ver. 2020

PANDUAN

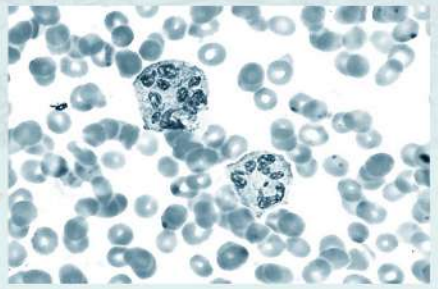
PERKHIDMATAN MAKMAL

Guidelines of Laboratory Services

JABATAN PERKHIDMATAN MAKMAL DIAGNOSTIK

HOSPITAL CANSELOR TUANKU MUHRIZ,
CHERAS, KUALA LUMPUR

Department of Diagnostic Laboratory Services



MS ISO 9001:2015 Cert. No. : QMS 01547

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 confidentiallity.

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

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Edited: 29 November 2023

2.0 Message From Head of Department

Praise to Allah SWT for His Grace and Mercy, the Laboratory Manual Guidelines (*Panduan Perkhidmatan Makmal;PPM*) version 2020 has been successfully published. This manual provides the guidelines and procedures pertaining to be handling and delivery of laboratory specimen offered by Department of Diagnostics Laboratory Services (JPMD), Hospital Canselor Tuanku Muhriz (HCTM). This manual is essential in order to improve the quality of services in JPMD to meet the ISO 15189 : 2014 accreditation standards.

The effort of having a comprehensive Laboratory Manual Guidelines was started in 2009. At early stage, physical documents were only available in clinics and wards of HCTM. Due to the advancement of digital technology, JPMD's online version of Laboratory Manual Guidelines 2017 has been developed and now can be accessed through 'Sistem Pengurusan Dokumen UKM (SPDUKM)'.

This user-friendly digital guidebook can be easily accessed by our customers and also HCTM's medical practitioners at every level of the healthcare system. I really hope this manual could help our customers to have a better understanding of the needs and criteria of diagnostics laboratory services offered by JPMD. Therefore, reliable and quality results can be produced.

Last but not least, I would like to congratulate the panel of the authors and all staffs that have tirelessly contributed their knowledge and experience to produce this JPMD's online Laboratory Manual Guidelines 2020.

Pelanggan Didahulukan.
Kualiti Diutamakan.
Kebajikan Ditingkatkan.

DATIN DR. ANITA SULONG
HEAD
DEPARTMENT OF DIAGNOSTICS LABORATORY SERVICES (JPMD)
HOSPITAL CANSELOR TUANKU MUHRIZ
UNIVERSITI KEBANGSAAN MALAYSIA

3.0 Acknowledgements

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 acknowledge. However, the group would like to express their deep appreciation and indebtedness particularly to the following:

Datin Dr. Anita Sulong (Head Of Department)

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En. Mohd Harisfazal Mohamed Basri
Pn. Hartini Satim
Pn. Haslina Mahbob
KIK PERMADI 2006

All JPMD Staffs

4.0 Service Unit at JPMD, HCTM

OFFICE HOUR
8.00 AM – 5.00 PM

UNIT	EXT	LOCATION
Bacteriology Unit	5480 / 5481	Basement
Blood Bank Unit	5454	G Floor
Chemical Pathology Unit	5451 / 5560	Basement
Culture Tissue Unit	5483	Basement
Cytogenetic Unit	5813 / 5824	Basement
Cytopathology Unit	5466	Basement
Forensic & Mortuary	5445	Basement
Haematology Unit	5834	Basement
Histopathology Unit	5464 / 5805	Basement
Immunology Unit	5482	Basement

UNIT	EXT	LOCATION
Media Preparation Unit	5485	Basement
Molecular Biology Unit	5853	Basement
Molecular Genetics Unit	5823	2nd Floor
Mycology Unit	5484	Basement
Phlebotomy Unit	7253/ 7254	G Floor
Stem Cell Transplant Unit	6752/ 5475	2nd Floor
Specialized Haemostasis Unit	6767	2nd Floor
Virology Serology Unit	5482	Basement

AFTER OFFICE HOUR
5.00 PM – 8.00 AM

UNIT	EXT	LOCATION
Blood Bank Unit	5454	G Floor
Chemical Pathology Unit	5451 / 5560	Basement
Forensic & Mortuary	019 - 3235631	Basement

UNIT	EXT	LOCATION
Haematology Unit	5834	Basement
Microbiology Lab	5480	Basement

5.0 Types of Collection Tubes/Container

A. BLOOD COLLECTION TUBES

Order of Draw	Type of Tube	Colour Code	Volume Size	Inversion
1 (Blood Culture)			Adult: 8-10 ml Paeds: 0.5-5 ml Mycobacteria: 1-5 ml	NA
2 (Sodium Citrate)			2.0 ml	3-4
3 (Plain Tube)			5.0 ml	5
4 (Plain Tube with Gel)			3.5 ml	5
5 (Lithium Heparin)			4.0 ml	8
6 (EDTA)			3.0 ml/ 6.0 ml	8
7 (Oxalate Fluoride)			2.0 ml	8

B. OTHERS TUBES/ CONTAINER

Tube/Container	Type of Tube	Colour Code	Volume
Sodium Heparin (without gel)			
Viral Transport Medium		NA	
Glass slide		NA	NA
Sterile/Urine Container		NA	
Swab Transport Medium		NA	
Liquid Based Cytology		NA	

6.0 Preanalytical Guidelines/

Phlebotomy Unit/ Bahagian Pengambilan Darah

PROCESS	REJECTION CRITERIA	OPERATION HOURS	NOTES
1. Penerimaan Borang Permintaan Ujian Yang Memenuhi Kriteria Penolakan	1. Tiada pelekat maklumat pesakit 2. Tiada diagnosis 3. Tiada permintaan ujian 4. Tiada tandatangan/cop doktor 5. Lokasi tidak dinyatakan 6. Cop status (berbayar/percuma) tidak jelas. 7. Salah identiti pesakit pada borang permintaan ujian 8. Salah borang permintaan ujian 9. Borang permintaan ujian dan urin tidak diasingkan 10. Lain-lain	7:30 pagi hingga 4:30 petang Isnin hingga Jumaat kecuali cuti umum	Semua borang permintaan ujian yang tidak memenuhi kriteria akan ditolak dan dikembalikan kepada pesakit untuk dibetulkan oleh klinik-klinik. Pesakit perlu kembali semula ke Bahagian Pengambilan Darah untuk prosedur pengambilan darah
2.Nombor Giliran Diberi Mengikut Kriteria	i. 1000 – untuk pesakit biasa ii. 2000 – untuk warga emas/oku iii. 3000 – pediatrik **iv.** 4000- kakitangan HCTM/ UKM		Pemakluman sendiri oleh pesakit atau waris dan pertanyaan dari kakitangan Bahagian Pengambilan Darah.
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES			
1. Penerangan waktu yang sesuai untuk penghantaran/ pengambilan spesimen 2. Membantu memastikan permintaan ujian yang diminta dilakukan di makmal yang ditawarkan sahaja			

7.0 Specimen Handling & Request Guidelines

7.1 Cytopathology Unit

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
PAP01 Gynae Cytology (Conventional)	Smeared slide and stain with Papanicolou	Glass slide	1 slide	8:00 am - 5:00 pm Monday-Friday	Not applicable	14 working days	1. Cytospray will be provided by Cytopathology Lab (Ext: 5466). 2. Please send sample to the lab together with the dispatch book. **DO NOT USE PNEUMATIC TUBE.**
PAP02 Gynae Cytology (Liquid Based Cytology (LBC))	Liquid based cytology and stain with Papanicolou	Liquid Based Cytology (Thin Prep Pap Test)	1 vial			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). 3. Please send to the lab together with the dispatch book. **DO NOT USE PNEUMATIC TUBE.**

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
PAP03 **HPV DNA TEST**	Hybridization and amplification signal	Liquid Based Cytology (Thin Prep Pap Test)	1 vial	8:00 am - 5:00 pm Monday-Friday	Not applicable	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). 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 her menstrual period**.)

PAP 01 Gynae Cytology (Conventional)

1. Use Cytobrush to collect the specimen.
2. Spray with the Cytospray.
3. Fix the smear immediately with Cytospray.
4. Hold the spray container 8-12 inches away from the slide to avoid 'blasting' the cells.
5. 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.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
NG01 **Non-Gynae Cytology** <u>Sample :</u> Body effusion: a. Pleural Fluid b. Peritoneal Fluid c. Pericardial Fluid	Cytospin and stain with Papanicolou and MGG	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 in refrigerator at 4°C. Note: **DO NOT FREEZE**	Not applicable	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 specimen. *Please refer at **FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION** **DO NOT USE PNEUMATIC TUBE.**
NG01 **Non-Gynae Cytology** <u>Sample:</u> Cerebrospinal Fluid (CSF)	Cytospin and stain with Papanicolou and MGG	Sterile Plain Container (Yellow Cap)	At least 3 drops or 1 ml			3 working days	
NG01 **Non-Gynae Cytology** <u>Sample :</u> Urine	Cytospin and stain with Papanicolou and MGG	Sterile Plain Container (Yellow Cap)	20-50 ml			7 working days	

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	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 and stain with Papanicolou 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).	8:00 am - 5:00 pm Monday-Friday If there is a delay in delivering the specimen, please keep in refrigerator at 4°C. Note: **DO NOT FREEZE**	Not applicable	7 working days	1. The samples should be submitted as soon as possible to the lab together with the dispatch book. 2. Cytospray will be provided by Cytopathology Lab (Ext: 5466). 3. Delay in receipt can lead to deterioration of specimen. *Please refer at **FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION** **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. Tzank Smear	**Others:** Cytospin and stain with Papanicolou and MGG stain **Tzank Smear:** Smeared slide and stain with Papanicolou and MGG	**Others:** Sterile Plain Container (Yellow Cap) **Tzank Smear:** Glass slide	**Others:** 10 – 50 ml **Tzank Smear :** Please call Ext: 5466 to request fixative solution			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.
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	NORMAL RANGE	TAT (Working Day)	NOTES
Fine Needle Aspirations (FNAC) **FNA 01 - Report Only** **FNA 02 – with procedure at FNAC Clinic**	Smeared slide and stain with Papanicolou and MGG	Glass slide/ Sterile Plain Container (Yellow Cap)	1. Minimum 2 air-dried slides and 2 alcohol-Fixed 2. Extra specimen should be kept in sterile plain container	**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 etc). Please call 5466	Not applicable	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 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 only.
2. Call 5466 to set an appointment.

For pediatric patients, please call 5466 for assistance. The Pediatrician must accompany the patient during the procedure and a proper sedation should be given.

REJECTION CRITERIA

REQUEST FORM (PPUKM RP/298) - 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 name and 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.
6. 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. Re-use container MUST be avoided.
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

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

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

NA

7.2 Cytogenetic Unit

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume, etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
Routine Karyotype Blood	Karyotyping	sodium/ lithium heparin without gel (to be obtained from the laboratory)	Minimum 2ml for adults and 1 ml for infants	8:00 am - 4:00 pm Monday-Tuesday **except Public Holiday**	Not applicable	28 days	i. **No specimen will be accepted on Wednesday-Friday**. ii. Any **urgent cases**; please **call the laboratory ext 5813/ 5824** to discuss for arrangement
Routine Karyotype Bone Marrow	Karyotyping		Minimum 3 ml in sodium heparin without gel		Not applicable	21 days	i. **No specimen will be accepted on Friday** or **if the next day is Public Holiday**. ii. Any **urgent cases**; please **call the laboratory ext 5813/ 5824** to discuss for arrangement. iii. Specimen should be obtained from the first or second aspirate. iv. Transport in room temperature (transport immediately within 24 hours).
Molecular Cytogenetics **FISH/ SKY Blood**	Fluorescence in situ hybridization (*FISH*)		Minimum 2ml for adults and 1 ml for infants		Not applicable	10 working days	i. **No specimen will be accepted on Wednesday-Friday**. ii. Any **urgent cases**; please **call the laboratory ext 5813/ 5824** to discuss for arrangement
	Spectral Karyotyping (SKY)					6 months	

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume, etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
Molecular Cytogenetics **FISH/ SKY Bone Marrow**	Fluorescence in situ hybridization (FISH)	Bone marrow - sodium heparin without gel (to be obtained from the laboratory)	Minimum 3 ml in sodium heparin without gel.	8:00 am - 4:00 pm Monday-Thursday **except Public Holiday**	Not applicable	10 working days	i. **No specimen will be accepted** on **Friday** or **if the next day is Public Holiday.** ii. Any **urgent cases**; please **call the laboratory ext 5813/ 5824** to discuss for arrangement. iii. Specimen should be obtained from the first or second aspirate. iv. Transport in room temperature (transport immediately within 24 hours)
	Spectral Karyotyping (SKY)					6 months	

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 no-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 transport medium/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. Specimen should be obtained from the first or second aspirate. Draw 3ml specimen and immediately add specimen to the sodium heparin tube (without gel). Cap tightly and mix well by inverting gently.
4. For blood samples, draw 2-4 ml peripheral blood aseptically and immediately add specimen to the sodium/lithium heparin tube (without gel). Cap tightly and mix well by inverting gently.
5. Keep specimen cool at room temperature. Do not freeze. Deliver to the laboratory immediately.

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	1. FISH probes are locus specific and only identify chromosomal abnormalities for the regions within the loci tested. 2. A normal result does not exclude micro/ cryptic chromosomal abnormalities and other congenital abnormalities that may occur.

7.3 Histopathology Unit

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
Hematoxylin & Eosin - examination for all type of specimens (small and large surgical specimens)	Hematoxylin & Eosin Staining	Container with 10% buffered formalin	The volume of formalin should be 10x the volume of specimen	8:00 am – 4:45 pm Monday – Friday **except Public Holiday**	Not applicable	i. Surgical Biopsy (large) = 30 working days ii. Surgical Biopsy (small) = 21 working days iii. Urgent specimen = 7 working days	Place specimen in a proper specimen container with 10% buffered formalin.
Enzyme acethycholenesterase - study for rectal biopsy in diagnosis of Hirschsprung's disease	Enzyme Acethycholenesterase Staining	Gauze moistened with normal saline in specimen container	Not applicable			Rectal biopsy (for Hirchsprung's disease) = 14 working days	**Wrap fresh specimen** in gauze moistened with **normal saline** in specimen container.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
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	Not applicable	8:00 am - 6:00 pm Monday-Friday **except Public Holiday**	Not applicable	Verbal report of frozen section = 30 Minute/ 1 tissue block	i. Specimen must be sent fresh. ii. Appointment for frozen section must be made at least one day before surgery. iii. Please inform MO/ Pathologist in-charge (ext: 5850) the time specimen is expected to arrive at the histopathology laboratory.
Renal, skin biopsy or other tissues for immunofluorescence study	Immunofluorescence Staining	Place fresh specimen on filter paper moistened with phosphate buffered saline (PBS) in a covered petri dish		8:00 am - 4:45 pm Monday-Friday **except Public Holiday**		Renal and skin biopsy or other tissues = 21 working days	Not applicable
SPECIAL STAINING ***ON REQUEST BY PATHOLOGIST ONLY**							
IMMUNOHISTOCHEMISTRY STAINING ***ON REQUEST BY PATHOLOGIST ONLY**							

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
1. The specimen and request form information do not match 2. The minimum essential information is missing from the request form (patient's RN, destination name, the type of specimen, medical officer's name, signature and stamp). 3. Wrong/No request form issued 4. Wrong/No specimen submitted 5. Specimen submitted in wrong fixation solution, e.g. alcohol solution	**SPECIMEN ACCEPTANCE CRITERIA** 1. Label on specimen's container must accurately include; - Patient's name - Patient's registration number (RN) - Type of specimen (type of specimens labelled on the container must match the type of specimen written on the request form) 2. Request form must accurately include; - Patient's name - Patient's registration number (RN) - Type of specimen (type of specimens written on the request form must match type of specimen labelled on the container) - Diagnosis and clinical summary - Medical Officer's name, signature and stamp

NOTES

- Specimens may be rejected if the criteria mentioned above is not fulfilled
- When specimens are rejected due to insufficient information, a report will be issued through the laboratory information system (LIS) by technologist on duty
- Specimens and request form are necessary to be retrieved by the customer on the same day reported
- Amendment should be made before resubmission of specimen to Histopathology laboratory

7.4 Chemical Pathology Unit

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	UNIT	TAT (Working Day)	NOTES
BLOOD AND BODY FLUID								
Ammonia	Photometry	Lithium Heparin, EDTA	Tube should completely filled with blood, Send in ice	8 am – 5 pm	18 – 72	µmol/L	1 hr	Sample sent **in ice** within **15 minutes**
Amylase		Plain Tube, Lithium Heparin	2.5 mL	24 Hours	25 – 125	U/L	4hrs 1 hrs (Urgent: Amylase & Calcium)	**Pneumatic tube usage** Only blood sample (with form) should be sent using pneumatic tube. Please ensure that those tube are cap tighly before deliver to any destination Sample such as **CSF ,Body fluid , urine and ESR (Erythrocyte Sedimentation Rate)** sample 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. Sample also should be separated based on laboratory and send directly to the designated laboratory.
AST (Aspartate Aminotransferase)					5–34	U/L		
CRP					≤ 0.5	mg/dL		
Calcium					2.10 – 2.55	mmol/L		
Chloride	Potentiometry			8am – 5pm	98 – 107	mmol/L		
Fructosamine	Photometry				205 – 285	µmol/L		
GGT					Male : 12 – 64 Female : 9 – 36	U/L		
HbA1C	HPLC	EDTA			< 5.7% < 39	% mmol/mol	3 days	

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	UNIT	TAT (Working Day)	NOTES
BLOOD AND BODY FLUID								
Lactate	Photometry	Sodium Fluoride, Potassium Oxalate	2.5mL	8am – 5pm	0.5 – 2.2	mmol/L	1 hr	
LDH		Plain Tube, Lithium Heparin	2.5 mL		125 – 220	U/L	4 hrs	
Uric Acid		Plain Tube, LithiumHeparin		24 Hours	Male: 210 – 420 Female: 150 – 350	µmol/L		
Osmolality (Serum)	Deep freezing point	Serum	2.5 mL		275 – 295	mOsm/kg	4 hrs 1 hrs (Urgent)	
BLOOD AND BODY FLUID								
ABG	* pH and pCO_2: Potentiometric * pO_2: Amperometric * sO2: Oximetry	Heparinized syringe	1 mL sample, send in ice	24 Hours	pH :7.35 – 7.45 pCO_2 : 35 – 48 pO_2 : 83 – 108 Std Bicarbonate:18-23 Base excess: -2 - +3 O2 saturated: 95-98	nil mm/Hg mm/Hg mmol/L mmol/L %	30 minutes	1. Sample sent **in ice.** 2. Use a **1ml** disposable syringe (usage of **insulin syringe** will lead to sample **rejection)** 3. Use **syringe cap**

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

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

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	UNIT	TAT (Working Day)	NOTES
PANEL								
BONE PROFILE								
Calcium	Photometry	Plain tube/ Lithium Heparin	2.5mL	24 hrs	2.10 –2.55	mmol/L	4 hrs	1 hrs (Urgent)
Magnesium					0.66 – 1.07			
Phosphate					0.74 – 1.52			
CSF								
Total Protein	Photometry	Bijou/ sterile urine bottle	1mL	24 hrs	150 – 400	mg/L	4 hrs	1 hrs (Urgent)
Glucose					2.2 – 3.9	mmol/L		
CARDIAC								
Creatine Kinase	Photometry	Plain tube/ Lithium Heparin	2.5mL	24 hrs	Male: 30 – 200 Female: 29 – 168	U/L	4 hrs	1 hrs (Urgent : Creatine Kinase)
CKMB	Chemiluminescent immunoassay (CMIA)	Plain tube			Male : < 5.2 Female : <3.1	ng/mL	1 hr	
TN-I					Male: <34.2 Female: <15.6	pg/mL		
IRON TIBC								
Iron Total	Photometry	Plain tube/ Lithium Heparin	2.5mL	8 am – 5 pm	Male: 11.6-31.3 Female: 9.0 – 30.4	µmol/L	4 hrs	
TIBC (Total Iron Binding Capacity)					Male: 24 – 74.3 Female: 21.5-85.9			
Transferrin	Photometry	Plain tube/ Lithium Heparin	2.5mL	8 am – 5 pm	Male: 1.74 – 3.64 Female: 1.8 – 3.82	g/L	4 hrs	
LIPID PROFILE/ FASTING SERUM LIPID								
Total Cholesterol	Photometry	Plain tube/ Lithium Heparin	2.5mL	24 hrs	Child <4.4 Adult <5.18	mmol/L	4 hrs	**Fasting**
HDL Cholesterol					Major Risk:<1.04 Negative Risk: 1.55			
LDL Cholesterol					<3.8			
Triglyceride					<1.7			

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	UNIT	TAT (Working Day)	NOTES
PANEL								
LIVER FUNCTION TEST								
Total Protein	Photometry	Plain tube/ Lithium Heparin	2.5mL	24 hrs	64 – 83	g/L	4 hrs	
Albumin					0 to 4 days: 28- 44 4 days to 14 years: 38- 54 Adult: 35 – 50 >60 years: 34-48			
Bilirubin Total					3.4 – 20.5	µmol/L		
ALP (Alkaline Phosphatase)					40– 150	U/L		
ALT (Alanine Amino Transferase					0 - 55			
RENAL PROFILE								
Potassium (K)	Potentiometry	Plain tube/ Lithium Heparin	2.5mL	24 hrs	3.5 – 5.1	mmol/L	4 hrs 1 hrs (Urgent)	
Sodium (Na)					136 – 145			
Urea	Photometry				Male : 3.2 – 7.4 Female : 2.5 – 6.7			
Creatinine					Male : 64 - 104 Female : 49 - 90	µmol/L		
SERUM BILIRUBIN								
Bilirubin Total	Photometry	Plain tube/ Lithium Heparin	2.5mL	24 hrs	3.4 – 20.5	µmol/L	4 hrs	
Bilirubin Direct					0 – 8.6			

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	UNIT	TAT (Working Day)	NOTES
PANEL								
BLOOD GLUCOSE								
Fasting Blood Sugar (FBS)	Photometry	Sodium Fluoride/ Potassium Oxalate	2.5mL	24 hrs	4.1 – 5.6	mmol/L	4 hrs	Fasting
Random Blood Sugar (RBS)					≤ 5.5		1 hrs (Urgent)	Minimum **2 hours after** taking food/drink
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES								
Pneumatic tube usage Only blood sample (with form) should be sent using pneumatic tube. Please ensure that those tube are cap tighly before deliver to any destination Sample such as **CSF ,Body fluid , urine and ESR (Erythrocyte Sedimentation Rate)** sample 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. Sample also should be separated based on laboratory and send directly to the designated laboratory.								

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	UNIT	TAT (Working Day)	NOTES
IMMUNOASSAYS								
AFP	Chemiluminescent immunoassay (CMIA)	Plain tube/ lithium heparin	2.5mL	8 am- 5 pm	0.00 – 8.78	ng/mL	3 days 4 hrs (Urgent: β-HCG, Cortisol)	Specimen for **immunoassay** testing should **not be shared** together **with** other **biochemistry** testing.
β- HCG					Male: < 5.0 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		
B12		Plain tube			138 - 652	pmol/L		
CA 19-9					<37	U/mL		
CA 125					0 - 35			
Cortisol					AM (before 10am): 101.2-535.7 Mid Night (After 5 pm): 79.0 – 447.8 Random : None	nmol/L		
Ferritin		Plain tube/ Lithium Heparin			Male: 21.81 – 274.66 Female: 4.63 - 204	µg/L		
Folate		Plain tube			7 – 46.4	nmol/L		

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	UNIT	TAT (Working Day)	NOTES
IMMUNOASSAYS								
FSH (Follicular Stimulating Hormone)	Chemiluminescent immunoassay (CMIA)	Plain tube/ Lithium Heparin	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: 26.72 – 133.41 Post-Menopausal: 26.72 – 133.41	UI/L	3 days 4 hrs (Urgent: FT4)	**Specimen for immunoassay testing should not be shared together with other biochemistry testing.**
FT3 (Tri- Iodothyronine Free)					2.63 – 5.70	pmol/L		
FT4 (Thyroxine Free)					9 – 19.05			
LH (Luteinising Hormone)		Plain Tube			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		

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	UNIT	TAT (Working Day)	NOTES
IMMUNOASSAYS								
Progesterone	Chemiluminescent immunoassay (CMIA) Chemiluminescent immunoassay (CMIA)	Plain Tube/ Lithium Heparin			Male: <0.32 – 0.64 Female: Follicular Phase: <0.32 – 0.95 Luteal Phase: 3.82 – 50.56 Post menopase: <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	**Specimen for immunoassay testing should not be shared together with other biochemistry testing.**
Prolactin		Plain Tube/ Lithium Heparin	2.5mL	8 am- 5 pm	Male: 3.46 – 19.40 Female: 5.18 – 26.53	µg/L		
Total PSA (Prostate Specific Antigen)		Plain Tube			< 4.0	ng/mL		
Free PSA (Prostate Specific Antigen)					< 0.5			

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	UNIT	TAT (Working Day)	NOTES
IMMUNOASSAYS								
TSH (Thyroid Stimulating Hormone)	Chemiluminescent immunoassay (CMIA)	Plain Tube/ Lithium Heparin			0.35 – 4.94 Cord Blood: Normal: <21 mU/L, Equivocal: 25-60 mU/L, High: >60 mU/L	uIU/mL	3 days 4 hrs (Urgent: TSH, Cortisol)	**Specimen for immunoassay testing should not be shared together with other biochemistry testing**
Estradiol		Plain Tube			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: 26.72 – 133.41	pmol/L		
CEA					< 5	ng/mL		
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES								
Immunoassay testing Request involve testing of βHCG, Cortisol, Ferritin, Folate, B12, FSH, Free T3, Free T4, Luteinising Hormone, Progesterone, Prolactin, Thyroid Stimulating Hormone, Alpha Fetoprotein, Ca19-9, and CA125 should be collected in separated tube from other biochemistry testing Sample should be collected using plain tube and adding any others test to previous sample that has been sent to the lab will be not entertained. Adequate sample should be provided at least 2 mL for each tube.								

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	UNIT	TAT (Working Day)	NOTES
URINE BIOCHEMISTRY TEST								
Albumin (24 Hours)	Photometry	24 hrs urine container	Minimum volume 20mL	8 am – 5 pm	< 30	mg/24Hrs	4 hrs	**For 24 Hours Creatinine Clearance : Plain tube** should be **send together**, for **serum creatinine** testing.
Amylase (24 Hours)					1 – 17	U/ hr		
Calcium (24 Hours)					2.5 -7.5	mmol/24Hrs		
Chloride (24 Hours)	Potentiometry				110 – 250			
Creatinine(24hours)	Photometry				M: 7.7 – 21.3 F: 5.9 – 14.1			
24 Hours Creatinine Clearance					Male: 61 - 147 Female: 59 – 151	mL/min		
Cortisol (24 hours)	Chemiluminescent immunoassay (CMIA)				11.8 - 486	nmol/L	3 days	
Glucose (24 hours)	Photometry				2.8	mmol/24hrs	4 hrs	
Magnesium (24 hours)					3.0 - 5.0			
Potassium (24 hours)	Potentiometry				24 – 125			
Sodium (24 hours)					40 – 220			
Phosphorus (24 hours)	Photometry	24 hrs urine container containing acid as preservative			12.9 – 42.0			

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	UNIT	TAT (Working Day)	NOTES
URINE BIOCHEMISTRY TEST								
Total Protein (24 hours)	Photometry	24 hrs urine container	Minimum volume 20mL	8 am – 5 pm	50 – 80	mg/24hrs	4 hours	
Urea (24 hours)					428 – 714	mmol/24hrs		
Uric Acid (24 hours)					1.48 – 4.43			
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES								
24hr Urine Use a urine collection container to collect 24hr urine. You may need more than one container Make sure each containers are labelled properly Start the 24-hr urine test in the morning after you wake up by urinating directly into the toilet. Do not collect this urine After your first urinate, write the date and time on your storage container Start collecting from the second urinate until 24 hours Exactly 24 hours after you started the test, urinate one last time and place the urine in your storage container. This is the end of your test Close the lid tightly and send the specimen to the lab (Note: During collection keep the specimen in the fridge / in a cooler) (For 24 hr urine catecholamine and phosphate you can get the preservative from Unit Patologi Kimia counter)								

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	UNIT	TAT (Working Day)	NOTES
URINE BIOCHEMISTRY TEST								
Albumin (Random)	Photometry	Urine container	Minimum volume 20 mL	8 am – 5 pm	< 30	mg/L	4 hours	Please sent random urine sample **within 4 hours** after collection. Otherwise, it will be rejected if being received more than 4 hours.
Urine Albumin Creatinine Ratio(Alb:Crea)					Male : <2.5 Female : <3.5	mg/mmol		
Amylase (Random)					-	U/L		
Creatinine (Random)		24 hrs urine container			Male : 5.1 – 14.2 Female : 3.9 – 9.4	mmol/L		
Glucose (Random)		Urine container			0.1 – 0.8	mmol/L		
Total Protein (Random)					10 – 140	mg/L		
Osmolality urine (random)	Deep Freezing Point			24 hrs	50 – 1200	mOsm/kg		
OTHER TEST								
Procalcitonin	Chemiluminescent Microparticle Immunoassay (CMIA)	Plain Tube	2.5mL	8 am – 5 pm	1. < 0.05 ng/mL : - Normal value 2. < 0.5 ng/mL : -Minor or no significant systemic inflammatory response.	ng/mL	1 days	
ESR	Westergren	Streck ESR tube	1.2 mL	8 am – 5 pm	1.0 – 15.0	mm/Hr	4 hours	

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	UNIT	TAT (Working Day)	NOTES
OTHER TEST								
Urine Pregnancy Test	Test Strip	Sterile urine container	Minimum volume 20 mL	8 am – 5 pm	Positive/ Negative		4 hours	
UFEME	Test Strip	Sterile urine container	Minimum volume 20 mL		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 hours	
Protein Electrophoresis	EP: Agarose gel electrophoresis IFE: Immunoprecipitation on agarose gel	Serum: Plain tube Urine: Sterile urine container	Urine: minimum 20ml Blood: Minimum 2.5mL				EP: 5 days IFE:10 days	**Blood and urine** should be **sent together**

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	UNIT	TAT (Working Day)	NOTES
METABOLIC								
Ketone		Sterile urine container	Minimum volume 20mL	8 am – 5 pm	Negative		3 days	
Stool Reducing Sugar								
Clinistix								
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES								

Random urine (Preferabbly midstream urine)

2.1 For Female

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

2.2 For Male

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

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

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	UNIT	TAT (Working Day)	NOTES
THERAPEUTIC DRUG MONITORING								
Acetaminophen	Photometry	Plain tube/ Lithium heparin	2.5 mL	24 hours	Refer Rumack Matthew Nomogram (Level must be taken within 4-24 hours post ingestion)[1]	µmol/L	4 hours	Please consult with HCTM PPUKM Department of Pharmacy for further enquiry.
Benzodiazepine					Depend on usage of drug			
Salicylate					Rheumatic fever[1]: 1.81-2.89 Anti inflammatory[1]: 1.09-2.17	mmol/L		
Amikacin				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		Plain tube only			**Trough 12 h post dose**[8] 0.60 – 1.2 **Toxic** >1.5	mmol/L	4 hours	
Digoxin	Chemiluminescent immunoassay (CMIA)	Plain tube/ lithium heparin			Pre level: 3.4 CHF: Up to 1.28 AF < 2.6 Toxic: >2.6	nmol/L	2 days	
Carbamazepine					17 – 51	µmol/L		
Phenytoin					39.6 – 79.2	µmol/L	2 days	

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	UNIT	TAT (Working Day)	NOTES
THERAPEUTIC DRUG MONITORING								
Gentamicin	Chemiluminescent immunoassay (CMIA)	Plain tube/ Lithium heparin	2.5 mL	8 am- 5 pm	**Once Daily Dosing[5]:** **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[6,7]:** Strep/enterococci **Peak**: 6.3-10.46 **Trough**: <2.1 Staphylococci **Peak**:10.46-20.92 **Trough:** <4.2	µmol/L	2 days	Please consult with HCTM PPUKM Department of Pharmacy for further enquiry.
Phenobarbital					65 – 172			
Theophylline					55-100 Elderly[9]: 27.75-55			
Valproic Acid					346.5 – 693			

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	UNIT	TAT (Working Day)	NOTES
THERAPEUTIC DRUG MONITORING								
Vancomycin					**Peak**: <27.6 **Trough**[10-12]: Non complicated infection: 6.9-10.3 Endocarditis, osteomyeliltis, meningitis, HAP, bacteremia[10-12]: 10.3-13.8 *trough level is usually done to access efficacy			
Cyclosporine	Chemiluminescent immunoassay (CMIA)	EDTA	2.5 mL	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					5 – 20		3 days	

References:

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2) A.H. Thomson, West Glasgow Hospital NHS Trust
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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]

CHEMICAL PATHOLOGY REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
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)	**Please refer notes.**

CHEMICAL PATHOLOGY REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
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 27. **Hemolysis, icterus and lipemic sample as well as certain medication may interfere with the testing of a analytes. Please refer to laboratory personnel for further inquiry (ext: 5560)**	**Please refer notes.**

Tarikh Kemaskini: 16 Mei 2023

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.

No.	Test	Indication	Description	Requester	Source/Rationale
2.	Liver function test (LFT)	1. **LFT** consist of **Total protein, albumin, ALT, ALP** and **total bilirubin.** 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.
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

No.	Test	Indication	Description	Requester	Source/Rationale
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.
		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		

No.	Test	Indication	Description	Requester	Source/Rationale
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 marker 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).	• 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
		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.**			
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,

No.	Test	Indication	Description	Requester	Source/Rationale
					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 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 3 months.	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

No.	Test	Indication	Description	Requester	Source/Rationale
					• 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/ <u>ALL ICU.</u>** **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
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

7.5 Hematology Unit

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
Full Blood Count (FBC)	- Sheath flow DC detection method - Flow cytometry method using semiconductor laser - SLS-Hemoglobin method	Adult 3 ml K_2EDTA (purple cap) Pediatric 0.5 ml K_2EDTA (purple cap) or MAP Microtube K_2EDTA 1.0 mg (purple cap)	Adult 2 ml Whole blood Pediatric 0.5ml Whole blood	24 hours	Please refer LIS for the current reference range	1 HOUR 30 MINUTES (*URGENT-all request from ED/ request by a call from ward/clinic)	1. Collect blood in a EDTA tube of 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. Specimen 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)	
Full Blood Picture (FBP) - FBP (+Retic)	Sliding and staining method	Adult 3 ml K_2EDTA (purple cap) Pediatric 0.5 ml K_2EDTA (purple cap)	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. Specimen is stable for 24 hours at room temperature. 4. Add test for FBP within 4 hours after blood collection.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
Coagulation test -PT -PT/INR -APTT -TT -FIB -D-Dimer	-Viscosity-based detection system (Mechanical Clot Detection) - Photometric Method and Latex Immunoassay	Adult 2.7 ml Sodium Citrate (blue cap) Pediatric 1.8 ml Sodium Citrate (blue cap)	Adult 2.7ml in 3.2% Sodium Citrate (Full draw) Pediatric 1.8ml in 3.2% Sodium Citrate (Full draw)	24 hours	Please refer LIS for the current reference range	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. Time of withdrawing blood 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) specimen must be tested within 2 hours. 8. Specimen is stable for 4 hours (from the withdrawal time) a room temperature.
DIVC Screening	-Viscosity-based detection system (Mechanical Clot Detection) - Photometric Method and Latex Immunoassay					1 HOUR (URGENT for all request DIVC)	

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
G6PD Screening	Fluorescence Polarization	Adult 3 ml K_2EDTA (purple cap) Pediatric 0.5 ml K_2EDTA (purple cap)	Neonates 2 ml Cord blood Adult 2 ml Whole 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 of DOB, gender, and age are **COMPULSORY**. 2. Specimen is stable for 24 hours at room temperature.
G6PD Enzyme Level (G6PD Quantitative)	Enzymatic colorimetric	Adult 3 ml K_2EDTA (purple cap) Pediatric 0.5 ml K_2EDTA (purple cap)	Adult 2 ml Whole blood Pediatric 0.5 ml Whole blood	8.00 am - 5.00 pm (Working days)	Please refer to LIS for the current reference range	3 WORKING DAYS	1. Specimen is stable for 24 hours at room temperature and ≤ 3 days at 2-8°C. 2. Information of DOB, gender, and age are **COMPULSORY**. 3. Please store and ship at refrigerated temperature. Forward promptly. (Specimen from external agency/ hospital). 4. Specimen **cannot** be frozen. 5. Please state the transfusion status for the past month (if applicable).

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL 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 MO/ Haematologist in charge) 2. Appointment must be made with Hematology Lab at least one day before the procedure 3. If no appointment, lab staff will refer to MO/ Hematologist in charge (For New Case 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. Please send the specimen immediately or at least one hour after urine collection 2. Appointment must be made with Hematology Lab at least one day before the procedure
Neutrophil Alkaline Phosphatase (NAP) Score	Sliding and staining Method	Adult 3 ml K_2EDTA (purple cap)	Slide smearing (fresh)	8.00 am - 5.00 pm (Working days)	35-100 neu	1 WORKING DAY	1. Appointment must be made with Hematology Lab at least one day before the procedure 2. Specimen is stable for 24 hours at room temperature 3. Specimen must reach Haematology Lab before 10.00 am.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
Haemoglobin Analysis	HPLC and Capillaries Electrophoresis	Adult 3 ml K_2EDTA (purple cap)	2 ml Whole blood	8.00 am - 5.00 pm (Working days)	Please refer LIS for the current reference range	10 WORKING DAYS	1. Please complete the full details (Name, MRN/IC Number) of family members for family screening 2. Please perform an iron study/ ferritin. Hemoglobin analysis cannot be performed without the serum iron status. 3. Please state the transfusion status for the past 3 months. 4. Specimen is stable for 24 hours at room temperature
H-inclusion	Sliding and staining Method				Negative Positive		
Kleihauer Test	Sliding and staining Method	Adult 3 ml K_2EDTA (purple cap)	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. Specimen is stable for 24 hours at room temperature
Ham's Test	% lysis	Adult 3 ml K_2EDTA (purple cap)	2 ml Whole blood	8.00 am - 5.00 pm (Working days)	Normal – No lysis	1 WORKING DAY	1. Appointment must be made with Hematology Lab at least one day before the procedure 2. Specimen is stable for 24 hours at room temperature

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
Cryoglobulin Test	Precipitation	Adult 3 ml K_2EDTA (purple cap) 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 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 (green cap)	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 Hematology Lab at least one day before the procedure 2. Specimen must reach Hematology Lab before 10.00 am. 3. Specimen is stable for 24 hours at room temperature 4. A normal specimen (as normal control) must be sent together with the patient specimen

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
Leukemia and Lymphoma Immunophenotyping	Flowcytometry	Adult 3 ml K_2EDTA (purple cap)	3ml x 3 tubes Whole blood/ bone marrow	8.00 am - 5.00 pm (Working days)		5 WORKING DAYS	1. Appointment must be made with Hematology Lab at least one day before the procedure
Lymphocyte Subset	Flowcytometry (Trucount tube)	Adult 3 ml K_2EDTA (purple cap)	3ml Whole blood	8.00 am - 5.00 pm (Working days)	Please refer LIS for the current reference range	2 WORKING DAYS	1. Appointment must be made with Hematology Lab at least one day before the procedure 2. Specimen must reach Hematology Lab before 11.00 am 3. Specimen is stable for 24 hours at room temperature
CD4/CD8	Flowcytometry (Trucount tube)	Adult 3 ml K_2EDTA (purple cap)	3ml Whole blood	8.00 am - 5.00 pm (Working days- Tuesday Only)	Please refer LIS for the current reference range	2 WORKING DAYS	1. Specimen must reach Hematology Lab before 11.00 am. 2. Specimen is stable for 24 hours at room temperature
PNH Investigation	Flowcytometry	Adult 3 ml K_2EDTA (purple cap)	3ml Whole blood	8.00 am - 5.00 pm (Working days)	Detected Not Detected	7 WORKING DAYS	1. Appointment must be made with Hematology Lab at least one day before the procedure 2. Specimen must reach Hematology Lab before 11.00 am. 3. Specimen is stable for 24 hours at room temperature

REJECTION CRITERIA

Please refer Haematology Request Form

FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION

(ANNEX 1)

GUIDELINES FOR FBP REQUEST

Purpose

The purpose of this guideline is to reduce number of unnecessary full blood picture (FBP) request. 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 stay. Requests of unnecessary FBP will cause increase in workload, affect the quality of the FBP slides and laboratory expenditure.

Indication for FBP

Request 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 satelitism).
    e) Very high platelet count > 1000 x 10^9/L.
    f) Severe anaemia, haemoglobin < 5g/dl, to look for evidence of haemolysis or iron/ folate deficiency.

* However if the patient is hospitalized and FBC is flagged almost everyday, 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) Haemolytic anaemia
    c) Microangiopathic haemolytic anaemia (MAHA)/ Fragmentation syndrome.
    d) Family screening for thalassemia

3. For clinic follow up of known haematological disorder cases eg: ALL, CML. If warded patient, probably just send 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 normal. (Exceptional to annual staff medical check-up)
3. Requests of daily FBP for hospitalized patient.
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 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 microcope) 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 haematology, 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

ANNEX 2

PRE-ANALYTICAL GUIDELINES FOR ROUTINE & SPECIAL COAGULATION TESTING

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

   b) Syringe method.
      - <20 ml syringe
      - Transfer blood to citrate tube immediately (≤ one minute)
      - **DANGER: Syringe method have greater potential for hemolysis and platelet activation = hemolyzed or clotted tube**
      - Hemolysis – **falsely shortened clotting times**

   c) Vascular access device
      - If drawing from central line, flush with 10 – 20 ml saline.
      - If drawing from a saline lock, discard 5 – 10 ml.
      - **DANGER: Have potential for sample dilution or contamination**

   d) Avoid prolonged tourniquet use
      - Leads to activation of platelet and clotting factor = **shortened result**

   e) Avoid "digging" to find the vein
      - DANGER: Can cause activation of clotting factors = **clotted tube**

   f) Excessive stress & vigorous fist clenching
      - will increase FVIII & vWF = **shortened result**

2. **Correct Anti-coagulant**
   - 3.2% trisodium citrate (Citrate : binds to calcium →prevents 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)
      - 9:1 = 9 parts blood to 1 part anticoagulant
      - **<90% fill is UNACCEPTABLE and WILL BE REJECTED**
        Underfilled tubes = prolonged clotting times (i.e. PT, APTT)
      - NEVER combine two underfilled tubes to make one filled tube.

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
      - micro clot→ shortened result
      - large clot-loss of coagulation factors to form clot → prolonged result
   b) Sodium citrate takes out calcium from patient's blood, which is required for clot formation
      - If sample is not mixed well, anticoagulant cannot remove calcium and sample will clot
      - Digging around for vein can cause factors to activate – not enough sodium citrate to overcome that and sample will clot
      - If sample is collected properly, calcium is permanently removed. The sample will not clot over time.

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

Additional information

Transportation & Timing Guidelines for **Routine & Special Coagulation Testing**

a) Send samples at **ROOM TEMPERATURE**.
   - **DANGER**: Sending samples on ice will activate the sample = **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.

REFERENCES

1. Quality Standards for Sample Collection in Coagulation Testing, Lippi *et al* 2012.
2. Haemostasis Made Easy, Dato' Dr Azizon Othman 2018.

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

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 Reticulocytes 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 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>
</table>

No.	Test	Indication	Description	Requester	Source/Rationale
3.	**G6PD Screening**	Newborn screening for G6PD deficiency is performed routinely in Malaysia because of our high disease prevalence.	• 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.	HO/ MO/ Specialist	• Guideline G6PD Screening in newborn. http://www.my.health.gov.my/en/g6pd-screeningscreening-newborn/
	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	• Limitation for G6PD Enzyme Level is acute haemolysis & reticulocytosis because it can cause false normal result in a G6PD deficient patient. Suggest to repeat the test 3 months later when reticulocyte count back to normal/ haemolysis resolves. • Tests carried out in 'batches'. • 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/

No.	Test	Indication	Description	Requester	Source/Rationale
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 thalassaemia. 3. For cases other than this must be justified with relevant clinical history (iron/ ferritin study must be performed for cases of hypochromic anaemia 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 multicolour flow cytometry in the diagnosis of haematological 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.

7.6 Blood Bank Unit

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
GXM FOR PACKED RBC/ WHOLE BLOOD OR GROUP SCREEN AND HOLD (GSH)	Tube / Gel Card	EDTA	6.0 ml For new cases with no ABO & Rh D blood group, EDTA 3.5ml need to be sent to check the blood group	Planned operation **(2 DAYS BEFORE OPERATION)** and **24 HOURS** for **EMERGENCY** cases **24 HOURS** ***Only when transfusion is required**	Not applicable	3 hours	i. In case of low blood stocks, please contact MO to obtain request code. *For cases with **special blood group** eg.Rh D neg or rare antibody, GXM **request** has to be made at least **1 week before** operation. ** **Please transfuse as soon as possible** *** **Please return blood bag immediately to Blood Bank if not use.** ii. All components request form must be **sent by hand** (cannot by pneumatic tube) and must obtain the request code from MO incharge or oncall **Please transfuse as soon as possible** *** **Please return blood component immediately to Blood Bank if not use together with a justification letter if not used.**

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)**	Tube/ Gel Card	EDTA	6.0 ml For new cases with no ABO & Rh D blood group, EDTA 3.5ml need to be sent to check the blood group	Planned operation **(2 DAYS BEFORE OPERATION)** and **24 HOURS** for **EMERGENCY** cases **24 HOURS *Only when transfusion is required**	-	3 hours	In case of low blood stocks, please contact MO to obtain request code *For cases with **special blood group** eg.Rh D neg or rare antibody, GXM **request** has to be made at least **1 week before** operation. **** Please transfuse as soon as possible** ***** Please return blood bag immediately to Blood Bank if not use.** All components request form must be **sent by hand** (cannot by pneumatic tube) and must obtain the request code from MO incharge or oncall *** Please transfuse as soon as possible** **** Please return blood component immediately to Blood Bank if not use together with a justification letter if not used**
Blood Grouping	Tube	EDTA	3.5 ml	8:00 am – 4:00 pm	-	24 hours	OFFICE HOURS (Samples from **clinics until 6pm**)
Direct and Indirect Coombs	Gel Card	EDTA	6.0 ml	8:00 am – 4:00 pm	-	24 hours	OFFICE HOURS (Samples from clinics until 6pm)

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	3.5 ml	24 hours	-	24 hours	
Rhesus/ RBC Phenotyping	Tube / Gel Card	EDTA	6.0 ml	8:00 am – 4:00 pm	-	15 days	Office hours
Transfusion Reaction	Tube / Gel Card	EDTA	6.0 ml X 2 tubes	24 hours	-	15 days	
Antibody Identification	Tube / Gel Card	EDTA	6.0 ml X 2 tubes	8:00 am – 4:00 pm	-	15 days	
Cold Agglutinin Titre	Tube	EDTA	6.0 ml X 2 tubes	8:00 am – 4:00 pm	-	15 days	**Appointment** only. Office hours.
ANTI-D Titre Test	Gel Card	EDTA	6.0 ml X 2 tubes	8:00 am – 4:00 pm	-	15 days	
Isohaemagglutinin	Tube / Gel Card	EDTA	6.0 ml X 2 tubes	8:00 am – 4:00 pm	-	15 days	Office hours

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
1. Patient's ID sticker overlapped with other patient's ID sticker. 2. Incomplete request form. - 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 or initial of Medical Officer 3. Patient's information on 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. Request received after office hours (for certain test). 6. Repeated request. 7. Sample stored overnight. 8. Sample received unlabelled. 9. Insufficient sample. 10. Spilled sample. 11. Wrong specimen tube. 12. Haemolysed sample. 13. Clotted sample. 14. No intial at specimen tube 15. The initial of 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 blood bank, no blood sample, patient's name not written in capital block).	**NA**
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES	
NA	

7.7 Specialized Haemostasis Unit

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
Factor VIII Assay	Clotting	 **X 1 TUBE** Sodium Citrate Tube	2.7 ml / volume specified on the specimen container	8.00 AM – 4.30 PM * Monday to Friday except Public Holiday	50 – 193 %	15 WORKING DAYS	1. To call MO before requesting; **ext: 6767** 2. Please **fill blood exactly up to the marked level** / volume specified on the specimen container to ensure its integrity for testing. * Specimen must reach lab **within 3 hours** from the time of venipuncture. Diagnostic service is from Monday to Friday and within office hours only.
Factor IX Assay					67 – 173 %		
Factor XIII Screening Test	Clotting	 **X1 TUBE** Sodium Citrate Tube			Negative: Clot remains insoluble/ not dissolved Positive: Clot is soluble/ dissolve	15 WORKING DAYS	
Heparin Induced Thrombocytopenia (HIT)	Lateral Flow Immunoassay	 **X 1 TUBE** Sodium Citrate Tube		**BY APPOINTMENT ONLY** 8.00 AM – 4.00 PM * Monday to Friday except Public Holiday	Positive/ Negative	24 HOURS	1. To call MO before requesting; **ext: 6767** * Specimen must reach lab **within 1 hour** from the time of venipuncture. Diagnostic service is from Monday to Friday and within office hours only.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
ANTI – Xa Assay (Low Molecular Weight Heparin)	Chromogenic	 **X 1 TUBE** Sodium Citrate Tube	2.7 ml / volume specified on the specimen container	**BY APPOINTMENT ONLY** 8.00 AM – 4.00 PM * Monday to Friday except Public Holiday	The therapeutic range depends on level of LMWH	24 HOURS	1. Please make an appointment by call one day earlier before requesting; **ext.: 6767** 2. Please **draw blood after 4 hours** taking anticoagulant * Specimen must reach lab **within 1 hour** from the time of venipuncture. Diagnostic service is from Monday to Friday and within office hours only.
INHIBITOR ASSAY							
Factor VIII Inhibitor	Clotting	 **X 3 TUBES** Sodium Citrate Tube	3 x (2.7 ml / volume specified on the specimen container)	8.00 AM – 4.30 PM * Monday to Friday except Public Holiday	1 BU = Amount of inhibitor that inactivates 50% of F.VIII/ F. IX in Normal Pool Plasma	15 WORKING DAYS	1. To call MO before requesting; **ext.: 6767** 2. Please **fill blood exactly up to the marked level** / volume specified on the specimen container to ensure its integrity for testing. * Specimen must reach lab **within 3 hours** from the time of venipuncture. Diagnostic service is from Monday to Friday and within office hours only.
Factor IX Inhibitor							

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
Inhibitor Screening	Clotting	 **X 2 TUBES** Sodium Citrate Tube	2 x (2.7 ml / volume specified on the specimen container)	8.00 AM – 4.30 PM * Monday to Friday except Public Holiday	≥10 sec: Presence of a time dependent inhibitor < 10 sec: Absence of a time dependant inhibitor	15 WORKING DAYS	
ANTI PHOSPHOLIPID SCREENING (APLS)							
Anti Cardiolipin IgG	Fluorescence Enzyme Immunoassay	 **X 1 TUBE** Sodium Citrate Tube	2.7 ml / volume specified on the specimen container	8.00AM – 4.30 PM * Monday to Friday except Public Holiday	<10 GPL-U/ml Negative 10-40 GPL-U/ml Weak Pos >40 GPL-U/ml Positive	25 WORKING DAYS	1. To call MO before requesting; **ext: 6767** 2. Please **fill blood exactly up to the marked level** / volume specified on the specimen container to ensure its integrity for testing. * Specimen must reach lab **within 3 hours** from the time of venipuncture. Diagnostic service is from Monday to Friday and within office hours only.
Anti Cardiolipin IgM					<10 GPL-U/ml Negative 10-40 GPL-U/ml Weak Pos >40 GPL-U/ml Positive		
Anti Beta 2 Glycoprotein 1 IgG					<7 U/ml Negative 7-10 U/ml Equivocal >10 U/ml Positive		
Anti Beta 2 Glycoprotein 1 IgM					<7 U/ml Negative 7-10 U/ml Equivocal >10 U/ml Positive		

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
LUPUS ANTICOAGULANT TEST PANEL							
PTT-LA (screen)	Clotting	 **X 2 TUBES** Sodium Citrate Tube	2 x (2.7 ml / volume specified on the specimen container)	8.00AM – 4.30 PM * Monday to Friday except Public Holiday	33.1 - 55.3 sec	25 WORKING DAYS	
STACLOT-LA (confirm)					< 8.0 sec. Negative ≥ 8.0 sec. Positive		
DRVVT (screen)					28.5 - 46.3 sec		
DRVVT (confirm)					31.2 - 39.0 sec		
THROMBOPHILIA PANEL							
Protein C Activity	Chromogenic	 **X 1 TUBE** Sodium Citrate Tube	2.7 ml / volume specified on the specimen container	8.00AM – 4.30 PM * Monday to Friday except Public Holiday	71 – 156 %	25 WORKING DAYS	1. To call MO before requesting; **ext: 6767** 2. Please **fill blood exactly up to the marked level** / volume specified on the specimen container to ensure its integrity for testing. * Specimen must reach lab **within 3 hours** from the time of venipuncture. Diagnostic service is from Monday to Friday and within 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	NORMAL RANGE	TAT (Working Day)	NOTES
PLATELET FUNCTION INVESTIGATION							
Clot Retraction	Clotting	 **X 4 TUBE** Sodium Citrate Tube	4 x (2.7 ml / volume specified on the specimen container)	**BY APPOINTMENT ONLY** 8.00AM – 4.30 PM * Monday to Friday except Public Holiday	Normal: > 40	20 WORKING DAYS	1. To call MO before requesting; **ext: 6767** 2. Please **fill blood exactly up to the marked level** / volume specified on the specimen container to ensure its integrity for testing. * Specimen must reach lab **within 3 hours** from the time of venipuncture. Diagnostic service is from Monday to Friday and within office hours only.
Blood Grouping	Antigen/ antibody				A/B/O/AB (Pos/ Neg)		
Platelet Aggregation Test	Impedance				**Refer To Pathological Report**		
VWD SCREENING TEST PANEL							
Von Willebrand Factor Antigen	Elisa	 **X 2 TUBE** Sodium Citrate Tube	2 x (2.7 ml / volume specified on the specimen container)	8.00AM – 4.30PM * Monday to Friday except Public Holiday	50 – 150 %	20 WORKING DAYS	1. * To call MO before requesting; **ext: 6767** 2. Please **fill blood exactly up to the marked level** / volume specified on the specimen container to ensure its integrity for testing.
Collagen Binding Assay					40 – 250 %		

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
Ristocetin Cofactor Assay	Chemilumi-nescence				45.6 – 176.3 %		* Specimen must reach lab **within 3 hours** from the time of venipuncture. Diagnostic service is from Monday to Friday and within office hours only.

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
The specimen will not be accepted and rejected for testing if: a. Specimen lysed b. Discrepancy of details between request form and specimen c. Using wrong request form d. Using wrong tube or specimen e. Specimens received in the laboratory for more than 3 hours after blood sampling. f. The service is not offered in the Specialized Hemostasis Unit. g. Sending test specimen not within the designated service operation hours (after 4.30pm). h. No appointment was made for tests that needs one. (For Platelet Function Test). i. Incomplete form (Ensure requests are filled with date, time & location (for critical and urgent tests), tests requested, 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. Duplicate requests (samples received within TAT). m. Frozen specimen. n. Receiving specimen from outside UKMMC laboratory in the form of:	**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 10th week of gestation. b. One or more pre-term births of a morphologically normal neonate before 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 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. **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 indicate increase risk of recurrence favouring long-term anticoagulation) 2. Young adults (<50 years) with ischaemic stroke. (The presence of APL indicates Increase risk of recurrence, anticoagulation with warfarin should be considered)

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
i) "Whole Blood" – For Anti Xa assay, the arrival of specimen is more than 1 hour from the time of venipuncture. ii) Plasma samples were shipped without ice box and ice pack / dry o. Request a test that is not related to the patient diagnosis.	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 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.* **Not recommended to test for APLS;** 1. Patient with venous thrombosis due to transient risk factor. (No sufficient evidence to recommend long-term anticoagulation even if the patient has APLS). 2. Patient with ischaemic stroke. **Blood sample for APLS tests;** 1. Whole blood in 2 citrate tubes (2.7 ml each). 2. Timing: During office hour only (Please send before 4.30pm latest to allow for preparation of sample) 3. Send sample to the lab within 3 hours after blood taking.

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

SPECIMEN COLLECTION GUIDELINES

1. For haemostasis tests, venous blood sample 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 venepunctures (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. 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				
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 inhibitor 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 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.
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 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.		

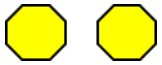
No.	Test	Indication	Description	Requester	Source/Rationale
C.	**Anti Phospholipid Screening (APLS)**				
13.	Anti Cardiolipin IgM	APLS is present if at least one of the criteria is met. i. Vascular thrombosis ii. Pregnancy morbidity iii. If aCL antibody of IgG and/or IgM isotype, present in medium or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

No.	Test	Indication	Description	Requester	Source/Rationale
D.	**Heparin**				
18.	Anti Xa Assay- Low Molecular Weight Heparin (LMWH)	A low molecular weight heparin (Clexane) 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 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

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE & UNIT	TAT (Working Day)	NOTES
CD34⁺ CELL COUNT	**Flow Cytometry**	 EDTA Tube	**1ml** of 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)	NA **cells/ul** (Peripheral Blood) **cells x10⁶/kgBW** (apheresis product) ❖ Target total PBSC CD34⁺ doses for collection: **≥ 5-8x10⁶ CD34⁺cells /kg**	**24 Hours** (Working Day)	❖ The specimens are accepted only on the date of appointment. ❖ The specimen be collected early morning for CD34 pre count for determination of PBSC harvesting and better yield of stem cell product. ❖ The target of PBSC CD34⁺ must be stated in the harvesting protocol and the dose must be disease dependent.
CD3⁺ CELL COUNT	**Flow Cytometry**	 EDTA Tube	**1ml** of Donor Lymphocyte Product		**cells/ul** (Donor lymphocyte product)	**24 Hours** (Working Day)	
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 under certain circumstances ,	**NA**	**NA**	❖ Appointment should be made at least one week before the procedure.
LYMPHOCYTE COLLECTION	**APHERESIS**	**DONOR**	**--**		**NA**	**NA**	

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE & UNIT	TAT (Working Day)	NOTES
				which have been discussed and agreed by both parties.			
STEM CELL & DONOR LYMPHOCYTE CRYOPRESERVATION	**CRYOPRESERVATION**		**APHERESIS STEM CELL** **OR** **LYMPHOCYTE PRODUCTS**	**8.00 am – 5.00 pm** **Monday to Friday except Public Holiday** ❖ The procedure will be carried out after office hour / weekend/ public holiday if apheresis is performed on Friday, weekend and public holiday	**NA**	**24 Hours**	❖ Cryopreserved stem cell and donor lymphocytes from deceased patients will be transferred to Pusat Terapi Sel (PTS) for storage/discard 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 if requested by Clinical Haematologist and approved by Pathologist)	**NA**	**NA**	❖ Appointment should be made at least one week before the procedure.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE & UNIT	TAT (Working Day)	NOTES
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 clinician and pathologist
LEUCOREDUCTION	**APHERESIS**	**PATIENT**	**-**		**NA**	**NA**	
PLATELET APHERESIS	**APHERESIS**	**DONOR**	**-**		**NA**	**NA**	
GRANULOCYTE COLLECTION	**APHERESIS**	**DONOR**	**-**		**NA**	**NA**	
ERYTHROPOETIN IMMUNOASSAY	**ELISA**	 2 Plain Tube with Gel	**Min volume: 1 ml** of Serum		**1.1- 23.3 mU/ml**	**7 WORKING DAYS**	❖ Specimens from outside of HCTM should be stored and transported with ice pack.
BETA - 2 - MICROGLOBULIN	**ELISA**	 Plain Tube with Gel	**1 ml** of Serum		**0.9 - 3.0 µg/ml**		**Send out 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 spill during transportation 6. Lysed spesimen 7. Clotted specimen 8. Specimen sent outside of service operation hours/weekend/public holidays 9. No or incorrect labelling of specimen tube with patient information 10. Request of test is repeated within a turn around time period	1. Haemolysed sample 2. Lipaemic sample 3. Icteric sample 4. Bacterially contaminated sample

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

1) <u>ERYTHROPOIETIN</u>

- ✓ It is highly recommended that the specimen be collected betwen 7.30am to 12.00 noon, because diurnal variation of erythropoetin has been reported (Wide *et al*, 1981 and Cahan *et al*,1992).
- ✓ Collect whole 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 sign eg; blood pressure, heart rate, respiratory rate and body temperature
iii. Good 'venous access'
iv. To start 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) Age of donor must be in between 18-60 years old. Informed written consent must be obtained from parent/guardian for donor age below 18 years old
    b) Platelet count ≥ 150 x 10^9 /L
    c) Donor in good condition
    d) 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 are to be carried out at day 4-5 after given growth factor (GCSF)
    i) Blood priming is needed for patient or donor with body weight less than 25kg – 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 leucopheresis
    a) The requirement for autologous PBSC harvesting and leucopheresis 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
    c. 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 Erythropoeitin***. Br J Haematol 1981; 48: 359-63
iv. Wide L, Bengtsson C, Birgegard G. ***Circadian Rhythym of Erythropoietin in Human Serum***. Br J Haematol 1989; 72:85-90

7.9 Molecular Genetics Unit

GENERAL RULE:

1. All test 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/ Pathologist.
4. Please ensure that the test request is appropriate with 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 Tube (purple cap)	Minimum 2 ml of fresh peripheral blood	8:00 am-5:00 pm Office Hour	Not applicable	30 working days	**Indication** 1. Donor and recipient who undergo stem cell transplantation (pre-transplant samples should send samples together) 2. Repeated samples (post transplant) within 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
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) 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	**Peripheral Blood Specimen**  EDTA Tube For (purple cap) **CVS/ Amniotic fluids:** * Plain sterile container and fully covered with aluminium foil. (protect from light)	Minimum 2 ml of fresh peripheral blood	8:00 am - 5:00 pm (Office Hour)	Not applicable	30 working days	**<u>Indication</u>** 1. Patients with thalassaemic red cells 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 & TIBC and Hemoglobin Analysis before send sample for Thalassaemia Genotype test.
			Minimum 10 ml of fresh CVS/ Amniotic fluids			3 working day	**Appointment** for prenatal diagnosis before send sample to the lab.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
BCR-ABL	Reverse Transcriptase PCR-Qualitative	 EDTA Tube (purple cap)	Minimum 2 ml of fresh peripheral blood/ bone marrow aspirate	8:00 am-5:00 pm (Office Hour)	Not applicable	15 working days	**Indication** 1. All new cases of acute leukaemia and MPN. 2. Repeated samples that positive with BCR-ABL at diagnosis. 3. All relapse cases of acute leukaemia. 4. Repeated & negative known cases will be rejected. Suggestion for : ● Acute Lymphoid Leukemia (ALL) ● Acute Myeloid Leukemia (AML) ● Chronic Eosinophilic Leukemia (CEL) ● Chronic Myeloid Leukemia (CML) ● Chronic Myeloid Monocytic Leukemia (CMML) ● Chronic Neutrophilic Leukemia (CNL) ● Essential Thrombocytosis (ET) ● Juvenile Myeloid Monocytic Leukemia (JMML) ● Myelodysplastic Syndrome (MDS) ● Myeloproliferative Neoplasms (MPN) ● Myelofibrosis (MF) ● Mastocytosis ● Polycythaemia Rubra Vera (PRV)

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
HLA Typing (PCR Class I & PCR CLASS II) LOCI A, B, C, DR, DQ	Specific Sequence Primer PCR Gel electrophoresis	 EDTA Tube (purple cap)	Minimum: 2ml x 2 tubes fresh peripheral blood	8:00 am-5:00 pm (Office Hour)	HLA Compatibility	15 working days	**Indication** 1. Appointment must be made with Molecular Genetics Lab at least one day before procedure. 2. Specimen is stable for 24 hours in room temperature. 3. New samples for pre-transplant donor and recipient only. Suggestion for : ●Stem cell transplant ●Renal transplant
JAK2 V617F Mutation	ARMS PCR		Minimum: 2 ml of fresh peripheral blood		Not applicable	30 working days	**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 ● Myelodisplastic Syndromes ● Chronic Myeloid Leukemia

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
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) 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)	 EDTA Tube (purple cap)	Minimum: 2 ml of fresh peripheral blood	8:00 am-5:00 pm (Office Hour)	Not applicable	30 working days	**Indication** 1. Require **family history information** for family screening cases. **2.** Please request FBC test, Serum Iron & TIBC and Hemoglobin Analysis before send sample for Thalassaemia Genotype test.

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
1. Request form not complete 2. Specimen not labeled 3. Wrong tube 4. Label at tube different from request form 5. Insufficient 6. Empty tube 7. No request form 8. Repeated request without clinical significant (test requested within short period of time)	1. Post transfusion samples for HLA Typing test.

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES	
INDICATION FOR BCR ABL 1. Acceptable cases for BCR-ABL test (new case only) a) Acute Lymphoblastic Leukaemia (ALL) b) Acute Myeloblastic Leukaemia (AML) c) Chronic Eosinophilic Leukeamia (CEL) d) Chronic Myeloid Leukeamia (CML) e) Chronic Myelomonocytic Leukeamia (CMML) f) Chronic Neutrophilic Leukeamia (CNL) g) Essential Thrombocytaemia (ET) h) Juvenile Myelomonocytic Leukaemia (JMML) i) Myelodisplastic Syndrome (MDS) j) Myeloproliferative Neoplasms (MPN) k) Myelodisplastic Syndrome/ Myeloproliferative Disease (MDS/MPD) l) Myelofibrosis (MF) m) Mastocytosis n) Polycythaemia Rubra Vera (PRV) 2. Cases which are not listed in (1) will be rejected. 3. Only cases that positive with BCR-ABL at diagnosis will be proceeded for the test. 4. All relapse cases will be categorize as new case and proceed for the test. 5. Repeated & negative known cases will be rejected.	**INDICATION FOR JAK2 V617F MUTATION** 1. Acceptable cases for JAK2 V617F mutation test (new case only) a) Polycythemia Vera (PRV) b) Essential Thrombocythaemia (ET) c) Myelofibrosis (MF) d) Chronic Myeloid Leukemia (CML) e) Chronic Neutrophilic Leukemia (CNL) f) Chronic Eosinophilic Leukemia (CEL) 2. Case/ diagnose which are not listed above will be rejected 3. Repeated & negative known cases will be rejected

7.10 Bacteriology Unit

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
1. **Blood Culture**	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	Not applicable	8 days (Except PUO/IE cases, 18 days)	* **Do not store** blood culture bottle **in the refrigerator.** * **Do not use expired blood culture bottle.** * **Transport specimen** to laboratory **WITHOUT UNDUE DELAY**. * **DO NOT SEND 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	NORMAL RANGE	TAT (Working Day)	NOTES
2. Cerebrospinal Fluid (CSF) Culture	Macroscopy Microscopy Culture & Sensitivity Identification	Sterile screw-capped containers	1-3 ml	Daily	Not applicable	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					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	NORMAL RANGE	TAT (Working Day)	NOTES
4. Bile Culture	Macroscopy Microscopy Culture & Sensitivity Identification	Sterile screw-capped container	Not applicable	Daily	Not applicable	5 days	**Transport specimen** to laboratory **WITHOUT UNDUE DELAY**.
5. Synovial Fluid Culture							
6. Pleural Fluid Culture							
7. Pericardial Fluid Culture							
8. Peritoneal/ ascites Fluid Culture							
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	NORMAL RANGE	TAT (Working Day)	NOTES
9. Throat Swab Culture	Culture & Sensitivity Identification	Swab transport medium	Not applicable	Daily	Not applicable	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**	**NORMAL RANGE**	**TAT (Working Day)**	**NOTES**
10. Nasal Swab Culture	Culture & Sensitivity Identification	Swab transport medium	Not applicable	Daily	Not applicable	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	NORMAL RANGE	TAT (Working Day)	NOTES
11. Nasopharyngeal Swab	Culture & Sensitivity Identification	Swab transport medium (flexible-wire calcium alginate-tipped)	Not applicable	Daily	Not applicable	18 days	* Please **request swab and transport medium** from **Microbiology Reception Counter**. * **Transport 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**	**NORMAL RANGE**	**TAT (Working Day)**	**NOTES**
12. Tracheal Aspirate Culture*	Microscopy Culture & Sensitivity Identification	Sterile container	Not applicable	Daily	Not applicable	5 days	
13. Bronchoalveolar Lavage (BAL) Culture**							
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	NORMAL RANGE	TAT (Working Day)	NOTES
14. Sputum Culture or Nasopharyngeal Aspirate (NPA) Culture	Microscopy Culture & Sensitivity Identification	Sterile container	Not applicable	Daily	Not applicable	5 days	Do not send saliva.
15. Mycoplasma/ Ureaplasma Identification	Hydrolysis Reaction	Sterile container	Not applicable	Daily	Not applicable	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	NORMAL RANGE	TAT (Working Day)	NOTES
16. Urine Culture	Macroscopy, Microscopy Culture & Sensitivity Identification	Sterile container	About half of the sterile container	Daily	Not applicable	5 days	* Urine that is left at room temperature allows bacteria to multiply; resulting in misleading semi-quantitative culture results. * **State the TIME** of collection on the container. * **Send the specimen within 2 hours** of collection. * **When immediate transport is not possible, refrigerate the urine at 4 to 8 ºC prior to sending.** * **Transportation requirement :** * in **ice pack** to maintain the stability
17. *Streptococcus pnemoniae* Antigen Detection	Immunochromatographic					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	NORMAL RANGE	TAT (Working Day)	NOTES
18. Faeces Culture	Macroscopy Culture & Sensitivity Identification	Sterile container	About 1 g	Daily	Not applicable	5 days	
19. *Clostridium Difficile* Culture	Culture & Sensitivity Identification					5 days	
20. *Clostridium Difficile* Toxin	Immunochromatographic					1 day	
21. Occult Blood						1 day	
22. Rotavirus Antigen Detection						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	NORMAL RANGE	TAT (Working Day)	NOTES
23. Ear Swab Culture	Microscopy Culture & Sensitivity Identification	Swab transport medium	Not applicable	Daily	Not applicable	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	NORMAL RANGE	TAT (Working Day)	NOTES
24. Eye Culture	Microscopy Culture & Sensitivity Identification	Swab transport medium	Not applicable	Daily	Not applicable	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**	**NORMAL RANGE**	**TAT (Working Day)**	**NOTES**
25. Vagina Swab Culture	Microscopy Culture & Sensitivity Identification	Swab transport medium	Not applicable	Daily	Not applicable	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. f. Allow the slide to air-dry.							

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
26. Endocervical Swab Culture	Microscopy Culture & Sensitivity Identification	Swab transport medium	Not applicable	Daily	Not applicable	5 days	Endocervical swab is **suitable for** the **isolation of *Neisseria gonorrhoeae*** by culture.
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	NORMAL RANGE	TAT (Working Day)	NOTES
27. Urethral Discharge Swab	Microscopy Culture & Sensitivity Identification	Swab transport medium	Not applicable	Daily	Not applicable	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	NORMAL RANGE	TAT (Working Day)	NOTES
28. Intrauterine Contraceptive Device (IUCD) Culture	Microscopy Culture & Sensitivity Identification	Sterile container	Not applicable	Daily	Not applicable	5 days	For **suspected** cases of **endometritis**.
29. Catheter Tip Culture (EVD/CVL)	Culture & Sensitivity Identification						* For suspected cases of catheter-related infection. * Submit catheter tip only if there are sign of infection. * For ventricular-peritoneal shunts, peritoneal or spinal fluid is preferred to the catheter tip.
30. Gastric aspirate Culture	Microscopy Culture & Sensitivity Identification						
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES							
Not Applicable.							

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
31. Corneal Scrapping for Microscopy Examination	Gram stain	Slide	Not applicable	Daily	Not applicable	1 day	
32. Corneal Scrapping Culture	Microscopy Culture & Sensitivity Identification	Plate	Not applicable	Daily	Not applicable	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	NORMAL RANGE	TAT (Working Day)	NOTES
33. Pus Culture	Microscopy Culture & Sensitivity Identification	Sterile container Ulcer (not discharged) : Swab transport medium	About 5 ml (pus)	Daily	Not applicable	5 days	
34. Ulcer/ Wound Culture	Microscopy Culture & Sensitivity Identification	Swab transport medium	Not applicable				
35. Tissue/ Bone Culture	Microscopy Culture & Sensitivity Identification	Sterile container	Not applicable				

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.

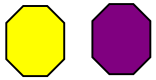
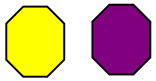
TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
36. Acid Fast Stain	Kinyoun Stain	Sterile container/ Swab transport medium	Refer to the above information	Daily	Not applicable	1 day	
37. Mycobacterium Culture	Culture & Sensitivity Microscopy Identification	Sterile container/ Blood culture bottle for mycobacterium culture	Refer to the above information	Weekdays		10 weeks	
38. 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 refer notes.**

7.11 Mycology Unit

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
1. Aspergillus antigen **2. Candida Antigen**	ELISA	Plain tube	Blood: Adult: 4ml Pead: 1-2ml	8:00 am - 5:00 pm (Office Hour)	Not applicable	10 working days	RT: 2 hours 2˚C-8˚C: 1 weeks -20˚C-80˚C > 1 year
3. Cryptococcuc antigen	Lateral Flow Assay	Plain tube or Sterile container	Blood: Adult: 4ml Pead: 1-2ml CSF	8:00 am - 5:00 pm (Office Hour) **24 hours ONLY for CSF**		2 working days 2 days for CSF	RT: 2 hours 2˚C-8˚C: 1 weeks -20˚C-80˚C > 1 year For CSF stable for 24 hours
4. Fungal culture	(where applicable) Blood agar SDA SDA+A Mycobiotic agar CMA PDA BHIA Sensitive Yeast One	Sterile container	1. Dermatological samples: (skin, nail and hair). 2. Respiratory. 3. Pus and exudate 4. Body fluids. 5. Tissue biopsy. 6. CSF 7. Urine 8. Stool	8:00 am - 5:00 pm (Office Hour)		30 working days	2˚C-8˚C: 1 weeks RT: 24 hours RT: 24 hours RT: 24 hours RT: 24 hours RT: 24 hours Do not refrigerate RT: 24 hours 2˚C-8˚C: 24 hours RT: 24 hours
5. Blood Culture (BACTEC bottle)		Myco/ F lytic bottle	Blood: 1-5ml				RT: 24 hours
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES							
Not Applicable.							

7.12 : MOLECULAR BIOLOGY UNIT

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
HEPATITIS B (DNA) VIRUS - QUANTITATIVE PCR	REAL - TIME PCR		3 mL x 2 tubes	8.00 AM - 5.00 PM (WORKING DAYS)	NA	14 DAYS	**1. Transport requirement:** a) Transport immediately **within 2 hours** after sample collection to the molecular lab at **room temperature.** b) Samples expected to reach the lab **> 2 hours** after sample collection must be transported **on ice (2°C - 8°C).**
HEPATITIS C (RNA) VIRUS - QUANTITATIVE PCR			3 mL x 2 tubes			30 DAYS	
HUMAN IMMUNODEFICIENCY VIRUS- QUANTITATIVE PCR			3 mL x 2 tubes			30 DAYS	
CYTOMEGALOVIRUS (DNA) - QUANTITATIVE PCR			3 mL x 2 tubes			14 DAYS	
MYCOBACTERIUM TUBERCULOSIS COMPLEX / NON-TUBERCULOUS MYCOBACTERIA - QUALITATIVE PCR		 SPUTUM, TISSUE, CSF, BRONCHIAL WASHINGS, URINE, BODY FLUIDS				14 DAYS	

EPSTEIN- BARR VIRUS- QUANTITATIVE PCR	REAL - TIME PCR	 **CSF**	3 mL	8.00 AM - 5.00 PM (WORKING DAYS)	NA	30 DAYS	
MERS-CoV QUALITATIVE PCR		 1.Deep cough sputum 2. Pleural fluid 3.Trancheal aspirate 4.Nasopharyngeal aspirate (NPA) 5.Bronchoalveolar lavage (BAL)				2 DAYS	1. Transport requirement: Samples must be transported on ice (2°C - 8ºC) and in the triple layer packaging  
COVID-19 QUALITATIVE PCR		 Combined nasopharyngeal and oropharyngeal swab (NP/OP swabs)				1 DAY	
RAPID MOLECULAR COVID-19		1.Throat swab 2. Nasal swab 3.Nasopharyngeal swab	NA	24 HOURS	NA	1 DAY	

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	**NA**
INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES	
NA	

ATTACHMENT A

TESTS	STABILITY OF SAMPLES
HEPATITIS B (DNA) VIRUS - QUANTITATIVE PCR HEPATITIS C (RNA) VIRUS - QUANTITATIVE PCR	**1. Stability of samples** a. Whole blood: i. **No longer than 24 hours** if stored at **2-25°C.** ii. Must be **centrifuge within 24 hours of collection.** b. Serum/ Plasma: i. up to **3 days** if stored at **Room Temperature (25-30°C)** ii. up **to 7 days** if stored at **refrigerated (2-8°C)** iii. at least **6 weeks** if stored at **-20°C to -80°C.** **Reference: Insert kit**
HUMAN IMMUNODEFICIENCY VIRUS- QUANTITATIVE PCR	**1. Stability of samples** a. Whole blood: i. **No longer than 24 hours** if stored at **2-25°C.** ii. Must be **centrifuge within 24 hours of collection.** b. Plasma: i. **up to 1 day** if stored at **Room Temperature (25-30°C).** ii. **up 6 days** if stored at **refrigerated (2-8°C).** iii. 6 weeks if stored at **-20°C to -80°C.** **Reference: Insert kit**
CYTOMEGALOVIRUS (DNA) - QUANTITATIVE PCR	**1. Stability of samples**

	a. Whole blood: i. **No longer than 6 hours** if stored at **2-25°C.** ii. Must be **centrifuge within 6 hours of collection.** b. Plasma: i. **Up to 7 days** if stored at **refrigerated (2-8°C).** ii. **at least 6 weeks** if stored at **-20°C to -80°C.** **Reference: Insert kit**
MYCOBACTERIUM TUBERCULOSIS COMPLEX / NON-TUBERCULOUS MYCOBACTERIA - QUALITATIVE PCR 1. Body Fluid 2. Cerebral Spinal Fluid (CSF) 3. Sputum, BAL, bronchial washing 4. Fresh Tissue 5. Urine	**1. Stability of samples** **up to 7 days** if stored at **refrigerated (2-8°C).** **Reference: website** **http://www.mayomedicallaboratories.com/test-catalog/specimen/88807**
	1. Stability of samples- Urine i. **Stable for 24 hours** at **18-25°C** ii. **up to 7 days** if stored at **refrigerated (2-8°C).** **Reference: Specimen collection and Transportation of Microbiology specimens, 2010 version 2.0 page 9 of 25**
EPSTEIN- BARR VIRUS- QUANTITATIVE PCR	**1. Stability of samples** a. Whole blood: i. **No longer than 24 hours** if stored at **4°C.** **Reference: Policy & Procedure Manual : Molecular Diagnostic Tests : Manual Policy # MI/MD/v50 page 94 of 291.**

TEST REQUEST PROCEDURE IN JPMD, PPUKM

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.

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 PCR-HCV(RNA)PCR	1. Confirmation of active hepatitis C disease in anti-HCV seropositive patients. 2. Confirmation of indeterminate or	• Not for screening. • Frequency or interval of testing depends on HCV viral load, liver function (ALT), cirrhosis, HCV	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

No.	Test	Indication	Description	Requester	Source/Rationale
		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)	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 Virus RNA Quantitative PCR- HIV(RNA)PCR	1. Confirmation of borderline or indeterminate serology 2. Baseline HIV viral load at diagnosis 3. Monitoring of HIV patients on HAART, according to consensus. 4. Diagnosis of HIV in newborns of HIV-positive mothers.	• Frequency or interval of testing depends on HIV 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-	1. For detections of MTB/NTM in body fluids and tissues.	• Must be done together with AFB stain and conventional culture.	MO / Specialist	• Report of an Expert Consultation on the Uses of Nucleic Acid Amplification Tests for the Diagnosis of Tuberculosis. CDC US. Available at

No.	Test	Indication	Description	Requester	Source/Rationale
	tuberculous Mycobacterium Qualitative PCR – TB/NTM PCR		• 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 determine bacteriologic cure or to monitor response to therapy. It is not known how long the PCR assay can remain positive following treatment.		https://www.cdc.gov/tb/publications/guidelines/amplification_tests/default.htm
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.

No.	Test	Indication	Description	Requester	Source/Rationale
					• 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. 1. For detection and quantitative measurement of EBV DNA. To monitor post-transplant lymphoproliferative disorders (PTLD). 2. As an adjunct in diagnosis, prognostication and post-treatment monitoring of nasopharyngeal carcinoma (NPC). 3. Diagnosis of central nervous system lymphoma in AIDS patients (CSF sample)	• Quantitative evaluation of EBV DNA has been shown to correlate highly with the subsequent (3-4 months) development of PTLD in 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.	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. • 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

p/s: Subject for change according to unit requirement

7.13 Tissue Culture Unit

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (VOLUME, ETC)	OPERATION HOURS	NORMAL RANGE	TAT (WORKING DAYS)	NOTES
Herpes Simplex Virus (HSV)	Culture & immunofluorescence	Viral transport medium / sterile container (on ice) 	1. Nasopharyngeal aspirate 2. Bronchoalveolar lavage 3. Tracheal aspirate	8:00 am - 5:00 pm (Working days)	Negative / positive	13 days	All specimens except CSF, faeces and blood must be sent on ice
			1. Throat swab 2. Nasal swab 3. Vesicle swab 4. Lesion swab 5. Genital swab 6. Cervical swab 7. Rectal swab 8. Meningeal swab 9. Conjunctiva swab 10. Conjunctiva scraping 11. Biopsy / autopsy				
		Sterile container (on ice)	Urine				
		Sterile container / bijou bottle (room temperature)	Cerebrospinal fluid				

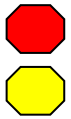
TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (VOLUME, ETC)	OPERATION HOURS	NORMAL RANGE	TAT (WORKING DAYS)	NOTES
Enterovirus : • **Echovirus** • **Coxsackie** • **Poliovirus**	Culture & immunofluorescence	Viral transport medium / sterile container (on ice) 	1. Nasopharyngeal aspirate 2. Bronchoalveolar lavage 3. Tracheal aspirate	8:00 am - 5:00 pm (Working days)	Negative / positive	17 days	All specimens except CSF, faeces and blood must be sent on ice
		Viral transport medium (on ice)	1. Throat swab 2. Nasal swab 3. Vesicle swab 4. Lesion swab 5. Genital swab 6. Cervical swab 7. Rectal swab 8. Conjunctiva swab 9. Conjunctiva scraping				
		Sterile container (on ice)	Urine				
		Sterile container (room temperature)	Faeces				
		Sterile container / bijou bottle (room temperature)	Cerebrospinal fluid				

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (VOLUME, ETC)	OPERATION HOURS	NORMAL RANGE	TAT (WORKING DAYS)	NOTES
Respiratory Viruses : • **Influenza A & B** • **Parainfluenza 1-3** • **Respiratory syncytial virus (RSV)** • **Adenovirus**	Direct immunofluorescence	Sterile container (on ice)	1. Nasopharyngeal aspirate 2. Bronchoalveolar lavage 3. Tracheal aspirate	8:00 am - 5:00 pm (Working days)	Negative / positive	3 days	**All specimens except CSF**, **faeces and blood** must be sent **on ice**
	Culture & immunofluorescence	Viral transport medium / sterile container (on ice) 	1. Nasopharyngeal aspirate 2. Bronchoalveolar lavage 3. Tracheal aspirate 4. Throat swab 5. Nasal swab			17 days	
Cytomegalovirus (CMV)	DEAFF	Heparin / EDTA (3 ml X 2 tubes)  (Room temperature)	Blood	Monday to Wednesday (**By appointment**)	Negative/ positive	5 days	**All specimens except CSF, faeces and blood** must be sent **on ice**
		Sterile container (on ice)	Urine				

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (VOLUME, ETC)	OPERATION HOURS	NORMAL RANGE	TAT (WORKING DAYS)	NOTES
Cytomegalovirus (CMV)	Culture & immunofluorescence	Viral transport medium / sterile container (on ice) 	1. Nasopharyngeal aspirate 2. Bronchoalveolar lavage 3. Tracheal aspirate	8:00 am - 5:00 pm (Working days)	Negative / positive	31 days	**All specimens except CSF, faeces and blood** must be sent **on ice**
		Viral transport medium (on ice)	1. Throat swab 2. Nasal swab 3. Cervical swab 4. Rectal swab 5. Meningeal swab 6. Biopsy / autopsy				
		Sterile container (on ice)	Urine				
		Sterile container (room temperature)	Faeces				
		Sterile container/ bijou bottle (room temperature)	Cerebrospinal fluid				

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (VOLUME, ETC)	OPERATION HOURS	NORMAL RANGE	TAT (WORKING DAYS)	NOTES
Chlamydia Trachomatis	Immunofluorescence	Sterile container	1. Nasopharyngeal aspirate 2. Bronchoalveolar lavage	8:00 am - 5:00 pm (Working days)	Negative / positive	3 days	**All specimens except CSF, faeces and blood** must be sent **on ice**
		Glass slide 	1. Cervical smear 2. Cervical scraping 3. Genital smear 4. Genital scraping 5. Conjunctiva smear 6. Conjunctiva scraping				

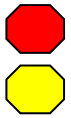
7.14 Virology Serology Unit

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
***Anti-HAV IgM**	Chemiluminescent Microparticle Immunoassay (CMIA)	 Plain tube/SST	1 x 3ml whole blood	8.00am – 5.00pm	NA	3	Any **urgent request after operation hours**, please **contact Virology Specialist or MO on-call to set an appointment**.
***Anti-HAV IgG**			1 x 3ml whole blood	8.00am – 5.00pm	NA	3	
***Anti-HBs**			1 x 3ml whole blood	8.00am – 5.00pm	NA	3	
HBsAg			1 x 3ml whole blood	8.00am – 5.00pm	NA	3	
Anti-HBc Total			1 x 3ml whole blood	8.00am – 5.00pm	NA	3	
***Anti-HBc IgM**			1 x 3ml whole blood	8.00am – 5.00pm	NA	3	
***Anti-HBe**			1 x 3ml whole blood	8.00am – 5.00pm	NA	3	
***HBeAg**			1 x 3ml whole blood	8.00am – 5.00pm	NA	3	
Anti-HCV			1 x 3ml whole blood	8.00am – 5.00pm	NA	3	
HIV Antigen & Antibody			1 x 3ml whole blood	8.00am – 5.00pm	NA	3	

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
Refer attachment	*Some of the test has 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

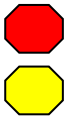
1. Relevant clinical history **MUST BE** provided in the serology request form.
2. If more than **FOUR** tests request, please provide **two tubes** of samples (at least 3ml each) to ensure sufficient amount of serum for testing.
3. **ONLY** the following samples are considered as **URGENT**: Sharp injury (1st sample), Screening for Stem cell/OrganTransplant and Blood Transfusion.
   For urgent request, please call MO/Specialist in-charge at ext: **5482** within operation hours.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
Dengue IgG & IgM	Immuno-chromatography Test (ICT)	 Plain tube/SST	1 x 3ml whole blood	24 hours	NA	1	Dengue Serology test **<u>can only be repeated after 48 hours</u>** of the first or initial request, if clinically indicated.
Dengue NS1 Antigen							Please include **<u>DAY OF FEVER</u>** in the clinical note.
Leptospira IgM	Latex agglutination		1 x 3ml whole blood	8.00am – 5.00pm	NA	3	Please call ext:5482 for sending confirmation test to IMR.

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

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

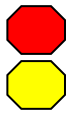
1. Relevant clinical history **<u>MUST BE</u>** provided in the serology request form.
2. Please include **<u>DAY OF FEVER</u>** in the clinical note.
3. **<u>ONLY</u>** the following samples are considered as **<u>URGENT</u>**: Sharp injury (1st sample), Screening for Stem cell/OrganTransplant and Blood Transfusion.
   For urgent request, please call MO/Specialist in-charge at ext: 5482 within operation hours.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
***Chlamydophila pneumoniae* IgG**	Enzyme Linked Immunosorbent Assay (ELISA)	 Plain tube/SST	1 x 3ml whole blood	8.00am – 5.00pm	NA	7	
***Chlamydophila pneumoniae* IgM**			1 x 3ml whole blood	8.00am – 5.00pm	NA	7	
***Chlamydia trachomatis* IgG**			1 x 3ml whole blood	8.00am – 5.00pm	NA	7	
***Chlamydia trachomatis* IgM**			1 x 3ml whole blood	8.00am – 5.00pm	NA	7	
Measles IgG			1 x 3ml whole blood	8.00am – 5.00pm	NA	7	
Measles IgM			1 x 3ml whole blood	8.00am – 5.00pm	NA	7	
Mumps IgG			1 x 3ml whole blood	8.00am – 5.00pm	NA	7	
Mumps IgM			1 x 3ml whole blood	8.00am – 5.00pm	NA	7	
***Mycoplasma pneumoniae* IgM**			1 x 3ml whole blood	8.00am – 5.00pm	NA	7	
VZV IgG			1 x 3ml whole blood	8.00am – 5.00pm	NA	7	
VZV IgM			1 x 3ml whole blood	8.00am – 5.00pm	NA	7	

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

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

1. Relevant clinical history **MUST BE** provided in the serology request form.
2. If more than **FOUR** tests request, please provide **two tubes** of samples (at least 3ml 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/OrganTransplant and Blood Transfusion.
   For urgent request, please call MO/Specialist in-charge at ext:5482 within operation hours.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
***Toxoplasma IgG**	Chemiluminescent Microparticle Immunoassay (CMIA)	 Plain tube/SST	1 x 3ml whole blood	8.00am – 5.00pm	NA	5	
***Toxoplasma IgM**			1 x 3ml whole blood	8.00am – 5.00pm	NA	5	
***CMV IgG**			1 x 3ml whole blood	8.00am – 5.00pm	NA	5	
***CMV IgM**			1 x 3ml whole blood	8.00am – 5.00pm	NA	5	
***Rubella IgG**			1 x 3ml whole blood	8.00am – 5.00pm	NA	5	
***Rubella IgM**			1 x 3ml whole blood	8.00am – 5.00pm	NA	5	
TORCH IgG	CMIA & ELISA		2 x 3ml whole blood	8.00am – 5.00pm	NA	14	Please send separate request for Syphilis (RPR/VDRL) test
TORCH IgM			2 x 3ml whole blood	8.00am – 5.00pm	NA	14	Please send separate request for Syphilis (RPR/VDRL) test

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
Refer attachment	*Some of the test has 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 serology request form.
2. If more than **FOUR** tests request, please provide **two tubes** of samples (at least 3ml 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/OrganTransplant and Blood Transfusion.
   For urgent request, please call MO/Specialist in-charge at ext: 5482 within operation hours.

TEST	METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Day)	NOTES
HSV IgG	Enzyme Linked Immunosorbent Assay (ELISA)	Plain tube/SST	1 x 3ml whole blood	8.00am – 5.00pm	NA	7	
HSV IgM			1 x 3ml whole blood	8.00am – 5.00pm	NA	7	
EBV IgG			1 x 3ml whole blood	8.00am – 5.00pm	NA	7	
EBV IgM			1 x 3ml whole blood	8.00am – 5.00pm	NA	7	
Legionella pneumophila IgG			1 x 3ml whole blood	8.00am – 5.00pm	NA	7	
Legionella pneumophila IgM			1 x 3ml whole blood	8.00am – 5.00pm	NA	7	
Leptospira IgG			1 x 3ml whole blood	8.00am – 5.00pm	NA	7	
Parvovirus IgG			1 x 3ml whole blood	8.00am – 5.00pm	NA	14	
Parvovirus IgM			1 x 3ml whole blood	8.00am – 5.00pm	NA	14	
Mycoplasma pneumoniae Total Antibodies	Particle Agglutination Test (PAT)	Plain tube/SST	1 x 3ml whole blood	8.00am – 5.00pm	NA	7	
HIV Confirmatory	Line Immuno Assay (LIA)		1 x 3ml whole blood	8.00am – 5.00pm	NA	14	By **Specialist request** only

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

INSTRUCTION FOR PREPARATION OF PATIENT AND INSTRUCTION FOR COLLECTION ACTIVITIES

1. Relevant clinical history **MUST BE** provided in the serology request form.
2. If more than **FOUR** tests request, please provide two tubes of samples (at least 3ml 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/OrganTransplant and Blood Transfusion.
   For urgent request, please call MO/Specialist in-charge at ext: 5482 within operation hours.

REJECTION CRITERIA	FACTORS KNOWN TO SIGNIFICANTLY AFFECT EXAMINATION PERFORMANCES / RESULT INTERPRETATION
1. Incomplete request form with these following information: i. Patient's details ii. MRN/IC/Passport No./Other iii. Applicant's details (eg: Doctor's name,official stamp & signature) iv. Tests v. Patient's or Requester's location vi. 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. Hemolysed specimen Notes : • All rejected bloods will be not returned to the ward/clinic and will be discarded. • Please refer "Borang Permohonan Ujian Rutin Unit Virologi Serologi" for further details.	**ALL REJECTED BLOOD WILL NOT BE RETURNED** Unit Virology Serology does not offer 24-hour lab service and does not conduct testing on public holidays except for dengue serology only. 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. Serum will be discarded 7 days after issuance of report/result.

Tarikh kemaskini: 08 Mei 2023

7.15 Immunology Unit

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	8:00 am-5:00 pm (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		
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 -RPR	**Agglutination**				Non-Reactive	4	For urgent request – please contact microbiologist incharge Ext: Office hour 5482 After office hour 5480
Anti-Streptolysin O	**Agglutination**				Negative	4	
Extractable Nuclear Antibodies (Screening)	**ELISA**				Negative	12	

TEST		METHOD	SPECIMEN CONTAINER	SPECIMEN REQUIREMENT (Volume , etc)	OPERATION HOURS	NORMAL RANGE	TAT (Working Days)	NOTES
Syphilis	**Syphilis (IgG & IgM)**	**ELISA**	**Plain Tube With Gel**	3ml Whole blood	8.00AM-5.00PM (Working days)	Negative	12	
	TP-PA	**Agglutination**				Non-Reactive	5	
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)**		**Dot Blot (EIA)**				Negative	5	

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 specimen 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
Not applicable

7.16 Forensic and Mortuary Unit

UNIT SERVICES

1. Receipt of body from ward and Emergency Department
   - The body of the deceased will be transferred to the mortuary by Forensic Attendants not less than one hour after notified by ward or emergency department staff.
2. Release of dead body to the next of kin/ claimant
   - All dead bodies shall be released to the next of kin/claimant as soon as practicable after all the relevant documents are completed.
3. Receipt of body from police (brought in dead).
4. Management of unclaimed bodies, human remains and body parts.
5. Medicolegal Autopsy.
6. Management of medicolegal specimens and evidence.
7. Handling of Postmortem Report.

OPERATING HOURS

PROCEDURE	OPERATION TIME
○ Receipt of body from ward ○ Body 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	Working Days Only (8:00 am – 5:00 pm)

8.0 List of Test and Specimen Requirements For Referral Laboratory 2020

8.0 List Of Test And Specimen Requirements For Referral Laboratory 2020

No.	ID Charge	Tests	Units, JPMD	Methodology	Type Of Specimens	TAT (Working days)	Referral Laboratory	Referral Lab Price (RM)	Patient's Charge (RM)
1	10418	ADAM TS-13	Specialized Hemostasis				Hospital Ampang	250	300
2	9263	APCR, FV Leuden	Specialized Hemostasis	PCR	Plasma	3	PDN	235	282
3	9260	Factor 10/ 11/12/ F13/ kesemua sekali	Specialized Hemostasis	1 Stage Clotting Method	Plasma	3	PDN	360	432
4	15940	Factor VII Assay (PT, PT Mixing, Factor VII Assay)	Specialized Hemostasis				Hospital Ampang	200	240
5		Factor 11	Specialized Hemostasis	1 Stage Clotting Method	Plasma		Hospital Ampang	215	258
6		Factor 12	Specialized Hemostasis	1 Stage Clotting Method	Plasma		Hospital Ampang	215	258
7		Coagulation Profile	Specialized Hemostasis	1 Stage Clotting Method	Plasma		Hospital Ampang	115	138
8	10443	Beta-2 Microglobulin	UTSS	Nephelometry	i) 1 ml serum in Plain/serum tube ii) Serum must reach the lab not more than 7 days after collection date	5	SERO IMR	140	168
9	5785	Platelet Antibody	Blood Bank	ELISA	Darah/plain/EDTA	14	PDN	75	95
10	9285	Antibody Identification	Blood Bank	Tube/Gel Card	Darah/EDTA		PDN	200	240
11	9132	Blood Spot For POMPE	Chemical Pathology				IMR	60	80

No.	ID Charge	Tests	Units, JPMD	Methodology	Type Of Specimens	TAT (Working days)	Referral Laboratory	Referral Lab Price (RM)	Patient's Charge (RM)
12	11514	Blood Spot LSDS	Chemical Pathology					100	120
13	9105	Galactosemia Screening (Total Galactose & Galactose-1-uridyltransferase)	Chemical Pathology	Quantitative by enzyme assay	3 circles of dried blood spot	5	IMR	100	120
14	9313	Ceruloplasmin	Chemical Pathology		Blood/ Plain tube	5	HKL	15	35
15	9244	cystine & Homocystine, urine	Chemical Pathology		Random Urine (5ml) send in clean universal bottle		Unit Biochemistry , IMR	110	132
16	9647	Cholinesterase	Chemical Pathology		Blood	1	HKL	10	30
17	10424	CSF Oligoclonal Band	Chemical Pathology	1. PRM/ Biuret 2. Nephelomery (Igs & Alb Quantification) 3. Immuno-isoelectric focusing electrophoresis	1 ml CSF and 1 ml serum in Plain/Serum tube * CSF must be accompanied by serum sample. * CSF must be frozen immediately after collection. CSF (frozen) & Serum (at 2C-8C) must reach the lab not more than 7 days after collection date.	10	IMR	695	834
18	10499	Everolimus	Chemical Pathology	Immuno-chemistry	1 ml serum with 2 mg sodium azide (preservative)		Hospital Selayang	70	95
19	10425	Melamine	Chemical Pathology				Jabatan Kimia, HKL	foc	20
20	9251	Mercury	Chemical Pathology		urine		Jabatan Kimia, HKL	foc	20

No.	ID Charge	Tests	Units, JPMD	Methodology	Type Of Specimens	TAT (Working days)	Referral Laboratory	Referral Lab Price (RM)	Patient's Charge (RM)
21	9315	Methotrexate (MTX)	Chemical Pathology		10 ml urine		HKL	60	80
22	9315	Methotrexate (MTX) 48 hours	Chemical Pathology		11 ml urine		HKL	60	80
23	9315	Methotrexate (MTX) 72 hours	Chemical Pathology		12 ml urine		HKL	60	80
24	9315	Methotrexate (MTX) 96 hours	Chemical Pathology		13 ml urine		HKL	60	80
25	9214	Plasma Very Long Chain Fatty Acids (VLCFA) and Phytanic acids	Chemical Pathology				IMR	100	120
26	10663	Pyruvate	Chemical Pathology				HKL	60	80
27	9242	Serum/ Urine copper	Chemical Pathology	Atomic Absorbtion Spectroscopy	Urine / serum	21	IMR	90	110
28	9133	Screening for IEM (Amino Acids & Acylcarnitines in blood spot)	Chemical Pathology	Quantitative by Tandem Mass Spectrometry	3 circles of dried blood spot	3	IMR	100	120
29	10426	Serum Antitrypsin	Chemical Pathology	Nephelometry	1.0ml serum in plain tube. Must reach the lab no more than 7 days(at 2-8 C) after date of collection	7	IMR	160	192
30	10427	Serum Ethanol, Methanol	Chemical Pathology				Jabatan Kimia, HKL	foc	20
31	10428	Serum Free Light Chain (Kappa:Lambda) ration	Chemical Pathology	Turbidimetry	Plain/ Serum Serum must reach the lab not more than 7 days (at 2-8C) after collection date	5	Unit Molekular Diagnostik & Protein, IMR	250	300
32	10429	Serum Phospholipid	Chemical Pathology		Darah		IMR	250	300

No.	ID Charge	Tests	Units, JPMD	Methodology	Type Of Specimens	TAT (Working days)	Referral Laboratory	Referral Lab Price (RM)	Patient's Charge (RM)
33	9312	Serum Sirolimus	Chemical Pathology				HKL	75	95
34	10430	Serum Zink	Chemical Pathology				Jabatan Kimia	foc	20
35	9218	Serum/Plasma amino acid	Chemical Pathology	HPLC	2 ml heparinised plasma. Morning (fasting) or 4 hrs after last meal. Centrifuge and freeze immediately. Transport frozen in dry ice.	10	IMR	125	150
36	10431	Serum Beta-2-Microglobulin	Chemical Pathology	Nephelometry	1 ml serum in Plain/serum tube Serum must reach the lab not more than 7 days after collection date.	5	IMR	140	168
37	10432	Serum Chromine	Chemical Pathology				Jabatan Kimia	foc	20
38	10433	Serum Cobalt	Chemical Pathology				Jabatan Kimia	foc	20
39	10435	Serum Protein Electrophoresis (Screening Profiling)- AGE	Chemical Pathology	Agarose-gel Electrophoresis (AGE)	3 ml serum Plain/ serum tube -must reach the lab not more than 7 days (at 2-8C) after collection	30	Unit Molekular Diagnostik & Protein, IMR	100	120
40	11300	Stool for Fat Globule	Chemical Pathology				Biochemistry PPUM	7	27
41	9390	Saliva kit (HLA Typing)	Haematology				IMR	100	120
42	9237	T& B Cell Enumeration	Haematology				Pusat Alergi dan Imunologi, IMR	230	276

No.	ID Charge	Tests	Units, JPMD	Methodology	Type Of Specimens	TAT (Working days)	Referral Laboratory	Referral Lab Price (RM)	Patient's Charge (RM)
43	6704	Total & Free Carnitine, Serum/Plasma	Chemical Pathology	End-point Enzymatic assay	Plasma - 2 ml heparinised plasma. Transport frozen in dry ice.	5	IMR	105	126
44	9264	Thyroglobulin	Chemical Pathology	ELISA	Frozen serum	20	IMR	60	80
45	9244	Total Homocysteine	Chemical Pathology	HPLC	2 ml heparinised plasma. Morning (fasting) or 4 hrs after last meal. Centrifuge and freeze immediately. Transport frozen in dry ice.	10	IMR	140	168
46	11293	Toxicologi,(lead.etc)	Chemical Pathology	GCMS	Serum		Jabatan Kimia, HKL	foc	20
47	9098	Urine Delta ALA	Chemical Pathology				IMR	80	100
48	10436	Urine Hemoglobinuria	Chemical Pathology				IMR	20	40
49	9509	Urine 5HIAA	Chemical Pathology	HPLC with Electrochemical Detector	25ml of 24 hr urine in 25% HCL	7	IMR	130	156
50	7144	Urine Amino Acid	Chemical Pathology	HPLC	Urine - 5mls Early morning Urine	10	IMR	125	150
51	9473	Urine Catecholamine	Chemical Pathology	HPLC	25ml of 24 hr urine in 25% HCL		PPUM	150	180
52	10437	Urine Drug Abuse (M & C)	Chemical Pathology		10 ml urine		HKL	60	80
53	10440	Urine Drug Abuse (M,C & ATS)	Chemical Pathology		10 ml urine		HKL	90	110
54	7147	Urine for GAG/MPS	Chemical Pathology				IMR	100	120

No.	ID Charge	Tests	Units, JPMD	Methodology	Type Of Specimens	TAT (Working days)	Referral Laboratory	Referral Lab Price (RM)	Patient's Charge (RM)
55	10439	Urine Ketamin	Chemical Pathology				HKL	30	50
56	5610	Urine Metabolic Screening	Chemical Pathology				IMR	110	132
57	10438	Urine Metephinehrine	Chemical Pathology		25ml of 24 hr urine in 25% HCL		UM	159	190.8
58	5611	Urine Myoglobin	Chemical Pathology				IMR	20	40
59	6710	Urine Oligosaccharide	Chemical Pathology				IMR	85	105
60	5612	Urine Organic Acid	Chemical Pathology	Qualitative by GCMS	5-10 ml random (morning) urine in sterile bottle. Preferably freeze in dry ice. Or with 2-3 drops of chloroform and transport at room temperature	5	IMR	110	132
61	9256	Urine Orotic Acid	Chemical Pathology	Quantitative by HPLC	2mls urine, no preservative (transport frozen in dry ice)	5	IMR	75	95
62	11294	Urine Phorphyrin	Chemical Pathology				IMR	30	50
63	7139	Urine Phosphobilinogen	Chemical Pathology				IMR	30	50
64	14352	Urine Succinylacetone	Chemical Pathology				IMR	100	120
65	11880	Vitamin D	Chemical Pathology				PPUM	110	132
66	25709	Panel ujian Urine Toksikologi (45 analytes termasuk Morphine, Canna bis, & Amphetamine)	Chemical Pathology		10 ml Urine		HKL	60	80

No.	ID Charge	Tests	Units, JPMD	Methodology	Type Of Specimens	TAT (Working days)	Referral Laboratory	Referral Lab Price (RM)	Patient's Charge (RM)
67	12826	Immunophenotyping	Haematology				Makmal Bone Marrow, PPUM	1100	1320
68	11686	Epidermal Growth Factor Receptor (EGFR)	Histopatology		Unstained slide	10	Makmal Genetik, HKL	700	840
69	11301	Immunohistokimia-Antibodi IgG	Histopatology				Molekular Genetik,HKL	50	70
70	15758	KRAS (Kirsten Rat Sarcoma)	Histopatology		Unstained slide	10 Hari bekerja	Makmal Genetik, Jabatan Patologi, Hospital Wanita Dan Kanak-Kanak KL	700	840
71	12292	Pewarnaan Immunohistokimia - HHV 8	Histopatology		Unstained slide	Tiada TAT	HKL	50	70
72	12463	Pewarnaan Immunohistokimia – Napsin	Histopatology		Unstained slide	Tiada TAT	HKL	50	70
73	12245	Pewarnaan Khusus - Rhodanine	Histopatology		Unstained slide	Tiada TAT	Hospital Selayang	60	80
74	12246	Pewarnaan Khusus - Victoria Blue	Histopatology		Unstained slide	Tiada TAT	Hospital Selayang	60	80
75	15270	DNA analysis thalassaemia (uncommon mutation Alpha)	Molecular genetics		Blood in EDTA	90	Molecular Genetic, IMR	750	900
76	10892	LIS 1 Gene mutation	Molecular genetics			Tiada TAT	IMR	1050	1260

No.	ID Charge	Tests	Units, JPMD	Methodology	Type Of Specimens	TAT (Working days)	Referral Laboratory	Referral Lab Price (RM)	Patient's Charge (RM)
77	15905	HLA Crossmatch (Complement Dependent Cytotoxicity)	Molecular genetics	PCR	Blood in Sodium Heparin (donor), Plain (patient)		Tranplantation Immunology Unit (Allergy and Immunology Research Centre)	335	402
78	14399	HLA Typing B*27	Molecular Genetics	PCR	Blood or Bone Marrow	30	IMR	500	600
79	14400	HLA Typing B*15:02	Molecular Genetics	PCR	Blood or Bone Marrow	30	IMR	500	600
80	14397	HLA Typing Antibody Test	Molecular Genetics	PCR	Blood or Bone Marrow	30	IMR	500	600
81	9163	HLA Typing Class I & II (Loci A, B, DR) High Resolution	Molecular Genetics	PCR	Blood or Bone Marrow	30	IMR	560	672
82	9391	HLA Typing Class I (Loci A, B, C) High Resolution	Molecular Genetics	PCR	Blood or Bone Marrow	30	IMR	500	600
83	14398	HLA Typing Class II (Loci DR, DQ) High Resolution	Molecular Genetics	PCR	Blood or Bone Marrow	30	IMR	500	600
84	14401	HLA Typing Disease Association (B*57:01)	Molecular Genetics	PCR	Blood or Bone Marrow	31	IMR	500	600
85	12943	BCR-ABL1 Quantitation (e13a2, e14a2)	Molecular Genetics				PPUM	420	504
86	16053	Cadasil (NOTCH3) - Hotspots	Molecular Genetics	PCR & Sequencing	Blood	3 months	Molecular Diagnostic & Protein (UMDP), IMR	950	1140

No.	ID Charge	Tests	Units, JPMD	Methodology	Type Of Specimens	TAT (Working days)	Referral Laboratory	Referral Lab Price (RM)	Patient's Charge (RM)
87	11296	HLA antibody test	Molecular Genetics		Serum		IMR	634	760.8
88	12418	FLT3-ITD	Molecular Genetics				Molecular Genetic, PPUM	770	924
89	12068	JAK2 ex12/ MPL ex10 mutation	Molecular Genetics				PPUM	280	336
90	12419	NPM1 Mutation	Molecular Genetics				Molecular Genetic, PPUM	390	468
91	7626	PML-RARA Detection (bcr1,bcr2,bcr3)	Molecular Genetics				Molecular Genetic, PPUM	770	924
92	12822	Duchenne Muscular Dystro phy (DMD)	Molecular Genetics				Molekular Genetik,HKL	1200	1440
93	16384	Spinocerebellar Ataxia Type 6 (SCA6) - Hotspot	Molecular Genetics	(PCR and capillary electrophoresis)	Blood	3 months	Molecular Diagnostic & Protein (UMDP), IMR	230	276
94	10469	Prader Willi Syndrome - Mutation Screen	Sitogenetics				IMR	230	276
95	10470	Angelman Syndrome (*SNRPN*) -MS-MLPA	Sitogenetics				IMR	230	276
96	10471	Angelman Syndrome (*UBE3A*)- sequencing	Sitogenetics				IMR	1300	1560
97	15185	DNA extraction and Sorage (High IEM Screening	Sitogenetik		EDTA tube		HKL	100	120
98	10472	Spinal Muscular Atrophy (Deletion) - MLPA	Sitogenetics				IMR	230	276

No.	ID Charge	Tests	Units, JPMD	Methodology	Type Of Specimens	TAT (Working days)	Referral Laboratory	Referral Lab Price (RM)	Patient's Charge (RM)
99	10473	Spinal Muscular Atrophy (Deletion) - PCR	Sitogenetics				IMR	950	1140
100	10475	Frax A PCR Screening - Fragile X Syndrome	Sitogenetics	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	230	276
101	10474	Frax E PCR Screening - Fragile X Syndrome	Sitogenetics					230	276
102	10476	Frax A Confirmation - Fragile X Syndrome	Sitogenetics				IMR	230	276
103	10477	MELAS - 3243 Hotspot	Sitogenetics				IMR	230	276
104	10478	MELAS - Full Panel	Sitogenetics				IMR	830	996
105	10479	Primary Dystonia:DYT1	Sitogenetics				IMR	660	792
106	10480	Primary Dystonia : DYT6	Sitogenetics				IMR	660	792
107	12827	Rett syndrome	Sitogenetics				Molekular Genetik,HKL	4000	4800
108	10481	Leber Hereditary optic neuropathy Panel (LHON)	Sitogenetics				IMR	850	1020
109	11159	Hemavision test 28	Sitogenetics					1000	1200
110	15841	HPV DNA (28 Genotypes)	Sitopathology	ThinPrep Pap Test.	Persampelan di bahagian cervix dan/atau vagina	14	Pantai Premier Pathology	110	132
111	15840	HPV Primary Screening	Sitopathology	ThinPrep Pap Test.	Persampelan di bahagian cervix dan/atau vagina	14	Pantai Premier Pathology	70	90

No.	ID Charge	Tests	Units, JPMD	Methodology	Type Of Specimens	TAT (Working days)	Referral Laboratory	Referral Lab Price (RM)	Patient's Charge (RM)
112	10664	Acute Flaccid Paralysis (AFP)	Bacteriology				IMR	foc	20
113	10446	Identification of anaerobes	Bacteriology	Culture on media	Culture	30	BAKTI-IDRC IMR	80	100
114	10460	Line probe assay (LPA)	Bacteriology		SPUTUM		MKAK Sg Buloh	350	420
115	10464	PCR and identification of *Burkholderia pseudomallei*	Bacteriology	Conventional PCR-Gel electrophoresis	Plate culture	2 weeks	BAKTI-IDRC IMR	200	240
116	10466	Salmonella (non-human) Serotyping	Bacteriology	Agglutination	Pure salmonella isolate-TSI	4	BAKTI-IDRC IMR	50	surveillance
117	10447	Verfication of antibiotic resistance other than Carbapenem Resistance Enterobacteriacea (CRE)	Bacteriology	Disc diffusion	Plat NA		IDRC-IMR	100	surveillance
118		*Mycobacterium tuberculosis* TB (ID & AST)	Bacteriology	Culture on media			MKAK Sg Buloh	foc	20
119	10448	Enterovirus -HFMD	Molecular Biology	PCR	RECTAL SWAB		MKAK Sg Buloh	100	120
120	15188	Enterovirus -HFMD	Molecular Biology	PCR	RECTAL SWAB/ Throat swab		IMR	250	300
121	10462	MERS- CoV	Culture Tissue	PCR	SWAB TEKAK/ NASAL/ SPUTUM		VIRO-HKL	150	180
122	9180	Anti Liver Kidney Microsomal (ANTI LKM)	Immunology					150	180
123	8914	Anti Cyclic Citrullinated Peptides (CCP)	Immunology	Indirect immunofluoresence (IFA)	3 ml serum/ 5 ml blood in plain tube	14	AIRC-IMR	170	204
124	9078	Anti Gamma-aminobutyric acid-b Receptor Antibody (GABA)	Immunology	Indirect immunofluoresence (IFA)	Serum		AIRC-IMR	50	70

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125	9125	Anti Glomerular Basement Mambrane	Immunology				AIRC-IMR	350	420
126	9323	Anti N-Methyl-D-Aspartate Receptor (NMDAR)	Immunology	Indirect immunofluoresence (IFA)	i. 3 ml serum/5 ml blood in plain tube ii. 1 - 1.5 ml CSF	7	AIRC-IMR	400	480
127		Anti-Desmoglein 1 & Anti-Desmoglein 3 (Skin Antibodies)	Immunology		Blood/ serum		AIRC-IMR	200	240
128	9121	Acethylcholine Receptor Antibodies	Immunology	ELISA	3 ml serum / 5 ml blood in plain tube	21	AIRC-IMR	500	600
129	9124	Anti-Ganglioside Antibodies (Sulfatides, Anti-GM1, Anti-GM2, Anti-GM3, Anti-GM4, Anti-GD1a, Anti-GD1b, Anti-GD2, Anti-GD3, Anti-GT1a, Anti-GT1b, Anti-GQ1b)	Immunology	Immunoblot	3 ml serum/ 5 ml blood in plain tube	14	AIRC-IMR	800	960
130	5537	Anti-Neutrophile Cytoplasmic Antibodies/ Anti-MPO/ Anti-PR3 1- P-ANCA 2- C-ANCA 3- Myeloperoxidase (MPO) 4- Proteinase 3 (PR3)	Immunology	Indirect immunofluoresence (IFA)	3 ml serum/ 5 ml blood in plain tube	7	AIRC-IMR	280	336
131	9280	P-ANCA	Immunology		3 ml serum/ 5 ml blood in plain tube	7	AIRC-IMR	70	90
132	9322	C-ANCA	Immunology	Indirect immunofluoresence (IFA)	3 ml serum/ 5 ml blood in plain tube		AIRC-IMR	70	90
133	10441	Myeloperoxidase (MPO)	Immunology	Indirect immunofluoresence (IFA)	3 ml serum/ 5 ml blood in plain tube		AIRC-IMR	70	90

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134	10442	Proteinase 3-PR3	Immunology	Indirect immunofluoresence (IFA)	3 ml serum/ 5 ml blood in plain tube		AIRC-IMR	70	90
135	9906	Anti-Aquaporin 4	Immunology	Indirect immunofluoresence (IFA)	i) 3 ml serum/5 ml blood in plain tube. ii) 1 - 1.5 ml CSF	7	AIRC-IMR	400	480
136	9130	Brucella serology	Immunology	ELISA	serum		BAKTI-IDRC IMR	80	100
137	12247	Brucellosis PCR	Molecular Biology	PCR			IMR	200	240
138	8982	Cat scratch disease-serology	Immunology	IIP	serum	5	BAKTI-IDRC IMR	100	120
139	9135	Coeliac Antibodies Test: -Anti-Tissue Transglutaminase (tTG) - Anti-endomysium, Anti-gliadin - Anti-gliadin	Immunology				AIRC-IMR	600	720
140	12902	Coxiella Serology (Q fever)	Immunology		Serum		IMR	100	120
141	9308	Diabetes Mellitus Antibodies- Anti Insulin	Immunology	ELISA	serum		AIRC-IMR	500	600
142	11297	Diabetes Mellitus Antibodies- Anti Islet Cell (ICA)	Immunology	ELISA	serum		AIRC-IMR	500	600
143	9053	Diabetes Mellitus Antibodies- Anti Glutamic Acid Decarboxylase (GAD)	Immunology	ELISA	Serum	14	AIRC-IMR	500	600

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144	11298	Diabetes Mellitus Antibodies- Anti Ansulinoma Associated Antigen-2- (IA2)	Immunology	ELISA	Serum		AIRC-IMR	500	600
145	9170	Immunoglobulin E (Total)	Immunology	Fluorescence EIA	serum	5	AIRC-IMR	350	420
146	9169	Immunoglobulin E (Specific) * per allergent	Immunology	Fluorescence EIA	serum	5	AIRC-IMR	220	264
147	10468	Tryptase * per test	Immunology				AIRC-IMR	1000	1200
148	9228	Specific liver antibodies:Anti-Ama, M2, M2-3E/BPO, sp100, PML,gp210, LKM1, LC-1, SLA/LP, Ro-52	Immunology	Indirect immunofluoresence (IFA)	Serum		AIRC-IMR	1300	1560
149	9186	Lyme's Disease serology screening	Immunology	Indirect immunofluoresence (IFA)	serum	5	IDRC-IMR	80	100
150	10461	Lyme's Disease confirmatory (western blot) IgM & IgG	Immunology	Western blot		4	IDRC-IMR	180	216
151	9200	Meliodosis-Indirect Fluorescent antibody test	Immunology	IFA test	SERUM	5	BAKTI-IDRC IMR	80	100
152	9122	Paraneoplastic Neurological Syndrome (PNS) antibodies (Anti-Ma, Anti-Yo, Anti-Ri, Anti-Hu, Anti-Amphiphysin, Anti-CV2)	Immunology	Immunoblot	3 ml serum / 5 ml blood in plain tube	10	AIRC-IMR	800	960
153	12862	CSF for VDRL	Immunology				HKL	60	80

No.	ID Charge	Tests	Units, JPMD	Methodology	Type Of Specimens	TAT (Working days)	Referral Laboratory	Referral Lab Price (RM)	Patient's Charge (RM)
154	9923	Indirect immunoperoxidase test for typhus	Immunology	Indirect immunoperoxidase test (IIF)	serum/ positive, negative dengan titre	5	BAKTI-IDRC IMR	100	120
155	8980	Pneumocystis jiroveci of Pneumocystis carinii (PCP)	Mycology	Indirect Immuno-fluorescent test (IF)	BAL, Tracheal Aspirate/ Induced sputum	5		50	70
156	11151	Adenovirus PCR	Molecular Biology				VIRO-IDRC IMR	150	180
157	5773	BK virus	Molecular Biology	PCR	urin/ EDTA		Hospital Sg. Buloh	100	120
158	9062	Dengue Multiplex Real Time RT-PCR	Molecular Biology	rRT-PCR	Serum	5	VIRO-IDRC IMR	250	300
159	9153	Enterovirus Real Time RT-PCR (Pan entero, CA16 and EV71)	Molecular Biology	rRT-PCR	CSF, Pericardial-In ice, throat/ nasal/ vesicle swab in VTM	5	VIRO-IDRC IMR	250	300
160	10449	Epstein-Barr virus PCR	Molecular Biology	PCR	CSF, Tissue, Plasma, Serum	1-2	Hospital Sg. Buloh	100	120
161	10455	Identification of fungi	Mycology	PCR=sequencing and Biochip identification	Sample Blood in EDTA, BAL, body fluid, pus, aspirate, tissue(swab, urine not acceptable).	5	IDRC-IMR	150	180
162	10453	Gene expert study (Pasif)	Molecular Biology	PCR	BAL		IPR	foc	20
163		Gene expert	Molecular Biology	PCR			MKAK Sg Buloh	350	420
164	10456	Hepatitic C- Genotype	Molecular Biology		DARAH-EDTA		VIRO,PPUM	407	488.4
165	10457	HIV-2 RT-PCR	Molecular Biology	rRT-PCR	Serum/ Plasma	5	VIRO-IDRC IMR	990	1188

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166	15298	HIV Genotyping Drug Resistant	Molecular Biology	PCR	Plasma		IMR	600	720
167	6347	Herpes Simplex Virus (HSV) PCR	Molecular Biology	PCR	CSF/ Darah	1-2	Hospital Sg. Buloh	100	120
168	13570	Herpes Simplex Virus (HSV) PCR	Molecular Biology	PCR	CSF/ Darah		HKL	150	180
169	10665	Human Herpes Virus-6 (HHV-6)	Molecular Biology				Hospital Sg. Buloh	250	300
170	11253	H1N1 PCR	Molecular Biology				HKL	150	180
171	11141	Cytomegalovirus PCR (CMV PCR)	Molecular Biology					100	120
172	12537	Japanese Encephalitis (JE) Virus PCR	Molecular Biology					150	180
173	10458	Leptospiral PCR	Molecular Biology	Lip L 32 gene detection, using Real Time PCR	Blood in EDTA/Urine/ Tissue (Kidney+livers)	5	BAKTI-IDRC IMR	200	240
174	11299	Tuberculosis PCR	Molecular Biology	PCR	CSF	5	IMR	200	240
175	10467	Varicella zoster virus (VZV) PCR	Molecular Biology	PCR	CSF/serum	1-2	Hospital Sg. Buloh	100	120
176	9205	Nipah IgG & IgM	Virology Serology				IMR	200	240
177	12536	Nipah Virus PCR	Virology Serology	PCR	CSF		MKAK Sg Buloh	250	300
178	8929	Chikungunya Real Time RT-PCR	Virology Serology	PCR	Serum	5	VIRO-IDRC IMR	150	180
179	10445	Chikungunya IF	Virology Serology	IF	Serum	5	VIRO-IDRC IMR	100	120

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180	9173	Japanese Encephalitis (JE) Serology	Virology Serology	EIA	Serum/ CSF	7-14 HARI	MKAK Sg Buloh	40	60
181	8986	Leptospirosis MAT	Virology Serology	Detection of Leptospiral antibody using Microagglutination test	Blood in plain tube/serum	30	BAKTI-IDRC IMR	200	240
182	12998	Stool FEME (Ova & cyst sahaja)	Parasitology		Stool Normal Volume: 5ml stool Min Volume: 0.5ml stool	1	Pantai Premier Pathology	9	30
183	13103	Microfilaria, Direct Smear	Parasitology		3ml EDTA (must be drawn between 8pm and 4am)	2	Fakulti Perubatan PPUM	9	30
184	12937	Malaria Parasite, Blood Film (BFMP)	Parasitology		3ml EDTA	1 to 3	Pantai Premier Pathology	4.50	25
185	13085	Malaria detection	Parasitology		EDTA Tube (3 – 5 mls Blood)	2 Jam	Fakulti Perubatan PPUM	70	90
186	13086	PCR Malaria	Parasitology		EDTA Tube (3 – 5 mls Blood)	2 – 3	Fakulti Perubatan PPUM	315	378
187	13087	Filariasis IgG	Parasitology		Plain Tube (3 – 5 mls Blood)	1	Fakulti Perubatan PPUM	100	120
188	13089	Leishmania donovani- Bone marrow Smear/ Blood	Parasitology		Universal Container EDTA Tube (3 – 5 mls Blood)	2 Jam	Fakulti Perubatan PPUM	50	70
189	13090	Leishmaniasis IgG	Parasitology		Plain Tube (3 – 5 mls Blood)	7	Fakulti Perubatan PPUM	325	390

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190	13091	Acanthamoeba Culture	Parasitology		Universal Container Eye Swab / Eye Wash	14	Fakulti Perubatan PPUM	65	85
191	13092	Amoebiasis IgG	Parasitology		Plain Tube (3 – 5 mls Blood)	7	Fakulti Perubatan PPUM	310	372
192	13057	Stool FEME (Full set)	Parasitology		Stool Normal Volume: 5ml stool Min Volume: 0.5ml stool	1	Fakulti Perubatan PPUM	80	100
193	13093	Identification of Dipteran Larvae	Parasitology		Universal Container	1.5 - 2 bulan	Fakulti Perubatan PPUM	50	70
194	13094	Cysticercosis IgG	Parasitology		Plain Tube (3 – 5 mls Blood)	7	Fakulti Perubatan PPUM	390	468
195	13095	Echinococcosis IgG	Parasitology		Plain Tube (3 – 5 mls Blood)	7	Fakulti Perubatan PPUM	310	372
196	13096	Toxocariasis IgG	Parasitology		Plain Tube (3 – 5 mls Blood)	7	Fakulti Perubatan PPUM	305	366
197	13097	Schistosomiasis IgG	Parasitology		Plain Tube (3 – 5 mls Blood)	7	Fakulti Perubatan PPUM	295	354
198	13098	Microfilariae detection	Parasitology		EDTA Tube (3 – 5 mls Blood)	2	Fakulti Perubatan PPUM	60	80
199	13100	PCR Toxoplasmosis	Parasitology		CSF Bijour Bottle	2 to 3	Fakulti Perubatan PPUM	315	378

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200	13101	Strongyloidiasis IgG	Parasitology		Plain Tube (3 – 5 mls Blood)	7	Fakulti Perubatan PPUM	320	384
201	13102	Urine/ Vaginal Discharge for Parasites Detection	Parasitology		Universal Container	1	Fakulti Perubatan PPUM	45	65
202	14330	Hemoglobin Analysis	Haematology		Whole blood	14	PPUM	160	192

JABATAN PERKHIDMATAN MAKMAL DIAGNOSTIK

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