in any liquid or **formalin** ● **DO NOT** store CSF in the **refrigerator**

5. Blood Culture (BACTEC bottle)	BACTEC FX	 Myco/ F lytic bottle	Blood: 1-5 ml	8.00am – 5.00pm (Office hours)	30 working days	**Stability of samples:** Room temp: 24 hours ● **DO NOT** store blood culture bottle in the **refrigerator.** ● **DO NOT** use **expired** blood culture bottle. ● **DO NOT** send the blood culture bottle **by pneumatic tube.**
6. *Pneumocystis jirovecii*	Giemsa staining	 Sterile container	Induced sputum and BAL	8.00am – 5.00pm (Office hours)	3 working days	**Stability of samples:** Room temp: 24 hours

REJECTION CRITERIA	**FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION**
1. Incomplete request form : ● No RN/ IC No./ Passport No. ● No type of specimen. ● No type of test. ● No name of Medical Officer (MO). ● No location of ward/clinic. ● No date/time of specimen.	**NA**

2. Unlabelled specimens : ● No RN/ IC No./ Passport No. ● No name of patient ● No type of specimen 3. Discrepancy between patient identification on requisition and specimen container label. 4. Specimen source or type not stated. 5. Request form being sent without accompanying specimen, vice-versa. 6. Tests that are not offered in routine services. 7. Improper or non sterile container. 8. Leaking container. 9. Specimen placed in wrong container. 10.Specimen sent in formalin. 11.Do not send urine, blood culture and other specimens in a glass container using a pneumatic tube. 12.Blood Bactec Myco/ F lytic expired 13. Empty tube/container received 14. Hemolyzed specimen 15. Insufficient specimen/sample 16. Test not offered 17. Specimen not suitable for testing	

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

- **Dermatological specimens:**
  Scrapings must be taken from the outside edge of the lesion using a scalpel blade held at right angles to the skin and put in a sterile petri dish. Do not put scalpel blade/ scraper together in a Petri dish.

- **Other specimens:**
  The steps involved are not described in this document. An experienced medical officer should perform the procedure.The specimen obtained is collected in sterile screw-capped containers.

- **Blood Culture specimens:**
  a. Always collect blood from peripheral veins except when 'catheter related' bloodstream infection is suspected, whereby both peripheral and catheter blood should be drawn concurrently with the same volume.
  b. Aseptic technique is used for venipuncture.
  c. Disinfect the skin starting from the center to periphery in concentric motion with antiseptic agent.
  d. Allow time for drying and do not touch the cleaned area except with a sterile glove.
  e. Perform venipuncture.
  f. Remove the cap of culture bottles, wipe the top part with alcohol and allow drying.
  g. Inoculate an adequate volume of blood into each bottle.
  h. Gently invert the inoculated blood culture bottle 2 to 3 times.
  i. Label each bottle with the patient's name and identification number.
  j. Sticker label should not block the existing barcode (on the bottle)
  k. **DO NOT** store blood culture bottles in the **refrigerator.**

Notes: Mycology unit does not offer 24-hour lab service and does not conduct testing on public holidays except for Cryptococcus antigen detection test (CSF specimen only).

7.12 Molecular Biology Unit

INTRODUCTION	:	Molecular Biology Unit is one of the laboratories in JPMD that provide molecular testing in detection and quantification of DNA/ RNA viruses and bacteria.
LOCATION	:	Level Basement, Gugusan Mikrobiologi, Blok Pendidikan, Hospital Canselor Tuanku Muhriz.
REQUEST FORM	:	HCTM/JKIK/PMD(RP) 02/17 (Pin. 1/2024)
CONTACT NUMBER	:	03-9145 5853

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
HEPATITIS B (DNA) VIRUS - QUANTITATIVE PCR	REAL - TIME PCR	 OR Plain tube/ EDTA Tube	3.0 ml x 2 tubes Plain/ EDTA Tube	8.00 AM - 5.00 PM (WORKING DAYS)	10 days	**<u>Stability of samples</u>** **a. Whole blood:** i. up to **24 hours** if stored at **2-25°C.** ii. Must be **centrifuged within 24 hours of collection.** **b. Serum/ Plasma**: i. up to **6 days** if stored at **2-8°C** ii. up to **12 weeks** if stored at **<u>≤</u> -18°C.** **Reference: Kit Insert**
HEPATITIS C (RNA) VIRUS - QUANTITATIVE PCR		 OR Plain tube/ EDTA Tube	3.0 ml x 2 tubes Plain/ EDTA Tube		10 days	

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
HUMAN IMMUNODEFICIENCY VIRUS-1 QUANTITATIVE PCR	REAL - TIME PCR	 EDTA Tube	3.0 ml x 2 tubes EDTA Tube	8.00 AM - 5.00 PM (WORKING DAYS)	10 days	**Stability of samples** **a. Whole blood**: i. up to **24 hours** if stored at **2-25°C.** ii. Must be **centrifuged within 24 hours of collection.** **b. Plasma:** i. up to **6 days** if stored at **2-8°C.** ii. up to **12 weeks** at **≤ -18°C** **Reference: Kit insert**
CYTOMEGALOVIRUS (DNA) - QUANTITATIVE PCR		 EDTA Tube	3.0 ml x 2 tubes EDTA Tube		10 days	**Stability of samples** **a. Whole blood:** i. up to **36 hours** if stored at **2-25°C.** ii. Must be **centrifuged within 24 hours of collection.** **b. Plasma:** i. up to **6 days** if stored at **2-8°C.** ii. up to **12 weeks** if stored at **-20°C ± 2°C.** **Reference: Kit insert**

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
MYCOBACTERIUM TUBERCULOSIS COMPLEX / NON-TUBERCULOUS MYCOBACTERIA - QUALITATIVE PCR	REAL - TIME PCR	 Sputum, Tissue, CSF, Bronchial washing, Urine, Body fuids  Bone marrow in EDTA tube 3.0 mL	Minimum 1.0 mL	8.00 AM - 5.00 PM (WORKING DAYS)	10 days	**Stability of samples** up to **48 hours** if stored at **2-8°C.** For long-term storage, recommend storing specimens at **-20°C** **Reference: Kit insert**
EPSTEIN- BARR VIRUS-QUANTITATIVE PCR		 EDTA tube 3.0mL OR  **CSF**	3.0 mL EDTA tube OR Minimum 0.5 mL CSF		30 days	**Stability of samples** a. Whole blood/ CSF: i. up to **24 hours** if stored at **2-8°C**.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
RAPID MOLECULAR COVID-19	Rapid Molecular PCR	1.Throat swab 2. Nasal swab 3.Nasopharyngeal swab 	Samples must be transported on ice (2°C - 8ºC) and in the triple layer packaging	24 hours	2 hours	<u>Triple layer packaging</u> 

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
1. Shared RN 2. Incomplete Request form 3. Unsuitable specimen transport 4. Incomplete label on request form 5. Labelling problem 6. Specimen transportation after working hours 7. Tests Requests not offered 8. Wrong form 9. Wrong label 10. Wrong tube 11. Specimen spills 12. Unsuitable sample 13. Clotted specimen 14. Lysed specimen 15. Insufficient specimen 16. No Request form 17. No Label 18. No RN 19. No sample 20. No tests requested 21. Empty tube 22. Test is not indicated 23. No Clinical History 24. Duplicate test request	**Please refer notes.**

TEST REQUEST PROCEDURE IN JPMD, HCTM

UNIT: MOLECULAR BIOLOGY

General rule:

1. Test requests as per indications and consensus / guidelines.
2. Requests will be screened prior to testing, those not fulfilling sample requirements and indications will be rejected.
   p/s: Subject for change according to unit requirement

No.	Test	Indication	Description	Requester	Source/Rationale
Specialised Test					
1.	Hepatitis B Virus DNA Quantitative PCR-HBV(DNA)PCR	1. Monitoring of chronic hepatitis B patients, after diagnosis by serology. 2. Diagnosis of hepatitis B reactivation in immunosuppressed patients, with non-reactive or reactive anti-HBs.	● Not for screening. ● Frequency or interval of testing depends on HBV viral load, liver function (ALT), HBeAg, cirrhosis etc.	MO / Specialist	Consensus opinion of the relevant expert working group, examples ● Asian-Pacific clinical practice guidelines on the management of hepatitis B: a 2015 update. Hepatol Int (2016) 10:1–98. ● DOI 10.1007/s12072-015-9675-4 ● 2015 World Health Organization (WHO) guidelines for the prevention, care, and treatment of persons with chronic hepatitis B infection. http://apps.who.int/medicinedocs/documents/s21813en/s21813en.pdf ● EASL 2017 Clinical Practice Guidelines on the management of hepatitis B virus infection European Association for the Study of the Liver. Journal of Hepatology 2017; 67:370–398.
2.	Hepatitis C Virus RNA Quantitative	1. Confirmation of active hepatitis C disease in anti-HCV seropositive patients.	● Not for screening. ● Frequency or interval of testing depends on HCV viral load, liver	MO / Specialist	● Guidelines for the screening, care and treatment of persons with chronic hepatitis C infection WHO 2016. http://apps.who.int/iris/bitstream/10665/205035/1/9789241549615_eng.pdf?ua=1

	PCR-HCV(RNA)PCR	2. Confirmation of indeterminate or borderline anti-HCV serology. 3. Monitoring of chronic hepatitis C patients according to consensus. 4. For confirmation of SVR (a qualitative HCV RNA is sufficient but the test is not offered)	function (ALT), cirrhosis, HCV genotype, treatment regimen, etc.		• APASL consensus statements and recommendation for hepatitis C prevention, epidemiology, and laboratory testing. Hepatol Int 2016 10:681–701. • Hepatitis C guidance: AASLD-IDSA recommendations for testing, managing, and treating adults infected with hepatitis C virus. 2015.
3.	Human Immunodeficiency-1 Virus RNA Quantitative PCR- HIV-1 (RNA)PCR	1. Confirmation of borderline or indeterminate serology 2. Baseline HIV-1 viral load at diagnosis 3. Monitoring of HIV-1 patients on HAART, according to consensus. 4. Diagnosis of HIV-1 in newborns of HIV-1 positive mothers.	• Frequency or interval of testing depends on HIV-1 viral load, CD4 count and other clinical parameters.	MO / Specialist	• Guidelines for the Management of Adult HIV Infection with Antiretroviral Therapy, MOH Malaysia 2011. • Consolidated guidelines on HIV prevention, diagnosis, treatment and care for key populations. WHO 2016. • Management of HIV infection in children. CPG, MOH Malaysia. 2008. http://www.moh.gov.my/penerbitan/CPG2017/3887.pdf • Diagnosis of HIV Infection in Infants and Children. https://aidsinfo.nih.gov/guidelines/html/3/perinatal/509/diagnosis-of-hiv-infection-in-infants-and-children • Guidelines for the Management of Adult HIV Infection with Antiretroviral Therapy. MOH Malaysia, 2017. http://www.moh.gov.my/images/gallery/Garispanduan/HIVGUIDELINES.pdf

4.	*Mycobacterium tuberculosis* & Non-tuberculous Mycobacterium Qualitative PCR – TB/NTM PCR	1. For detections of MTB/NTM in body fluids and tissues.	● Must be done together with AFB stain and conventional culture. ● Test results should be correlated with symptoms and clinical presentations. ● Does not distinguish between viable, disease-related organisms and nucleic acid persisting from prior infection. ● Not indicated in patients already AFB positive or previously treated. ● This test has not been studied for use with specimens from patients being treated with anti-tuberculous agents and, therefore should not be used to	MO / Specialist	● Report of an Expert Consultation on the Uses of Nucleic Acid Amplification Tests for the Diagnosis of Tuberculosis. CDC US. Available at https://www.cdc.gov/tb/publications/guidelines/amplification_tests/default.htm

			determine bacteriologic cure or to monitor response to therapy. It is not known how long the PCR assay can remain positive following treatment.		
5.	Cytomegalovirus DNA Quantitative PCR - CMV(DNA) PCR	1. To monitor immunocompromised patients such as post-transplant, HIV patients for pre-emptive treatment and to determine response to treatment.	● Maximum once a week (viral half-life is 5 days). ● Viral load cut-off not defined, depends on host factors, transplant etc.	MO / Specialist	● S.A. Ross, Z. Novak, S. Pati, and S.B. Boppana. Diagnosis of Cytomegalovirus Infections. Infect Disord Drug Targets. 2011; 11(5): 466–474. ● Kotton CN, Kumar D, Caliendo AM, et al. Updated international consensus guidelines on the management of cytomegalovirus in solid-organ transplantation. *Transplantation*. 2013:96:333-360. ● Razonable RR, Åsberg A, Rollag H, et al. Virologic suppression measured by a cytomegalovirus (CMV) DNA test calibrated to the WHO international standard is predictive of CMV disease resolution in transplant recipients. Clin Infect Dis. 2013;56:1546–1553.
6.	Epstein-Barr Virus Quantitative PCR- EBV PCR	1. For detection and quantitative measurement of EBV DNA. To monitor post-transplant lymphoproliferative disorders (PTLD).	● Quantitative evaluation of EBV DNA has been shown to correlate highly with the subsequent (3-4 months) development of PTLD in	MO / Specialist	● Kanakry JA, Hegde AM, Durand CM, et al. The clinical significance of EBV DNA in the plasma and peripheral blood mononuclear cells of patients with or without EBV diseases. Blood 2016;127:2007-2017. ● Green M, Cacciarelli TV, Mazariegos GV, et al: Serial measurement of Epstein-Barr viral load in peripheral blood in lymphoproliferative disease. Transplantation 1998;66(12):1641-1644.

		2. As an adjunct in diagnosis, prognostication and post-treatment monitoring of nasopharyngeal carcinoma (NPC). Diagnosis of central nervous system lymphoma in AIDS patients (CSF sample)	susceptible patients. ● Serial determination of blood specimens is necessary to monitor increasing (risk of development PTLD) or decreasing (treatment efficacy) levels of EBV DNA. ● Viremia or viral shedding may occasionally be detected in asymptomatic individuals. ● This test should not be used to screen asymptomatic patients.		● Chan KCA, Woo JKS, King A, et al. Analysis of plasma Epstein–Barr virus DNA to screen for nasopharyngeal cancer. N Engl J Med 2017;377:513-22. ● Chan KCA. Plasma Epstein-Barr virus DNA as a biomarker for nasopharyngeal carcinoma. Chin J Cancer; 2014; 33(12):598-603. ● M Bibas, A Antinori. EBV and HIV-Related Lymphoma. Mediterr J Hematol Infect Dis. 2009; 1(2): e2009032. ● doi: 10.4084/MJHID.2009.032

7.13 Tissue Culture Unit

INTRODUCTION	:	A tissue culture laboratory previously offered testing for respiratory viruses by growing virus samples in cultured cells to observe their effects and identify the virus. However, this method has now been replaced by molecular testing, such as Multiplex PCR, which offers faster, more accurate, and more sensitive results. Additionally, we provide testing for Influenza A+B, COVID-19, and Chlamydia trachomatis using the Immunochromatography method.
LOCATION	:	Level Basement, Gugusan Mikrobiologi, Blok Pendidikan, Hospital Canselor Tuanku Muhriz.
REQUEST FORM	:	HCTM/JKIK/PMD(RP) 06/17 (Pin. 1/2024)
CONTACT NUMBER	:	03 - 9145 5483

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
Influenza A+B **Rapid Test**	Fluorescence immunochromatography	 Viral Transport Medium for nasal & nasopharyngeal swab  Sterile container for nasopharyngeal & tracheal aspirate	1. Nasal swab 2. Nasopharyngeal swab 3. Nasopharyngeal aspirate 4. Tracheal aspirate	Working days (8.00 am – 5.00 pm)	1 day	Specimen must be transported to the laboratory immediately **on ice**

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
COVID-19 Antigen **Rapid Test**	Immunochromatography	 Flocked swab	Nasopharyngeal swab	24 hours	4 hours	Specimen must be transported to the laboratory immediately **on ice**

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
Automated Multiplex Meningitis Panel PCR 1) *Escherichia coli K1* 2) *Haemophilus influenzae* 3) *Listeria monocytogenes* 4) *Neisseria meningitidis* 5) *Streptococcus agalactiae* 6) *Streptococcus pyogenes* 7) *Streptococcus pneumoniae* 8) *Mycoplasma pneumoniae* 9) *Herpes simplex virus 1* 10) *Herpes simplex virus 2* 11) *Human herpes virus 6* 12) *Enterovirus* 13) *Human parechovirus* 14) *Varicella zoster virus* 15) *Cryptococcus neoformans/ gattii*	Multiplex PCR	 Sterile container	Cerebrospinal fluid (200 µl)	Working days (8.00 am – 5.00 pm)	3 days	Specimen must be transported to the laboratory immediately **on ice**

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
Automated Multiplex Respiratory Panel PCR 1) *Adenovirus* 2) *Bocavirus* 3) *Coronavirus 229E* 4) *Coronavirus HKU1* 5) *Coronavirus NL63* 6) *Coronavirus OC43* 7) *Human Metapneumovirus A+B* 8) *Influenza A* 9) *Influenza A H1* 10) *Influenza A H1N1/pdm09* 11) *Influenza A H3* 12) *Influenza B*	Multiplex PCR	 Universal Transport Medium	Nasopharyngeal swab	Working days (8.00 am – 5.00 pm)	3 days	Specimen must be transported to the laboratory immediately **on ice**

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
13) *Parainfluenza 1* 14) *Parainfluenza 2* 15) *Parainfluenza 3* 16) *Parainfluenza 4* 17) *Respiratory Syncytial Virus A+B* 18) *Rhinovirus/Enterovirus* 19) *Bordetella pertussis* 20) *Chlamydophila pneumoniae* 21) *Legionella pneumophila* 22) *Mycoplasma pneumoniae*	Multiplex PCR	 Universal Transport Medium	Nasopharyngeal swab	Working days (8.00 am – 5.00 pm)	3 days	Specimen must be transported to the laboratory immediately **on ice**

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
Chlamydia trachomatis	Immunofluorescence staining	 Sterile container nasopharyngeal aspirate & bronchoalveolar lavage	1. Nasopharyngeal aspirate 2. Bronchoalveolar lavage	Working days (8.00 am – 5.00 pm)	3 days	
		 Glass slide	1. Cervical smear 2. Genital smear 3. Conjunctiva smear 4. Conjunctiva scraping	Working days (8.00 am - 5.00 pm)	3 days	

REJECTION CRITERIA

1. Incomplete request form with following information:

    a. Patient's details
    b. MRN/ IC/ Passport No./ Other
    c. Applicant's details (e.g. name, signature & official stamp)
    d. Patient's location
    e. Tests
    f. Type of specimen
    g. Clinical history

2. Wrong tube/ container
3. Insufficient specimen for testing
4. Specimen spilled from tube/ container
5. Specimen not suitable for testing
6. Test requested not offered by lab
7. Test requested not indicated
8. Duplicate request
9. Discrepancy of details between request form and specimen
10. No specimen received
11. No request form received
12. Empty tube/ container received
13. Specimen sent not on ice

7.14 Virology Serology Unit

INTRODUCTION	:	Virology Serology Unit provides diagnostic and consultative serology services to support screening, diagnosis and treatment monitoring of infectious diseases caused by viruses and bacteria.
LOCATION	:	Level Basement, Gugusan Mikrobiologi, Blok Pendidikan, Hospital Canselor Tuanku Muhriz.
REQUEST FORM	:	HCTM/JKIK/PMD(RP)04/17 (Pin. 1/2024)
CONTACT NUMBER	:	03 - 9145 5482

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume)	OPERATION HOURS	TAT (Working Day)	NOTES
***Anti-HAV IgM**	Chemiluminescent Microparticle Immunoassay (CMIA)	 Plain tube 3.5ml **OR**  SST tube 3.5ml	1 x 3.0ml whole blood	8.00am – 5.00pm	3 days	All **urgent requests must be notified** to the serology lab at ext. 5482 (office hours) before dispatching samples to the laboratory. For urgent requests **after office hours**, please notify Specialist (Virology) or MO (Microbiology) on-call at **018-7878488** for further consultation. Staff screening request for Hepatitis & HIV **must be through** Poliklinik Warga or Klinik Kesihatan Pekerjaan,HCTM
***Anti-HAV IgG**			1 x 3.0ml whole blood	8.00am – 5.00pm	3 days	
***Anti-HBs**			1 x 3.0ml whole blood	8.00am – 5.00pm	3 days	
HBsAg			1 x 3.0ml whole blood	8.00am – 5.00pm	3 days	
Anti-HBc Total			1 x 3.0ml whole blood	8.00am – 5.00pm	3 days	
***Anti-HBc IgM**			1 x 3.0ml whole blood	8.00am – 5.00pm	3 days	
***Anti-HBe**			1 x 3.0ml whole blood	8.00am – 5.00pm	3 days	
***HBeAg**			1 x 3.0ml whole blood	8.00am – 5.00pm	3 days	
Anti-HCV			1 x 3.0ml whole blood	8.00am – 5.00pm	3 days	
HIV Antigen & Antibodies			1 x 3.0ml whole blood	8.00am – 5.00pm	3 days	
HIV Confirmatory	Line Immuno Assay (LIA)		1 x 3.0ml whole blood	8.00am – 5.00pm	14 days	By special request only; upon discussion with Microbiology specialist

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
Refer attachment	*Some of the tests have not been established for the use of cadaveric blood specimens or the use of bodily fluids other than human serum.

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

1. Relevant clinical history **MUST BE** provided in the request form.
2. **ONLY** the following samples are considered as **URGENT**: Sharp injury (1st sample), screening for stem cell or organ transplant and blood transfusion.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume)	OPERATION HOURS	TAT (Working Day)	NOTES
***Toxoplasma IgG**	CMIA	 Plain tube 3.5ml **OR**  SST tube 3.5ml	1 x 3.0ml whole blood	8.00am – 5.00pm	5 days	
***Toxoplasma IgM**			1 x 3.0ml whole blood	8.00am – 5.00pm	5 days	
***CMV IgG**			1 x 3.0ml whole blood	8.00am – 5.00pm	5 days	
***CMV IgM**			1 x 3.0ml whole blood	8.00am – 5.00pm	5 days	
***Rubella IgG**			1 x 3.0ml whole blood	8.00am – 5.00pm	5 days	
***Rubella IgM**			1 x 3.0ml whole blood	8.00am – 5.00pm	5 days	
TORCH IgG	CMIA & ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	14 days	This panel does not include Syphilis (RPR/VDRL) test
TORCH IgM	CMIA & ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	14 days	This panel does not include Syphilis (RPR/VDRL) test

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
Refer attachment	*Some of the tests have not been established for the use of cadaveric blood specimens or the use of bodily fluids other than human serum.

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

1. Relevant clinical history **MUST BE** provided in the request form.
2. If more than **FOUR** tests are requested, please provide **two tubes** of samples (at least 3 ml each) to ensure sufficient amount of serum for testing.
3. **ONLY** the following samples are considered as **URGENT**: Sharp injury (1st sample), screening for stem cell or organ transplant and blood transfusion.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume)	OPERATION HOURS	TAT (Working Day)	NOTES
Dengue Combo **(IgG,IgM & NS1 Antigen)**	Immuno - chromatographic Test (ICT)	 Plain tube 3.5ml **OR**  SST tube 3.5ml	1 x 3.0ml whole blood	24 hours	24 hours	Please include the **day of fever** in the clinical note. For **urgent requests**, please call lab at ext: **5482** (office hour) or after office hour at ext: **5480** /**018-7878488** MO on-call (Microbiology)
EBV IgG	ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	
EBV IgM	ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	
HSV 1 & 2 Total IgG	ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	
HSV 1 & 2 Total IgM	ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	
Measles IgG	ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	
Measles IgM	ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	

REJECTION CRITERIA	**FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION**
Refer attachment	NA

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

1. Relevant clinical history **MUST BE** provided in the request form.
2. If more than **FOUR** tests are requested, please provide **two tubes** of samples (at least 3 ml each) to ensure sufficient amount of serum for testing.
3. **ONLY** the following samples are considered as **URGENT**: Sharp injury (1st sample), screening for stem cell or organ transplant and blood transfusion.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume)	OPERATION HOURS	TAT (Working Day)	NOTES
Mumps IgG	ELISA	 Plain tube 3.5ml **OR**  SST tube 3.5ml	1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	
Mumps IgM	ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	
Parvovirus IgG	ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	
Parvovirus IgM	ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	
VZV IgG	ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	
VZV IgM	ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	
***Chlamydia pneumoniae* IgG**	ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	
***Chlamydia pneumoniae* IgM**	ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
Refer attachment	NA

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

1. Relevant clinical history **MUST BE** provided in the request form.**(HCTM/JKIK/PMD(RP)04/17 (Pin. 1/2024)**
2. If more than **FOUR** tests are requested, please provide **two tubes** of samples (at least 3 ml each) to ensure sufficient amount of serum for testing.
3. **ONLY** the following samples are considered as **URGENT**: Sharp injury (1st sample), screening for stem cell or organ transplant and blood transfusion.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume)	OPERATION HOURS	TAT (Working Day)	NOTES
Chlamydia trachomatis IgG	ELISA	 Plain tube 3.5ml **OR**  SST tube 3.5ml	1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	
Chlamydia trachomatis IgM	ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	
Legionella pneumophila IgG	ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	
Legionella pneumophila IgM	ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	
Leptospira IgM	Latex Agglutination		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	For confirmation test to IMR,please refer serology lab at ext: 5482
Leptospira IgG	ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	
***Mycoplasma pneumoniae* Total Antibodies**	Particle Agglutination		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	
***Mycoplasma pneumoniae* IgM**	ELISA		1 x 3.0ml whole blood	8.00am – 5.00pm	7 days	

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
Refer attachment	NA

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

1. Relevant clinical history **MUST BE** provided in the request form.
2. If more than **FOUR** tests are requested, please provide **two tubes** of samples (at least 3 ml each) to ensure sufficient amount of serum for testing.
3. **ONLY** the following samples are considered as **URGENT**: Sharp injury (1st sample), screening for stem cell or organ transplant and blood transfusion.

REJECTION CRITERIA

1. Incomplete request form with these following information:

    a. Patient's details
    b. MRN/IC/Passport No./Other
    c. Applicant's details (eg: Doctor's name,official stamp & signature)
    d. Tests
    e. Patient's or Requester's location
    f. Clinical summary (eg: for dengue test, please stated day of fever)

2. Blood collection tube not labelled with MRN/IC/Passport No. & patient's name
3. Discrepancy information between request form and specimen's tube
4. Duplicate/repeated request or test
5. Wrong tube
6. Insufficient specimen/sample
7. Test not offered
8. Specimen not suitable for testing
9. Specimen spilled from blood collection tubes/container
10. Test requested not indicated
11. No specimen received
12. No request form received
13. Empty tube/container received
14. Hemolyzed specimen

NOTES :

- **All rejected bloods will not be returned** to the ward/clinic and will be discarded.
- Unit Virology Serology does not offer 24-hour lab service and does not conduct testing on public holidays except for dengue serology.
- Any request or sample that is sent after operation hours or public holidays, the laboratory may reject the request and sample, if it does not meet the lab's reception criteria.
- All samples will be discarded 7 days after issuance of report/result.

7.15 Immunology Unit

INTRODUCTION	:	The Immunology Unit is a specialized laboratory dedicated to the study and understanding of the human immune system, particularly its role in maintaining health and contributing to disease. The unit is actively involved in the investigation of various immunological conditions including infections, autoimmune diseases, allergies, and immunodeficiencies. At the moment, our laboratory services focus on the detection of autoantibodies and screening of the primary immunodeficiency diseases.
LOCATION	:	Level Basement, Gugusan Mikrobiologi, Blok Pendidikan, Hospital Canselor Tuanku Muhriz.
REQUEST FORM	:	HCTM/JKIK/PMD(RP)05/17 (PIN.1/2024)
CONTACT NUMBER	:	03-91455482

TEST		METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Days)	NOTES
Anti Nuclear Antibody (ANA)	**Titration**	**IFA**	 **Plain Tube With Gel**	3ml whole blood	8.00AM - 5.00PM (Working days)	Negative	12	
Anti-Double Stranded DNA (dsDNA)		**ELISA**				Negative	12	
Anti Smooth Muscle Antibodies (ASMA)		**IFA**				Negative	12	
Anti-Mitochondrial Antibodies (AMA)		**IFA**				Negative	12	
Rheumatoid Factor (RhF)		**Agglutination**				Negative	4	
Complement 3 (C3)		**Nephelometry**				Please refer OMS for the current reference range	4	
Complement 4 (C4)								
Immunoglobulin A (IgA)								
Immunoglobulin G (IgG)								
Immunoglobulin M (IgM)								
Syphilis Screening (*Treponema pallidium*)	**RPR**	**Agglutination**				Non-Reactive	4	For urgent request - please contact microbiologist incharge Ext: Office hour 5482 After office hour 018-7878488 (on-call)

TEST		METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Days)	NOTES
Syphilis (*Treponema pallidium*)	**TP-PA**	**Agglutination**	 **Plain Tube With Gel**	3ml whole blood	8.00AM - 5.00PM (Working days)	Non-Reactive	7	
Anti-Streptolysin O		**Agglutination**				Negative	4	
Extractable Nuclear Antibodies (Panel)	**Ribonucleoprotein (RNP)**	**Immunoblot (EIA)**				Negative	30	
	Smith (Sm)					Negative		
	SSA (Ro)					Negative		
	SSB (La)					Negative		
	Antiscleroderma (Scl-70)					Negative		
	Jo-1					Negative		
***Salmonella typhi* (Serologi)**		**EIA**				Negative	5	
Nitroblue Tetrazolium Test (NBT)		**Microscopic**	Specialized Heparinized Tube Provided by Cellular Immunology Laboratory	10 ml Fresh Blood	by appointment Call Immunology Laboratory Ext;5482 Working days	Unstimulated cells = 0-38% PMA Stimulated cells = 63% - 90% (Microscopic)	14	Specimen must be transported to the laboratory immediately
Phagocytic Function Test		**Microscopic & Chlemuniesence Assay**						

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
1. Incomplete request form 2. No request form 3. Insufficient specimen volume 4. Wrong specimen container 5. Lysed spesimen 6. No or incorrect labelling of specimen tube with patient information 7. Request of test is repeated within a turn around time period	1. Hemolysed sample 2. Lipemic sample
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES	
NA	

7.16 Parasitology Section

INTRODUCTION	:	Parasitology testing in the lab is the process of diagnosing and identifying parasitic infections by analyzing patient samples. It typically involves examining bodily fluids, feces, blood, or tissue samples under a microscope, or using molecular and immunological methods.
LOCATION	:	Level Basement, Gugusan Mikrobiologi, Blok Pendidikan, Hospital Canselor Tuanku Muhriz.
REQUEST FORM	:	HCTM/JKIK/PMD(RP) 22/19 (Pin. 1/2024)
CONTACT NUMBER	:	03-91455928

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	TAT (Working Day)	NOTES
1. Malaria parasite	Blood smear and staining (thick and thin smear)	 EDTA tube 3.0ml	Blood Adult : > 1.0 ml Pead : > 0.5 ml	24 hours	2 hour	Mix gently by inverting 6 -10 times. Tubes inversions prevent clotting. Specimen is stable for 24 hours in room temperatures. Please send specimen immediately or at least 30 minutes after blood collection at room temperature. Repeated applications on the same day will be rejected.

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
1. Incomplete request form with these following information: a. Patient's details b. MRN/IC/Passport No./Other c. Applicant's details (eg: Doctor's name,official stamp & signature) d. Tests e. Patient's or Requester's location f. Clinical summary (eg: for dengue test, please stated day of fever) 2. Blood collection tube not labelled with MRN/IC/Passport No. & patient's name	

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES
For hospitalized patients, repeat BFMP at 24, 48, and 72 hours after starting therapy.

7.17 Forensic and Mortuary Unit

UNIT SERVICES

1. Handling of deceased from Ward and Emergency department.
2. Handling of deceased brought in by police (brought-in-dead).
3. Release of deceased to next of kin/authorized claimant.
4. Management of unclaimed deceased, human remains and body parts.
5. Medicolegal autopsy.
6. Management of medicolegal specimens and forensic evidence.
7. Processing and handling of postmortem reports.

OPERATING HOURS

PROCEDURE	OPERATION TIME
○ Receive of body from ward and A&E ○ Receive of body from Police ○ Body/body part release to next of kin/ claimant	24hrs *Public Holiday, Weekend and After Working Hours: by Staff On Duty Call (Hotline : 018-9602218)
○ Request and collection of postmortem report	Monday - Friday (8:00 am – 5:00 pm) **CLOSED ON PUBLIC HOLIDAY**

8.0 List Of Test And Specimen Requirements For Referral Laboratory

Chemical Pathology (Ext. Counter: 5453 / 5451)

No	ID charge	Test	Methodology	Specimen Type / Volume / Container	Schedule / LTAT	Referral Laboratory	Patient's Charge (RM)
1.	9473	Urine Catecholamine		25ml of 24 hrs urine in 6N HCl (25% HCL) collected in 24hrs urine container	14 working days	PPUM	180
2.	10438	Urine Metanephrine		25ml of 24 hrs urine in 6N HCl (25% HCL) collected in 24hrs urine container	14 working days (Freq of testing is every 2 weeks)	PPUM	180
3.	17469	Urine Vanilly Mandelic (VMA)		Urine as collected in urine container with 6N HCl (3ml HCl) random or 24hrs	5 working days (Freq of testing is weekly)	PPUM	50
4.	21030	24 Hrs Urine Copper		24 hrs urine in 24hrs urine container	5 working days (Freq of testing is weekly)	PPUM	132
5.	23507	Serum Copper		Serum in Dark Blue Tube (Trace Element Free) – please make appointment with chemical pathology before collect specimen.	5 working days (Freq of testing is weekly)	PPUM	132
6.	11880	Vitamin D		serum in plain tube with red cap	1 week (Freq of testing is weekly)	PPUM	132

No	ID charge	Test	Methodology	Specimen Type / Volume / Container	Schedule / LTAT	Referral Laboratory	Patient's Charge (RM)
7.	17542	Serum Free Light Chain (Kappa:Lambda ratio)		2-3 ml serum (plain tube) spin, separate the serum & place into the sekunder tube without gel shipping condition: send with ice (2-8c) stability: 6month (-20c)	1 month (Freq of testing is monthly)	PPUM	264
8.	17981	Serum Bile Acid		5ml Serum. Sample must send with ice in icebox.	3 working day	PPUM	85
9.	21222	Sirolimus		Plasma in EDTA tube		PPUM	132
10.	21841	Methotrexate (MTX)		5 ml serum in plain tube-red cap (appoinment required for weekends / public holiday- ext 2847)	1 working day	PPUM	174
11.	21841	Methotrexate (MTX) 48 hours		5 ml serum in plain tube-red cap (appoinment required for weekends / public holiday- ext 2847)	1 working day	PPUM	174
12.	21841	Methotrexate (MTX) 72 hours		5 ml serum in plain tube-red cap (appoinment required for weekends / public holiday- ext 2847)	1 working day	PPUM	174
13.	21841	Methotrexate (MTX) 96 hours		5 ml serum in plain tube-red cap (appoinment required for weekends / public holiday- ext 2847)	1 working day	PPUM	174
14.	25309	New born screening for IEM (dried blood spots)		3 circles of dried blood spot on Whatmann 903 special filter paper	3 working days	PPUM	192
15.	23128	Thyroid stimulating immunoglobulin		Plain Tube –red cap (5 ml blood)	10 working days	PPUM	240
16.	9313	Ceruloplasmin		3 ml blood/ Plain tube with gel (yellow cap)	2 working days	HKL	35

No	ID charge	Test	Methodology	Specimen Type / Volume / Container	Schedule / LTAT	Referral Laboratory	Patient's Charge (RM)
17.	9467	Cholinesterase		3 ml blood/ Plain tube with gel (yellow cap)	1 working day	HKL	35
18.	19275	Mycophenolic Acid		3 ml plasma in EDTA tube / For referring labs: centrifuge, alliquote and freeze plasma sample before send to referral lab. Use TDM form.	Every Friday / 1 working days	Special Chemical Pathology, HKL	95
19.	10499	Everolimus		3ml Whole blood / EDTA tube Sample stability: 3 days (2-8°C) 28 days (-20°C). Use TDM form.	Every Tuesday & Friday / 1 working days)	Special Chemical Pathology, HKL	95
20.	9218	Serum/Plasma amino acid		2ml plasma in heparin tube/ plain tube with or without gel	-	IMR	150
21.	7144	Urine Amino Acid		2ml random urine in clean universal bottle	-	IMR	150
22.	6704	Total & Free Carnitine, Serum/Plasma		2ml plasma in EDTA tube/ serum in plain tube		IMR	126
23.	9244	Total Homocysteine		2ml plasma in EDTA tube/ serum in plain tube	-	IMR	168
24.	5612	Urine Organic Acid		2ml random urine in clean universal bottle	-	IMR	132
25.	25291	Urine Myoglobin		20ml random urine in urine container	10-15 working days	Premier Integrated Lab	428
26.	22735	FGFR3 Related Disorders (FGFR3 Restriction Enzyme Analysis/ FGFR3 Sequence Analysis)		EDTA Tube (2-5 ml blood EDTA (1-2 ml is acceptable for infants)/DNA) By Consultation Only	-	Makmal Molekular Diagnostik, IMR	276
27.	22074	Calcitonin		8ml serum plain gel yellow tube) transfer to secondary tube & simpan -20c	14 working days	Innoquest Lab	432

No	ID charge	Test	Methodology	Specimen Type / Volume / Container	Schedule / LTAT	Referral Laboratory	Patient's Charge (RM)
28.	17632	Pyruvate		2ml blood collect in Perchloric acid tube (collect tube from IEM lab,PPUM). tube must always store at 2-8c before & after blood draw. sample received must spin at 3,500 rpm, 10 min. Send sample in ice.	5 working days (freq of testing is weekly)	PPUM	65
29.	5616	Urine Paraquat		10ml urine in sterile urine container	1 hour (urgent)	HKL	50
30.	18736	Stool Reducing Sugar		Stool in steril plain cup	5 working days (freq of testing is weekly)	PPUM	29
31.	25369	Thyroglobulin		Serum In Plain tube – red cap/sst tube (5 ml blood)	7 working days	PPUM	70
32.	25394	Amyloid Beta Protein		5 ml plasma in EDTA tube	14 working days	Innoquest Pathology	2160
33.	25405	CYP2C19		3 ml Whole Blood in EDTA tube	3 - 5 working days	Zakesy Biotech Sdn Bhd	186

Haematology (Ext. Counter: 5834)

No	ID charge	Test	Methodology	Specimen Type / Volume / Container	Schedule / LTAT	Referral Laboratory	Patient's Charge (RM)
1.	12826	MRD Immunophenontyping	Flow Cytomtery	Bone Marrow	5	Premier Integrated Lab Sdn Bhd	1800
2.	23383	MRD BALL Immunophenotyping	Flow Cytomtery	Bone Marrow	5	JPMD HPKK	2000
3.	21232	Lymphocyte Subset	Flow Cytomtery	Darah	5	PPUM	336

Specialized Haemostasis (Ext Counter: 6767)

No	ID charge	Test	Methodology	Specimen Type / Volume / Container	Schedule / LTAT	Referral Laboratory	Patient's Charge (RM)
1	15292	FACTOR II (2) ASSAY	Automated Coagulation Analyzer	Plasma/ 3 microtube (1mL per tube)	5 working days	Hospital Ampang	120
2	17386	FACTOR V (5) ASSAY	Automated Coagulation Analyzer	Plasma/ 3 microtube (1mL per tube)	5 working days	Hospital Ampang	120
3	15940	FACTOR VII (7) ASSAY	Automated Coagulation Analyzer	Plasma/ 3 microtube (1mL per tube)	5 working days	Hospital Ampang	120
4	17384	FACTOR X (10) ASSAY	Automated Coagulation Analyzer	Plasma/ 3 microtube (1mL per tube)	5 working days	Hospital Ampang	120
5	17633	FACTOR XI (11) ASSAY	Automated Coagulation Analyzer	Plasma/ 3 microtube (1mL per tube)	5 working days	Hospital Ampang	120
6	12996	FACTOR XII (12) ASSAY	Automated Coagulation Analyzer	Plasma/ 3 microtube (1mL per tube)	5 working days	Hospital Ampang	120
7	17478	FACTOR XIII (13) ASSAY	Automated Coagulation Analyzer	Plasma/ 3 microtube (1mL per tube)	5 working days	Hospital Ampang	120
8	10418	ADAMTS-13 ACTIVITY	Elisa	Plasma/ 3 microtube (1mL per tube)	6 weeks	Hospital Ampang	300

No	ID charge	Test	Methodology	Specimen Type / Volume / Container	Schedule / LTAT	Referral Laboratory	Patient's Charge (RM)
9	18131	RISTOCETIN COFACTOR	Photo Optical Automated Coagulation Analyzer	Plasma/ 3 microtube (1mL per tube)	6 weeks	PPUM	174

Stem Cell Transplant (Ext Counter: 6752)

No	ID charge	Test	Methodology	Specimen Type / Volume / Container	Schedule / LTAT	Referral Laboratory	Patient's Charge (RM)
1	17549	BETA 2 MICROGLOBULIN (B2M)	Biochemistry Analyzer	Blood/ plain tube/ 3mL	10 days	Innoquest Pathology	140

Molecular Genetics (Ext Counter: 5823)

No	ID charge	Test	Methodology	Specimen Type / Volume / Container	Schedule / LTAT	Referral Laboratory	Patient's Charge (RM)
1	12943	Bcr-abl1 quantitation (E13A2, E14A2)	PCR	Whole blood/ Bone marrow/ EDTA Tube/ 3mL	30 days	PPUM	840
2	12418	FLT3-ITD Mutation	PCR	Whole blood/ Bone marrow/ EDTA Tube/ 3mL	30 days	PPUM	924
3	12068	JAK2 exon 12 Mutation	PCR	Whole blood/ Bone marrow/ EDTA Tube/ 3mL	30 days	PPUM	336
4	21218	MPL ex 10 mutation	PCR	Whole blood/ Bone marrow/ EDTA Tube/ 3mL	30 days	PPUM	336
5	12419	NPM1 mutation	PCR	Whole blood/ EDTA Tube/ 3mL	30 days	PPUM	468
6	12920	PML RaRa	PCR	Whole blood/ Bone marrow/ EDTA Tube/ 3mL	30 days	PPUM	924
7	17264	Calreticulin (Calr gene)	PCR	Whole blood/ EDTA Tube/ 3mL	30 days	PPUM	168

No	ID charge	Test	Methodology	Specimen Type / Volume / Container	Schedule / LTAT	Referral Laboratory	Patient's Charge (RM)
9	17325	Panel HLA Typing Class I/ II (Loci A,B,C,DR,DQ) - Low to Medium Resolution	PCR	Whole blood/ EDTA Tube/ 6mL	14 days	PPUM	1140
10	18060	HLA Typing B*27	PCR	Whole blood/ EDTA Tube/ 3mL	30 days	PPUM	294
11	17416	HLA Typing B*15:02	PCR	Whole blood/ EDTA Tube/ 3mL	30 days	PPUM	240
12	23380	Alpha Thalassaemia	PCR	Whole blood/ EDTA Tube/ 3mL	30 days	PPUM	612
13	15270	DNA analysis thalassaemia (uncommon mutation Alpha)	MLPA, Sequencing	Whole blood/ EDTA Tube/ 3mL	120 working days	IMR	900
14		DNA analysis thalassaemia (uncommon mutation Beta)	MLPA, Sequencing	Whole blood/ EDTA Tube/ 3mL	120 working days	IMR	900
15	14397	HLA Typing Antibody Test	Luminex	Whole blood/ Plain tube/ 6mL	20 days	IMR	761
16		HLA Typing Class I & II (Loci A, B, DR) Low/ medium Resolution	PCR	Whole blood/ EDTA Tube/ 6mL	10 days	IMR	672
17	14398	HLA Typing Class II (Loci DR, DQ) High Resolution	PCR	Whole blood/ EDTA Tube/ 6mL	10 days	IMR	600/ loci = 1200
18	9391	HLA Typing Class I (Loci A, B, C) High Resolution	PCR	Whole blood/ EDTA Tube/ 6mL	10 days	IMR	600/ loci = 1800
19	15496	Panel HLA Typing Class I & II	PCR	Whole blood/ EDTA Tube/ 6mL	10 days	IMR	936

No	ID charge	Test	Methodology	Specimen Type / Volume / Container	Schedule / LTAT	Referral Laboratory	Patient's Charge (RM)
		(Loci A,B,C,DR,DQ)-Low Resolution					
20	14399	HLA Typing Disease Association (B*27)	PCR	Whole blood/ EDTA Tube/ 6mL	10 days	IMR	600
21	4400	HLA Typing Disease Association (B*15:02)	PCR	Whole blood/ EDTA Tube/ 6mL	10 days	IMR	600
22	14401	HLA Typing Disease Association (B*57:01)	PCR	Whole blood/ EDTA Tube/ 6mL	10 days	IMR	600
23	15905	HLA crossmatch (Complement dependent cytotoxicity)	Complement dependent cytotoxicity	Sodium Heparin Tube (donor, 18mL), Plain Tube (patient, 6mL)	10 days	IMR	402
24	17303	Acute Myeloid Leukaemia Study (FLT3-Gene)	PCR	Whole blood/ EDTA Tube/ 3mL	14 days	IMR	672

Bacteriology (Ext Counter : 5928/5480)

No.	ID Charge	Test	Methodology	Specimen Type/ Volume/ Container	TAT	Referral Laboratory	Patient's charge (RM)
1.		TB ID & SENSITIVITY	Culture	LJ Medium		MKAK Sg. Buloh	20 (service charge)
2.	13782	IGRA (Interferon Gamma Release Assay)	Antigen Testing	Whole blood in Special Quantiferon tubes		MKAK Sg. Buloh	115
3.	25345	IGRA (Interferon Gamma Release Assay)		Whole blood in Special Quantiferon tubes	3 working days	Pantai Premier	361
4.	25351	Liquid NTM (Non-Tuberculosis mycobacteria)		Sputum / body fluid / tissue etc	8 weeks	Pantai Premier	451

Molecular Biology (Ext Counter : 5853)

No.	ID Charge	Test	Methodology	Specimen Type/ Volume/ Container	TAT	Referral Laboratory	Patient's charge (RM)
1.	5773	BK Virus	PCR	1. Urine – Congenital baby less than 3 weeks. Whole blood in EDTA - Adult	5 days	Hospital Sg. Buloh	120
2.	21142	HIV Drug Resistance Test (Reverse Transcriptase Protease)	PCR & Sequencing	Whole blood in EDTA: 1. Centrifuge and separate PLASMA into another plain tube. Send PLASMA 2. Please ensure that the patient's most recent viral load is > 1000 cp/mL	40 days	Unit Virology, IMR	720
3.	21141	HIV Drug Resistance Test (Integrase)	PCR & Sequencing	Whole blood in EDTA: 1. Centrifuge and separate PLASMA into another plain tube. Send PLASMA 2. Please ensure that the patient's most recent viral load is > 1000 cp/mL	40 days	Unit Virology, IMR	480
4.	33382	Hepatitis C Genotyping	PCR Sequencing	Whole blood in Serum Separator Tube (yellow) x2	42 - 56 working days	Unit Virology, IMR	540
5.	21664	Acanthamoeba PCR	rRT-PCR	1. Corneal scraping 2. Contact lens 3. Contact lens suspension CSF	7 days	Unit Parasitologi, IMR	192
6.	22578	Bartonella PCR (Required consultation by Dr IMR)	Multiplex Real-Time PCR	1. Whole blood in EDTA tube. Tissue (Lymph Node)	5 days	Unit Bakteriologi, IMR	180

No.	ID Charge	Test	Methodology	Specimen Type/ Volume/ Container	TAT	Referral Laboratory	Patient's charge (RM)
7.	22079	PCR for STI Essential Screening Panel (PCRsti1) ✓ *Neisseria gonorrhoeae* ✓ *Chlaymydia trachomatis* ✓ *Trichomonas vaginalis* ✓ *Mycoplasma hominis* ✓ *Mycoplasma genitalium* ✓ *Ureaplasma urealyticum* *Ureaplasma parvum*	Multiplex Real-Time PCR	1. Genital swab in VTM 2. Urine in sterile container Liquid-based Cytology	2 working days	LABLINK Medical Laboratory	336
8.	23349	TB GeneXpert Study	Real-Time PCR (Xpert)	1. Sputum 2. Gastric aspirate 3. CSF 4. Peritoneal fluid 5. Pleural fluid Bronchoalveolar Lavage (BAL)	2 – 3 working days	LABLINK Medical Laboratory	438
9.	23361	Adenosine Deaminase (ADA)	Spectrophotometry PCR	Body fluid	14 working days	LABLINK Medical Laboratory	81.60
10.	21028	Mers-COV	PCR	1. Nasopharyngeal swab in UTM/VTM 2. Combined nose/throat swab in UTM/VTM 3. Nasopharyngeal aspirate in sterile container Bronchoalveola aspirate/	1 working day	Geneflux Bioscience	420

No.	ID Charge	Test	Methodology	Specimen Type/ Volume/ Container	TAT	Referral Laboratory	Patient's charge (RM)
				lavage fluid in sterile container			
11.	25370	PCR for Gastrointetsinal Bacterial Pathogen Panel (PCRGI3)	PCR	Raw stool Sterile container/ stool container (preservative/media-free) Volume: 2- 3 ml	1 – 2 working days upon specimen arrival	Lablink Medical Laboratory	480

Immunology Serology (Ext Counter : 5482)

No.	ID Charge	Test	Methodology	Specimen Type/ Volume/ Container	TAT	Referral Laboratory	Patient's charge (RM)
1.	9121	Acethylcholine Receptor Antibodies	ELISA	Serum	21 days	IMR	600
2.	10664	Acute Flaccid Paralysis (AFP)-POLIO	Virus isolation	Stool: >5 g	14 days	IMR	20 (service charge)
3.	17762	ANCA *(P-ANCA, C-ANCA)*		Serum		PPUM	115
4.	17765	Anti Cyclic Citrullinated Peptides (CCP)		Serum		PPUM	95
5.	17820	Anti Liver kidney microsomal (LKM)	Imunoblot	Serum		PPUM	216
6.	9323	Anti N-Methyl-D-Aspartate Receptor (NMDAR)	Indirect Immuno fluorescence (IIF)	Serum / CSF	7 days	IMR	480
7.	23309	Calprotectin		Stool: >5 g		PPUM	360

No.	ID Charge	Test	Methodology	Specimen Type/ Volume/ Container	TAT	Referral Laboratory	Patient's charge (RM)
8.	22502	Cat scratch/ Bartonella antibody		Serum		HOSP. SG BULOH	192
9.	9135	Coeliac Antibodies Test	Indirect Immuno fluorescence (IIF)	Serum	21 days	IMR	720
10.	17881	CSF for VDRL		CSF		HOSP. SG BULOH	40
11.	23260	Diabetes Antibodies - Panel *(Anti Islet Cells (ICA), Anti-Glutamic Acid Decarboxylase (GAD) & Anti-Insulinoma-Associated Antigen 2 (IA2))*	CLIA	Serum	14 days	IMR	1800
12.	9308	Diabetes Mellitus Antibodies- Anti Insulin	CLIA	Serum	14 days	IMR	600
13.	23377	Encephalitis Autoimmune Profile 7 *(Anti-NMDAR, Anti-AMPA1/2, Anti-CASPR2, Anti-LGI1, Anti-DPPX, Anti-GABA B) & Paraneoplastic Antigens Antibodies*	IFA & Immunoblot	Serum	6 days	LABLINK	1200
14.	9169	Immunoglobulin E (Specific) * per allergent	Fluorescence EIA	Serum	10 days	IMR	264
15.	9170	Immunoglobulin E (Total)	Fluorescence EIA	Serum	10 days	IMR	420
16.	23418	Liver Autoimmune Specific Autoantibody	Immunoblot	Serum	3 days	LABLINK	228

No.	ID Charge	Test	Methodology	Specimen Type/ Volume/ Container	TAT	Referral Laboratory	Patient's charge (RM)
		(Anti-Ro-52, Anti-AMA-M2, Anti-M2-3E, Anti-Sp100, Anti-gp210, Anti-PML, Anti-LKM-1, Anti-LC-1, Anti-SLA/LP)					
17.	9200	Meliodosis-Indirect Fluorescent antibody test	ELISA	Serum	5 days	IMR	100
18.	23351	Myositis profile	Imunoblot	Serum		PPUM	480
19.	23363	Panel IL-6 Cytokines	CLIA	Serum	3 days	PREMIER INTEGRATED LAB	183
20.	9122	Paraneoplastic Neurological Syndrome (PNS) antibodies	Immunoblot	Serum / CSF	14 days	IMR	960
21.	22159	PLA2RAb - ELISA Quantitative	ELISA	Serum	3 days	LABLINK	720
22.	22158	PLA2RAb - IIFT Semiquantitative	IIFT	Serum	3 days	LABLINK	540
23.	9922	Rickettsia - Rickettsia Serology	indirect immunoperoxidase test (IIP)	Serum	5 days	IMR	120
24.	23376	Vasculitis Autoimmune Profile *(ANCA, MPO, PR3, GBM)*	IFA & ELISA	Serum	3 days	LABLINK	300

Tissue Culture (Ext Counter : 5485)

No	ID Charge	Test	Methodology	Specimen Type / Volume / Container	TAT	Referral Laboratory	Patient's Charge (RM)
1.	23493	Respiratory Panel 36	PCR	1. Sputum (1-3 ml) 2. Throat swab in UTM (1 ml) 3. Nasal swab in UTM (1 ml) 4. Bronchoalveolar lavage fluid in sterile container (1-3 ml) Tracheal aspirate in sterile container (1-3 ml)	Within 24 hours	Geneflux Bioscience	456
2.		Cytomegalovirus Isolation	Virus Isolation	1. Urine / cerebrospinal fluid / bronchoalveolar lavage / pericardial fluid in sterile container (1-3 ml) Tissue biopsy / autopsy in sterile container containing VTM or sterile normal saline to keep tissue moist (about 1.5cm cubes of various parts of affected organs)	14-35 days (inclusive of weekends and public holiday)	IMR	300

Parasitology (Ext Counter : 5928)

No.	ID Charge	Test	Methodology	Specimen Type/ Volume/ Container	TAT	Referral Laboratory	Patient's charge (RM)
1.	13098	MICROFILARIAE DETECTION	Microscopic Examination (Staining)	Whole blood in EDTA (1 - 5 ml)	2 days	Pusat Perubatan Universiti Malaya, PPUM	132

No.	ID Charge	Test	Methodology	Specimen Type/ Volume/ Container	TAT	Referral Laboratory	Patient's charge (RM)
2.	13087	FILARIASIS IgG	Immunoassay	Plain Sterile tube (1 – 5 ml)	1 days	Pusat Perubatan Universiti Malaya, PPUM	120
3.	13091	ACANTHAMOEBA CULTURE	Culture	Eye swab / Eye wash (Sterile Container)	14 days	Pusat Perubatan Universiti Malaya, PPUM	147.60
4.	13057	STOOL FEME (FULL SET)	Microscopic Examination (Staining)	Stool Container (As Collected)	1 days	Pusat Perubatan Universiti Malaya, PPUM	174
5.	12998	STOOL (OVA & CYST)	Microscopic Examination (Staining)	Stool Container (As Collected)	2 days	Pantai Premier Pathology Sdn Bhd	30
6.	9299	AMOEBIASIS IGG	enzyme-linked immunosorbent assay (ELISA)	Plain Sterile tube (2 ml)	5 days	Unit Parasitologi, IMR	180
7.	23289	Cryptosporidium sp, cyclospora, isospora, (DMSO stain) & microsporidium spp (Gram chromotrope stain)	Microscopic Examination (Staining)	Screw Capped, Air Tight Container (Fresh Specimen)	5 days	Unit Parasitologi, IMR	168

Mycology (Ext Counter : 5484)

No.	ID Charge	Test	Methodology	Specimen Type/ Volume/ Container	TAT	Referral Laboratory	Patient's charge (RM)
1.	12260	Fungal PCR (Research)	PCR	**Specimen Type:** Fresh specimens for fungal PCR research	7 days	Unit Bacteriology, IDRC IMR NIH Setia Alam	20 (service charge)

No.	ID Charge	Test	Methodology	Specimen Type/ Volume/ Container	TAT	Referral Laboratory	Patient's charge (RM)
				Container Type: sterile container **Volume:** 2 mls blood; other samples as much as possible **Description:** For better sensitivity, blood samplings should be repeated 2 or 3 times, at 3-4 hours interval. Transportation at ambient temperature. If delayed keep at 2-8 degree celcius.			
2.	9311	Fungal PCR	PCR	**Specimen Type:** Fresh clinical specimens : Blood in EDTA, serum, blood in blood culture vial, CSF and other sterile body fluids, skin/tissue biopsies, FFPE can be sectionned and submit in sterile container **Container Type:** Blood in EDTA, plain tube or blood culture bottle. FFPE ribbon shavings in sterile container, tissue and other body fluids in sterile container. **Volume:**	14 days	Unit Bacteriology, IDRC IMR NIH Setia Alam	420

No.	ID Charge	Test	Methodology	Specimen Type/ Volume/ Container	TAT	Referral Laboratory	Patient's charge (RM)
				2 ml blood; other samples as much as possible **Description:** Sample from sterile site only. For better sensitivity, blood samplings should be repeated 2 or 3 times, at 3-4 hours interval. FFPE specimens need to be taken with clean blade and aseptic technique into a sterile container. Transportation at room temperature. If delayed keep at 2-8 °C.			

Virology Serology (Ext Counter : 5482)

No	ID Charge	Test	Methodology	Specimen Type / Volume / Container	TAT	Referral Laboratory	Patient's Charge (RM)
1.		Leptospira MAT	MAT	Plain Tube (3-5ml)	NA	IMR	240
2.		Borrelia Burgdorferi IgG	ELISA	Plain Tube (3-5ml)	2-3 Hari Bekerja	Hosp Sg Buloh	156
3.		Borrelia Burgdorferi IgM	ELISA	Plain Tube (3-5 ml)	2-3 Hari Bekerja	Hosp Sg Buloh	156
4.	25363	(1, 3)-Beta-D-Glucan Antigen	CMIA	Plain Tube (5ml)	3-5 Hari Bekerja	Makmal Virologi, Hospital Sungai Buloh	180

Histopathology (Ext. Counter: 5464)

No	ID charge	Test	Methodology	Specimen Type / Volume / Container	TAT	Referral Laboratory	Patient's Charge (RM)
1.	11686	Epidermal Growth Factor Receptor (EGFR)		Unstained slide	10 working days	Makmal Genetik, HKL	840
2.	11301	Immunohistokimia-Antibodi IgG		Unstained slide		Makmal Genetik, HKL	70
3.	12292	Pewarnaan Immunohistokimia - HHV 8		Unstained slide		HKL	70
4.	12463	Pewarnaan Immunohistokimia – Napsin		Unstained slide		HKL	70
5.	12245	Pewarnaan Khusus - Rhodanine		Unstained slide		Hospital Selayang	80
6.	17344	Pewarnaan Immunohistokimia - BRACHYURY		Unstained slide		HKL	70
7.	12246	Pewarnaan Khusus - Victoria Blue		Unstained slide		Hospital Selayang	80
8.	17631	Pewarnaan Immunohistokimia – SOX 11		Unstained slide		Unit Histopatologi, Jabatn Patologi Hospital Ampang	240
9.	15758	KRAS (Kirsten Rat Sarcoma)		Unstained slide		Makmal Genetik, Jabatan Patologi, Hospital Wanita Dan Kanak-Kanak KL	840

10.	22500	Pewarnaan NeuN		Unstained slide	3 working days	PPUM	372
11.	22501	Pewarnaan Khusus Luxol Fast Blue		Unstained slide	3 working days	PPUM	75
12.	25366	EBER ISH		3 Unstained charged slides	3 working days	PREMIER INTEGRATED LAB	660

Cytogenetics (Ext. Counter: 5813 / 5824)

No	ID charge	Test	Methodology	Specimen Type / Volume / Container	TAT	Referral Laboratory	Patient's Charge (RM)
1.	10469	Prader Willi Syndrome - Mutation Screen		EDTA tube		IMR	276
2.	10470	Angelman Syndrome (SNRPN) -MS-MLPA		EDTA tube		IMR	276
3.	10471	Angelman Syndrome (UBE3A)- sequencing		EDTA tube		IMR	1560
4.	15185	DNA extraction and Sorage (High IEM Screening)		EDTA tube		HKL	120
5.	10472	Spinal Muscular Atrophy (Deletion) - MLPA		EDTA tube		IMR	276
6.	10473	Spinal Muscular Atrophy (Deletion) - PCR		EDTA tube		IMR	1140
7.	10475	Frax A PCR Screening - Fragile X Syndrome	PCR and capillary electriphoresis	2.5ml blood/ EDTA Send at room temperature. If>3 hours, keep sample cooled/refrigerated (do not freeze the sample)		IMR	276

No	ID charge	Test	Methodology	Specimen Type / Volume / Container	TAT	Referral Laboratory	Patient's Charge (RM)
8.	10474	Frax E PCR Screening - Fragile X Syndrome		EDTA tube			276
9.	10476	Frax A Confirmation - Fragile X Syndrome		EDTA tube		IMR	276
10.	10477	MELAS - 3243 Hotspot		EDTA tube		IMR	276
11.	10478	MELAS - Full Panel		EDTA tube		IMR	996
12.	10479	Primary Dystonia:DYT1		EDTA tube		IMR	792
13.	10480	Primary Dystonia : DYT6		EDTA tube		IMR	792
14.	12827	Rett syndrome		EDTA tube		Molekular Genetik,HKL	4800
15.	10481	Leber Hereditary optic neuropathy Panel (LHON)		EDTA tube		IMR	1020
16.	11159	Hemavision test 28		EDTA tube		IMR	1200
17.	18550	Y Microdeletion Test		EDTA tube		HTA	720

Cytopathology (Ext. Counter: 5466/6424)

No	ID charge	Test	Methodology	Specimen Type / Volume / Container	TAT	Referral Laboratory	Patient's Charge (RM)
1.	15841	HPV DNA (28 Genotypes)		Cervical sampling/ Thinprep		Pantai Premier	132
2.	15840	HPV Primary Screening		Cervical sampling/ Thinprep		Pantai Premier	90

Blood Bank (Ext Counter : 5454)

No	ID charge	Test	Methodology	Specimen Type / Volume / Container	TAT	Referral Laboratory	Patient's Charge (RM)
1.	17358	Platelet Crossmatching (SPRCA)	Serology	Plain tube, non gel tube : 10mL Note : if requesting together with platelet antibody, please refer to Platelet Antibody test sample requirement.	Not applicable. Platelet supply depends on date required	Pusat Darah Negara (PDN)	115
2.	17895	Red Cell Genotyping- ABO Genotyping (SSP)	Molecular	EDTA, non gel tube : 2-4mL	20 working days		498
3.	17896	Red Cell Genotyping- Rh Genotyping (DCcEe) (SSP)	Molecular				528
4.	17897	Red Cell Genotyping- D Variant (SSP)	Molecular				660
5.	17898	Extended Red Cell Genotyping- (BioArray)	Molecular				768
6.	17899	Platelet Immunology testing (MAIPA)	Serology	**NAIT case** :			95

No	ID charge	Test	Methodology	Specimen Type / Volume / Container	TAT	Referral Laboratory	Patient's Charge (RM)
7.	5785	Platelet Antibody Screening	Serology	(note : mother/father = biological parents) ● Mother sample : - EDTA (non gel tube) : 10ml and - Plain (non gel tube) : 10ml ● Father sample : EDTA (non gel tube) : 10ml ● Baby sample : EDTA (non gel tube) : 1ml **PTR and PTP case** : ● EDTA (non gel tube) : 10ml ● Plain (non gel tube) : 10ml **ITP case** : ● Plain (non gel tube) : 10ml, and ● EDTA (non gel tube) : - 10ml : if plt > 20 x 10^9/L) - 15-20ml : if plt 10-20 x 10^9 /L) - 2ml : if plt <9 x 10^9/L	10 working days · With molecular : 20 working days	Pusat Darah Negara (PDN)	95
8.	17900	Platelet Genotyping	Molecular	EDTA, non gel tube : 2-4mL			456
9.	29394	ABO Confirmation	Serology	· EDTA, non gel tube : 10mL · Plain tube, non gel tube : 10mL · For cases involving baby : 1ml EDTA, non gel tube of baby's sample	10 working days		120

Note:-

· LTAT may vary depending on complexity of case

· Final charges may vary depending on the specific tests performed

Disclaimer :

The prices listed are updated until April 2025 and all prices are subject to change at any time. For confirmation prices, please refer to Unit Hasil, Jabatan Kewangan HCTM by referring to the test ID Charge.