## Chemical Pathology

### Services Offered

The Chemical Pathology Department provides a comprehensive suite of routine and specialised tests including;

* General biochemistry, including test profiles for renal, liver, bone, cardiac, muscle, lipid disorders and glucose homeostasis.
* Immunoassay tests of thyroid, gonadal, adrenal and pituitary function, haematinics, therapeutic drug monitoring.
* Biochemical tests for phaeochromocytoma, neuroblastoma and carcinoid tumours including Plasma Free Metanephrines, urinary fractionated catecholamines, metanephrines and 5HIAA.
* Protein Electrophoresis, Immunofixation and Serum Free Light Chain analysis.
* CSF Xanthochromia

### Out of Hours / Weekend Service

Out of Hours / Weekend service provided includes the tests shown in the table below.

**All tests marked with \* must be discussed with the laboratory staff on duty.**

In the event of the laboratory having an incident that curtails service provision, the tests listed in Column A will be given priority over those in Columns B & C

**Column A:** Priority Tests

**Column B:** Assays will be available when possible

**Column C:** Assays will be deferred until full service provision returns.

Assays not listed below may have samples drawn if clinically urgent, i.e. they must be taken at baseline prior to a clinical intervention; contact the laboratory for further information. The samples will be stored for analysis the next working day.

|  |  |  |
| --- | --- | --- |
| **A** | **B** | **C** |
| Na/K | Urea | Chloride |
| Creatinine | CRP | Cholesterol |
| Calcium | Bilirubin | Triglyceride |
| Magnesium | ALT | HDL |
| Albumin | AST | Urate |
| CSF Protein | Alkaline phosphatase | Protein |
| CSF Glucose | Phosphate | Transferrin Saturation |
| Amylase | ETOH | Urine Amylase |
| BDS | ƴGT | Urine Na |
| Iron | LDH |  |
| Paracetamol \* | ABG |  |
| Salicylate \* | CK |  |
| Lithium \* | TCO2 |  |
| Osmolality \* | Digoxin \* |  |
| Troponin | Phenytoin \* |  |
| Gentamycin | Phenobarb \* |  |
| Vancomycin | Carbamazepine \* |  |
|  | Valproate \* |  |

### Contact Details for Medical / Clinical Advice

**For medical advice contact;**

Consultant Chemical Pathologist; Dr. Shari Srinivasan on (01) 8092676

Consultant Chemical Pathologist: Dr. Clodagh Loughrey on (01) 8092035

**During working hours medical advice can also be obtained by contacting;**   
Chemical Pathology Specialist Registrar; (01) 8092666 or 8093000 Bleep #331

**During working hours** **scientific advice can be obtained by contacting;**

Chief Medical Scientist; Alison Griffin (01) 8092670

Chief Medical Scientist; Miriam Shinners (01) 7977811

For information on test requirements please see below.

### Requests for Additional Tests

Samples are retained in the Department for 72 hours and are validated for testing only up to this time. The laboratory will advise on the suitability of the sample for additional testing. Please note that verbal requests for additional testing are not acceptable and all requests for further testing should be implemented by ordering the test on Powerchart using the same episode number as the existing sample.

Added-on requests cannot be processed STAT. If the request is clinically urgent a fresh sample is advised.

In the event that the automated sample filing equipment is out of order – the laboratory will be unable to accept any add-on orders.

### Routine Test Profiles and their Components

|  |  |  |
| --- | --- | --- |
| **Description** | **Mnemonic** | **Tests** |
| Renal Profile | Renal | Urea, Na, K, Cl, Creatinine |
| Liver Profile | Liver | Bilirubin, ALT, ALK, γGT, AST, ALB, TP, Globulin |
| Lipid Profile - Fasting  Lipid Profile - Non-fasting | FHDL  HDL | Cholesterol, Triglyceride, HDL, Calculated LDL, non-HDL Cholesterol |
| Bone Profile | Bone | Ca, ALB, Phosphate, Ca Adjusted, ALK |
| Thyroid Function Test | TFT | FreeT4 and TSH |

### Fluid Orders

All orders for testing of ‘fluids’ – that is **not** blood, urine or CSF, must be ordered on Powerchart.

The type of ‘fluid’ must be entered into each request from the drop down window – e.g. Pleural, Ascites etc.

Samples must be drawn into the tube type specified on the barcode label.

CAPD fluid ordering is managed via Renal wards through a dedicated menu.

### Testing for Familial Hypercholesterolaemia

Order on Powerchart, FHC. The samples are referred to St James’s for analysis. The requested must be accompanied by a completed request form. The form can be printed from the Beaumont Hospital Intranet: Pathology: Laboratory User Guides and Forms.

### Urine Catecholamines and Metabolites

#### Adult reference ranges:

|  |  |
| --- | --- |
| **Analyte** | **Reference Interval** |
| Noradrenaline | < 0.900 umol/24hrs |
| Adrenaline | < 0.230 umol/24hrs |
| Dopamine | < 3.300 umol/24hrs |
| Metanephrine | < 1.80 umol/24 hrs |
| Normetanephrine | < 2.80 umol/24 hrs |

#### Paediatric Reference Ranges:

| **Age Group (yrs)** | **Noradrenaline** | **Adrenaline** | **Dopamine** |
| --- | --- | --- | --- |
| < 1 | < 0.43 | < 0.08 | < 1.95 |
| 1 – 3 | < 0.20 | < 0.08 | < 1.45 |
| 3 – 5 | < 0.19 | < 0.08 | < 0.95 |
| 5 – 8 | <0.18 | < 0.08 | < 0.85 |
| 8 – 11 | <0.17 | < 0.08 | < 0.75 |
| > 11 | <0.13 | < 0.08 | < 0.65 |

Units are mmol/mol Urinary Creatinine

### Plasma Metanephrines

#### Adult Reference Ranges

|  |  |  |
| --- | --- | --- |
| **Analyte** | **Reference Interval** | **Comments** |
| Plasma Normetanephrine | 0 – 1180 pmol/L | Seated |
| Plasma Metanephrine | 0 – 510 pmol/L | Seated |
| Plasma 3 Methoxytyramine | 0 – 180 pmol/L | Seated |
| Plasma Normetanephrine | < 730 pmol/L | Supine (30 mins) |
| Plasma Metanephrine | < 450 pmol/L | Supine (30 mins) |
| Plasma 3 Methoxytyramine | < 180 pmol/L | Supine (30 mins) |

#### Drugs that may cause elevated Plasma Metanephrines

Drug causes of elevated values should be excluded prior to further investigation. See below for list of drugs that can cause elevated plasma metanehrines.

|  |  |
| --- | --- |
| **Drug Class** | **Examples** |
| Tryclic Antidepressants | Amitriptyline, Clomipramine, Dosulepin |
| Selective Serotonin Reuptake Inhibitors | Citalopram, Fluoxetine, Sertraline |
| Serotonin/Noradrenaline Reuptake Inhibitors | Venlafaxine, Duloxetine |
| Alpha Adrenergic Receptor Blockers | Phenoxybenzamine, Doxazosin, Indoramin |
| Beta Adrenergic Receptor Blockers | Atenolol, Labetolol, Propanolol |
| Calcium Channel Blockers | Amlopidine, Diltiazem, Nifedipine |
| Monoamine Oxidase Inhibitors | Isocarboxazid, Phenelzine, Moclobamide |
| DOPA Related | L-Dopa, Methyldopa |
| Stimulant/Sympathomimetic Drugs | Ephedrine, Amphetamine, Cocaine, Nicotine, Caffeine |

### Critical Phoning Limits

* Results falling outside defined alert limits are telephoned to the appropriate ward or requesting clinician.
* Note: This may not be possible due to an inability to contact the relevant clinical personnel out of hours. In such cases, the critical alert value will be telephoned to the medical SHO on-call.
* It is the responsibility of the healthcare professional who requests a laboratory test to ensure that the result is reviewed and appropriate action taken.
* Results apply to the **current patient episode**.
* **Urgency A**- rapid communication of the result within 2 hours.
* **Urgency B**- results require communication within 24 hours, and preferably on the same working day. This would also apply to outpatients. For outpatients if there is no facility to phone on a Saturday then discuss with the on-call senior to determine the urgency.
* **Urgency C**- communication of these results on the next working day is deemed satisfactory.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **RESULTS FOR URGENT COMMUNICATION** | | | | | | |
|  | **Units** | **Action Limits** | | **Urgency** | **Ref.** | **Comments** |
| **Analyte** | **Lower** | **Upper** |
| Sodium | mmol/L | 120  130 if< 16 yrs  125 GP/OPD | 155 | A  A  A | 1  2  3 | **Note different phoning limits for in-patients and GP/OPD** |
| Potassium | mmol/L | 2.5  2.7 GP/OPD | 6.5  6 GP/OPD | A  A  A | 2  1  3 | Check for haemolysis, age of sample & EDTA contamination.  **Note different limits for in-patients and GP/OPD** |
| Urea | mmol/L | - | 30  10 if< 16 yrs  35 CKD patients | A  A  A | 1  2  3 |  |
| Creatinine | µmol/L | - | 354  200 if < 16 yrs  800 CKD patients | A  A  A | 1,2  2  3 |  |
| Glucose | mmol/L | 2.5 | 25  30 GP/OPD/known diabetics  15 if < 16 yrs | A  A  A | 1,2,3  2  2 |  |
| Calcium Adjusted  (Total Calcium if no calculation available) | mmol/L | 1.8\* | 3.5  3 GP/out-patients  3.2 CKD patients | A  B  A | 1,2  1  3 | \*report with Albumin  Request and perform U&E.  All calcium results above upper action limit to be phoned regardless of previous critical result. |
| Phosphate | mmol/L | 0.3  0.45 GP/OPD | - | A  B | 2  1 |  |
| Magnesium | mmol/L | 0.4 |  | A | 1,2 |  |
| Creatine Kinase | U/L | - | 5000  400 if <16 yrs | A  A | 1,2  3 |  |
| Amylase | U/L | - | 500 | A | 1,2 |  |
| CRP | mg/L | - | 300 | A | 1,2 |  |
| AST | IU/L | - | 500 female  600 male | A  A | 1,2  1,2 |  |
| ALT | IU/L | - | 500 female  600 male | A  A | 1,2  1,2 |  |
| Cortisol | nmol/l | 50 | - | A | 1 | Unless part of dexamethasone suppression test  **Do not assume a dexamethasone test has been undertaken.** |
| Cortisol (SST) | nmol/L | 250 |  | A | 2 | As part of short synacthen test |
| Bicarbonate | mmol/L | 10 | - | A | 2 | Excluding ICU patients |
| Ethanol | mg% (mg/dL) |  | 400  All levels in <16 yrs | A  A | 2  3 |  |
| CSF results | All Xanthochromia results to be phoned | | | A | 3 |  |
| Paracetamol | mg/L | All results | | A | 2 |  |
| Digoxin | ug/L | - | 2.5 | A inpatients  B GP/OPD | 2  1,2 | Check timing > 6 hrs from last dose. Give U&E results also.  More urgent if K+< 3 mmol/L. Phone **immediately** to GP/OPD requestor if overdose suspected or K+ low |
| Carbamazepine | mg/L |  | 15 | A inpatients  B GP/OPD | 3  3 |  |
| Phenobarbitone | mg/L | - | 70 | A inpatients  B GP/OPD | 3 |  |
| Phenytoin | mg/L | - | 25 | A inpatients  B GP/OPD | 2,3  1,2,3 |  |
| Valproate (Valproic acid) | mg/L | - | 120 | A inpatients  B GP/OPD | 3 |  |
| Theophylline | mg/L |  | 25 | A inpatients  B GP/OPD | 2  2 |  |
| Lithium | mmol/L | - | 1.5 | A inpatients  B GP/OPD | 2  1,2 |  |
| Salicylate | mg/L | - | 300 | A | 2 |  |
| Triglycerides | mmol/L | - | 20 | B | 1 | If specimen lipaemic, measure and report direct ISE Sodium and Potassium. |
| Haem 4+ samples | Phone all URGENT haem 4+  (this will include all ED) | | | A | 3 |  |
| PSA | ng/mL | - | 40 | C | 3 | If no previous critical result |
| Ferritin | ng/mL | - | 5000 | C | 3 |  |
| TSH | mU/L |  | 30 | C | 3 |  |
| fT4 | pmol/L | - | 50 | C | 1,3 |  |
| Prolactin | mU/L | - | 2000 | C | 3 |  |
| Testosterone female | nmol/L | - | 5 | C | 3 |  |
| Gamma-  globulins | g/L | IgG<3 |  | C | 1 | With low IgA and IgM |
| Serum FLC Ratio |  | - | >100 | C | 3 | First time detection |
| Paraprotein | g/L | Any IgE/IgD | IgG>15  IgA>10  IgM>10 | C | 1 | First time detection |
| Monoclonal free light chain- any size, whether or not with intact paraprotein | | C | 3 | First time detection |

### Interference in Laboratory Tests

Many laboratory tests are subject to interference by endogenous or exogenous factors which may alter the true concentration of a substance within the body, or cause an analytical interference giving a potentially erroneous or misleading result.   
All samples are routinely checked for Haemolysis, Lipaemia and Icterus which can interfere with laboratory tests to varying extents. Significant levels of any of these may affect the quality of some test results which will be highlighted and/or removed from the individual report.   
Test results should be interpreted in conjunction with clinical findings and if interference is suspected please contact the laboratory Drug interferences are also commonly encountered, a summary list is available at <http://www.beaumont.ie/media/Interference_in_Laboratory_Tests1.pdf>.

### Externally Referred Tests

Test reports from external referral laboratories are scanned into the patient record when the result is available.

### Reference Intervals

All reference intervals and/or clinical decision values apply only to non-pregnant adults unless specifically stated otherwise.

### Blood, CSF & Fluid Tests

| **Test** | **Sample**  **Required** | **Specimen Container** | **Minimum**  **Volume** | **Reference Range** | | | **TAT** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ACTH | EDTA Plasma | Potasium EDTA  (Blue Top) | 4.9ml | 7.2 – 63.3 pg/ml | | | 10days  STAT: Contact laboratory |
| Alanine Transaminase ALT | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | M < 41 I.U/L  F < 33 I.U/L | | | Routine: 4hrs  STAT: 2hrs |
| Albumin | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 35 - 52 g/L | | | Routine: 4hrs  STAT: 2hrs |
| Alcohol (ETOH) Plasma | Plasma | Fluoride Oxalate (Yellow Top) | 2.7ml | Units: mg% | | | Routine: 4hrs  STAT: 2hrs |
| Aldosterone | EDTA plasma  (patient must be seated for 10mins prior to sample draw) | Potasium EDTA  (Blue Top) | 4.9ml | Female: 0 – 1179pmol/L  Male: 0 - 670pmol/L | | | 20 days |
| Alkaline Phosphatase | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | M 40 - 129I.U/L  F 35 – 104 I.U/L | | | Routine: 4hrs  STAT: 2hrs |
| Alpha Fetoprotein (blood) | Serum | Brown top (Serum) | 4.9ml | 0 – 5.8 (kU/L) | | | 3days |
| Alpha-1-Antitrypsin | Plasma | Lithium  Heparin  (Orange Top) | 4.9ml | 0.9-2.0 g/L | | | 72 hours |
| Adrenal Vein Sampling  (Aldosterone and Cortisol) | See labels | See labels | See labels | See individual tests | | | See individual tests |
| Amylase | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 28 - 100 I.U/L | | | Routine: 4hrs  STAT: 2hrs |
| Amylase (fluid) | Fluid | Plain  (White Top) | 5ml | N/A  Interpret in conjunction with clinical findings. | | | Routine: 4hrs  STAT: 2hrs |
| Aspartate Transaminase | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | M < 40 I.U/L  F < 32 I.U/L | | | Routine: 4hrs  STAT: 2hrs |
| B2 Microglobulin Serum | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | <60yrs: 0.8 – 2.4mg/L  >60yrs: ≤ 3.0mg/L | | | 72 hours |
| Beta Human Chorionic Gonadotrophin | Serum | Serum  (Brown Top) | 4.9ml | IU/L  Non-pregnant, pre-menopausal women: <1  Postmenopausal women: <7  Men: <2 | | | Routine: 3days  STAT:2hrs |
| Beta Natriuretic Peptide  (NT proBNP II) | Lithium Heparin or Serum | Plain  (White Top) or Lithium Heparin (Orange Top) | 4.9ml | 35y-45y M 0-115pg/mL  35y-45y F 0-237 pg/mL  45y-55y M 0-173 pg/mL  45y-55y F 0-284 pg/mL  55y-65y M 0-386 pg/mL  55y-65y F 0-352 pg/mL  65y-75y M 0-879 pg/mL  65y-75y F 0-623 pg/mL | | | 24hours |
| Beta 2 Transferrin | Fluid collection (otorrhoea / rhinorrhea) plus  Paired serum sample | Fluid - Plain  Serum (white top) | As much as possible  4.9ml | See Interpretive Comment | | | 196 hrs |
| Bilirubin | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | < 21 μmol/L | | | Routine: 4hrs  STAT: 2hrs |
| Bilirubin (fluid) | Fluid | Plain  (White Top) | 5ml | N/A  Interpret in conjunction with clinical findings. | | | Routine: 4hrs  STAT: 2hrs |
| Bilirubin Direct | Lithium Heparin  Protected from light. | Lithium Heparin (Orange Top) | 4.9ml | < 5.0μmol/L | | | 72 hours |
| C-Peptide | Serum | Plain  (White Top) | 4.9ml | 1.1 – 4.4µmol/L | | | 10days |
| C Reactive Protein | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 0 – 5 mg/L | | | Routine: 4hrs  STAT: 2hrs |
| CA 12-5 | Serum | Brown top (Serum) | 4.9ml | <35 kU/L | | | 3days |
| CA 15-3 | Serum | Brown top (Serum) | 4.9ml | <25–kU/L | | | 3days |
| CA 19-9 | Serum | Brown top (Serum) | 4.9ml | <27 kU/L | | | 3days |
| Caeruloplasmin | Lithium Heparin | Lithium  Heparin  (Orange top) | 4.9ml | M 0.15 – 0.30 g/L  F 0.16 – 0.45g/L | | | 72 hours |
| Calcium | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 18-60yrs: 2.15 – 2.50mmol/L  60-90yrs: 2.20 – 2.55mmol/L  >90yrs: 2.05 – 2.40mmol/L | | | Routine: 4hrs  STAT: 2hrs |
| Calcium Adjusted | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 2.21 – 2.52 mmol/L  (Locally derived equation) | | | Routine: 4hrs  STAT: 2hrs |
| Carbamazepine | Serum | Plain  (White Top) | 4.9ml | 4.0 - 12.0 mg/L | | | Routine: 4hrs  STAT: 2hrs |
| Carcinoembryonic Antigen | Serum | Brown top (Serum) | 4.9ml | <5.2 ng/ml | | | 3days |
| Chloride Plasma | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 95 - 108 mmol/L | | | Routine: 4hrs  STAT: 2hrs |
| Cholesterol | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | < 5.0mmol/L | | | Routine: 4hrs |
| Cholesterol – Fluid | Fluid | Plain  (White Top) | 4.9ml | N/A  Interpret in conjunction with clinical findings. | | | Routine: 4hrs |
| Cortisol A.M. | Serum | Brown Top (Serum) | 4.9ml | 166 - 507 nmol/L | | | 24hrs |
| Cortisol Day Curve (Hydrocortisone)10 timed samples for Cortisol | See Labels | See Labels | 7.5ml | N/A  Dynamic Function Test | | | 24hrs |
| Cortisol Day Curve (Cushings)  6 timed samples for Cortisol | Serum | Brown Top (Serum) | 4.9ml | N/A  Dynamic Function Test | | | 24hrs |
| Cortisol M/N | Serum | Brown Top (Serum) | 4.9ml | See Interpretive Comment | | | 24hrs |
| Cortisol Random | Serum | Brown Top (Serum) | 4.9ml | See Interpretive Comment | | | Routine: 24hrs  STAT: 2hrs |
| Creatine Kinase Total | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | M 39 – 308 I.U/L  F 26 - 192 I.U/L | | | Routine: 4hrs  STAT: 2hrs |
| Creatinine (fluid) | Fluid | Plain  (White Top) | 4.9ml | N/A  Interpret in conjunction with clinical findings. | | | Routine: 4hrs |
| Creatinine (plasma) | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | M 59 – 104 μmol/L  F 45 - 84 μmol/L | | | Routine: 4hrs  STAT: 2hrs |
| Creatinine Clearance  2 labels print – 24 hr Urine and Blood | Lithium Heparin/24HU | Lithium Heparin (Orange Top)/24HU | 4.9ml & 24HU | 80 - 125 ml/min | | | Routine: 48hrs |
| CRF  Timed samples for Cortisol and ACTH | See Labels | See Labels | 4.9ml | N/A  Dynamic Function Test | | | STAT: Contact laboratory |
| Cryoglobulins (CRYOS, SPE, IGG)  Sample must be clotted @ 37°C | Serum & EDTA plasma  8 hour Fasting Samples Required | Serum Plain  (White Top)  Plasma Pink EDTA | 7.5ml filled  2.6ml filled | Qualitative  See individual tests | | | 840 hours |
| CSF Protein / Glucose | CSF | Plain | 300ul | See individual tests | | | Routine: 4hrs  STAT: 2hrs |
| CSF Xanthochromia | CSF Brown | Brown plastic | 1ml | N/A  See Interpretive Comment | | | 24hours |
| Cyclosporin A | Whole Blood | Potassium EDTA  (Pink Top) | 2.6ml | N/A  See Interpretive Comment | | | 10 days |
| Cystatin C | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 0.61mg/L – 0.95mg/L | | | 10 days |
| Dehydroepiandrostenesulphate (DHEAS) | Serum | Plain  (White Top) | 4.9ml | **Years** | **Females** | **Males** | 3days |
| 15-20y | 1.8-10.0µmol/L | 1.9-13.4 µmol/L |
| 20-25y | 4.0-11.0µmol/L | 5.7-13.4 µmol/L |
| 25-35y | 2.7-9.2µmol/L | 4.3-12.2 µmol/L |
| 35-45y | 1.7-9.2µmol/L | 2.4-11.6 µmol/L |
| 45-55y | 1.0-7.0µmol/L | 1.2-9.0 µmol/L |
| 55-65y | 0.5-5.6µmol/L | 1.4-8.0 µmol/L |
| 65-75y | 0.3-6.7µmol/L | 0.9-6.8 µmol/L |
| ≥ 75y | 0.3-4.2µmol/L | 0.4-3.3 µmol/L |
| Dexamethasone Supression.  High Dose Long  3 Timed Cortisol Samples | Serum | Brown Top (Serum) | 4.9ml | N/A  Dynamic Function Test | | | 24hrs |
| Dexamethasone Supression.  Low Dose Long  3 Timed Cortisol Samples | Serum | Brown Top (Serum) | 4.9ml | N/A  Dynamic Function Test | | | 24hrs |
| Dexamethazone Overnight Supression.  Single Timed Cortisol Sample | Serum | Brown Top (Serum) | 4.9ml | N/A  Dynamic Function Test | | | Routine: 24hrs  STAT: 2hrs |
| Dexamethazone Suppression Test 8mg | Serum | Brown Top (Serum) | 4.9ml | N/A  Dynamic Function Test | | | 24hrs |
| Digoxin | Serum | Plain  (White Top) | 4.9ml | 0.6 – 1.2 μg/L | | | Routine: 4hrs  STAT: 2hrs |
| Estimated Glomerular Filtration Rate (eGFR) | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | >90ml/min/1.72m2 | | | Routine: 4hrs  STAT: 2hrs |
| Ethanol | Plasma | Fluoride oxalate  (YELLOW cap) | 2.7ml | Unit: mg % | | | 2 hours for STAT samples |
| Ferritin | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | Female 17-60yr: 13 – 150 ng/mL  Male 20-60yr: 30 – 400 ng/mL  No reference range for >60yr old. | | | 3days |
| Folate/Folic Acid | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 3.9-26.8 µg/L | | | 3days |
| Follicle Stimulating Hormone | Serum | Brown Top (Serum) | 4.9ml | Male :1.5 – 12.4 U/L  Female:  Follicular: 3.5-12.5 U/L  Mid Cycle: 4.7 – 21.5 U/L  Luteal 1.7-7.7 U/L  Post Menopausal : 25.8-134.8 U/L | | | 3days |
| Free T3 | Lithium Heparin | Lithium  Heparin  (Orange Top) | 4.9ml | 3.1 – 6.8 | | | 3days |
| Free Thyroxine (FT4) | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 11.9 -21.6 pmol/L | | | 3days |
| G-Glutamyl Transferase | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | M < 59 I.U/L  F< 39 I.U/L | | | Routine: 4hrs  STAT: 2hrs |
| Globulin (calculated value includes Protein & Albumin) | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | See individual tests | | | Routine: 2.5hrs  STAT: 2hrs |
| Glucagon Test | See Labels | See Labels | 4.9ml | N/A  Dynamic Function Test | | | See individual tests |
| Glucose (fluid) | Fluid | Fluoride Oxalate (Yellow Top) | 2.7ml | N/A  Interpret in conjunction with clinical findings. | | | Routine: 4hrs |
| Glucose 120 minutes (2 HR PP) | Plasma | Fluoride Oxalate (Yellow Top) | 2.7ml | Units: mmol/L | | | Routine: 4hrs  STAT: 2hrs |
| Glucose Random Sample | Plasma | Fluoride Oxalate (Yellow Top) | 2.7ml | Units: mmol/L | | | Routine: 4hrs  STAT: 2hrs |
| Glucose Tolerance Test | See Labels | Fluoride Oxalate (Yellow Top) | 2.7ml | Units: mmol/L | | | Routine: 4hrs  STAT: 2hrs |
| Glucose Tolerance Test (Short) | See Labels | See Labels | See Labels | See individual tests | | | See individual tests |
| Glucose Tolerance Test for HGH | See Labels | See Labels | See Labels | N/A  Dynamic Function Test | | | 20 days |
| Glucose Tolerance with Rels. Factors | See Labels | See Labels | See Labels | See individual tests | | | See individual tests |
| Glucose Zero Time (Fasting) | Plasma | Fluoride Oxalate (Yellow Top) | 2.7ml | 3.6 – 6.0mmol/L | | | Routine: 4hrs  STAT: 2hrs |
| Gonadotrophins (FSH & LH) | Serum | Brown Top (Serum) | See Labels | See individual tests | | | 3days |
| GTT Prolonged | See Labels | See Labels | See Labels | N/A  Dynamic Function Test | | | See individual tests |
| GTT with Insulin | See Labels | See Labels | 4.9ml | N/A  Dynamic Function Test | | | 10 days |
| Haemoglobin A1C | Whole Blood | Potassium EDTA  (Pink Top) | 2.6ml | 20 – 42 mmol/mol  In normal subjects | | | 96hours |
| HGH day Curve  5 Timed GH samples | See Labels | See Labels | See Labels | N/A  Dynamic Function Test | | | 20days |
| Hirsute Synacthen Stimulation | See Labels | See Labels | See Labels | N/A  Dynamic Function Test | | | See individual tests |
| Human Growth Hormone | Serum | Brown Top (Serum) | 4.9ml | (ng/ml)  See Interpretive Comment | | | 20days |
| Hypoglycaemia Screen  glucose, insulin, c-peptide, proinsulin, beta-hydroxybutyrate  serum Sulphonylureas | See Labels | See Labels | See Labels | See Individual Tests | | | See individual tests |
| Interleukin 6 | Serum | Brown Top (Serum) | 4.9ml | < 7.0pg/mL | | | 10 days |
| Immunoglobulins G,A,M | Serum | Brown Top (Serum) | 4.9ml | IgG: 7.0 – 16.0g/L  IgA: 0.7-4.0 g/L  IgM: 0.4-2.3 g/L | | | 72 hours |
| Insulin & C-Peptide | See Labels | See Labels | See labels | See individual tests | | | 10days |
| Insulin Stress Test  Timed samples for Insulin, Growth Hormone & Glucose | See Labels | See Labels | See Labels | N/A  Dynamic Function Test | | | 10days |
| Insulin Stress Test+ Release Factors | See Labels | See Labels | See Labels | N/A  Dynamic Function Test | | | 10days |
| Insulin Fasting | Serum | Plain  (White Top) | See Labels | Fasting: 2.6-24.9 mU/L  (provided fasting glucose is within normal/ reference range) | | | 10days |
| Insulin-Like Growth Factors-1 | Serum | Plain  (White Top) | 4.9ml | (ng/ml)   |  |  |  | | --- | --- | --- | | *Years* | *Female* | *Male* | | 0-1y | 17.9-125.6 | 27.0-157.0 | | 1-2y | 19.5-132.3 | 29.7-166.8 | | 2-3y | 22.2-145.4 | 33.9-183.9 | | 3-4y | 25.9-164.2 | 39.0-204.5 | | 4-5y | 30.7-187.8 | 44.3-225.0 | | 5-6y | 26.2-214.4 | 50.0-245.5 | | 6-7y | 42.0-240.4 | 56.2-267.1 | | 7-8y | 48.6-269.6 | 63.4-291.9 | | 8-9y | 56.9-305.3 | 72.4-323.1 | | 9-10y | 67.2-349.4 | 83.6-361.6 | | 10-11y | 79.5-400.3 | 96.9-406.6 | | 11-12y | 92.6-452.6 | 111.6-454.4 | | 12-13y | 105.3-499.1 | 126.1-498.7 | | 13-14y | 115.9-533.4 | 138.6-532.5 | | 14-15y | 123.4-552.0 | 147.5-551.2 | | 15-16y | 127.4-554.2 | 152.2-553.5 | | 16-17y | 127.9-541.5 | 152.9-541.8 | | 17-18y | 125.3-517.3 | 150.6-520.6 | | 18-19y | 120.5-485.8 | 146.2-493.6 | | 19-20y | 114.4-450.8 | 140.2-462.7 | | 20-21y | 107.8-416.0 | 133.1-430.0 | | 26-31y | 78.4-270.0 | 97.9-281.6 | | 31-36y | 73.1-243.0 | 88.3-246.0 | | 36-41y | 69.0-227.0 | 83.4-232.7 | | 41-46y | 61.5-204.4 | 74.9-216.4 | | 46-51y | 56.8-194.5 | 66.9-205.1 | | 51-56y | 53.0-189.6 | 60.6-200.3 | | 56-61y | 45.6-172.4 | 54.3-194.2 | | 61-66y | 42.2-169.0 | 48.8-187.7 | | 66-71y | 38.3-162.5 | 46.5-191.9 | | 71-76y | 36.6-164.7 | 40.9-179.2 | | 76-81y | 34.7-164.8 | 37.1-172.0 | | 81-86y | 34.4-172.4 | 33.8-165.4 | | 86-91y | 33.6-177.8 | 32.2-166.1 | | | | 20days |
| Intravenous Petrosal Sampling  16 site specific labels for ACTH | EDTA Plasma | BLUE | 4.9ml | N/A  Dynamic Function Test | | | 10days |
| Iron (FE) & Transferrin Saturation | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 5.8 – 34.5µmol/L  A Fasting Transferrin Saturation > 55% in Males or  > 50% in Females indicates Iron accumulation. | | | Routine: 4hrs |
| Lactate | CSF | Plain | 300ul | 1.01 – 2.09 mmol/L | | | Routine: 4hrs  STAT: 2hrs |
| Lactate Dehydrogenase | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | M 135 – 225 I.U/L  F 135 – 214 I.U/L  Please note: LDH test results may be increased by up to 14% by sending the sample to the laboratory using the pneumatic chute transport system. Interpret results with caution. | | | Routine: 4hrs |
| LDH (fluid) | Fluid | Plain  (White Top) | 5ml | N/A  Interpret in conjunction with clinical findings. | | | Routine: 4hrs |
| Lithium Serum | Serum | Plain  (White Top) | 4.9ml | 0.6 – 1.2 mmol/L | | | Routine: 4hrs  STAT: 2hrs |
| Lipid Profile (Fasting) | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | Cholesterol ≤ 5.0mmol/L  LDL (calculated) ≤ 3.0mmol/L  HDL Cholesterol ≥ 1.0mmol/L  Triglycrides ≤ 1.7mmol/L  Non HDL cholesterol ≤ 3.8mmol/L | | | Routine: 4hrs |
| Lipid Profile (Non Fasting) | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | Cholesterol ≤ 5.0mmol/L  LDL (calculated) ≤ 3.0mmol/L  HDL Cholesterol ≥ 1.0mmol/L  Triglycrides ≤ 2.0mmol/L  Non HDL cholesterol ≤ 3.8mmol/L | | | Routine: 4hrs |
| Liver Function | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | See individual tests | | | Routine: 4hrs  STAT: 2hrs |
| Lutenising Hormone | Serum | Brown Top (Serum) | 4.9ml | Follicular: 2.4 - 12.6 U/L  Ovulation: 14.0 - 95.6 U/L  Luteal: 1.0 - 11.4 U/L  Post Menopausal: 7.7 - 58.5 U/L  Male : 1.7 - 8.6 U/L | | | 3days |
| Lutenising Hormone Releasing F. | See Labels | See Labels | 4.9ml | See individual tests | | | See individual tests |
| Magnesium | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 0.66 – 1.07mmol/L | | | Routine: 4hrs  STAT: 2hrs |
| Oestradiol | Serum | Brown Top (Serum) | 4.9ml | Male: 41.4 – 159 pmol/L  Female:  Follicular: –114-332 pmol/L  Ovulation: 222-1959 pmol/L  Luteal: 222-854 pmol/L  Post Menopausal: 18.4 - 505 pmol/L | | | 3days |
| Osmolality Plasma | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 275 – 295 mOsm/Kg | | | Routine: 4hrs  STAT: 4hrs |
| Paracetamol - Serum | Serum | Plain  (White Top) | 4.9ml | N/A  Interpret in conjunction with clinical findings. | | | Routine: 4hrs  STAT: 2hrs |
| Parathyroid Hormone | Plasma | Potasium EDTA  (Blue Top) | 4.9ml | 17 - 74pg/mL | | | 3days |
| Phenobarb | Serum | Plain  (White Top) | 4.9ml | 10.0 - 40.0 mg/L | | | Routine: 4hrs  STAT: 2hrs |
| Phenytoin | Serum | Plain  (White Top) | 4.9ml | 5.0-20.0 mg/L | | | Routine: 4hrs  STAT: 2hrs |
| Phosphate | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 0.81 - 1.45 mmol/L | | | Routine: 4hrs  STAT: 2hrs |
| Pituitary Screen | See Labels | See Labels | See labels | See Individual Tests | | | 20days |
| Plasma Metanephrines | EDTA Plasma on Ice (Sample must arrive in the Lab within 1 hour of collection) | REDL | 7.5ml | Reference ranges are based on  a fasting adult patient in a  seated position:  Normetanephrine <1180 pmol/L  Metanephrine <510 pmol/L  3-Methoxytyramine <180 pmol/L  For samples taken in a supine  Posture (post 30 mins rest),  supine reference ranges  are recommended:  Normetanephrine <730 pmol/L  Metanephrine <450 pmol/L  3-Methoxytyramine <180 pmol/L | | | 12 days |
| Post Transplant GTT(Timed GLUC and INS) | See Labels | See Labels | See Labels |  | | | See individual tests |
| Potassium | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 3.5 – 5.3 mmol/L | | | Routine: 4hrs  STAT: 2hrs |
| Potassium (fluid) | Fluid | Plain  (White Top) | 5ml | N/A  Interpret in conjunction with clinical findings. | | | Routine: 4hrs |
| Procalcitonin | Serum | Brown Top (Serum) | 4.9ml | See Interpretive Comment | | | 1 batch run daily |
| Progesterone | Serum | Brown Top (Serum) | 4.9ml | Male: 0.159 - 0.474 nmol/L  Female:  Follicular: 0.159 – 0.616 nmol/L  Ovulation: 0.175 – 13.2 nmol/L  Luteal: 13.1 – 46.3 nmol/L  Post Menopasal: 0.159-0.401 nmol/L | | | 3days |
| Prolactin | Serum | Brown Top (Serum) | 4.9ml | Total Prolactin  Female: 102-496 mIU/L  Male: 86-324 mIU/L  Bioactive Prolactin:  Female: 75-381mIU/L  Male: 63-245 mIU/L  Bioactive prolactin is the biologically active form of prolactin. | | | Routine: 3days  STAT: Discuss with laboratory |
| Prostate Specific Antigen | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | Age related PSA Levels  (non-suspicious DRE)  <50 = <2ug/L  50 – 59 = <3ug/L  60 – 69 = <4ug/L  70+ = <5ug/L | | | Routine: 3days |
| Protein & Albumin | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | See individual tests | | | Routine: 4hrs  STAT: 2hrs |
| Protein & Albumin (fluid) | Fluid | Plain MSU | 5ml | See individual tests | | | Routine: 4hrs |
| Protein Total | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 60 - 80 g/L | | | Routine: 4hrs  STAT: 2hrs |
| Renal Profile (UREA/NA/K/CL/CREAT) | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | See individual tests | | | Routine: 4hrs  STAT: 2hrs |
| Renin | EDTA plasma | Potasium EDTA  (Blue Top) | 4.9ml | Female: 6.1 – 62.7mIU/L  Male: 9.0 – 103.5mIU/L | | | 20days |
| Salicylate - serum | Serum | Plain  (White Top) | 4.9ml | N/A  Interpret in conjunction with clinical findings. | | | Routine: 4hrs  STAT: 2hrs |
| Saline Suppression Test | See Labels | See Labels | 4.9ml | N/A  Dynamic Function Test | | | See individual tests |
| Serum Free Light Chains | Serum | White Top (Serum) | 4.9ml | Free Kappa 3.30 – 19.40 mg/L  Free Lamda 5.71 – 26.30 mg/L  Kappa / Lambda ratio 0.26 – 1.65  Modified Kappa / Lambda ratio of 0.82 – 3.6 where eGFR ≤55Ml/min//1.73m2 | | | 14 days |
| Serum Protein Electrophoresis  (Protein Total, SPE, IGGs) | Serum | Brown Top (Serum) | 4.9ml | Protein Total 60 - 80 g/L  IgG: 7.0 – 16.0g/L  IgA: 0.7-4.0 g/L  IgM: 0.4-2.3 g/L  And Interpretative Comment | | | 840 hours |
| Sex Hormone Binding Globulin | Serum | Plain  (White Top) | 4.9ml | M: 20-49yr: 18.3-54.1 nmol/L  M: ≥ 50yr: 20.6-76.7 nmol/L  F: 20-49yr: 32.4-128 nmol/L  F: ≥ 50yr: 27.1-128 nmol/L  No SHBG reference intervals for <20yr old. | | | 3days |
| Sodium | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 133 - 146 mmol/L | | | Routine: 4hrs  STAT: 2hrs |
| Sodium (fluid) | Fluid | Plain  (White Top) | 5ml | N/A  Interpret in conjunction with clinical findings. | | | Routine: 4hrs |
| Synacthen Stimulation Test | See Labels | See Labels | 4.9ml | N/A  Dynamic Function Test | | | Routine: 24hrs  STAT: 2hrs |
| Tacrolimus (FK506) | Whole Blood | Potassium EDTA  (Pink Top) | 2.6ml | N/A  See Interpretive Comment | | | 72hrs. Cut off for receipt of samples for same day analysis is 11am |
| Testosterone | Serum | Plain  (White Top) | 4.9ml | Male: (19 - 50y): 8.6 - 29.0 nmol/L  (≥50y): 6.7 - 25.7 nmol/L  Female:  (19 - 50y): 0.3 - 1.7 nmol/L  (≥50y): 0.1 –1.4 nmol/L | | | 3days |
| Theophylline | Serum | Plain  (White Top) | 4.9ml | 10.0 - 20.0 mg/L | | | Routine: 4hrs  STAT: 2hrs |
| Thyroid Function Tests | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | See TSH & FT4 reference ranges. | | | Routine: 3days |
| Thyroid Stimulating Hormone | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 0.27-4.20 mU/L | | | Routine: 3days |
| Thyrotropin Releasing Factor | See Labels | See Labels | 7.5ml | N/A  Dynamic Function Test | | | See individual tests |
| Total CO2 / Bicarbonate | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 22 - 29 mmol/L | | | Routine: 4hrs  STAT: 2hrs |
| Total Thyroxine (TT4) | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 66 – 181nmol/L | | | 3days |
| Triglyceride | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | Fasting 0.5 – 1.7mmol/L  Non Fasting 0.5 – 2.0mmol/L | | | Routine: 4hrs |
| Triglyceride (fluid) | Fluid | Plain  (White Top) | 5ml | N/A  Interpret in conjunction with clinical findings. | | | Routine: 4hrs |
| Troponin T  Must have a dedicated sample | Lithium Heparin | Lithium Heparin (Orange Top) | 2.7ml | < 14 ng/L | | | 1.5 hours |
| Urate/Uric Acid | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | M 202 - 416μmol/L  F 143 - 340μmol/L | | | Routine: 4hrs  STAT: 2hrs |
| Urea | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 2.8 – 8.1mmol/L | | | Routine: 4hrs  STAT: 2hrs |
| Urea (fluid) | Fluid | Plain  (White Top) | 5ml | N/A  Interpret in conjunction with clinical findings. | | | Routine: 4hrs  STAT: 2hrs |
| UREA/NA/K/CL/CREAT/TCO2 | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | See individual tests | | | Routine: 4hrs  STAT: 2hrs |
| Valproic Acid | Serum | Plain  (White Top) | 4.9ml | 50 – 100 mg/L | | | Routine: 4hrs  STAT: 2hrs |
| Vit.B12 / Folic Acid | Lithium Heparin | Lithium Heparin (Orange Cap) | 4.9ml | See individual tests | | | 3days |
| Vitamin B12 | Lithium Heparin | Lithium Heparin (Orange Top) | 4.9ml | 197-771ng/L | | | 3days |
| Vitamin D | Serum | Plain  (White Top) | 4.9ml | Deficient: < or = 50nmol/L | | | 10 days |
| Water Deprivation Test  10 Timed Samples plasma & urine osmolality | See Labels | See Labels | 4.9ml plasma  5ml urine | N/A  Dynamic Function Test | | | 24 hours |

### Urine Tests

| **Test** | **Sample**  **Required** | **Specimen Container** | **Minimum**  **Volume** | **Reference Range** | **TAT** |
| --- | --- | --- | --- | --- | --- |
| 5-HIAA Urine | 24 Hour Urine | Pre-Acidified Container | N/A | <50 umol/24hours | 288 hours |
| Albumin Creatinine Ratio(Urine) | MSU | Plain MSU | 5ml | M 0.0 – 2.5mg/mmol  F 0.0 – 3.5mg/mmol | Routine: 96hrs |
| Alcohol (ETOH) urine | MSU | Plain MSU | 5ml | Qualitative | Temporarily outsourced. 5 days |
| Amylase - Spot Urine Sample | MSU | Plain MSU | 5ml | M: 16 – 491 I.U/L  F: 21 – 447 I.U/L | Routine: 4hrs  STAT: 2hrs |
| Calcium - 24 Hour Urine | 24 Hour Urine | 24hr. No Preservative | N/A | 2.5 - 7.5 mmol/24Hr | Routine: 48hrs  STAT: 2.5hrs |
| Chloride - Spot Urine Sample | MSU | Plain MSU | 5ml | Units: mmol/L | Routine: 4hrs |
| Creatinine - Spot Urine Sample | MSU | Plain MSU | 5ml | Units µmol/L | Routine: 4hrs |
| Creatinine – 24 Hour Urine | 24 Hour Urine | 24hr. No Preservative | N/A | M 9000 – 19000 µmol/24Hrs  F 6000 - 13000 µmol/24Hrs | Routine: 4hrs |
| Magnesium - 24 Hour Urine | 24 Hour Urine | 24hr Collection. No Preservative | N/A | 3.0 – 5.0 mmol/24Hr | Routine: 24hrs |
| Osmolality Urine | MSU | Plain MSU | 5ml | 400-1000 mOsm/Kg | Routine: 24hrs  STAT: 4hrs |
| Phosphate - 24 Hour Urine | 24 Hour Urine | 24hr Collection. No Preservative | N/A | 13.00 – 42.00 mmol/24Hrs | Routine: 24hrs |
| Potassium – Spot Urine Sample | MSU | Plain MSU | 5ml | Units: mmol/L | Routine: 4hrs |
| Potassium - 24 Hour Urine | 24 Hour Urine | 24hr Collection. No Preservative | N/A | 30.0 – 100.0mmo/24Hrs | Routine: 24hrs  STAT: 2.5hrs |
| Protein-Creatinine Ratio | MSU | Plain MSU | 5ml | 3 - 14 mg/mmol | Routine: 96hrs |
| Sodium - 24 Hour Urine | 24 Hour Urine | Plain Container | N/A | 40.0 – 220.0mmol/24Hrs | Routine: 24hrs  STAT: 2.5hrs |
| Sodium - Spot Urine Sample | MSU | Plain MSU | 5ml | Units: mmol/L | Routine: 4hrs |
| Total Urinary Proteins | 24 Hour Urine | Plain Container | N/A | 0.05 - 0.14 g/24HR | Routine: 24hrs  STAT: 2.5hrs |
| Urate - 24 Hour Urine | 24 Hour Urine | Plain Container | N/A | 1.20 – 5.90mmol/24Hr | Routine: 24hrs |
| Urea - 24 Hour Urine | 24 Hour Urine | Plain Container | N/A | 428.0 – 714.0mmol/24Hr | Routine: 24hrs |
| Urea - Spot Urine Sample | MSU | Plain MSU | 5ml | Units: mmol/L | Routine: 4hrs |
| Urinary Catecholamines | 24 Hour Urine | Pre-Acidified Container | N/A | Reference Ranges quoted in Section above this table | Routine: 576hrs |
| Urinary Total Fractionated Metanephrines (Total Metanephrine & Total Normetanephrine) | 24 Hour Urine | Pre-Acidified Container | N/A | Reference Ranges quoted in Section above this table | Routine:  576hrs |
| Urine Protein Electrophoresis:  (BJP) or Myeloma Screen  Known Myeloma Patient | EMU (early morning urine)  24 Hour Urine | Plain Container | N/A | Qualitative | 35 days |
| Urine Stone Screen. | See Labels | See Labels | See Labels | See individual tests | See individual tests |

#### Calculated / Derived Tests

| Calculated Parameter | Formula | Reference Range | Units | Important Notes |
| --- | --- | --- | --- | --- |
| Calcium Adjusted | [Ca] + (46.18 – [Alb]) \* 0.01516 | 2.21 – 2.52 | mmol/L | Equation only validated for Albumin > 30g/L and < 52g/L. Equation derived in house. |
| Globulin | Total protein - albumin | N/A | g/L |  |
| LDL (Low Density Lipoprotein) Cholesterol | Cholesterol – HDL – (triglyceride / 2.2) | See Above | mmol/L | The calculation is unsuitable if the triglyceride level is > 4.5mmol/l |
| Non-HDL Cholesterol | Total Choleaterol – HDL Cholesterol. | See Above | mmol/L |  |
| Transferrin saturation (TfS) | (Iron / Transferrin) \* 398 | See Interpretive Comment | % | If transferrin saturation > 50% please repeat on a morning fasting sample.  Refer to: BSCH guidelines.  A fasting transferrin saturation  > 55% in males or  >50% in females indicates iron accumulation. |
| Unconjugated Bilirubin | Total Bilirubin – Conjugated Bilirubin | 0.0 – 5.0 | μmol/L | Lithium Heparin, protected from light. |