B.P. Clinical Lab Sdn. Bhd

Company No: 152314-H
Address: Glenmarie Lab
No: 2, Jalan Pendafatar U1/54, Section U1, Temasya @ Glenmarie 40150 Shah Alam, Selangor Malaysia
Tel: 603-55699996; Fax: 603 -55696827
This BP Clinical Laboratory Service Guide 2017 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 2015
CHAIRMAN’S MESSAGE

It gives me great pleasure to write a forward for this 2nd edition of the BP Clinical Laboratory Service Guide 2015. This Guide reflects what BP Clinical Lab stands for today in terms of quality laboratory service.

Quality and reliable results is demanded by clinicians and healthcare providers who rely heavily on our results to support their diagnosis and treatment. In the past thirty over years BP Clinical Lab has undergone continuous evolution and improvement to meet international medical laboratory standards in terms of manpower training, automation technology up-grading and Laboratory Information System (LIS) development and customization to reduce pre-analytical registration and result transcription error.

Attaining Accreditation according to requirements of ISO 15189 Standard and Joint Commission International, (JCI) provides verification that BP Clinical Laboratories are adhering to established quality and competence standards deemed necessary for accurate and reliable patient testing, operational performance, quality management, and competence. Our support and commitment to stringent high quality practice in laboratory testing has reach a level where such commitment is an assimilated working culture of BP Clinical Lab’s staff with discipline as a way of life in the laboratory.

The BP Clinical Laboratory Service Guide provides information on the list of laboratory tests available in BP Clinical Lab and the specimen requirements as well as proper patient preparation and specimen collection using evidence based techniques. It is my hope that this manual will be used by BP Collection centers and clinic staff when requesting for laboratory testing.
Table of Contents

OVERVIEW of BP HEALTHCARE GROUP ............................................................................................................. 6
OVERVIEW OF BP CLINICAL LABORATORY ........................................................................................................... 8
BP OUTLETS ......................................................................................................................................................... 8
CONTACT INFORMATION ..................................................................................................................................... 18
SECTION I: Policies, Guidelines, Sample Collection, Packaging and Transportation, and Special Procedures ................................................................................................................................. 19
GENERAL POLICIES ........................................................................................................................................... 20
  GENERAL REQUIREMENTS ................................................................................................................................ 20
  TEST REQUEST .................................................................................................................................................. 20
PATIENT PREPARATION AND INFORMATION ..................................................................................................... 21
LABORATORY REQUEST FORM .............................................................................................................................. 22
SAMPLE LABELS ................................................................................................................................................ 23
SAMPLE COLLECTION ........................................................................................................................................ 24
PACKAGING THE SAMPLES ................................................................................................................................ 25
SAMPLE STORAGE .............................................................................................................................................. 27
SAMPLE TRANSPORTATION TO LABORATORY .................................................................................................... 27
COMMUNICATION WITH THE LABORATORY .......................................................................................................... 27
TURNAROUND TIME .......................................................................................................................................... 28
HANDLING OF TEST RESULTS ............................................................................................................................ 30
CRITICAL LABORATORY VALUES .......................................................................................................................... 31
WHO GUIDELINES ON DRAWING BLOOD: BEST PRACTICES IN PHLEBOTOMY ........................................... 34
BLOOD SAMPLE COLLECTION ............................................................................................................................ 39
SPECIMEN REQUIREMENTS FOR OPTIMAL RESULTS ......................................................................................... 43
SPECIFIC SAMPLE COLLECTION .......................................................................................................................... 48
SPECIAL PROCEDURES FOR BIOCHEMISTRY TESTS .......................................................................................... 48
  24-Hour Urine Collection .................................................................................................................................. 49
  24-Hour Urine Catecholamines ............................................................................................................................ 49
  Lactate ................................................................................................................................................................. 50
  Ammonia ............................................................................................................................................................. 51
SPECIAL PROCEDURES FOR MICROBIOLOGY TEST .......................................................................................... 51
  General Guidelines for Proper Specimen Collection and Transport ................................................................. 51
  Special Instructions .......................................................................................................................................... 52
  Urine Culture ..................................................................................................................................................... 52

BP Clinical Laboratory Service Guide Version 4, 2017
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
4. MS ISO 15189:2008 accreditation

BP Laboratory Branches

<table>
<thead>
<tr>
<th>Main Laboratory</th>
<th>Area Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP Clinical Lab Sdn Bhd, Ipoh</td>
<td>Northern, Central, Kota Bharu and Kuala Terengganu</td>
</tr>
<tr>
<td>BP Clinical Lab Sdn Bhd, Glenmarie</td>
<td>Metro, Southern and East Malaysia branches, Kuantan, Mentakab and Bentong</td>
</tr>
<tr>
<td>Cytopathology Lab, Penang</td>
<td>Northern, Central and East Coast branches</td>
</tr>
<tr>
<td>BP Food Testing Sdn Bhd, Butterworth</td>
<td>All branches (Occupational Health Testing &amp; Food Samples)</td>
</tr>
<tr>
<td>BP Environmental Testing Sdn Bhd, Subang Jaya</td>
<td>All branches (Water &amp; Waste water samples)</td>
</tr>
</tbody>
</table>
## BP OUTLETS

### LEGENDS

- **SC**: Specialist Centre
- **HA**: Hearing
- **DC**: Diagnostic Centre
- **LAB**: Dispensary

### KUALA LUMPUR

#### 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

| Tel: 03-91309163, 03-91308301 |
| Fax: 03-91411392 |

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

#### OUG

| 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: 8.00 am – 1.00 pm
- Sunday & Public Holiday: Closed

#### Pudu

| No. 458, Jalan Pudu, 55100 Kuala Lumpur |
| Tel: 03-92222800, 03-92222801 |
| Fax: 03-92222802 |

**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

#### Kuala Lumpur

| No. 16, Persiaran 65C, Pekeling Business Centre, Off Jalan Pahang Barat, 53000 Kuala Lumpur. |
| Tel: 03-40210041, 03-40210161 |
| Fax: 03-40210722 |

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

### Glenmarie (Shah Alam)

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

### Rawang

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

### Kajang

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: 8.00 am - 1.00 pm
- Sunday & Public Holiday: 8.00 am - 1.00 pm

### Taman Megah

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 - 5.00 pm
- Saturday, Sunday & Public Holiday: 7.30 am - 1.00 pm

### Subang Jaya

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: 8.00 am - 1.00 pm
- Sunday & Public Holiday: 8.00 am - 1.00 pm

### Klang

104, Leboh Turi, Taman Chi Liung, 41200 Klang, Selangor. Tel: 03-33724748, 03-33718637 Fax: 03-33724723

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

### Klang II

No. 29, Jalan Bayu Tinggi 1A/K56, Taman Bayu Tinggi, 41200 Klang, Selangor Tel: 03-33229169, 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

### Seri Kembangan

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: 8.00 am - 1.00 pm
- Sunday & Public Holiday: Closed
  *Closed on 12 public holidays and 52 sundays
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 Belau 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
Saturday & Sunday: 8.00 am – 1.00 pm
Public Holiday: Closed
*Closed on 12 public holidays

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

Penang II

Suite 4-2 & 4-3, Menara Penang Garden, 42A, Jalan Sultan Ahmad Shah, 10050 Penang.
Tel: 04-2264416, 04-2292323
Fax: 04-2292675

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

JOHOR

Batu Pahat

No. 5-2 (Tingkat Bawah) Jalan Zabedah, 84000 Batu Pahat, Johor Darul Takzim
Tel: 07-4311759, 07-4348813, 07-4348893
Fax: 07-4317400

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

Johor Bahru

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
Kuakng

No. 18 & 20, Jalan Haji Manan, 86000 Kuakng, Johor
Tel: 07-7715469, 07-7717135, 07-7760435 (Lab)
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

No. 34, Jalan Bakri, 84000 Muar, Johor Darul Takzim
Tel: 06-9515264, 06-9533485
Fax: 06-9534135

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

No 121 & 122, Jalan Genuang, 85000 Segamat, Johor.
Tel: 07-9312980 / 07-9311210 (DC), 07-9313027 (Lab)
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

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

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 sundays

Skudai

Tower 1, No. 68, Jalan Pertama 1, Danga Utama Commercial Center, 81300 Skudai Johor Bahru
Tel: 07-5500317, 07-5500323, 07-5500331, 07-5500315 (Lab)
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

No. 275, Jalan Raja Permaisuri Bainun (Jalan Kampar), 30250 Ipoh, Perak, Malaysia
Tel: 05-2559090, 05-2553442, 05-2418484
Fax: 05-2419226, 05-2426888, 05-2439196

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

Kampar

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**

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**

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**

No. 46, Jalan Besar,
35900 Tanjung Malim, Perak
Tel: 05-4590522, 05-4599522
Fax: 05-488692

**Operation Time**:
Monday to Friday: 7.30 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**

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**

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

---

**PCMH**

No. 277, Jalan Kampar, 30250 Ipoh, Perak
Tel: 05-2557788
Fax: 05-2537366

**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

---

**KEDAH**

**Alor Setar II**

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**

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
# NEGERI SEMBILAN

**Seremban**

No. 178 & 179 (Ground & Mezz Floor), Jalan Dato’Bandar Tunggal, 70000 Seremban, Negeri Sembilan.
Tel: 06-7616163, 06-7614188, 06-7626813 (lab)
Fax: 06-7661653

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

**Seremban II**

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: 8.00 am – 1.00 pm
- Sunday & Public Holiday: Closed

*Closed on 12 public holidays and 52 sundays

---

**Bahau**

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

---

**MELAKA**

**Melaka**

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: 8.00 am – 1.00 pm
- Sunday & Public Holiday: 8.00 am – 1.00 pm

---

**KELANTAN**

**Kota Bharu**

Lot 795 & 796, Tingkat Bawah, Seksyen 27, Jalan Kebun Sultan,
15200 Kota Bharu, Kelantan
Tel: 09-7471508, 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**

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**

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

---

**BP Clinical Laboratory Service Guide Version 4, 2017**
**Kuantan**

A255, Ground and Mezzanine Floor,
Jalan Beserah, 25300 Kuantan, Pahang.
Tel: 09-562367, 09-5672367
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**

No. 6 Jalan Jubi 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

---

**SARAWAK**

**Kuching**

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**

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: 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

**Kuching II**

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**

Lot 1268, Ground Floor, Jalan Melayu,
Centrepoint Commercial Centre Phase 1,
98000 Miri, Sarawak
Tel: 085-441622, 085-418202, 085-441433
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

---

**TERENGGANU**

**Kuala Terengganu**

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

**Operation Time:**
Monday 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

---

**PERLIS**

**Kangar**

No. 6 Jalan Jubi 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

---

**SARAWAK**

**Kuching**

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**

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: 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

**Kuching II**

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**

Lot 1268, Ground Floor, Jalan Melayu,
Centrepoint Commercial Centre Phase 1,
98000 Miri, Sarawak
Tel: 085-441622, 085-418202, 085-441433
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

---

**TERENGGANU**

**Kuala Terengganu**

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

**Operation Time:**
Monday 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
### Bintulu

![Lab Icon](Image)

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 Icon](Image) + [DC Icon] + [HA Icon]  
Lot 36, Block D, Ground Floor, Dama 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

![Lab Icon](Image) + [HA Icon] + [Disp Icon]  
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*

#### Keningau

![Lab Icon](Image)  
Lot 8, Tang Yiu Loong Shopping Complex, 89000 Keningau, Sabah  
Tel: 088-7331261  
Fax: 088-7331262  
*Closed on 12 public holidays and 52 sundays*  
Dispatch HP: 013-8581214

#### Lintas

![Lab Icon](Image) + [HA Icon] + [Disp Icon]  
Lot 26 (DBKK Lot 19-0), Ground Floor, Block D, Lintas Square, Jalan Lintas, 88300 Kota Kinabalu, Sabah  
Tel: 088-261244, 088-261245  
Fax: 088-253740  
**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*

#### Lahad Datu

![Lab Icon](Image)  
No. 97, Kampung Muhibbah, Peringkat 3, Jalan Silam, 91100 Lahad Datu, Sabah  
Tel: 014-8737383  
*Closed on 12 public holidays and 52 sundays*

#### Sandakan

![Lab Icon](Image) + [DC Icon] + [HA Icon] + [Disp Icon]  
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*
<table>
<thead>
<tr>
<th>Location</th>
<th>Address</th>
<th>Phone</th>
<th>Fax</th>
<th>Operation Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damai KK</td>
<td>Lot No. 29 (DBKK Shop No. 30-1), Lorong Pokok Kayu Manis 1, No. 010512759 District of Kota Kinabalu, Block C, Damai Plaza Phase 1, Jalan Damai, 88300 Kota Kinabalu</td>
<td>088-252421</td>
<td></td>
<td>Monday to Friday: 8.00 am – 5.00 pm, Saturday: 8.00 am – 1.00 pm, Sunday &amp; Public Holiday: Closed</td>
</tr>
<tr>
<td>Labuan</td>
<td>3rd Floor, U 0139, Jalan Bunga Mawar, 87000 Wilayah Persekutuan Labuan</td>
<td>087-440118</td>
<td>087-440118</td>
<td>Monday to Friday: 8.00 am – 5.00 pm, Saturday: 8.00 am – 1.00 pm, Sunday &amp; Public Holiday: Closed</td>
</tr>
</tbody>
</table>

*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 (Operational Manager/LISCOM). 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/

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 be 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.
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 Ipoh 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 in 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. 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**

**CLINICAL SAMPLE**

- Liquid sample
- Plastic zip-lock bag
- **Primary Package**

- Frozen sample/ temperature controlled specimen
- **Secondary Package**

- ICE or ICE Pack
- Use tape to seal Polystyrene box

- **Tertiary Package**

- Medical bag/ Dispatch bag
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
+603- 5569 6826 +603- 5569 6001 (new) +603- 5569 6002 (new)
Monday – Friday : 0800 – 2359
Saturday, Sunday and Public Holiday : 0800 - 1300

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 within 24 hours 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

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 **three 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 7/10/2016. For updated information on non-routine test, please refer to the web link: [http://bphealthcare.com/new/non-routine-test/](http://bphealthcare.com/new/non-routine-test/)

<table>
<thead>
<tr>
<th>Test Code</th>
<th>Test Description</th>
<th>Sample Requirement</th>
<th>Schedule</th>
<th>Dept</th>
</tr>
</thead>
<tbody>
<tr>
<td>1244</td>
<td>25-HydroxyVitamin D</td>
<td>5ml Plain Blood/Serum</td>
<td>Wednesday and Sunday only</td>
<td>Immunology</td>
</tr>
<tr>
<td>A007, A008, A009</td>
<td>Allergy Basic, Standard and Food Profiles</td>
<td>5 ml Plain Blood/Serum</td>
<td>Batch run (TAT 1 week)</td>
<td>Immunology</td>
</tr>
<tr>
<td>3105</td>
<td>Anti-Cardiolipin Ab (Phospholipid Ab)</td>
<td>3 ml Plain Blood/Serum</td>
<td>Tuesday only</td>
<td>Serology</td>
</tr>
<tr>
<td>3107</td>
<td>Anti-ds DNA*</td>
<td>3 ml Plain Blood/Serum</td>
<td>Tuesday only</td>
<td>Serology</td>
</tr>
<tr>
<td>3112</td>
<td>Anti-Nuclear Factor (ANF) - ELISA Method*</td>
<td>3 ml Plain Blood/Serum</td>
<td>Tuesday and Friday only</td>
<td>Serology</td>
</tr>
<tr>
<td>1110</td>
<td>Apolipoprotein A1/B</td>
<td>3 ml Plain Blood/Serum (Fasting)</td>
<td>Sunday only</td>
<td>Biochemistry</td>
</tr>
<tr>
<td>1246</td>
<td>Beta-2-Microglobulin</td>
<td>3 ml Plain Blood/Serum</td>
<td>Tuesday only</td>
<td>Biochemistry</td>
</tr>
<tr>
<td>3121</td>
<td>Chlamydia IgG*</td>
<td>3 ml Plain Blood/Serum</td>
<td>Wednesday and Sunday only</td>
<td>Serology</td>
</tr>
<tr>
<td>3123</td>
<td>Complement 3 (C3)</td>
<td>3 ml Fresh Plain Blood/Serum</td>
<td>Friday only</td>
<td>Biochemistry</td>
</tr>
<tr>
<td>3124</td>
<td>Complement 3 (C3)</td>
<td>3 ml Fresh Plain Blood/Serum</td>
<td>Friday only</td>
<td>Biochemistry</td>
</tr>
<tr>
<td>1116</td>
<td>C-Peptide</td>
<td>3 ml Plain Blood/Serum (Fasting)</td>
<td>Thursday only</td>
<td>Immunology</td>
</tr>
<tr>
<td>3125</td>
<td>Cytomegalovirus (CMV) IgG Ab*</td>
<td>3 ml Plain Blood/Serum</td>
<td>Thursday only</td>
<td>Serology</td>
</tr>
<tr>
<td>3126</td>
<td>Cytomegalovirus (CMV) IgG Ab*</td>
<td>3 ml Plain Blood/Serum</td>
<td>Thursday only</td>
<td>Serology</td>
</tr>
<tr>
<td>7008</td>
<td>Dehydroepiandrosteronesulfate (DHEA-S)</td>
<td>3 ml Plain Blood/Serum</td>
<td>Thursday only</td>
<td>Immunology</td>
</tr>
<tr>
<td>3135</td>
<td>Epstein-Barr Virus, VCA IgA Ab*</td>
<td>3 ml Plain Blood/Serum</td>
<td>Tuesday - Saturday, Sun</td>
<td>Serology</td>
</tr>
<tr>
<td>8113</td>
<td>Estriol (E3)</td>
<td>3 ml Plain Blood/Serum</td>
<td>Monday only</td>
<td>Immunology</td>
</tr>
<tr>
<td>1130</td>
<td>Folic Acid (Folate)</td>
<td>3 ml Plain Blood/Serum</td>
<td>Wednesday &amp; Sunday</td>
<td>Immunology</td>
</tr>
<tr>
<td>7029</td>
<td>Free Testosterone (calculated) (include Testosterone,SHBG,Albumin)</td>
<td>5 ml Plain Blood/Serum</td>
<td>Thursday only</td>
<td>Immunology</td>
</tr>
<tr>
<td>3235</td>
<td>Hep B Virus DNA viral load (Quantitative, Real-time PCR)</td>
<td>3 ml Plain Blood/Serum</td>
<td>Tuesday only</td>
<td>Molecular Testing</td>
</tr>
<tr>
<td>Code</td>
<td>Test Description</td>
<td>Specimen Type</td>
<td>Days Available</td>
<td>Department</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------------------------------------</td>
<td>---------------------</td>
<td>-----------------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>3156</td>
<td>Herpes simplex I IgG Ab (HSV I IgG)*</td>
<td>3 ml Plain Blood/Serum</td>
<td>Monday &amp; Friday only</td>
<td>Serology</td>
</tr>
<tr>
<td>3202</td>
<td>Herpes simplex I IgM Ab (HSV I IgM)*</td>
<td>3 ml Plain Blood/Serum</td>
<td>Thursday only</td>
<td>Serology</td>
</tr>
<tr>
<td>3157</td>
<td>Herpes simplex II IgG Ab (HSV II IgG)*</td>
<td>3 ml Plain Blood/Serum</td>
<td>Monday &amp; Friday only</td>
<td>Serology</td>
</tr>
<tr>
<td>3158</td>
<td>Herpes simplex II IgM Ab (HSV II IgM)*</td>
<td>3 ml Plain Blood/Serum</td>
<td>Thursday only</td>
<td>Serology</td>
</tr>
<tr>
<td>3217</td>
<td>Human Papilloma Virus DNA, (High Risk Screen &amp; Genotyping)</td>
<td>Cervical specimen in Liquid cytology, Pap Test solution</td>
<td>Thursday only</td>
<td>Molecular Testing</td>
</tr>
<tr>
<td>3211</td>
<td>Immunoglobulin E (Total IgE)</td>
<td>3 ml Plain Blood/Serum</td>
<td>Batch run (TAT 3 days)</td>
<td>Immunology</td>
</tr>
<tr>
<td>7017</td>
<td>Insulin</td>
<td>3 ml Plain Blood/Serum (Fasting)</td>
<td>Thursday only</td>
<td>Immunology</td>
</tr>
<tr>
<td>7030</td>
<td>Insulin Like Growth Factor 1 (IGF-1)</td>
<td>3 ml Plain Blood/Serum (Fasting)</td>
<td>Monday only</td>
<td>Immunology</td>
</tr>
<tr>
<td>3168</td>
<td>Measles IgG Ab (Rubella IgG)*</td>
<td>3 ml Plain Blood/Serum</td>
<td>Thursday only</td>
<td>Immunology</td>
</tr>
<tr>
<td>3178</td>
<td>PSA Total, Free PSA &amp; Ratio</td>
<td>3 ml Plain Blood/Serum</td>
<td>Sunday only</td>
<td>Immunology</td>
</tr>
<tr>
<td>3210</td>
<td>Sex Hormone Binding Globulin (SHBG)</td>
<td>3 ml Plain Blood/Serum</td>
<td>Thursday only</td>
<td>Immunology</td>
</tr>
<tr>
<td>3185</td>
<td>Toxoplasma IgG Ab*</td>
<td>3 ml Plain Blood/Serum</td>
<td>Thursday only</td>
<td>Serology</td>
</tr>
<tr>
<td>3186</td>
<td>Toxoplasma IgM Ab*</td>
<td>3 ml Plain Blood/Serum</td>
<td>Thursday only</td>
<td>Serology</td>
</tr>
<tr>
<td>3195</td>
<td>Varicella-Zoster(Herpes Zoster) IgG Ab*</td>
<td>3 ml Plain Blood/Serum</td>
<td>Thursday only</td>
<td>Immunology</td>
</tr>
<tr>
<td>1164</td>
<td>Vitamin B12</td>
<td>3 ml Plain Blood/Serum</td>
<td>Wednesday &amp; Sunday</td>
<td>Immunology</td>
</tr>
<tr>
<td>3237</td>
<td>HbsAg Confirmatory Test (Qualitative)</td>
<td>3 ml Plain Blood/Serum</td>
<td>Monday &amp; Friday only</td>
<td>Immunology</td>
</tr>
</tbody>
</table>

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 is 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

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium</td>
<td>2.8 mmol/L</td>
<td>6.0 mmol/L</td>
<td>Potassium</td>
<td>2.8 mmol/L</td>
<td>6.0 mmol/L</td>
</tr>
<tr>
<td>Sodium</td>
<td>125 mmol/L</td>
<td>155 mmol/L</td>
<td>Sodium</td>
<td>125 mmol/L</td>
<td>155 mmol/L</td>
</tr>
<tr>
<td>Glucose</td>
<td>50 mg/dL</td>
<td>360 mg/dL</td>
<td>CSF-Glucose</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>6.0 mg/dL</td>
<td>12.0 mg/dL</td>
<td>Calcium</td>
<td>6.8 mg/dL</td>
<td>12.4 mg/dL</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.99 mg/dL</td>
<td>4.86 mg/dL</td>
<td>Magnesium</td>
<td>1.21 mg/dL</td>
<td>4.37 mg/dL</td>
</tr>
<tr>
<td>Phosphate</td>
<td>1.0 mg/dL</td>
<td>8.8 mg/dL</td>
<td>Phosphate</td>
<td>1.2 mg/dL</td>
<td>8.6 mg/dL</td>
</tr>
<tr>
<td>Urea</td>
<td></td>
<td>200 mg/dL</td>
<td>Urea</td>
<td></td>
<td>53 mg/dL</td>
</tr>
<tr>
<td>Creatinine</td>
<td>7.4 mg/dL</td>
<td></td>
<td>Creatinine</td>
<td>4.3 mg/dL</td>
<td></td>
</tr>
<tr>
<td>Triglycerides</td>
<td>500 mg/dL</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Creatinine kinase</td>
<td>≥10,000 U/L</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Amylase</td>
<td>500 U/L</td>
<td></td>
<td>Uric Acid</td>
<td>8 mg/dL</td>
<td></td>
</tr>
<tr>
<td>Serum Osmolality</td>
<td>250 mmol/kg</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lithium</td>
<td>1.5 mmol/L</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

BP Clinical Laboratory Service Guide Version 4, 2017
Critical Values for Hematology Tests

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>7.0 g/dL</td>
<td>Haemoglobin</td>
<td>19.0 g/dL</td>
<td>7.0 g/dL</td>
<td>Haemoglobin</td>
<td>20.0 g/dL</td>
</tr>
<tr>
<td>8.0 g/dL</td>
<td>Haemoglobin (Neonate)</td>
<td>22.0 g/dL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20%</td>
<td>Hematocrit</td>
<td>60%</td>
<td>20%</td>
<td>Hematocrit</td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>25%</td>
<td>Hematocrit</td>
<td>70%</td>
</tr>
<tr>
<td>50 x 10^3/μL</td>
<td>Platelet</td>
<td>1000 X 10^3/μL</td>
<td>50 x 10^3/μL</td>
<td>Platelet</td>
<td>1000 X 10^3/μL</td>
</tr>
<tr>
<td>1,000 /cmm</td>
<td>TWCC</td>
<td>50,000 /cmm</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1.5 M/cmm</td>
<td>TRCC</td>
<td>6.5 M/cmm</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>8 Seconds</td>
<td>PT</td>
<td>20 Seconds</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>-</td>
<td>APTT</td>
<td>50 Seconds</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>100 mg/dL</td>
<td>Fibrinogen</td>
<td>-</td>
<td>70 mg/dL</td>
<td>Fibrinogen</td>
<td>-</td>
</tr>
</tbody>
</table>

Critical Findings for Microbiology

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

Critical Findings for Anatomical Pathology

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

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

PEP, post-exposure prophylaxis; WHO, World Health Organization.

* [http://www.who.int/gpsc/5may/background/5moments/en/index.html](http://www.who.int/gpsc/5may/background/5moments/en/index.html)
Wash Yours Before Venipuncture

**HOW TO HANDWASH?**

- Wash hands only when visibly soiled!

1. Wet hands with water
2. Apply enough soap to cover all hand surfaces.
3. Rub hands palm to palm.
4. Right palm over left dorsum with interlaced fingers and vice versa.
5. Palm to palm with fingers interlaced.
6. Backs of fingers to opposing palms with fingers interlocked.
7. Rotational rubbing, of left thumb clasped in right palm and vice versa.
8. Rinse hands with water
9. Dry thoroughly with a single use towel
10. Use towel to turn off faucet
11. Your hands are safe.

**HOW TO HANDRUB?**

- Otherwise, use handrub!

1. Apply a palmful of the product in a cupped hand and cover all surfaces.
2. Rub hands palm to palm;
3. Right palm over left dorsum with interlaced fingers and vice versa;
4. Palm to palm with fingers interlaced;
5. Backs of fingers to opposing palms with fingers interlocked;
6. Rotational rubbing of left thumb clasped in right palm and vice versa;
7. Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa.
8. Once dry... your hands are safe.
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

Filling tubes
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.

13. Discard the used needle and syringe or blood-sampling device immediately into the sharps container
14. Check the label and forms for accuracy

BP Clinical Laboratory Service Guide Version 4, 2017
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

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.
### 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:

<table>
<thead>
<tr>
<th>Order of Draw</th>
<th>Description</th>
<th>Tube Content</th>
<th>Draw Volume</th>
<th>Determinations</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BACTEC Blood Cultures</td>
<td>8-10 mL per bottle</td>
<td>Aerobic &amp; Anaerobic Cultures</td>
<td>Sample for Blood cultures should be done separately. However, if blood samples are also needed, then <strong>blood cultures are done first</strong> to avoid contamination by additives from other blood tubes.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Sodium Citrate</td>
<td>2.7 mL</td>
<td>PT/PTT PT/INR Platelets Function Test (PPT) (use 7 tubes for PFT)</td>
<td>Allow tube to fill completely. Mix by inverting 4 times</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Plain</td>
<td>6 mL</td>
<td>Antibody identifications (Immunohaematology)</td>
<td>Mix by inverting 5 times</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>SST (Plain with Gel)</td>
<td>5 mL</td>
<td>For Biochemistry tests (serum determinations)</td>
<td>Mix by inverting 5 times</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Lithium Heparin</td>
<td>4 mL</td>
<td>Ammonia (<strong>please send in with ice-pack</strong>), HLAB27 (use 2 tubes), Cytogenetic investigations</td>
<td>Mix by inverting 8 times</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>K₂EDTA 10.8 mg</td>
<td>6 mL</td>
<td>Strictly for Group X-Match, Pre-transfusion Tests (Blood Group, Antibody Screen, Compatibility test)</td>
<td>Mix by inverting 8 times</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>K₂EDTA 5.4 mg</td>
<td>3 mL</td>
<td>FKS06, Cyclosporin, G6PD, FBC, HbA1c, Homocysteine (<strong>please send in with ice-pack</strong>)</td>
<td>Mix by inverting 8 times</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Sodium Fluoride</td>
<td>6 mL</td>
<td>Lactate (<strong>please send in with ice-pack</strong>), Pyruvate, GTT</td>
<td>Mix by inverting 8 times</td>
<td></td>
</tr>
</tbody>
</table>
**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 requisition 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

![Images of 3mL EDTA Vacutainer and 2mL Sodium Fluoride Vacutainer](image-url)
**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:

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

*BP Clinical Laboratory Service Guide Version 4, 2017*
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
- CA 19-9
- 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)
- Gastrin
- Glucose
- Growth Hormone
- Homocysteine
- Insulin
- Insulin-like Growth Factor
- Intact Parathyroid Hormone (iPTH)
- Lipids
- 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. Temperature

Specimen (excluding swab and semen) must be stored at 2-8°C and must reach the laboratory as soon as possible, within minutes for blood gas analysis, 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** Lactate Dehydrogenase Isoenzymes specimens. **Keep at room temperature.**

5. 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.**

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 K1

**SPECIMEN ARTEFACTS**

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

<table>
<thead>
<tr>
<th>Problem</th>
<th>Common Causes</th>
<th>Consequences</th>
</tr>
</thead>
</table>
| 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                                                           | • High Potassium, Aspartate Transaminase (AST), Lactate Dehydrogenase (LDH), Magnesium (Mg)  
• Delay in transit                             | • 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 |                                                                                     |
<table>
<thead>
<tr>
<th>Problem</th>
<th>Common Causes</th>
<th>Consequences</th>
</tr>
</thead>
</table>
| 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 PCO₂
• Increased PCO₂ | |
| 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, Phosphate (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 |
<table>
<thead>
<tr>
<th>Problem</th>
<th>Common Causes</th>
<th>Consequences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clots in anticoagulated blood</td>
<td>• Difficult venipuncture</td>
<td>• Shortened PT</td>
</tr>
<tr>
<td></td>
<td>• Specimens not mixed well</td>
<td>• Spurious results in FBC, ABG, Cyclosporin, hormones and other assays requiring whole blood specimens</td>
</tr>
<tr>
<td>Specimens not chilled or sent to the laboratory immediately</td>
<td>• Delay in transit</td>
<td>• Spurious results in Ammonia (NH₃), Lactate, Pyruvate, ABG, Gastrin, Parathyroid Hormone (iPTH), Adrenocorticotropic Hormone (ACTH), Renin and complement.</td>
</tr>
<tr>
<td></td>
<td>• No coolant available</td>
<td>• May not identify Chlamydia, amoeba and some microorganisms because of poor viability</td>
</tr>
<tr>
<td></td>
<td>• Instructions not understood</td>
<td></td>
</tr>
</tbody>
</table>

**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.
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 by 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 get up (e.g. 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 2-8°C (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 4°C (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 4°C 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 2-8°C 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

<table>
<thead>
<tr>
<th>Collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>o Venous blood</td>
</tr>
<tr>
<td>▪ infants: 0.5 - 2 ml</td>
</tr>
<tr>
<td>▪ children: 2 - 5 ml</td>
</tr>
<tr>
<td>▪ adults: 5 - 10 ml</td>
</tr>
<tr>
<td>o Requires aseptic technique</td>
</tr>
<tr>
<td>o Collect within 10 minutes of fever</td>
</tr>
<tr>
<td>▪ if suspect bacterial endocarditis: 3 sets of blood culture are required</td>
</tr>
</tbody>
</table>

### 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 4°C for up to 72 hours
- Specimens that cannot be processed within 48-72 hours should be kept in the refrigerator at 4°C.

**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.
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

<table>
<thead>
<tr>
<th>Blood for smears</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Collection</strong></td>
</tr>
<tr>
<td>Capillary blood from finger prick</td>
</tr>
<tr>
<td>• Make smear</td>
</tr>
<tr>
<td>• Fix with methanol or other fixative</td>
</tr>
<tr>
<td><strong>Handling and transport</strong></td>
</tr>
<tr>
<td>• Transport slides within 24 hours</td>
</tr>
<tr>
<td>• Do not refrigerate as chill can alter cell morphology</td>
</tr>
</tbody>
</table>
Step 1  **Materials for finger pricks:**
- Disinfectant
- Swabs
- Microscope slides (with or without frosted end)
- Sterile lancets
- Special slide as spreader
- Disposable gloves

Step 2  **Finger-prick (capillary blood)**
- 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  **Thin films (capillary blood)**
- 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  **Thick films (Capillary blood)**
- 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 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 4°C 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 scraping 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.

<table>
<thead>
<tr>
<th>Specimen Collection</th>
<th>A spatula and cytobrush are a very effective sampling combination. Collect with a spatula first, followed by the cytobrush</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ectocervical/Endocervical Scraping</td>
<td>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.</td>
</tr>
<tr>
<td>Cytobrush</td>
<td>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.</td>
</tr>
<tr>
<td>The brush specimen should be in addition to, never instead of, the ectocervical scraping</td>
<td></td>
</tr>
</tbody>
</table>

BP Clinical Laboratory Service Guide Version 4,2017
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 from 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.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Unsatisfactory</td>
<td>Unsatisfactory</td>
<td>Unsatisfactory</td>
<td>Unsatisfactory</td>
</tr>
<tr>
<td>I</td>
<td>Negative</td>
<td>Negative</td>
<td>WNL (Within Normal Limits)</td>
<td>NILM</td>
</tr>
<tr>
<td>II</td>
<td>Negative</td>
<td>Negative</td>
<td>BCC</td>
<td>NILM</td>
</tr>
<tr>
<td>III</td>
<td>No term</td>
<td>No term</td>
<td>ASCUS/AGUS</td>
<td>ASCUS/ASC-H</td>
</tr>
<tr>
<td>III</td>
<td>Mild</td>
<td>I</td>
<td>LGSIL</td>
<td>LGSIL</td>
</tr>
<tr>
<td>No term</td>
<td>Moderate</td>
<td>II</td>
<td>HGSIL</td>
<td>HGSIL</td>
</tr>
<tr>
<td>IV</td>
<td>Severe</td>
<td>III</td>
<td>HGSIL</td>
<td>HGSIL</td>
</tr>
<tr>
<td>IV</td>
<td>CIS</td>
<td>III</td>
<td>HGSIL</td>
<td>HGSIL</td>
</tr>
<tr>
<td>V</td>
<td>Carcinoma</td>
<td>Carcinoma</td>
<td>Carcinoma</td>
<td>Carcinoma</td>
</tr>
</tbody>
</table>

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 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 use 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 the 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

<table>
<thead>
<tr>
<th>Test</th>
<th>Specimen Required</th>
<th>Reference Interval</th>
<th>Method</th>
<th>Turnaround Time</th>
<th>Medical Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABO &amp; Rh Grouping</td>
<td>3ml EDTA blood</td>
<td>Blood group: A, B, AB, O, Rhesus: Positive / Negative</td>
<td>Antibody antigen reaction</td>
<td>Daily, 24 hours</td>
<td>Detect clinically significant alloantibodies. Selecting compatible blood products for transfusion therapy</td>
</tr>
<tr>
<td>Ketone Screening (Acetoacetic Acid)</td>
<td>20ml urine</td>
<td>Negative/Positive</td>
<td>Urinalysis</td>
<td>Daily, 24 hours</td>
<td>Monitoring of diabetic patients, prolonged illness.</td>
</tr>
<tr>
<td>Alphafoetoprotein (AFP)</td>
<td>Serum / Plasma</td>
<td>0.4-15.0ug/L</td>
<td>Chemiluminescence Immunoassay</td>
<td>Daily</td>
<td>Tumour marker for testicular and liver tumours</td>
</tr>
<tr>
<td>Albumin</td>
<td>3ml plain blood</td>
<td>3.5 - 5.0 g/dl</td>
<td>Bromocresol Green</td>
<td>Daily, 24 hours</td>
<td>Indicator of nutritional status. Liver Function Test</td>
</tr>
<tr>
<td>Alkaline Phosphatase</td>
<td>3ml plain blood</td>
<td>&gt;20 years old: 40-150 U/L (SI), &lt;20 years old: &lt;750 U/L (SI) IFCC</td>
<td>Daily, 24 hours</td>
<td>Liver profile assessment. Evaluation of metabolic bone disease Diagnosis &amp; monitoring treatment of liver, bone, intestinal &amp; parathyroid disease</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>Description</td>
<td>Specimen Required</td>
<td>Reference Interval</td>
<td>Method</td>
<td>Turnaround Time</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>-------------------</td>
<td>-------------------</td>
<td>--------</td>
<td>----------------</td>
</tr>
<tr>
<td>6</td>
<td>Alanine Transaminase (ALT, SGPT)</td>
<td>3ml plain blood</td>
<td>0 - 55 U/L</td>
<td>IFCC</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>7</td>
<td>Amphetamine/ Methamphetamine</td>
<td>20 ml Urine</td>
<td>Non-Reactive</td>
<td>Enzyme Immunoassay</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>8</td>
<td>Amylase (Diatase)</td>
<td>20 ml random urine</td>
<td>≤ 460 U/L</td>
<td>2-Chloro-PNP-a-maltotrioside</td>
<td>3 days</td>
</tr>
<tr>
<td>9</td>
<td>Amylase (serum)</td>
<td>3ml plain blood</td>
<td>≤ 100 U/L</td>
<td>2 Chloro-PNP-a-maltotrioside</td>
<td>3 days</td>
</tr>
<tr>
<td>10</td>
<td>Anti-Hepatitis B Core Antibody (Anti-HBc) IgM</td>
<td>Serum</td>
<td>Non-reactive</td>
<td>1 week</td>
<td>A &quot;reactive&quot; result suggests acute or very recent hepatitis B infection</td>
</tr>
<tr>
<td>Test</td>
<td>Anti-Hepatitis B e Antibody (Anti-HBe)</td>
<td>Serum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>------------------------------------</td>
<td>-------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specimen Required</td>
<td></td>
<td>Non-reactive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Interval</td>
<td></td>
<td>Chemiluminescence Immunoassay</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Method</td>
<td>Daily</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turnaround Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Indicates sero-conversion from infective stage, suggesting good prognosis for resolution of acute infection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Anti-Hepatitis B Surface Antibody (Anti-HBs)</th>
<th>Serum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td></td>
<td>Non-reactive</td>
</tr>
<tr>
<td>Reference Interval</td>
<td></td>
<td>Chemiluminescence Immunoassay</td>
</tr>
<tr>
<td>Method</td>
<td>Daily</td>
<td></td>
</tr>
<tr>
<td>Turnaround Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Presence of hepatitis B surface antibody suggests previous hepatitis B infection or immunization</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Anti-Hepatitis C Antibody (Anti-HCV)</th>
<th>Serum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td></td>
<td>Non-reactive</td>
</tr>
<tr>
<td>Reference Interval</td>
<td></td>
<td>Chemiluminescence Immunoassay</td>
</tr>
<tr>
<td>Method</td>
<td>Daily</td>
<td></td>
</tr>
<tr>
<td>Turnaround Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical Indication</td>
<td>A &quot;reactive &quot; results suggests that a patient has been or is currently infected with Hepatitis C virus</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Apolipoprotein A1/B</th>
<th>3ml plain blood/ EDTA blood (fasting)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td></td>
<td>Apolipoprotein A1 : Male : 95 - 186 mg/dl, Female : 101 - 223 mg/dl</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Apolipoprotein B : Male 49 - 173 mg/dl, Female : 53 - 182 mg/dl</td>
<td></td>
</tr>
<tr>
<td>Method</td>
<td>Immuno-turbidimetric</td>
<td></td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>1 week</td>
<td></td>
</tr>
<tr>
<td>Medical Indication</td>
<td>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 hypobetalipoproteinemia</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>Specimen Required</td>
<td>Reference Interval</td>
</tr>
<tr>
<td>------</td>
<td>------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>15. <strong>Beta-2-Microglobulin</strong></td>
<td>3ml plain blood</td>
<td>0.97 - 2.64 mg/L</td>
</tr>
<tr>
<td>16. <strong>Bence Jones Protein</strong></td>
<td>20ml urine</td>
<td>Positive/Negative</td>
</tr>
<tr>
<td>17. <strong>Bicarbonate</strong></td>
<td>3ml plain blood (send to lab immediately)</td>
<td>23 - 34 mmol/L</td>
</tr>
<tr>
<td>18. <strong>Bile Pigments (Bilirubin &amp; Urobilinogen)</strong></td>
<td>20ml urine</td>
<td>Negative/Positive</td>
</tr>
<tr>
<td>Test</td>
<td>Specimen Required</td>
<td>Reference Interval</td>
</tr>
<tr>
<td>------</td>
<td>-------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>19</td>
<td>Bilirubin, Conjugated, Unconjugated, Total</td>
<td>3ml plain blood</td>
</tr>
<tr>
<td>20</td>
<td>Bilirubin, Neonatal</td>
<td>plain blood in capillary tube</td>
</tr>
<tr>
<td>21</td>
<td>Chlamydia IgG</td>
<td>3ml Plain Blood/Serum</td>
</tr>
<tr>
<td>22</td>
<td>Cytomegalovirus IgM</td>
<td>3 ml Plain/Serum</td>
</tr>
<tr>
<td>23</td>
<td>Cytomegalovirus IgG</td>
<td>Serum</td>
</tr>
<tr>
<td>24</td>
<td>CA125 (Tumour Marker)</td>
<td></td>
</tr>
</tbody>
</table>

*BP Clinical Laboratory Service Guide Version 4, 2017*
<table>
<thead>
<tr>
<th>Specimen Required</th>
<th>Serum/Plasma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference Interval</td>
<td>0.0 - 35.0 U/ml</td>
</tr>
<tr>
<td>Method</td>
<td>Chemiluminescence immunoassay</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 Hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Tumour marker for ovarian cancer</td>
</tr>
</tbody>
</table>

**25**  
**Test**  
**CA15-3 (Tumour marker)**  
**Method** Chemiluminescence immunoassay  
**Medical Indication** Tumour marker for stage II or III breast cancer.

**26**  
**Test**  
**CA19.9 (Tumour marker)**  
**Method** Chemiluminescence immunoassay  
**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
<table>
<thead>
<tr>
<th>Test</th>
<th>Specimen Required</th>
<th>Reference Interval</th>
<th>Method</th>
<th>Turnaround Time</th>
<th>Medical Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td><strong>Cannabinoids (Urine)</strong>&lt;br&gt;25 ml Urine</td>
<td>Non-Reactive</td>
<td>Enzyme Immunoassay</td>
<td>Daily, 24 Hours</td>
<td>Screen to detect the marijuana exposure &amp; abuse by measures the level of by-products of cannabis in urine</td>
</tr>
<tr>
<td>30</td>
<td><strong>C-peptide</strong>&lt;br&gt;3ml plain blood/serum (fasting)</td>
<td>0.78 - 5.19 ng/mL</td>
<td>Chemilumminometric (CMIA)</td>
<td>1 week</td>
<td>Evaluate residual B-cell function in insulin-dependent diabetics Aids in differential diagnosis of hypoglycaemia (includes factitious hypoglycaemia, insulin autoimmune hypoglycaemia &amp; insulinoma). Diagnostic workup of hypoglycemia</td>
</tr>
<tr>
<td>31</td>
<td><strong>Carcinoembryonic Antigen (CEA)</strong>&lt;br&gt;Serum/Plasma</td>
<td>0.0 - 5.0ug/L</td>
<td>Chemiluminescence immunoassay</td>
<td>Daily, 24 Hours</td>
<td>Tumour marker for colorectal &amp; pancreatic cancer increased level seen in smokers</td>
</tr>
<tr>
<td>32</td>
<td><strong>Chloride</strong>&lt;br&gt;3ml plain blood</td>
<td>98 - 107 mmol/L</td>
<td>I.S.E Indirect Potentiometry</td>
<td>Daily, 24 hours</td>
<td>Evaluation of electrolyte &amp; acid-base status</td>
</tr>
<tr>
<td>33</td>
<td><strong>Chloride (Urine)</strong>&lt;br&gt;24 hour urine</td>
<td>110-250 mmol/24 hours</td>
<td>I.S.E Indirect Potentiometry</td>
<td>Daily, 24 hours</td>
<td>Indicator of fluid balance, acid-base homeostasis &amp; electrolyte balance</td>
</tr>
<tr>
<td>34</td>
<td><strong>Cholestrol, HDL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>Specimen Required</td>
<td>Reference Interval</td>
<td>Method</td>
<td>Turnaround Time</td>
<td>Medical Indication</td>
</tr>
<tr>
<td>------</td>
<td>-------------------</td>
<td>-------------------</td>
<td>--------</td>
<td>----------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>35</td>
<td>Cholesterol, LDL</td>
<td>3ml plain blood (fasting)</td>
<td>&gt; 40 mg/dL</td>
<td>Direct &quot;Elimination Method&quot;</td>
<td>Cardiovascular risk assessment. Negative risk factor for coronary heart disease (CHD)</td>
</tr>
<tr>
<td>36</td>
<td>Cholesterol, Total</td>
<td>3ml plain blood (fasting)</td>
<td>&lt; 100 mg/dL</td>
<td>Calculated based on total, HDL Cholesterol and Triglycerides</td>
<td>Evaluation of cardiovascular risk.</td>
</tr>
<tr>
<td>37</td>
<td>CK-MB</td>
<td>3ml plain blood</td>
<td>3.4 - 7.2 ng/mL</td>
<td>Immunoinhibition</td>
<td>Diagnosis of acute myocardial infarction. The serial quantitation of CK-MB levels performed at admission &amp; 8-hours, 16-hours &amp; 24-hours after admission has been used as an aid in the diagnosis of myocardial injury</td>
</tr>
<tr>
<td>38</td>
<td>Cholinesterase (Pseudocholinesterase)</td>
<td>3ml plain blood</td>
<td>Male : 4389 - 10928 U/L, Female : 2879 - 12669 U/L</td>
<td>Butyl-thiocholine</td>
<td>Marker for organophosphate insecticide exposure. Monitoring patients with liver disease, particularly those undergoing liver transplantation</td>
</tr>
<tr>
<td>Test</td>
<td>Complement 3 (C3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-----------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lab Section</td>
<td>Send to laboratory immediately</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specimen Required</td>
<td>Serum</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reference Interval</td>
<td>M: 82-185 mg/dl F: 83-193 mg/dl</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Method</td>
<td>Immunoturbidimetry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>1 week</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Acute phase protein. Useful in screening for classic &amp; activation of alternate complement pathway. Decreased levels seen in immune complex diseases (esp. lupus nephritis) acute glomerulonephritis, massive necrosis, viraemia, sepsis, hereditary deficiency &amp; infancy.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Complement 4 (C4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Section</td>
<td>Send to laboratory immediately</td>
</tr>
<tr>
<td>Specimen Required</td>
<td>Serum</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>M: 15-53 mg/dl F: 15-57 mg/dl</td>
</tr>
<tr>
<td>Method</td>
<td>Immunoturbidimetry</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>1 Week</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Decreased levels seen in immune complex disease, hereditary deficiency, acute glomerulonephritis, infancy or when classic pathway activated.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Coomb's Test Direct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>3ml EDTA blood</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Negative / Positive</td>
</tr>
<tr>
<td>Method</td>
<td>Antibody antigen reaction</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Detect the presence of globulins (IgG and C3d) coating red cells in autoimmune hemolytic anemia, hemolytic transfusion reactions, drug-induced hemolytic anemia</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Coomb's Test (Both Direct &amp; Indirect)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>3ml EDTA blood, 3ml plain blood</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Negative / Positive</td>
</tr>
<tr>
<td>Method</td>
<td>Antibody antigen reaction</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Detect the presence of globulins (IgG and C3d) coating red cells in autoimmune hemolytic anemia, hemolytic transfusion reactions, drug-induced hemolytic anemia</td>
</tr>
</tbody>
</table>

<p>| Test | Cortisol, urine |</p>
<table>
<thead>
<tr>
<th>Test</th>
<th>Creatinine</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>3ml plain blood</td>
<td></td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Male: 0.72 - 1.25 mg/dL, Female: 0.57 - 1.1 mg/dL</td>
<td></td>
</tr>
<tr>
<td>Method</td>
<td>Alkaline Picrate</td>
<td></td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
<td></td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Diagnosis and monitor acute renal disease. Renal function test</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Creatinine (Urine)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>24 hour urine</td>
<td></td>
</tr>
<tr>
<td>Reference Interval</td>
<td>1.0-2.0 g/24 hours</td>
<td></td>
</tr>
<tr>
<td>Method</td>
<td>Alkaline Picrate</td>
<td></td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
<td></td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Confirms completeness of 24 hours urine collection. Calculate creatinine clearance, measure of renal function</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Creatinine Phosphokinase (CK)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>3ml plain blood</td>
<td></td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Male: 30 - 200 U/L, Female: 29 - 168 U/L</td>
<td></td>
</tr>
<tr>
<td>Method</td>
<td>NAC Activator</td>
<td></td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>2-3 days</td>
<td></td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Evaluate and monitor disorders of skeletal and cardiac muscle. Diagnosis and monitoring of myocardial infarction &amp; myopathies such as the progressive Duchenne muscular dystrophy</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Creatinine Clearance Test</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>3ml plain blood, 24 hour urine sample</td>
<td></td>
</tr>
<tr>
<td>Reference Interval</td>
<td>52 - 155 ml/min</td>
<td></td>
</tr>
<tr>
<td>Method</td>
<td>Alkaline Picrate</td>
<td></td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
<td></td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Renal function test, measure Glomerular Filtration Rate</td>
<td></td>
</tr>
</tbody>
</table>

| Test | Dengue NS1 Ag |  |
Specimen Required | Whole blood/Plasma or serum
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

49 Test | Dengue IgG/IgM
Specimen Required | Serum/Plasma
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

50 Test | Dehydroepiandrosterone Sulphate (DHEAS)
Specimen Required | Serum
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 Immunoassay
Turnaround Time | 1 week
Medical Indication | Evaluation of Androgen deficiency or excess state
| Test |  | Electrolytes (Na+, K+, Cl-)
Specimen Required | 3ml plain blood
Reference Interval | Na+ (132-143 mmol/L), K+ (3.5-5.1 mmol/L), Cl- (98-107 mmol/L)
Method | I.S.E. Indirect Potentiometry
Turnaround Time | Daily, 24 hours
Medical Indication | Evaluation of electrolyte balance.

| Test |  | Epstein Barr Virus IgA antibody
Specimen Required | Serum
Reference Interval | Titre < 8 Negative, 8-12 Equivocal, >12 Positive
Method | Immunofluorescence
Turnaround Time | 3 days
Medical Indication | May suggest severe diseases due to EBV, Screening test for Nasopharyngeal cancer

| Test |  | Erythrocyte Sedimentation Rate (ESR)
Specimen Required | 3ml EDTA blood
Reference Interval | Male: 0-15 mm/hr, Female: 1-20 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

| Test |  | Estradiol
Specimen Required | Serum
Reference Interval | Male: 11-44 pg/ml : 40.4-161.5 pmol/L
Female
Follicular Phase: 21-251 pg/ml : 77.1-921.4
Mid-cycle Peak: 38-649 pg/ml : 139.5-2382.5
Luteal Phase: 21-312 pg/ml : 77.1-1145.4
Post Menopausal
Not on HRT: < 10-28 : < 36.7-102.8
On HRT: < 10-144 : < 36.7-528.6
Method | Chemiluminescence Immunoassay
Turnaround Time | Daily, 24 hours
Medical Indication | Female: Assess hypothalamic-pituitary-ovarian axis
Male: Investigate unexplained gynaecomastia
### Fecal Occult Blood (FOB)

**Specimen Required**
Stool

**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.

---

### Follicle Stimulating Hormone (FSH)

**Specimen Required**
Serum

**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 gonadal axis in the diagnosis of amenorrhea, androgen deficiency & gonadal dysfunction.

---

### Ferritin

**Specimen Required**
3ml plain blood

**Reference Interval**
- Male: 1.81 - 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.

---

### Folic Acid

**Specimen Required**
3ml plain blood

**Reference Interval**
3.1 - 20.5 ng/mL

**Method**
Chemiluminescent Microparticle Immunoassay (CMIA)

**Turnaround Time**
4 working days

**Medical Indication**
Investigation of suspected folate deficiency & to monitor therapy

---

### Full Blood Count

**Specimen Required**
3ml EDTA blood

**Reference Interval**
Haemoglobin level, WBC, RBC, Platelet count, Indices, WBC differential, peripheral blood film comment
Male
WBC: 4,000 - 11,000 /cmm
RBC: 4.5 - 6.0 M/cm³
Hb: 12.5 - 17.5 g/dl
HCT: 40 - 50 %
MCV: 82 - 98 fl
MCH: 27 - 33 pg
MCHC: 31 - 35%
Plt: 150,000 - 400,000 /cmm
RDW: 11.0 - 16.0%
Polymorph: 50 - 70%
Lymphocytes: 20 - 40%
Monocytes: <6%
Eosinophils: <4%
Basophils: <1%

Female
WBC: 4,000 - 11,000 /cmm
RBC: 4.0 - 5.5 M/cm³
Hb: 11.5 - 15.5 g/dl
HCT: 37 - 45%
MCV: 82 - 98 fl
MCH: 27 - 33 pg
MCHC: 31 - 35%
Plt: 150,000 - 400,000 /cmm
RDW: 11.0 - 16.0%
Polymorph: 50 - 70%
Lymphocytes: 20 - 40%
Monocytes: <6%
Eosinophils: <4%
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

---

60 Test
Gamma Glutamyl 1 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

---

61 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

---

62 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
<table>
<thead>
<tr>
<th>Test</th>
<th>Glucose Tolerance Test (3 points)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>3ml fluoride blood at fasting, 1HPP and 2HPP</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Fasting : &lt;100 mg/dL, 1HPP : &lt;200 mg/dL, 2HPP : ≥ 200 mg/dL</td>
</tr>
<tr>
<td>Method</td>
<td>Hexokinase</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Diagnosis of diabetes mellitus</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Glucose -6 Phosphate Dehydrogenase (G6PD) Screening</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>3ml EDTA blood</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Deficiency Detected / Not Detected</td>
</tr>
<tr>
<td>Method</td>
<td>Fluorescence Method</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Qualitative screening test for G6PD enzyme level. (Note: Any recent blood transfusion or acute hemolysis can affect the result obtained)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Haemoglobin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>3ml EDTA blood</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Male : Hb : 12.5 - 17.5 g/dl</td>
</tr>
<tr>
<td></td>
<td>Female : Hb : 11.5 - 15.5 g/dl</td>
</tr>
<tr>
<td>Method</td>
<td>Light Scattering Flow Cytometry</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Assess general health of an individual, screening for haematological disorders</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Hb Electrophoresis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>5ml EDTA blood</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Hb A2 : 2.1 - 3.7 %</td>
</tr>
<tr>
<td></td>
<td>HB A : 96.3 - 97.9 %</td>
</tr>
<tr>
<td></td>
<td>Hb F : &lt;1.0 %</td>
</tr>
<tr>
<td>Method</td>
<td>Capillary Electrophoresis</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>2 weeks</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Aids in diagnosis of Thalassemias and haemoglobin variants. Evaluation of unexplained microcytosis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>HbA1c (Glycosylated Hb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>2ml EDTA blood</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Non-diabetic : &lt;6%, Goal : &lt;7%, Poor control : &gt;8%</td>
</tr>
<tr>
<td>Method</td>
<td>Turbidimetric inhibition immunoassay (TINIA)</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Long term monitoring of glucose control in diabetes. Diagnosis of</td>
</tr>
<tr>
<td>Test</td>
<td>Hepatitis B e Antigen (-HBeAg)</td>
</tr>
<tr>
<td>------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Specimen Required</td>
<td>Non-reactive</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Chemiluminescence Immunoassay</td>
</tr>
<tr>
<td>Method</td>
<td>Daily</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Non-reactive</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>A 'reactive' results suggests current infectious hepatitis B infection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Hepatitis B Surface Antigen (-HBsAg)</th>
<th>Serum/Plasma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>Non-reactive</td>
<td></td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Chemiluminescence Immunoassay</td>
<td></td>
</tr>
<tr>
<td>Method</td>
<td>Daily</td>
<td></td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Non-reactive</td>
<td></td>
</tr>
<tr>
<td>Medical Indication</td>
<td>A 'reactive' results suggests current infectious hepatitis B infection</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Hepatitis B Surface Antigen (HBsAg) Confirmatory Test (Qualitative)</th>
<th>Serum/Plasma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>Not Confirmed</td>
<td></td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Specific Antibody Neutralization</td>
<td></td>
</tr>
<tr>
<td>Method</td>
<td>1 week</td>
<td></td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>1 week</td>
<td></td>
</tr>
<tr>
<td>Medical Indication</td>
<td>A reactive screen result confirmed as positive by hepatitis B surface antigen (HBsAg) confirmatory test indicative of acute or chronic hepatitis B virus (HBV) infection, or chronic HBV carrier state.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Helicobacter pylori IgG</th>
<th>Serum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>&lt;0.90 Negative, 0.90-0.99 Equivocal, &gt;1.00 Positive</td>
<td></td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Enzyme Immunoassay</td>
<td></td>
</tr>
<tr>
<td>Method</td>
<td>3 days</td>
<td></td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Detection of IgG Antibodies to Helicobacter Pylori in serum</td>
<td></td>
</tr>
<tr>
<td>Medical Indication</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Herpes Simplex Virus 1 IgM</th>
<th>Serum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>Non-reactive</td>
<td></td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Enzyme Immunoassay</td>
<td></td>
</tr>
<tr>
<td>Method</td>
<td>1 Week</td>
<td></td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Diagnosis of Herpes simplex infection</td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>Herpes Simplex Virus 1 IgG</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>--------------------------</td>
<td></td>
</tr>
<tr>
<td>Specimen Required</td>
<td>Serum</td>
<td></td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Non-reactive</td>
<td></td>
</tr>
<tr>
<td>Method</td>
<td>Enzyme Immunoassay</td>
<td></td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>3 days</td>
<td></td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Diagnosis of Herpes simplex infection</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Herpes Simplex Virus 2 IgM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>Serum</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Non-reactive</td>
</tr>
<tr>
<td>Method</td>
<td>Solid Phase enzyme-linked Immunosorbent Assay</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Diagnosis of Herpes simplex infection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Herpes Simplex Virus 1 IgG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>Serum</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Non-reactive</td>
</tr>
<tr>
<td>Method</td>
<td>Solid Phase enzyme-linked Immunosorbent Assay</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Diagnosis of Herpes simplex infection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>HIV antibody-antigen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>Serum</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Non-Reactive</td>
</tr>
<tr>
<td>Method</td>
<td>Chemiluminescent microparticle Immunoassay</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Diagnosis of HIV infection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Homocysteine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>3ml plain blood</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>FPIA/Direct Chemiluminescent</td>
</tr>
<tr>
<td>Method</td>
<td>Adult: 5 - 15 µmol/L, &gt;60 years: 5-20 µmol/L</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Assess CHD risk, obstetric complications &amp; neural tube defects. Aid for screening patient suspected of having an inherited disorder for</td>
</tr>
</tbody>
</table>
### Methionine Metabolism

**Test**
Intact Parathyroid Hormone,

**Specimen Required**
EDTA Plasma

Place specimen in ice and send to the laboratory immediately

**Reference Interval**
1.3 - 7.6 pmol/L

**Method**
Chemiluminescence Immunoassay

**Turnaround Time**
Daily

**Medical Indication**
Differential diagnosis of hyperparathyroidism & hypoparathyroidism

---

### Insulin

**Test**
Insulin

**Specimen Required**
Serum

Fasting sample (10-12 hrs) required

**Reference Interval**
0.0 - 25.0 mU/L

**Method**
Chemiluminescence Immunoassay

**Turnaround Time**
1 Week

**Medical Indication**
Differential diagnosis of hypoglycaemia (including factitious hypoglycaemia, insulin autoimmune hypoglycaemia & insulinoma)

---

### Iron

**Test**
Iron

**Specimen Required**
3 ml 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

---

### Lactate Dehydrogenase (LDH)

**Test**
Lactate Dehydrogenase (LDH)

**Specimen Required**
3 ml plain blood

**Reference Interval**
125 - 243 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 chemotherapy, 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
<table>
<thead>
<tr>
<th>Test</th>
<th>Luteinising Hormone (LH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen</td>
<td>Serum</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Children : 0.2 - 1.4 IU/L</td>
</tr>
<tr>
<td></td>
<td>Male : 0.8 - 6.1 IU/L</td>
</tr>
<tr>
<td></td>
<td>Female: Follicular Phase : 2.4 - 12.6 IU/L</td>
</tr>
<tr>
<td></td>
<td>Ovulating Phase : 14.0 - 95.6 IU/L</td>
</tr>
<tr>
<td></td>
<td>Luteal : 1.0 - 11.4IU/L</td>
</tr>
<tr>
<td></td>
<td>Post Menopausal: 7.7 - 58.5 IU/L</td>
</tr>
<tr>
<td>Method</td>
<td>Chemiluminescence Immunoassay</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Assessment of hyperthalamic-pituitary gondal axis in the diagnosis of amenorrhea, androgen deficiency &amp; gonadal dysfunction.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Magnesium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen</td>
<td>5ml plain blood</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>1.9 - 2.5 mg/dL</td>
</tr>
<tr>
<td>Method</td>
<td>Arsenazo</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>3 days</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Determine deficiency or excess states. May be used to monitor preeclampsia patients being treated with magnesium sulfate.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Magnesium (Urine)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Section</td>
<td>Referral</td>
</tr>
<tr>
<td>Specimen</td>
<td>24 hours urine (preservative 10ml concentrated HCL)</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>6.0 - 10.0 mmol/day. Varies with diet</td>
</tr>
<tr>
<td>Method</td>
<td>Colorimetry</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>1 week</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Assessing cause of abnormal serum magnesium concentrations. Determining whether the body is receiving adequate nutrition.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Malaria Parasite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen</td>
<td>3ml EDTA blood</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Positive/ Negative</td>
</tr>
<tr>
<td>Method</td>
<td>Direct microscopy (thick and thin film)</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Screening, detection&amp; identification of malaria parasites.</td>
</tr>
<tr>
<td>Test</td>
<td>Measles IgG</td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
</tr>
<tr>
<td><strong>Specimen Required</strong></td>
<td>Serum</td>
</tr>
<tr>
<td><strong>Reference Interval</strong></td>
<td>Non-reactive: &lt;250 mIU/mL&lt;br&gt;Reactive: ≥ 250 mIU/mL</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>Enzyme Immunoassay</td>
</tr>
<tr>
<td><strong>Turnaround Time</strong></td>
<td>1 Week</td>
</tr>
<tr>
<td><strong>Medical Indication</strong></td>
<td>A &quot;reactive&quot; result suggests previous exposure or immunization to measles.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Microalbumin</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Specimen Required</strong></td>
<td>20ml random urine, 24 hour urine</td>
</tr>
<tr>
<td><strong>Reference Interval</strong></td>
<td>Random urine: &lt;20 mg/L, 24 hour urine: &lt;30 mg/24 hours</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>Immunno-turbidimetric</td>
</tr>
<tr>
<td><strong>Turnaround Time</strong></td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td><strong>Medical Indication</strong></td>
<td>Early detection of nephropathy in patients with diabetes mellitus. Assessing the potential for early onset of nephropathy in diabetic patients</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Microalbumin ACR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Specimen Required</strong></td>
<td>20ml random urine, 24 hour urine</td>
</tr>
<tr>
<td><strong>Reference Interval</strong></td>
<td>&lt; 30 mg/g</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>Calculated from 24 hour urine creatinine and microalbumin</td>
</tr>
<tr>
<td><strong>Turnaround Time</strong></td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td><strong>Medical Indication</strong></td>
<td>Early detection of nephropathy in patients with diabetes mellitus. Assessing the potential for early onset of nephropathy in diabetic patients</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Mirofilaria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Specimen Required</strong></td>
<td>3ml EDTA blood</td>
</tr>
<tr>
<td><strong>Reference Interval</strong></td>
<td>Positive/ Negative</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>Direct microscopy (thick &amp; thin film)</td>
</tr>
<tr>
<td><strong>Turnaround Time</strong></td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td><strong>Medical Indication</strong></td>
<td>Detection of microfilariae in peripheral blood</td>
</tr>
<tr>
<td>Test</td>
<td>Specimen Required</td>
</tr>
<tr>
<td>------</td>
<td>-------------------</td>
</tr>
<tr>
<td>90</td>
<td>Monospot Serum</td>
</tr>
<tr>
<td>91</td>
<td>Morphine (Screening), Urine</td>
</tr>
<tr>
<td>92</td>
<td>Osmolality (Urine)</td>
</tr>
<tr>
<td>93</td>
<td>Osmolality</td>
</tr>
<tr>
<td>94</td>
<td>Packed Cell Volume (PCV)</td>
</tr>
<tr>
<td>Test</td>
<td>Partial Thromboplastin Time (Act.), APTT</td>
</tr>
<tr>
<td>------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>Specimen Required</td>
<td>Sodium Citrate</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>28 - 40 seconds</td>
</tr>
<tr>
<td>Method</td>
<td>Clot Detection</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Monitoring heparin therapy (unfractionated heparin [UFH]). Screening for certain coagulation factor deficiencies. Detection of coagulation inhibitors such as lupus anticoagulant, specific factor inhibitors &amp; non-specific inhibitors</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Peripheral Blood Film</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>3ml EDTA blood</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Morphological description of WBC, RBC, platelet &amp; other blood components</td>
</tr>
<tr>
<td>Method</td>
<td>Direct microscopy</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Assess general health of an individual, screening for haematological disorders. Morphology review of blood cells</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Phosphorus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>3ml plain blood</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>2.3 - 4.7 mg/dL</td>
</tr>
<tr>
<td>Method</td>
<td>Phosphomolybdate UV</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Assessment of calcium and phosphate disorders. Used in diagnosis &amp; management of a variety of disorders including bone, parathyroid &amp; renal disease</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Platelet Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>3ml EDTA blood</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Plt : 150,000 - 400,000 /cmm</td>
</tr>
<tr>
<td>Method</td>
<td>Light Scattering Flow Cytometry</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Screening for bleeding disorders, platelet dysfunction</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Potassium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>3ml plain blood</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>3.5 - 5.1 mmol/L</td>
</tr>
<tr>
<td>Method</td>
<td>I.S.E Indirect Potentiometry</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
</tbody>
</table>
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.

100 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.

101 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

102 Test
Progesterone
Specimen
Serum
Reference Interval
Male : 0.95-11.95 Miu/ml
Normally Menstruating Females:
Follicular Phase : 3.03-8.08 mIU/ml
Mid-cycle Peak : 2.55-16.69 mIU/ml
Luteal Phase : 2.55-16.69 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

103 Test
Prolactin
Specimen
Serum
Reference Interval
Male : 2.1-17.7 ng/ml
Non-Pregnant : 2.8-29.2 ng/ml
Pregnant : 9.7-208.5 ng/ml
Postmenopausal : 1.8-20.3 ng/ml
Method
Chemiluminescence Immunoassay
Turnaround Time
Daily, 24 hours
### Medical Indication
Diagnosis & management of pituitary adenoma. Investigation of hypogonadism

<table>
<thead>
<tr>
<th>Test</th>
<th>Protein (Total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>3ml plain blood</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>6.4 - 8.3 g/dL</td>
</tr>
<tr>
<td>Method</td>
<td>Biuret/ Endpoint</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>3 days</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Liver function test. Marker of nutritional status, establish hypoprotinaemia or hyperprotnenaemia. Diagnosis &amp; treatment of a variety of disease involving the liver, kidney, or bone marrow, as well as other metabolic or nutritional disorders.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Protein, Total (Urine)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>24 hour urine, CSF sample</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Urine : &lt; 0.2 g/24 hours, CSF : 15 - 45 mg/dL</td>
</tr>
<tr>
<td>Method</td>
<td>Turbidimetric</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Prothrombin Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>Sodium Citrate</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>28 - 40 seconds</td>
</tr>
<tr>
<td>Method</td>
<td>Clot Detection</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Monitoring heparin therapy (unfractionated heparin [UFH]). Screening for certain coagulation factor deficiencies Detection of coagulation inhibitors such as lupus anticoagulant, specific factor inhibitors &amp; non-specific inhibitors.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Prostate specific Antigen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>Serum</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Draw blood before rectal examination or biopsy procedure. Send specimen to the laboratory immediately</td>
</tr>
<tr>
<td>Age</td>
<td>ug/L</td>
</tr>
<tr>
<td>&lt;50</td>
<td>0-1.7</td>
</tr>
<tr>
<td>50-60</td>
<td>0 - 2.3</td>
</tr>
<tr>
<td>61-70</td>
<td>0 - 4.0</td>
</tr>
<tr>
<td>&gt;70</td>
<td>0 - 6.3</td>
</tr>
<tr>
<td>Method</td>
<td>Chemiluminescence Immunoassay</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Tumour marker for prostate cancer. Increased levels seen in BPH &amp; prostatitis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Reticulocyte Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>3ml EDTA blood</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Adults and children : 0.5-2.5%</td>
</tr>
<tr>
<td>Method</td>
<td>Manual Brilliant Cresyl Blue Stain</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Indication of degree of erythropoietic activity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Rubella IgG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>Serum/Plasma</td>
</tr>
</tbody>
</table>
| 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 |

<table>
<thead>
<tr>
<th>Test</th>
<th>Rubella IgM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>Serum/Plasma</td>
</tr>
</tbody>
</table>
| 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 |

<table>
<thead>
<tr>
<th>Test</th>
<th>Rheumatoid Factor (RF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>Serum</td>
</tr>
</tbody>
</table>
| Reference Interval | 0-20 IU/mL                              
Method | Immunoturbidimetry  
Turnaround Time | Daily  
Medical Indication | Supports diagnosis of Rheumatoid arthritis. |

<table>
<thead>
<tr>
<th>Test</th>
<th>Sex Hormone Binding Globulin (SHBG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>Serum</td>
</tr>
</tbody>
</table>
Reference Interval | Male : 11-52 nmol/L | Female (Non-pregnant) : 20 - 122 nmol/L
Method | Electrochemiluminescence Immunoassay
Turnaround Time | 1 Week
Medical Indication | Useful in investigation of hirsutism and virilisation in females

113 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

114 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

115 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

116 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.

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Test</th>
<th>Specimen Required</th>
<th>Reference Interval</th>
<th>Medical Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>117</td>
<td>Testosterone</td>
<td>Serum</td>
<td>Female: 0.22 - 2.90 nmol/L&lt;br&gt;Male 0-1 yrs: 0.42 - 0.72&lt;br&gt;1-6 yrs: 0.10 - 1.12&lt;br&gt;7-12 yrs: 0.10 - 2.37&lt;br&gt;13-17 yrs: 0.98 - 3.85&lt;br&gt;Adult: 9.90 - 27.80</td>
<td>Diagnosis of hypogonadism in males, investigation of hirsutism &amp; virilisation in females</td>
</tr>
</tbody>
</table>

**Method:** Chemiluminescence immunoassay  
**Turnaround Time:** Daily, 24 hours

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Test</th>
<th>Specimen Required</th>
<th>Reference Interval</th>
<th>Medical Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>118</td>
<td>Thyroid Stimulating Hormone (TSH)</td>
<td>Serum</td>
<td>Adult: 0.45 - 4.50 mIU/L&lt;br&gt;Cord Blood: 2.20 - 25.00 mIU/L&lt;br&gt;1-4 days: 0.50 - 13.30&lt;br&gt;4 days - 5 weeks: 0.50 - 10.00&lt;br&gt;5 weeks - 15 years: 0.50 - 4.00</td>
<td>Diagnosis hyperthyroidism &amp; hypothyroidism. Monitor thyroxine replacement or suppression therapy. Distinguish non-thyroidal illness (NT) from hyperthyroidism</td>
</tr>
</tbody>
</table>

**Method:** Chemiluminescence immunoassay  
**Turnaround Time:** Daily, 24 hours

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Test</th>
<th>Specimen Required</th>
<th>Reference Interval</th>
<th>Medical Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>119</td>
<td>Thyroxine (T4)</td>
<td>Serum</td>
<td>Adult: 70 - 140 mIU/L&lt;br&gt;Cord Blood: 80 - 180&lt;br&gt;1-4 days: 152 - 290&lt;br&gt;4 days - 3 weeks: 126 - 215&lt;br&gt;3 weeks - 5 weeks: 90 - 195&lt;br&gt;1-5 months: 95 - 185&lt;br&gt;5-13 months: 100 - 212&lt;br&gt;1-6 years: 94 - 193&lt;br&gt;6-11 years: 82 - 171&lt;br&gt;11-16 years: 72 - 151</td>
<td>Diagnosis hyperthyroidism &amp; hypothyroidism</td>
</tr>
</tbody>
</table>

**Method:** Chemiluminescence immunoassay  
**Turnaround Time:** Daily

---

*BP Clinical Laboratory Service Guide Version 4, 2017*
<table>
<thead>
<tr>
<th>Test</th>
<th>Total Iron Binding Capacity (TIBC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen</td>
<td>3ml plain blood</td>
</tr>
<tr>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Male : 134 - 415 µg/dL, Female : 120 - 480 µg/dL</td>
</tr>
<tr>
<td>Method</td>
<td>Spectrophotometrically</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Screening for chronic iron overload disease, particularly hereditary hemochromatosis. Diagnosis of iron deficiency. Evaluate red cell production &amp; destruction, iron metabolism or iron transport.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Total RBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen</td>
<td>3ml EDTA blood</td>
</tr>
<tr>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Male : RBC : 4.5 - 6.0 M/cmm, Female : RBC : 4.0 - 5.5 M/cmm</td>
</tr>
<tr>
<td>Method</td>
<td>Light Scattering Flow Cytometry</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Assess general health of an individual, screening for haematological disorders, infection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Total White &amp; Differential Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen</td>
<td>3ml EDTA blood</td>
</tr>
<tr>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Reference Interval</td>
<td>WBC : 4,000 - 11,000 /cmm, Polymorph : 50 - 70 %, Lymphocytes : 20 - 40 %, Monocytes : &lt;6 %, Eosinophils : &lt;4 %, Basophils : &lt;1 %</td>
</tr>
<tr>
<td>Method</td>
<td>Light Scattering Flow Cytometry</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Assess general health of an individual, screening for haematological disorders, infection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Total WBC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen</td>
<td>3ml EDTA blood</td>
</tr>
<tr>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Reference Interval</td>
<td>WBC : 4,000 - 11,000 /cmm</td>
</tr>
<tr>
<td>Method</td>
<td>Light Scattering Flow Cytometry</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Assess general health of an individual, screening for haematological disorders, infection</td>
</tr>
</tbody>
</table>
124 Test
Human Chorionic Gonadotropin (hCG) Total β HCG
Specimen Required
Serum
Reference Interval
0.0 - 6.1 IU/L
Method
Chemiluminescence Immunoassay
Turnaround Time
Daily, 24 hours
Medical Indication
Tumour marker for hydatiform mole, choriocarcinoma & testicular cancer

125 Test
Toxoplasma IgG
Specimen Required
Serum
Reference Interval
Non-reactive ≤ 10 IU/L
Reactive > 10 IU/L
Method
Chemiluminescence Immunoassay
Turnaround Time
1 Week
Medical Indication
A "reactive" results suggests past toxoplasma infection.

126 Test
Toxoplasma IgM
Specimen Required
Serum
Reference Interval
Non-reactive
Method
Chemiluminescence Immunoassay
Turnaround Time
1 Week
Medical Indication
A "reactive" results suggests recent or current infections

127 Test
Transferrin
Specimen Required
3ml plain blood
Reference Interval
200 - 300 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.

128 Test
Troponin I
Specimen Required
3ml lithium heparin or EDTA blood
Reference Interval
Positive/Negative
Method
Rapid one - step Chromatographic Immunoassay
Turnaround Time
Daily, 24 hours
Medical Indication
Marker of myocardial injury. Exclusion diagnosis of acute myocardial infarction
<table>
<thead>
<tr>
<th>Test</th>
<th>Triglycerides</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>3ml plain blood (fasting)</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>&lt; 150 mg/dL</td>
</tr>
<tr>
<td>Method</td>
<td>Enzymatic Colourimetric</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Evaluation of risk factors in individuals with elevated cholesterol values. Risk factor for acute pancreatitis &amp; coronary heart disease</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>T-Uptake</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>3ml Plain blood</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>0.66-1.27</td>
</tr>
<tr>
<td>Method</td>
<td>Chemiluminescent microparticles Immunoassay</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>Assessment of Thyroid function Status</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Urea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>3ml plain blood</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>Adults &lt;50 years old (Male) : 19 - 44 mg/dL</td>
</tr>
<tr>
<td></td>
<td>Adults &lt;50 years old (Female) : 15 - 40 mg/dL</td>
</tr>
<tr>
<td>Method</td>
<td>Enzymatic GLDH/Urease</td>
</tr>
<tr>
<td>Turnaround Time</td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td>Medical Indication</td>
<td>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 &amp; post-renal hyperuremia. Evaluate protein metabolism.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Test</th>
<th>Urea (Urine)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specimen Required</td>
<td>24 hours urine (preservative 10ml concentrated HCL)</td>
</tr>
<tr>
<td>Reference Interval</td>
<td>26-43 g/24 hours</td>
</tr>
<tr>
<td>Method</td>
<td>Enzymatic GLDH/Urease</td>
</tr>
<tr>
<td>Test</td>
<td>Medical Indication</td>
</tr>
<tr>
<td>----------</td>
<td>------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Urine FEME &amp; Specific Gravity</strong></td>
<td>Assessment of protein intake &amp;/or nitrogen balance. Renal function test.</td>
</tr>
<tr>
<td><strong>Specimen Required</strong></td>
<td>20ml urine</td>
</tr>
<tr>
<td><strong>Reference Interval</strong></td>
<td>pH, colour, transparency, Specific Gravity, Positive/ Negative for Protein, Glucose, Ketone, Blood Microscopy for RBC, WBC, Epithelia Cells, casts, Bacteria &amp; others</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>Urinalysis</td>
</tr>
<tr>
<td><strong>Turnaround Time</strong></td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td><strong>Medical Indication</strong></td>
<td>Screening for urinary tract diseases &amp; some non-renal diseases</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Medical Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Urine :FEME &amp; Smear</strong></td>
<td>Screening for urinary tract diseases &amp; some non-renal diseases</td>
</tr>
<tr>
<td><strong>Specimen Required</strong></td>
<td>20ml urine</td>
</tr>
<tr>
<td><strong>Reference Interval</strong></td>
<td>As in FEME &amp; Specific Gravity, Microscopy reporting of gram stain.</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>Urinalysis and Conventional Gram Stain Procedure</td>
</tr>
<tr>
<td><strong>Turnaround Time</strong></td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td><strong>Medical Indication</strong></td>
<td>Presumptive diagnosis of bacterial infection. Stain is used to identify the presence of microorganisms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Medical Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Urine : Microscopy</strong></td>
<td>Screening for urinary tract diseases and some non-renal diseases</td>
</tr>
<tr>
<td><strong>Specimen Required</strong></td>
<td>20ml urine</td>
</tr>
<tr>
<td><strong>Reference Interval</strong></td>
<td>Microscopy for RBC, WBC, Epithelial cells, casts, Bacteria &amp; others</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>Urinalysis</td>
</tr>
<tr>
<td><strong>Turnaround Time</strong></td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td><strong>Medical Indication</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Medical Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Urine : Specific Gravity</strong></td>
<td>As a partial assessment of the kidney's ability to concentrate urine</td>
</tr>
<tr>
<td><strong>Specimen Required</strong></td>
<td>20ml urine</td>
</tr>
<tr>
<td><strong>Reference Interval</strong></td>
<td>1.010 - 1.030</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>Urinalysis</td>
</tr>
<tr>
<td><strong>Turnaround Time</strong></td>
<td>Daily, 24 hours</td>
</tr>
<tr>
<td><strong>Medical Indication</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Medical Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Varicella-Zoster IgG</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Specimen Required</strong></td>
<td>Serum</td>
</tr>
<tr>
<td><strong>Reference Interval</strong></td>
<td>Not-Detected</td>
</tr>
<tr>
<td><strong>Method</strong></td>
<td>Indirect Immunoenzyme assay</td>
</tr>
<tr>
<td><strong>Turnaround Time</strong></td>
<td>1 Week</td>
</tr>
<tr>
<td>Test</td>
<td>Medical Indication</td>
</tr>
<tr>
<td>------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Serum</td>
<td>Detection of Antibody to Varicella Zoster Virus</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specimen Required</th>
<th>Reference Interval</th>
<th>Method</th>
<th>Turnaround Time</th>
<th>Medical Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum</td>
<td>Non-Reactive</td>
<td>Manual Slide test</td>
<td>Daily, 24 hours</td>
<td>Screening test for Syphilis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Medical Indication</th>
<th>Vitamin B12</th>
</tr>
</thead>
<tbody>
<tr>
<td>3ml plain blood</td>
<td>Investigation of macrocytic anemia. Workup of deficiencies seen in megaloblastic anemias. Diagnose pernicious anemia. Increased levels seen in hepatic cell damage &amp; myeloid leukaemia</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specimen Required</th>
<th>Reference Interval</th>
<th>Method</th>
<th>Turnaround Time</th>
<th>Medical Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>187 - 833 pg/mL</td>
<td>CMIA</td>
<td>4 days</td>
<td>Investigation of macrocytic anemia. Workup of deficiencies seen in megaloblastic anemias. Diagnose pernicious anemia. Increased levels seen in hepatic cell damage &amp; myeloid leukaemia</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Medical Indication</th>
<th>Widal Weil Felix (WWF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum</td>
<td>Diagnosis of rickettsial Infections</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specimen Required</th>
<th>Reference Interval</th>
<th>Method</th>
<th>Turnaround Time</th>
<th>Medical Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum</td>
<td>Negative</td>
<td>Tube Method</td>
<td>1 day</td>
<td>Diagnosis of rickettsial Infections</td>
</tr>
</tbody>
</table>
Appendix A: PATHOLOGY REQUEST FORMS

PATHOLOGY Request Form

Patient’s Name: ____________________________
IC No.: ____________________________ Date: __________
Nature of Specimen: ____________________________
Examination Required: ____________________________
Date: __________ Time: __________
Doctor’s Signature: ____________________________

CLINICAL SUMMARY:

BP Clinical Laboratory Service Guide Version 4, 2017