FEDERAL TEACHING HOSPITAL
IDO-EKITI

DEPARTMENT
OF
CHEMICAL PATHOLOGY
LABORATORY HANDBOOK
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1.0 Introduction

1.1 Overview

The Chemical Pathology Laboratory (Laboratory) of the Federal Teaching Hospital, Ido-Ekiti (FETHI) is a consultant led service that provides diagnostic, analytical and interpretative services for a large range of analytes in body fluids and tissues. Chemical Pathology deals with the biochemical basis of diseases and the use of biochemical tests for diagnosis, prognosis, screening and management. The laboratory provides a reliable analytical service and advice on the management of patients with metabolic disturbances.

Apart from routine diagnostic work, the Department of Chemical Pathology is actively involved in teaching students of medical laboratory science, science technology, and medicine. The Department has teaching and research links with the College of Medicine and Health Sciences, Afe Babalola University, and the College of Medicine, Ekiti State University. The Laboratory is involved in collaborative research with clinical colleagues, international collaborators and postgraduate research is also carried out.

The Department is working towards accreditation by the postgraduate Colleges for residency training in Laboratory Medicine.

1.2 Objectives of the laboratory handbook

The Chemical Pathology Laboratory is committed to providing the highest quality diagnostic and consultative services for all its users.

Major Objectives

i. To provide reliable test results that are fit for their intended use.
ii. To provide laboratory personnel with the knowledge, training, and tools necessary to allow for the completion of accurate, reliable and timely work.
iii. To provide an effective service to its customers.
iv. To uphold professional values and conduct.
v. To provide safe and suitable conditions for all staff and visitors to the laboratory.
vi. To procure and maintain equipment and other resources needed for the provision of the service.
vii. To ensure that all personnel are familiar with the contents of the Laboratory Quality Manual and all procedures relevant to their work.
viii. To collect, transport and handle all specimens in such a way as to ensure correct performance of laboratory tests.
ix. To report results of tests in ways which are timely, confidential, accurate, reliable and clinically useful.
x. To operate a quality management system that integrates the organisation, procedures, processes and resources.

2.0 General Information

2.1 The location of the laboratory

The Chemical Pathology Laboratory occupies a wing of the ground floor of the Medical and Surgical Speciality Clinics building, behind the General Administrative building of the FETHI.

2.2 Opening Hours and Laboratory Telephone Numbers

The Chemical Pathology Laboratory provides daily 24-hour service divided into routine (8.00am to 4.00pm, Monday to Friday) and emergency hours (4.00pm to 8.00am, Monday to Friday and 24 hours a day during Weekends and Public Holidays).
During the emergency period, clinicians are reminded to request urgent laboratory tests **only when necessary;** and the result of such tests will have a significant beneficial effect on patient management. (Routine laboratory tests requested during call hours and weekends will be carried out during the normal routine working hours.)
To facilitate the processing of samples and improve the turnaround time, clinicians are urged to send all routine tests requests to the laboratory preferably before 2.00 pm daily.
Turnaround times differs for each specified test although emergency services are given for specified tests. (Refer to Section 8.0 for list of emergency tests)
Refer to Table 7.1 for turnaround times of various tests.

Refer to Section 2.3 for telephone numbers.

2.3 Contact Details

Dr S. M Ghazali, Head of Department	(CUG) 09062386389
Dr A. K. Jimoh, Consultant Chemical Pathologist	(CUG) 09062951368
Dr A. Adelekan, Consultant Chemical Pathologist	08037256280
Dr A. R. Olaleye, Senior Medical Officer	08034088933
Mr B. A. Adeleke, Chief Medical Laboratory Scientist	(CUG) 09062386434
Mr S. O. Ajiboye, Principal Medical Laboratory Scientist	07031248471
Mrs B. F. Olowolagba, Principal Medical Laboratory Scientist	08060714797
Mr T. Falayi, Principal Medical Laboratory Scientist	08066269654
Laboratory Quality Manager	……..
Laboratory Reception phone number	……..
Resident on Call:	see call rooster
Medical Laboratory Scientist on Call:	see call rooster

2.4 Clinical advice on ordering of laboratory investigations and interpretation of results

i. Clinical advice on ordering of tests and on interpretation of test results is routinely available and can be obtained by contacting the Laboratory Physicians (refer to section 2.3).
ii. Interpretative comments and clinical advice are provided on the report where appropriate.
iii. Refer to section 5.0 for further information regarding the ordering of laboratory tests.

iv. Refer to the A-Z Test Directory for a list of tests performed, samples required, primary sample volumes, special precautions, turnaround time, reference intervals, and clinical decision values.

v. The Metabolic Clinic provides services to referring family physicians, outpatient clinics, other hospital medical/surgical departments and outside hospitals whereby they receive advice and helpful guidelines from the Consultant Chemical Pathologists. Metabolic medicine is the clinical arm of Chemical Pathology, and involves direct clinical care of patients with diabetes mellitus and other endocrine disorders, dyslipidaemia, hypertension, obesity, special nutritional needs, metabolic bone disease, renal stones and inherited metabolic diseases. The clinical work in metabolic medicine fits well alongside the laboratory work of Chemical Pathology. The clinic also saves patients unnecessary trips to the Laboratory.

2.5 The laboratory's complaint procedure

The goal of the laboratory is to ensure that our customers receive accurate, reliable, meaningful and timely laboratory results. It is your right as a customer to make complaints if you believe that standards of care, treatment or practice fall short of what is acceptable. If you need to make a complaint, we want the process to be easy, effective and fair.

In order to help you to do so please contact the Head of Department or the Chief Medical Laboratory Scientist or the Laboratory Quality Manager (refer to 2.3 for contact details) or the Hospital SERVICOM unit (CUG 09062951368).

2.6 Policy on protection of personal information

2.7 Instructions for transportation of samples

Instructions for the transport of specimens to the Laboratory are described in Section 6.5.

NOTE: All urgent Chemical Pathology samples should be brought directly to the Chemical Pathology Laboratory and handed directly to a Medical Laboratory Scientist.

Please contact the laboratory for information on the correct procedure for centrifugation and specimen storage prior to transport to the laboratory if request is from outside the hospital.

3.0 Clinical Services offered by the Chemical Pathology Laboratory

3.1 Chemical Pathology Tests

Services offered include:

i. Glucose
ii. Liver profile
iii. Renal profile
iv. Lipids e.g., cholesterol, triglycerides, lipoproteins
v. Endocrinology e.g., thyroid function tests, infertility testing, etc.
vi. Dynamic Tests
vii. Cardiac markers
viii. Urinalysis

3.2 Point of Care Tests e.g., Blood glucose meter

Blood glucose meters situated outside the laboratory give high quality results if used and maintained correctly. Do NOT use this equipment unless you have been trained. Blood glucose meters may be calibrated in the Laboratory.

i. Blood Glucose Meters - Blood Glucose Meters are located throughout the Hospital to monitor known diabetics. These are not to be used for the diagnosis of diabetes mellitus, for which a blood specimen must be sent to the laboratory.

4.0 Instructions for Patient collected specimens

4.1 24-hour collection of urine

Key Points:

a. Ensure the collection bottle/container for the 24-hour urine collection contains a preservative before you leave the hospital.
b. All of the urine passed during the 24-hour period should be collected. Failure to collect all urine may invalidate result.
c. An exact timing of the 24-hour period is required.
d. Ensure container is labelled with patient's full name, age, date of collection and time collection was started and time collection was finished.
e. Do not void urine directly into the 24-hour container but into a suitable clean detergent free container and then pour urine into the 24-hour container with the help of a new funnel.
f. If the container contains a preservative, please exercise care when adding urine to the 24-hour container to avoid splashing.
g. Keep container away from children at all times.
h. In between collections, urine container may be placed in a refrigerator.

Procedure:

a. Empty your bladder at 8am on rising or at a more convenient/appropriate time and discard that sample. The collection period has now started. Write start time on container.
b. Collect all urine passed during the next 24 hours and place in container.
c. On the following morning empty your bladder at 8am on rising (must be the same time as starting time) and add this sample to the collection. The collection is now complete. Write the finish time on the container.
d. Close the container cap securely and ensure container and request form contain required information
e. Bring collection to the laboratory on the day of completion.

Incomplete collections:

a. If you forget and lose a sample down the toilet, then discard all urine collected up to that time and start collection again.
b. If the collection requires a preservative return the container to the laboratory and request a new container.

4.2 Stool Sample Collection

a. Ensure that you are provided with a collection container for the stool collection before you leave the hospital.
b. The container should be labelled with your full name, date of birth (or your Hospital number if you have it), date / time of collection and the sample type, i.e. Stool.
c. The sterile container should not be opened until you are ready to collect the sample.
d. Wash and dry your hands.
e. Do not submit faeces contaminated with urine or toilet water. Urinate into the toilet if needed.
f. Place plenty of lavatory paper in a clean potty or in the lavatory pan. Make sure there is no trace of disinfectant or bleach present, as this will interfere with the test. Faeces (a bowel movement) should then be passed on to the toilet paper. Do not send stool wrapped in toilet paper to the laboratory

g. Note: If you have severe diarrhoea or a watery stool, a potty may be needed to collect the initial sample.
h. Open the container and, using the 'spoon' that is provided, transfer enough stool in order to fill approximately 1/3 of the container. Do not overfill the container. Also please ensure that the outside of the container is not soiled with stool.
i. You should ensure that the lid of the container is firmly closed. Note that a leaking container may be infectious. Place the container into the specimen bag attach to the laboratory request form.
j. Flush away the remaining paper and faeces down the lavatory.
k. Wash and dry hands thoroughly with soap and warm water.
l. Specimens should be brought to the laboratory as soon as possible.

5.0 Ordering laboratory Tests

5.1 Instruction for completion of request forms

i. For accurate identification of patients and specimens, it is essential that request forms be completed fully, legibly and accurately. **Please remember that inadequate information on request forms makes it difficult to issue a clinically useful report, or contact the doctor in case of urgent or unexpected results.**

ii. The Laboratory request forms are colour coded white for the Department of Chemical Pathology. The two (2) Laboratory request forms are General Chemistry (Glucose, lipids, renal and liver panels, etc) and Hormonal studies (thyroid function tests and fertility profile) in one request form, and Urinalysis in another request form. Multiple tests can be sent on one request form, but separate specimens and request forms are required if the sample types are different.

Request forms are issued from the Hospital stores. Therefore, requesting departments should order supplies in advance to facilitate timely delivery.

iii. Laboratory request forms are expected to contain the following data:

a. Patient's Full Surname and First name
b. Patient's Hospital Number. If a hospital number is not available or relevant (i.e., outside hospital patients), a date of birth and address must be supplied on the request form and specimen label.
c. Patient's Age (in months or year) OR Date of Birth
d. Patient's Gender
e. Date, time and place of specimen collection
f. Name of the Requesting Consultant
g. Type of specimen collected
h. Last menstrual period (LMP) for females
i. Clinical information relevant to or affecting sample collection, test performance or result interpretation (e.g., history of administration of drugs).
j. Name and number of requesting doctor
k. Analysis (analytes) requested
l. Time of sample receipt at the Laboratory Reception

iv. If a specimen is urgent please indicate on request form and the request will be prioritised. If results are extremely urgent please contact the Laboratory (see Section 2.3) to discuss your requirement. Overuse of the urgent service will adversely affect the turnaround time for all urgent tests.

v. Clinical summary (of clinical history and examination), relevant treatment information and details of foreign travel are extremely useful to the Laboratory Physicians in interpreting results.

vi. Refer to the A-Z Test Directory in this Laboratory Handbook for a list of tests performed, the sample required, turnaround time and other information regarding specimen collection. The Consultant Chemical Pathologists, Residents and/or laboratory staff should be consulted where uncertainty exists about the availability, appropriateness, or selection of tests, the nature of the specimen required, or the interpretation of results.

5.2 Criteria for accepting and rejecting samples

The Laboratory makes every effort to ensure that samples are processed as requested. However, samples must be appropriate for the requested investigation, the safety of laboratory staff must not be threatened and there must be no ambiguity as to the identification of the patient. The criteria for sample acceptance, as described below, are strictly adhered to in the interest of patient safety. Failure to provide the required data shall lead to rejection of the specimen and request form.

Acceptance criteria

Labelling Requirements	**Required Information**
Request Form	Patients full name, Age and Gender Patient's Hospital Number Patient's location Patient's Consultant Date and time of specimen collection Clinical summary Patient's address Relevant therapy and foreign travel NB: Certain analytes may not be processed if mandatory fields are incomplete
Specimen Container	Patients full name Investigation required Date and time of specimen collection All non-blood samples: sample type

Rejection criteria

i. Specimen container not labelled
ii. Name on specimen and request form do not agree
iii. Specimen Quantity Not sufficient (QNS) for testing
iv. Specimen unsuitable for testing; haemolyzed, too old, clots (in plasma)
v. Date of specimen collection unknown
vi. Improperly sealed or leaking container
vii. Blood-stained request forms

5.3 List of factors known to significantly affect the outcome of laboratory tests and, or the interpretation of the results

Many sources of error exist that could affect the test result. Refer to the A-Z Test Directory in this Laboratory Handbook for any special rejection criteria that may apply. Listed below are some of the major pre-analytical reasons for test cancellation or delay.

Request form problems that will cause test cancellation or delay:

i. Illegible patient demographics, illegible name of ordering clinician or incorrect ward or location
ii. Absent or incorrect patient hospital number
iii. Absent or incorrect time and date of request
iv. Unclear or totally absent marking of test request boxes
v. Type of body fluid or tissue not identified
vi. Request form contaminated by specimen

Specimen problems that will cause test cancellation or delay:

i. Leaking specimen bottle (rejected because of infection risk)
ii. Specimen bottle is unlabelled, incorrectly labelled or does not match the accompanying form
iii. Too few specimens or an insufficient volume for analysis. Send separate samples for each laboratory department. Split a CSF sample when requesting both cell culture and biochemistry.
iv. Misrouting of specimens e.g. inappropriate laboratory
v. Incorrect laboratory request form used
vi. Specimen collected into an incorrect preservative/anticoagulant bottle.

6.0 Specimen collection and transport

6.1 Instructions for preparation of the patient

Patients can help to ensure that their laboratory tests are accurate by following pre-testing instructions carefully and by providing complete medical histories, including lists of medications to their physicians.

Variables that could affect test results

i. Patient variables including exercise, diet, age, sex, circadian variation, posture, obesity, stress, smoking and medication may affect laboratory test results.
ii. An individual's diet and lifestyle may affect laboratory test results. It is generally recommended that the night before laboratory tests patients avoid high-fat foods, alcohol and strenuous exercise.
iii. Patients should ask their doctors if certain medications should be stopped prior to laboratory testing as certain medications may interfere with the laboratory test results.

Blood Tests

i. Patients may need to fast prior to certain blood tests. For example, patients should not eat or drink anything except water for 9 to 12 hours prior to glucose and lipid profile tests.
ii. The amount of blood drawn at the time of collection for laboratory testing depends on the tests that are ordered.
iii. Some patients become anxious when they have their blood drawn. The health care professional who is drawing the blood should inquire if they feel faint or sick during the procedure. Slow deep breaths prior to the needle stick may help to alleviate anxiety. They may ask patient to close eyes or look away if they prefer.
iv. After a blood draw, the health care professional makes sure that all signs of bleeding have stopped. A plaster may be applied after the removal of needle.
v. Aspirin or other anticoagulant (blood thinners) drugs can prolong bleeding. For such cases, pressure should be applied for a longer period until the bleeding has stopped.

Post phlebotomy care (when necessary)

i. A cold pack may be necessary to reduce swelling and bruising.
ii. Patient should sit for a couple of minutes after blood is drawn before leaving.
iii. After a patient has blood drawn, even when bleeding has stopped, patients should not carry or lift a heavy object with that arm for a minimum of one hour.

Collecting Specimens at Home

i. Patients must follow all instructions exactly for collection of specimens (urine, stool, saliva) performed at home then brought to the laboratory for testing.
ii. Special containers with a powder or liquid preservative may be provided for urine collection. Patients should never empty or discard any powder or liquid from the container before beginning the collection of a specimen.
iii. Specimens should be delivered to the laboratory in the prescribed time-frame in order to ensure accuracy.

Results

i. Depending on the laboratory work performed, test results may be available within a few hours to as long as a week.
ii. Laboratory test results are often reported with a reference interval to assist the clinician in interpreting them. These reference intervals reflect the values in the majority of healthy individuals; however, there often some outliers. A few healthy people may have results that are slightly higher than upper limit of reference interval, or lower than lower limit of reference interval. Hence, laboratory results should be interpreted by laboratory physicians who can decide whether or not specific results indicate medical anomaly.

6.2 Phlebotomy Services

The Phlebotomy Unit covers the Paediatric wards, all the adult wards, Out-Patients Clinics, the Psychiatric Department and the Accident and Emergency Department.
Wards: The service is Sunday to Saturday; 24 hours service.
Out-Patients Clinics: The service is Monday to Friday; 8.00 am – 4.00 pm.
Accident and Emergency Department: The service is Sunday to Saturday; 24 hours service.

Standard precautions to be adhered while taking bodily specimens.

i. Hand hygiene.
ii. Use of personal protective equipment (e.g., gloves, masks, eyewear).
iii. Respiratory hygiene / cough etiquette.
iv. Sharps' safety (Needles not to be recapped after use, Needles and holders to be disposed of safely, Sharp bins provided for disposal of sharps.).
v. Clean and disinfected environmental surfaces. (Clinical waste bags provided for any bloodstained material, Spillages /blood – Appropriate disinfectant to be used to clean and disinfect, Large spillages of blood /body fluid - Contact Hospital Infection Control Committee and follow their laid down protocols for infection control.)

6.3 Blood collection order of draw

Specimen volume*	**Specimen Bottle Cap Colour****	**Bottle additive**	**Mix by inverting**	**Use**
5ml	Serum (Plain)/Red	Non	5 times	Hormone Studies, Serum biochemical profiles
5ml	Heparin/Blue	Lithium Heparin (Na^+/K^+)	8 to 10 times	Plasma determinations
5ml	EDTA/Purple	EDTA	8 to 10 times	HbA1c
2ml	Fluoride (Glucose)/Yellow	Sodium fluoride	8 to 10 times	Glucose, Oral Glucose Tolerance Test

* the specimen volume may be dependent on specimen bottle specification

** Specimen bottle cap colour may change depending on supplies; please read labelling on the side of the specimen bottle.

6.4 Sample transport

Samples are to be transported as quickly as possible to the Laboratory, within thirty (30) minutes. If there are many patients to be bled, bring in batches, every thirty (30) minutes. Every sample must be enclosed in a suitable, leak proof container/wrapper. The request form should not be attached to the sample container or be used as a sample label or wrapper.

To minimize exposure to bloodborne pathogens during transport of specimens, Standard Precautions must be used. ALL blood and other potentially infectious material are treated as if they are known to be infectious with HIV or hepatitis and other bloodborne pathogens. All specimens must be transported in a suitable, leak proof container, preferably a sealed biohazard bag.

Specimens suspected of biohazard category 4 organisms e.g., SARS-CoV-2 virus, viral haemorrhagic fevers (Lassa virus), etc, must not be sent to the routine Laboratory, and the FETHI Infections Control Team must be informed before sending the specimen to designated Laboratories.

Some samples will need special requirements for transport e.g., bilirubin specimen should be wrapped with carbon paper, aluminium foil or tissue paper. Refer to the A-Z Test directory for requirements for other analytes (Section 9).

6.5 Specimen Storage Conditions

1. Store blood and urine specimens at room temperature, unless otherwise specified.
2. If specimen cannot get to the Laboratory within thirty (30) minutes, please contact the laboratory for advice on specimen storage (call Consultant, Chief Resident, Laboratory Quality Manager, see section 2.3 for contact details)
3. For the addition of test requests to existing samples, please contact the Laboratory for advice on sample integrity. (see section 2.3 for contact details)

7.0 Laboratory Reports and Interpretative comments

All laboratory results should be reported by the Laboratory Physicians before release to customers.

7.1 Turnaround Times

Turnaround time (TAT) is given as the maximum number of working hours/days between specimen receipt and issuing a laboratory report under normal operating conditions. In addition to the routine service, there is an emergency (or "urgent") system whereby the target turnaround time is shorter. The turnaround time for individual tests is given in the A-Z Test Directory (see Section 9) in this Laboratory Handbook.

Overuse of the emergency service will adversely affect the turnaround time for all urgent tests. Many specialised tests are performed on a weekly basis; if such tests are required urgently please phone the Laboratory to discuss the request.

7.2 Critical Results Reporting

A critical value is defined as an imminent life-threatening laboratory result requiring immediate physician notification/attention. Because of their critical nature, urgent notification of a critical value to the appropriate healthcare professional is necessary.

The table below has been adapted from Tietze textbook of Clinical Chemistry and Molecular Diagnostics (6th ed).

Test	Lower Limit	Upper Limit
Albumin (children)	8 g/L	17 g/L
ALT/AST	-	>1000 IU/L
Bilirubin (newborn)	-	>257 µmol/L
Calcium (total)	1.65 mmol/L	3.5 mmol/L
Calcium (children)	1.63 mmol/L	3.18 mmol/L
Calcium (free)	0.78 mmol/L	1.6 mmol/L
Chloride (adult)	80 mmol/L	120 mmol/L
Creatinine (adult)	-	442 µmol/L
Creatinine (children)	-	336 µmol/L
Glucose	2.2 mmol/L	27.8 mmol/L
Glucose (children)	2.6 mmol/L	27.2 mmol/L
Glucose (new born)	1.7 mmol/L	18 mmol/L
Glucose, CSF (adult)	2.2 mmol/L	11.1 mmol/L
Glucose, CSF (children)	2.2 mmol/L	27.8 mmol/L
Phosphate	0.3 mmol/L	2.9 mmol/L
Potassium	2.8 mmol/L	6.2 mmol/L
Potassium (newborn)	2.8 mmol/L	7.8 mmol/L
Protein (children)	34 gl/L	95 g/L
Protein, CSF (children)	-	1.9 g/L
Sodium	120 mmol/L	160 mmol/L
Urea	-	35.6 mmol/L

Uric acid	-	0.8mmol/L
Uric acid (children)	-	0.7mmol/L

Physician notification policy:

In the event of a laboratory clinical value, the laboratory will immediately contact the requesting physician responsible for patient's primary care, and or Consultant in charge of the patient. In their absence, the originating Ward/Clinic will be notified through the Nurse in charge. This will be done within a stipulated time-frame of thirty (30) minutes.

8.0 Emergency services

The emergency service is restricted to true emergencies. The turn-around time will be adversely affected if excessive demands are made on the service.

Tests Available on Emergency Service

Test	Unrestricted	Restricted (Call Laboratory first)
Creatinine	*	
CSF Protein and Glucose	*	
Direct Bilirubin	*	
Total Bilirubin	*	
Glucose	*	
Pregnancy Test	*	
Potassium	*	
Sodium	*	
Urea	*	
Urinalysis	*	

9.0 Test Directory (A-Z)

9.1 Summary of common tests and profiles

Test	Specimen	Specimen Bottle	Bottle top Colour	Turnaround Time
Electrolytes	Plasma	Lithium heparin	Green	8 hours
Glucose	Plasma	Fluoride oxalate	Grey	8 hours
Renal profile	Plasma	Lithium heparin	Green	8 hours
Liver function tests	Plasma	Lithium heparin	Green	72 hours
Lipid profile	Plasma	Lithium heparin	Green	72 hours
Thyroid function tests	Serum	Plain bottle	Red	1 week
Fertility profile	Serum	Plain bottle	Red	1 week
Pregnancy Test	Urine/Serum	Universal/Plain bottle	Red	30 minutes
Urinalysis	Urine	Universal Botte	Red	30 minutes

9.2 A – Z Directory

Test	Specimen	Specimen Bottle	Turn-around Time	Reference Interval	Considerations
AFP	Serum	Plain bottle	1week	< 8.5 ng/mL	Fasting morning specimen best
ALT	Plasma	Lithium Heparin	72 hours	Up to 18 IU	
ALP	Plasma	Lithium Heparin	72 hours	9 - 30 IU	
Anti H. Pylori IgM	Serum	Plain bottle	1 week		
AST	Plasma	Lithium Heparin	72 hours	Up to 20 IU	
Albumin	Plasma	Lithium Heparin	72 hours	30 – 50 g/L	
Bilirubin (total)	Plasma	Lithium Heparin	72 hours	Up to 15 IU	
Bilirubin (conjugated)	Plasma	Lithium Heparin	72 hours	Up to 5 IU	
Bilirubin (neonate; total/conjugated)	Plasma	Lithium Heparin	30 minutes	Up to 15 IU/ Up to 5 IU	
BJP	Urine	Universal bottle	30 minutes	Qualitative (Present or Absent)	No special preparation required
CA-125	Serum	Plain bottle	1 week	≤ 35 IU/mL	
CEA	Serum	Plain bottle	1 week	≤ 5 ng/ml (non-	

				smoker), ≤ 10 ng/ml (smoker)	
CRP	Serum	Plain bottle	1 week		
Calcium (total)	Plasma	Lithium Heparin	72 hours	2.15 – 2.57 mmol/L	
Calcium (ionised)	Plasma	Lithium Heparin	72 hours	1.15 – 1.39 mmol/L	
Chloride	Plasma	Lithium Heparin	8 hours	95 – 110 mmol/L	
Cholesterol (total)	Plasma	Lithium Heparin	72 hours	2.0 – 5.0 mmol/L	Fasting morning specimen best
Cortisol	Serum	Plain bottle	1 week	4.8 -20.6 µg/dL (M) 5.1 -21.9 µg/dL (F)	
Creatinine	Plasma	Lithium Heparin	8 hours	50 – 110 µmol/L	
CSF Glucose	CSF	Fluoride Oxalate	30 min	2.5 – 3.6 mmol/L	
CSF Protein	CSF	Plain bottle	30 min	15 – 45 mg/L	
DHEA	Serum	Plain bottle	1 week	1.8 - 12.5 ng/mL (M) 1.3 - 12.8 ng/mL (F)	
DHEA-S	Serum	Plain bottle	1 week	0.06- 4.58 µg/mL (M) 0.03 - 5.88 µg/mL (F)	
FSH	Serum	Plain bottle	1 week	2 – 12 mIU/ml	
FT3	Serum	Plain bottle	1 week	1.4 - 4.2 pg/ml	Fasting morning specimen best
FT4	Serum	Plain bottle	1 week	0.8 – 2.0 ng/dl	Fasting morning specimen best
Glucose (Fasting)	Plasma	Fluoride Oxalate	8 hours	3.6 – 6.1 mmol/L	Fasting morning specimen ONLY
Glucose (Random)	Plasma	Fluoride Oxalate	8 hours	3.6 – 10.0 mmol/L	
OGGT*	Plasma	Fluoride Oxalate	8 hours	Diagnostic criteria	
HCO_3^-	Plasma	Lithium Heparin	8 hours	20 -30 mmol/L	
HbA1c	Plasma	EDTA	8 hours	≥6.5%, ≥48 mmol/mol	
β-hCG	Serum	Plain bottle	1 week	60 ng/mL (28weeks GA)	
HDL	Plasma	Lithium Heparin	72 hours	0.8 – 1.4 mmol/L	
hs-CRP	Serum	Plain bottle	1 week	1.0 – 3.0 µg/mL	Fasting morning specimen best
Inorganic phosphorus	Plasma	Lithium Heparin	72 hours	1.0 – 1.9 mmol/L	
LDL	Plasma	Lithium	72 hours	0.0 – 4.5 mmol/L	

		Heparin			
LH	Serum	Plain bottle	1 week	0.5 – 10.5 mIU/mL	
Microalbumin	Serum	Plain bottle	1 week		
Oestradiol (E_2)	Serum	Plain bottle	1 week	44 – 196 pg/mL	
Potassium	Plasma	Lithium Heparin	8 hours	3.0 – 5.0 mmol/L	
Pregnancy test	Urine/ Serum	Universal bottle/ Plain bottle	30 min	Positive, negative or…	Early morning urine specimen best
Prolactin	Serum	Plain bottle	1 week	1.2 – 19.5 ng/mL	
Progesterone	Serum	Plain bottle	1 week	2.0 – 25 ng/mL	
tPSA	Serum	Plain bottle	1 week	0.0 – 6.5 ng/mL	Fasting morning specimen best
fPSA	Serum	Plain bottle	1 week	≤ 1.3ng/ml	Fasting morning specimen best
Sodium	Plasma	Lithium Heparin	8 hours	135 – 145 mmol/L	
TSH	Serum	Plain bottle	1 week	0.28 – 6.82 µIU/mL	Fasting morning specimen best
Testosterone	Serum	Plain bottle	1 week	2.5 – 10.0 ng/mL (M) 0.2 – 0.95 ng/mL (F)	
Triglyceride	Plasma	Lithium Heparin	72 hours	0.7 – 2.0 mmol/L	Fasting morning specimen best
Troponin I	Serum	Plain bottle	-	≤ 0.4 ng/mL	
Total Protein	Plasma	Lithium Heparin	72 hours	60 – 80 g/L	
Uric acid	Plasma	Lithium Heparin	72 hours	0.2 – 0.5 mmol/L	
Urinalysis	Urine	Universal bottle	30 min		Early morning specimen best

10.0 Glossary of abbreviations

AFP Alpha- Fetoprotein

ALT Alanine aminotransferase

ALP Alkaline phosphatase

AST Aspartate aminotransferase

β-hCG beta-human chorionic gonadotrophin

BJP Bence Jones Protein

CA-125 Carbohydrate antigen 125

CEA Carcinoembryonic antigen

CRP C-reactive protein

CSF Cerebrospinal fluid

DHEA Dehydroepiandrosterone

DHEA-S Dehydroepiandrosterone sulphate

E_2 Oestrogen

EDTA Ethylene diamine tetra-acetic acid

FETHI Federal Teaching Hospital, Ido-Ekiti

FSH Follicle stimulating hormone

FT3 Free Triiodothyronine

FT4 Free thyroxine ((tetraiodothyronine))

HbA1c Glycated haemoglobin A1c

HCO_3^- Bicarbonate

HDL High density lipoprotein

hs-CRP high sensitivity C-reactive protein

LDL Low density lipoprotein

LH Luteinising hormone

OGTT Oral glucose tolerance test

PSA Prostate specific antigen

TSH Thyroid stimulating hormone