Leader in Health Check

2021

BP Clinical Laboratory Service Guide

B.P. Clinical Lab Sdn. Bhd

Company No: 152314-H
Address: Glenmarie Lab
No: 2, Jalan Pendaftar U1/54, Section U1,
Temasya @ Glenmarie
40150 Shah Alam, Selangor Malaysia
Tel: 603-55699996; Fax: 603 -55696827

This BP Clinical Laboratory Service Guide 2021 was prepared by the staff of BP Clinical Lab Sdn . (Glenmarie Branch) It has been approved for use by Dato Beh Chun Chuan , Chairman of BP Healthcare Group .

It is a revised version of the BP Clinical Laboratory Service Guide 2020

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OVERVIEW of BP HEALTHCARE GROUP

Established in 1982, BP Healthcare Group has gone through over 32 years of innovation and transformation. Today, BP Healthcare Group has over:

- 70 Laboratories
- 50 Diagnostic centres
- 50 Hearing Aids centres
- 50 Dispensaries & Pharmacies
- 50 Food and Industrial Testing centres
- 5 Specialist/ Daycare Centres
- 3 Dental Specialist clinics
- 1 Eye Specialist Clinic

With this network nationwide (and still expanding), multiple awards and credentials earned, BP Healthcare Group is a leader in the Malaysia Private Healthcare Industry, serving more than 35 million customers over the last 30 years and the number is growing. We provide comprehensive primary health care services in all disciplines to cover the needs of Medical Practitioners, Hospitals and Corporate Clients. With capabilities across the entire spectrum of primary healthcare services, BP Healthcare Group can drive improvement in health status and lower the overall costs to healthcare, more effectively than anyone else in this industry. BP Healthcare Group has undergone aggressive expansion and transformation since its establishment in 1982. The group has grown from strength to strength in tandem with the nation's rapid growth.

Today, the group is proud to have become one of the country's leading integrated healthcare providers with core competence and innovative strength in medical diagnostics, clinical laboratory and medical technologies, complemented by other specialized primary healthcare services. The group has remained relentless in its pursuit of healthcare services of the highest quality for its customers. To this end the group continues to strive towards providing excellence healthcare services through a concerted and committed effort in continuous improvement, investing in state-of-the art medical devices and equipment, competent and dedicated human resource and investment in ICT.

VISION

To be the largest integrated and comprehensive private healthcare provider in the country, with the core strengths in diagnostics and medical services, and providing healthcare of the highest quality to its customers to enhance quality of life of Malaysian

MISSION

To achieve the Vision, BP Healthcare Group strives to:

1. Prosper healthy partnerships with public and private healthcare providers, and other related agencies to enhance delivery of integrated and comprehensive healthcare services and be a leader in health check.
2. Gain and retain customers' trust and loyalty through meeting and exceeding their expectation
3. Invest in human potential to achieve a high competent workforce
4. Commit towards innovative technologies to advance the diagnostics and medical services
5. Create conducive work environment to enhance safety and productivity of its workforce

VALUES

To uphold the Vision and Mission, BP Healthcare Group believes in:

1. Customer first
2. Professionalism
3. Teamwork
4. Integrity
5. Accountability
6. Effective communication
7. Continuous improvement
8. Efficient
9. No blame culture

GOALS

BP Healthcare Group aims to annually:

1. Increase market share
2. Increase market expansion beyond Malaysia
3. Increase productivity
4. Increase positive customer feedback
5. Increase in number of workforce who are knowledgeable and skillful
6. Increase investment in innovative technology

OVERVIEW OF BP CLINICAL LABORATORY

B.P. Clinical Lab Sdn. Bhd. (BP Clinical Lab) commenced its business as a provider of medical laboratory testing services and analyses in the 1980's.

Through our network of laboratories, BP currently serves thousands of private medical practitioners, private and public hospitals throughout the country and generates millions of test results. BP Lab also serves as a panel laboratory for some corporations and insurance companies.

The source of our strength is our team of highly qualified and competent professional staff comprising of a panel of experienced pathologists, hundreds of professional medical technical staff and ancillary support.

Test methodologies, media and laboratory equipment are constantly being evaluated and updated to keep abreast with the state-of-the-art instrumentation and to improve efficiency of test procedures with faster turnaround time. With our philosophy of meeting challenges through continuous delivery of quality service and assurance of customer satisfaction, BP Lab has today become one of the leading key players in the clinical laboratory.

Through our adaptability and responsiveness to changes and our culture of work excellence, we are confident that we can maintain our reputation and position in the coming years.

BP Clinical Lab is proud to have achieved the following:

1. Joint Commission International (JCI) Clinical Laboratory Accreditation (BP Clinical Lab (Glenmarie) is the 1st clinical laboratory in Asia to be accredited by JCI)
2. ISO/IEC17025 for blood lead
3. MS ISO 9001:2000 certification for BP (HQ).
4. MS ISO 15189:2008 accreditation

BP Laboratory Branches

Main Laboratory	**Area Coverage**
BP Clinical Lab Sdn Bhd , Glenmarie	All branches
BP Clinical Lab Sdn Bhd, Penang	Northern area
BP Food Testing Sdn Bhd	All branches (Occupational Health Testing & Food Samples)
BP Environmental Testing Sdn Bhd,	All branches (Water & Waste water samples)

BP OUTLETS

LEGENDS
SC Specialist Centre DC Diagnostic Centre LAB LAB
HA Hearing Dispensary

KUALA LUMPUR

Kepong

DC + LAB + HA +

Kepong
No. 23, Jalan Metro Perdana Barat 1,
Taman Usahawan Kepong, Kepong Utara,
Kepong, 52100 Kuala Lumpur.
Tel: 03-62593884, 03-62593885
Fax: 03-62593887

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Sat, Sun & Public Holiday : 8.00 am – 1.00 pm

Cheras

SC + LAB + HA + +

No 37, 39, 41 & 43, Jalan 4/96A,
Taman Cheras Makmur, Cheras,
56100 Kuala Lumpur.
Tel: 03-91309163, 03-91308301
Fax: 03-91411392

Operation Time :
Monday to Friday : 7.30 am – 5.00pm
Saturday, Sunday & Public Holidays : 7.30 am – 1.00 pm

OUG

DC + LAB + HA +

No. 82 Jalan Mega Mendung,
Bandar Park, Batu 5,
Jalan Kelang Lama,
58200 Kuala Lumpur.
Tel: 03-79802061, 03-79802079
Fax: 03-79802180

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday, Sunday & Public Holiday : 8.00 am – 1.00 pm

Medan Tuanku Kuala Lumpur

SC + LAB + HA +

No. 17, 19 & 21,
Jalan Medan Tuanku Satu,
Medan Tuanku,
50300 Kuala Lumpur
Tel : 03-92129266, 03-92129267
Fax : 03-22028573

Operation Time :
Monday to Friday : 7.30 am – 8.00 pm
Sat, Sun & Public Holidays : 7.30 am – 1.00 pm

SELANGOR

Glenmarie (Shah Alam)

SC + LAB + HA + + PERKESO

Lot 2, Jalan Pendaftar U1/54,
Section U1, Temasya @ Glenmarie,
40150 Shah Alam,
Selangor, Malaysia.
Tel: 03-55699996, 03-55696826
Fax: 03-55696829, 03-56352855

Operation Time :
Monday- Friday : 7am-5pm
Consultation hours : 8.00 am - 5.00 pm
Saturday, Sunday & Public Holiday : 7.30 am - 1.00 pm

Kajang

DC + LAB + HA +

No. 40&41, Jalan Tukang,
43000 Kajang, Selangor
Tel : 03-87337433 , 03-87364553
Fax: 03-87343295

Store Hours :
Monday to Friday : 7.30 am – 5.00 pm
Saturday, Sunday & Public Holiday : 8.00 am – 1.00 pm

Subang Jaya

DC + LAB + HA +

No. 3 & 5, Jalan SS15 / 4E,
47500 Subang Jaya, Selangor
Tel : 03-56329473, 03-56323123
Fax: 03-56335062

Store Hours :
Monday to Friday : 7.30 am – 5.00 pm
Saturday, Sunday & Public Holiday : 8.00 am – 1.00 pm

Klang II

SC + LAB + HA + + PERKESO

No. 29, Jalan Bayu Tinggi 1A/KS6,
Taman Bayu Tinggi, 41200 Klang, Selangor
Tel : 03-33239169, 03-33249169
Fax: 03-33221976

Store Hours :
Monday to Friday : 7.30 am – 5.00 pm
Saturday, Sunday & Public Holiday : 7.30 am - 1.00 pm

Rawang

DC + LAB + HA +

No 7 & 9,
Jalan Bandar Rawang 10,
Pusat Bandar Rawang,
48000 Rawang, Selangor.
Tel : 03-60931333, 03-60926451
Fax: 03-60931555

Store Hours :
Monday to Friday : 7.30 am – 5.00 pm
Saturday & Sunday : 8.00 am – 1.00 pm
Public Holiday : Closed
*Closed on 12 public holidays

Taman Megah

SC + LAB + HA + + PERKESO

No. 79, Jalan SS 23/15, Taman SEA,
47400 Petaling Jaya, Selangor.
Tel: 03-78030992
Fax: 03-78030913

Store Hours :
Monday to Friday : 7.30 am – 5.00pm
Saturday, Sunday & Public Holiday : 7.30 am – 1.00 pm

Seri Kembangan

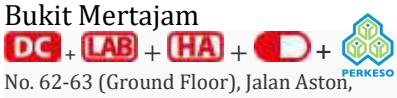
DC + LAB + HA +

No. 1 & 3, Ground Floor,
Jalan Besar Susur 1,
43300 Seri Kembangan, Selangor.
Tel : 03-89599924, 03-89599983
Fax: 03-89389766

Store Hours :
Monday to Friday : 7.30 am – 5.00 pm
Saturday, Sunday & Public Holiday : 8am-1pm

PENANG

Bukit Mertajam



No. 62-63 (Ground Floor), Jalan Aston,
14000 Bukit Mertajam, Penang
Tel: 04-5375889, 04-5377889
Fax: 04-5374889

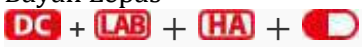
Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday, Sunday & Public Holiday : 8.00 am – 1.00 pm

Butterworth

5001 & 5002, Jalan New Ferry,
12100 Butterworth, Penang.
Tel: 04-3246722, 04-3327944
Fax: 04-3239508

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday , Sunday & Public Holiday : 8.00 am – 1.00 pm

Bayan Lepas



Ideal Avenue, 1-1-1, Medan Kampung Relau 1,
Jalan Tun Dr. Awang,
11900 Bayan Lepas, Penang.
Tel: 04-6410382, 04-6410803
Fax: 04-6410801

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Public Holiday, Saturday & Sunday : 8.00 am – 1.00 pm

Penang

Suite G1 & G2, Menara Penang Garden,
42A Jalan Sultan Ahmad Shah, 10050 Penang
Tel: 04-2292677, 04-2263160
Fax: 04-2272886

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday, Sunday & Public Holiday : 8.00 am – 1.00 pm

JOHOR

Batu Pahat

DC + LAB + HA +

No.5-2,(Tingkat Bawah) Jalan Zabedah,
84000 Batu Pahat,
Johor Darul Takzim
Tel: 07-4311759
Fax: 07-4317400

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday, Sunday & Public Holidays : 8.00 am – 1.00 pm

Johor Bahru

DC + HA +

No. 67 & 67A Jalan Harimau Tarum, Taman Century,
80250 Johor Bahru, Johor
Tel: 07-3348723, 07-3348722
Fax: 07-3348623

Operation Time : Monday to Friday : 7.30 am – 5.00 pm
Saturday & Sunday : 8.00 am – 1.00 pm
Public Holiday : Closed
*Closed on 12 public holidays

Kluang

DC + LAB + HA +

No. 18 & 20, Jalan Haji Manan,
86000 Kluang, Johor
Tel: 07-7715469
Fax: 07-7715487

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday & Sunday : 8.00 am – 1.00 pm
Public Holiday : Closed
*Closed on 12 public holidays

Muar

DC + LAB + HA +

No. 34, Jalan Bakri,
84000 Muar,
Johor Darul Takzim
Tel : 06-9515923
Fax: 06-9515699

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday & Sunday : 8.00 am – 1.00 pm
Public Holiday : Closed
*Closed on 12 public holidays

Segamat

DC + LAB + HA +

No 121 & 122, Jalan Genuang,
85000 Segamat, Johor.
Tel: 07-9312980
Fax: 07-9320982

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday ; 8.00 am – 1.00 pm
Sunday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

Johor Jaya

DC + LAB + HA +

No. 53-G, Jalan Rosmerah 2/10,
Taman Johor Jaya, 81100 Johor Bahru, Johor
Tel : 07-3530325, 073532923
Fax: 07-3510018

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday, Sunday & Public Holidays : 8.00 am – 1.00 pm

Kulai Jaya

DC + HA +

No. 18 & 19,
Jalan Raya, Taman Seraya,
81000 Kulai Jaya, Johor
Tel: 07-6635697, 07-6625477
Fax: 07-6621679

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday : 8.00 am – 1.00 pm
Sunday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sunday

Skudai

SC + LAB + HA + + PERKESO

Tower 1, No. 68, Jalan Pertama 1,
Danga Utama Commercial Center,
81300 Skudai Johor Bahru
Tel : 07-5500317
Fax : 07-5500329

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday, Sunday & Public Holidays : 7.30 am – 1.00 pm

PERAK

Ipoh

SC + LAB + HA + + PERKESO

No. 275, Jalan Raja Permaisuri Bainun (Jalan Kampar),
30250 Ipoh, Perak,
Malaysia
Tel: 05-2559090
Fax: 05-2419226

Operation Time:
Monday- Friday : 7.00 am - 5.00 pm
Public Holiday, Saturday & Sunday : 7.00 am - 1.00 pm

Kampar

DC + LAB + HA +

No. 6, Jalan Kranji,
31900 Kampar, Perak.
Tel : 05-4669784
Fax : 05-4652916

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday : 8.00 am – 1.00 pm
Sunday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

Sitiawan

DC + LAB + HA +

Lot 287 & 288 (Ground Floor),
Lot Kosong, Jalan Lumut,
32000 Sitiawan, Perak
Tel: 05-6923233, 05-6911060
Fax: 05-6926233

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday : 8.00 am – 1.00 pm
Sunday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

Taiping

DC + LAB + HA +

No. 178 & 180 Jalan Kota,
34000 Taiping, Perak
Tel : 05-8069907, 05-8201344
Fax : 05-8201345

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday : 8.00 am – 1.00 pm
Sunday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

Tanjung Malim

DC + LAB + HA +

No. 46, Jalan Besar,
35900 Tanjung Malim, Perak
Tel : 05-4598522, 05-4599522
Fax : 05-4585992

Operation Time :
Monday to Friday : 8.00 am – 5.00 pm
Sat : 8.00 am – 1.00 pm
Sunday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

Teluk Intan

LAB

No. 15 Jalan Intan 2 (Ground Floor),
Bandar Baru Teluk Intan,
Jalan Chongkat Jong,
36000 Teluk Intan, Perak
Tel: 05-6218205, 05-6214607
Fax: 05-6214605

Operation Time :
Monday to Friday : 8.00 am – 5.00 pm
Saturday : 8.00 am – 1.00 pm
Sunday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

Parit Buntar

DC + LAB + HA +

No. 11 & 13 Jalan Wawasan 1,
Taman Wawasan Jaya,
34200 Parit Buntar, Perak.
Tel: 05-7161262, 05-7165262
Fax: 05-7176478

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday : 8.00 am – 1.00 pm
Sunday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

KEDAH

Alor Setar II

DC + LAB + HA +

No. 30 & 32 (Ground Floor),
Jalan Putra, 05150 Alor Setar, Kedah
Tel: 04-7325641, 04-7315641
Fax: 04-7335641

Operation Time :
Sunday to Thursday : 7.30 am – 5.00 pm
Friday & Saturday ; 8.00 am – 1.00 pm
Public Holiday: Closed
*Closed on 12 public holidays

Sungai Petani

DC + LAB + HA +

No. 22 (Ground Floor & First Floor),
Jalan Ibrahim, 08000 Sungai Petani, Kedah.
Tel: 04-4258389, 04-4254940
Fax: 04-4292096

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday & Sunday : 8.00 am – 1.00 pm
Public Holiday: Closed
*Closed on 12 public holidays

Langkawi

LAB

No 23A-1(1st oor), Maha City,
Jalan Mahawangsa 1, 07000 Kuah,
Langkawi.
Tel: 04-961 0915

Operation Time :
Sunday to Thursday : 8.00 am – 5.00 pm
Friday : 8.00 am – 1.00 pm
Public Holiday: Closed *Closed on 12 public holidays

NEGERI SEMBILAN

Bahau

LAB

No. 107 Ground Floor, Jalan Dato' Komo, 72100 Bahau, Negeri Sembilan
Tel : 06-4542596
Fax : 06-4541932

Operation Time :
Monday to Friday : 8.00 am – 5.00 pm
Saturday : 8.00 am – 1.00 pm
Sunday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

Seremban

DC + LAB + HA +

No. 38, Jalan S2 B 18 Biz Avenue, Seremban 2,
70300 Seremban, Negeri Sembilan
Tel: 06-6012057, 06-6012072
Fax: 06-6012793

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday, Sunday & Public Holiday : 8.00 am – 1.00 pm

MELAKA

Melaka

DC + LAB + HA +

No. 113 & 114, Jalan Merdeka,
Taman Melaka Raya, 75000 Melaka
Tel: 06-2869902
Fax: 06-2850296

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday, Sunday & Public Holiday : 8.00 am – 1.00 pm

KELANTAN

Kota Bharu

DC + LAB + HA +

Lot 795 & 796, Tingkat Bawah, Seksyen 27,
Jalan Kebun Sultan,
15200 Kota Bharu, Kelantan
Tel: 09-7478158, 09-7471501
Fax: 09-7471504

Operation Time :
Sunday to Thursday : 7.30 am – 5.00 pm
Saturday : 8.00 am - 1.00 pm
Friday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

PAHANG

Bentong

DC + LAB + HA +

No. 66 Ground Floor, Jalan Ah Peng,
28700 Bentong, Pahang
Tel: 09-2235453
Fax: 09-2211081

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday : 8.00 am – 1.00 pm
Sunday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

Mentakab

DC + LAB + HA +

No 61-A, Ground Floor, Jalan Temerloh,
28400 Mentakab, Pahang.
Tel: 09-2781108, 09-2771645
Fax: 09-2771646

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday ; 8.00 am – 1.00 pm
Sunday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

Kuantan

DC + LAB + HA +

A255, Ground and Mezzanine Floor,
Jalan Beserah, 25300 Kuantan, Pahang.
Tel: 09-5662367
Fax: 09-5672361

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday, Sunday & Public Holiday : 8.00 am – 1.00 pm

PERLIS

Kangar

LAB + HA + DC

No. 6 Jalan Jubli Perak, 01000 Kangar, Perlis
Tel: 04-9773285, 04-9770623
Fax: 04-9770618

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday : 8.00 am – 1.00 pm
Sunday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

TERENGGANU

Kuala Terengganu

LAB

134-C(Ground Floor),
Jalan Sultan Zainal Abidin,
20000 Kuala Terengganu, Terengganu
Tel: 09-6221210
Fax: 09-6248154

Operation Time :
Sunday to Thursday : 8.00 am – 5.00 pm
Saturday : 8.00 am - 1.00 pm
Friday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

SARAWAK

Kuching

DC + HA +

Lot 127, Section 51, 4 Jalan Song Thian Cheok, and
Lot 128, Section 51, 2 Jalan Song Thian Cheok,
93100 Kuching, Sarawak
Tel: 082-237037, 082-237219
Fax: 082-237477

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday, Sunday & Public Holiday : 8.00 am – 1.00 pm

Sibu

LAB + HA

Ground and First Floor, 17E & 17F,
Jalan Pedada, 96000 Sibu, Sarawak
Tel: 084-317075, 084-317081
Fax: 084-316057, 084-317075

Operation Time :
Monday to Friday : 8.00 am – 5.00 pm
Saturday : 8.00 am – 1.00 pm
Sunday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

Kuching II

LAB

No. 11 Ground Floor,
Jalan Song Thian Cheok,
93100 Kuching, Sarawak
Tel: 082-231964
Fax: 082-230932

Operation Time :
Monday to Friday : 8.00 am – 5.00 pm
Saturday : 8.00 am – 1.00 pm
Sunday & Public Holiday: Closed
*Closed on 12 public holidays and 52 sundays

Miri

LAB

Lot 1268, Ground Floor, Jalan Melayu,
Centrepoint Commercial Centre Phase 1,
98000 Miri, Sarawak
Tel: 085-441622
Fax: 085-441434

Operation Time :
Monday to Friday : 8.00 am – 5.00 pm
Saturday : 8.00 am – 1.00 pm
Sunday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

Bintulu

LAB

Lot 4205, Bintulu Parkcity Commerce Square (Phase 6),
Jalan Tun Ahmad Zaidi,
97000 Bintulu, Sarawak
Tel: 086-330064, 086-335172

Operation Time :
Monday to Friday : 8.00 am – 5.00 pm
Saturday : 8.00 am – 1.00 pm
Sunday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

SABAH

Kota Kinabalu

LAB + DC + HA +

36, Block D, Ground Floor, Damai Plaza, PH1
Luyang, 88300 Kota Kinabalu, Sabah.
Tel: 088-235241, 088-235040
Fax: 088-251609

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday, Sunday & Public Holiday : 8.00 am – 1.00 pm

Tawau

DC + HA +

TB585, Ground Floor, Lot 45,
Tacoln Commercial Complex,
Jalan Haji Karim 91000 Tawau, Sabah
Tel: 089-757090, 089-757092
Fax: 089-757091

Operation Time :
Monday to Friday : 7.30 am – 5.00 pm
Saturday : 8.00 am – 1.00 pm
Sunday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

Sandakan

LAB + HA

Block 18, Lots 166 & 167,
Ground Floor, Phase II, Prima Square,
Mile 4 Jalan Utara, 90000 Sandakan
Tel: 089-227658
Fax: 089-227653

Operation Time :
Monday to Friday : 8.00 am – 5.00 pm
Saturday : 8.00 am – 1.00 pm
Sunday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

Labuan

LAB

3rd Floor, U 0139, Jalan Bunga Mawar,
87000 Wilayah Persekutuan Labuan
Tel: 087-440118
Fax: 087-440118

Operation Time :
Monday to Friday : 8.00 am – 5.00 pm
Saturday : 8.00 am – 1.00 pm
Sunday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

Fortuna

LAB

Ground Floor Lot 15, Block C, Fortuna Commercial Centre,
Jalan Penampang Fortuna, Majukota Commercial Centre,
88300 Kota Kinabalu, Sabah
Tel: 088-278772

Operation Time :
Monday to Friday : 8.00 am – 5.00 pm
Saturday : 8.00 am – 1.00 pm
Sunday & Public Holiday : Closed
*Closed on 12 public holidays and 52 sundays

CONTACT INFORMATION

Contact Details

Glenmarie, Shah Alam (Operational Headquarter)
Lot 2, Jalan Pendaftar U1/54, Section U1, Temasya @ Glenmarie, 40150 Shah Alam, Selangor, Malaysia.
Tel: 03-55699996, 03-55696826, 03-55690936
Fax: 03-55696829, 03-56352855, 03-55696827

Operation Time:
Monday- Friday : 7am-5pm
Consultation hours : 8.00 am - 5.00 pm
Saturday, Sunday & Public Holiday : 7.30 am - 1.00 pm
Tel : 1-800-88-7171

Email : online@bphealthcare.com

To continue to improve and provide better service , we need the valuable feedback and suggestions from you , as our valued customer

If you have a complaint or feedback (positive /negative) please :-

1. Contact the Customer Service Centre, Marketer or Laboratory frontline staff. The telephone numbers have been given for each branch in the list of branches above
2. Get feedback forms which are available in all the diagnostic centers.
3. Feedback can also be done online in our website http://bphealthcare.com/new/contact-us/feedback/
4. If in particular when the laboratory process has not been effective in resolving your concern, you can report your concerns to JCI via email at jciaccreditation@jcrinc.com .

Verbal complaints may be also given to the staff at the counter in all the branches, Diagnostic or Specialist centers which will be recorded in the Complaint investigation Form FR03-QA05c. Acknowledgment and the complaint number will be given immediately
For all the other modes of feedback, acknowledgement will done within 48 hours (either verbally through a telephone call or email)

All complaints will be investigated and a written reply will be given to the complainant as soon as the investigation is over. If the complainant requires further clarification, to be provided in writing or face to face meeting, a meeting will be arranged with the relevant parties to help resolve the matter and give closure to the complaint.

GENERAL POLICIES

SECTION I: Policies, Guidelines, Sample Collection, Packaging and Transportation, and Special Procedures

GENERAL POLICIES

GENERAL REQUIREMENTS

Proper patient preparation; timing of sample collection; selection of sample container type including preservatives and anticoagulants; sample transportation; and relevant patient clinical data are critical for successful testing, timely reporting of laboratory results, and proper diagnosis.

TEST REQUEST

Routine Test Request

All test requests for laboratory tests should be made by a registered medical practitioner using the BP Clinical Lab Sdn Bhd: **Pathology Request Form (FR3-0P01b) (Appendix A)**

STAT or URGENT Test Request

If the laboratory test result is required urgently for patient(s)' management, please write in red using bold letter "**URGENT** " on the request form and call the laboratory for informing us and urgent pick-up.

The laboratory will notify the doctor immediately once the results are ready, followed by fax or email as per request.

Add-On Test

We discourage additional tests to be requested on sample drawn earlier due to sample degradation because of storage changes and sample integrity which can affect test results.

However, if you need to add on a test after the sample has been collect by the laboratory, please call the respective diagnostic center/main laboratory in Glenmarie or Penang to check if the sample is still available and suitable for performing the additional test request.

Test sent to Referral Laboratory

The list of referral test is included in the Esoteric List. For more detail information on specimen requirement and Turnaround time, please refer to web link **:** http://bphealthcare.com/new/esoteric-list/

PATIENT PREPARATION AND INFORMATION

Patient Preparation

Patient should be instructed about particular requirements of fasting, special dietary consumption, or other requirements before collection. If the test requires self-collection, for example the 24-hours urine collection, please provide the specific instruction pamphlet to the patient.

Patient Identification

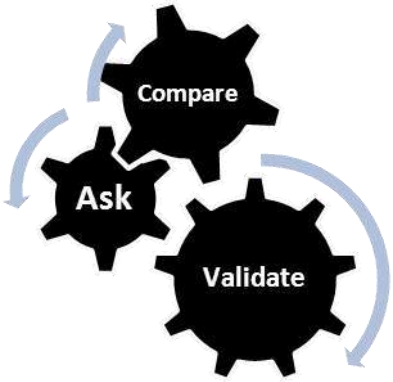
"Correct identification is essential for patient safety "

Each patient must be identified positively, using active communication techniques by means of **two patient identifiers** (patient's name/Identification number (I.C. No)/Passport number) before collecting a sample for clinical testing.

In an in-patient setting, the patient's room number or physical location should **NOT** be used as an identifier. The patient's name and hospital ID number may be used as the two identifiers.

The patient's identity should be verified by asking the patient to identify him or herself, prior to collecting the samples.

The identifying label must be attached to the sample container(s) **at the time** of collection. The containers used for laboratory samples should be labeled with the identifiers in the presence of the patient.



Proper identification is a three – step process!

Patient's Informed Consent

Please provide clear explanation to the patients about the laboratory tests and how they will be collected. Where necessary, such as HIV testing, please obtain written informed consent.

LABORATORY REQUEST FORM

The test request must be made in BP Clinical Lab Sdn Bhd: **Pathology Request Form (FR3-0P01b) (refer Appendix A).**

Mandatory Information Needed on All Patient Requisitions

Patient's name

Please write the patient's name clearly and legibly. Correct spelling of patient's name and provision of other relevant bio-data are essential to ensure that the sample collected and received by the laboratory come from the correct patient.

Patient's NRIC Number or Passport Number

The NRIC (National Registration Identity Card) number is often used as one of the two patient's identifiers.

Date and Time of Sample Collection

The exact date and time of sample collection should be indicated to enable monitoring of sample integrity. The laboratory will counter check the availability at the time of reception. This information is critical for proper evaluation of the results, especially for test results affected by diurnal differences, such as some of hormonal tests.

Nature of Sample

Identify sample source by indicating the specific body site from which the sample had been taken.

Name and Details of Ordering Doctor

Details of the requesting doctor (i.e. name, address, telephone and fax number of the organization, and e-mail address) should be included in the requesting form. The requesting doctor must sign the requesting form. This is to facilitate communication of test results, including notification of critical laboratory results, urgent test results or further discussion of the case (if needed). The use of pre-signed forms is strongly discouraged.

Clinical History, Age and Gender

This information is useful in assisting the laboratory to interpret test results, where the appropriate reference ranges can be included in the patient's laboratory reports.

Please include the clinical diagnosis, suspected disease/organism, brief clinical history, name, date and duration of treatment given, previous test results with dates and previous laboratory numbers, patient's immune status (e.g. any underlying diseases, cancer chemotherapy, immunosuppressive treatment), and any other relevant patient or clinical data in the special instruction section of the requesting form. These information are useful in assisting the laboratory staff interpret the results.

Clinical history is essential for laboratory interpretation of Histopathology, Cytology, Cytogenetic and Virology tests' results.

For Microbiology Tests, the following additional information is required:

* Body site and sample type
* Antimicrobial treatment history
* Date of onset of illness

Test Request

Indicate the test required by ticking the appropriate boxes on the request form. Ambiguous tick in between the boxes is not acceptable.

** When making test requests, please ensure that the tests listed as a group are not ordered again as single tests.

To order tests that are not listed on the form, please write clearly the name of the tests in the space marked "Additional Test (Please specify)".

SAMPLE LABELS

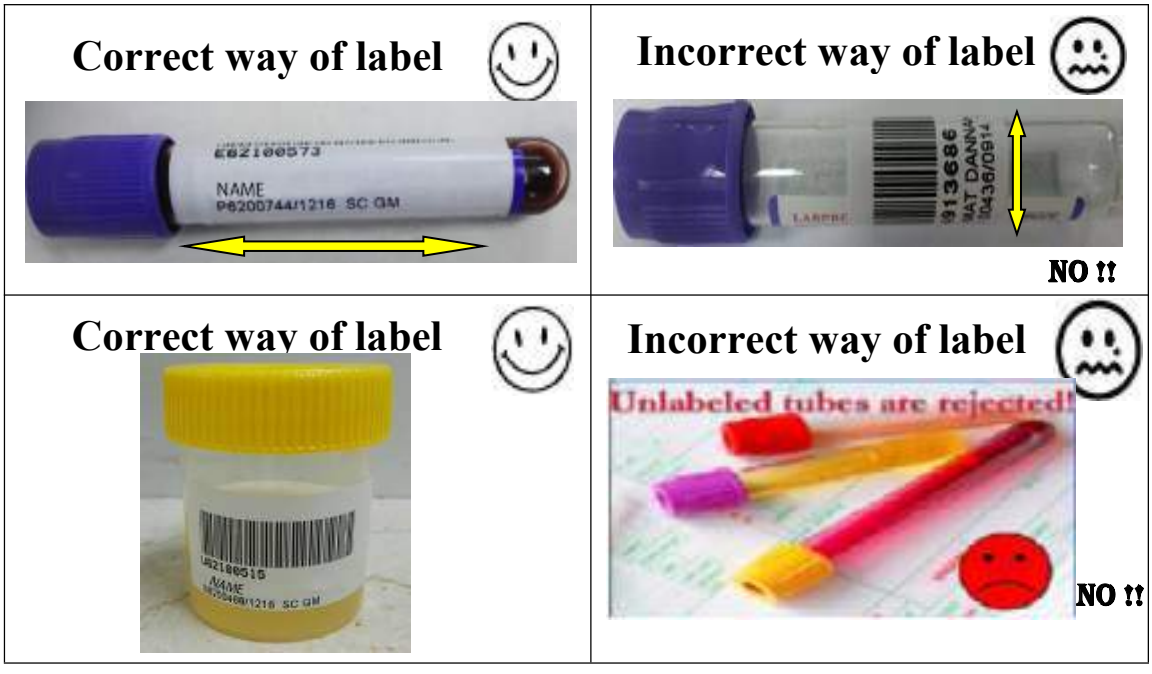
Label all sample containers prior to collection at the patient's side. Together, we can instill the right culture to ensure the right specimen is collected from the right patient and the right order of test being filled in the request form.

The following information is mandatory

- Patient's name
- Patient ID (NRIC or Passport No.)
- Date & Time of collection
- Source of sample (where relevant)

Please stick the label **lengthwise.**

Unlabeled samples will be **rejected**.



SAMPLE COLLECTION

Please note that the sample collection process is dependent on test required and the accuracy and timeliness of test results begin with a successful sample collection.

1. Determine the **type of tests to be ordered and the accompanying instructions** for sample collection (e.g. fasting, non-fasting, pre- or post-medication, pre- or post-dialysis). Determine the time of last medication/meal (if required).

2. Identify the **correct containers/tube types** to be used with the correct additives (if required). Please refer to the ***Testing Listing*** (***Appendix B***) for the appropriate container. Samples must be collected into appropriate containers supplied by or approved by BP Clinical Laboratory.

3. Please **check containers** for any defects **before use**.

4. **Aseptic techniques** must be employed during sample collection to prevent the introduction of micro-organisms into the patient's anatomical space, and to prevent the sample from being contaminated.

5. Collect **sufficient amount** of sample to enable the test(s) to be carried out, especially when multiple tests are ordered. In the case the amount of sample is insufficient please state which tests should be done in order of priority.

6. Please **check the containers again after sample collection** for any leakage and **tighten the lids** of containers properly to prevent leakage of samples during handling and transportation. A leaked sample container can pose infection hazards to the transportation and laboratory staff, besides risking the sample to be insufficient.

7. Please ensure that the **outer surfaces** of the containers are not contaminated by the patients' samples.

8. Please place the sample container in the **plastic bag** provided. Please insert the **Request Form in the pocket** on the side of the bag and **not** in the sample compartment.

9. All samples should be regarded as potentially infectious and the **standard universal precaution guidelines** should be adhered by all healthcare workers during sample collection and handling.

Unacceptable Samples (Rejection Criteria)
The following criteria will be used to consider a sample is unacceptable and will be rejected. The Laboratory staff will inform the ordering clinician will be notified.

- Incompletely filled or no sample identify on the request form
- Sample without accompanying request form
- Sample without any label
- Discrepancy in patient's identity between the request form and sample label
- Inappropriate test sample, e.g. wrong use of container/preservative
- Leaking specimen container
- Grossly haemolysed sample
- Sample received with intact needles

PACKAGING THE SAMPLES

Primary Package

Clinical/biological samples should be placed in a sealed container, for example a sealed Vacutainer™ or a specimen container. For discipline specific container, please refer to the relevant sections in the specific sample collection.

Secondary Package

If the sample is liquid, then the sealed primary container should be placed inside a sealed leak proof secondary package such as a sealed plastic bag or another watertight container which would be sufficient to contain all of the liquid content if the primary container breaks.
Please do the following:

- **One bag** per patient
- Insert the paper request form into the bag's side compartment/pouch/pocket
- Do **not** put the request form together with the sample in same pouch
- Do **not** use staples
- **Needles** must be removed from all sample collection devices before transporting. Samples received with intact needles will be rejected

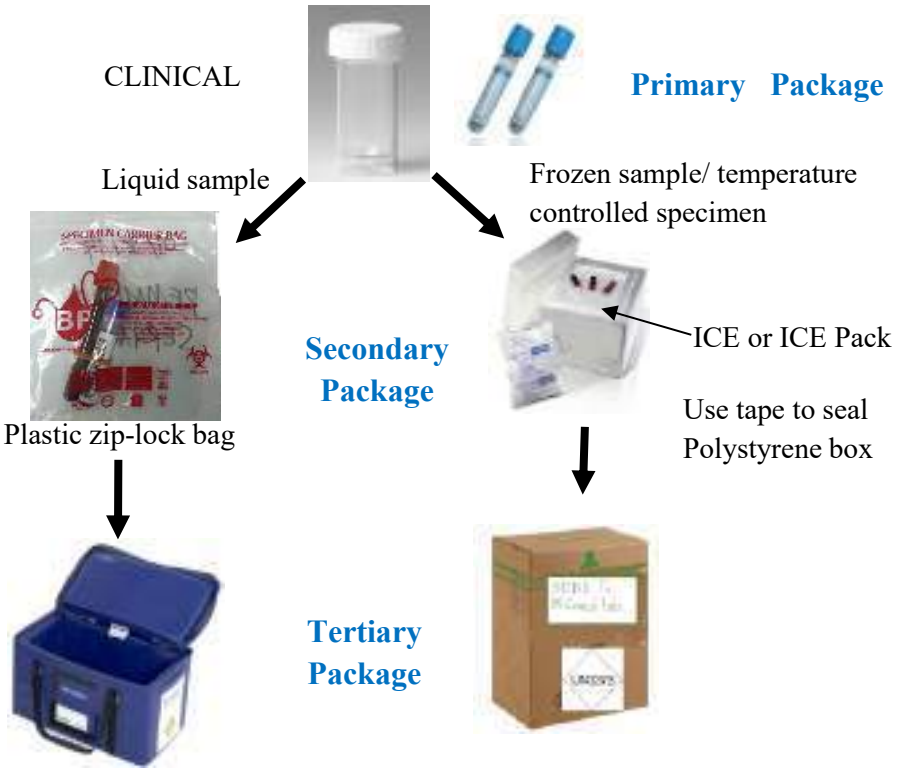
Tertiary Package

A rigid sealed/secured outer container e.g. a cardboard box or plastic container, to house the secondary package. Contain of Ice/ Ice pack to remain low temperature to maintain the sample integrity. Please label the laboratory address clearly.

Special Requirement for Frozen Samples

- For temperature sensitive samples the secondary container may also be a polystyrene box containing wet/dry ice. The box should be sealed with tape
- The polystyrene box is then placed inside a tertiary package with proper labeling

SUMMARY OF PACKAGING FOR CLINICAL / BIOLOGICAL SAMPLE TRANSPORT



PACKAGING OF INFECTIOUS SUBSTANCES AND DIAGNOSTIC SPECIMENS

Triple Packaging System

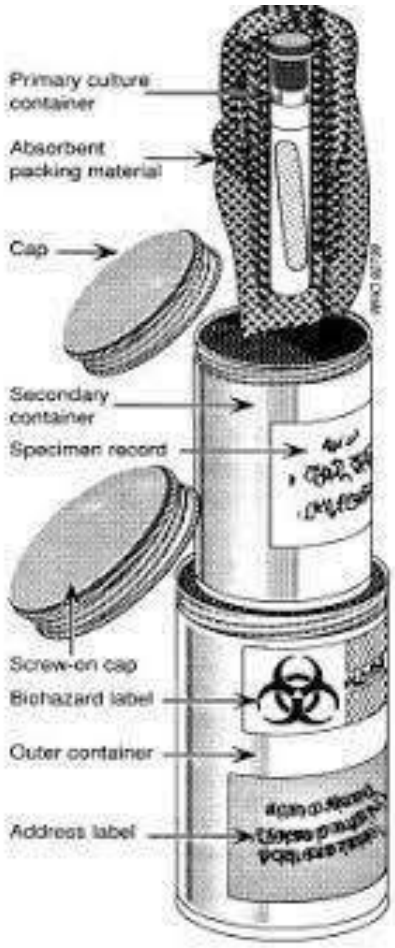
Tests for infectious specimens (Such as: Covid-19 Specimens) require to pack specially to prevent the exposure of infectious microorganisms that may escape from broken, leaking or improperly packaged material.

Primary Package - A primary watertight, leak-proof package containing the specimen. Wrap around with absorbing materials to absorb all fluid in case of breakage.

Secondary - A durable, watertight, leak-proof container (polyester box) to enclose and protect the primary package. Ice packs needed to pack with the primary package to prevent the change of sample integrity.

Tertiary (Shipping package) - The secondary contain is placed in an outer shipping package which protect the secondary package from outside influences such as physical damage and water while in transit.

(WHO: Guidelines for the Safe Transport of Infectious Substances and Diagnostic Specimens)



SAMPLE STORAGE

While waiting for the pick-up services arrive, please keep all samples collected within the recommended temperature, as indicated in the specific sample procedure and List of Tests in Section II.

SAMPLE TRANSPORTATION TO LABORATORY

- All samples should be sent to the laboratory **as soon as possible**
- All samples will be **picked up** from the clinics via the morning and evening pre-determined schedules.
- Sample pick-ups for **urgent test request** can be arranged with B.P. Clinical Lab Sdn. Bhd. at respective outlet laboratories
- Please do not send samples that are **not urgent** during non-office hours.

Transportation of Samples within the Same Building

Please follow instruction as for Primary Package and Secondary Package.

Transport of Samples to Other Areas Not Within the Same Building

Samples should be packaged as per instruction as Primary, Secondary and Tertiary

COMMUNICATION WITH THE LABORATORY

For information regarding laboratory results, specimen collection or Inquiry , please call our laboratory or Customer Service Centre as below:

Direct Line Glenmarie	+603- 5569 6826 +603- 5569 6001 (new) +603- 5569 6002 (new) Monday – Friday : 0800 – 2359 Saturday, Sunday and Public Holiday : 0800 – 1300 Email: online@bphealthcare.com, lsgm@bphealthcare.com

Customer Service Centre **(An alternative line when the Direct Line could not be reached)**

Hotline	1-800-88-7171 and select option 3 for Lab Department, followed by option 1 if you are a doctor or from a Clinic
Operational Headquarters	+603-5569 9996 and select option 3 for Lab Department, followed by option 1 if you are a doctor or from a Clinic

TURNAROUND TIME

Routine Tests

These tests are performed daily and most of the results will be ready 1 **days** after receipt of sample in the laboratory.

STAT/URGENT Tests

A STAT test or an URGENT test request will be given priority over all requests and performed as soon as possible upon receipt. These test results are required urgently for immediate patient management. The turnaround time is **2 hours** and the staff in the laboratory will inform the doctor once the results are ready.

The following are the Tests available on a STAT basis:

- ABO + Rh Grouping
- ESR
- Full Blood Count
- Hb
- PCV
- Platelet Count
- TWBC
- TWDC
- Urine Microscopy
- Urine Feme
- Beta HCG
- Dengue Fever Studies
- Dengue Fever Studies-NS1
- Febrile Studies
- Covid-19 (SARS-CoV-2) Screening (RT-PCR)
- Covid-19 (SARS-CoV-2) Nucleocapsid IgM/IgG

Histopathology

The TAT is generally **three working days** for routine histopathology if the specimen is received at the laboratory before 5.00pm. However, this may be delayed in the following circumstances:

1) Calcified or ossified tissues (usually delayed by two working days)
2) Tissues received at laboratory inadequately fixed (usually delayed by one day)
3) Large complex specimen requiring repeat gross examinations and additional blocks to be taken (usually delayed by one day)
4) Any specimen requiring additional special staining e.g. demonstration of infectious organisms, special stains or immuno-peroxidase stains
5) Any specimen with difficult or unusual findings requiring further study, inter-pathologist discussion, clinico-pathological correlation with the clinician or telepathology consultation
6) Specialized biopsies

Urgent histopathology cases can be reported by the **end of the second working day** if the specimen is small and could reach the regional laboratory by 5.00pm of the first day.

Cytology

Gynaecological PAP smears usually require **two working days**. These smears are initially screened by our PAP screener. The TAT may be longer in cases with suspicious or positive cytological findings, cases randomly selected for quality control re-screen by our pathologists, and those for digital imaging processing.

Non-gynaecological cytological specimen usually require **two working days**. Cases with difficult cytological features may require a longer TAT.

Non-routine Tests

These tests are performed according to a specified schedule. Turnaround time to issuance of results is usually **within a week**. The following is the non-routine test schedule in BP Clinical Lab (Glenmarie) ,updated on 23rd February 2021.

Test Code	Test Description	Sample Requirement	Schedule	Dept
A007, A008, A009	Allergy Basic, Standard and Food Profiles	5 ml Plain Blood/Serum	Batch run (TAT 1 week)	Immunology
3239	Anti-Cardiolipin Ab (Phospholipid Ab)	3 ml Plain Blood/Serum	Tuesday only	Serology
3107	Anti-ds DNA*	3 ml Plain Blood/Serum	Tuesday, Thursday and Saturday	Serology
3112	Anti-Nuclear Factor (ANF) - ELISA Method*	3 ml Plain Blood/Serum	Tuesday, Thursday and Sunday	Serology
1110	Apolipoprotein A1/B	3 ml Plain Blood/Serum (Fasting)	Sunday only	Biochemistry
1246	Beta-2-Microglobulin	3 ml Plain Blood/Serum	Tuesday only	Biochemistry
3121	Chlamydia IgG*	3 ml Plain Blood/Serum	Monday, Wednesday and Friday	Serology
3123	Complement 3 (C3)	3 ml Fresh Plain Blood/Serum	Tuesday and Friday only	Biochemistry
3124	Complement 4 (C4)	3 ml Fresh Plain Blood/Serum	Tuesday and Friday only	Biochemistry
1116	C-Peptide	3 ml Plain Blood/Serum (Fasting)	Monday and Thursday only	Immunology

7008	Dehydroepiandrosteronesulfate (DHEA-S)	3 ml Plain Blood/Serum	Monday and Thursday only	Immunology
3135	Epstein-Barr Virus, VCA IgA Ab*	3 ml Plain Blood/Serum	Tuesday - Saturday, Sun	Serology
7029	Free Testosterone (calculated) (include Testosterone,SHBG,Albumin)	5 ml Plain Blood/Serum	Monday and Thursday only	Immunology
3156	Herpes simplex I IgG Ab (HSV I IgG)*	3 ml Plain Blood/Serum	Monday, Wednesday & Friday only	Serology
3157	Herpes simplex II IgG Ab (HSV II IgG)*	3 ml Plain Blood/Serum	Monday, Wednesday & Friday only	Serology
3211	Immunoglobulin E (Total IgE)	3 ml Plain Blood/Serum	Batch run (TAT 1 week)	Immunology
7017	Insulin	3 ml Plain Blood/Serum (Fasting)	Monday and Thursday only	Immunology
3168	Measles IgG Ab (Rubeola IgG)*	3 ml Plain Blood/Serum	Monday only	Serology
3178	PSA Total, Free PSA & Ratio	3 ml Plain Blood/Serum	Sunday only	Immunology
3210	Sex Hormone Binding Globulin (SHBG)	3 ml Plain Blood/Serum	Monday and Thursday only	Immunology
3195	Varicella-Zoster(Herpes Zoster) IgG Ab*	3 ml Plain Blood/Serum	Monday	Serology
3237	HbsAg Confirmatory Test (Qualitative)	3 ml Plain Blood/Serum	Monday & Friday only	Immunology

Note: Above TAT apply to any profile test code which consist of above single test code
[*]: Specimen received after the batch test started on the same day (morning) or after the schedule date will be proceed on the next batch.
[*]: If result required repeat/ verification, test will schedule on the next batch.

HANDLING OF TEST RESULTS

- All test results are treated with strict confidentiality.
- Laboratory management is responsible for ensuring that reports are received by the appropriate individuals within an agreed-upon time interval. When results transmitted as an interim report, the final report will be forwarded to the requester.
- The total turnaround time (i.e. from the time the specimen is requested till the report is available to the requestor) is monitored for urgent test requests by the laboratory.
- All shortfalls in the turnaround time are investigated and where necessary, corrective action are taken immediately to address any problems.
- Copies or files of reported results are retained electronically in the Laboratory Information System. This facilitates retrieval of the information.
- The laboratory will notify the physician (or other clinical personnel responsible for patient care) when the test results for critical properties fall within established “alert” or “critical” interval and when an urgent test is requested.

CRITICAL LABORATORY VALUES

Definition:

Critical laboratory Result — Test result or value that falls outside the critical limits or the presence of any unexpected abnormal findings, cells or organisms which may cause imminent danger *to the patient, and/or require immediate medical attention*

Critical Limit — Boundaries of low and high laboratory test values beyond which may cause imminent danger to the patient and/or require immediate medical attention

Who Do We Inform?

To the clinician who had ordered the test or to the next designated person if the responsible clinician is not around.

How are the Critical Values Identified?

The values are adapted and modified from a study done in Ministry of Health hospitals (2004-2009) and feedback from 611 clinicians from various specialization *(Lily et al: Improving Notification of critical results in MOH Hospitals-Delphi Survey Report 2009)*

Critical Values for Biochemistry Tests

Values for Adults			Values for Paediatric		
Lower Critical Limit	**Analytes**	**Upper Critical Limits**	**Lower Critical Limit**	**Analytes**	**Upper Critical Limits**
2.8 mmol/L	Potassium	6.0 mmol/L	2.8 mmol/L	Potassium	6.0 mmol/L
125 mmol/L	Sodium	155 mmol/L	125 mmol/L	Sodium	155 mmol/L
50 mg/dL	Glucose	360 mg/dL	28 mg/dL	CSF-Glucose	-
6.0 mg/dL	Calcium	12.0 mg/dL	6.8 mg/dL	Calcium	12.4 mg/dL
0.99 mg/dL	Magnesium	4.86 mg/dL	1.21 mg/dL	Magnesium	4.37 mg/dL
1.0 mg/dL	Phosphate	8.8 mg/dL	1.2 mg/dL	Phosphate	8.6 mg/dL
-	Urea	200 mg/dL		Urea	53 mg/dL
-	Creatinine	7.4 mg/dL		Creatinine	4.3 mg/dL
-	Triglycerides	500 mg/dL	-	-	-
-	-	-	-	Bilirubin	Neonate 30.0 mg/dL Children 25 mg/dL
-	Creatinine kinase	≥10,000 U/L	-	-	-
-	-	-	-	Uric Acid	8 mg/dL
-	Amylase	500 U/L	-	-	-
250 mmol/kg	Serum Osmolality	350 mmol/kg	250 mmol/kg	Serum Osmolality	310 mmol/kg
-	Lithium	1.5 ммol/L	-	-	-

Critical Values for Hematology Tests

Values for Adults			Values for Paediatric		
Lower Critical Limit	**Analytes**	**Upper Critical Limits**	**Lower Critical Limit**	**Analytes**	**Upper Critical Limits**
7.0 g/dL	Haemoglobin	19.0 g/dL	7.0 g/dL	Haemoglobin	20.0 g/dL
			8.0 g/dL	Haemoglobin (Neonate)	22.0 g/dL
20%	Hematocrit	60%	20%	Hematocrit	40%
			25%	Hematocrit (Neonate)	70%
50 X 10^3/µL	Platelet	1000 X 10^3/µL	50 X 10^3/µL	Platelet	1000 X 10^3/µL
1,000 /cmm	TWCC	50,000 /cmm	-	-	-
1.5 M/cmm	TRCC	6.5 M/cmm	-	-	-
8 Seconds	PT	20 Seconds	-	-	-
-	APTT	50 Seconds	-	-	-
100 mg/dL	Fibrinogen	-	70 mg/dL	Fibrinogen	-

Critical Findings for Microbiology

Test	Results
Cerebrospinal fluid C&S	Microscopic result (N or abN)
Cerebrospinal fluid Ag	Positive rapid Antigen detection
Blood Culture	Positive result gram stain/culture
Sterile body fluids	Positive result gram stain/culture
Acid Fast Bacilli	Positive smear result /culture
Malaria Parasite	Presence of parasite on blood film
Stool Culture	Salmonella typhi, vibro cholerae, shigella, E.coli O157
Any Type Culture	ESBLs, MRSA, MRO, VRE, VRSA.
Antigen detection	Legionella sp
Pernasal swab	Bordetella Pertussis, Corynebacterium diptheria

Critical Findings for Anatomical Pathology

Test	Results
Unexpected /discrepant findings	Unexpected malignancy, wrong organ removed
Reports of infections	Bacteria in heart valve or bone marrow Organisms in an immune-compromised patients such as AFB, fungi, viral, protozoa Organisms in CSF Unusual organisms or organism in unusual sites
Reports on critically ill patients requiring immediate therapy	Crescents in greater than 50% of glomeruli in renal biopsy specimen Transplants rejections
Cases that have immediate clinical consequences	Fat in an endometrial curettage Mesothelial cells in heart biopsy Fat in snare colon biopsy specimens

WHO GUIDELINES ON DRAWING BLOOD: BEST PRACTICES IN PHLEBOTOMY

WHO Guidelines

WHO GUIDELINES ON DRAWING BLOOD: BEST PRACTICES IN PHLEBOTOMY

WHO GUIDELINES ON DRAWING BLOOD: BEST PRACTICES IN PHLEBOTOMY

Purpose and scope

The following guidelines summarize the best practices in phlebotomy to improve the outcomes for health workers and patients, for all levels of health care where phlebotomy is practiced. They extend the scope of the existing guidelines from the World Health Organization (WHO) and the Safe Injection Global Network (SIGN), which is a WHO-hosted network.

Objective

The objectives of these guidelines are:

- To improve knowledge and awareness of the risks associated with phlebotomy among all health workers involved in the practice;
- To increase safe practices and reduce blood borne virus exposure and transmission;
- To improve patient confidence and comfort;
- To improve the quality of laboratory tests.

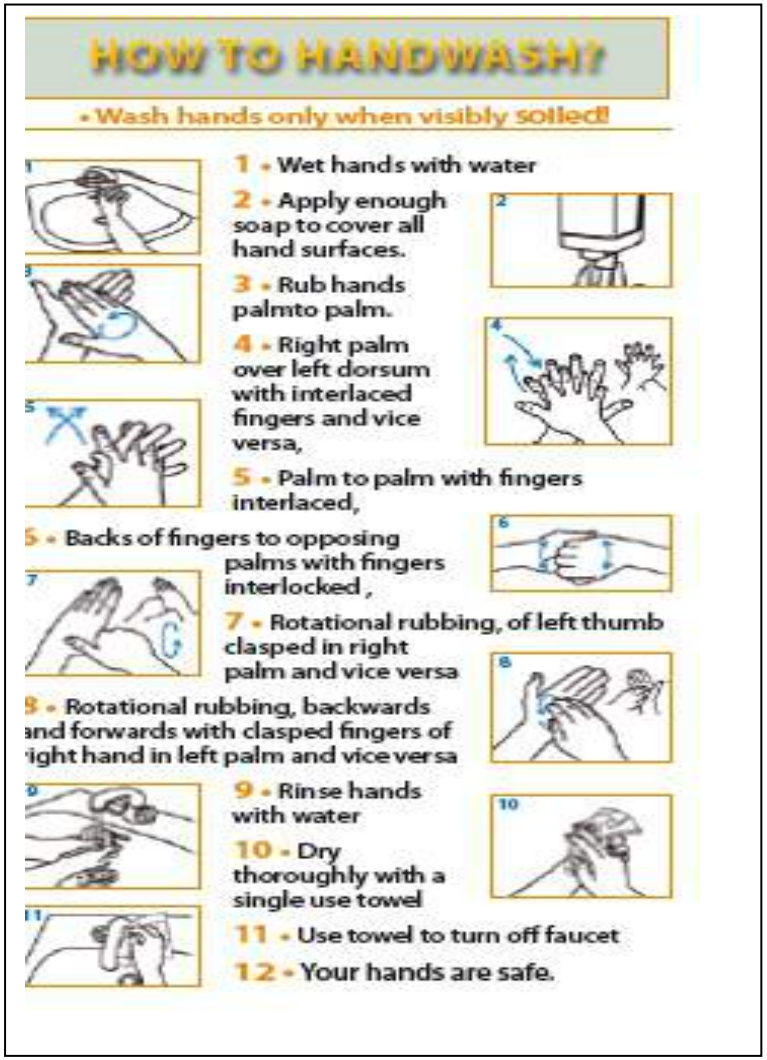
Infection Prevention and Controls:

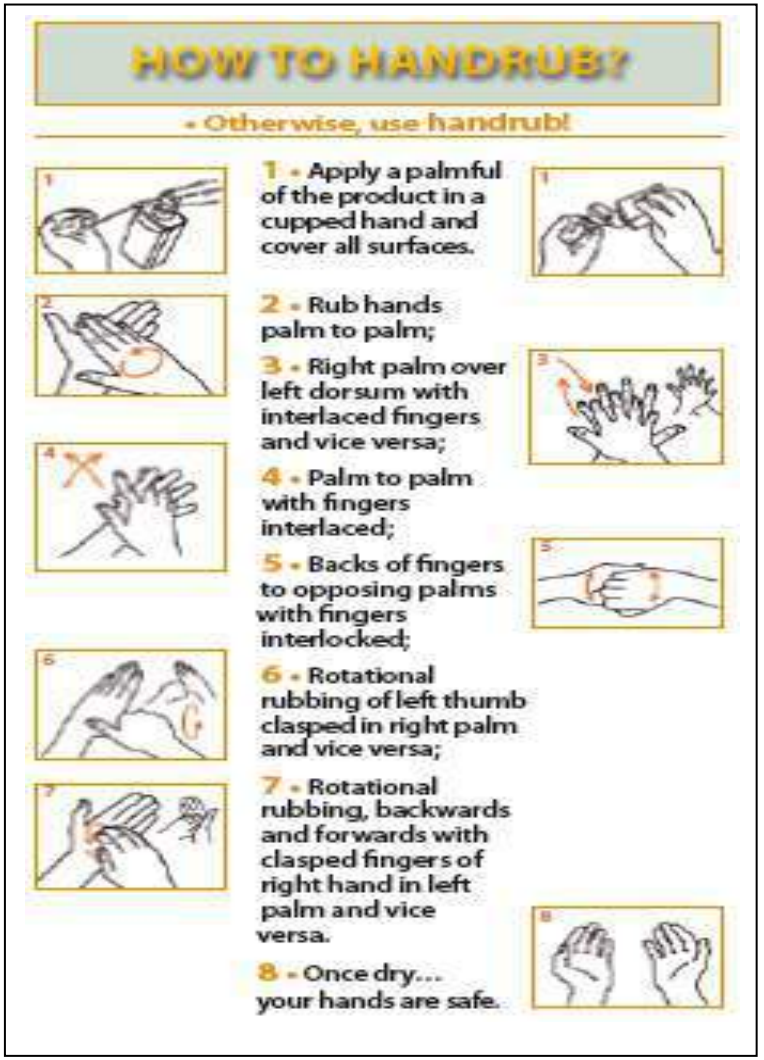
At all times, follow the strategies for infection prevention and control as listed below:-

DO	DO NOT
DO carry out hand hygiene (use soap & water or alcohol rub), & wash carefully, including wrists & spaces between the fingers for at least 30 seconds (Please note the WHO's 'My 5 moments for hand hygiene)	DO NOT forget to clean your hands
DO use one pair of non-sterile gloves per procedure or per patient	DO NOT use the same pair of gloves for more than one patient DO NOT wash gloves for reuse
DO use a single-use device for blood sampling & Drawing	DO NOT use a syringe, needle or lancet for more than one patient
DO disinfect the skin at the venipuncture site	DO NOT touch the puncture site after disinfecting it
DO discard the used device (a needle and syringe is a single unit) immediately into a robust sharps container	DO NOT leave an unprotected needle lying outside the sharps container
Where recapping of a needle is unavoidable, DO use the one-hand scoop technique	DO NOT recap a needle using both hands
DO seal the sharps container with a tamper-proof lid	DO NOT overfill or decant a sharps container
DO place laboratory sample tubes in a sturdy rack before injecting into the rubber stopper	DO NOT inject into a laboratory tube while holding it with the other hand
DO immediately report any incident or accident linked to a needle or sharp injury, and seek assistance; start PEP as soon as possible, following protocols	DO NOT delay PEP after exposure to potentially contaminated material; beyond 72 hours, PEP is NOT effective

PEP, post-exposure prophylaxis; WHO, World Health Organization.
An http://www.who.int/gpsc/5may/background/5moments/en/index.html

Wash Yours Before Venipuncture

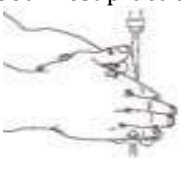




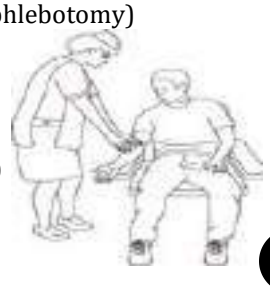
Practical Guidance on Venipuncture for Laboratory Testing

(WHO guidelines on drawing blood: Best practices in phlebotomy)

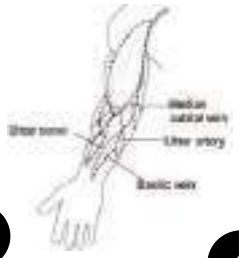
1. Assemble equipment to include needle and syringe or vacuum tube, depending on which is to be used



2. Perform hand hygiene



3. Identify and prepare the patient. Ask the patient to state his full name.

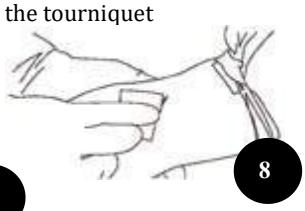


4. Select the site (preferably at the bend of the elbow). Palpate the area; locate a vein of a good size that is visible, straight and clear. The vein should be visible without applying the tourniquet

5. Apply a tourniquet 4–5 finger widths above the selected site

6. Ask the patient to form a fist so that the veins are more prominent

7. Put on well fitting, non-sterile gloves

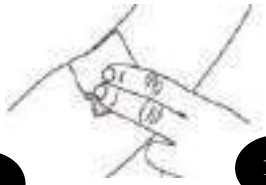


8. Disinfect the site. Use 70% isopropyl alcohol and allow to dry. **DO NOT touch the site once disinfected.**

9. Anchor the vein by holding the patient's arm and placing a thumb BELOW the venipuncture site. DO NOT touch the cleaned site; in particular, DO NOT place a finger over the vein to guide the needle

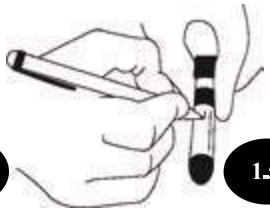
10. Perform venipuncture. Enter the vein swiftly at a 30 degree angle

11. Once sufficient blood has been collected, release the tourniquet BEFORE withdrawing the needle



12. Withdraw the needle gently. Give the patient a clean gauze or dry cotton-wool ball to press gently on the site. Ask the patient **NOT to bend the arm**

13. Discard the used needle and syringe or blood-sampling device immediately into the sharps container



14. Check the label and forms for accuracy

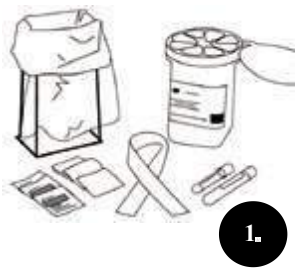
<u>Filling tubes</u>

1. If the tube does not have a rubber stopper, press the plunger in slowly to reduce haemolysis (This is safer than removing the needle).

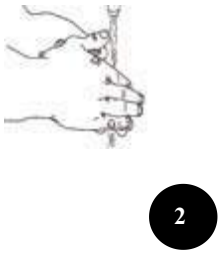
2. Place the stopper in the tube.

3. Following laboratory instructions, invert the sample gently to mix the additives with the blood before dispatch**.**

Practical Guidance on Pediatric and Neonatal Blood Sampling (WHO guidelines on drawing blood: Best practices in phlebotomy)

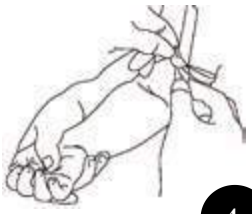


1. Collect supplies and equipment. Use a winged steel needle



2. Perform hand hygiene

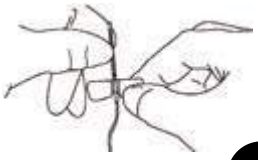
3. Immobilize the baby or child



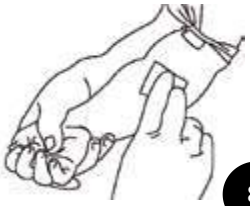
4. Apply a tourniquet

5. Put on well-fitting, non-sterile gloves

6. Attach the end of a winged infusion set to the end of the vacuum tube

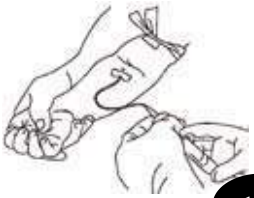


7. Remove the plastic sleeve from the end of the butterfly

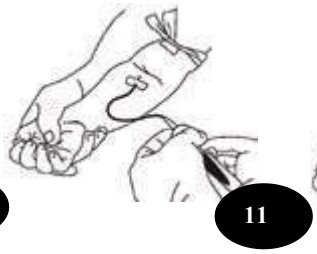


8. Disinfect the collection site

9. Use a thumb to draw the skin tight and insert the needle

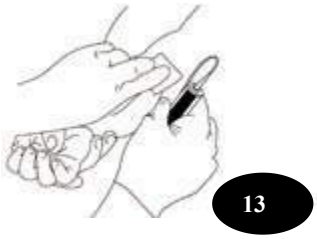


10. Push the vacuum tube completely onto the needle



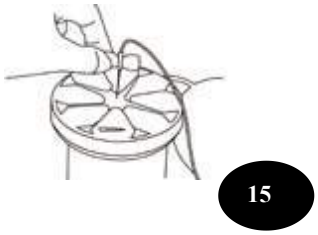
11. Blood should begin to flow into the tube. Fill the tube until it is full or until the vacuum is exhausted

12. Release the tourniquet

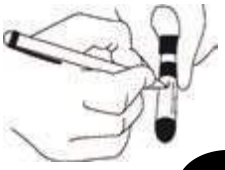


.
13. Place dry gauze over the venipuncture site and slowly withdraw the needle

14. Ask the parent to continue applying mild pressure



15. Remove the butterfly from the vacuum tube holder. Dispose of the butterfly in a sharps container



16. Label the tube with the patient identification number and date

BLOOD SAMPLE COLLECTION

BLOOD SAMPLE COLLECTION

Blood Sample

Most laboratory tests are performed on anti-coagulated whole blood, plasma or serum.

Whole Blood

Draw sufficient blood into appropriate tube. Invert the tube **gently**, 6 to 8 times immediately after collection. Please **do not** vigorously shake the tube for it will cause haemolysis. Send sample to the laboratory as soon as possible.

Plasma

Draw sufficient blood into appropriate tube. Invert the tube **gently**, 6 to 8 times immediately after collection. Send sample to the laboratory as soon as possible. If required, separate the plasma from the clot within 20-30 minutes, by centrifuging.

Serum

Draw sufficient blood into appropriate tube. Allow blood to clot at room temperature. Send sample to the laboratory immediately. If required, separate serum from the clot within 20-30 minutes, by centrifuging.

Vacuum Tube System Reminders

1. Tubes with **powdered anticoagulants** should be **tapped near the stopper** to dislodge any anticoagulant that may be between the stopper and the tube wall.
2. All tubes with liquid anticoagulants should be **filled to the exhaustion** of the vacuum to ensure proper ratio of anticoagulant to blood.

Order-Of-Draw Guidelines

The following order-of-draw is recommended when drawing multiple samples for clinical laboratory testing during a single venipuncture. Its purpose is to avoid possible test result error due to cross contamination from tube additives. This procedure should be followed for both, glass and plastic venous blood collection tubes:

1. Blood culture tube
2. Coagulation tube (e.g. blue closure)
3. Serum tube with or without clot activator, with or without gel (e.g. red closure)
4. Heparin tube with or without gel plasma separator (e.g. green closure)
5. EDTA (e.g. lavender closure)
6. Glycolytic inhibitor (e.g. gray closure)

When using a winged blood collection set for venipuncture and a coagulation tube is the first tube to be drawn, a discard tube should be drawn first. The discard tube must be used to fill the blood collection tubing dead space and to assure maintenance of the proper anticoagulant/blood ratio and need not be completely filled. The discard tube should be a non-additive or a coagulation tube.

(Reference: CLSI DOCUMENT H3-A5, Procedures for the Collection of Diagnostic Blood Samples by Venipuncture; Approved Standard-5th edition, Vol. 23, No. 32)

Order of Draw for Multiple Tube Collections:

Blood should be collected in the RECOMMENDED order based on the test(s) being collected to prevent contamination:-

Order of Draw	Description	Tube Content	Draw Volume	Determinations	Instructions
1		BACTEC Blood Cultures	8-10 mL per bottle	Aerobic & Anaerobic Cultures	Sample for Blood cultures should be done separately. However, if blood samples are also needed, then **blood cultures are done first** to avoid contamination by additives from other blood tubes
2	 Blue	Sodium Citrate	2.7 mL	PT/PTT PT/INR Platelets Function Test (PFT) (use 7 tubes for PFT)	Allow tube to fill completely. Mix by inverting **4** times
3	 Red	Plain	6 mL	Antibody identifications (Immuno-haematology)	Mix by inverting **5** times
4	 Gold	SST (Plain with Gel)	5 mL	For Biochemistry tests (serum determinations)	Mix by inverting **5** times
5	 Green	Lithium Heparin	4 mL	Ammonia **(please send in with ice-pack)**, HLAB27 (use 2 tubes), Cytogenetic investigations	Mix by inverting **8** times
6	 Pink	K_2EDTA 10.8 mg	6 mL	Strictly for Group X-Match, Pre-transfusion Tests (Blood Group, Antibody Screen, Compatibility test)	Mix by inverting **8** times
7	 Laven der	K_2EDTA 5.4 mg	3 mL	FK506, Cyclosporin, G6PD, FBC, HbA1c, Homocysteine **(please send in with ice-pack)**	Mix by inverting **8** times
8	 Grey	Sodium Fluoride	6 mL	Lactate **(please send in with ice-pack)**, Pyruvate, GTT	Mix by inverting **8** times

CLSI: Clinical Laboratory and Standards Institute.
Reference: H3-A5 Vol. 23 No. 32 Replaces H3-A4 Vol. 18 No. 7

Blood Collection

a) It is recommended to take blood from **a seated patient before breakfast** to avoid interference from food, diurnal variation and variations arising from body position (exception for hospital in-patients).

b) **Venous blood** is used for testing most substances except for blood pH and blood gases measurement (whole arterial blood is heparinized in a tube with minimal head space or syringe in which it was taken).

c) **Avoid prolonged venous stasis** by releasing the tourniquet soon after the needle enters the vein. Refrain from taking blood from a limb with a running intravenous infusion.

d) Observe careful technique and gentle handling to prevent haemolysis and trauma to the surrounding tissues.

e) Collect blood samples in **standard colour-coded vacutainers**. Obtain the tubes from B.P. Clinical Lab Sdn. Bhd. outlet laboratory. Users can requisite for blood tubes using consumables requisition form.

f) Fill all tubes until the vacuum is exhausted and blood ceases to flow. For accurate results, fill the tubes **to the marked line** to ensure the correct blood anticoagulant ratio is attained and invert the tubes **gently** 6 to 10 times immediately after venipuncture.

Draw sufficient blood
- Fill to the **"BLACK" mark** on the tube

3mL EDTA 2mL Sodium Fluoride

Description of Vacutainer Blood Collection Tubes

LABPRO tubes are used at B.P. Clinical Lab Sdn. Bhd. The table below gives a summary of the tubes available:

Color Code	Anticoagulant	Available Size	Laboratory Use	Number of inversion
Red 	No anticoagulant	5mL vacutainer 7mL vacutainer	For serum determinations in chemistry. May be used for routine blood donor screening and diagnostic testing of serum for infectious disease. ** Blood clotting time: 60 minutes	5
Blue 	Sodium Citrate	3mL vacutainer	For trace-element, toxicology, and nutritional-chemistry determinations. Special stopper formulation provides low levels of trace elements	8
Yellow 	No anticoagulant. Contains gel for serum separation.	8mL vacutainer	For serum determinations in chemistry. May be used for routine blood donor screening and diagnostic testing of serum for infectious disease. ** Blood clotting time: 30 minutes.	5
Green 	Sodium Heparin	5mL vacutainer	For plasma determinations in chemistry. Tube inversions ensure mixing of anticoagulant (heparin) with blood to prevent clotting	8
Lavender 	EDTA (K3)	3mL vacutainer	K3EDTA for whole blood hematology determinations. ***Tube inversions ensure mixing of anticoagulant (EDTA) with blood to prevent clotting	8
Gray 	Sodium Fluoride	2mL vacutainer	For glucose determinations. Sodium fluoride is the antiglycolytic agent. ***Tube inversions ensure proper mixing of additive with blood.	8

SPECIMEN REQUIREMENTS FOR OPTIMAL RESULTS

1. Contamination and Evaporation

Specimens should be kept in closed tubes

2. Prompt Processing

Please inform dispatcher to collect specimens and deliver to the laboratory as soon as possible (**within 2 hours** of collection).

For longer periods, **separate** serum or plasma from contact with cells (non-whole blood) and **keep in the refrigerator** until delivery to the laboratory. If centrifuge is not available, collect serum using a Pasteur pipette and transfer it into a plain container once the clot has retracted.

3. Fasting Blood

Draw blood after an overnight fast of 10-12 hours. Take all essential medication with a glass of plain water only. Fasting specimens are required for the following tests:

- Alpha-Fetoprotein (AFP)
- Apolipoprotein A1/B
- B-hCG
- CA 12-5
- CA 15-3
- Carcinoembryonic Antigen (CEA)
- C-peptide
- Dehydroepiandrosterone sulfate (DHEA-S)
- Estradiol (E2)
- Ferritin
- Folate/Folic Acid
- Follicle Stimulating Hormone (FSH)
- Free Prostate Specific Antigen (Free PSA)
- Free Thyroxine (FT4)
- Free Triiodothyronine (FT3)
- Glucose
- Growth Hormone
- Homocysteine
- Insulin
- Insulin-like Growth Factor
- Intact Parathyroid Hormone (iPTH)
- Lipids Profile
- Luteinizing Hormone (LH)
- Parathyroid Hormone, Intact
- Progesterone
- Prolactin
- Sex Hormone Binding Globulin (SHBG)
- Testosterone
- Thyroid Stimulating Hormone (TSH)
- Total Prostate Specific Antigen (Total PSA)
- Total Thyroxine (TT4)
- Total Triiodothyronine (TT3)
- T-Uptake
- Unconjugated Estriol (E3)
- Vitamin B12
- Vitamin D

4. Timing

Please ensure timed specimens are collected for analytes which show **marked diurnal variation**, e.g. ACTH and cortisol. Please ensure that the correct test is ordered, for example**,** ***Cortisol 8am for specimens taken at 8am***.

5. Temperature

Specimen (excluding swab and semen) must be stored at **2-8°C** and must reach the laboratory as soon as possible, **2 hours** for coagulation studies and ESR,

The following general rules apply to the storage of serum or plasma:

- At room temperature, no significant changes occur in metabolites, enzymes and electrolytes over a 4 hour period;
- At 2-8°C, metabolites, enzymes and electrolytes are practically unchanged after 24 hours.

Other samples may remain stable over a longer period than the above specified rules.

Specimens are chilled to inhibit the metabolism of blood cells and to stabilize certain thermo labile constituents. **Do not** chill **whole blood specimens** unless indicated.

PLEASE CHILL the specimens for the following analytes immediately in either crushed ice or a mixture of ice and water. Ensure that the coolant covers the specimen level in the tube.

- Adrenocorticoid Hormone (ACTH)
- Parathyroid Hormone, intact
- Gastrin
- Growth Hormone

Do NOT chill <u>Lactate Dehydrogenase Isoenzymes</u> specimens.
Keep at room temperature.

6. Exposure to Light

Photosensitive analytes may be degraded on exposure to direct sunlight (UV) or artificial light. Protect samples with aluminum foil wrap or equivalent.

All **urine specimens** that require protection from light should be collected in a brown tinted container, placed in a brown paper bag, or wrapped in foil (preferred).

All **serum, plasma, or whole blood specimens** that require protection from light should be placed in a brown paper bag or wrapped in foil (preferred).

The following is a listing of tests that require that the sample be protected from light:

- Amphotericin B, Serum
- Bilirubin, Fractionated
- Bilirubin, Total
- Carotene
- Chlordiazepoxide, Serum
- Chlorpromazine, Serum
- Folic Acid, Erythrocytes
- Isoniazid, Serum
- Lipid Survey, Body Fluids
- Porphobilinogen(PBG), Quantitative, Urine
- Porphyrins, Qualitative Screen, Urine
- Porphyrins, Quantitative, Urine
- Pyridoxal 5-Phosphate, Plasma
- Rifampin
- Thioridazine
- Trifluoperazine, Serum
- Vitamin A
- Vitamin B1, Plasma or Serum
- Vitamin B1, Whole Blood
- Vitamin B2
- Vitamin B3 (Niacin)
- Vitamin C, Plasma
- Vitamin E
- Vitamin K

SPECIMEN ARTEFACTS

Inaccurate blood tests results may be due to the following errors in collection technique, transportation or processing:

Problem	Common Causes	Consequences
Prolonged venous stasis during collection (tourniquet)	• Cuff being left up around arm	• High serum Calcium (Ca), Albumin (ALB), Lipids, Protein (TP), Haemoglobin (Hb), Packed Cell Volume (PCV), White Cell Count (WCC), Platelet Count (Plt) • APTT/PT may be shortened
Delay in separation of serum or plasma	• Overnight storage • Delay in transit	• High Potassium, Aspartate Transaminase (AST), Lactate Dehydrogenase (LDH), Magnesium (Mg) • Low Sodium (Na) (occasionally), Glucose (GLU) • Inaccurate coagulation results
Incorrect container or anticoagulant; inadequate anticoagulant ratio	• No enzyme inhibitor • EDTA tube for routine chemistry • Improper mixing of specimen	• Low GLU • High Na, K • Low Ca, Alkaline Phosphatase (Alkp) • Prolonged APTT/PT (EDTA/Heparin) • Low Plt (Heparin) • Artefactual changes in cell morphology, on blood film (too little blood added to anticoagulant) • Low Hb/PCV, WCC, Plt (small clot detected) (too much blood added to anticoagulant)
Lipaemia	• Specimen taken immediately after fatty meals or in patients with hypertriglyceridaemia	• Optical interference with many assays such as Ca, ALB, Phos, Creat, Alkp, AST, Glucose • Falsely low Na • Falsely elevated Hb
Hyperglobulinaemia	• Patients with liver disease	• Low Na, Ca • Elevated Hb
Contamination of blood by infused fluids	• High Molecular Weight dextrans • Dextrose • Crystalloid solutions • Phosphate • Citrate	• Elevated TP, ALB • High GLU, Triglycerides • Spurious Na, K, Chloride (Cl) • Low ionized Ca • High Na • Low Phosphate (Phos), Creatinine (Creat), Alkp, AST • Prolonged APTT/PT (Heparin) • Low Hb/PCV, WCC, Plt
Photolabile analytes	• Specimen not protected with aluminum foil wrap/equivalent	• Low Folate, Vitamin B12, Porphyrins Neonatal Bilirubin, Vitamin A
Bubbles in blood for arterial gases	• Leaking syringe/needle junctions • Inadequate stoppering	• Low PCO_2 • Increased PCO_2

Problem	Common Causes	Consequences
Haemolysis	• Blood sample forced through a needle into container/tube • Vigorous mixing of sample • Excessive delay in transit • Sample in hot place • Difficult venipuncture or blood drawn from haematoma • Disease process causing intravascular haemolysis • Ethanol on skin	• High K, Hb, Phospate (PO4) • Low Na, Cl, Thyroxine (T4), GLU • High AST, LDH, LDH1, Alanine Transaminase (ALT) • High Mg, Ca, ALB, TP, Iron (Fe) • Interferences in colorimetric assays • Activates clotting factors • Red cell parameters altered in Full Blood Count (FBC)
Incorrect proportion of anticoagulant to blood (<90% of the expected fill of the vacutainers)	• Excess citrate • Excess liquid heparin • Excess EDTA	• Prolonged PT and APTT • Abnormal Arterial Blood Gases (ABG) and diluted analytes • PCV, Cell Count, Cell Morphology affected
Clots in anticoagulated blood	• Difficult venipuncture • Specimens not mixed well	• Shortened PT • Spurious results in FBC, ABG, Cyclosporin, hormones and other assays requiring whole blood specimens
Specimens not chilled or sent to the laboratory immediately	• Delay in transit • No coolant available • Instructions not understood	• Spurious results in Ammonia (NH_3), Lactate, Pyruvate, ABG, Gastrin, Parathyroid Hormone (iPTH), Adrenocorticotropic Hormone (ACTH), Renin and complement. • May not identify Chlamydia, amoeba and some microorganisms because of poor viability

ROUTINE URINALYSIS:

- Routine urinalysis should be performed on a fresh specimen.
- Specimens that are **more than two hour** old will usually show signs of deterioration and will be unreliable for testing.
- Specimens collected from the patient should be delivered immediately to the laboratory.
- Samples can be **refrigerated** if there is a delay in delivering to the laboratory.

SPECIFIC SAMPLE COLLECTION

SPECIAL PROCEDURES FOR BIOCHEMISTRY TESTS

24-Hour Urine Collection

Most quantitative assays are performed on urine specimen collected over 24 hours. The 24-hour timing allows for circadian rhythmic changes in excretion at certain time of day.

Procedure of collection:

- The 24-hour urine bottle which contains preservative for the required test is available at the collection center and provided on request, with the accompanying request form or note.
- On the day of collection, the first urine voided must be thrown away. Time of first urine voided is the start of the timing for the 24-hour collection.
- Collect the second and subsequent voided urine for 24-hour from the timed start into the 24-hour urine bottle.
- For male patient, it is advisable NOT to void the urine directly into the 24-hour urine bottle. This is to avoid possible chemical burns.
- At the end of 24 hours, the last urine voided is collected. For best result, refrigerate the sample.
- Label the bottle as directed and send immediately to the laboratory.
- Examples of the tests: 24-hours urine cortisol and 24-hours urine catecholamine

24-Hour Urine Catecholamines

- Please refer to the procedure for 24-hour urine collection to collect urine for 24-hour urine catecholamines.
- Please note that, 10 mls of 25% HCl is added into the bottle to preserve the analytes. It is important for the requesting physician to advise the patient **NOT** to discard the preservative.
- Instructions on patient preparation and specimen collection:
  - Abstain from bananas, coffee, pineapple and walnuts one day prior to and during the 24-hour urine collection.
  - Certain drugs alter the metabolism of catecholamines. It is advisable to stop such medications at least days prior to urine sampling. The medications include: Alpha2 agonists, Calcium channel blockers, ACE inhibitors, Bromocriptine, Methyldopa, Monoamine oxidase inhibitors, Alpha blockers and Beta blockers, Phenothiazines and Tricylic antidepressants.
  - Please advise patient to avoid stress, exercise, and smoking prior to and during urine collection.

Patient Information for 24-hour urine collection

With any medical test it is important that other factors do not interfere with your test result. Please read and follow these instructions carefully.

- You must use the collection bottle provided BP Diagnostic center
- ***Do not*** discard or touch any of the preservatives in the bottle.
- Keep the lid on tight.

Collecting the specimen

Drink your normal amount of fluids during the 24-hour period.

Day 1

- When you get up (e.g. 7:30am) pass urine into the toilet.
- Do **not** collect this first urine
- Please collect the subsequent urine you void throughout the day and night. In the collection bottle
- Write the **date, time, your name and IC No**. on the collection bottle label.

Collect ALL urine for 24 hours

- Use a clean plastic container
- Pour the urine into the collection bottle
- Store the specimen in a cool place
- Rinse the plastic container after each use.

Day 2

- Collect only the first morning sample of urine when you 7:30am).
- Add it to the collection bottle
- This is the end of the 24-hour collection. Write the **date and time** on the label.

Delivering the specimen

Deliver the specimen promptly to your nearest BP Diagnostic center

Your results

Your doctor will advise you when results are available

Lactate

Collection of a satisfactory specimen for lactate analysis requires special procedure to prevent changes in lactate concentration while and after the specimen is drawn. Please inform the laboratory at least two hours prior to blood collection for the instruments to be calibrated and ready for analysis on receipt of specimen.

Procedure of collection:

- Patient should be fasting and at complete rest.
- A venous specimen is best drawn without a tourniquet or immediately after the tourniquet has been applied briefly.
- If the tourniquet has been applied very long, it should be removed after the puncture has been performed and blood allowed to circulate for at least 2 minutes before the blood is withdrawn.
- Collect 2 mls of blood in a container with fluoride EDTA as anticoagulant (use glucose tube).

Important notes:

- Sample should be **chilled in ice water** and sent to the laboratory immediately.
- Separation of cells at the laboratory should be done **within ½ hour.**
- Stability of supernatant plasma: 3 days at 2-8ºC (after separation from cells).
- Haemolysis may affect results.

Ammonia

Collection of a satisfactory specimen for ammonia analysis requires special procedures to prevent changes in ammonia concentration while and after the specimen is drawn.

Procedure of collection:

- A venous specimen is best drawn without a tourniquet or immediately after the tourniquet has been applied briefly.
- If the tourniquet has been applied very long, it should be removed after the puncture has been performed and blood allowed to circulate for at least 2 minutes before the blood is withdrawn.
- Collect 2 ml of blood in a container with EDTA as anticoagulant.

Important notes:

- Sample should be **chilled in ice water** and sent to the laboratory immediately.
- Separation of cells at the laboratory should be done **within 15 minutes**.
- Stability of supernatant plasma: 2 hours at 4ºC (after separation from cells).
- Assay to be performed immediately.
- Smoking may affect ammonia level.

SPECIAL PROCEDURES FOR MICROBIOLOGY TEST

General Guidelines for Proper Specimen Collection and Transport

- Collect specimen before administering antimicrobial agents where possible.
- Use **sterile containers** and **aseptic technique** to collect specimens to prevent introduction of microorganisms during the invasive procedures.
- Collect an **adequate amount** of specimen. Inadequate amounts of specimen may yield false negative results.
- Transport of swabs in suitable media is essential for reliable results.
- Specimens obtained using **needle aspiration** should be transferred to a sterile container and transported to the laboratory as soon as possible. If there is only a small volume of material in the syringe, add some sterile saline, mix and then transfer to a sterile container.
- **Formalin** must not be used to preserve microbiology samples.
- All specimens from **high risk patients** (HIV, Hep B, TB, and others) must be clearly marked as high risk.
- The specimen container must be **properly labeled**, placed in a biohazard plastic bag and accompanied by a completed laboratory request form.
- Specimens should be transported to the laboratory as soon as possible and preferably within 24 hours.

Special Instructions

Urine Culture

A clean mid-stream specimen is essential. In urinary tract infection (UTI) the bacterial count exceeds 100,000 organisms/ml in the majority of cases.

Urine acts as a culture medium and therefore specimens should be **stored at 4ºC** to prevent subsequent multiplication of bacteria after collection of the patient's sample which would invalidate the bacterial count. **Any sample which may be subject to delay of more than 2 hours before being sent to the lab should be refrigerated.**

Urines for culture should be collected as described below in a sterile 90mL container. The patient's full name, I.C. Number, source of specimen and date and time of collection should be specified on the request form **and** sample container. Also include additional relevant information concerning pregnancy, antibiotic medication, drug allergies, etc. on the requisition.

A **"mid-stream clean catch"** urine sample is necessary for culture so that any bacteria present around the urethra and on the hands do not contaminate the specimen.

Collection of a Mid-stream Urine Samples

(a) Early morning urine specimens are preferred, although urine collected at other times of the day are acceptable.
(b) Use a sterile container for collection.
(c) Complete the information requested on the container label: full name, IC Number, source of specimen and date and time of collection.

(d) **Instruction given to the patient**:

- Wash and dry your hands thoroughly.
- Remove the container lid and set it aside. Do not touch inner surfaces of container
- Wash your urogenital area ("lower parts") with the towelette
- For women, wipe from front to back between the folds of skin
- For men, retract the foreskin (if un-circumcised), and clean the glans (head of the penis)
- Pass a small amount of urine into the toilet (a women needs to hold the skin folds apart) and then midway through urination, urinate into the container. The container should only be 1/2 to 2/3 full.
- Replace the lid and tighten firmly.
- Wash and dry your hands thoroughly.

(e) **Immediately refrigerate** the specimen and dispatch to the laboratory **within 24 hours** of collection (maintain at **2-8ºC** when transporting).

(f) If transportation to the laboratory is expected to go **beyond 24 hours**, transfer 10mL of urine into an **NCS tube with boric acid preservative**. Maintain preserved urine (NCS tube) at room temperature and submit to the laboratory **within 72 hours** of collection.

Blood Culture

Ensuring that blood cultures are obtained in a manner that prevents contamination is a cornerstone of an infection prevention and control process. In addition, the increasing use of blood cultures obtained through vascular/arterial devices necessitates meticulous technique and timely communication with the microbiology laboratory.

Blood for cultures

Collection

- Venous blood
  - infants: 0.5 - 2 ml
  - children: 2 - 5 ml
  - adults: 5 - 10 ml
- Requires aseptic technique
- Collect within 10 minutes of fever
  - if suspect bacterial endocarditis: 3 sets of blood culture are required

Timing and Number

Acute Sepsis: Collect **two or three** sets of culture from **separately prepared sites** prior to initiating antimicrobial therapy. Each set consists of two bottles, one aerobic and one anaerobic or two aerobic.

Acute Endocarditis:

Obtain **three** blood cultures from **separate venipuncture sites** over 1 – 2 hours, prior to initiating therapy. These cultures are often obtained **30 minutes apart** in order to document persistent bacteremia.

Subacute Endocarditis:

Obtain **three** blood cultures on **day 1** (15 minutes or more apart). If cultures are negative after 24 hours, obtain 3 more.

Volume of Blood:

The volume of blood is **critical** because the concentration of organisms in most cases of bacteremia is low, especially if the patient is already on antimicrobial therapy. However, in infants and children, the concentration of organisms during bacteremia is higher than in adults, so less volume of blood is required.

Adults: **10 ml** of blood per culture bottle. In the event that **less** than 10 ml of blood is obtained from an adult, put it all into **one aerobic** blood culture bottle.

Children and infants: **1 – 3 ml** of blood per culture bottle. The minimum volume is dependent upon the weight of the child/infant, please contact the microbiology department prior to obtaining the blood if assistance is needed in determining the correct amount of blood needed for the child/infant.

Procedure for blood Collection

Blood can be collected by venipuncture of peripheral veins or arteries. Collection from intravascular catheters is not recommended as they are intrinsically contaminated. If a line must be used, indicate the type of line or port through which the blood was obtained.

Technique is important to prevent contamination of the blood resulting in inaccurate results. The following are the basic tips to prevent contamination of blood collection:

- Perform hand hygiene, explain the procedure to the patient prior to collection of all specimen, and adhere to all appropriate safety equipment.
- Locate the venipuncture site prior to skin disinfection.
- Disinfect the venipuncture site and the stoppers of the bottles prior to blood collection.
- Use chlorhexidine/alcohol combination (e.g. ChloraPrep™) for skin disinfection for optimal results.
- Disinfect the top of the blood culture bottle(s) with 70% isopropyl or ethyl alcohol.
- Scrub the site with a chlorhexidine/alcohol swab or wand, using single stroke.
- Allow the disinfectant to dry. (**DO NOT** palpate the vein after disinfecting the skin, prior to inserting the needle).
- Draw blood using a sterile safety syringe and needle, or safety butterfly, designed to attach to a vacutainer holder and dispense the appropriate amount of blood into the bottles.

NOTE: The blood culture bottles can be used with the vacutainer adapter, but it may not deliver a controlled draw. Care must be taken to dispense the appropriate amount of blood into the culture bottle.

- After venipuncture and inoculation of bottles, engage safety device on needle or butterfly and immediately dispose of collection materials in a sharps container. Wipe residual chlorhexidine/alcohol from skin with alcohol to prevent irritation of the skin.
- Indicate site of draw, date and time of draw, and initials of person drawing blood.
- If blood has been obtained through an indwelling intravascular device, provide specific information including lumen and location of the device.
- Transport blood cultures to the Laboratory **immediately**. **Do not** refrigerate. Delay in transport may compromise the specimen and recovery of organisms.

Nasal Swab

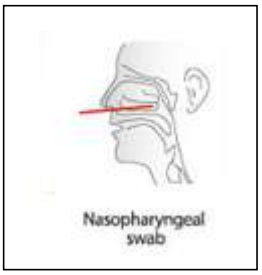
A nasal swab is not usually useful for the investigation of sinusitis. Antral lavage or pus from sinus should be sent if acute maxillary sinusitis is suspected.

Nasal swabs are useful for the investigation of carriage of Staphylococcus, including MRSA.

Use Infection Control Precautions

- Wear a surgical mask and disposable gloves.
- Wash hands thoroughly with soap and water or alcohol-based hand gel before and after the procedure.
- When completed, dispose of all PPE and other contaminated materials in the trash.

How to Do a Nasopharyngeal Swab



- Remove patient's surgical mask to perform the procedure and replace with a new one when done.
- Use a flexible fine-shafted aluminum swab with a polyester (dacronor rayon, not cotton or calcium alginate) tip.
- The distance from the patient's nose to the ear gives an estimate of the distance the swab should be inserted.
- Insert swab into one nostril down and backward into the nasopharynx and leave in place for a few seconds.
- Slowly withdraw swab with a rotating motion.
- Place tip of the swab into a vial containing 2–3 ml of VTM* and cut the shaft.

Storage

- Specimen can be kept refrigerated at **4ºC for up to 72 hours**
- Specimens that cannot be processed within 48-72 hours should be kept in the refrigerator at **4ºC.**

Deep Throat Saliva

Things to make sure before the collection of the deep throat saliva sample

i. Patient or person under surveillance (PUS) must not eat or drink, smoke, chew tobacco/betel leaves, brush teeth or gargle with mouth freshener for at least 1 to 2 hours prior to the sample collection.

ii. Let the patient or person under surveillance (PUS) sit comfortably, in a well ventilated space.

Methods of deep throat saliva collection

i. Instruct patient or PUS to drain mucus from the back of the nose and throat at least 3 times

ii. Ask patient or PUS to forcefully breath in 3 times, with head tilt slightly up and cough out the deep throat saliva with mucus.

iii. If patient or PUS find difficulty with earlier method, they can be asked to collect the saliva in mouth and bring at deep throat then gargle it for >30sec.

v. Ask patient or PUS to lift specimen collection cup close to his/her mouth and take a deep breath in and cough out or spit out the deep throat saliva into the collection cup.

v. A minimum of 2 ml of deep throat saliva sample is required.

Genital Infections Sexually Transmitted Diseases

Specimens Required

Females: Cervical or High vaginal swabs, Urethral swabs
Males: Urethral swab, penile swab

Genital tract swabs

Cervical and high vaginal swabs should be taken with the aid of a speculum. It is important to avoid vulvar contamination of the swab. For *trichomonas*, the posterior fornix, including any obvious candida plaques should be swabbed. If pelvic infection, including gonorrhea, is suspected, the cervical os should be swabbed.

High Vaginal Swabs

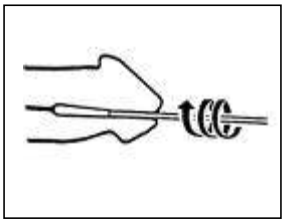
After the introduction of the speculum, the swab should be rolled firmly over the surface of the vaginal vault. The swab should then be placed in transport medium preferably with charcoal.

Cervical Swabs

After introduction of the speculum into the vagina, the swab should be rotated inside the endocervix. The swab should then be placed in transport medium preferably with charcoal.

Urethral Swabs

Contamination with micro-organisms from the vulva or the foreskin should be avoided.



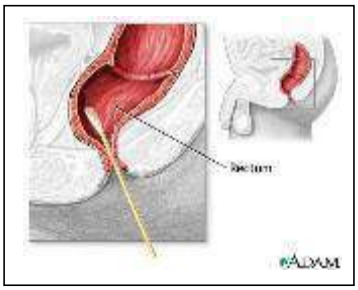
Thin swabs are available for collection of specimens.

The patient should not have passed urine for at least 1 hour.

For males, the swab is gently passed through the urethral meatus and rotated. Place the swab in transport medium preferably with charcoal.

Intrauterine Contraceptive Devices (IUCDs)

The entire device should be sent in a sterile universal container.



Rectal Swabs
Rectal swabs should be taken via a proctoscope.

Advantages of rectal swabs:

- Convenient
- Adapted to small children, debilitated patients and other situations where voided stool sample not feasible

Drawbacks of rectal swabs:

- No macroscopic assessment possible
- Less material available
- Not recommended for viruses

Pus Samples/ Wound Swabs

Wound swabs should only be taken when signs of clinical infection are present. Deep rather than superficial swabs give more accurate representation of bacteria/fungi if present.

Please indicate clearly on the request form and the swab, the site of the wound to facilitate interpretation of culture results.

Specimens Required

1. **Pus** sample (always preferable to a wound or pus swab) in sterile universal container.
2. **Wound swab** in transport medium.

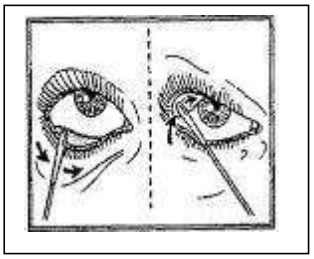
Wound or Pus samples are screened for all likely bacterial pathogens and, if present, these organisms and their antibiotic sensitivity results will be reported. The inclusion of relevant clinical information on the request form will assist in determining the bacterial isolates.

Abscess

1. Decontaminate the surface with 70-95% alcohol and 1-2% tincture of iodine.
2. Collect the purulent material aseptically from an un-drained abscess, using a **sterile needle and syringe**. Open miliary abscesses with a sterile scalpel and collect the expressed material with a sterile needle and syringe.
3. Transfer 5-10 ml of the aspirated material to an **anaerobic** transport vial. Transport immediately. *Anaerobic transport media is **not recommended** for AFB culture. If requesting AFB culture, transfer at least 1 ml of the aspirated material into a sterile container.*
4. **Swabs are a poor choice** because they dry easily and because of the limited amount of material obtained. Swabs are not optimal for fungal, anaerobe cultures, or decubitis ulcers. Swabs are **not** accepted for mycobacterial cultures, perirectal abscesses, oral abscesses. Gram stains cannot be provided from a single swab. If a Gram stain is needed, collect two swabs.

i

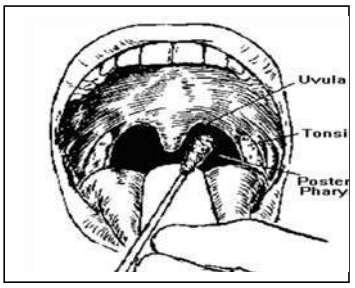
Eye Swab



- **Explain** the procedure and the purpose of the investigation to the patient to obtain informed consent, gain co-operation, and allay any fears and anxieties.
- **Sit or lay** the patient with head well-supported and with the chair at an appropriate height to ensure safety for the patient and the nurse.
- Do **hand hygiene** to reduce the risk of cross infection
- Ask the patient to look up and gently pull down the lower lid exposing the conjunctiva.
- Gently sweep the swab stick along the lower fornix, from **inner to outer canthus**, taking care not to touch the eyelids. Place swab immediately into bacterial medium container, then ask patient to close the eye for a few seconds. This will ensure safe technique of swab taking and avoid damage to the cornea.
- Repeat the procedure to the other eye if necessary to comply with investigatory request, **wash hands in between** to minimize the risk of contamination to the other eye. A **separate swab** is required for each eye.

Throat Swab

(posterior pharyngeal swab)



- Hold tongue away with tongue depressor.
- Locate areas of inflammation and exudate in posterior pharynx, tonsillar region of throat behind Uvula.
- Avoid swabbing soft palate.
- Do not touch tongue.
- Rub the affected area back and forth with cotton or Dacron swab

BLOOD FILMS FOR PARASITOLOGY

Step 1 **<u>Materials for finger pricks</u>:**

- Disinfectant
- Swabs
- Microscope slides (with or without frosted end)
- Sterile lancets
- Special slide as spreader
- Disposable gloves

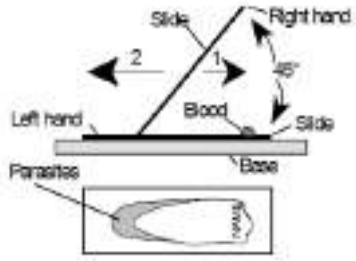
Step 2 **<u>Finger-prick (capillary blood)</u>**

- Select the third finger (big toe can be used with children).
- Use cotton wool lightly soaked in alcohol to clean the finger, using firm strokes to remove grease from the ball of the finger.
- Let finger air-dry.
- With a sterile lancet puncture the ball of the finger using a quick rolling action.

Step 3

- By applying gentle pressure to the finger express the first drop of blood and wipe it away with dry cotton wool.
- Make sure no strands of cotton remain on the finger.
- Working quickly with capillary blood and handling clean slides only by the edges, apply a gentle pressure to the finger and collect a single small drop of blood about the size ● on the end of the slide. This is for the **thin film**.

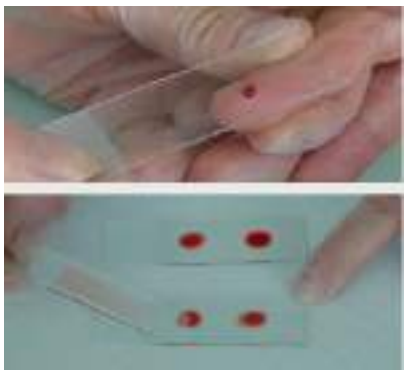
Step 4 **<u>Thin films (capillary blood)</u>**



- Take another clean slide to act as a "spreader".
- Place the slide with the blood drops resting on a flat, firm surface.
- Touch the small drop with the spreader (1) and allow the blood to run along its edge.
- Firmly push the spreader along the slide (2), away from the drops, keeping the spreader at an angle of 45°. Make sure the spreader is in even contact with the surface of the slide.

Step 5 **<u>Thick films (Capillary blood)</u>**

- Apply gentle pressure to the finger and collect two larger drops, about a size ●, on the slide as shown in the upper picture.
- Handle the "spreader" by the edge, using the corner to spread the blood in a circular form with 3-6 movements



Step 6 Combination of a thin and a thick film on the same slide

BLOOD SMEAR

Blood for smears

Collection

Capillary blood from finger prick

- Make smear
- Fix with methanol or other fixative

Handling and transport

- Transport slides within 24 hours
- Do not refrigerate as chill can alter cell morphology

PREPARATION FOR HAEMATOLOGY

Aim of blood smear

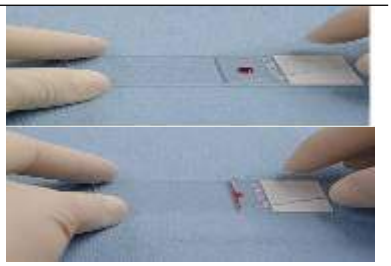
Examination of thin blood films is important in the investigation and management of anaemia, infections, and other conditions which produce changes in the appearance of blood cells and differential white cell count.

Step 1

- Fill a capillary tube three-quarter full with the anticoagulated specimen (EDTA).
- Place a drop of blood, about 2 mm in diameter, approximately an inch from the frosted area of the slide.

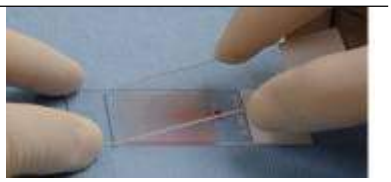
Step 2

- Place the slide on a flat surface, and hold the narrow side of the non-frosted edge between your left thumb and forefinger.
- With your right hand, place the smooth clean edge of a second "spreader" slide on the specimen slide, just in front of the blood drop.
- Hold the "spreader" slide at a 30° angle, and draw it back against the drop of blood.
- Allow the blood to spread almost to the edges of the slide



Step 3

- Push the "spreader" forward with one light, smooth, and fluid motion. A thin film of blood in the shape of a bullet with a feathered edge will remain on the slide.

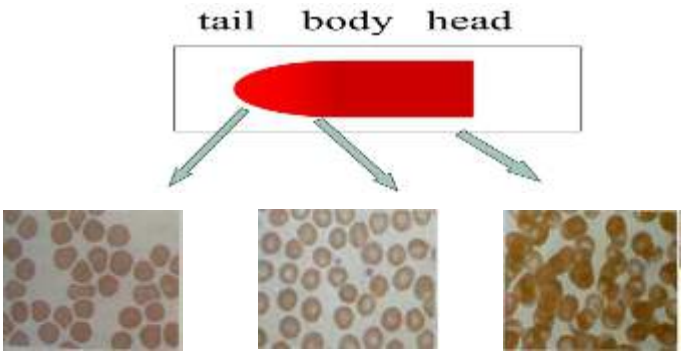


Step 4

- Label the frosted edge with patient name, ID number and date.
- Allow the blood film to air-dry completely before staining. **Do not** blow to dry. The moisture from your breath will cause RBC artifact.

Bad slide

Good slide



SPECIAL PROCEDURES FOR HISTOPATHOLOGY/CYTOLOGY TEST

Histopathology

Please **do not combine** Histopathology and Cytology requests from the same patient into one request form.

Specimen Containers

Please use containers which would enable easy identification and its removal from the container in the laboratory.

Guidelines:

1) Containers should preferably be transparent so that laboratory and other staff can see and verify the specimen without having to open the cap.
2) The mouth of the containers should not be smaller than the body. In narrow-mouthed containers, the tissue may damage while the specimen being removed, especially when the specimen is larger than the mouth.
3) Containers should be of adequate size so that it has enough capacity to hold the specimen **AND** at least thrice its volume of fixative.
4) Containers should be appropriately labeled and tally with the request form.

Fixative

Please **do not** place tissue in fixative if it is **a frozen section** specimen.

For all others, we recommend **10% buffered neutral formalin** solution for routine fixation. For large specimens, please cut open the tissue to facilitate penetration of fixative. Formalin usually does not penetrate tissues for more than a depth of about 1.0cm.

If delay in transportation to laboratory is expected or if fixative is not available, please keep specimen in refrigerator at **4ºC** but **DO NOT FREEZE** the specimen.

Tissues not placed in fixatives will undergo **autolysis**. In such cases, lysed blood could be seen in the solution. The tissue will also not change its colour from bright red to dull chocolate brown. Please ask your staff to transfer to formalin fixative if you suspect autolysis is occurring.

Small Biopsies

Punch biopsies (endoscopic, bronchoscopic and trucut biopsies, aspiration biopsies, etc.) are preferably mounted on pieces of paper prior to placing in the fixative. This helps to reduce tissue loss and damage.

If incisional biopsies are done, please try to obtain wedges of tissue instead of irregular fragments. Irregular fragments are difficult to orientate and interpret. In general, the larger the lesion, the bigger should be the incisional biopsy specimen. The myth that the more obvious the tumour is malignant, the smaller the biopsy specimen needed, is wrong.

Paired structures (such as vagi, vas deferentia or fallopian tubes) could be placed into the same container if one of these could be easily distinguished from the other (e.g. tag one by suture). Otherwise, biopsies from multiple sites should be placed in different containers.

Please do not wrap small biopsies in gauze as they are very difficult to retrieve once they got fix onto the gauze.

Large Specimen

Please slice open the specimen. For better photography, please make good even cuts.

Use liberal amounts of fixative and select a large container so that specimen shall not be distorted or moulded by the container. Enough formalin should be used so that the specimen is freely submerged in the fixative solution. If the specimen floats, ensure the exposed surface is covered by gauze.

Refrigerate (but **do not freeze**) specimen if transport to laboratory is not expected immediately. For empty organs such as urinary bladders or gut, cut open and empty the contents. Please note that surgical margins (e.g. pneumonectomy) could not be evaluated microscopically if these are closed with metal wires.

Large specimen could also be sent un-fixed as un-fixed tissues are better for photography. Please wrap these un-fixed tissues in **saline soaked gauze** to avoid desiccation. Un-fixed specimen must be **refrigerated immediately** while waiting for transfer to the laboratory.

All specimens that are to be transported outstation must also be fixed.

To assist orientation of large specimens, sutures could be placed in appropriate areas and described in the request forms. For example, borders of the pectoralis muscle could be marked so that the pathologist could divide axillary nodes into levels. Areas of interest (such as margins, lymph node groups) which the surgeon want microscopic studies done could also be marked by sutures.

Frozen Section Specimen

Make sure tissue is not calcified or ossified.

Please make sure the doctor's name and phone number (with exact extension) are recorded in request form accompanying the specimen. **Do not add** fixative. **Do not wrap** tissue in gauze or cotton. **Do not ask** for frozen section if **infectious** aetiology is likely.

Gynaecological Pap Smears (Pap Test)

Please submit only one slide per case and use only the request form reserved for PAP smears. This form helps to ensure all relevant clinical and gynaecological history are recorded.

For **hormonal evaluation**, please also submit another slide taken from the **upper 1/3** of the lateral vaginal wall.

For detecting **vaginal adenosis** submit **a scrapping from each quadrant** of the upper vagina.

It is important that the vaginal specimens be collected **before** the cervical specimen is obtained, and that the areas to be sampled are **first swabbed** to remove any contaminating secretion from the cervix.

Sensitivity and Specificity

PAP test is not a perfect test. Precise data on the sensitivity and specificity of PAP smears are lacking due to a variety of factors including the quality of screening laboratory, definition of positive cases and methodology of the studies.

A **false negative rate** (missing out precancerous cells) of about 5-45% is most frequently quoted (i.e. **sensitivity** of **55 to 95%**). Up to **2/3** of the false negatives are due to factors related to **the collection procedure**. The **specificity** of a positive test (presence of precancerous cells) is probably **90-97**%.

Despite these limitations, the PAP test is still the **most effective** cancer screening test known.

Screening Interval

It is recommended that PAP screening be initiated as soon as a woman is sexually active. This is repeated once every one to three years depending on individual risk factors. In view of the fact that precancerous lesions of the cervix usually take many years (estimated to be about 10 years or more) to progress into invasive cancers, this screening interval is acceptable. If there had been three successive normal smears, screening interval may be increased. Screening may also be discontinued for women aged 65 years and over at the discretion of the physician provided previous smears are normal.

PAP tests are screening tests, not diagnostic tests. Hence, any patient suspected of having cervical cancer should have a cervical biopsy rather than a PAP test.

Patient Preparation
Advise patient as follows:
1) Do not use a vaginal douche or topical vaginal medications for 48 hours prior to examination.
2) Do not have sexual intercourse for 24 hours prior to examination.
3) Schedule examination 14 days after onset of the last menstrual period.

PAP Smears: Conventional

The Pap smear is primarily for detection of cervical premalignant and malignant changes and should not be relied upon to detect endometrial malignancy.

NOTE: The PAP test is a screening test for cervical cancer with inherent false negative results.

Specimen Collection

A spatula and cytobrush are a very effective sampling combination. Collect with a spatula first, followed by the cytobrush

Ectocervical/Endocervical Scraping – it is the single **most productive sample** and should be taken to sample the entire **squamocolumnar junction**. Use the **spatula** for scraping of the ectocervix.

Cytobrush provides a **superior sample** from the **endocervical canal** as compared to swab. The brush should be used according to the instructions and should **not be used** on **pregnant patients** or to sample the endometrium.

The brush specimen should be **in addition to**, never instead of, the ectocervical scraping

Labeling Slides: The patient's first name and IC Number must be written in pencil on the frosted end of the slide

Smears: Smears should be made with **one or two swipes** of the spatula on the slide, not with a mixing motion. The cytobrush should be **rolled** on the slide.
The smear should be obtained about **mid-cycle,** or about day 14, from a woman of childbearing age

Fixation: Rapid fixation is critical for good quality smears. The smears should be fixed immediately to avoid air-drying. If an aerosol spray is used, the spray nozzle should be about **twelve inches** from the slide. If held too close, the spray "freezes" the cells and also lifts them form the slide, causing them to clump.

Requisition Form It is important that clinical information is also included, as it helps in the interpretation of the specimen. Clinical information should include:

- Patient's First and Last Name
- Date of birth
- LMP (last menstrual period)
- Hormonal status (e.g. post-partum, post-menopausal, etc.)
- Hormonal therapy (including birth control pills), other therapy (e.g. cautery)
- Any history of prior abnormal Pap smears
- Specimen Source
- Collection Date

Reporting of PAP Smear

The **PAP classification** had been considered outdated and inadequate because of the new knowledge about cervical cancer. This system of classification has no equivalent term in histological diagnosis.

Currently, the two most widely used systems are the **CIN** and the **Bethesda** systems. BP Lab reports the PAP test using a combination of these systems because many doctors are more familiar with the PAP classification. We believe that it is important for the doctors to understand the report and explain it to their patients. Hence, until most doctors are familiar with the Bethesda system, we will still include a statement of the PAP classification in our reports.

The following table is an estimated equivalent terms in the various systems of PAP smear classification.

PAP	DYSPLASIA	CIN	BETHESDA (1988)	BETHESDA (2001)
0	Unsatisfactory	Unsatisfactory	Unsatisfactory	Unsatisfactory
I	Negative	Negative	WNL (Within Normal Limits)	NILM
II	Negative	Negative	BCC	NILM
III	No term	No term	ASCUS/AGUS	ASCUS/ASC-H
III	Mild	I	LGSIL	LGSIL
No term	Moderate	II	HGSIL	HGSIL
IV	Severe	III	HGSIL	HGSIL
IV	CIS	III	HGSIL	HGSIL
V	Carcinoma	Carcinoma	Carcinoma	Carcinoma

Notes:
1) CIS – Carcinoma in situ.
2) WNL – Within Normal Limits.
3) BCC – Benign cellular changes. These include those due to infection, atrophy, radiation or repair on Bethesda system).
4) NILM – Negative for intraepithelial lesion or malignancy. These include those that are within normal limits, benign cellular changes and other non-neoplastic findings.
5) ASCUS – Atypical squamous cells of undetermined significance. A high percentage of these cases will be found to have more severe lesion (LGSIL or HGSIL) subsequently.
6) AGUS – Atypical glandular cells of undetermined significance.
7) LGSIL/LSIL – Low grade squamous intraepithelial lesion. This is includes CIN I changes. Cellular changes due to HPV are usually classified at least as LGSIL.
8) HGSIL/HSIL – High grade squamous intraepithelial lesion. This includes CIN II and III changes on histology.
9) ASC-H – Atypical squamous cells, cannot exclude high-grade squamous intraepithelial lesion.

Adequacy of Smears

Smears may be unsatisfactory for reporting due to the following:

1) The presence of an endocervical component (endocervical or metaplastic cells) is generally considered necessary to classify a smear as a satisfactory specimen. However, we have found positive smears even in the absence of an endocervical component and the data available is not conclusive as to whether absence of endocervical component will increase the risk of a false negative smear. In addition, some smears are also taken without sampling of the endocervical canal and are not expected to contain an endocervical component. Hence, we may report PAP smears without an endocervical component as satisfactory, but the absence of this component will be recorded in the report.

2) Inadequate cells in smear

3) Too thick a smear

4) Too much blood, secretions or contaminating lubricants in the smear

5) Too much inflammatory cells

6) Too much crush artifacts

7) Poorly fixed smears or severe air drying artifact

Non-Gynaecological Cytology

See gynaecological cytology for fixation and labeling of smears.

Urine, body cavity fluids, cerebrospinal fluids and secretions should be **refrigerated** or **transported in icebox** if delivery to laboratory is not immediate. Smears from FNAC procedures should be **fixed immediately**. Please provide at least two air-dried and alcohol-fixed smears.

Air Drying Smears

This may be done by **vigorously waving** the smears in **room air**. For better result, you may also dry with **hair blower,** but do **not uses hot hair**. Rapid drying reduces autolysis and improves cytologic preservation. (Note: Gynaecological PAP smears should **never** be air-dried.)

Sputum Collection

Send expectorated sputum, **not** saliva, **not** nasal secretions.

Please ask patient to rinse his/her mouth and then expectorates a deep cough specimen into the container. An early morning deep cough yields the best specimen.

Sputum recovered from chest physiotherapy or tracheal suctions are also acceptable. Sputum specimen with anthracotic histiocytes ('dust' cells) are considered good specimen.

FNAC Technique for Solid Lesions

1) Label slides prior to performing procedure.

2) Use a 21 to 23 gauge needle, attached to a sterile syringe.

3) Introduce needle into the mass or lesion. While applying suction (negative pressure) move the needle up and down within the mass, **rotating it by turning your wrist at the same time**. The cutting edge of the needle tip will free cells in the lesion which are sucked **into the fine pore of the needle. Please avoid sucking cells into the body of the syringe.**

4) To increase cell yields, you may aim the needle at different angles each time.

5) If the lesion is expected to be **vascular**, you **may not need** to attach the syringe to the needle as no suction should be used.

6) The moment blood or any other material appears in the hub of the needle, stop suction and allow negative pressure to equalize. Thereafter withdraw needle from the lesion. Withdrawing the needle while applying suction will cause cellular material to be sucked into the body of the syringe, making them difficult to be delivered onto the slide.

7) Detach needle from syringe with the aspirated material still in the needle and hub.

8) Withdraw syringe to introduce air into it and then re-attach needle.
9) Position end of needle on a slide and expel one to two drops of aspirate onto it.

10) Use the needle to spread out the fragments as evenly as possible. If very large fragments are present, you may have to spread it flat with the help of another slide.

11) If too much blood is mixed with the cell fragments, as sometimes happen in thyroid aspirates or vascular lesions, use a piece of gauze to absorb the excess blood before spreading out the aspirate.

12) In general, try to spread the aspirate as thin and as even as possible.

13) Fix smears immediately before any drying has started. Air-dry some smears without fixation.

14) Repeat the above if there are still more aspirated material in the needle or hub and make more smears.

15) If there is no cellular material in the first pass, repeat aspirate may be performed with the needle at different angle.

FNAC of Cystic Lesions

Aspirate as much fluid as possible and deliver these into leak-proof container without fixative or anticoagulant. The aspirated fluid should be **refrigerated** or **transported in icebox** if delivery to laboratory is not immediate. Aspirate any residual solid mass and prepare smears from it as described above.

SECTION II: Alphabetical listing of tests

Alphabetical listing of tests provided by BP Clinical Lab

1	**Test**	**ABO & Rh Grouping**
	Specimen Required	3ml EDTA blood
	Reference Interval	Blood group : A, B, AB, O , Rhesus : Positive / Negative
	Method	Antibody antigen reaction
	Turnaround Time	Daily, 24 hours
	Medical Indication	Detect clinically significant alloantibodies. Selecting compatible blood products for transfusion therapy
2	**Test**	**Ketone Screening (Acetoacetic Acid)**
	Specimen Required	20ml urine
	Reference Interval	Negative/Positive
	Method	Urinalysis
	Turnaround Time	Daily, 24 hours
	Medical Indication	Monitoring of diabetic patients, prolonged illness.
3	**Test**	**Alphafoetoprotein (AFP)**
	Specimen Required	Serum /Plasma
	Reference Interval	Up to 15.00 ng/ml
	Method	Chemiluminescence Immunoassay
	Turnaround Time	Daily
	Medical Indication	Tumour marker for testicular and liver tumours
4	**Test**	**Albumin**
	Specimen Required	3ml plain blood
	Reference Interval	3.5 - 5.2 g/dl
	Method	Bromocresol Green
	Turnaround Time	Daily, 24 hours
	Medical Indication	Indicator of nutritional status. Liver Function Test
5	**Test**	**Alkaline Phosphatase**
	Specimen Required	3ml plain blood
	Reference Interval	1-12 years old: <500 U/L, Male >20 years old, Female >15 years old: 40- 150 U/L Male 12 – 15 years old: <750 U/L
	Method	IFCC
	Turnaround Time	Daily, 24 hours
	Medical Indication	Liver profile assessment. Evaluation of metabolic bone disease Diagnosis & monitoring treatment of liver, bone, intestinal & parathyroid disease
6	**Test**	**Alanine Transaminase (ALT,SGPT)**
	Specimen Required	3ml plain blood
	Reference Interval	0 - 55 U/L
	Method	IFCC
	Turnaround Time	Daily, 24 hours
	Medical Indication	Diagnosis & monitoring of liver disease associated with hepatic necrosis. Liver profile assessment

7	**Test**	**Amphetamine/ Methamphetamine**
	Lab Section	Urinalysis department
	Specimen Required	20 ml Urine
	Reference Interval	Non-Reactive
	Method	Enzyme Immunoassay
	Turnaround Time	Daily,24 hours
	Medical Indication	Detects the presence of Amphetamine, methamphetamine, & others amphetamine like substances in urine. Used to evaluate for suspected drug abuse or overdose
8	**Test**	**Amylase (Diatase)**
	Specimen Required	20 ml random urine
	Reference Interval	32 – 641 U/L
	Method	2-Chloro-PNP-a-maltrotrioside
	Turnaround Time	3 days
	Medical Indication	Assessment of acute rejection of bladder-drained pancreas transplants. Differential diagnosis of acute pancreatitis
9	**Test**	**Amylase (serum)**
	Specimen Required	3ml plain blood
	Reference Interval	25 -125 U/L
	Method	2 Chloro-PNP-a-maltotrioside
	Turnaround Time	3 days
	Medical Indication	Differential diagnosis of pancreatic disease. Diagnosing acute pancreatitis
10	**Test**	**Antineutrophil Cytoplasmic Antibodies (ANCA)**
	Specimen Required	3ml Plain Serum
	Reference Interval	< 5 U/mL : Negative
	Method	Manual ELISA
	Turnaround Time	1 week
	Medical Indication	Evaluating patients suspected of having autoimmune vasculitis (both Wegener granulomatosis [WG] and microscopic polyangiitis)
11	**Test**	**Anti-Hepatitis B Core Antibody (Anti-HBc)Total**
	Specimen Required	3ml plain blood
	Reference Interval	Non-reactive
	Method	Chemiluminescence Immunoassay
	Turnaround Time	Daily
	Medical Indication	A "reactive" result suggests recent and past hepatitis B infection
12	**Test**	**Anti-Hepatitis B e Antibody (Anti-HBe)**
	Specimen Required	3ml plain blood
	Reference Interval	Non-reactive
	Method	Chemiluminescence Immunoassay
	Turnaround Time	Daily
	Medical Indication	Indicates sero-conversion from infective stage, suggesting good prognosis for resolution of acute infection

13	**Test**	**Anti-Hepatitis B Surface Antibody (Anti-HBs)**
	Specimen Required	3ml plain blood
	Reference Interval	Non-reactive
	Method	Chemiluminescence Immunoassay
	Turnaround Time	Daily
	Medical Indication	Presence of hepatitis B surface antibody suggests previous hepatitis B infection or immunization
14	**Test**	**Anti-Hepatitis C Antibody (Anti-HCV)**
	Specimen Required	3ml plain blood
	Reference Interval	Non-reactive
	Method	Chemiluminescence Immunoassay
	Turnaround Time	Daily
	Medical Indication	A "reactive " results suggests that a patient has been or is currently infected with Hepatitis C virus
15	**Test**	**Apolipoprotein A1/B**
	Specimen Required	3ml plain blood/ EDTA blood (fasting)
	Reference Interval	Apolipoprotein A1 : Male : 95 - 186 mg/dl, Female : 101 - 223 mg/dl Apolipoprotein B : Male 49 - 173 mg/dl, Female : 53 - 182 mg/dl
	Method	Immuno-turbidimetric
	Turnaround Time	1 week
	Medical Indication	Second-line test for ascribing cardiovascular disease. Evaluation of risk for atherosclerotic disease. Definitive studies of cardiac risk factors in individuals with significant family histories of coronary artery disease or other increased risk factors. Follow-up studies in individual with abnormal LDL cholesterol levels. Confirmation of suspected abetalipoproteinemia or hypobetalipoporteinemia
16	**Test**	**Anti-Streptolysin O Titer (ASOT)**
	Specimen Required	3ml plain blood
	Reference Interval	Negative (<200 IU/mL)
	Method	Antibody-Antigen Reaction, Latex Agglutination test
	Turnaround Time	Daily,24 hours
	Medical Indication	Demonstration of acute or recent streptococcal infection causing rheumatic fever or glomerulonephritis.
17	**Test**	**Aspartate Aminotransferase (AST, SGOT)**
	Specimen Required	3ml plain blood
	Reference Interval	5 – 34 U/L
	Method	IFCC method
	Turnaround Time	Daily, 24 hours
	Medical Indication	As an aid in diagnosis and monitoring liver disease, particularly diseases resulting in destruction of hepatocytes. Assessment of Liver Profile. Diagnosis of Acute Myocardial Infarct.

18	**Test**	**Beta-2-Microglobulin**
	Specimen Required	3ml plain blood
	Reference Interval	0.97 - 2.64 mg/L
	Method	Immuno-turbidimetric
	Turnaround Time	1 week
	Medical Indication	Prognosis assessment of multiple myeloma, evaluation of renal tubular disorders, management of multiple myeloma and lymphoma. Elevated levels seen in renal insufficiency
19	**Test**	**Bilirubin, Conjugated, Unconjugated, Total**
	Specimen Required	3ml plain blood
	Reference Interval	Total : Adults : 0.2 - 1.2 mg/dl, Newborn : up to 10.0 mg/dl Direct : up to 0.5 mg/dl
	Method	Diazonium Salt
	Turnaround Time	Daily, 24 hours
	Medical Indication	Evaluation of jaundice and liver functions. Differential diagnosis of jaundice. Evaluating a wide range of diseases affecting the production, uptake, storage, metabolism or excretion of bilirubin
20	**Test**	**Bilirubin, Total**
	Specimen Required	3ml plain blood
	Reference Interval	Adult: Up to 1.2 mg/dL Newborn: <10.0 mg/dL
	Method	Diazonium Salt.
	Turnaround Time	Daily, 24 hours
	Medical Indication	For assessing liver function, evaluating a wide range of diseases affecting the production, uptake, storage, metabolism or excretion of bilirubin, to monitor diseases causing jaundice in newborn and monitoring the efficacy of neonatal phototherapy.
21	**Test**	**Chlamydia IgG**
	Specimen Required	3ml Plain Blood/Serum
	Reference Interval	<0.9 No detectable antibody C.trachomatic IgG ; 0.9-1.1 Borderline Positive; >1.1 Detectable antibody to C.trachomatic IgG
	Method	Enxyme-linked Immunosorbent assay
	Turnaround Time	1 week
	Medical Indication	Screening test in detection of IgG antibody to Chlamydia Trachomatis
22	**Test**	**Cytomegalovirus IgM**
	Specimen Required	3ml plain blood
	Reference Interval	<0.90 Negative, 0.90 -0.99 Equivocal, ≥1.00 Positive
	Method	Chemiluminscence Immunoassay
	Turnaround Time	1 week
	Medical Indication	A 'Reactive" results suggests current active cytomegalovirus infection

23	**Test**	**Cytomegalovirus IgG**
	Specimen Required	3ml plain blood
	Reference Interval	<0.90 Negative, 0.90 -0.99 Equivocal, ≥1.00 Positive
	Method	Chemiluminscence Immunoassay
	Turnaround Time	1 week
	Medical Indication	A 'Reactive" results suggests a previous cytomegalovirus infection
24	**Test**	**CA125 (Tumour Marker)**
	Specimen Required	3ml plain blood
	Reference Interval	0.0 -35.0 U/ml
	Method	Chemiluminescence immunoassay
	Turnaround Time	Daily,24 Hours
	Medical Indication	Tumour marker for ovarian cancer
25	**Test**	**CA15-3 (Tumour marker)**
	Specimen Required	3ml plain blood
	Reference Interval	0.0 -31.3 U/ml
	Method	Chemiluminescence immunoassay
	Turnaround Time	Daily,24 Hours
	Medical Indication	Tumour marker for stage II or III breast cancer.
26	**Test**	**CA19.9 (Tumour marker)**
	Specimen Required	3ml plain blood
	Reference Interval	0.0 -37.0 U/ml
	Method	Chemiluminescence immunoassay
	Turnaround Time	Daily,24 Hours
	Medical Indication	Tumour marker for pancreatic cancer.
27	**Test**	**Calcium**
	Specimen Required	3ml plain blood
	Reference Interval	8.4 - 10.2 mg/dL
	Method	Arsenazo Dye
	Turnaround Time	Daily, 24 hours
	Medical Indication	Evaluation of calcium metabolism. Diagnosis & monitoring of a wide range of disorders including diseases of bone, kidney, parathyroid gland, or gastrointestinal tract. Calcium levels may also reflect abnormal Vitamin D or protein levels
28	**Test**	**Calcium (Urine)**
	Specimen Required	24 hours urine (preservative 10ml concentrated HCL)
	Reference Interval	100 - 300 mg/24 hrs
	Method	Arsenazo Dye
	Turnaround Time	Daily, 24 hours
	Medical Indication	Evaluation of calcium metabolism. Identification of abnormal physiologic states causing excess or suppressed excretion of calcium, such as hyperparathyroidism, Vitamin D abnormality, disease that destroy bone, prostate cancer & drug treatment such as thiazide therapy

29	**Test**	**Cannabinoids (Urine)**
	Specimen Required	25 ml Urine
	Reference Interval	Non-Reactive
	Method	Enzyme Immunoassay
	Turnaround Time	Daily,24 Hours
	Medical Indication	Screen to detect the marijuana exposure & abuse by measures the level of by-products of cannabis in urine
30	**Test**	**C-peptide**
	Specimen Required	3ml plain blood/serum (fasting)
	Reference Interval	0.78 - 5.19 ng/mL
	Method	Chemiluminnometric (CMIA)
	Turnaround Time	1 week
	Medical Indication	Evaluate residual B-cell function in insulin-dependent diabetics Aids in differential diagnosis of hypoglycaemia (includes factitious hypoglycaemia, insulin autoimmune hypoglycaemia & insulinoma). Diagnostic workup of hypoglycemia
31	**Test**	**Carcinoembryonic Antigen (CEA)**
	Specimen Required	3ml plain blood
	Reference Interval	Up to 5.00 ng/mL
	Method	Chemiluminescence immunoassay
	Turnaround Time	Daily,24 Hours
	Medical Indication	Tumour marker for colorectal & pancreatic cancer increased level seen in smokers
32	**Test**	**Chloride**
	Specimen Required	3ml plain blood
	Reference Interval	98 - 107 mmol/L
	Method	I.S.E Indirect Potentiometry
	Turnaround Time	Daily, 24 hours
	Medical Indication	Evaluation of electrolyte & acid-base status
33	**Test**	**Chloride (Urine)**
	Specimen Required	24 hour urine
	Reference Interval	110-250 mmol/24 hours
	Method	I.S.E Indirect Potentiometry
	Turnaround Time	Daily, 24 hours
	Medical Indication	Indicator of fluid balance, acid-base homeostasis & electrolyte balance
34	**Test**	**Cholestrol, HDL**
	Specimen Required	3ml plain blood (fasting)
	Reference Interval	> 40 mg/dL
	Method	Direct "Elimination Method"
	Turnaround Time	Daily, 24 hours
	Medical Indication	Cardiovascular risk assessment. Negative risk factor for coronary heart disease (CHD)

35	**Test**	**Cholestrol, LDL**
	Specimen Required	3ml plain blood (fasting)
	Reference Interval	< 100 mg/dL
	Method	Calculated based on total, HDL Cholesterol and Triglycerides
	Turnaround Time	Daily, 24 hours
	Medical Indication	Evaluation of cardiovascular risk.
36	**Test**	**Cholesterol, Total**
	Specimen Required	3ml plain blood (fasting)
	Reference Interval	< 200 mg/dL
	Method	Enzymatic Colourimeric
	Turnaround Time	Daily, 24 hours
	Medical Indication	Evaluation of cardiovascular risk. Identify the presence of hypoerlipidaemia & ascribe risk for coronary disease
37	**Test**	**CK-MB**
	Specimen Required	3ml plain blood
	Reference Interval	Male: Up to 5.2 ng/mL Female: Up to 3.1 ng/mL
	Method	Immunoinhibition
	Turnaround Time	2-3 days
	Medical Indication	Diagnosis of acute myocardial infarction. The serial quantitation of CK-MB levels performed at admission & 8-hours, 16-hours & 24-hours after admission has been used as an aid in the diagnosis of myocardial injury
38	**Test**	**Cholinesterase (Pseudocholinesterase)**
	Specimen Required	3ml plain blood
	Reference Interval	Male : 4,389 – 10,928 U/L, Female : 2,879 – 12,669 U/L
	Method	Butyl-thiocholine
	Turnaround Time	2-3 days
	Medical Indication	Marker for organophosphate insecticide exposure. Monitoring patients with liver disease, particularly those undergoing liver transplantation
39	**Test**	**Cocaine Screening**
	Specimen Required	20ml fresh urine
	Reference Interval	Non-Reactive
	Method	**One Step Drug Test Strip**
	Turnaround Time	Daily, 24 hours
	Medical Indication	Screen to detect the Cocaine exposure & abuse

40	**Test**	**Complement 3 (C3)**
	Lab Section	Send to laboratory immediately
	Specimen Required	3ml plain blood
	Reference Interval	Male (1 – 14 years) : 80-170 mg/dl , Female (1 – 14 years): 82-173 mg/dl Male (>14 – 80 years): 82 – 185 mg/dl Female (>14 – 80 years): 83 – 193 mg/dl
	Method	Immunoturbidimetry
	Turnaround Time	1 week
	Medical Indication	Acute phase protein. Useful in screening for classic &activation of alternate complement pathway. Decreased levels seen in immune complex diseases (esp. lupus nephritis) acute glomerulonephritis, massive necrosis, viraemia, sepsis, hereditary deficiency & infancy.
41	**Test**	**Complement 4 (C4)**
	Lab Section	Send to laboratory immediately
	Specimen Required	3ml plain blood
	Reference Interval	Male (1 – 14 years): 14.0 – 44.0 mg/dl Female (1 – 14 years): 13.0 – 46.0 mg/dl Male (>14 – 80 years): 15.0 – 53.0 mg/dl Female (>14 – 80 years): 15.0 – 57.0 mg/dl
	Method	Immunoturbidimetry
	Turnaround Time	1 Week
	Medical Indication	Decreased levels seen in immune complex disease, hereditary deficiency, acute glomerulonephritis, infancy or when classic pathway activated.
42	**Test**	**Cortisol ,urine**
	Specimen Required	24 hours Urine
	Reference Interval	4.3-176.0 ug/24hours (11.87 - 485.76 nmol/24 hours)
	Method	Chemiluminescent microparticle immunoassay (CMIA)
	Turnaround Time	3 days
	Medical Indication	Screening test for Cushing 's syndrome
43	**Test**	**COVID-19 Screening**
	Specimen Required	Nasopharyngeal Swab, Deep Throat Saliva
	Reference Interval	Not-Detected
	Method	Rt-PCR (Nucleic Acid Amplification, Qualitative)
	Turnaround Time	Daily, 24 hours
	Medical Indication	Screening test for the infection of Covid-19 virus.
44	**Test**	**COVID-19 IgG/IgM Screening**
	Specimen Required	Plain Serum
	Reference Interval	Not-Detected
	Method	Colloidal Gold
	Turnaround Time	Daily, 24 hours
	Medical Indication	Screening test for Covid-19 IgG/IgM antibody presences. Can determine the infection status with combination with COVID-19 Screening

45	**Test**	**CRP, High Sensitive (hsCRP)**
	Specimen Required	**3ml plain blood**
	Reference Interval	0.00 - 0.50 mg/dL (0.0 – 5.0 mg/L)
	Method	Turbidimetric/Immunoturbidimetric
	Turnaround Time	**Daily, 24 hours**
	Medical Indication	Used as a marker of general diagnostic indicator of infections and inflammation, to monitor patient response to pharmacological therapy and surgery. It is also used for assessment of risk of developing myocardial infarction in patients presenting with acute coronary syndromes, risk of developing cardiovascular disease or ischemic events in individuals who do not manifest disease at present. For risk management of coronary heart disease and for early detection of infection in paediatric patients.
46	**Test**	**Creatinine**
	Specimen Required	3ml plain blood
	Reference Interval	Male : 0.72 - 1.25 mg/dL, Female : 0.57 - 1.11 mg/dL
	Method	Alkaline Picrate
	Turnaround Time	Daily, 24 hours
	Medical Indication	Diagnosis and monitor acute renal disease. Renal function test.
47	**Test**	**Creatinine (Urine)**
	Specimen Required	24 hour urine, random urine
	Reference Interval	24 hours Male: 950 – 2,490 mg/day, Female: 710 – 1,650 mg/day Random Male: 63 – 166 mg/dl, Female: 47 – 110 mg/dl
	Method	Alkaline Picrate
	Turnaround Time	Daily, 24 hours
	Medical Indication	Confirms completeness of 24 hours urine collection. Calculate creatinine clearance, measure of renal function
48	**Test**	**Creatinine Phosphokinase (CK)**
	Specimen Required	3ml plain blood
	Reference Interval	Male : 30 - 200 U/L, Female : 29 - 168 U/L
	Method	NAC Activator
	Turnaround Time	2-3 days
	Medical Indication	Evaluate and monitor disorders of skeletal and cardiac muscle. Diagnosis and monitoring of myocardial infarction & myopathies such as the progressive Duchenne muscular dystrophy
49	**Test**	**Creatinine Clearance Test**
	Specimen Required	3ml plain blood, 24 hour urine sample
	Reference Interval	Male: 66 – 163 ml/min, Female: 66 – 165 ml/min
	Method	Alkaline Picrate
	Turnaround Time	Daily, 24 hours
	Medical Indication	Renal function test, measure Glomerular Filtration Rate

50 **Test** **Dengue NS1 Ag**

Specimen Required	Whole blood/3ml plain blood
Reference Interval	Negative
Method	In vitro Immunochromatographic,one step assay
Turnaround Time	Daily,24 hours
Medical Indication	Detect Dengue Virus NS1 Antigen in human serum, plasma or whole blood

51 **Test** **Dengue IgG/IgM**

Specimen Required	3ml plain blood
Reference Interval	Negative
Method	Solid Phase Immunochromatographic assay
Turnaround Time	Daily, 24 hours
Medical Indication	Detection of IgG, IgM antibodies to Dengue Virus in Human serum or Plasma

52 **Test** **Dehydroepiandrosterone Sulphate (DHEAS)**

Specimen Required 3ml plain blood

Reference Interval

Gender	Age (Years)	Normal range (ug/dl)
Children	<1 week	24.6-302.8
	1-4 weeks	8.5-317.3
	1-12 months	31.6-214.1
	1-4 years	32.7-276.0
	5-10 years	24.4-209.7
Male	11-14 years	16.6-242.7
	15-19 years	45.1-385.0
	20-24 years	238.4-539.3
	25-34 years	167.9-591.9
	35-44 years	139.7-484.4
	45-54 years	136.2-447.6
	55-64 years	48.6-361.8
	65-70 years	228.5-283.6
Female	11-14 years	8.6-169.8
	15-19 years	61.2-493.6
	20-24 years	134.2-407.4
	25-34 years	95.8-511.7
	35-44 years	74.8-410.2
	45-54 years	56.2-282.9
	55-64 years	29.7-182.2
	65-70 years	33.6-78.9

Method	Electrochemiluminescence Immunoasay
Turnaround Time	1 week
Medical Indication	Evaluation of Androgen deficiency or excess state

53 **Test** **DNA Double-Stranded (dsDNA) Antibodies, Quantitative**

Specimen Required	3ml plain Serum
Reference Interval	<10 IU/ml: Negative
Method	Phadia 100 / EliA
Turnaround Time	**1 week**
Medical Indication	Evaluating patients with signs and symptoms consistent with systemic lupus erythematosus (SLE) Monitoring patients with documented SLE for flares in disease activity

54 **Test** **Electrolytes (Na+, K+, Cl-)**

Specimen Required	3ml plain blood
Reference Interval	Na+: 135-145 mmol/L, K+: 3.5 – 5.1 mmol/L Cl-: 98- 107 mmol/L
Method	I.S.E. Indirect Ppotentiometry
Turnaround Time	Daily, 24 hours
Medical Indication	Evaluation of electrolyte balance.

55 **Test** **Epstein Barr Virus IgA antibody**

Specimen Required	3ml plain blood
Reference Interval	Titre < 8 Negative, 8-12 Equivocal, >12 Positive
Method	Immunofluoresence
Turnaround Time	3 days
Medical Indication	May suggest severe diseases due to EBV, Screening test for Nasopharygeal cancer

56 **Test** **Erythrocyte Sedimentation Rate (ESR)**

Specimen Required	3ml EDTA blood
Reference Interval	Male : 0-16 mm/hr Female : 0 - 20 mm/hr
Method	Manual Westergren Method, Micro TEST 1
Turnaround Time	Daily, 24 hours
Medical Indication	A measure of acute phase response. Provides an index of disease progress

57 **Test** **Estradiol (E2)**

Specimen Required	3ml plain blood
Reference Interval	Male : 11-44 pg/ml (40.4 – 161.5 pmolL) <u>Female</u> Follicular Phase : 21-251 pg/ml (77.1 – 921.4 pmol/L) Mid-cycle Peak : 38-649 pg/ml (139.5 – 2382.5 pmol/L) Luteal Phase : 21-312 pg/ml (77.1 – 1145.4 pmol/L) <u>Post Menopausal</u> Not on HRT : < 10-28 pg/mL (<36.7 – 102.8 pmol/L) On HRT : < 10-144 pg/mL (<36.7 – 528.6 pmol/L)
Method	Chemiluminescense Immunoassay
Turnaround Time	Daily,24 hours
Medical Indication	Female: Assess hypothalamic -pituitary-ovarian axis Male: Investigate unexplained gynaecomastia

58 **Test** **Fecal Occult Blood (FOB)**

Specimen Required	Stool (fresh)
Reference Interval	Negative
Method	1 Step Fecal Occult Blood test Device, Rapid Chromatograph Immunoassay.
Turnaround Time	2 days
Medical Indication	Check for hidden(Occult) blood in the stool, aims to check subtle blood loss in the gastrointestinal tract

59	**Test**	**Follicle Stimulating Hormone (FSH)**
	Specimen Required	3ml plain blood
	Reference Interval	Male : 0.95-11.95 mIU/ml Normal Menstrual Female : Follicular Phase : 3.03 -8.08 mIU/mL Mid-cycle Peak : 2.55 - 16.69 mIU/mL Luteal Phase : 1.38 -5.47 mIU/mL Pregnant : < 0.3 mIU/mL Post Menopausal: 26.72-133.41 mIU/mL
	Method	Chemiluminescence Immunoassay
	Turnaround Time	Daily,24 hours
	Medical Indication	Assessment of hyperthalamic-pituitary gondal axis in the diagnosis of amenorrhea, androgen deficiency & gonadal dysfunction.
60	**Test**	**Ferritin**
	Specimen Required	3ml plain blood
	Reference Interval	Male : 21.81-274.66 ng/mL Female : 4.63-204.00 ng/ml
	Method	Chemiluminescent Microparticle Immunoassay (CMIA)
	Turnaround Time	Daily, 24 hours
	Medical Indication	Measurement of iron stores in iron deficiency anaemia & iron overload states e.g. Haemochromatosis
61	**Test**	**Folic Acid**
	Specimen Required	3ml plain blood
	Reference Interval	3.1 - 20.5 ng/mL
	Method	Chemiluminescent Microparticle Immunoassay (CMIA)
	Turnaround Time	3 - 4 days
	Medical Indication	Investigation of suspected folate deficiency & to monitor therapy
62	**Test**	**Free Triiodothyronine (FT3)**
	Specimen Required	3ml plain blood
	Reference Interval	1.71 – 3.71 pg/mL
	Method	Chemiluminescence immunoassay
	Turnaround Time	Daily, 24 hours
	Medical Indication	For the quantitative determination of free triiodothyronine (Free T_3) in human serum and plasma as an aid in the assessment of thyroid status, useful in assessing the severity of the thyrotoxic state. It also provides further confirmation of hyperthyroidism, supplementing the tetraiodothyronine (T4), sensitive thyrotropin (sTSH), and total T3 assays. Evaluating clinically euthyroid patients who have an altered distribution of binding proteins. Monitoring thyroid hormone replacement therapy

63	**Test**	**Free Thyroxine (FT4)**
	Specimen Required	3ml plain blood
	Reference Interval	Adult: 0.70 – 1.48 ng/dL Newborn: 0.90 – 3.00 ng/dL
	Method	Chemiluminescence immunoassay
	Turnaround Time	Daily, 24 hours
	Medical Indication	Diagnosis of hyperthyroidism and hypothyroidism. Evaluation of suspected thyroid function disorders using free thyroxine measured together with thyroid-stimulating hormone, aid in the assessment of thyroid status.

64	**Test**	**Full Blood Count**
	Specimen Required	3ml EDTA blood
	Reference Interval	Haemoglobin level, WBC, RBC, Platelet count, Indices, WBC differential, peripheral blood film comment

Male	Female
WBC : 4,000 - 11,000 /cmm	WBC : 4,000 - 11,000 /cmm
RBC : 4.5 - 6.0 M/cmm	RBC : 4.0 - 5.5 M/cmm
Hb : 12.5 - 17.5 g/dl	Hb : 11.5 - 15.5 g/dl
HCT : 40 - 50 %	HCT : 37 - 45%
MCV : 82 - 98 fl	MCV : 82 - 98 fl
MCH : 27 - 33 pg	MCH : 27 - 33 pg
MCHC : 31 - 35%	MCHC : 31 - 35%
Plt : 150,000 - 400,000 /cmm	Plt : 150,000 - 400,000 /cmm
RDW : 11.0 - 16.0%	RDW : 11.0 - 16.0%
Polymorph : 50 - 70%	Polymorph : 50-70%
Lymphocytes : 20 - 40%	Lymphocytes : 20 -40%
Monocytes : <6%	Monocytes : <6%
Eosinophils : <4%	Eosinophils : <4%
Basophils : <1%	Basophils : <1%

	Method	Light Scattering Flow Cytometry, Microscopy
	Turnaround Time	Daily, 24 hours
	Medical Indication	Assess general health of an individual, screening for haematological disorders, infection

65	**Test**	**Gamma Glutamyl Transpeptidase (GGT)**
	Specimen Required	3ml plain blood
	Reference Interval	Male : 12 - 64 U/L, Female : 9 - 36 U/L
	Method	IFCC
	Turnaround Time	Daily, 24 hours
	Medical Indication	Diagnosing and monitoring hepatobiliary disease, the most sensitive enzymatic indicator of liver disease. Liver profile assessment. Screening test for occult alcoholism

66	**Test**	**Globulin**
	Specimen Required	3ml plain blood
	Reference Interval	2.1 - 4.0 g/dL
	Method	Calculated based on Total Protein, Albumin
	Turnaround Time	Daily, 24 hours
	Medical Indication	Indicator of nutritional status. Liver Function Test

67	**Test**	**Glucose**
	Specimen Required	3ml fluoride blood
	Reference Interval	Fasting : ≤100 mg/dL, Random <140 mg/dL
	Method	Hexokinase
	Turnaround Time	Daily, 24 hours
	Medical Indication	Diagnosis & management of diabetes mellitus & other carbohydrate metabolism disorders including gestational diabetes, neonatal hypoglycemia, idiopathic hypoglycemia & pancreatic cell carcinoma
68	**Test**	**Glucose Tolerance Test (3 points)**
	Specimen Required	3ml fluoride blood at fasting, 1HPP and 2HPP
	Reference Interval	Fasting : ≤100 mg/dL, 1HPP : <200 mg/dL, 2HPP : < 140 mg/dL
	Method	Hexokinase
	Turnaround Time	Daily, 24 hours
	Medical Indication	Diagnosis of diabetes mellitus
69	**Test**	**Glucose -6 Phosphate Dehydrogenase (G6PD) Screening**
	Specimen Required	3ml EDTA blood
	Reference Interval	Deficiency Detected / Not Detected
	Method	Fluorescence Method
	Turnaround Time	Daily, 24 hours
	Medical Indication	Qualitative screening test for G6PD enzyme level. (Note : Any recent blood transfusion or acute hemolysis can affect the result obtained)
70	**Test**	**Haemoglobin**
	Specimen Required	3ml EDTA blood
	Reference Interval	Male : Hb : 12.5 - 17.5 g/dl Female :Hb : 11.5 - 15.5 g/dl
	Method	Light Scattering Flow Cytometry
	Turnaround Time	Daily, 24 hours
	Medical Indication	Assess general health of an individual, screening for haematological disorders
71	**Test**	**Hb Electrphoresis**
	Specimen Required	2 x 3ml EDTA blood
	Reference Interval	Hb A2 : 2.1 - 3.7 % HB A : 96.8 - 97.9 % Hb F : <1.0 %
	Method	Capillary Electrophoresis
	Turnaround Time	2 weeks
	Medical Indication	Aids in diagnosis of Thalassemias and haemoglobin variants. Evaluation of unexplained microcytosis
72	**Test**	**HbA1c (Glycosylated Hb)**
	Specimen Required	3ml EDTA blood
	Reference Interval	Non-diabetic : <6%, Goal : <7%, Poor control : >8%
	Method	Enzymatic method
	Turnaround Time	Daily, 24 hours
	Medical Indication	Long term monitoring of glucose control in diabetes. Diagnosis of diabetes

73	**Test**	**Hepatitis A IgG (Anti-HAV IgG)**
	Specimen Required	3ml plain blood
	Reference Interval	Non-Reactive
	Method	Chemiluminescence Immunoassay
	Turnaround Time	Daily, 24 hours
	Medical Indication	Detection of recent or previous exposure or immunity to hepatitis A
74	**Test**	**Hepatitis A IgM (Anti-HAV IgM)**
	Specimen Required	3ml plain blood
	Reference Interval	Non-Reactive
	Method	Chemiluminescence Immunoassay
	Turnaround Time	Daily, 24 hours
	Medical Indication	Diagnosis of acute or recent hepatitis A infection
75	**Test**	**Hepatitis Be Antigen (HBeAg)**
	Specimen Required	3ml plain blood
	Reference Interval	Non-reactive
	Method	Chemiluminescence Immunoassay
	Turnaround Time	Daily, 24 hours
	Medical Indication	A 'reactive' results suggests current infectious hepatitis B infection
76	**Test**	**Hepatitis B Surface Antigen (HBsAg)**
	Specimen Required	3ml plain blood
	Reference Interval	Non-reactive
	Method	Chemiluminescence Immunoassay
	Turnaround Time	Daily
	Medical Indication	A 'reactive' results suggests current infectious hepatitis B infection
77	**Test**	**Hepatitis B Surface Antigen (HBsAg) Confirmatory Test (Qualitative)**
	Specimen Required	3ml plain blood
	Reference Interval	Not Confirmed
	Method	Specific Antibody Neutralization
	Turnaround Time	1 week
	Medical Indication	A reactive screen result confirmed as positive by hepatitis B surface antigen (HBsAg) confirmatory test ndicative of acute or chronic hepatitis B virus (HBV) infection, or chronic HBV carrier state.
78	**Test**	**Hepatitis B Virus (HBV) DNA viral load**
	Specimen Required	3ml plain blood
	Reference Interval	Not Detected
	Method	Real time - Polymerase Chain Reaction
	Turnaround Time	1 week
	Medical Indication	This tests screened the amount of hepatitis B virus DNA in the blood of chronically infected patients.
79	**Test**	**Hepatitis C Virus Antibody (Anti-HCV)**
	Specimen Required	3ml plain blood
	Reference Interval	Non-reactive
	Method	Enzyme Immunoassay
	Turnaround Time	Daily, 24 hours
	Medical Indication	A 'reactive' antibody test suggest that you have been infected with the hepatitis C virus at some point in time.

80	**Test**	**Hepatitis C Virus (HCV) RNA viral load**
	Specimen Required	3ml plain blood
	Reference Interval	Not-Detected
	Method	Real time - Polymerase Chain Reaction
	Turnaround Time	1 week
	Medical Indication	This screening test refers to the amount of virus present in the bloodstream that used to confirm active hepatitis C infection and are used during treatment to help determine response.
81	**Test**	**Helicobacter pylori IgG**
	Specimen Required	3ml plain blood
	Reference Interval	≤0.90 Negative, 0.91-0.99 Equivocal, ≥1.00 Positive
	Method	Enzyme Immunoassay
	Turnaround Time	Daily, 24 hours
	Medical Indication	Detection of IgG Antibodies to Helicobacter Pylori in serum
82	**Test**	**Herpes Simplex Virus 1 IgM**
	Specimen Required	3ml plain blood
	Reference Interval	<0.90 Negative, 0.90 -0.99 Equivocal, ≥1.00 Positive
	Method	Enzyme Immunoassay
	Turnaround Time	1 Week
	Medical Indication	Diagnosis of Herpes simplex infection
83	**Test**	**Herpes Simplex Virus 1 IgG**
	Specimen Required	3ml plain blood
	Reference Interval	<0.90 Negative, 0.90-0.99 Equivocal, ≥1.00 Positive
	Method	Enzyme Immunoassay
	Turnaround Time	3 days
	Medical Indication	Diagnosis of Herpes simplex infection
84	**Test**	**Herpes Simplex Virus 2 IgM**
	Specimen Required	3ml plain blood
	Reference Interval	<0.90 Negative, 0.90-0.99 Equivocal, ≥1.00 Positive
	Method	Solid Phase enzyme-linked Immunosorbent Assay
	Turnaround Time	1 Week
	Medical Indication	Diagnosis of Herpes simplex infection
85	**Test**	**Herpes Simplex Virus 2 IgG**
	Specimen Required	3ml plain blood
	Reference Interval	<0.90 Negative, 0.90-0.99 Equivocal, ≥1.00 Positive
	Method	Solid Phase enzyme-linked Immunosorbent Assay
	Turnaround Time	3 days
	Medical Indication	Diagnosis of Herpes simplex infection
86	**Test**	**HIV antibody-antigen**
	Specimen Required	3ml plain blood
	Reference Interval	Non-Reactive
	Method	Chemiluminescent microparticle Immunoassay
	Turnaround Time	Daily,24 hours
	Medical Indication	Diagnosis of HIV infection

87	**Test**	**HIV-1 Confirmation Test (HIV RNA Viral Load)**
	Specimen Required	5 ml EDTA Plasma
	Reference Interval	Not-Detected
	Method	Real Time - Polymerase Chain Reaction
	Turnaround Time	2 - 3 weeks
	Medical Indication	This test 'detected' determine the virus is at work making copies of itself, and the disease may progress quickly.
88	**Test**	**Homocysteine**
	Specimen Required	3ml plain blood
	Reference Interval	FPIA/Direct Chemiluminescent
	Method	Male: 5.46 – 16.20 µmol/L, Female: 4.44-13.56 Overall: 5.08 – 15.39 µmol/L
	Turnaround Time	Daily, 24 hours
	Medical Indication	Assess CHD risk, obstetric complications & neural tube defects. Aid for screening patient suspected of having an inherited disorder for methionine metabolism
89	**Test**	**Human Papilloma Virus DNA (High Risk Screen & Genotyping)**
	Specimen Required	Cervical specimen in Liquid cytology Pap Test solution
	Reference Interval	Not Detected
	Method	Real Time - Polymerase Chain Reaction
	Turnaround Time	2 weeks
	Medical Indication	Screening the presences of human papilloma virus.
90	**Test**	**Intact Parathyroid Hormone (iPTH)**
	Specimen Required	3ml EDTA blood (fasting) Place specimen in ice and send to the laboratory immediately
	Reference Interval	15.0 – 68.3 pg/ml
	Method	Chemiluminescence Immunoassay
	Turnaround Time	Daily
	Medical Indication	Differential diagnosis of hyperparathyroidism & hypoparathyroidism
91	**Test**	**Insulin**
	Specimen Required	5ml plain blood (fasting) Fasting sample (10-12hrs) required
	Reference Interval	2 .0-25.0 uU/L
	Method	Chemiluminescence Immunoassay
	Turnaround Time	1 Week
	Medical Indication	Differential diagnosis of hypoglyaemia (including factitious hypoglycaemia, insulin atoimmune hypoglycaemia & insulinoma)
92	**Test**	**Iron**
	Specimen Required	3ml plain blood
	Reference Interval	Males : 65 - 175 µg/dL, Female : 50 - 170 µg/dL
	Method	Spectrophotometrically
	Turnaround Time	Daily, 24 hours
	Medical Indication	Screening for chronic iron overload disease, particularly hereditary hemochromatosis. Diagnosis of iron deficiency. Evaluate red cell production & destruction, iron metabolism or iron transport

93	**Test**	**Lactate Dehydrogenase (LDH)**
	Specimen Required	3ml plain blood
	Reference Interval	125 – 220 U/L
	Method	IFCC
	Turnaround Time	Daily, 24 hours
	Medical Indication	Investigation of a variety of disease involving the heart, liver, kidney, lung & blood. Monitoring changes in tumor burden after chemotheraphy, but elevations in cancer patients are too erratic to be used in diagnosis of cancer. Increased in megaloblastic & pernicious anaemia, extensive carcinomatosis, viral hepatitis, shock, hypoxia, extreme hyperthermia, cirrhosis, obstructive jaundice, renal diseases, skeletal muscle diseases, neoplastic diseases and congestive heart failure
94	**Test**	**Luteinising Hormone (LH)**
	Specimen	3ml plain blood
	Reference Interval	Males: 0.57 – 12.07 mIU/mL <u>Normally Menstruating Females</u> Follicular Phase: 1.80 – 11.78 mIU/mL Mid-Cycle Peak: 7.59 – 89.08 mIU/mL Luteal Phase: 0.56 – 14.00 mIU/mL Post Menopausal Females (without HRT): 5.16 – 61.99 mIU/mL
	Method	Chemiluminescence Immunoassay
	Turnaround Time	Daily, 24 hours
	Medical Indication	Assessment of hyperthalamic-pituitary gondal axis in the diagnosis of amenorrhea, androgen deficiency & gonadal dysfunction.
95	**Test**	**Magnesium**
	Specimen Required	3ml plain blood
	Reference Interval	1.60 – 2.60 mg/dL
	Method	Arsenazo
	Turnaround Time	3 days
	Medical Indication	Determine deficiency or excess states. May be used to monitor preeclampsia patients being treated with magnesium sulfate.
96	**Test**	**Magnesium (Urine)**
	Lab Section	Referral
	Specimen Required	24 hours urine (preservative 10ml concentrated HCL)
	Reference Interval	6.0 - 10.0 mmol/day. Varies with diet
	Method	Colorimetry
	Turnaround Time	1 week
	Medical Indication	Assessing cause of abnormal serum magnesium concentrations. Determining whether the body is receiving adequate nutrition.
97	**Test**	**Malaria Parasite**
	Specimen Required	3ml EDTA blood
	Reference Interval	Positive/ Negative
	Method	Direct microscopy (thick and thin film)
	Turnaround Time	Daily, 24 hours
	Medical Indication	Screening, detection& identification of malaria parasites.

98	**Test**	**Measles IgG**	
	Specimen Required	3ml plain blood	
	Reference Interval	Not-Detected	<250mlU/mL
		Detected	≥ 250 mlU/mL
	Method	Enzyme Immunoassay	
	Turnaround Time	1 Week	
	Medical Indication	A "reactive" results suggests previous exposure or immunization to measles.	

99	**Test**	**Microalbumin**
	Specimen Required	20ml random urine, 24 hour urine in 10ml concentrated HCL
	Reference Interval	Random urine : <20 mg/L, 24 hour urine : <30mg/24 hours
	Method	Immuno-turbidimetric
	Turnaround Time	Daily, 24 hours
	Medical Indication	Early detection of nephropathy in patients with diabetes mellitus. Assessing the potential for early onset of nephropathy in diabetic patients

100	**Test**	**Microalbumin ACR**
	Specimen Required	20ml random urine, 24 hour urine
	Reference Interval	< 30 mg/g
	Method	Calculated from 24 hour urine creatinine and microalbumin
	Turnaround Time	Daily, 24 hours
	Medical Indication	Early detection of nephropathy in patients with diabetes mellitus. Assessing the potential for early onset of nephropathy in diabetic patients

101	**Test**	**Mirofilaria**
	Specimen Required	3ml EDTA blood (Note : Certain type of microfilariae have a nocturnal periodicity, & the blood specimen is best taken between 10pm & 2am)
	Reference Interval	Positive/ Negative
	Method	Direct microscopy (thick & thin film)
	Turnaround Time	Daily, 24 hours
	Medical Indication	Detection of microfilariae in peripheral blood

102	**Test**	**Monospot**
	Specimen Required	3ml plain blood
	Reference Interval	Negative
	Method	One Step rapid Latex particle Agglutination test
	Turnaround Time	Daily,24 hours
	Medical Indication	Detection of infectious mononucleosis due to EBV

103	**Test**	**Morphine (Screening),Urine**
	Specimen Required	25 ml random urine
	Reference Interval	Negative
	Method	Homogenous Enzyme Immunoassay
	Turnaround Time	Daily, 24 hours
	Medical Indication	Detection of Opiates in Urine

104 **Test** **Osmolality (Urine)**

Lab Section	Referral
Specimen Required	20 ml random urine
Reference Interval	100 - 1200 mmol/kg
Method	Freezing Point Osmometry
Turnaround Time	1 week
Medical Indication	Assessing the concentration & diluting ability of the kidney. Assess fluid & electrolyte balance

105 **Test** **Osmolality**

Lab Section	Referral
Specimen Required	3ml plain blood
Reference Interval	275 - 300 mmol/kg
Method	Freezing Point Osmometry
Turnaround Time	1 week
Medical Indication	Evaluating acutely ill or comatose patients. Assess fluid & electrolyte balance

106 **Test** **Packed Cell Volume (PCV)**

Specimen Required	3ml EDTA blood
Reference Interval	Male : HCT : 40 - 50 % Female : HCT : 37 - 45%
Method	Light Scattering Flow Cytometry
Turnaround Time	Daily, 24 hours
Medical Indication	Assess general health of an individual, screening for haematological disorders

107 **Test** **Partial Thomboplsatin Time (Act.), APTT**

Specimen Required	Sodium Citrate
Reference Interval	28 - 40 seconds
Method	Clot Detection
Turnaround Time	Daily, 24 hours
Medical Indication	Monitoring heparin therapy (unfractionated heparin [UFH]). Screening for certain coagulation factor deficiencies. Detection of coagulation inhibitors such as lupus anticoagulant, specific factor inhibitors & non-specific inhibitors

108 **Test** **Peripheral Blood Film**

Specimen Required	3ml EDTA blood
Reference Interval	Morphological description of WBC, RBC, platelet & other blood components
Method	Direct microscopy
Turnaround Time	Daily, 24 hours
Medical Indication	Assess general health of an individual, screening for haematological disorders. Morphology review of blood cells

109 **Test** **Phosphorus**

Specimen Required	3ml plain blood
Reference Interval	2.3 - 4.7 mg/dL
Method	Phosphomolybdate UV
Turnaround Time	Daily, 24 hours
Medical Indication	Assessment of calcium and phosphate disorders. Used in diagnosis & management of a variety of disorders including bone, parathyroid & renal disease

110	**Test**	**Platelet Count**
	Specimen Required	3ml EDTA blood
	Reference Interval	Plt : 150,000 - 400,000 /cmm
	Method	Light Scattering Flow Cytometry
	Turnaround Time	Daily, 24 hours
	Medical Indication	Screening for bleeding disorders, platelet dysfunction
111	**Test**	**Potassium**
	Specimen Required	3ml plain blood
	Reference Interval	3.5 - 5.1 mmol/L
	Method	I.S.E Indirect Potentiometry
	Turnaround Time	Daily, 24 hours
	Medical Indication	Evaluation of electrolyte balance, cardiac arrhythmia, muscular weakness, hepatic encephalopathy & renal failure. Monitoring purpose during treatment of many conditions especially in diabetic ketoacidosis & any intravenous therapy for fluid replacement
112	**Test**	**Potassium (Urine)**
	Specimen Required	24 hour urine
	Reference Interval	25-125 mmol/24 hours
	Method	I.S.E Indirect Potentiometry
	Turnaround Time	Daily, 24 hours
	Medical Indication	Evaluate electrolyte balance. Evaluation of hypo- or hyperkalemia.
113	**Test**	**Pregnancy test**
	Specimen Required	20ml urine
	Reference Interval	Negative/Positive
	Method	Rapid Test Kit
	Turnaround Time	Daily, 24 hours
	Medical Indication	Screening for pregnancy
114	**Test**	**Progesterone**
	Specimen	3ml plain blood
	Reference Interval	Male : <0.1 – 0.2 ng/mL Normally Menstruating Females : Follicular Phase : <0.1 – 0.3 ng/mL Luteal Phase : 1.2 – 15.9 ng/mL Pregnant : <0.3 mIU/ml Post Menopausal: <0.1 – 0.2 ng/mL Pregnant: First Trimester : 2.8 – 147.3 ng/mL Second Trimester : 22.5 – 95.3 ng/mL Third Trimester : 27.9 – 242.5 ng/mL
	Method	Chemiluminescence Immunoassay
	Turnaround Time	Daily, 24 hours
	Medical Indication	Assess ovarian function. Assess abnormal pregnancy. Detect progestrone-secreting tumour.

115 **Test** **Prolactin**

Specimen Required	3ml plain blood
Reference Interval	Male : 3.46 – 19.40 ng/mL Female : 5.18 – 26.53 ng/mL Postmenopausal : 1.8-20.3 ng/ml
Method	Chemiluminescense Immunoassay
Turnaround Time	Daily, 24 hours
Medical Indication	Diagnosis & management of pituitary adenoma. Investigation of hypogonadism

116 **Test** **Protein (Total)**

Specimen Required	3ml plain blood
Reference Interval	6.4 - 8.3 g/dL
Method	Biuret/ Endpoint
Turnaround Time	Daily, 24 hours
Medical Indication	Liver function test. Marker of nutritional status, establish hypoprotienaemia or hyperprotinenaemia. Diagnosis & treatment of a variety of disease involving the liver, kidney, or bone marrow, as well as other metabolic or nutritional disorders.

117 **Test** **Protein, Total (Urine)**

Specimen Required	24 hour urine, keep specimen on ice during collection. Avoid collection of specimen within 24 hours of intense exercise since this can falsely elevate protein excretion.
Reference Interval	<300 mg/day
Method	Turbidimetric
Turnaround Time	Daily, 24 hours
Medical Indication	Evaluation of renal disease. Indicator of renal impairment. To detect increased permeability of the blood-brain barrier to plasma proteins. To detect increased intrathecal production of immunoglobulins. Screening for monoclonal gammopathy.

118 **Test** **Prothrombin Time**

Specimen Required	Sodium Citrate
Reference Interval	10 – 14 seconds
Method	Clot Detection
Turnaround Time	Daily, 24 hours
Medical Indication	Monitoring heparin therapy (unfractionated heparin [UFH]). Screening for certain coagulation factor deficiencies Detection of coagulation inhibitors such as lupus anticoagulant, specific factor inhibitors & non-specific inhibitors.

119 **Test** **Prostate specific Antigen**

Specimen Required	3ml plain blood Draw blood before rectal examination or biopsy procedure. Send specimen to the laboratory immediately
Reference Interval	<4.0 ng/ml
Method	Chemiluminescense Immunoassay
Turnaround Time	Daily,24 hours
Medical Indication	Tumour marker for prostate cancer. Increased levels seen in BPH & prostatitis

120 **Test** **Reticulocyte Count**

Specimen Required	3ml EDTA blood
Reference Interval	Adults and children : 0.5-2.5%
Method	Manual Briliant Cresyl Blue Stain
Turnaround Time	Daily, 24 hours
Medical Indication	Indication of degree of erythropoietic activity

121 **Test** **Rubella IgG**

Specimen Required	3ml plain blood
Reference Interval	Non-Reactive ,5 IU/ml Gray Zone 5.0 -9.9 Reactive ≥ 10 IU/ml
Method	Chemiluminescence Immunoassay
Turnaround Time	Daily
Medical Indication	A "reactive ' results suggest a current or previous exposure or immunization to Rubella

122 **Test** **Rubella IgM**

Specimen Required	3ml plain blood
Reference Interval	Non-Reactive
Method	Chemiluminescence Immunoassay
Turnaround Time	2-3 days
Medical Indication	A "reactive ' results suggest a current or recent exposure to Rubella

123 **Test** **Rheumatoid Factor (RF)**

Specimen Required	3ml plain blood
Reference Interval	<30 IU/mL
Method	Immunoturbidimetry
Turnaround Time	Daily
Medical Indication	Supports diagnosis of Rheumatoid arthritis.

124 **Test** **Sex Hormone Binding Globulin (SHBG)**

Specimen Required	3ml plain blood
Reference Interval	Male : 11.2 -78.1 nmol/L Female (Non-pregnant) : 11.7 – 137.2 nmol/L
Method	Electrochemiluminescence Immunoassay
Turnaround Time	1 Week
Medical Indication	Useful in investigation of hirsutism and virilisation in females

125 **Test** **Seminal Analysis**

Specimen Required	Semen
Reference Interval	Amount : 2-5 ml Colour : Greyish/Opaque white PH : Alkaline (7.2-8.5) Motility : Within 2 hours ejaculation, 60 % are vigorously motile & show progressive activity Morphology : 75 % -80 % normal sperms Liquefaction time: Less than 60 minutes
Method	Direct measure/Observation/Microscopic examination
Turnaround Time	Daily, 24 hours
Medical Indication	Evaluate Male fertility

126 **Test** **Sodium**
Specimen Required 3ml plain blood
Reference Interval 135 - 145 mmol/L
Method I.S.E. Indirect Potentiometry
Turnaround Time Daily, 24 hours
Medical Indication Evaluation /assessment of electrolyte balance. Important in assessing acid-base balance, water balance, water intoxication & dehydration

127 **Test** **Sodium (Urine)**
Specimen Required 24 hour urine
Reference Interval 30-300 mmol/24 hours
Method I.S.E Indirect Potentiometry
Turnaround Time Daily, 24 hours
Medical Indication Assessing acid-base balance, water balance, water intoxication and dehydration. Evaluation & assessment of electrolyte balance

128 **Test** **Stone Analysis (Calculi)**
Specimen Required Stone/Calculi
Reference Interval Report indicates presence or absence of calcium, phosphate, oxalate, uric acid, carbonate, magnesium & ammonia
Method Biochemical tests
Turnaround Time 4-5 days
Medical Indication Management of patients with recurrent renal calculi.

129 **Test** **Testosterone**
Specimen Required 3ml plain blood
Reference Interval Male 142.39 – 923.14 ng/dl
Female 10.83 – 56.94 ng/dl
Method Chemiluminescence immunoassay
Turnaround Time Daily, 24 hours
Medical Indication Diagnosis of hypogonadism in males, investigation of hirsutism & virilisation in females

130 **Test** **Triiodothyronine (T3)**
Specimen Required 3ml plain blood
Reference Interval 0.58 – 1.59 ng/mL
Method Chemiluminescence immunoassay
Turnaround Time Daily, 24 hours

131 **Test** **Thyroid Stimulating Hormone (TSH)**
Specimen Required 3ml plain blood
Reference Interval Adult 0.35 – 4.94 ulU/L
Newborn 0.68 – 28.60 ulU/L
Method Chemiluminescence immunoassay
Turnaround Time Daily, 24 hours
Medical Indication Diagnosis hyperthyroidism & hypothyroidsm. Monitor thyroxine replacement or suppression therapy. Distinguish non-thyroidal illness (NT) from hyperthyroidism

132	**Test**	**Thyroxine (T4)**
	Specimen Required	3ml plain blood
	Reference Interval	Adult 4.87 – 11.72 µg/dl Newborn 8.50 – 22.0 µg/dl
	Method	Chemiluminescence immunoassay
	Turnaround Time	Daily
	Medical Indication	Diagnosis hyperthyroidism & hypothyroidsm.
133	**Test**	**Total Iron Binding Capacity (TIBC)**
	Specimen Required	3ml plain blood
	Reference Interval	Male : 134 - 415 µg/dL, Female : 120 - 480 µg/dL
	Method	Spectrophotometrically
	Turnaround Time	Daily, 24 hours
	Medical Indication	Screening for chronic iron overload disease, particularly hereditary hemochromatosis. Diagnosis of iron deficiency. Evaluate red cell production & destruction, iron metabolism or iron transport.
134	**Test**	**Total RBC**
	Specimen Required	3ml EDTA blood
	Reference Interval	Male : RBC : 4.5 - 6.0 M/cmm Female : RBC : 4.0 - 5.5 M/cmm
	Method	Light Scattering Flow Cytometry
	Turnaround Time	Daily, 24 hours
	Medical Indication	Assess general health of an individual, screening for haematological disorders, infection
135	**Test**	**Total White & Differential Count**
	Specimen Required	3ml EDTA blood
	Reference Interval	WBC : 4,000 - 11,000 /cmm Polymorph : 50 - 70 % Lymphocytes : 20 - 40 % Monocytes : <10 % Eosinophils : <4 % Basophils : <1 %
	Method	Light Scattering Flow Cytometry
	Turnaround Time	Daily, 24 hours
	Medical Indication	Assess general health of an individual, screening for haematological disorders, infection
136	**Test**	**Total WBC**
	Specimen Required	3ml EDTA blood
	Reference Interval	WBC : 4,000 - 11,000 /cmm
	Method	Light Scattering Flow Cytometry
	Turnaround Time	Daily, 24 hours
	Medical Indication	Assess general health of an individual, screening for haematological disorders, infection.

137	**Test**	**Human Chorionic Gonadotropin (hCG) Total β HCG**
	Specimen Required	3ml plain blood
	Reference Interval	Non-pregnant: ≤5.00 mIU/mL Weeks Post LMP 1 – 10 : <1.20 – 417, 430 mIU/mL 11 – 15 : 16,996 – 247,465 mIU/mL 16 – 22 : 6,860 – 50,239 mIU/mL 23 – 40 : 1,583 – 65,911 mIU/mL
	Method	Chemiluminescence Immunoassay
	Turnaround Time	Daily, 24 hours
	Medical Indication	Tumour marker for hydatiform mole, choriocarcinoma & testicular cancer
138	**Test**	**Toxoplasma IgG**
	Specimen Required	3ml plain blood
	Reference Interval	<0.90 Negative, 0.90-0.99 Equivocal, ≥1.00 Positive
	Method	Chemiluminescence Immunoassay
	Turnaround Time	1 Week
	Medical Indication	A "reactive" results suggests past toxoplasma infection.
139	**Test**	**Toxoplasma IgM**
	Specimen Required	3ml plain blood
	Reference Interval	<0.90 Negative, 0.90-0.99 Equivocal, ≥1.00 Positive
	Method	Chemiluminescence Immunoassay
	Turnaround Time	1 Week
	Medical Indication	A "reactive" results suggests recent or current infections
140	**Test**	**Transferrin**
	Specimen Required	3ml plain blood
	Reference Interval	Male: 92 – 286 mg/dl Female : 83 – 330 mg/dl
	Method	Calculated from Iron and TIBC
	Turnaround Time	Daily, 24 hours
	Medical Indication	Differential diagnosis of anaemia. Decreased levels seen in protein-calorie malnutrition, liver dysfunction & acute inflammation. Screening for chronic iron overload diseases, particularly hereditary hemochromatosis.
141	**Test**	**Triglycerides**
	Specimen Required	3ml plain blood (fasting)
	Reference Interval	< 150 mg/dL
	Method	Enzymatic Colourimetric
	Turnaround Time	Daily, 24 hours
	Medical Indication	Evaluation of risk factors in individuals with elevated cholesterol values. Risk factor for acute pancreatitis & coronary heart disease
142	**Test**	**T-Uptake**
	Specimen Required	3ml Plain blood
	Reference Interval	0.69 – 1.41 T-Uptake units
	Method	Chemiluminescent microparticles Immunoassay
	Turnaround Time	Daily,24 hours
	Medical Indication	Assessment of Thyroid function Status

143 **Test** **Urea**

Specimen Required	3ml plain blood
Reference Interval	Male: 19-44 mg/dl (<50 years), 18-55 mg/dl (>50 years) Female : 18 -55 mg/dl (<50 years), 21 – 43 mg/dl (>50 years)
Method	Enzymatic GLDH/Urease
Turnaround Time	Daily, 24 hours
Medical Indication	Screening test for the evaluation of kidney function. Frequently requested with serum creatinine since determination of these 2 compounds aids in the differential diagnosis of pre-renal, renal & post-renal hyperuremia. Evaluate protein metabolism.

144 **Test** **Uric Acid**

Specimen Required	3ml plain blood
Reference Interval	Male : 3.5 - 7.2 mg/dL , Female : 2.6 - 6.0 mg/dL
Method	Uricase
Turnaround Time	Daily, 24 hours
Medical Indication	Diagnose gout & other disorders of uric acid. Diagnosis & treatment of renal failure & monitoring patients receiving cytotoxic drugs & a variety of other disorders including gout, leukemia, psoriasis, starvation & other wasting conditions.

145 **Test** **Urea (Urine)**

Specimen Required	24 hours urine (preservative 10ml concentrated HCL)
Reference Interval	12 – 20 g/day (428 - 714 mmol/day)
Method	Enzymatic GLDH/Urease
Turnaround Time	Daily, 24 hours
Medical Indication	Assessment of protein intake &/or nitrogen balance. Renal function test.

146 **Test** **Urine FEME & Specific Gravity**

Specimen Required	20ml urine
Reference Interval	pH, colour ,transparency, Specific Gravity, Positive/ Negative for Protein, Glucose, Ketone, Blood Microscopy for RBC, WBC, Epithelia Cells, casts, Bacteria & others
Method	Urinalysis
Turnaround Time	Daily, 24 hours
Medical Indication	Screening for urinary tract diseases & some non-renal diseases

147 **Test** **Urine :FEME & Smear**

Specimen Required	20ml urine
Reference Interval	As in FEME & Specific Gravity, Microscopy reporting of gram stain.
Method	Urinalysis and Conventional Gram Stain Procedure
Turnaround Time	Daily, 24 hours
Medical Indication	Presumptive diagnosis of bacterial infection. Stain is used to identify the presence of microorganisms

148 **Test** **Urine : Microscopy**

Specimen Required	20ml urine
Reference Interval	Microscopy for RBC, WBC, Epithelial cells, casts, Bacteria & others
Method	Urinalysis
Turnaround Time	Daily, 24 hours
Medical Indication	Screening for urinary tract diseases and some non-renal diseases

149 **Test** **Urine : Specific Gravity**
Specimen Required 20ml urine
Reference Interval 1.010 - 1.030
Method Urinalysis
Turnaround Time Daily, 24 hours
Medical Indication As a partial assessment of the kidney's ability to concentrate urine

150 **Test** **Varicella-Zoster IgG**
Specimen Required 3ml plain blood
Reference Interval Not-Detected
Method Indirect Immunoenzyme assay
Turnaround Time 1 Week
Medical Indication Detection of Antibody to Varicella Zoster Virus

151 **Test** **Venereal Disease Research Laboratory (VDRL)**
Specimen Required 3ml plain blood
Reference Interval Non-Reactive
Method Manual Slide test
Turnaround Time Daily, 24 hours
Medical Indication Screening test for Syphilis

152 **Test** **Vitamin B12**
Specimen Required 3ml plain blood
Reference Interval 187 - 883 pg/mL
Method CMIA
Turnaround Time Daily, 24 hours
Medical Indication Investigation of macrocytic anemia. Workup of deficiencies seen in megaloblastic anemias. Diagnose pernicious anemia. Increased levels seen in hepatic cell damage & myeloid leukaemia

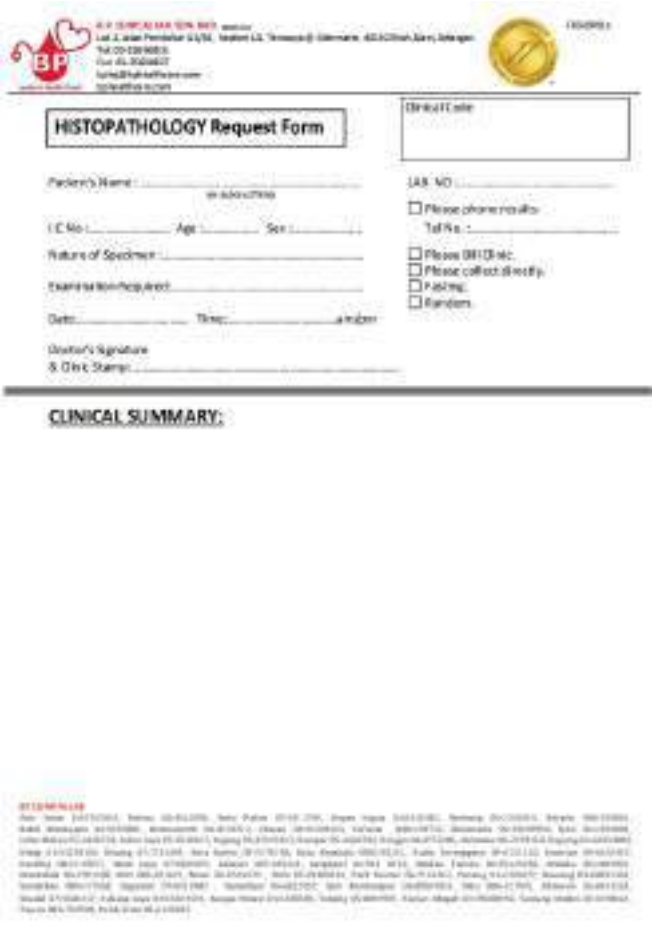
153 **Test** **Widal Weil Felix (WWF)**
Specimen Required 3ml plain blood
Reference Interval Negative
Method Tube Method
Turnaround Time Daily, 24 hours
Medical Indication Diagnosis of rickettsial Infections

Appendix A: PATHOLOGY REQUEST FORMS

CYTOLOGY Request Form

SCREENING INFORMATION

CLINICAL SUMMARY



HISTOPATHOLOGY Request Form

CLINICAL SUMMARY:

PATHOLOGY REQUEST FORM