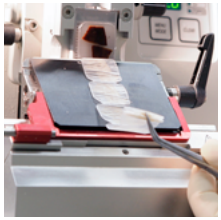


Handbook of Pathology Services

Third Edition
2022

Editors

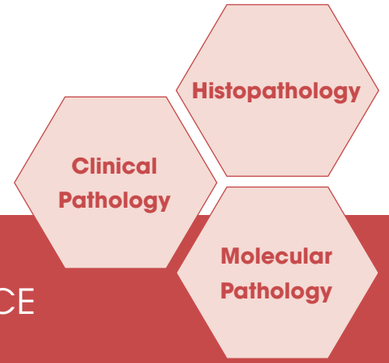
Mr. Alex C.P. Leung
Ms. Christina S.M. Long Leung
Mr. Thomas H.C. Wong

Copies of this handbook can be obtained from the secretary of the Department of Pathology.
A web version is also available at "Department of Pathology" on https://www.hksh-hospital.com.

Standing (left to right):
Christina Long, Thomas Wong, Kith Tsui, Esda Ng, Patrick Lam, Matthew Ho, Dr. Chris Chan PhD, Chen Miu Wah, Kristi Lai, Chan Tsz Ming, Ryon Heung, Dr. Raymond Chan DHSc, Twinky Chan and Jack Lam

Seated (left to right):
Dr. John Nicholls, Dr. Tony Ma, Dr. Robert Collins, Dr. May Chan, Dr. Chan Wai Kong, Dr. Laurence Hou (Director of Histopathology & Cytology Division), Dr. Tsao Yen Chow (Head (Administrative)), Dr. Edmond Ma (Director of Clinical Pathology & Molecular Pathology Division), Dr. Jonpaul Zee, Dr. Bone Tang, Dr. Melody Hui and Mr. Alex Leung (Senior Medical Technologist in-charge)

TABLE OF CONTENTS



PREFACE

With the rapid expansion of clinical services and the ever increasing demand for pathology support from different sub-specialty groups, it has become imperative that we publish a new edition of the Handbook in order to accommodate all the new information that have accumulated. Nevertheless, the aim of our Department remains the same, i.e. to provide a service that is fast, reliable and comprehensive. The Handbook remains a tool for easy reference to the wide range of services in our Department.

Of late, our HKSH Medical Group has been popularizing the concept of 'partnership in care'. This applies not just to the cooperation between doctors and nurses but also between all members of the Group including para-medicals and laboratories. In order to provide a better and reliable service, good communication must be maintained between users and the laboratory. We welcome information and feed-backs from all clinical staff.

Already, we have 2 pathologists in haematology, 2 pathologists in microbiology and 7 histopathologists collaborating closely with the clinicians. Our molecular laboratory also works hand-in-hand with our clinicians. Other aspects of laboratory service, including the standard of service, turn-around time etc. have also to be looked into.

We hope this Handbook will continue to serve as a ready reference for you and will also publish it as a soft copy so that you can download into your computer.

Dr. Y. C. Tsao
Administrative Director
Department of Pathology

INTRODUCTION

The Third Edition of this handbook comes at a time when great strides are made in laboratory medicine, in which laboratory testing is not only reserved for diagnostic purpose but also intended to support the clinician in disease prognostication, treatment guidance, monitoring of progress and disease prevention. The laboratory closely partners with the clinician in the advancement of patient care and management.

Like the previous edition, the Third Edition of the Handbook of Laboratory Services is prepared with the laboratory user in mind, aiming to assist them in making the best use of the Pathology Services offered by HKSH Medical Group. Through consulting this booklet, laboratory investigations relevant to various body systems or clinical specialties can be selected and ordered.

Proper adherence to sample collection and handling guidelines will ensure accurate results with minimal delay. General procedures of requesting laboratory tests are described in the initial sections. Special attention must be drawn to the fact that serious error can occur as a result of patient misidentification. Hence we urge the proper completion of sample requisition form with the appropriate patient identifiers and clinical information. Our pathologists, scientists and technologists are always ready to assist in laboratory test selection.

There has been an impressive expansion of Molecular Pathology service provision that covers the scope of oncology testing, rapid infectious disease diagnostics and genetic testing. The Division of Molecular Pathology is equipped with state-of-the-art genome sequencers, automated molecular systems and cytogenomic workstations that enable the application of precision medicine to serve patient needs.

Point-of-care testing devices are introduced in the hospital to guide patient management decisions at the bedside. The Clinical Laboratory is responsible for instrument evaluation and quality assurance of these devices.

The complete list of laboratory tests can be found in subsequent sections grouped in disciplines under the three divisions of the department. Test information includes test names, sample requirements, methodologies, test frequency, test turnaround time and special remarks. We are only providing brief information of each test for easy referencing. More detailed specifications and indications of special tests are available under the Pathology Services Update in the Doctors' Corner of the Hospital homepage.

Besides laboratory diagnostics, we are also involved in direct patient related services, namely phlebotomy, urea breath testing, sleep apnoea (polysomnography), and electrocardiography.
The Clinical Laboratory is a certified phlebotomy training centre recognised by the American Society of Clinical Pathology.

In order to achieve and maintain excellent standard of services, the Department of Pathology emphasizes in quality management, staff training, external accreditation and communication. By adhering strictly to official occupation safety and health guidelines, we strive to provide a safe environment for staff through the minimization and management of workplace hazards and anticipation of risks.

Medical and technical staff of the Department is prepared to provide help and advice on the available laboratory investigations. As always, we welcome any comments and suggestions, and are committed to providing pathology services of the highest standards, to the ultimate benefit of our patients.

Dr. Edmond S. K. Ma
Director of Clinical and Molecular Pathology

Hours of Operation

	Normal Service	Outside Office Hours
Clinical Pathology Division **Blood Bank** **Clinical Chemistry** **Clinical Haematology** **Clinical Microbiology**	24 hours a day, 7 days a week	
Clinical Immunology and Serology	8:00 am to 4:00 pm Monday to Saturday	N/A
Stem Cell	9:00 am to 5:00 pm Weekday 9:00 am to 1:00pm Saturday	N/A
Send-out Tests	9:00 am to 5:00 pm Weekday 9:00 am to 1:00pm Saturday	N/A
Histopathology and Cytology Division	8:00 am to 6:00 pm Weekday 8:00 am to 1:00 pm Saturday	Frozen section cases at an extra charge
Molecular Pathology Division	8:00 am to 6:00 pm Weekday 8:00 am to 6:00 pm Saturday	On call for special cases

Useful Contact Numbers

Administrative Director
Dr. Tsao Yen Chow 2835-8800

Director, Clinical and Molecular Pathology
Dr. Ma Shiu Kwan, Edmond 2835-8017

Director, Histopathology and Cytology
Dr. Hou Lee Tsun, Laurence 2835-8773

Clinical Microbiologist
Dr. Yung Wai Hung, Raymond 2835-8800
Dr. Tang Siu Fai, Bone 2835-8969
Dr. Zee Sze Tsing, JonPaul 2835-7064

Consultant Haematologist
Dr. Choi Wai Lap, William 2835-8499

Consultant Histopathologist
Dr. Chan Kwok Mei, May 2835-8771
Dr. Chan Wai Kong 2835-8772
Dr. Robert John, Collins 2835-7691
Dr. Ma Kwok Fai, Tony 2835-8775
Dr. Hui Yin, Melody 2835-7692
Dr. John Malcolm Nicholls 2835-7848

Senior Medical Technologist In-charge
Mr. Leung Chin Pang, Alex 2835-8798

Blood Bank
Ms. Ng Hon Yi, Esda 2835-8793

Clinical Chemistry
Mr Ho Kam Shing, Matthew 2835-7083

Clinical Haematology
Ms. Lau Yin See 2835-8795

Clinical Microbiology
Mr. Chan Tsz Ming..... 2835-8791

Clinical Immunology & Serology
Ms. Lai Tsz Wan, Kristi 2835-8796

General Laboratory and Send-out Test Services
Ms. Chen Miu Wah 2835-8790

Stem Cell
Mr. Wong Hin Ching, Thomas 2835-8412

Histopathology and Cytology Division
Mr. Lam Chi Wai, Patrick 2835-8839

Molecular Pathology Division
Dr. Chan Tsun Leung, Chris (Ph.D.) 2835-8779

General Enquiries
Clinical Pathology 2835-8790
Histopathology and Cytology 2835-8839
Molecular Pathology.....2835-8779

Phlebotomy Hotline
..... 2835-8790 ext. 5189

Facsimile Number
Clinical Pathology 2835-8799
Histopathology and Cytology 2834-6392
Molecular Pathology.....2892-7558

Department Secretary
.....2835-7032

Hospital Operator
.....2572-0211

How to Order Lab Tests

Under normal circumstances, our team of highly trained phlebotomists is responsible for blood collection of inpatients and outpatients of the Hospital. In case of blood collection being done externally by doctors or nurses, please ensure that the blood is placed in appropriate containers for the required tests, clearly labelled and delivered promptly to our Department for processing. Incorrectly labelled / unidentified samples and forms will be rejected (See Rejection Criteria for details).

Please use the correct request form(s) for test(s) required. Patient demographics must be given, together with the date and time of collection. The test(s) must be ordered and signed by the attending doctor or attending nurse on his/her behalf. For phlebotomy requests, please send us the form as soon as possible so as to minimise delays in processing. Due to limited manpower, we might be unable to answer your calls during night time. And for urgent cases, please call the Hospital Operator, and we shall get back to you as soon as possible.

Outside specimens must be placed in securely sealed triple packaging , to which the request forms are also securely attached. (Refer to Standard Precautions for Specimen Handling).

Patient Identification Policy

It is the Group's policy that services are only rendered to patients upon presentation of valid identification documentations. Those who do not hold a HKID must provide other forms of identification.

Standard Precautions for Specimen Handling

- All specimens should be treated as infectious and handled using standard precautions.
- Specimens must be delivered to the laboratory in "triple-layer packaging" in accordance with the Group's guidelines.
- A leak-proof container must be used as a primary holder of the specimen, packed in a single secondary container.
- All secondary containers should be placed into an outer container or packaging / box during delivery. The outer container should be made of strong material that can be cleansed and disinfected, and should be labelled with biohazard warning signs.
- Appropriate personal protective equipment (PPE) must be worn when handling specimens.

Rejection of Unacceptable Specimens

All efforts will be made in attempting to process specimens. Specimens may be deemed unsuitable or unsafe for processing and thus rejected under the following circumstances:

- Request forms without a unique patient identifier
- Request forms without indication of test required
- Request forms without the name of requesting doctor
- Request forms with illegible writing
- Request forms contaminated with blood or body fluids
- Specimens without labelling
- Specimens in wrong container type
- Haemolyzed or insufficient amount of sample
- Spilled specimens, leaking or cracked tubes and containers
- Mismatched information on the forms and specimens

Unsatisfactory Analytic Results

The duty technologist will repeat the test with justification if the result(s) is/are considered doubtful. Samples are retaken if the duty supervisor remains unsatisfied with the results.

Critical Value Reporting Policy

Critical values are defined as laboratory results, found in pathological states, that show significant variations from normal ranges and are potentially life-threatening. Laboratory staff will verbally report these results over the phone directly to the doctor-in-charge so that immediate action can be taken. Nurses at of ward/ centre / outside clinics will be informed if the doctor cannot be reached.

Policy for the Disclosure of Results

The Group prohibits disclosure of confidential information to parties not directly concerned with the test-requesting patient. Only doctors, ward nurses and other authorised persons will receive the results, which are given at the total discretion of the Department of Pathology.

Confidentiality of Data

The Department would like to reassure its users that all laboratory test results and patient data remain fully confidential.

Test Turnaround Time

The turnaround time of laboratory tests varies according to the type of tests required. In general, it ranges from 30 minutes for an urgent CBP to a few weeks for tests sent to other countries. Frequency and turnaround time of each test are provided in this Handbook for reference. As a large number of tests are processed every day, please indicate clearly on the request form if urgent results are expected. We shall make our best effort to cater to your needs.

Unlisted Tests

Please contact the Department at 2835-8702 for tests not listed in this Handbook. We will try our best to search for testing laboratories that suit your needs.

Point-of-Care Testing (POCT)

Point-of-care testing provides rapid critical test results at the patient's bedside, enabling clinicians to make informed treatment decisions promptly. All POCT testing devices are managed by the Department of Pathology, and we strive to provide accurate test instruments through vigorous quality control, maintenance schedules and parallel testing with laboratory instruments. POCT devices are currently available for bedside testing of some vital analytes at the Operating Theatre, Intensive Care Unit, Department of Diagnostic & Interventional Radiology and Cardiac Catheterization & Intervention Centre. For further enquiry, please call 2835-8790.

TEST DISCIPLINES

CLINICAL PATHOLOGY DIVISION

Blood Bank (ext. 8793)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
"Blood Group Rh (D) typing"	Not applicable	EDTA whole blood	Forward & Reverse typing	On arrival	Immuno-haematology	"Routine: within 2 hours"	
Direct Coombs	Negative	EDTA whole blood	Serology	On arrival	Immuno-haematology	"Routine: within 4 hours after receipt of the specimen"	
Indirect Coombs	Negative	EDTA whole blood	Serology	On arrival	Immuno-haematology	"Routine: within 4 hours"	
Cold Agglutinin	<32	Serum	Serology at 4°C	On arrival	Immuno-haematology	1 working day	
Warm Agglutinin	Negative	Serum	Serology at 37°C	On arrival	Immuno-haematology	"Routine: within 4 hours"	
Warm Agglutinin	Negative	Serum	Serology at 37 °C	On arrival	Immuno-haematology	Urgent: 1 to 1½ hours Routine: within 4 hours	
Crossmatch	Compatible	EDTA whole blood	Serology	On arrival	Immuno-haematology	"Routine: within 4 hours"	
Type & Screen	No irregular antibodies detected	EDTA whole blood	Serology	On arrival	Immuno-haematology	"Routine: within 4 hours"	
Private Donor	Suitable for donation	EDTA whole blood	Serology	On request	Blood Transfusion	At least 7 working days	
Autologous Transfusion	Suitable for donation	EDTA whole blood	Serology	On request	Blood Transfusion	At least 7 working days	

General Laboratory and Send-out Test Services (ext. 8702)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Pledge TAT	Remarks
Urea Breath Test	< 4 Delta	Carbon dioxide gas	Infra-red spectrometry	On request	2 working days	Patients should fast for at least 4 hours before testing. Some drugs are restricted, please enquire

Clinical Chemistry sample type notation:

AF - Ascitic Fluid
CSF - Cerebral Spinal Fluid
EP - EDTA Plasma
F - Fluoride Plasma
HW - Heparinized Whole Blood
S - Serum
WB - Whole Blood
CP - Citrated Plasma
DF - Drain Fluid
EW - EDTA Whole Blood
HP - Heparinized Plasma
PF - Pleural Fluid
U - Urine
24-hr U - 24 hour Urine

Clinical Chemistry (ext. 8792)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Adrenocorticotropic hormone (ACTH)	1.6 - 13.9 pmol/L	EP	ECLIA	Every 2 days	Hormone	2 days	Transport on ice, separate from cells asap
Alanine aminotransferase (ALT)	M: <41 U/L F: <33 U/L	HP	IFCC, without Pyridoxal phosphate	On arrival	Liver	4 hours	
Albumin	40 - 49 g/L	HP	BCG	On arrival	Liver	4 hours	
Alkaline phosphatase (ALP)	M: 40 - 129 U/L F: 35 - 104 U/L	HP	IFCC, AMP buffer	On arrival	Liver	4 hours	
Allergen component IgE	<=0.34 KU/L	S	ImmunoCAP	Daily	Allergy	5 days	Peanut, Egg, Milk
Alpha-fetoprotein (AFP)	<7.0 µg/L	HP	ECLIA	On arrival	Tumor Marker	24 hours	
Amikacin	Peak (Therapeutic): 34.2 - 42.8 µmol/L Peak (Toxic): >59.9 µmol/L Trough (Therapeutic): 8.6 - 17.1 µmol/L	HP	KIMS	On arrival	Therapeutic drug level	4 hours	
	Trough (Toxic): >17.1 µmol/L	HP	KIMS	On arrival	Therapeutic drug level	4 hours	
Ammonia	M: 16 - 60 µmol/L F: 11 - 51 µmol/L	EP	Enzymatic	On arrival	Liver	4 hours	Transport on ice, separate from cells asap
Amylase	28 - 100 U/L	HP	IFCC, Enzymatic colorimetric	On arrival	Pancreas	4 hours	

Clinical Chemistry (ext. 8792)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Amylase (drain fluid)	N/A	DF	IFCC, Enzymatic colorimetric	On arrival	Body fluid	24 hours	
Amylase, pancreatic	13 - 53 U/L	HP	Salivary amylase inhibition	On arrival	Pancreas	4 hours	
Anti-thyroglobulin	<115 KIU/L	S	ECLIA	Every 2 days	Thyroid	2 days	
Apolipoprotein A1	M: 1.10 - 2.05 g/L F: 1.25 - 2.15 g/L	S	Turbidimetry	Daily	Atherosclerosis risk markers	24 hours	
Apolipoprotein B	M: 0.55 - 1.40 g/L F: 0.55 - 1.25 g/L	S	Turbidimetry	Daily	Atherosclerosis risk markers	24 hours	
Ascitic fluid- LDH	<60% of plasma total LDH	AF	IFCC, Lactate to pyruvate	On arrival	Body fluid	24 hours	
Ascitic fluid - Glucose	>60% of plamsa glucose	AF	Hexokinase	On arrival	Body fluid	24 hours	
Ascitic fluid - Protein	<50% of plasma protein	AF	Biuret method	On arrival	Body fluid	24 hours	
Aspartate aminotransferase (AST)	M: <40 U/L F: <32 U/L	HP	IFCC, without Pyridoxal phosphate	On arrival	Liver	4 hours	
beta-CrossLaps (CTX)	M(18-30yr): 0.155 - 0.873 µg/L M(31-50yr): 0.093 - 0.630 µg/L M(51-70yr): 0.035 - 0.836 µg/L M(>70yr): <=0.854 µg/L F(pre-menopause): 0.025 - 0.573 µg/L F(post-menopause): 0.104 - 1.008 µg/L	EP	ECLIA	Every 2 days	Bone marker	2 days	

Clinical Chemistry (ext. 8792)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
b-human chorionic gonadotropin (hCG)	M: <2 IU/L F(Non-pregnant premenopausal: <=1 IU/L F(Post-menopausal): <=7 IU/L	S	ECLIA	On arrival	Pregnancy	4 hours	
Bicarbonate (HCO_3)	24 - 31 mmol/L	HP	Enzymatic, PEP carboxylase	On arrival	Renal	4 hours	Collected in air-proof container
Bilirubin, conjugated	<=6.8 µmol/L	HP	Colorimetric, Diazo method	On arrival	Liver	4 hours	Protect from light
Bilirubin, total	<=21 µmol/L	HP	Colorimetric, Diazo method	On arrival	Liver	4 hours	Protect from light
Blood Gas	pH(arterial): 7.35 - 7.45 pH(Venous): 7.32 - 7.43 pCO2(Arterial): 32.0 - 48.0 mmHg PCO_2(Venous): 6-7 mmHg higher than arterial pCO_2 pO_2(Arterial): 83.0 - 108.0 mmHg	Arterial/ Venous/ Capillary WB	Potentiometry/ Amperometry	On arrival	Blood gas	1 hour	Transport on ice (collected in air-proof container)
CA125	<35 KAU/L	S	CMIA	On arrival	Tumor Marker	24 hours	
CA15.3	<28 KAU/L	S	CMIA	On arrival	Tumor Marker	24 hours	
CA19.9	<37 KAU/L	S	CMIA	On arrival	Tumor Marker	24 hours	

Clinical Chemistry (ext. 8792)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
CA72.4	<6.9 KU/L	HP	ECLIA	Every 2 days	Tumor Marker	2 days	
Calcium	2.15 - 2.55 mmol/L	HP	NM-BAPTA	On arrival	Metabolic/Bone	4 hours	Included albumin-adjusted calcium
Calcium, ionized	1.15 - 1.33 mmol/L	Ca-balanced HepWB (collected in air-proof container)	Direct ISE	On arrival	Metabolic/Bone	4 hours	Transport on ice
Carboxyhaemoglobin	Non-smokers: <3% Smokers: <10%	Arterial/ Venous/ Capillary WB (collected in air-proof container)	Co-oximetry	On arrival	Co-oximetry	4 hours	
Carcinoembryonic antigen (CEA)	Non-smokers: <5 µg/L Smokers: <10 µg/L	S	CMIA	On arrival	Tumor Marker	24 hours	
CSF- Glucose	approx. 60% of plasma glucose	CSF	Hexokinase	On arrival	CSF	2 hours	
CSF- Protein	150 - 450 mg/L		Turbidimetry	On arrival	CSF	2 hours	
CSF- Albumin	<0.35 g/L		Turbidimetry	On arrival	CSF	24 hours	
CSF- IgG	<0.034 g/L		Turbidimetry	On arrival	CSF	24 hours	
CSF- IgG Index	<0.8	CSF, S	Turbidimetry	On arrival	CSF	24 hours	
Chloride	98 - 107 mmol/L	HP	Indirect ISE	On arrival	Renal	4 hours	
Cholesterol, total	Desirable <5.18 mmol/L	HP	Cholesterol oxidase/ Peroxidase	On arrival	Lipids	4 hours	
Cholesterol, total to HDL-Cholesterol Ratio	Desirable <5.0	HP	Calculated from total Chol & HDL	On arrival	Lipids	4 hours	

Clinical Chemistry (ext. 8792)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
CKMB	M: <6.2 µg/L F: <4.9 µg/L	HP	ECLIA	On arrival	Cardiac	2 hours	
Complement C3	0.81 - 1.57 g/L	S	Turbidimetry	Daily	Immune	24 hours	
Complement C4	0.129 - 0.392 g/L	S	Turbidimetry	Daily	Immune	24 hours	
Cortisol	6-10am: 133 -537 nmol/L 4-8pm: 68.2 - 327 nmol/L	HP	ECLIA	Daily	Hormone	24 hours	
C-Reactive protein	<5 mg/L	HP	Immunoturbidimetric	On arrival	Inflammatory marker	4 hours	
Creatine Kinase (CK)	M: 39 - 308 U/L F: 26 - 192 U/L	HP	IFCC, Imidazole buffer	On arrival	Cardiac	4 hours	
Creatinine	M: 62 - 106 µmol/L F: 44 - 80 µmol/L	HP	Jaffe, Alk. Picrate	On arrival	Renal	4 hours	
Creatinine Clearance	M: 0.82 - 1.20 ml/s/sq.m F: 0.72 - 1.11 ml/s/sq.m	HP & 24-hr U	Jaffe, Alk. Picrate	Daily	Renal	24 hours	
Cyclosporin A	Therapeutic (12hr post dose): 100 - 400 µg/L (24hr post dose): 100 - 200 µg/L Toxic: >400 µg/L	EW	CMIA	Daily	Immunosuppressants	24 hours	
Cytomegalovirus IgG	N/A	S	CMIA	Daily	Serology	2 days	
Cytomegalovirus IgM	N/A	S	CMIA	Daily	Serology	2 days	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Dehydroepiandrosterone sulfate (DHEA-S)	M(<11yr): <3.9 µmol/L	S	CMIA	Daily	Hormone	24 hours	
	M(11-14yr): 0.5 -6.6 µmol/L						
	M(15-19yr): 1.2 - 10.4 µmol/L						
	M(20-24yr): 6.5 - 14.6 µmol/L						
	M(25-34yr): 4.6 - 16.1 µmol/L						
	M(35-44yr): 3.8 - 13.1 µmol/L						
	M(45-54yr): 3.7 - 12.1 µmol/L						
	M(55-64yr): 1.3 - 9.8 µmol/L						
	M(65-70yr): 6.2 - 7.7 µmol/L						
	F(<11yr): <3.8 µmol/L						
	F(11-14yr): 0.2 - 4.6 µmol/L						
	F(15-19yr): 1.7 - 13.4 µmol/L						
	F(20-24yr): 3.6 - 11.1 µmol/L						
	F(25-34yr): 2.6 - 13.9 µmol/L						
	F(35-44yr): 2.0 - 11.1 µmol/L						

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Dehydroepiandrosterone sulfate (DHEA-S)	F(45-54yr): 1.5 - 7.7 µmol/L		CMIA	Daily	Hormone	24 hours	
	F(55-64yr): 0.8 - 4.9 µmol/L						
	F(65-70yr): 0.9 - 2.1 µmol/L						
Digoxin	Therapeutic: 1.0 - 2.6 nmol/L	S	KIMS	On arrival	Therapeutic drug level	4 hours	
	Toxic: >2.6 nmol/L						
Estimated glomerular filtration rate (eGFR)	>60 ml/ min/1.73sq.m	HP	Modified MDRD equation	On arrival	Renal	4 hours	
Estradiol (E2)	Follicular: 46 - 607 pmol/L	HP	ECLIA	On arrival	Fertility Hormone	24 hours	
	Ovulation: 315 - 1828 pmol/L						
	Luteal: 161 - 774 pmol/L						
	Menopause: <201 pmol/L	HP	ECLIA	On arrival	Fertility Hormone	24 hours	
	Pregnancy (1st trimester): 789 - >15781 pmol/L						
	M: 28 - 156 pmol/L						
Ferritin	M: 30 - 400 µg/L	HP	ECLIA	On arrival	Anaemic marker	24 hours	
	F: 13 - 150 µg/L						
Fibrinogen antigen	1.8 - 3.5 g/L	CP	Nephelometry	On arrival	Coagulation	24 hours	
Folate, RBC	Deficient <340 nmol/L	EW	Competitive Immunoassay, FBP	Every 2 days	Anaemic marker	2 days	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Folate, serum	Deficient <10.0 nmol/L	HP	Competitive Immunoassay, FBP	Every 2 days	Anaemic marker	2 days	
Follicle stimulating hormone (FSH)	Follicular: 3.5 - 12.5 IU/L	HP	ECLIA	On arrival	Fertility Hormone	24 hours	
	Ovulation: 4.7 - 21.5 IU/L						
	Luteal: 1.7 - 7.7 IU/L						
	Post-menopause: 25.8 - 134.8 IU/L						
	M: 1.5 - 12.4 IU/L						
Free T3	3.1 - 6.8 pmol/L	HP	ECLIA	On arrival	Thyroid Hormone	24 hours	
Free T4	12.0 - 21.9 pmol/L	HP	ECLIA	On arrival	Thyroid Hormone	24 hours	
G6PD Quantitative	Age >3 months	EW	Enzymatic	Daily	Anaemia	2 days	
	Normal: >6.10 U/g Hb						
	Borderline: 2.41 - 6.10 U/g Hb						
	Deficient: <2.41 U/g Hb						
	Age <=3 months						
	Normal: >9.61 U/g Hb						
	Borderline: 3.86 - 9.61 U/g Hb						
	Deficient: <3.86 U/g Hb						
Gamma-glutamyltransferase (GGT)	M: 10 - 71 U/L	HP	IFCC, Enzymatic colorimetric	On arrival	Liver	4 hours	
	F: 6 - 42 U/L						

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Globulin	23 - 38 g/L	HP	Calculated from protein & albumin	On arrival	Liver	4 hours	
Glucose	Fasting: 3.9 - 5.6 mmol/L	HP/F	Hexokinase	On arrival	Diabetes	4 hours	8 hours fasting. Fluoride bottle must be used if sample deliver from outside lab
	Random: 3.9 - 7.8 mmol/L						
Glycohaemoglobin HBA1c	<6.5%	EW	HPLC	Daily	Diabetes	2 days	
Haptoglobin	0.32 - 1.97 g/L	S	Turbidimetry	Daily	Specific Protein	2 days	
Hepatitis A virus IgG	N/A	S	CMIA	Every 2 days	Hepatitis Serology	2 days	
Hepatitis A virus IgM	N/A	S	CMIA	Every 2 days	Hepatitis Serology	2 days	
Hepatitis B virus core antibody IgM (HBcoreIgM)	N/A	S	CMIA	Every 2 days	Hepatitis Serology	2 days	
Hepatitis B virus core total antibody (HBcore Ab)	N/A	S	CMIA	Daily	Hepatitis Serology	2 days	
Hepatitis B virus envelop antibody (HBeAb)	N/A	S	CMIA	Daily	Hepatitis Serology	24 hours	
Hepatitis B virus envelop antigen (HBeAg)	N/A	S	CMIA	Daily	Hepatitis Serology	24 hours	
Hepatitis B virus surface antibody (HBsAb)	N/A	S	CMIA	Daily	Hepatitis Serology	24 hours	
Hepatitis B virus surface antigen (HBsAg) qualitative	N/A	S	CMIA	Daily	Hepatitis Serology	24 hours	

Clinical Chemistry (ext. 8792)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Hepatitis B virus surface antigen (HBsAg) quantitative	N/A	S	CMIA	Daily	Hepatitis Serology	24 hours	
Hepatitis C virus antibody (HCV)	N/A	S	CMIA	Daily	Hepatitis Serology	24 hours	
High density lipoprotein cholesterol (HDL-C)	M: Desirable >=1.55 mmol/L; At risk <1.04 mmol/L	HP	Homogeneous enzymatic colorimetric	On arrival	Lipids	4 hours	
	F: Desirable >=1.55 mmol/L; At risk <1.30 mmol/L						
High sensitive C-Reactive protein (hs-CRP)	<3.0 mg/L	S	Nephelometry	Daily	Atherosclerosis risk marker	24 hours	
Homocysteine	<= 12.0 µmol/L	EP	Enzymatic	Weekly	Cardiovascular risk	7 days	Transport on ice
Human Epididymis protein (HE4)	Pre-menopause: <=70 pmol/L	S	CMIA	Daily	Tumor Marker	24 hours	
	Post-menopause: <=140 pmol/L						
Human growth hormone	M(<11yr): 0.28 - 18.90 mIU/L	S	ECLIA	Every 2 days	Hormone	2 days	
	M(11-17yr): 0.23 - 32.40 mIU/L						
	M(>17yr): <7.41 mIU/L						
	F(<11yr): 0.36 - 23.40 mIU/L						

Clinical Chemistry (ext. 8792)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Human growth hormone	F(11-17yr): 0.37 - 24.15 mIU/L	S	ECLIA	Every 2 days	Hormone	2 days	
	F(>17yr): 0.38 - 29.64 mIU/L						
Human immunodeficiency virus antibody/p24 antigen (HIV Ag/Ab)	N/A	S	CMIA	Daily	Serology	24 hours	
Immunofixation	N/A	S	Agarose gel electrophoresis	Daily	Paraprotein	5 days	
Immunoglobulin IgA	0.85 - 4.99 g/L	S	Turbidimetry	Daily	Immunoglobulin	24 hours	
Immunoglobulin IgE, allergen specific	<=0.34 KU/L	S	ImmunoCAP	Twice per week	Allergy panel	5 days	
Immunoglobulin IgE, total	<100 KU/L	S	ImmunoCAP	Twice per week	Allergy panel	5 days	
Immunoglobulin IgG	6.10 - 16.16 g/L	S	Turbidimetry	Daily	Immunoglobulin	24 hours	
Allergen speciic Immunoglobulin IgG and IgG4	N/A	S	ImmunoCAP	Weekly	Allergen components	5 days	Egg white, Egg yolk, Peanut & Milk
Immunoglobulin IgM	0.35 - 2.42 g/L	S	Turbidimetry	Daily	Immunoglobulin	24 hours	
Immunoglobulin subtype G4 (IgG4)	0.04 - 0.86 g/L	S	Turbidimetry	Daily	Immunoglobulin	24 hours	
Inorganic phosphorus	0.81 - 1.45 mmol/L	HP	Phosphomolybdate formation	On arrival	Metabolic/Bone	4 hours	
Insulin	18 - 173 pmol/L	HP	ECLIA	On arrival	Hormone	24 hours	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Iron	M: 11.0 - 28.0 µmol/L F: 6.6 - 26.0 µmol/L	HP	FerroZine method without deproteinization	On arrival	Anaemia	4 hours	
Lactate	0.5 - 2.2 mmol/L	F	Enzymatic colorimetric	On arrival	Metabolic	4 hours	Transport on ice. Serparate from blood cells ASAP
Lactate dehydrogenase (LDH)	M: 135 - 225 U/L F: 135 - 214 U/L	HP	IFCC, Lactate to pyruvate	On arrival	Cardiac	4 hours	
Lipoprotein(a)	<75 nmol/L	S	Immunoturbidimetric	Every 2 days	Atherosclerosis risk marker	2 days	
Low density lipoprotein cholesterol (LDL-C)	Optimal: <2.59 mmol/L Near optimal: 2.59 - 3.34 mmol/L Borderline high: 3.35 - 4.12 mmol/L High: 4.13 - 4.90 mmol/L Very high: >=4.91 mmol/L	HP	Homogeneous enzymatic colorimetric	On arrival	Lipids	4 hours	Direct measurement
Lutinizing hormone (LH)	Follicular: 2.4 - 12.6 IU/L Ovulation: 14.0 - 95.6 IU/L Luteal: 1.0 - 11.4 IU/L	HP	ECLIA	On arrival	Fertility Hormone	24 hours	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Lutinizing hormone (LH)	Post-menopause: 7.7 -58.5 IU/L M: 1.7 -8.6 IU/L	HP	ECLIA	On arrival	Fertility Hormone	24 hours	
Magnesium	13-20yr: 0.70 - 0.91 mmol/L 21-60yr: 0.66 - 1.07 mmol/L 61-90yr: 0.66 - 0.99 mmol/L	HP	Colorimetric, Xylidyl blue	On arrival	Metabolic	4 hours	
	>90yr: 0.70 - 0.95 mmol/L	HP	Colorimetric, Xylidyl blue	On arrival	Metabolic	4 hours	
Methaemoglobin	<=1.5 %	Arterial/Venous/ Capillary WB (collected in air-proof container)	Co-oximetry	On arrival	Co-oximetry	4 hours	
Methotrexate	24hr post dose: Toxic >10.0 umol/L 48hr post dose: Toxic >1.0 umol/L 72hr post dose: Toxic >0.1 umol/L	HP (Without gel, double-spin)	CMIA	Daily	Therapeutic drug level	24 hours	Wrap in foil, Protect from light, double-spin
Microalbumin	Random urine: <30 mg/L 24 hour urine: Normal: <=28.8 mg/day Micro albuminuria: 28.8 - 288 mg/day	U	Immunoturbidimetric	On arrival	Renal	24 hours	

Clinical Chemistry (ext. 8792)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Microalbumin	Overt albuminuria: >288 mg/day	U	Immunoturbidimetric	On arrival	Renal	24 hours	
Microalbumin to creatinine ratio	<1.92 mg/mmol	U	Calculated from Microalbumin & Creatinine, urinary	On arrival	Renal	24 hours	
Myoglobin	M: 28 - 72 µg/L	S	ECLIA	Every 2 days	Cardiac marker	2 days	
	F: 25 - 58 µg/L						
Neonatal Bilirubin	Full Term Newborn	HW	Optical	On arrival	Neonatal	1 hour	
	up to 24 hours: 34 - 103 µmol/L						
	up to 48 hours: 103 - 171 µmol/L						
	3 - 5 days: 68 - 137 µmol/L						
	Premature Newborn						
	up to 24 hours: 17 - 137 µmol/L						
	up to 48 hours: 103 - 205 µmol/L						
	3 - 5 days: 171 - 239 µmol/L						
Non-HDL-Cholesterol	Desirable <4.20 mmol/L	HP	Calculated from total Chol & HDL	On arrival	Lipids	4 hours	
N-terminal prohormone of brain natriuretic peptide (NT-proBNP)	Rule out acute CHF: <35.5 pmol/L	HP	ECLIA	On arrival	Cardiac marker	2 hours	
	Age straified cutoff for acute CHF						

Clinical Chemistry (ext. 8792)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
N-terminal prohormone of brain natriuretic peptide (NT-proBNP)	<50yr: >53.3 pmol/L	HP	ECLIA	On arrival	Cardiac marker	2 hours	
	50-75yr: >106.6 pmol/L						
	>75yr: >213.1 pmol/L						
Osmolality, plasma	284 - 306 mOsm/kg	HP	Freezing point depression	On arrival	Metabolic	24 hours	
Osmolality, urine	50 - 1200 mOsm/kg	U	Freezing point depression	On arrival	Metabolic	24 hours	
Osteocalcin	9 - 42 µg/L	EP	ECLIA	Every 2 days	Bone marker	2 days	
Parathyroid hormone (PTH)	1.6 - 6.9 pmol/L	EP	ECLIA	Daily	Parathyroid	24 hours	
Phenytoin	Therapeutic: 39.6 - 79.2 µmol/L	S	KIMS	On arrival	Therapeutic drug level	4 hours	
Pleural fluid- Adenosine deaminase	<35 U/L	PF	Enzymatic	On arrival	Body fluid	24 hours	
Pleural fluid- Glucose	>50% of plasma glucose	PF	Hexokinase	On arrival	Body fluid	24 hours	
Pleural fluid- Protein	<50% of plasma protein	PF	Biuret method	On arrival	Body fluid	24 hours	
Pleural fluid- Lactate dehydrogenase (LDH)	<60% of plasma total LDH	PF	IFCC, Lactate to pyruvate	On arrival	Body fluid	24 hours	
Potassium	3.2 - 4.8 mmol/L	HP	Indirect ISE	On arrival	Renal	4 hours	Separate plasma if sample deliver from outside lab
Prealbumin	0.20 - 0.40 g/L	S	Turbidimetry	Daily	Nutritional assessment	24 hours	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Procalcitonin	Bacterial infection unlikely <0.15 ng/ml	HP	ECLIA	Daily	Inflammatory marker	24 hours	
	Systemic or severe localized bacterial infection >2.0 ng/ml	HP	ECLIA	Daily	Inflammatory marker	24 hours	
Progesterone	Follicular: <2.8 nmol/L	HP	ECLIA	Daily	Fertility Hormone	24 hours	
	Ovulation: <38.1 nmol/L						
	Luteal: 5.8 - 75.9 nmol/L						
	Post-menopause: <0.6 nmol/L						
	M: <0.6 nmol/L						
Prolactin	Non-pregnant: 102 - 496 mIU/L	HP	ECLIA	Daily	Fertility Hormone	24 hours	
	M: 86 - 324 mIU/L						
Prostate specific antigen, free (F-PSA)	<0.93 µg/L	S	CMIA	Daily	Tumor Marker	24 hours	
Prostate specific antigen, total (PSA)	M(<60yr): <4.0 µg/L	S	CMIA	Daily	Tumor Marker	24 hours	
	M(60-69yr): <5.0 µg/L						
	M(70-79yr): <7.1 µg/L						
	M(>79yr): <5.9 µg/L						
Protein electrophoresis	N/A	S	Agarose gel electrophoresis	Daily	Paraprotein	5 days	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Protein, total	66 - 87 g/L	HP	Biuret method	On arrival	Liver	4 hours	
Rheumatoid factor (RF)	<14 KU/L	S	Turbidimetry	Every 2 days	Arthritis	2 days	
Rubella virus IgG	N/A	S	CMIA	Daily	Serology	24 hours	
Rubella virus IgM	N/A	S	CMIA	Every 2 days	Serology	2 days	
SARS-CoV-2 virus IgG	Negative <1.4 Index Positive ≥1.4 Index	S	CMIA	Daily	Serology	24 hours	
SARS-CoV-2 virus IgG quantitative	Negative <50 AU/ml Positive ≥50 AU/ml	S	CMIA	Daily	Serology	24 hours	
SARS-CoV-2 virus IgM	Negative <1.0 Index Positive ≥1.0 Index	S	CMIA	Daily	Serology	24 hours	
Serum free light chains	Free kappa 3.30 - 19.40 mg/L	S	Turbidimetry	Daily	Paraprotein	24 hours	
	Free lambda 5.71 - 26.30 mg/L						
	Kappa/Lambda ratio: 0.26 - 1.65						
Serum IgA heavy light chain pair assay	IgA kappa: 0.588 - 2.984 g/L	S	Turbidimetry	Daily	Paraprotein	24 hours	
	IgA lambda: 0.432 - 2.035 g/L						
	IgA kappa/ lambda ratio: 0.91 - 2.42						

Clinical Chemistry (ext. 8792)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Serum IgG heavy light chain pair assay	IgG kappa: 4.03 - 9.78 g/L IgG lambda: 1.97 - 5.71 g/L IgG kappa/ lambda ratio: 0.98 - 2.75	S	Turbidimetry	Daily	Paraprotein	24 hours	
Serum IgM heavy light chain pair assay	IgM kappa: 0.19 - 1.63 /L IgM lambda: 0.12 - 1.01 g/L IgM kappa/ lambda ratio: 1.18 - 2.74	S	Turbidimetry	Daily	Paraprotein	24 hours	
Serum immunofixation	N/A	S	Agarose gel electrophoresis	Daily	Paraprotein	5 days	
Sirolimus	Therapeutic: 3 - 20 µg/L Toxic: >20 µg/L	EW	CMIA	Daily	Therapeutic drug level	24 hours	
Sodium	134 - 148 mmol/L	HP	Indirect ISE	On arrival	Renal	4 hours	
Soluble Transferrin Receptor (sTfR)	M: 1.80 - 4.70 mg/L F: 1.78 - 4.59 mg/L	S	Immunoturbidimetric	Every 2 days	Anaemia	2 days	
Syphilis Treponema pallidum total antibody (TPAb)	N/A	S	CMIA	Daily	Serology	24 hours	
Tacrolimus	Therapeutic: 3 - 20 µg/L Toxic: >25 µg/L	EW	CMIA	Daily	Therapeutic drug level	24 hours	

Clinical Chemistry (ext. 8792)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Testosterone	M(<1yr): 0.4 - 0.7 nmol/L M(1-6yr): 0.1 - 1.1 nmol/L	S	ECLIA	Every 2 days	Hormone	2 days	
Testosterone	M(7-12yr): 0.1 - 2.4 nmol/L M(13-17yr): 1.0 - 38.5 nmol/L M(18-19yr): 8.6 - 29.0 nmol/L M(20-49yr): 8.6 - 29.0 nmol/L M(>50yr): 6.7 - 25.7 nmol/L F(<1yr): 0.4 - 0.7 nmol/L F(1-6yr): 0.1 - 1.1 nmol/L F(7-12yr): 0.1 - 2.4 nmol/L F(13-17yr): 1.0 - 38.5 nmol/L F(18-19yr): 0.3 - 1.7 nmol/L F(20-49yr): 0.3 - 1.7 nmol/L F(>50yr): 0.1 - 1.4 nmol/L	S	ECLIA	Every 2 days	Hormone	2 days	
Thyroglobulin	>=21yr: 3.5 - 77.0 µg/L	S	ECLIA	Every 2 days	Thyroid	2 days	
Thyroid stimulating hormone (TSH)	0.27 - 4.20 mIU/L	HP	ECLIA	Daily	Thyroid	24 hours	

Clinical Chemistry (ext. 8792)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Total iron binding capacity (TIBC)	44.8 - 80.6 µmol/L	HP	Calculated from transferrin	On arrival	Anaemic marker	24 hours	
Total procollagen-type 1 N-terminal-propeptide (P1NP)	M: 22 - 87 µg/L	EDTA Plasma	ECLIA	Every 2 days	Bone marker	2 days	
	F (pre-menopause): 15 - 59 µg/L						
	F (Post-menopause): 16 - 74 µg/L						
Total T3	0.54 - 2.96 nmol/L	S	CMIA	Every 2 days	Hormone	2 days	
Total T4	58 - 154 nmol/L	S	CMIA	Every 2 days	Hormone	2 days	
Transferrin	2.0 - 3.6 g/L	HP	Immunoturbidimetric	On arrival	Anaemic marker	24 hours	
Triglycerides	Normal <1.69 mmol/L	HP	Lipase/Glycerol Kinase/GPO	On arrival	Lipids	4 hours	12 hours fasting
	Borderline high: 1.69 - 2.25 mmol/L						
	High: 2.26 - 5.64 mmol/L						
	Very high: >=5.65 mmol/L						
Troponin I	M: <0.0342 µg/L	HP	CMIA	On arrival	Cardiac marker	2 hours	
	F: <0.0156 µg/L						
Troponin T	<0.014 µg/L	HP	ECLIA	On arrival	Cardiac marker	2 hours	
Tryptase	<11.0 µg/L	S	ImmunoCAP	Daily	Tryptase	24 hours	

Clinical Chemistry (ext. 8792)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Urea	2.8 - 8.1 mmol/L	HP	Enzymatic, Urease	On arrival	Renal	4 hours	
Uric acid	M: 0.25 - 0.48 mmol/L	HP	Enzymatic, Urease/ Peroxidase	On arrival	Renal/Gout	4 hours	
	F: 0.14 - 0.34 mmol/L						
Urine albumin-to-creatinine ratio	M: <1.92 mg/mmol	U	Turbidimetry/Jaffe	Daily	Renal	24 hours	
	F: <2.83 mg/mmol						
Urine Bence Jones protein	N/A	U	Agarose gel electrophoresis	Daily	Paraprotein	5 days	preferred 24 hr U, at least 50 mL
Urine immunofixation	N/A	U	Agarose gel electrophoresis	Daily	Paraprotein	5 days	preferred 24 hr U, at least 50 mL
Urine protein-to-creatinine ratio	18-83 years: <0.16 mg/mg	U	Biuret/Jaffe	On arrival	Renal	24 hours	
Valproic acid	Therapeutic: 347 - 693 umol/L	S	Enzyme immunoassay	On arrival	Therapeutic drug level	4 hours	
	Toxic: >693 umol/L						
Vancomycin	Therapeutic (peak): 17.3 - 27.6 µmol/L	S	KIMS	On arrival	Therapeutic drug level	4 hours	
	(trough): 3.5 - 6.9 µmol/L						
Vitamin B12	Deficient: <150 pmol/L	HP	ECLIA	Every 2 days	Anaemic marker	2 days	

Clinical Chemistry (ext. 8792)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Vitamin D (25-OH) total	Deficient: <25 nmol/L Insufficient: 25 - 50 nmol/L Adequate: 50 - 250 nmol/L Potentially toxic: >250 nmol/L	HP	ECLIA	Every 2 days	Vitamin	2 days	
24 hr Urinary calcium	2.5 - 7.5 mmol/day	24-hr U	NM-BAPTA	Daily	Parathyroid/Renal stones	24 hours	
24 hr Urinary creatinine	M: 9 - 21 mmol/day F: 7 - 14 mmol/day	24-hr U	Jaffe, Alk. Picrate	Daily	Renal	24 hours	
24 hr Urinary potassium	25 - 125 mmol/day	24-hr U	Indirect ISE	Daily	Renal	24 hours	
24 hr Urinary protein	<0.14 g/day	24-hr U	Turbidimetry	Daily	Renal	24 hours	
24 hr Urinary sodium	40 - 220 mmol/day	24-hr U	Indirect ISE	Daily	Renal	24 hours	
24 hr Urinary inorganic phosphorus	13 - 42 mmol/day	24-hr U	Phosphomolybdate formation	Daily	Renal	24 hours	
24 hr Urinary urea	<580 mmol/day	24-hr U	Enzymatic, Urease	Daily	Renal	24 hours	

Clinical Haematology (ext. 8795)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT
Complete blood picture (CBP) Haemoglobin	Male: 13-17 g/dL Female: 11.5-15.5g/dL	EW	Automated cell counter	On arrival	Haematology	2-4 hours
RBC	Male: 4.50-6.00 x 1012/L Female: 3.70-5.20 x 1012/L					
HCT	Male: 40.0 - 50.0 % Female: 35.0 - 46.0 %					
MCV	80.0 - 98.0 fL					
MCH	27.0 - 33.0 pg					
MCHC	32.0 - 36.0 g/dL					
RDW	10.0 – 15.0 %					
WBC Count	4.00 - 11.0 x 109/L					
Neutrophil	70 - 8.00 x 109/L 40.0 - 75.0 %					
Lymphocyte	1.00 - 4.50 x 109/L 16.0 - 45.0 %					
Monocyte	0.2 - 1.0 x 109/L 2.5 -13.0 %					
Eosinophil	0.0 - 0.5 x 109/L 0.0 - 6.5 %					
Basophil	0.0 - 0.15 x 109/L 0.0 - 2.0 %					
Platelet	150 - 400 x 109/L					

Clinical Haematology (ext. 8795)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT
Reticulocyte Count	32-135 x 109/L 0.2-2.0 %	EW	Automated cell counter	On arrival	Haematology	2-4 hours
Ret Hb Content	30.7-39.1 pg	EW	Automated cell counter	On arrival	Haematology	2-4 hours
Blood film review by Hosp. Haematologist	N/A	EW/ Blood Smear	Microscope	On arrival	Haematology	24 hours
E.S.R.	Male ≤60 yrs: 0 - 15 mm/hr Male ≥60 yrs: 0 - 20 mm/hr Female≤60 yrs: 0-20mm/hr Female≥60 yrs: 0-30 mm/hr	EW	Modified Westergren Automated	On arrival	Haematology	2-4 hrs
Haemoglobin pattern (quantification of HbA2, HbF, detection of Hb variants)	HbA2: 2.2-3.3 % HbF: <2.0 %	EW	High Performance Liquid Chromatography	Every Thursday	Haematology	1 week
Malaria Parasites	Negative	EW	Microscopy	On arrival	Haematology	2-4 hours
Malaria p.f./p.v. Antigen by immunoassay	Negative	EW	P.f (HRPII) / Pan (aldolase)	On arrival	Haematology	2-4 hours
Activated partial thromboplastin time	22.6 – 33.2 seconds	C	Clotting assay	On arrival	Haematology	2-4 hours
Prothrombin time (PT) & INR	10.0 – 13.0 seconds	C	Clotting assay	On arrival	Haematology	2-4 hours
Thrombin Time (TT)	16.3-19.2 seconds	C	Clotting assay	On arrival	Haematology	2-4 hours

Clinical Haematology (ext. 8795)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT
Fibrinogen (Clauss Assay)	1.6-3.7g/L	C	Von Clauss	On arrival	Haematology	2-4 hours
Fibrinogen degradation products (FDP)	<5µg/mL	C	Latex agglutination	Every Tuesday & Friday	Haematology	2-4 hours
D-dimer (Quantitative)	<500µg/L FEU	C	Immunoturbidimetric assay	On arrival	Haematology	2-4 hours
Antithrombin	79 - 120 %	C	Chromogenic assay	Every Friday	Haematology	1 week
Activated Protein C Resistance (APCR) ratio	0.9 - 1.3	C	Clotting assay	Every Friday	Haematology	1 week
Factor II	70-150%	C	Clotting assay	Every Friday	Haematology	1 week
Factor V	70-150%	C	Clotting assay	Every Friday	Haematology	1 week
Factor VII	70-150%	C	Clotting assay	Every Friday	Haematology	1 week
Factor VIII	70-200%	C	Clotting assay	Every Friday	Haematology	1 week
Factor IX	70-120 %	C	Clotting assay	Every Friday	Haematology	1 week
Factor X	70-150%	C	Clotting assay	Every Friday	Haematology	1 week
Factor XI	60-150%	C	Clotting assay	Every Friday	Haematology	1 week
Factor XII	40-120%	C	Clotting assay	Every Friday	Haematology	1 week
Factor XIII	50-120%	C	Chromogenic assay	Every Friday	Haematology	1 week

Clinical Haematology (ext. 8795)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT
Lupus anticoagulant	0.8-1.2	C	Clotting assay	Every Friday	Haematology	1 week
Protein C Activity	77-178%	C	Clotting assay	Every Friday	Haematology	1 week
Free Protein S Ag	Male: 67.5-139% Female: 60-114%	C	Immunoturbidimetric assay	Every Friday	Haematology	1 week
Von Willebrand factor antigen	50-160%	C	Immunoturbidimetric assay	Every Friday	Haematology	1 week
Von Willebrand factor Activity	52-181%	C	Immunoturbidimetric assay	Every Friday	Haematology	1 week
Heparin monitoring (Anti-Xa Assay)	Therapeutic LMWH: 0.5-1.2 IU/mL Prophylactic LMWH: 0.2-0.5 IU/ml	C	Chromogenic assay	Every Tuesday	Haematology	1 week
Hemoclot Thrombin Inhibitor (Dabigatran monitoring)	N/A	C	Clotting assay	Every Tuesday	Haematology	1 week
Rivaroxaban (Xarelto monitoring)	N/A	C	Chromogenic assay	Every Tuesday	Haematology	1 week
Apixaban (Eliquis monitoring)	N/A	C	Chromogenic assay	Every Tuesday	Haematology	1 week
Edoxaban (Lixiana monitoring)	N/A	C	Chromogenic assay	Every Tuesday	Haematology	1 week
Bleeding Time (Platelet function by PFA-100)	N/A	CW&EW	PFA-100	On arrival	Haematology	2-4 hours

Clinical Haematology (ext. 8795)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT
VerifyNow Aspirin response	N/A	CW&EW	Turbidometric based optical detection	On arrival	Haematology	2-4 hours
VerifyNow Plavix response	N/A	CW&EW	Turbidometric based optical detection	On arrival	Haematology	2-4 hours
Bone Marrow Reporting by Hosp. Haematologist	N/A	BM	N/A	On arrival	Haematology	2-4 hours
Cytochemistry & Reporting	N/A	BM/EW	N/A	On arrival	Haematology	4-6 hours
Trephine Reporting by Hosp. Haematologist	N/A	BM	N/A	On arrival	Haematology	2 days

*C: Citrated plasma
*U: Urine
*CW: Citrate Whole blood
*MU: Morning urine
*BM: Bone marrow
*S: Serum
*BF: Body fluid
*EW: EDTA Whole blood

Clinical Microbiology (Ext. 8791)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT
AFB Stain	N/A	All kinds	Kinyoun stain Auramine O stain	Daily On arrival	TB profile	Routine: 1 day Urgent: 3-6 hours
Amoeba	N/A	Stool	Microscopy	On arrival	Stool	1-2 days
Anaerobic Culture	N/A	All kinds	Culture medium inoculation	On arrival	Bacterial culture	5 days
Blood Culture	N/A	Blood	Broth inoculation	On arrival	Bacterial culture	7 days
Clostridium difficile Culture	N/A	Stool	Selective medium inoculation	On arrival	Stool	2 days
Culture & Sensitivity	N/A	All kinds	Culture medium inoculation/ Antibiotic disk diffusion	On arrival	Bacterial culture	2-3 days
CPE Screen	N/A	Stool / Rectal swab / others	Selective medium inoculation	On arrival	MDRO Screening	2 days
Fungus Culture	N/A	All kinds	Selective medium inoculation	On arrival	Fungal culture	14 days
Fungus Smear	N/A	All kinds	Lactophenol cotton blue stain Gram's stain	Daily On arrival	Differential staining	Routine: 1 day Urgent: 2-6 hours
Gram Stain	N/A	All kinds	Gram's stain	Daily On arrival	Differential staining	Routine: 1 day Urgent: 2-6 hours
Group B Beta-streptococcus Screen (GeneXpert) & GBS C&ST	N/A	Vaginal / Rectal swab	PCR/Selective medium inoculation / Antibiotic disk diffusion	On arrival	Rapid Nucleic Acid Detection	4 hours

Clinical Microbiology (Ext. 8791)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT
H. pylori Culture & Sensitivity	N/A	Gastric biopsy	Selective medium inoculation / Antibiotic disk diffusion	On arrival	Helicobacter	7-10 days
India Ink	N/A	CSF	India Ink Stain	On arrival	Differential staining for Cryptococcus	2 hours
Microscopic Examination of Crystals	N/A	Joint fluid	Microscopic polarization examination	On arrival	Joint fluid	1 day
Microscopy for Demodex	N/A	Eye lashes	Microscopic examination	Prior arrangement required	Microscopic examination	2 hours
MRSA Screen	N/A	Nasal swab / others	Selective medium inoculation / Antibiotic disk diffusion	On arrival	MDRO Screening	2 days
MRSA Screen (GeneXpert) & MRSA C&ST	N/A	Nasal swab / others	PCR/Selective medium inoculation / Antibiotic disk diffusion	On arrival	Rapid Nucleic Acid Detection	4 hours
MTB-Nucleic Acid Detection	N/A	All kinds	PCR	Daily	TB profile	1 day
MTB/RIF resistance (GeneXpert)	N/A	Sputum	PCR	On arrival	Rapid Nucleic Acid Detection	6 hours
Mycoplasma hominis & Ureaplasma urealyticum C&ST	N/A	Genital swab	Strip inoculation	On arrival	STD	2-3 days

Clinical Microbiology (Ext. 8791)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT
Occult Blood	Negative: <50 ng/mL Borderline: 50-99 Positive: ≥100	Stool	Fecal immunochemical test	On arrival	Stool	8-16 hours
Stool routine	N/A	Stool	Microscopic examination	On arrival	Stool	8-16 hours
Trichomonas & Monilia	N/A	Genital Swab	Microscopic examination	On arrival	STD	2 days
Urine routine	N/A	Urine	Automated urine chemistry & cell count analysis	On arrival	Urine	2-4 hours
Pregnancy test	N/A	Urine	Lateral flow assay	On arrival	Urine	2 hours
VRE Screen	N/A	Stool / Rectal swab	Selective medium inoculation	On arrival	MDRO Screening	2 days

Note: For bacterial and fungal culture, a preliminary report will be issued once the pathogenic microorganism is isolated.

Clinical Immunology (ext. 8796)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
ADAMTS 13 Antigen & Auto-Antibody	Antigen: Normal 0.32-0.73 (IU/mL) Antibody: Negative <15 (units/mL) Borderline: 15-20 Positive: >20	Citrate plasma	ELISA	Monthly	Immunology	1 month	Freeze double-spin plasma at -80°C if not tested right away
ADAMTS Activity	Normal: 70-160%	Citrate plasma	FRET	1-2 times a week	Immunology	2-5 working days	Freeze double-spin plasma at -80°C if not tested right away
ANCA	Negative: <20 (Titre) Positive: ≥20	Serum	IFA	2 times a week	Immunology	4 working days	
ANCA-MPO & ANCA-PR3	Normal: <20 (RU/mL) Elevated: ≥20	Serum	ELISA	2 times a week	Immunology	4 working days	
Anti-Cardiolipin IgG & IgM	IgG & IgM: Negative: <12 (U/mL) Elevated: ≥12	Serum	ELISA	2 times a week	Immunology	4 working days	
Anti-CCP (cyclic citrullinated peptide)	Normal: <5 RU/mL Elevated: ≥5	Serum	ELISA	2 times a week	Immunology	4 working days	
Anti-ds DNA	Negative: <100 (IU/mL) Positive: ≥100	Serum	ELISA	2 times a week	Immunology	4 working days	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Anti-ENA Profile by ELISA (Ribosomal P proteins, nRNP/Sm, Sm, SS-A, SS-B, Scl-70, Jo-1 & Centromeres)	Negative: <1.0 Weak Positive: ≥1.0-2.0 Positive: >2.0-5.0 High Positive: >5.0	Serum	ELISA	Weekly	Immunology	7 working days	
Anti-ENA Profile by Immunoblot (Mi-2, Ku, nRNP/ Sm, Sm, SS-A,Ro-52, SS-B, Scl-70, PM-Scl, Jo-1, CENP-B, PCNA, dsDNA, Nucleosomes, Histones, Rib P protein, AMA, M2, DFS70)	N/A	Serum	Immunoblot	2 times a week	Immunology	4 working days	
Anti-Nuclear Antibody (ANA)	Negative: ≤40 (Titre) Positive: >40	Serum	IFA	Daily (Except Saturday, Sundays and public holidays)	Immunology	2-4 working days	
Anti-PF4 IgG	N/A	Serum	ELISA	2 times a week	Immunology	4 working days	
Anti-PM-Scl IgG	Normal: <20 (RU/mL) Elevated: ≥20	Serum	ELISA	Weekly	Immunology	7 working days	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Anti-β2 Glycoprotein 1 IgG & IgM	IgG & IgM: Normal: <20 (RU/mL) Elevated: ≥20	Serum	ELISA	2 times a week	Immunology	4 working days	
Aspergillus Galactaomannan Antigen	Serum: Negative <0.5 Positive ≥0.5 BAL: Negative <1.0 Positive ≥1.0	Serum/BAL	ELISA	3 times a week	Immunology	2 working days	
Autoimmune Inflammatory Myopathy (Anti-Mi-2α, Anti-Mi-2β, Anti-TiF1γ, Anti-MDA5, Anti-NXP2, Anti-SAE1, Anti-Ku, Anti-PM-Scl-100, Anti-PM-Scl-75, Anti-Jo-1, Anti-SRP, Anti-PL-7, Anti-PL-12, Anti-EJ, Anti-OJ, Anti-Ro-52, Anti-cN-1A, Anti-HMGCR)	N/A	Serum	Immunoblot	2 times a week	Immunology	4 working days	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Bacterial Antigen Screen (H.influenza b, Strep B, Pneumococcus, Meningococcus, E. coli)	N/A	Serum	Latex agglutination	On arrival	Immunology	1 working day	
Bacterial Antigen Screen (H.influenza b, Strep B, Pneumococcus, Meningococcus, E. coli)	N/A	CSF	Latex agglutination	On arrival	Immunology	3 hours	
Brucella Agglutination Test	N/A	Serum	Latex agglutination	Daily	Immunology	2 working days	
Chlamydia pneumoniae Ab-IgG/IgM	Negative: <0.8 Boderline: 0.8-1.0 Positive: >1.0	Serum	ELISA	2 times a week	Immunology	4 working days	
Chlamydia trachomatis Ab-IgG	Negative: <0.8 Boderline: 0.8-1.0 Positive: >1.0	Serum	ELISA	2 times a week	Immunology	4 working days	
Cryptococcal Antigen	N/A	CSF	Lateral flow assay	On arrival	Immunology	3 hours	
Cryptococcal Antigen	N/A	Serum	Lateral flow assay	On arrival	Immunology	1 working day	
Dengue Virus Ab IgG, IgM and NS1 Rapid Test	N/A	Serum	Lateral flow assay	On arrival	Immunology	4 hours	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
EBV Ab IgM & IgG for infectious mononucleosis	N/A	Serum	Immunoblot	3 times a week	Immunology	4 working days	
EBV Ab-IgA	Negative: VCA: <10 (Titre) EA: <5 Positive: VCA: ≥10 (Titre) EA: ≥5	Serum	IFA	2 times a week	Immunology	4 working days	
Entamoeba histolytica Ab-IgG	N/A	Serum	ELISA	2 times a week	Immunology	4 working days	
H. pylori Ab-IgG	N/A	Serum	Lateral flow assay	Daily (Except Sundays and public holidays)	Immunology	1 working day	
H. pylori Antigen	N/A	Stool	Lateral flow assay	Daily (Except Sundays and public holidays)	Immunology	1 working day	
HSV 1 Specific Ab-IgG	Negative: <0.8 (Index value) Equivocal: 0.8-1.0 Positive: >1.0	Serum	ELISA	2 times a week	Immunology	4 working days	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
HSV 2 Specific Ab-IgG	Negative: <0.8 (Index value) Equivocal: 0.8-1.0 Positive: >1.0	Serum	ELISA	2 times a week	Immunology	4 working days	
Legionella Urinary Antigen	N/A	Urine	Lateral flow assay	On arrival	Immunology	4 hours	
Measles Ab-IgG	N/A	Serum	Enzyme immunoassay	3 times a week	Immunology	4 working days (6 hours for pregnancy case)	
Monospot Test (Heterophile Ab-IgM)	N/A	Serum	Lateral flow assay	Daily	Immunology	1 working day	
Mycoplasma pneumoniae Ab-IgM	N/A	Serum	ELISA	Daily (Except Saturday, Sundays and public holidays)	Immunology	1 working day	
Parasite Antigen Screen (Giardia. Entamoeba histolytica, Crytosporidium)	N/A	Stool	Lateral flow assay	Daily (Except Sundays and public holidays)	Immunology	1 working day	
Parvovirus B19 Ab-IgG	Negative: <64 (Titre) Positive: ≥64	Serum	IFA	2 times a week	Immunology	4 working days	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Parvovirus B19 Ab-IgM	Negative: <16 (Titre) Positive: ≥16	Serum	IFA	2 times a week	Immunology	4 working days	
QuantiFeron-TB Gold	Negative: <0.35 (IU/mL) Borderline: ≥0.35 and <0.70 Positive: ≥0.70	Plasma (special tubes required, provided by lab)	ELISA	2 times a week	Immunology	4 working days	
Rapid Influenza A & B and RSV Screen	N/A	Nasopharyngeal swab/ Nasopharyngeal aspirate	PCR	On arrival	Immunology	2 hours	
SARS-CoV-2 Neutralizing Antibody Test	N/A	Serum	CLIA	Daily (Except Sundays and public holidays)	Immunology	1-2 working day	
Seminal Fluid Routine Analysis	N/A	Semen	Microscopy	On arrival (service time: 08:00-15:00 except Sunday and public holidays)	Immunology	1 working day	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Streptococcus pneumoniae Antigen	N/A	Urine	Lateral flow assay	On arrival	Immunology	4 hours	
Streptococcus pyogenes Group A Antigen	N/A	Throat swab	Lateral flow assay	On arrival	Immunology	2 hours	
Strongyloides Ab-IgG	N/A	Serum	ELISA	2 times a week	Immunology	4 working days	
Syhpilis RPR	N/A	Serum	Latex agglutination	Daily (Except Sundays and public holidays)	Immunology	1 working day	
Syphilis VDRL	N/A	CSF	Latex agglutination	On arrival	Immunology	4 hours	
Systemic Sclerosis Profile (Anti-Scl-70, Anti-CENP A, Anti-CENP B, Anti-RP11, Anti-RP155, Anti-Fibrillarin, Anti-NOR90, Anti-Th/To, Anti-PM-Scl-100, Anti-PM-Scl-75, Anti-Ku, Anti-PDGFR, Anti-Ro-52)	N/A	Serum	Immunoblot	2 times a week	Immunology	4 working days	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
T.P.P.A. for Syphilis	N/A	Serum	Latex agglutination	2 times a week	Immunology	4 working days (6 hours for pregnancy case)	
TPO Antibodies	Negative: <50 (IU/mL) Positive: ≥50 (IU/mL)	Serum	ELISA	2 times a week	Immunology	4 working days	
TSH Receptor Ab-IgG	Normal: <1 (IU/mL) Elevated: ≥1 (IU/mL)	Serum	ELISA	2 times a week	Immunology	4 working days	
Varicella Zoster Virus IgG	N/A	Serum	Enzyme immunoassay	3 times a week	Immunology	4 working days (6 hours for pregnancy case)	
Weil-Felix Test	N/A	Serum	Latex agglutination	Daily	Immunology	2 working days	
Widal Test	N/A	Serum	Latex agglutination	Daily	Immunology	2 working days	

Core Laboratory Service

Test Name	Ref. Range	Specimen	Method	Test Frequency	TAT (upon arrival of the specimen)	Panel
CSF routine analysis (WBC, D/C, RBC, Glucose, Protein)	MNC <5/uL Glucose: Protein:	CSF	Microscopic examination	On arrival	2 hours	CSF
Pleural fluid routine analysis (pH, WBC, D/C, RBC, Glucose, Protein)	Exudate: WBC >1000/uL RBC >1000/uL Transudate: WBC <1000/uL RBC <1000/uL Glucose: Protein: pH: >7.64	Pleural fluid	Microscopic examination	On arrival	2-4 hours	Pleural fluid
Ascitic fluid routine analysis (pH, WBC, D/C, RBC, Glucose, Protein)	Peritonitis: WBC >500/uL Glucose: Protein: pH: >7.36	Ascitic fluid	Microscopic examination	On arrival	2-4 hours	Ascitic fluid
Joint fluid analysis (WBC, RBC)	WBC <200/uL Septic arthritis ≥50000/uL	Joint fluid	Microscopic examination	On arrival	2-4 hours	Joint fluid
Other body fluid analysis (pH, WBC, D/C, RBC)	N/A	Body fluid	Microscopic examination	On arrival	2-4 hours	Other body fluid

Stem Cell (ext. 8412)

Test Name	Ref. Range	Specimen	Test Frequency	Panel	Pledge TAT
Hematopoietic Progenitor Cells (Apheresis) Processing and Cryopreservation	N/A	Fresh *HPC(A)	Prior arrangement required	HPC(A)	2 days (preliminary report) 14 days (final report)
Hematopoietic Progenitor Cells (Apheresis) Thawing	N/A	Frozen HPC(A)	Prior arrangement required	HPC(A)	2 days (preliminary report) 14 days (final report)

*HPC(A): Hematopoietic Progenitor Cells (Apheresis)

Flow Cytometry (ext. 8412)

Test Name	Ref. Range	Specimen*	Method	Test Frequency	Panel	Pledge TAT
Immunophenotyping By Flow Cytometry						
CD34 enumeration	N/A	EW	Flow Cytometry	Prior arrangement required	Flow Cytometry	6 hours
Lymphocyte subsets study including CD4 cell count	CD3+ T cells: 56.3 - 86.0 % 764 - 2620 cells/µL CD3+/CD4+ T cells: 25.2 - 53.0 % 354 - 1526 cells/µL CD3+/CD8+ T cells: 17.9 - 46.0 % 318 - 1457 cells/µL CD19+ B cells: 6.2 - 19.2 % 103 - 666 cells/µL CD3-CD56+ NK cells: 6.6 - 28.6 % 89 - 621 cells/µL	EW	Flow Cytometry	Daily	Flow Cytometry	2 days
Leukaemia and lymphoma Immunophenotyping	N/A	EW/BM/BF	Flow Cytometry	Daily	Flow Cytometry	2 days
Minimal residual disease testing	<0.01% of MRD cells in all WBCs	EW/BM	Flow Cytometry	Daily	Flow Cytometry	2 days
Red cell study						
PNH analysis	<1% of PNH clones detected	EW	Flow Cytometry	Daily	Flow Cytometry	2 days
EMA binding test	<20% reduction of mean florescence intensity from controls	EW	Flow Cytometry	Daily	Flow Cytometry	2 days

Flow Cytometry (ext. 8412)

Test Name	Ref. Range	Specimen*	Method	Test Frequency	Panel	Pledge TAT
Fetal red cells in maternal circulation	N/A	EW	Flow Cytometry	Daily	Flow Cytometry	2 days
Platelet study						
GPIIb/IIIa and GP1b/V/IX detection	Normal expression of CD41, CD42b and CD61	EW & C	Flow Cytometry	Daily	Flow Cytometry	2 days
Basophil activation test						
Autologous serum PEG	<5% CD63+/CD203c in basophils	EW & S	Flow Cytometry	Daily	Flow Cytometry	1 day

*EW: EDTA Whole blood
*C: Citrated plasma
*BM: Bone marrow
*S: Serum
*BF: Body fluid

Sleep Test (ext. 8794)

Test Name	Test Frequency	Pledge TAT	Remarks
Polysomnography	Prior arrangement required	Within 3 working days	Overnight hospitalisation required
Auto C-PAP	Prior arrangement required	1 working day	Overnight hospitalisation required
WATCH-PAT 100	Prior arrangement required	1 working day	Overnight hospitalisation required
Oximetry	Prior arrangement required	1 working day	Overnight hospitalisation required
$TcCO_2$	Prior arrangement required	1 working day	Overnight hospitalisation required
SleepView	Prior arrangement required	Within 3 working days	Home Sleep Test

HISTOPATHOLOGY AND CYTOLOGY DIVISION

Histopathology (ext. 8839)

Test Name	Specimen	Storage & Transport	Pledged TAT	Notes
Biopsy (Routine)	Tissue	Fix in 10% buffered formalin*	1-3 working day Large specimen may take longer	
Breast Cancer Markers (ER; PR; Ki67; Her2)	1.Tissue OR 2.Paraffin tissue block OR 3.Tissue section on charged/ coated slide	Fix in 10% buffered formalin*	1-5 working days	
Consultation and Review	Stained slide / paraffin tissue block		1-3 working days	Slides or blocks returned if requested
Electron Microscopy (EM)	Tissue	Fresh tissue. Store and transport at 4°C	Send-out test	Please contact Lab for further information
Immunofluorescence (IF)	FRESH tissue	Fresh tissue. Store and transport at 4°C (DO NOT FREEZE)	Send-out test	Please contact Lab for further information
Immunohistochemical staining (IHC)	1.Tissue OR 2.Paraffin tissue block OR 3.Tissue section on charged/coated slide	Fix tissue in 10% buffered formalin*	1-5 working days	Please contact Lab for further information
Muscle Biopsy	Fresh muscle tissue	• Enzyme studies: Fresh tissue • Routine Histology: Fix in 10% buffered formalin*	Send-out test	Please contact Lab for further information

Histopathology (ext. 8839)

Test Name	Specimen	Storage & Transport	Pledged TAT	Notes
Renal Biopsy	Fresh renal tissue	• EM: Fresh tissue • Routine Histology: Fix in 10% buffered formalin*	EM: Send-out test	Please contact Lab for further information
Skin Biopsy	Fresh skin tissue	• IF: Fresh tissue. Store and transport at 4°C (DO NOT FREEZE) • Routine Histology: Fix in 10% buffered formalin*	IF: Send-out test	Please contact Lab for further information
Special staining	1.Tissue OR 2.Paraffin tissue block OR 3.Tissue section on charged/coated slide	Fix tissue in 10% buffered formalin*	1-3 working days	

1. Office hours: 8am-6pm (Mon-Fri); 8am-1pm (Saturday); Closed on Saturday afternoon, Sunday & public holiday
2. For fresh specimen, please send to Lab ASAP.
3. *Please contact Lab for the issue of formalin-containing bottles.

Cytology - Gynaecological (ext. 8839)

Test Name	Specimen	Storage & Transport	Pledged TAT	Notes
Pap smear (BD SurePath Liquid-based Pap Test)	Brushed endocervical / vaginal cells placed into the BD SurePath collection vial with preservation fluid	Store and transport at room temperature	5 working days	1. Please contact Lab for issue of BD SurePath collection vial (vial and brush) 2. Clinical information must include age, date of last menstrual period (LMP) and any relevant gynaecological history
Pap smear (Conventional method)	Brushed endocervical / vaginal cells smeared on a microscopic glass slide and fixed immediately with cytofix spray	Store and transport at room temperature	5 working days	1. Please contact Lab for issue of cytofix spray 2. Clinical information must include age, date of last menstrual period (LMP) and any relevant gynaecological history
Human Papilloma Virus (HPV) – HPV PCR – HPV Genotyping	Cervical cells from cervix preserved in BD SurePath collection vial	Store and transport at room temperature	5 working days	3. Please contact Lab for issue of BD SurePath collection vial (vial and brush) 4. Clinical information must include age, date of last menstrual period (LMP) and any relevant gynaecological history

Office hours: 8am-6pm (Mon-Fri); 8am-1pm (Saturday); Closed on Saturday afternoon, Sunday & public holiday

Cytology – Non-gynaecological (ext. 8839)

Test Name	Specimen	Storage & Transport	Pledged TAT	Notes
Body cavity fluid for cytology	Peritoneal, pelvic, pleural, thoracic cavity and chest fluid	• Deliver to Lab immediately. • After office hours, store in 4°C refrigerator (DO NOT FREEZE) and then deliver to Lab as soon as possible.	1-3 working days	
Bronchial-alveolar lavage	Lavage from bronchio-alveolar spaces	• Deliver to Lab immediately. • After office hours, store in 4°C refrigerator (DO NOT FREEZE) and then deliver to Lab as soon as possible.	1-3 working days	
Bronchial washing	10 ml. of warm sterile buffered saline washing of cells washed from the bronchi through a fibreoptic bronchoscope	• Deliver to Lab immediately. • After office hours, store in 4°C refrigerator (DO NOT FREEZE) and then deliver to Lab as soon as possible.	1-3 working days	
Brushing (bronchial, CBD, etc)	Cellular material obtained by brushing and swiped on microscopic slides	• Fix smear/ slide IMMEDIATELY in a container of 95% alcohol or using Cytospray. • Keep brush in a separate bottle filled with 50% alcohol. • Deliver to Lab immediately. • After office hours, store in 4°C refrigerator (DO NOT FREEZE) and then deliver to Lab as soon as possible.	1-3 working days	Do not discard brush as there may be residual cells useful for diagnosis
Cerebro-spinal fluid (CSF)	Fluid drained from lumbar puncture or brain ventricles	• Urgent transport to Lab is essential as the cells degenerate rapidly. • After office hours, store in 4°C refrigerator (DO NOT FREEZE) and then deliver to Lab as soon as possible.	1-3 working days	
Fine Needle aspiration (FNA)	Materials collected by fine needle aspiration and spread on slides	• Fix slides IMMEDIATELY in a container of 95% alcohol or using Cytospray. • Any residual material in the needle or syringe may be rinsed into FNA bottle. Refrigerate in 4°C if the specimen without fixative	1-3 working days	Please contact Lab for the issue of FNA fixative-containing bottles

Cytology – Non-gynaecological (ext. 8839)

Test Name	Specimen	Storage & Transport	Pledged TAT	Notes
Peritoneal washing	Washings from peritoneum	• Deliver to Lab immediately. • After office hours, store in 4°C refrigerator (DO NOT FREEZE) and then deliver to Lab as soon as possible.	1-3 working days	
Sputum	Early morning "deep cough" sputum	• Deliver to Lab immediately. • After office hours, store in 4°C refrigerator (DO NOT FREEZE) and then deliver to Lab as soon as possible.	1-3 working days	Use sterile container
Urine	Voided urine	• Deliver to Lab immediately. • After office hours, store in 4°C refrigerator (DO NOT FREEZE) and then deliver to Lab as soon as possible.	1-3 working days	

Office hours: 8am-6pm (Mon-Fri); 8am-1pm (Saturday); Closed on Saturday afternoon, Sunday & public holiday

Frozen Section (ext. 8839)

Test Name	Specimen	Storage & Transport	Test	Pledged TAT
Biopsy (Urgent quick section by rapid tissue processing)	Small tissue (tissue size not larger than 0.5cm)	Fresh tissue or fix in 10% buffered formalin*	Preliminary result will be given on or before 6pm within the same day	1. Please deliver the specimen to lab on or before 11am 2. Urgent quick section will be arranged at 50% additional charge 3. Full report: 1-3 working days
Frozen section	Fresh tissue	Fresh. DO NOT FIX IN FORMALIN.	30 minutes (verbal result)	1. Full report: 1-3 working days 2. For large specimen issue of full report may take longer

1. Office hours: 8am-6pm (Mon-Fri); 8am-1pm (Saturday); Closed on Saturday afternoon, Sunday & public holiday
2. Frozen section can be pre-arranged outside office hours at double charge.
   Advanced booking is preferred to guarantee manpower availability.
3. For fresh specimen, please send to Lab ASAP.
4. *Please contact Lab for the issue of formalin-containing bottles.

MOLECULAR PATHOLOGY DIVISION

Infectious Disease (ext. 8779)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
EBV DNA Quantitative PCR	N/A	EW	Quantitative real-time PCR	2 times a week	Viremia, therapeutic monitoring	3-5 working days	
HBV DNA Quantitative PCR	N/A	EW	Quantitative real-time PCR	2 times a week	Viremia, therapeutic monitoring	3-5 working days	
CMV DNA Quantitative PCR	N/A	EW	Quantitative real-time PCR	On arrival	Viremia, therapeutic monitoring	1-3 working days	
HIV RNA Quantitative RT-PCR	N/A	EW	Quantitative real-time PCR	2 times a week	Viremia, therapeutic monitoring	3-5 working days	
HCV RNA Quantitative RT-PCR	N/A	EW	Quantitative real-time PCR	2 times a week	Viremia, therapeutic monitoring	3-5 working days	
HBV YMDD Mutation	N/A	EW	PCR & sequencing	On arrival	Viral resistance	7 working days	
HBV ADV and ETV Drug Resistance	N/A	EW	PCR & sequencing	On arrival	Viral resistance	7 working days	
HCV RNA Genotyping	N/A	EW	RT-PCR & sequencing	On arrival	Viral resistance	7 working days	
High-Risk HPV DNA PCR	N/A	Autocyte, ThinPrep, others	Real-time PCR	2 times a week	Cervical screening, HPV infection	3-5 working days	
HPV DNA Genotyping	N/A	Autocyte, ThinPrep, others	Real-time PCR & next-/ third-generation sequencing	2 times a week	Cervical screening, HPV infection	3-5 working days	
Chlamydia trachomatis PCR	N/A	Genital swab, urine	Real-time PCR	On arrival	STD screening	2-4 working days	
Neisseria gonorrhoeae PCR	N/A	Genital swab, urine	Real-time PCR	On arrival	STD screening	2-4 working days	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Real-time Reverse Transcription PCR for SARS-CoV-2	N/A	Respiratory specimens	Real-time RT-PCR	On arrival	SARS-CoV-2 infection	1-2 working days	
Respiratory Pathogen Panel by Multiplex PCR	N/A	Respiratory specimens	Real-time PCR	On arrival	Respiratory tract infection (bacterial & viral)	1-2 working days	
Pneumonia Panel by Multiplex PCR	N/A	Respiratory specimens	Real-time PCR	On arrival	Pneumonia (bacterial & viral)	1-2 working days	
Real-time PCR detection for Influenza A, H1N1pdm09, H3N2	N/A	Respiratory specimens	Real-time RT-PCR	On arrival	Influenza	1-2 working days	
Real-time PCR detection for Influenza A, H1N1pdm09, H3N2, H5N1	N/A	Respiratory specimens	Real-time RT-PCR	On arrival	Influenza	1-2 working days	Please consult our Clinical Microbiologists/ Infection Control Unit
Real-time PCR detection for Influenza B Virus	N/A	Respiratory specimens	Real-time RT-PCR	On arrival	Influenza	1-2 working days	
Macrolide-Resistant Mycoplasma pneumoniae PCR	N/A	Respiratory specimens	Real-time RT-PCR	On arrival	Atypical pneumonia	2-4 working days	
Pneumocystis jirovecii PCR	N/A	Respiratory specimens	Semi-quantitative real-time PCR	On arrival	PCP pneumonia	2-4 working days	
Measles virus PCR	N/A	Respiratory specimens	Real-time RT-PCR	On arrival	Measles	2-4 working days	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Enteric Pathogens Detection by Multiplex PCR	N/A	Stool	Real-time RT-PCR	On arrival	Gastroenteritis	1-2 working days	
Viral Enteric Pathogens PCR (Norovirus & Rotavirus)	N/A	Stool	Real-time RT-PCR	On arrival	Gastroenteritis	1-2 working days	
Clostridium difficile Toxin PCR	N/A	Stool	Real-time RT-PCR	On arrival	Gastroenteritis	1-3 working days	
Meningitis/ Encephalitis Pathogen Detection by Multiplex PCR	N/A	CSF	Real-time RT-PCR	On arrival	Meningitis/ encephalitis	1-2 working days	
Mosquito-borne Pathogen Detection by Multiplex PCR	N/A	Clotted Blood	RT-PCR & Microsphere-based assay	On arrival	Mosquito-borne disease	3-5 working days	
Pathogen identification by direct sequencing	N/A	Varies	Next-/ third-generation sequencing	On arrival	Targeted/ non-targeted metagenomics	7 working days	Please Consult our Clinical Microbiologists

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Myeloid Panel by NGS	N/A	EW, BM	NGS	once a week	Myeloid Leukemia	1 month	
Myeloid Panel + Rapid Aneuploidy Screen	N/A	EW, BM	NGS	once a week	Myeloid Leukemia	1 month	
Fusion Panel by NGS	N/A	EW, BM	NGS	once a week	Haematological neoplasm	1 month	
Rapid Aneuploidy Screen	N/A	EW, BM	NGS	once a week	Haematological neoplasm	7-10 working days	
MRD Single Variant (by NGS)	N/A	EW, BM	NGS	once a week	Haematological neoplasm	2-4 weeks	
Karyotyping	N/A	EW, Heparin blood	Karyotyping	On arrival	Cytogenetics	7-10 working days	
RUNX1::RUNX1T1 RT-PCR - t(8;21)	N/A	EW, BM	Conventional RT-PCR	On arrival	Acute Myeloid Leukemia	2-4 working days	
RUNX1::RUNX1T1 quantitative RT-PCR – t(8;21)	N/A	EW, BM	Real-time quantitative RT-PCR	once a week	Acute Myeloid Leukemia	7 working days	
FLT3-ITD & TKD Mutation	N/A	EW, BM	PCR + Fragment Analysis / Sanger sequencing	On arrival	Acute Myeloid Leukemia	2-4 working days	
NPM1 exon 12 Mutation	N/A	EW, BM	PCR + Fragment Analysis / Sanger sequencing	On arrival	Acute Myeloid Leukemia	2-4 working days	
CBFB/MYH11 (inv 16) RT-PCR	N/A	EW, BM	Conventional RT-PCR	On arrival	Acute Myeloid Leukemia	2-4 working days	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
CBFB::MYH11 Type A quantitative RT-PCR	N/A	EW, BM	Real-time quantitative RT-PCR	once a week	Acute Myeloid Leukemia	7 working days	
IDH1 and IDH2 hotspots Mutation	N/A	EW, BM	PCR + Sanger sequencing	On arrival	Acute Myeloid Leukemia	2-4 working days	
IDH1 R132 Mutation	N/A	EW, BM	PCR + Sanger sequencing	On arrival	Acute Myeloid Leukemia	2-4 working days	
IDH2 R140 & R172 Mutation	N/A	EW, BM	PCR + Sanger sequencing	On arrival	Acute Myeloid Leukemia	2-4 working days	
CEBPA Mutation	N/A	EW, BM	PCR + Sanger sequencing	On arrival	Acute Myeloid Leukemia	3-5 working days	
KIT exon 17 D816V Mutation	N/A	EW, BM	PCR + Sanger sequencing	On arrival	Acute Myeloid Leukemia Myeloid and Lymphoid Neoplasms with eosinophilia	2-4 working days	
MRD Single Variant (by ddPCR)	N/A	EW, BM	ddPCR	On arrival	Haematological neoplasm	7-10 working days	(2-3 months for new assay)
BCR::ABL1 p190 & p210 RT-PCR	N/A	EW, BM	Conventional RT-PCR	On arrival	Acute Lymphoblastic Leukemia Chronic Myeloid Leukemia	2-4 working days	
BCR::ABL1 p210 RT-PCR - t(9;22)	N/A	EW, BM	Conventional RT-PCR	On arrival	Acute Lymphoblastic Leukemia Chronic Myeloid Leukemia	2-4 working days	
BCR::ABL1 Multiplex RT-PCR (atypical variants)	N/A	EW, BM	Conventional RT-PCR	On arrival	Acute Lymphoblastic Leukemia Chronic Myeloid Leukemia	3-5 working days	

Molecular Haematopathology (ext. 8779)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
BCR::ABL1 p190 quantitative RT-PCR	N/A	EW, BM	Real-time quantitative RT-PCR	once a week	Acute Lymphoblastic Leukemia	7 working days	
BCR::ABL1 p210 quantitative RT-PCR	N/A	EW, BM	Real-time quantitative RT-PCR	once a week	Chronic Myeloid Leukemia	7 working days	
BCR::ABL1 p190/ p210 Kinase Domain Mutation	N/A	EW, BM	PCR + Sanger sequencing	On arrival	Acute Lymphoblastic Leukemia Chronic Myeloid Leukemia	3-5 working days	
PML::RARA L and S-isoform RT-PCR	N/A	EW, BM	Conventional RT-PCR	On arrival	Acute Myeloid Leukemia	2-4 working days	
PML::RARA L-isoform bcr1 / bcr2 quantitative RT-PCR	N/A	EW, BM	Real-time quantitative RT-PCR	once a week	Acute Myeloid Leukemia	7 working days	
PML::RARA S-isoform bcr3 quantitative RT-PCR	N/A	EW, BM	Real-time quantitative RT-PCR	once a week	Acute Myeloid Leukemia	7 working days	
CLL FISH Panel	N/A	EW, BM	FISH	2 times a week	Chronic Lymphocytic Leukemia / Lymphoma	5-7 working days	
TP53 Mutation (Full gene)	N/A	EW, BM	NGS	once a week	Chronic Lymphocytic Leukemia / Lymphoma	1 month	
CLL FISH + TP53 Mutation (Combo)	N/A	EW, BM	FISH / NGS	2 times a week/ once a week	Chronic Lymphocytic Leukemia / Lymphoma	5-7 working days and 1 month	
IGHV Somatic Hypermutation *(blood)	N/A	EW, BM	NGS	once a week	Chronic Lymphocytic Leukemia / Lymphoma	1 month	

Molecular Haematopathology (ext. 8779)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
TCR gene rearrangement (T-cell clonality) *(blood)	N/A	EW, BM	NGS	once a week	Chronic Lymphocytic Leukemia / Lymphoma	1 month	
IGH / IGK detection (B-cell clonality) *(blood)	N/A	EW, BM	NGS	once a week	Chronic Lymphocytic Leukemia / Lymphoma	1 month	
IG and TCR detection(B+T cell clonality)- Blood	N/A	EW, BM	NGS	once a week	Chronic Lymphocytic Leukemia / Lymphoma	1 month	
IG and TCR detection(B+T cell clonality)- FFPE	N/A	FFPE	NGS	once a week	Chronic Lymphocytic Leukemia / Lymphoma	1 month	
MM FISH Panel	N/A	BM	FISH	2 times a week	Multiple Myeloma	7-10 working days	
IGH::CCDN1 t(11;14) FISH	N/A	EW, BM	FISH	2 times a week	Multiple Myeloma / Lymphoma	7 working days	
Eosinophilia Panel	N/A	EW, BM + Clotted blood	FISH / Conventional RT-PCR / PCR + Sanger Sequencing / NGS	On arrival	Myeloid and Lymphoid Neoplasms with eosinophilia	5-7 working days	1 month for TCR gene rearrangement Tryptase (refer to Clinical Chemistry)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
MPD Panel – BCR::ABL1 p190 & p210 RT-PCR, JAK2 exon 14 V617F, CALR exon 9	N/A	EW, BM	Conventional RT-PCR / Allele-specific PCR + PCR-RFLP / PCR-Fragment Analysis/ PCR + Sanger Sequencing	On arrival	Myeloproliferative Neoplasm/Disorders	3-5 working days	
Ph-MPD Panel – JAK2 exon 14 V617F, CALR exon 9, MPL exon 10 S505 and W515 (reflex testing)	N/A	EW, BM	RT-PCR and Sequencing	On arrival	Myeloproliferative Neoplasm/Disorders	7 working days	
JAK2 exon 14 V617F Mutation	N/A	EW, BM	Allele-specific PCR + PCR-RFLP	On arrival	Myeloproliferative Neoplasm/Disorders	2-4 working days	
JAK2 exon 12 Mutation	N/A	EW, BM	PCR + Sanger Sequencing	On arrival	Myeloproliferative Neoplasm/Disorders	2-4 working days	
CALR exon 9 Mutation	N/A	EW, BM	PCR-Fragment Analysis (Sanger Sequencing if necessary)	On arrival	Myeloproliferative Neoplasm/Disorders	2-4 working days	
MPL exon 10 S505 and W515 Mutation	N/A	EW, BM	PCR + Sanger Sequencing	On arrival	Myeloproliferative Neoplasm/Disorders	2-4 working days	
MDS FISH Panel	N/A	EW, BM	FISH	2 times a week	Myelodysplastic Syndrome	5-7 working days	
MYD88 exon 5 L265P Mutation	N/A	EW, BM	Allele-specific PCR	On arrival	Haematological neoplasm	2-4 working days	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
CXCR4 Mutation	N/A	EW, BM	PCR + Sanger Sequencing	On arrival	Haematological neoplasm	3-5 working days	
CSF3R exon 14 and 17 Mutation	N/A	EW, BM	PCR + Sanger Sequencing	On arrival	Haematological neoplasm	3-5 working days	
STAT3 & STAT5b Mutation	N/A	EW, BM	PCR + Sanger Sequencing	On arrival	Haematological neoplasm	3-5 working days	
BRAF Mutation (exon 15 hotspots)	N/A	EW, BM	PCR + Sanger Sequencing	On arrival	Haematological neoplasm	3-5 working days	
PCM1::JAK2 RT-PCR	N/A	EW, BM	Conventional RT-PCR	On arrival	Haematological neoplasm	7 working days	
Factor II (G20210A) Mutation	N/A	EW	Real-time PCR	On arrival	Thrombophilia	1-2 working days	
Factor V Leiden (G1691A) Mutation	N/A	EW	Real-time PCR	On arrival	Thrombophilia	1-2 working days	
Factor II & V Leiden Mutations	N/A	EW	Real-time PCR	On arrival	Thrombophilia	1-2 working days	
MONO Blood FISH (1 probe)	N/A	EW, Marrow blood	FISH	2 times a week	Haematological neoplasm	3-7 working days	Probe list stated on our request form.
DUO Blood FISH (2 probes)	N/A	EW, Marrow blood	FISH	2 times a week	Haematological neoplasm	3-7 working days	Probe list stated on our request form.
TRIO Blood FISH (3 probes)	N/A	EW, Marrow blood	FISH	2 times a week	Haematological neoplasm	3-7 working days	Probe list stated on our request form.
FFPE Blood Panel (4 probes)	N/A	EW, Marrow blood	FISH	2 times a week	Haematological neoplasm	3-7 working days	Probe list stated on our request form.

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Lung Cancer Panel (LCMAP)	N/A	Tumor tissue	Real-time PCR + IHC	2 times a week	Lung Cancer	3-5 working days	IHC is performed by Histopathology Division
Lung Cancer Panel-NGS (LCMAP-NGS)	N/A	Tumor tissue	NGS + FISH	once a week	Lung Cancer	1 month	
Lung Cancer-Combo (LCMAP-Combo)	N/A	Tumor tissue	Real-time PCR + NGS + FISH + IHC	once a week	Lung Cancer	1 month	IHC is performed by Histopathology Division
EGFR Mutation (exons 18-21 hotspots)	N/A	Tumor tissue	Real-time PCR	2 times a week	Solid Tumor	3-5 working days	
KRAS Mutation (exons 2-4 hotspots)	N/A	Tumor tissue	Real-time PCR	2 times a week	Solid Tumor	3-5 working days	
ALK Kinase Domain Mutation	N/A	Tumor tissue	PCR + Sanger Sequencing	On arrival	Solid Tumor	5-7 working days	
PIK3CA Mutation (exons 9 & 20)	N/A	Tumor tissue	PCR + Sanger Sequencing	On arrival	Solid Tumor	3-5 working days	
HER2 Mutation (exon 20)	N/A	Tumor tissue	PCR + Sanger Sequencing	On arrival	Solid Tumor	3-5 working days	
BRAF Mutation (exon 15)	N/A	Tumor tissue	Real-time PCR	On arrival	Solid Tumor	3-5 working days	
MET exon 14 skipping	N/A	Tumor tissue	PCR + Sanger Sequencing	On arrival	Solid Tumor	3-5 working days	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
NGS-BREAST PANEL - 9 genes (Blood)	N/A	EW, Clotted blood	NGS	once a week	Solid Tumor	1 month	
Somatic BRCAl & BRCA2 Mutation by NGS	N/A	Tumor tissue	NGS	once a week	Solid Tumor	1 month	
Combo BRCA gene NGS Panel (Blood and FFPE)	N/A	EW, Clotted blood, Tumor tissue	NGS	once a week	Solid Tumor	1 month	
BRCA1 or BRCA2 or PTEN or TP53 large genomic rearrangement detection by MLPA	N/A	EW, Tumor tissue	MLPA	On arrival	Solid Tumor	5-7 working days	
BRCA1 Known Mutation (Blood)	N/A	EW, Clotted blood	PCR & sequencing	Prior arrangement required	Solid Tumor	5-7 working days	
BRCA2 Known Mutation (Blood)	N/A	EW, Clotted blood	PCR & sequencing	Prior arrangement required	Solid Tumor	5-7 working days	
Targeted genes by NGS (Blood/ FFPE)	N/A	EW, Clotted blood, Tumor tissue	NGS +/- MLPA	once a week	Solid Tumor	1 month	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
Colon Cancer Panel (CCMAP)	N/A	Tumor tissue	Real-time PCR + IHC	2 times a week	Solid Tumor	3-5 working days	IHC is performed by Histopathology Division
NRAS Mutation	N/A	Tumor tissue	Real-time PCR	2 times a week	Solid Tumor	3-5 working days	
Microsatellite Instability (MSI)	N/A	EW, Tumor Tisse	PCR-Fragment Analysis	once a week	Solid Tumor	7-10 working days	
MMR genes by NGS (Blood/ FFPE)	N/A	EW, Clotted blood, Tumor tissue	NGS + MLPA	once a week	Solid Tumor	1 month	
FAP APC & MUTYH Full Gene Mutation by NGS (Blood/ FFPE)	N/A	EW, Clotted blood, Tumor tissue	NGS + MLPA	once a week	Colon Cancer	1 month	
MLH1 / MSH2 / PMS2 / MSH6 / APC / MUTYH Known Mutation (Blood/FFPE)	N/A	EW/ Tumour tissue	PCR + Sanger Sequencing	once a week	Colon Cancer	3-5 working days	

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
MLH1/ MSH2/ PMS2/ MSH6/ APC/ MUTYH large genomic rearrangement detection by MLPA (Blood)	N/A	EW/ Tumour tissue	MLPA	once a week	Colon Cancer	5-7 working days	
MLH1/ MSH2/ PMS2/ MSH6 Promoter Methylation by MLPA (Blood/ FFPE)	N/A	EW/ Tumour tissue	MLPA	once a week	Colon Cancer	5-7 working days	
Brain Cancer Panel (1p/19q FISH, IDH1, IDH2, MGMT)	N/A	Noraml and Tumor tissue	FISH + PCR + Sanger Sequencing + MLPA	once a week	Brain Cancer	7-10 working days	
IDH1 & IDH2 Hotspots Mutation	N/A	Tumor tissue	PCR + Sanger Sequencing	On arrival	Solid Tumor	3-5 working days	
MGMT Promoter Methylation by MLPA	N/A	Noraml and Tumor tissue	MLPA	once a week	Solid Tumor	5-7 working days	
KIT Mutation	N/A	Tumor tissue	PCR + Sanger Sequencing	On arrival	Solid Tumor	3-5 working days	
PDGFRA Mutation	N/A	Tumor tissue	PCR + Sanger Sequencing	On arrival	Solid Tumor	3-5 working days	
KIT & PDGFRA Mutation	N/A	Tumor tissue	PCR + Sanger Sequencing	On arrival	Solid Tumor	3-5 working days	

Molecular Oncology (ext. 8779)

Test Name	Ref. Range	Specimen	Method	Test Frequency	Panel	Pledge TAT	Remarks
MONO FFPE FISH (1 probe)	N/A	Tumor tissue	FISH	2 times a week	Solid Tumor	3-7 working days	Probe list stated on our request form
DUO FFPE FISH (2 probes)	N/A	Tumor tissue	FISH	2 times a week	Solid Tumor	3-7 working days	Probe list stated on our request form
TRIO FFPE FISH (3 probes)	N/A	Tumor tissue	FISH	2 times a week	Solid Tumor	3-7 working days	Probe list stated on our request form
FFPE FISH Panel (4 probes)	N/A	Tumor tissue	FISH	2 times a week	Solid Tumor	3-7 working days	Probe list stated on our request form.
Other molecular test by special request (genetic test, Structural Rearrangement Breakpoint Mapping….)	N/A	EW, BM, Tissue	PCR/Sanger Sequencing/ MLPA/FISH/ Long-read PCR-free nanopore sequencing	On arrival	N/A	Depends on the test requested	Please contact our divison in advance

EW = EDTA whole blood
NGS = Next-generation sequencing
ddPCR = Droplet digital polymerase chain reaction
FFPE = Formalin-fixed, paraffin-embedded tissue
RFLP = Restriction fragment length polymorphism
BM = Bone marrow
RT-PCR = Reverse transcriptase polymerase chain reaction
FISH = Fluorescent in-situ hybridisation
MLPA = Multiplex Ligation-dependent Probe Amplification

HEALTH ASSESSMENT PACKAGES

Health Assessment Schemes		Male/Fermale		Fermale	
		A	B	C	D
Medical History		✓	✓	✓	✓
Complete Physical Examiniation		✓	✓	✓	✓
Laboratory Investigation					
Complete Blood Count including Platelet		✓	✓	✓	✓
Blood Film		✓	✓	✓	✓
E.S.R.		✓	✓	✓	✓
*Blood Grouping and Rh Typing		✓	✓	✓	✓
*G6PD		✓	–	✓	–
Kidney Function:	Urea	✓	✓	✓	✓
	Creatinine	✓	✓	✓	✓
Electrolytes:	Na, K	✓	✓	✓	✓
	Calcium	✓	✓	✓	✓
Liver Function:	Albumin adjusted calcium	✓	✓	✓	✓
	Bilirubin, total and direct	✓	✓	✓	✓
	A. S. T.	✓	✓	✓	✓
	A. L. T.	✓	✓	✓	✓
	Alkaline phosphatase	✓	✓	✓	✓
	Gamma GT	✓	✓	✓	✓

TEST PANELS / PACKAGES

Charge Code	Details	Tests
465-4	Ante-Natal Screening Package	CBP, Blood group & Rh(D), Treponema pallidum Ab, Rubella Ab-IgG, HBsAg, HIV 1 + 2 Ab/p24 Ag
418-2	Arthritis Panel	CBP, ESR, uric acid, albumin, globulin, CRP, RA factor screen, ANA, Anti-CCP IgG
408-5	Cardiology check-up package	CBP, urea, creatinine, sodium, potassium, glucose fasting, ALT, Total cholesterol, HDL cholesterol, LDL cholesterol, triglycerides, hs-CRP
409-3	Cardiology 1st line intervention	Total cholesterol, HDL cholesterol, LDL cholesterol, Triglycerides, hs-CRP
410-7	Cardiology 2nd line intervention	Homocysteine, Apo A-1, Apo B, Lp(a), urine microalbumin
90037-4	Child Health Program (plan y – 9 month)	CBP, urine routine, HBsAb screening
90038-2	Child Health Program (plan z – 6 years)	CBP, urine routine, urea, creatinine, total cholesterol, ALT
504-9	Female Hormone Profile 1	E2, LH, FSH
505-7	Female Hormone Profile 2	E2, LH, FSH, Prolactin
506-5	Female Hormone Profile 3	E2, LH
507-3	Female Hormone Profile 4	DHEA-S, E2, FSH, LH, Prolactin
470-1	Lipid Profile	Cholesterol(total), HDL, LDL, Triglyceride, cholesterol/HDL Ratio, Non-HDL cholesterol
468-9	Liver Function Test (LFT 2)	Total & direct bilirubin, ALP, AST, ALT, GGT, Total Protein, Albumin, Globulin
467-1	Pre-Marriage Checkup (Female)	CBP, Blood Group & Rh(D), Treponema pallidum Ab for Syphilis, Rubella Ab-IgG, HBsAg, HBsAb, HIV 1+2 Ab/p24 Ag, HBA1c, Chickenpox IgG, Urine routine
466-2	Pre-Marriage Checkup (Male)	CBP, Blood Group & Rh(D), Treponema pallidum Ab for Syphilis, HBsAg, HBsAb, HIV 1+2 Ab/p24 Ag, HBA1c, Urine routine, Semen Analysis
503-1	Pre-pregnancy Profile	CBP, Blood Group & Rh(D), Treponema pallidum Ab for Syphilis, Rubella Ab-IgG, HBsAg, HBsAb, HIV 1+2 Ab/p24 Ag, Chickenpox IgG

Charge Code	Details	Tests
469-7	Renal Function Test (RFT 2)	Urea, creatinine, sodium, potassium, chloride, bicarbonate
432-8	Thrombosis panel	Antithrombin, Protein C, Protein S, APCR, Lupus anticoagulant, Anti-cardiolipin Ab
90046-3	Genital Infection Package A	Culture & Sensitivity (including G.C.), Trichomonas & Monilia, Gonococcal & Chlamydia trachomatis-DNA and Mycoplasma hominis/ Ureaplasma urealyticum C&ST (Gel swab for culture, non-gel swab for Mycoplasma, Amplicor STD swab for DNA)
90047-1	Genital Infection Package B	Treponema Pallidum Ab for Syphilis, HIV 1 + 2 Ab/p24 Ag
90058-7	Genital Infection Package C	Culture & Sensitivity (including G.C.), Trichomonas & Monilia, Gonococcal & Chlamydia trachomatis-DNA (Gel swab for culture specimen and Amplicor STD Swab for DNA)
542-1	STD screening (1st visit) (Female)	CBP, Blood Group & Rh(D), Rubella Ab-IgG, HBsAg, HBsAb, HIV 1+2 Ab/p24 Ag, HCV Ab, VDRL
541-3	STD screening (1st visit) (Male)	CBP, HBsAg, HIV 1+2 Ab/p24 Ag, HCV Ab, VDRL
543-0	STD screening (2nd visit) (Female / Male)	HBsAg, HIV 1+2 Ab/p24 Ag, HCV Ab, VDRL
540-5	Well Women Screening Program	CBP, Urine routine
832-3	Pre-operation coagulation screen	CBP, PT, APTT, PFA-100
833-1	Comprehensive screen for bleeding disorder	CBP, PT, APTT, Fibrinogen, TT, D-Dimer
834-0	VWD panel	CBP, PT, APTT, PFA-100, VWF Ag, VWF Ac, Factor VIII
835-8	Haemophilia panel	CBP, PT, APTT, PFA-100, Factor VIII, Factor IX

GUIDELINES / PATIENT NOTES FOR SPECIAL TESTS

Guidelines / Patient Notes for Special Tests

The general and brief information listed below is for the use by medical personnel when providing instructions to patients on the following special tests. For further details of these tests, please contact the Clinical Laboratory at 2835-8790.

^{13}c Urea Breath Test

Fasting must be observed for at least 4 hours prior to testing. In addition, some medications, such as antibiotics, proton-pump inhibitors, etc. may affect test accuracy and should be stopped beforehand. For a comprehensive list of medications, please contact the Clinical Laboratory.

24 HOUR URINE

Patients are requested to visit our Clinical Laboratory and obtain a special specimen container for urine collection. Please advise patients not to touch / pour away the chemicals inside the container. The container should be kept in a cool, dry place for the duration of sample collection. Patients should void and discard a urine sample before commencing collection. Thereafter, all urine voided in the next 24 hours must be collected completely in the container. For creatinine clearance, the patient's height and weight must be obtained with a blood sample within 48 hours before or after urine collection. Sampling during menstruation should be avoided.

Interpretation Chart for EBV Ab-IgM & IgG for Infectious Mononucleosis

	IgM	IgG	IgM	IgG	IgM	IgG	IgM	IgG
Anti-EBNA-1	-	-	+/-	-	-	-/+	-	-/+
Anti-p22	-	-	+/-	-	-	+	-	+
Anti-VCA	-	-	+	-/+	-	+	+	+
Anti-EA D	-	-	+	+/-	-	-	+	+
Infection status	Negative		Primary / Acute Infection		Convalescence / Past Infection	Reactivated Infection		

Fasting Sample Definition

While there are various different guidelines on the definition of fasting, the Hospital has established a general guideline using information from the American Diabetes Association: a fasting period is defined as "no calorie intake for at least 8 hours". It is recommended that patients do not eat after midnight at the latest, and proceed to the Laboratory for blood tests in the morning. They may have small sips of water while fasting.

Semen Analysis

Semen analysis is done by automated analyzer. Patients are required to abstain from sexual activity 3-5 days prior to sample collection. A suitable container will be provided by the Clinical Laboratory. Semen samples should be obtained by masturbation and collected directly into a container without using condoms. The collection time should be recorded. The sample should reach the Clinical Laboratory within an hour after collection, ideally kept warm to simulate body conditions.

APPENDIX

PHONE RESULT LIST (CLINICAL CHEMISTRY AND CLINICAL HAEMATOLOGY)

Clinical Chemistry

Analytes	Unit	Phone Value		Critical Value		Department of Health Assessment Phone Value	
Blood gases pH		<7.3					
Glucose, fasting	mmol/L	<3.0	>8.0	<2.0	>28.0	<3.0	>8.0
Glucose, random	mmol/L	<3.0	>12.0	<2.0	>28.0	<3.0	>12.0
Sodium	mmol/L	<125	>155	<120	>165	<125	>150
Potassium	mmol/L	<3.0	>5.4	<2.5	>7.0	<3.0	>5.4
Chloride	mmol/L	<75	>125				
Urea	mmol/L		>33.4				>15.0
Creatinine	umol/L		>618				>200
Calcium, albumin adjusted	mmol/L	<1.90	>2.80	<1.75	>3.25	<1.90	>3.00
Ionized Calcium	mmol/L	<1.12	>1.35	<0.78	>1.58		
Amylase, total	U/L		>400		>1000		>400
Amylase, pancreatic	U/L		>400				>400
Total bilirubin	umol/L		>239				>239
AST	U/L		>200				>200
ALT	U/L		>400				>400
Total protein	g/L	<50	>100			<50	>100
Albumin	g/L	<20				<20	
CK	U/L		>500		>1000		>500
LDH	U/L		>400				>400
Magnesium	mmol/L	<0.6		<0.4		<0.6	
Phosphorus	mmol/L	<0.48	>2.81			<0.48	>2.81
Triglycerides	mmol/L				>30.0		>10.0
Neonatal bilirubin	umol/L	All outpatient results if requested			>340		

The above figures are for internal reference only and subject to regular updates.

Hematology

Analytes	Unit	Phone Value		Critical Value		Department of Health Assessment Phone Value	
Haemoglobin *	g/dL	<8.0	>19.0	<6.5	>20.0	<10.0	>19.0
WBC *	109 /L	<1.0	>50.0	<0.5	>80.0	<2.5	>13.0
Platelet *	109 /L	<50	>600	<10	>1000	<100	>600
Malaria parasites		Positive					
Blood film		Leukemia or other blood dyscrasias					
Prothrombin time (PT) ^	sec		>40		>60		
	INR		>4.0		>4.5		
APTT ^	sec		>60		>120		

* Unless the patient is having similar values on delta check (eg. Oncology patient) or previous result is being phoned already.
^ Unless the patient is having similar values on delta check or is known to be on warfarin therapy.
The above figures are for internal reference only and subject to regular updates.

COMMONLY USED LABORATORY FORMULAE

1. Creatinine Clearance

The creatinine clearance is calculated based on serum and timed urine collection for creatinine measurement. It is an assessment of glomerular filtration rate and hence renal function. The creatinine clearance is more sensitive than serum creatinine in the detection of early glomerular dysfunction. Please note that significant decrease in creatinine clearance may not occur until up to 30% of glomeruli cease to function. Complete and accurately timed urine collection is essential. The height and weight of the patient should be measured for the surface area to be calculated and the creatinine clearance adjusted to the standard body surface area of 1.73m^2.

Creatinine Clearance (ml/min/1.73m^2) = [Urine creatinine (mmol/L) x Urine volume (mL) x 1.73] ÷ [Plasma creatinine (mmol/L) x Time (min) x Body surface area (m^2)]

2. Friedewald Equation

LDL cholesterol (mmol/L) = Total cholesterol (mmol/L) – HDL cholesterol (mmol/L) – [Triglyceride (mmol/L) x 0.46]

LDL cholesterol result is directly measured rather than calculated from Friedewald Equation unless otherwise specified.

3. Estimated Glomerular Filtration Rate (eGFR)

The modified MDRD formula for Chinese patients is adopted for better correlation with creatinine clearance measurement in the Chinese population. Please note that the modified formula gives a slightly higher eGFR result than the original MDRD formula, especially in females and at high GFR values. The eGFR may not be accurate in people at extremes of body type, e.g. the malnourished and the amputees. Its validity has not been tested across all ethnic groups. The eGFR is not valid in pregnant women and children.

Chronic renal disease is unlikely when the eGFR is >60 ml/min/1.73m^2 and in the absence of clinical evidence of kidney disorder. Moreover, in persons ≥ 70 years of age, an eGFR value in the range of 45 – 59 ml/min/1.73m^2, if stable over time and unaccompanied by evidence of renal damage, may be interpreted as typical for this age group and unlikely to be associated with chronic renal disease.

MDRD (Modification of Diet in Renal Disease) formula traceable to IDMS:

eGFR (ml/min/1.73m^2) = 175 x [serum creatinine (μmol/L)÷88.4]$^{-1.154}$ x Age$^{-0.203}$ x 0.742 (if female)

Modified MDRD formula for Chinese (J Am Soc Nephrol 17: 2937 – 44, 2006):

eGFR (ml/min/1.73m^2) = 175 x [serum creatinine (μmol/L)÷88.4]$^{-1.234}$ x Age$^{-0.179}$ x 0.79 (if female)

4. HbA1c-estimated Average Glucose (eAG)

eAG (mmol/L) = [28.7 x HbA1c (%) – 46.7] ÷ 18 or

eAG (mmol/L) = [2870 x HbA1c (fraction) – 46.7] ÷ 18

The estimated Average Glucose (eAG) is a new parameter recommended by the American Diabetes Association in 2008 and replaces the mean plasma glucose. The eAG equation is based on the A1c-derived Average Glucose (ADAG) Study published in Diabetes Care 31: 1473 – 8, 2008, which has confirmed the existence of a linear relationship between HbA1c and average blood glucose level. The eAG value is slightly lower than the previously used mean plasma glucose value.

5. Albumin Adjusted Calcium (AACA)

Free calcium, the physiological active form can be estimated using mathematical calculation of total calcium and albumin level.

AACA (mmol/L) = plasma calcium (mmol/L) + 0.012 [40.3 – plasma albumin (g/L)]

CLINICAL CHEMISTRY UNIT CONVERSION TABLE

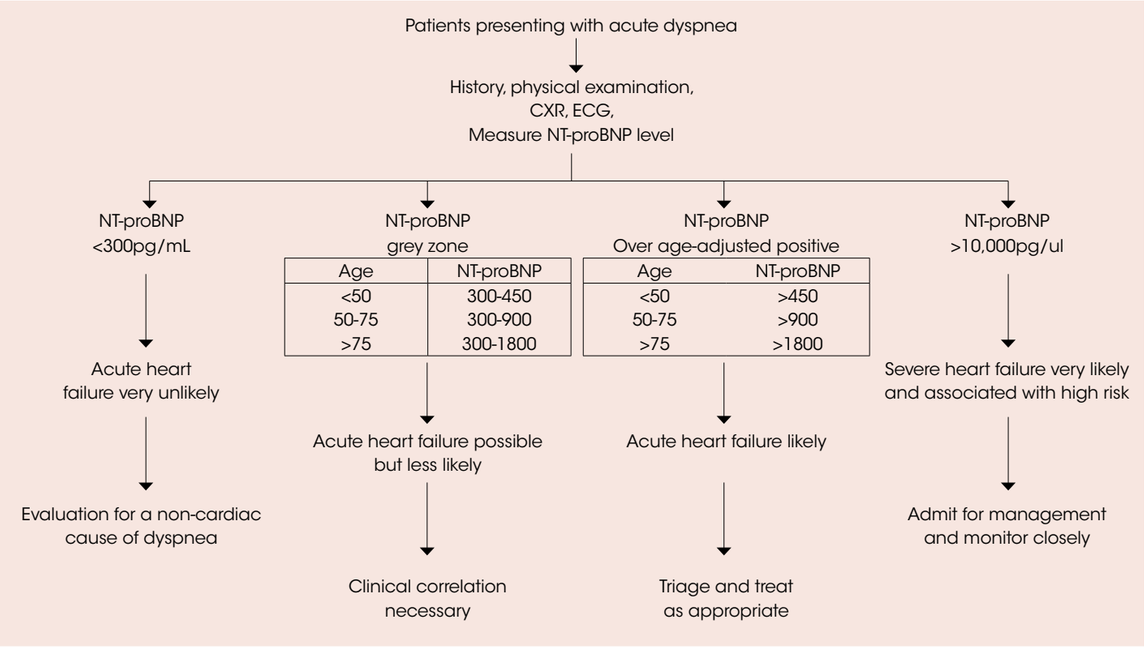
Test Name	SI Unit	Conventional Unit	Conversion Factor	
			SI to Conventional	Conventional to SI
Acetaminophen	µmol/L	µg/mL	0.1512	6.614
Albumin	g/L	g/dL	0.1	10
Amikacin	µmol/L	µg/mL	0.5848	1.71
Ammonia	µmol/L	µg/dL	1.70	0.5872
Bilirubin	µmol/L	mg/dL	0.058	17.1
Calcium	mmol/L	mg/dL	4	0.25
Carbamazepine	µmol/L	µg/mL	0.2364	4.23
Cholesterol, Total	mmol/L	mg/dL	38.7	0.02586
Cortisol	nmol/L	µg/dL	0.0362	27.6
Creatinine	µmol/L	mg/dL	0.0113	88.4
Creatinine Clearance	ml/sec/sq.m	ml/min/1.73sq.m	103.8	0.0096
Cyclosporine A	nmol/L	ng/mL	1.205	0.83
Digoxin	nmol/L	ng/mL	0.7813	1.28
Estradiol	pmol/L	pg/mL	0.2725	3.67
Folate	nmol/L	ng/mL	0.4415	2.265
Free T3	pmol/L	pg/dL	65	0.0154
Free T4	pmol/L	ng/dL	0.0777	12.87
FSH	IU/L	mIU/mL	1	1
Gentamicin	µmol/L	µg/mL	0.4785	2.09
Glucose	mmol/L	mg/dL	18.0	0.0555
HDL-cholesterol	mmol/L	mg/dL	38.7	0.02586
Homocysteine	µmol/L	µg/mL	0.1352	7.396
Inorganic Phosphorus	mmol/L	mg/dL	3.097	0.3229
Insulin	pmol/L	µIU/mL	0.1394	7.175
Iron	µmol/L	µg/dL	5.58	0.1791
LDL-Cholesterol	mmol/L	mg/dL	38.7	0.02586
LH	IU/L	mIU/mL	1	1
Magnesium	mmol/L	mg/dL	2.43	0.4114

Test Name	SI Unit	Conventional Unit	Conversion Factor	
			SI to Conventional	Conventional to SI
Microalbumin to creatinine ratio	mg albumin/ mmol creatinine	mg albumin/ g creatinine	8.85	0.113
Netilmicin	µmol/L	µg/mL	0.4762	2.10
NT-proBNP	pmol/L	pg/ml	8.457	0.118
Osmolality	mmol/kg	mOsmol/kg	1	1
Phenobarbital	µmol/L	µg/mL	0.232	4.31
Phenytoin (Dilantin)	µmol/L	µg/mL	0.2525	3.96
Progesterone	nmol/L	ng/mL	0.3145	3.18
Prolactin	mIU/L	ng/ml	0.0472	21.2
Protein	g/L	g/dL	0.1	10
PTH	pmol/L	ng/mL	0.01	100
RBC-G6PD Quantitative Test	MU/mol Hb	U/g Hb	15.5	0.0645
Salicylate (Aspirin)	mmol/L	mg/dL	13.812	0.0724
T3	nmol/L	ng/dL	65	0.0154
T4	nmol/L	µg/dL	0.0777	12.87
Testosterone	nmol/L	ng/dL	28.8	0.0347
Theophylline	µmol/L	µg/mL	0.1802	5.55
TIBC	µmol/L	µg/dL	5.5835	0.179
Tobramycin (Nebcin)	µmol/L	µg/mL	0.4673	2.14
Triglycerides	mmol/L	mg/dL	88.57	0.01129
TSH	mIU/L	µIU/mL	1	1
Urea	mmol/L	mg/dL	5.988	0.167
Uric acid	mmol/L	mg/dL	16.95	0.059
Valproic Acid (Epilim)	µmol/L	µg/mL	0.1443	6.93
Vancomycin	µmol/L	µg/mL	1.4493	0.69
Vitamin B12	pmol/L	pg/mL	1.355	0.738
β-hCG	IU/L	mIU/mL	1	1

NT-proBNP IN HEART FAILURE

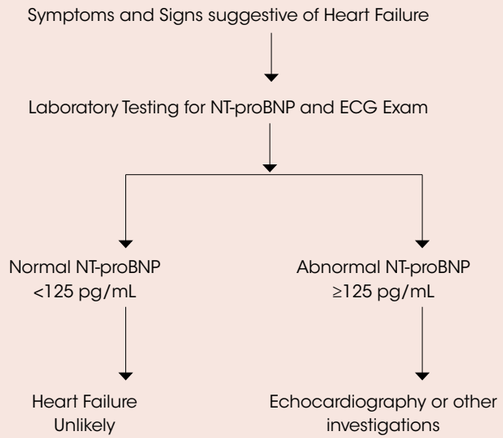
Clinical Use of NT-proBNP in the Diagnosis of Heart Failure

Acute setting



Clinical Use of NT-proBNP in the Diagnosis of Heart Failure

Non-Acute Setting



INDEX

INDEX

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