Clinical Biochemistry Service Users Handbook

Contents

Aim of User Handbook

The Clinical Biochemistry Department is committed to providing a high quality, safe, efficient and cost effective service. It is aware of and considers the needs and requirements of its service users. These include patients and staff of Torbay and South Devon NHS Foundation Trust, Primary Care Trusts, and other agencies within the district.

This guide is intended to enable all users to make best use of the various services provided, ensuring an accessible and efficient service.

If you have any comments on the content of this handbook, please contact a member of the management team. Details can be found in the 'key contacts' section.

This is a controlled document. The most up to date version will only be available from the Department.

1.0 General Information

The Clinical Biochemistry Department is in the main building at Torbay Hospital. The Biochemistry laboratory at Torbay & South Devon NHS Foundation Trust offers a 24/7 service that serves the area of Torbay for the hospital and community.

The scope of the service offered by Clinical Biochemistry includes a full analytical and advisory service appropriate for a District General Hospital. More complex or rare investigations will be referred to other appropriate (UKAS Accredited) laboratories.

The Clinical Biochemistry Department includes the following specialties:

- Specimen Reception Clinical Biochemistry
- Point of Care Testing (POCT)

The Clinical Biochemistry department is committed to providing comprehensive high quality, interpretive, advisory and consultancy service that is cost effective and responsive to the needs of our commissioners and patients.

All staff employed within the department are trained and assessed for competency to comply with Trust and departmental policy and ISO 15189 (2022) Accreditation.

1.1 Location

We are situated on Level 3, in the main building at Torbay Hospital.

Access to the department is controlled via a keycard to the entrance door, and keycard for the inner door.

1.2 Postal Address

Department of Clinical Biochemistry
Torbay and South Devon NHS Foundation Trust
Torbay Hospital
Lowes Bridge
Torquay
TQ2 7AA

1.3 Normal Working Hours

Specimen Reception - Opening Hours:

- Monday to Friday: 09:00 to 17:30
- Saturdays: 09:00 to 12:30
- Bank Holidays: 09:00 to 12:00

Clinical Biochemistry – Opening Hours:

- Monday to Friday: 09:00 to 17:30
- Saturday: 12:00 to17:00
- Sunday: 9:30 to 16:30
- Bank Holidays: 12:00 to17:00

Outside of these hours the laboratory operates a reduced Rota of an on call BMS and support staff.

1.4 Contact Information

Due to increasing operational pressures within the laboratory all add on requests and nonurgent queries should be sent via email

- **Add on requests**: Please make add on requests via tsdft.biochemistryaddons@nhs.net Add on requests will be processed providing the pre analytical requirements for the analyte has been met. Samples are routinely kept for 3 days, if your sample is older than this, we may be unable to process your add on request. Please ensure your add on request has the following information, the request will not be processed otherwise: patient's name, date of birth, NHS or hospital number, the date and time the sample was collected, and the test(s) you would like to add.
- **General biochemistry queries:** tsdft.biochemistryenquiries@nhs.net
- **Non urgent clinical advice:** tsdft.dutybiochemist@nhs.net **Urgent clinical advice:** 55218/55231 (within routine hours)

1.5 Key Contacts

To contact the biochemistry laboratory please phone 55222 and listen to the options given to help direct your call or query to the most appropriate phoneline or general email address. Other key contacts are listed below.

Job Title	Name	Email	Ext:
Consultant Chemical Pathologist and Head of Departments	Dr Aabha Sharma	Aabha.sharma@nhs.net	55231
Consultant Biochemist	Joe Bailey	Joebailey@nhs.net	55218
Head of Pathology	Anthony Lowe	Anthony.lowe@nhs.net	55222/55231
Biochemistry Technical Manager	Patrick Lee	Plee@nhs.net	55229
Senior Clinical Scientist	Dr Trish Woodley	Patricia.woodley@nhs.net	54430
Senior Clinical Scientist	Emily Kingston	Emily.kingston1@nhs.net	55218
Senior Biomedical Scientist	Jayne Baker	Jayne.Baker2@nhs.net	55222
Senior Biomedical Scientist	Zoe Carwardine	Zoe.Carwardine@nhs.net	55222
Quality Team	Nikki Harwood (Manager)	tsdft.qualityteampathology@nhs.net	55230
Pathology Reception Phone			55234

Urgent Bench Phone			55232
Biochemistry Lab phone (Biomedical Scientists)			55222 (bleep 220 OOH)
Point of Care Testing (POCT)		tsdft.poct@nhs.net	55254

Torbay and South Devon NHS
NHS Foundation Trust

2.0 Sample Collection

2.1 Sample Containers

Torbay hospital staff can obtain these from General Procurement (level 1 of Torbay Hospital) during their normal opening hours.
Specialist containers (e.g. blood cultures, ESR tubes, 24hr urine containers) are available between 09:00 - 17:00 from General Pathology (Level 3 of Torbay Hospital).
General Practitioners can obtain specimen containers by completing the form for ordering Laboratory supplies. Please do not purchase your own specimen containers without first speaking to the appropriate Laboratory Manager.

2.2 Types of Blood Specimen Tubes

Blood Tubes

	Adult	Paediatric
Serum separating tube	Gold top 	Brown top 
Floride oxalate	Grey top 	Grey top 
EDTA	Purple top 	Purple top 
Lithium Heparin	Green top 	Green top 
Trace element	Dark (royal) blue top 	Not available. Take 1x brown top and send to laboratory with 1x brown top of same lot number 

Torbay and South Devon NHS
NHS Foundation Trust

Urine Containers

Plain urine 
Plain urine tube with straw collection device 
24 hour plain urine collection (available on request from the lab) 
24 hour acid urine collection (available on request from the lab) 
Boric acid 

Faecal containers

Brown stool pot
Calex collection device (for faecal calprotectin and faecal elastase available from biochemistry upon request)
FIT Kit (for faecal immunochemical testing available from biochemistry upon request)

3.0 Tests Provided

3.1 Locally Performed Biochemistry Test Repertoire

Test/Profile Name	Abbre-viation	Test information and clinical indications	Reference range	Units	Preferred sample type	Alternative sample type	Add on		Sampling and sample handling information for the requestor/patient	Sampling and sample handling information within the laboratory	Time to result (from receipt of sample)	UKAS Accredited
							Secondary care (Hospital)	Primary care (GP locations)				
24h Urine Calcium		Evaluation of urine calcium excretion levels can aid in the differential diagnosis of recurrent renal calculi, as well as in the differentiation of familial hypocalciuric hypercalcemia from asymptomatic primary hyperparathyroidism although a random sample in usually recommended in the latter	2.5 – 7.5	mmol/ 24hr	24 hour urine (acidified)		Y	Y	Patient required to collect 24 hour sample as per instructions provided with collection bottle. Accurate collection timings are required to obtain valid results	Weight sample to obtain sample volume, record in LIMS. Aliquot sample into false bottom tube to run on analyser. Aliquoted sample into 50ml aliquoted	1 day run routinely Mon-Fri	Urine assay Y 24 hour calculated comp N
24hr Urine Creatinine		Urine creatinine is often used in the calculation of ratios in 24h urine samples. It is also used to measure glomerular function as part of the creatinine clearance test.	No reported RR	mmol/ 24hr	24 hour urine		Y	Y	Patient required to collect 24 hour sample as per instructions provided with collection bottle. Accurate collection timings are required to obtain valid results	Weight sample to obtain sample volume, record in LIMS. Aliquot sample into false bottom tube to run on analyser. Aliquoted sample into 50ml aliquoted	1 day run routinely Mon-Fri	Urine assay Y 24 hour calculated comp N
24hr Urine Magnesium		Measurement can be useful in the diagnosis and investigation of magnesium deficiency. Low urine magnesium levels may result from decreased renal excretion e.g. dehydration or reduced magnesium intake e.g. malnutrition/ malabsorption. Increased urine magnesium may be seen in hyperaldosteronism, drug therapy (e.g. cisplatin), osmotic diuresis and chronic glomerulonephritis. The	2.4-6.5	mmol/ 24h	24 hour urine (acidified)		Y	Y	Patient required to collect 24 hour sample as per instructions provided with collection bottle. Accurate collection timings are required to obtain valid results	Weight sample to obtain sample volume, record in LIMS. Aliquot sample into false bottom tube to run on analyser. Aliquoted sample into 50ml aliquoted	1 day run routinely Mon-Fri	Urine assay Y 24 hour calculated comp N

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		detection of significant urine magnesium in the presence of a low serum magnesium suggests renal loss as the cause of hypomagnesaemia.										
24hr Urine Phosphate		Urinary phosphate analysis is useful in the differential diagnosis of hyper and hypophosphatemia and in the diagnosis and monitoring of renal calculi.	15-50	mmol/ 24h	24 hour urine (acidified)		Y	Y	Patient required to collect 24 hour sample as per instructions provided with collection bottle. Accurate collection timings are required to obtain valid results	Weight sample to obtain sample volume, record in LIMS. Aliquot sample into false bottom tube to run on analyser. Aliquoted sample into 50ml aliquoted	1 day run routinely Mon-Fri	Urine assay Y 24 hour calculated comp N
24hr Urine Potassium		Urinary potassium may be ordered in the workup of hypokalaemia. In case of GI loss of potassium, the urine potassium will be low. In case of renal loss of potassium, the urine potassium levels will be high. Decreased levels of urine potassium are also seen in hypoaldosteronism and adrenal insufficiency.	25-125	mmol/ 24h	24 hour urine		Y	Y	Patient required to collect 24 hour sample as per instructions provided with collection bottle. Accurate collection timings are required to obtain valid results	Weight sample to obtain sample volume, record in LIMS. Aliquot sample into false bottom tube to run on analyser. Aliquoted sample into 50ml aliquoted	1 day run routinely Mon-Fri	Urine assay Y 24 hour calculated comp N
24hr Urine Protein		Total protein concentration, preferably in 24-hour urine, aids in the detection of proteinuria. Proteinuria may be caused by renal impairment, systemic overload, or postrenal diseases.	<0.14	g/24h	24 hour urine		Y	Y	Patient required to collect 24 hour sample as per instructions provided with collection bottle. Accurate collection timings are required to obtain valid results	Weight sample to obtain sample volume, record in LIMS. Aliquot sample into false bottom tube to run on analyser. Aliquoted sample into 50ml aliquoted	1 day run routinely Mon-Fri	Urine assay Y 24 hour calculated comp N

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24hr Urine Sodium		Urinary sodium, together with assessment of volume status, is useful in the differential diagnosis of hyponatraemia. Urinary sodium levels are also frequently ordered during the workup of acute renal failure with the fractional excretion of sodium used as an important marker in distinguishing pre-renal from post-renal failure. A urinary sodium of <20mmol/L in a dehydrated patient is consistent with functional renal tubules which will respond to rehydration whilst a urinary sodium of >20mmol/L is indicative of SIADH. It is also used to monitor compliance with a low salt diet in hypertensive patients.	40-220	mmol/ 24h	24 hour urine		Y	Y	Patient required to collect 24 hour sample as per instructions provided with collection bottle. Accurate collection timings are required to obtain valid results	Weight sample to obtain sample volume, record in LIMS. Aliquot sample into false bottom tube to run on analyser. Aliquoted sample into 50ml aliquoted	1 day run routinely Mon-Fri	Urine assay Y 24 hour calculated comp N
24hr Urine Urate		Evaluation of urinary urate excretion may assist in the selection of appropriate treatment for hyperuricaemia and aid in the differential diagnosis and monitoring of recurrent renal calculi.	1.5-4.5	mmol/ 24h	24 hour urine		Y	Y	Patient required to collect 24 hour sample as per instructions provided with collection bottle. Accurate collection timings are required to obtain valid results	Weight sample to obtain sample volume, record in LIMS. Aliquot sample into false bottom tube to run on analyser. Aliquoted sample into 50ml aliquoted	1 day run routinely Mon-Fri	Urine assay Y 24 hour calculated comp N
24hr Urine Urea		Measurement of urine urea is useful for the assessment of protein intake and/ or nitrogen balance and in the diagnosis and monitoring of kidney disease. Factors which tend to increase urea excretion include increases in glomerular filtration rate, increased dietary protein intake, protein catabolic conditions, and water diuretic states. Factors which reduce urea excretion include low protein intake and conditions	170-580	mmol/ 24h	24 hour urine		Y	Y	Patient required to collect 24 hour sample as per instructions provided with collection bottle. Accurate collection timings are required to obtain valid results	Weight sample to obtain sample volume, record in LIMS. Aliquot sample into false bottom tube to run on analyser. Aliquoted sample into 50ml aliquoted	1 day run routinely Mon-Fri	Urine assay Y 24 hour calculated comp N

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		which result in low urine output (eg. dehydration).										
Alanine aminotransferase	ALT	ALT is an enzyme found mostly in the liver; smaller amounts are also found in the kidneys, heart and muscles. When the liver is damaged, ALT is released into the bloodstream, hence increasing the concentration that can be detected in a blood test. This often happens before more obvious symptoms of liver damage occur, such as jaundice (yellowing of the eyes and skin).	0 up to 1 Days 0-31 1 Days up to 5 Days 0-52 5 Days up to 7 Months 0-60 7 Months up to 1 Years 0-57 1 Years up to 13 Years 0-39 13 Years up to 17 Years 0-23 (F) 0-26 (M) 17 Years up to unspecified 0-33 (F) 0-41 (M)	IU/L	Serum	Lithium heparin plasma	Y	Y			1 day	Y
Albumin		Albumin is the most abundant protein in the blood. It keeps fluid from leaking out of blood vessels; nourishes tissues; and transports hormones, vitamins, drugs, enzymes, and ions like calcium throughout the body. Albumin is made in the liver and is extremely sensitive to liver damage. The concentration of albumin drops when the liver is damaged, when a person is malnourished, or if a person experiences inflammation in the body. Albumin increases when a person is dehydrated.	< 1 Year 30-45 1 Year up to 16 years 30 -50 16 Year up to unspecified 35-50	g/L	Serum	Lithium heparin plasma	Y	Y			1 day	Y

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Alcohol		Symptoms progress proportionately to blood alcohol content. Actual levels required to cause given symptoms vary with tolerance, but in typical users the following occur: 200 to 500 mg/L: Tranquillity, mild sedation, and some decrease in fine motor coordination 500 to 1000 mg/L: Impaired judgment and a further decrease in coordination 1000 to 1500 mg/L: Unsteady gait, nystagmus, slurred speech, loss of behavioural inhibitions, and memory impairment 1500 to 3000 mg/L : Delirium and lethargy (likely) 3000 to 4000 mg/L: Possible Coma >4000 mg/L Fatalities reported	No reference range	mg/L	Floride oxalate plasma	Serum	Y	N			1 day	Y
Alkaline phosphatase	ALP	Alkaline phosphatase is an enzyme found in high amounts in bone and liver. Smaller amounts of ALP are found in the placenta of women who are pregnant, and in the intestines. When a person has evidence of liver disease, very high ALP levels can tell the doctor that the person's bile ducts are somehow partially or totally blocked or inflamed.	< 1 Month 70-380 1 Month up to 16 years 60-425 16 Year up to unspecified 30-130	IU/L	Serum	Lithium heparin plasma	Y	Y			1 day	Y

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Alpha 1 Antitrypsin	A1AT	Alpha-1 antitrypsin (A1AT) is a protein that is produced in the liver and released into the bloodstream. A1AT works by inactivating several enzymes but the main one is the enzyme elastase present in the lungs. Elastase breaks down proteins so that they can be removed and used again by the body. If its action is not regulated by A1AT, elastase will also begin to break down and damage lung tissue. If the A1AT produced does not work properly it can accumulate in the liver cells that produce it. As it builds up in these cells, the A1AT forms abnormal protein chains which begin to destroy the cells and damage the liver.	0.9-1.9	g/L	Serum		Y	Y			1 day run routinely Mon-Fri	Y
Alpha fetoprotein	AFP	AFP can also be produced by certain tumours and diseases of the liver. Raised concentrations of AFP are found in the majority of patients with a type of liver cancer called hepatocellular carcinoma and also in some patients with cancer of the testis.	0 up to 1 Months 41-83000 1 Months up to 4 Months 33-830 4 Months up to 18 Years 0-10 18 Years up to unspecified 0-6	IU/mL	Serum		Y	Y			1 day run routinely Mon-Fri	Y
Ammonia		Ammonia is produced by bacteria in the intestine and by cells in the body during the processing of proteins. Ammonia is a poisonous waste product which is normally transported to the liver, and then converted into urea and glutamine. The urea is then carried by the blood to the kidneys, where it is excreted in the urine.	0 up to 29 Days <=100 29 Days up to 16 Years <=50 16 Years up to unspecified 11-51 (F) 16-60 (M)	µmol/L	EDTA Plasma		N	N	Samples to be bought to the laboratory immediately (within 30 minutes), preferably on ICE	Separate sample and analyse immediately or freeze	1 hour	Y

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Amylase		Amylase is an enzyme made mainly by the pancreas. It is released from the pancreas into the digestive tract to help digest starch in our food. It is usually present in the blood in small quantities. When cells in the pancreas are injured or if the pancreatic duct is blocked (by a gallstone or rarely by a tumour) increased amounts of amylase find their way into the bloodstream.	0 up to 15 Days 3-11 15 Days up to 13 Weeks 0-25 13 Weeks up to 1 Years 3-58 1 Years up to 19 Years 29-118 19 Years up to unspecified 0-100	IU/L	Serum	Lithium heparin plasma	Y	Y			1 day	Y
Angiotensin converting enzyme	ACE	ACE is present on the surface on monocytes and acts by converting angiotensin I and angiotensin II which helps regulate blood pressure by temporarily causes blood pressure to increase. Increased amounts of ACE are sometimes produced by cells found at the outside borders of granulomas, classic feature of sarcoidosis. ACE may also be raised in infections such as tuberculosis and leprosy.	20-70	U/L	Serum		Y	Y		Place in batch rack	Run weekly (Monday)	Y
Aspartate Aminotransferase	AST	AST is an enzyme found mostly in the heart and liver and to a lesser extent in skeletal muscle. When heart, liver or muscle cells are injured, they release AST into the bloodstream.	<15 Days 0-155 15 Days up to <1 Year 0-63 1 Year to 7 Years 0-41 7 years to <12 Years 0-33 12 Years up to 17 Years 0-23 (F) 0-32 (M) 17 Years up to unspecified 0-32 (F) 0-40 (M)	U/L	Serum	Lithium heparin plasma	Y	Y			1 day	Y

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Bicarbonate		Essential for maintaining the pH of blood. Measuring bicarbonate alongside pH and gases dissolved in the blood gives an estimation of acid-base status and infer if any disruption if due to metabolic or respiratory causes. Total carbon dioxide is measured routinely in the blood. However, since the majority of total carbon dioxide is bicarbonate it is often just called 'bicarbonate'.	22-29	mmol/L	Serum		Y (if sample stored rightly capped)	Y (if sample stored rightly capped)		Leave sample capped until analysis	1 day	Y
Bile Acids		Intrahepatic cholestasis of pregnancy (ICP) (also referred to as obstetric cholestasis) is a multifactorial condition of pregnancy characterised by pruritis (skin itching) in the absence of a skin rash with abnormal maternal bile acid concentrations. The clinical importance of ICP lies in the potential foetal risks, which may include spontaneous preterm birth, iatrogenic preterm birth and foetal death.	Interpretation of peak bile acid levels for pregnant people with itching of normal skin: Non-ICP Gestational Pruritus: <19 Mild ICP: 19–39 Moderate ICP: 40–99 Severe ICP: ≥100	µmol/L	Serum	Lithium heparin	Y	Y	Fasting samples should be avoided		1 day run routinely Mon-Fri	N
Bone profile		Bone profile is made up of ALP, albumin and adjusted calcium.			Serum	Lithium heparin plasma	Y	Y			1 day	Y
B-Type Natriuretic Peptide (BNP)	NT-PRO BNP	BNP is a hormone that helps to regulate blood volume. NT-proBNP is an inactive fragment produced at the same time as BNP. Both BNP and NT-proBNP are mainly produced by the heart's left ventricle (the organ's main pumping chamber). The heart releases more BNP and NT-proBNP when the left ventricle is stretched from having to work harder as can happen in heart	<400 makes heart failure unlikely	pg/mL	Serum	Lithium heparin or EDTA plasma	Y	Y			1 day	Y

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		failure. BNP and NT-proBNP concentrations increase in heart failure as well as in other diseases that affect the heart and circulatory system. BNP (or NT-proBNP) is used to exclude the presence of chronic heart failure.										
C Reactive Protein	CRP	C-reactive protein (CRP) is an acute phase reactant, a protein made by the liver that is released into the blood within a few hours after tissue injury, the start of an infection or other inflammation.	<5	mg/L	Serum	Lithium heparin plasma	Y	Y			1 day	Y
CA 125		CA 125 is a protein often found on the surface of ovarian cancer cells and in some normal tissues. It is used as a marker for ovarian cancer. However, CA 125 levels may also be high in other types of non-cancerous conditions, including menstruation, pregnancy, and pelvic inflammatory disease.	<35	U/mL	Serum	Lithium heparin or EDTA plasma	Y	Y		Place in batch rack	1 day run routinely Mon-Fri	Y
CA 15-3		Cancer antigen 15-3 (CA 15-3) is a normal product of breast cells. Concentrations of CA 15-3 in the blood are often increased in breast cancer. It is a protein that is shed by the tumour cells, making it useful as a marker to follow the course of the cancer. CA 15-3 also may be elevated in healthy people and in individuals with other cancers, or diseases, such as bowel cancer, lung cancer, cirrhosis, hepatitis, and benign breast disease.	<30	U/mL	Serum	Lithium heparin or EDTA plasma	Y	Y		Place in batch rack	Run weekly (Wednesday)	Y

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CA 19-9		CA 19-9 is elevated in most patients with advanced pancreatic cancer, but it may also be elevated in other cancers and diseases such as bowel cancer, lung cancer and gall bladder cancer, as well as in benign diseases such as gall stones, pancreatitis, cystic fibrosis, and liver disease.	<35	U/mL	Serum	Lithium heparin or EDTA plasma	Y	Y		Place in batch rack	Run twice weekly (Tuesday & Friday)	Y
Calcium (Adjusted for albumin)		Calcium is one of the most important minerals in the body, required for proper functioning of muscles, nerves, heart, as well as essential in blood clotting and bone formation. About 99% of calcium is found in the bones, while only < 1% of calcium circulates in the blood. In the blood, total calcium is present in three forms: Free calcium, also refereed as ionised calcium, the physiologically active form (about 50% of total plasma calcium) , protein-bound (mainly to albumin; about 40–50% of total plasma calcium) and complexed (primarily with phosphate and citrate). Calculated calcium adjusted for albumin concentration is reported by the laboratory.	<1 Month uncorrected calcium reported: 2-2.7 >1 Month adjusted calcium reported: 2.1-2.6	mmol/L	Serum	Lithium heparin plasma	Y	Y			1 day	Calcium Y Adj Calcium N

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Carbamazepine		Carbamazepine (Tegretol) is an anticonvulsant drug, used in particular for the treatment of trigeminal neuralgia, all forms of partial epilepsy, generalised tonic-clonic seizures and simple and complex partial seizures. The specific mechanism of carbamazepine is proposed as a depressant action on transmission through the nucleus ventralis anterior of the thalamus. In the circulation, carbamazepine is approximately 70 % bound by protein. The drug is metabolised to carbamazepine-10,11-epoxide, which is pharmacologically active, and then to carbamazepine-10,11-dihydroxide, both of which are excreted in urine. The plasma concentration of the epoxide	4-12	mg/L	Serum	Lithium heparin or EDTA plasma	N	N	Serum sample (0.5ml) taken just before a dose i.e. trough level. (Time to steady state 2 - 4 weeks). Peak levels (3 - 4 hours post dose) may also be useful in confirming toxicity and defining the concentration-time profile in the individual patient.	Place in batch rack	Run twice weekly (Tuesday & Friday)	Y
Carcinoembryonic antigen	CEA	CEA is often used to monitor patients with cancers of the gastrointestinal (GI) tract such as bowel (colorectal) cancer. It may be raised in other cancers, such as ovarian and breast cancers, but can also be raised in benign conditions such as liver disease and inflammatory bowel disease (Crohn's disease or ulcerative colitis).	<3.8	U/mL	Serum	Lithium heparin or EDTA plasma	Y	Y			1 day run routinely Mon-Fri	Y

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Chloride		Chloride is an electrolyte. When combined with sodium it is mostly found in nature as "salt." Chloride is important in maintaining the normal acid-base balance of the body and, along with sodium, in keeping normal levels of water in the body. Chloride generally increases or decreases in direct relationship to sodium, but may change without any change in sodium when there are problems with too much acid or base in your body.	95-108	mmol/L	Serum	Lithium heparin plasma	Y	Y			1 day	Y
Complement C3/C4		Used to help diagnose the cause of recurrent microbial infections, angioedema, or inflammation. It may be used to help diagnose and monitor the activity of chronic autoimmune diseases such as systemic lupus erythematosus (SLE). It may be tested and monitored in other immune complex-related diseases and conditions such as serum sickness, and some cases of rheumatoid arthritis, glomerulonephritis (a kidney disorder), and vasculitis. The more active the disease, the lower the complement C3 and C4 levels.	C3 0.9-1.8 C4 0.1-0.4	g/L	Serum	Lithium heparin plasma	Y	Y			1 day run routinely Mon-Fri	Y
Conj Bilirubin		A water-soluble form of bilirubin formed in the liver by the chemical addition of sugar molecules to unconjugated bilirubin. This is secreted into bile and carried to the intestine where bacteria break it down. If conjugated bilirubin is elevated, this could suggest there may be a blockage of the liver or bile ducts, hepatitis, trauma to the liver,	<5	umol/L	Serum		Y	Y			1 day	Y

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		cirrhosis, a drug reaction, or long-term alcohol abuse.										
Cortisol		Cortisol is a steroid hormone, produced by the adrenal gland, which is essential for survival. Cortisol is a steroid hormone that breaks down fat and protein and stimulates glucose production in the liver. It helps the body react to physical and emotional stress, helps to regulate blood pressure, to control inflammation, and can affect cardiovascular function. The concentration of cortisol in the blood increases during times of stress, and it also helps regulate the immune system. Heat, cold, infection, trauma, exercise, obesity, and debilitating disease influence cortisol secretion.	No reference range, interpretive comment on report	mmol/L	Serum	Lithium heparin or EDTA plasma	Y	Y	Preferably 8-9 am sample. Exogenous gluccocoricosteroids may interfere with this assay		1 day	Y
Creatine Kinase	CK	CK is an enzyme found in the heart muscle, brain tissue, skeletal muscle and other tissues. Increased amounts are released into the bloodstream when there is muscle damage (muscle trauma, particularly from crush injuries, burns or electrocution, and are likely to develop rhabdomyolysis), follow a long period of immobilisation on a hard surface, following a fit, during infection, after intense exercise and due to the use of statins.	0 up to 1 day 0-712 2 days up to 5 days 0-652 6 days up to 7 months 0-295 7 months up to 1 year 0-203 1 year up to < 4 years 0-228 4 years up to 7 years 0-149 7 years up to 13 years 0-154 (F) 0-247 (M)	U/L	Serum	Lithium heparin or EDTA plasma	Y	Y			1 day	Y

Test/Profile Name	Abbre-viation	Test information and clinical indications	Reference range	Units	Preferred sample type	Alternative sample type	Add on		Sampling and sample handling information for the requestor/patient	Sampling and sample handling information within the laboratory	Time to result (from receipt of sample)	UKAS Accredited
							Secondary care (Hospital)	Primary care (GP locations)				
			13 years up to 17 years 0-123 (F) 0-247 (M) 17 years up to Unspecified 25-200 (F) 0-270 (M)									
Creatinine		Produced in the muscles from the breakdown of creatine. Results from blood creatinine test is used directly in the assessment of kidney function, or used indirectly, in calculated kidney markers. Blood creatinine measurements along with age and gender are used to calculate a marker called "estimated glomerular filtration rate" (eGFR).	0 up to 15 Days 35-86 15 Days up to 2 Years 15-38 2 Years up to 5 Years 24-43 5 Years up to 12 Years 33-59 12 Years up to 15 Years 45-77 15 Years up to 19 Years 48-79 (F) 60-100 (M) 19 Years up to Unspecified 45-84 (F) 59-104 (M)	umol/L	Serum	Lithium heparin plasma	Y	Y			1 day	Y
Creatinine Clearance		The results are used to work out how much creatinine has been cleared from the blood and passed into the urine. This number reflects how much blood is being passed through the filtering part of the kidneys (the glomeruli) in a 24-hour time period.	Male: 85 – 125 Female: 75 – 115	mL/min	Paired serum&urine		N	N	Paired serum and 24hour urine		1 day	N

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CSF Glucose		CSF glucose is normally about 2/3 the concentration of blood glucose. Glucose levels may decrease when cells that are not normally present metabolise the glucose. These may include bacteria or cells such as WBC present due to inflammation or shed by tumours.	0 up to 18 years 3.3-4.4 18 Years up to Unspecified 2.2-3.9	mmol/L	CSF in a fluoride oxalate tube		Y (in FlOx sample can add on for 3 days)	N			1 day	Y
CSF Lactate		Often used to distinguish between viral and bacterial meningitis. The level will usually be increased with bacterial and fungal meningitis while it will remain normal or only slightly elevated with viral meningitis.	0 up to 3 Days 1.1-6.7 3 Days up to 10 Days 1.1-4.4 10 Days up to 18 Years 1.1-2.8 18 Years up to Unspecified 1.2-2.4	mmol/L	CSF in a fluoride oxalate tube		Y (in FlOx sample can add on for 3 hours)	N			1 day	Y
CSF LDH		Increased levels of CSF LDH are associated with several pathologies affecting the brain and CNS including trauma (brain haemorrhagic necrosis), infection (encephalitis, meningitis (significantly elevated in bacterial meningitis), progressive leukoencephalopathy) and neoplastic disorders (metastatic brain disease, metastases to spinal cord, meningioma).	No reference range	IU/L	Plain CSF		Y	N			1 day	N

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CSF Total Protein		Protein is usually on present in smalls amounts within the CSF because proteins are large molecules and do not cross the blood/brain barrier easily. Decreases in CSF protein are not generally considered significant. Increases in protein are most commonly seen with meningitis and brain abscess, brain or spinal cord tumours, multiple sclerosis, Guillain-Barré Syndrome and syphilis.	1 Day up to 2 Months 0.25-0.72 2 Months up to 4 Months 0.2-0.72 4 Months up to 7 Months 0.15-0.5 7 Months up to 12 Months 0.1-0.45 1 Year up to 3 Years 0.1-0.4 3 Years up to 5 Years 0.1-0.38 5 Years up to 8 Years 0.1-0.43 8+ years up to Unspecified 0.15-0.45	g/L	Plain CSF		Y	N			1 day	Y
Digoxin		Digoxin is a used to treat abnormal heart rhythms and severe heart failure. The drug has a narrow therapeutic window and levels may be needed to help does adjust or in the case of suspected toxicity. Hypokalaemia can increase risk of toxicity	0.5-1	ug/L	Serum		N	N	6 hours post dose	Place in batch rack	Run twice weekly (Tuesday & Friday)	Y
Faecal calprotectin		Calprotectin is released at sites of inflammation by neutrophils in the bowel. Intestinal inflammation is associated with, for example, some bacterial or viral infections and, in people with inflammatory bowel disease (IBD), it is associated with disease activity and severity. The faecal calprotectin test is not diagnostic but may be used to distinguish between IBD and non-inflammatory disorders and to monitor IBD disease activity.	<100	ug/g	Stool		Y	Y			3 days. Samples are only extracted and assayed Monday-Friday	N

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Faecal elastase		Marker of exocrine pancreatic function. Elastase is a protein-cleaving enzyme produced in and secreted by the pancreas. It is resistant to degradation by other enzymes and so is excreted and can be measured in the stool. The amount of this enzyme is reduced in pancreatic insufficiency.	>200	ug/g	Stool		Y	Y			Run weekly (Friday)	N
Ferritin		Ferritin is the main storage complex and is present mostly in the liver, but also in the bone marrow, spleen, and muscles. Small amounts of ferritin also circulate in the blood. The ferritin concentration within the blood stream reflects the amount of iron stored in your body. Ferritin will be low in long term iron deficiency and high in cases of iron overload, inflammation or infection and liver disease.	Up to 1 Year 12-327 1 Year up to 4 Years 6-67 4 Years up to 7 Years 4-67 7 Years up to 13 Years 7-84 (F) 14-124 (M) 13 Years up to 17 Years 13-68 (F) 14-152 (M) 17 Year up to Unspecified 13-150 (F) 30-400 (M)	ug/L	Serum	Lithium heparin or EDTA plasma	Y	Y			1 day	Y
Fluid Albumin			No defined reference range		Fluid		Y	N	Please inform of fluid type on request	Pleural fluid centrifuged in microbiology	1 day	N
Fluid Amylase			No defined reference range		Fluid		Y	N	Please inform of fluid type on request	Pleural fluid centrifuged in microbiology	1 day	N
Fluid CEA			No defined reference range		Fluid		Y	N	Please inform of fluid type on request	Pleural fluid centrifuged in microbiology	1 day run routinely Mon-Fri	N
Fluid Cholesterol			No defined reference range		Fluid		Y	N	Please inform of fluid type on request	Pleural fluid centrifuged in microbiology	1 day	N
Fluid Creatinine			No defined reference range		Fluid		Y	N	Please inform of fluid type on request	Pleural fluid centrifuged in microbiology	1 day	N

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Fluid Glucose			No defined reference range		Fluid		Y	N	Please inform of fluid type on request	Pleural fluid centrifuged in microbiology	1 day	N
Fluid LDH			No defined reference range		Fluid		Y	N	Please inform of fluid type on request	Pleural fluid centrifuged in microbiology	1 day	N
Fluid Potassium			No defined reference range		Fluid		Y	N	Please inform of fluid type on request	Pleural fluid centrifuged in microbiology	1 day	N
Fluid Sodium			No defined reference range		Fluid		Y	N	Please inform of fluid type on request	Pleural fluid centrifuged in microbiology	1 day	N
Fluid Total Protein			No defined reference range		Fluid		Y	N	Please inform of fluid type on request	Pleural fluid centrifuged in microbiology	1 day	N
Fluid Triglyceride			No defined reference range		Fluid		Y	N	Please inform of fluid type on request	Pleural fluid centrifuged in microbiology	1 day	N
Fluid Urea			No defined reference range		Fluid		Y	N	Please inform of fluid type on request	Pleural fluid centrifuged in microbiology	1 day	N
Fluid Uric Acid			No defined reference range		Fluid		Y	N	Please inform of fluid type on request	Pleural fluid centrifuged in microbiology	1 day	N
Follicle Stimulating Hormone	FSH	Follicle-stimulating hormone (FSH) is made by the pituitary gland and is stimulated by gonadotrophin releasing hormone (GnRH) present in the hypothalamus. In women, FSH stimulates the growth and development of ovarian follicles (unfertilised eggs) during the follicular phase of the menstrual cycle. In men, FSH stimulates the testes to produce mature sperm. FSH levels are relatively constant in men after puberty. In infants and children, FSH levels rise shortly after birth and then fall to very low levels (by 6 months in boys and 1-2	Males: 18 Years up to unspecified 1.5-12.4 Female (cycle dependent): Follicular 3.5-12.5 Luteal 1.7-7.7 Midcycle 4.7-21.5 Post-Menopausal 25.8-134.8	U/L	Serum	Lithium heparin or EDTA plasma	Y	Y	Take sample on day 2-5 of cycle for female fertility investigations		1 day run routinely Mon-Fri	Y

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		years in girls). At about 6-8 years, levels again rise with the beginning of puberty and the development of secondary sexual characteristics. Samples for women should be taken on day 2-5 in women and should not be used in women over 45 to diagnose menopausal state (this is a clinical diagnosis).										
Free androgen index	FAI	A calculation used to estimate the ratio of total testosterone to SHBG and has proved a useful indicator of abnormal androgen status in conditions such as polycystic ovary syndrome and hirsutism. This is particularly useful when the total testosterone concentration is normal but the SHBG is low, resulting in an elevated concentration of non-protein bound testosterone. FAI = Total Testosterone/SHBG x 100	20 Years up to 49 Years 0.297-5.62 (F) 35.0-92.6 (M) 50 years up to Unspecified 0.187-3.63 (F) 24.3-72.1 (M)	%	Serum		Y	Y			1 day run routinely Mon-Fri	N
Free T3		T3 is one of two major hormones produced by the thyroid gland. T3 makes up less than 10% of total thyroid hormone. T3, is about four times as strong as T4, and is thought to cause most, if not all, the effects of thyroid hormones. A high free T3 result may indicate an overactive thyroid gland (hyperthyroidism).	3.9-6.8	pmol/L	Serum	Lithium heparin or EDTA plasma	Y	Y			1 day run routinely Mon-Fri	Y

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Free T4		Thyroxine (T4) is one of two major hormones produced by the thyroid gland. Thyroxine is one of two major hormones produced by the thyroid gland. T4 makes up nearly all of total thyroid hormone. It aids in the diagnosis of hypothyroidism or hyperthyroidism. The test may also be used to help evaluate a patient with an enlarged thyroid gland, called a goitre. It may also aid in the diagnosis of female infertility problems.	11-24	pmol/L	Serum	Lithium heparin or EDTA plasma	Y	Y			1 day	Y
Gamma-glutamyl transferase	GGT	The GGT helps to detect liver disease and bile duct injury. Used to help find the reason for a raised concentration of alkaline phosphatase (ALP) within the bloodstream. Both ALP and GGT are elevated in disease of the bile ducts and in some liver diseases. GGT can also be used to screen for excessive alcohol consumption (it will be elevated in about 75% of long-term drinkers) and is induced by some drugs such as carbamazepine, phenytoin, valproic acid, methotrexate and certain anticoagulants such as heparin	Up to 15 Days 17-175 15 Days up to 1 Year 5-101 1 Year up to 11 Years 4-12 11 Years up to19 Years 4-16 19 Years up to Unspecified 0-40 (F) 0-60 (M)	U/L	Serum	Lithium heparin or EDTA plasma	Y	Y			1 day	Y
Gentamicin		Gentamicin is an aminoglycoside antibiotic used to treat several types of bacterial infections.	Interpretation for pre dose, post dose and random levels provided on reports	mg/L	Serum		Y	N	Please inform whether pre dose, post dose or random sample		1 day	Y

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Globulins		Globulins are a group of proteins and include immunoglobulins, enzymes, carrier proteins and complement. A calculated component calculated by subtracting the concentration of albumin away from the total protein concentration (globulins= total proteins - albumin).	18-40	g/L	Serum		Y	Y				N
Haematinic profile		Profile made up on folate, vitamin B12 and ferritin	See individual analytes				Y	Y				Y
Haemoglobin A1C (Glycated haemoglobin)	HBA1C	Measure glycated hemoglobulin to provide a snapshot of blood glucose control over the past 2-3 months. Used in both the diagnosis and monitoring of diabetes	<42	mmol/mol	EDTA whole blood		Y	Y			2 days	Y
High density lipoprotein cholesterol	HDL-C	HDL is a class of lipoproteins that carry cholesterol in the blood. HDL removes excess cholesterol from tissues and carries it to the liver for disposal. Low HDL levels are associated with increasing cardiovascular risk high levels are not necessarily protective. The test for HDL measures the amount of cholesterol carried on HDL particles in blood.	Target of 1-3	mmol/L	Serum	Lithium heparin or EDTA plasma	Y	Y	Patient preferably fasted		1 day	Y

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Human chorionic gonadotrophin	HCG	Hormone produced in the placenta in pregnant people. During the early weeks of pregnancy, hCG is important in maintaining function of the corpus luteum (which is formed from the ruptured ovarian follicle following ovulation). Production of hCG increases steadily during the first trimester of a normal pregnancy, peaking around the 10th week after the last menstrual cycle. Concentrations then fall slowly during the remainder of the pregnancy. May also be used as a tumour marker in men, particularly in germ cell tumours and gestational trophoblastic diseases.	<5 (F) <2 (M)	U/L	Serum	Lithium heparin or EDTA plasma	Y	Y			1 day	Y
Immunoglobulin profile		Profile made up of IgG, IgA and IgM.	Lot of age defined reference ranges	g/L	Serum	Lithium heparin or EDTA plasma	Y	Y			1 day run routinely Mon-Fri	Y
Iron		Only useful on it's own if iron poisoning suspected. Otherwise used as part of a panel of tests to calculate transferrin saturation. Iron deficiency may be seen with insufficient intake, inadequate absorption, or increased requirements, such as may be seen during pregnancy or with acute or chronic blood loss. Iron overload may be acute or chronic. Acute iron poisoning may occur, especially in children, with the ingestion of iron tablets. Chronic overload may be due to excessive intake, hereditary haemochromatosis, multiple blood	6.6-28.3 (F) 10.6-28.3 (M)	umol/L	Serum	Lithium heparin plasma	Y	Y	Usually ordered as part of transferrin saturation. Iron should only be requested as an individual component if ?iron poisoning		1 day	Y

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		transfusions or several other conditions.										
Lactate		Mainly requested to help detect and measure the severity of low levels of oxygen in the body (hypoxia) and lactic acidosis. It may be used with blood gases (to look at the body's acid/base balance and oxygenation) and/or with groups of tests, such as a metabolic screen or a full blood count, in a patient with evidence of acidosis. In patients being treated for a rapidly developing condition (such as shock or heart attack) or a slowly developing condition (such as severe congestive heart failure), lactate concentrations may be requested at intervals to help monitor hypoxia and the response to treatment.	0.6-2.5	mmol/L	Floride Oxalate Plasma		Y	Y			1 day	Y
Lactate dehydrogenase	LDH	There are 5 LDH isoenzymes. This assay measures total LDH. The main use for LDH is as a general indicator of the existence and severity of acute or chronic tissue damage and is sometimes used to monitor progressive conditions. LDH isoenzymes may also be used to help determine which organs are likely to be involved but this test is rarely available.	Up to 20 Days 225-600 20d Days up to 15 Years 120-300 15 Years up to Unspecified 135-214 (F) 135-225 (M)	U/L	Serum	Lithium heparin plasma	Y	Y			1 day	Y

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Lipid profile		Fasting lipid profile: Cholesterol, Triglycerides, HDL, Non-HDL, HDL-Ratio, LDL. Non fasting lipid profile: Cholesterol, Triglycerides, HDL, Non-HDL, HDL-Ratio			Serum		Y	Y			1 day	Y
Lipoprotein (a)	LPA	Lp(a) is a risk factor for heart disease especially when LDL cholesterol is also raised. Its measurement will tell the doctor whether the concentration of Lp(a) is contributing to the patient's risk of cardiovascular disease. Once levels of Lp(a) have been determined, they do not usually need to be checked again, but it is important to continually monitor the other risk factors.	<75	nmol/L	Serum		N	N	Requests only accepted from Secondary Care Lipid Consultants	Place in batch rack	Weekly (Thursday)	N
Lithium		Lithium is a drug that is used to treat mood disorders such as bipolar disorder. The lithium test is requested to monitor whether drug concentrations are at the "therapeutic range". Once stable blood concentrations in the therapeutic range have been achieved, then lithium should be monitored at regular intervals (3 monthly in the first year, 3-6 monthly thereafter) to ensure that the concentration remains in this range. Different brands of lithium release lithium into the stomach differently, and blood testing may be required if the brand of lithium is changed, to ensure that blood levels stay the same.	0.4 - 1.0 (12 hours post dose)	mmol/L	Serum		N	N	12 hours post dose		1 day	N
Liver Profile	LFT	Liver profile made up of total protein, ALP, ALT and total bilirubin.			Serum	Lithium heparin plasma	Y	Y			1 day	Y

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Low density lipoprotein cholesterol	LDL-C	Cholesterol is carried in the blood by lipoproteins. LDL stands for 'low-density lipoprotein'. LDL is considered to be undesirable because it deposits excess cholesterol in the walls of blood vessels and contributes to atherosclerosis. LDL-C is used to identify people at high risk of developing cardiovascular disease, to monitor treatment of people known to be at high risk of developing cardiovascular disease and in people with a family history of premature cardiovascular disease and a suspected genetic cholesterol condition.	Target of <3	mmol/L	Serum		Y	Y	Calculated on fasted patients only. Invalid so not calculated if triglycerides are >4.5 mmol/L		1 day	N
Luteinizing hormone	LH	Luteinising hormone (LH) is produced by the pituitary gland and release is controlled by the gonadotrophin-releasing hormone (GnRH). LH is often used in conjunction with other tests (FSH, testosterone, oestradiol and progesterone) in the investigation of infertility in both men and women. LH measurements are also useful in the investigation of menstrual irregularities (irregular periods) and to aid in the diagnosis of pituitary gland disorders. Samples in women should be requested at days 1-5 of the menstrual cycle (during menstruation or bleeding). In children, FSH and LH are used to diagnose delayed and precocious (early) puberty.	Males: 18 Years up to unspecified 1.7-8.6 Female (cycle dependent): Follicular 2.4-12.6 Luteal 1-11.4 Midcycle 14-96 Post-Menopausal 7.7-58.5	U/L	Serum	Lithium heparin or EDTA plasma	Y	Y			1 day run routinely Mon-Fri	Y

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Macroprolactin		Macroprolactinaemia refers to a polymeric form of prolactin in which several molecules form aggregates with circulating IgG. It is biologically inactive but causes false elevations in the laboratory macroprolactin assay. First time prolactin results >700 IU/L are investigated for macroprolactin interference.	<60 (no evidence of macroprolactin)	%	Serum				Requests driven by the laboratory, analysis added on to samples presenting for the first time with an prolactin >700 IU/L		3 days	Y
Magnesium		Abnormal levels of magnesium are most frequently seen in conditions or diseases that cause impaired or excessive excretion of magnesium by the kidneys or that cause poor absorption in the intestines. Magnesium levels may be checked as part of an evaluation of the severity of kidney problems or of uncontrolled diabetes and may help in the diagnosis and monitoring of gastrointestinal disorders, sometimes characterised by prolonged diarrhoea. Magnesium testing may be requested as a follow-up to persistently low levels of calcium and potassium. It may also be requested if you have symptoms of an abnormally low magnesium level such as muscle weakness, twitching, cramping, confusion, cardiac arrhythmias, and seizures.	0.7 - 1.0	mmol/L	Serum	Lithium heparin plasma	Y	Y			1 day	Y

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Methotrexate		Methotrexate is primarily used to treat childhood acute lymphocytic leukaemia and, some lymphomas. In adults, it is used for: cancers of the lung, head, neck, and breast, non-Hodgkin's lymphoma and is also prescribed to treat rheumatoid arthritis (RA), severe Crohn's disease and psoriasis. A methotrexate test is typically requested at 24 hours, 48 hours, and at 72 hours as needed after high-dose methotrexate is administered. A methotrexate blood test may also be requested whenever a person has symptoms or signs that suggest methotrexate toxicity.	Levels are checked to ensure they are decreasing adequately at 24, 48 and 72 hours post commencement of MTX treatment, typically aiming to be <0.10 µmol/L at 48 hours	umol/L	Serum		N	N	Protect samples from light. Take samples 24 and 48 hours post high dose methotrexate infusion		Ad hoc	Y
Neurone specific enolase	NSE	NSE is released from neurones during injury and is used as a biomarker of hypoxic brain injury. It is used as a prognostic indicator and marker of poor outcome following cardiac arrest. NSE is also used as a tumour marker in small cell lung cancer.	<17 ug/L (not relevant for neuro prognostication for post cardiac arrest as levels can be much higher than this)	ug/L	Serum		N	N	ICU consultants only. Samples must be received into the laboratory within 1 hour	Samples must be centrifuged immediately	Ad hoc	N
Oestradiol		Oestrogen (oestradiol) levels are used to evaluate ovarian function and to help diagnose the cause of precocious puberty in girls (signs of puberty before aged 8 years) or delayed puberty (age greater than 13 years in girls or 14 years in boys) and gynaecomastia in men.	Follicular phase 45 - 854 Mid-cycle peak 151 - 1461 Luteal 82 - 1251 Menopausal Up to 505	pmol/L	Serum	Lithium heparin or EDTA plasma	Y (if samples <2 days old)	Y (if samples <2 days old)			1 day run routinely Mon-Fri	Y
Paracetamol		Serum paracetamol concentration is used to establish a diagnosis of paracetamol overdose and to help decide on the need for treatment. The test must be performed at least	No range quoted	mg/L	Serum	Lithium heparin or EDTA plasma	Y	N			1 day	Y

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		four hours after suspected ingestion of the drug to allow accurate measurements to be made of the amount of drug that has been absorbed into the body.										
Parathyroid Hormone	PTH	Parathyroid hormone (PTH) is required for calcium and phosphate balance. It is part of a 'feedback loop' that includes calcium, PTH, vitamin D, phosphate and magnesium. PTH is requested to help determine the cause of a low or high calcium concentration, to help distinguish between parathyroid-related and non-parathyroid-related causes. It may also be requested to monitor the effectiveness of treatment when a patient has a parathyroid-related condition. PTH should be requested with serum calcium as this allows an evaluation of the response of the parathyroid glands to changing concentrations of calcium.	1.6 - 6.9	pmol/L	Serum		Y (If sample <24 hours old)	Y (If sample <24 hours old)			1 day run routinely Mon-Fri	Y
Phenytoin		Phenytoin is a drug that is used to treat some seizure disorders (also called epilepsy). The phenytoin test measures the amount of phenytoin in the blood and to determine whether drug concentrations are in the appropriate (therapeutic) range.	5 - 20	mg/L	Serum		N	N	Take samples pre dose (trough) level	Place in batch rack	Run twice weekly (Tuesday & Friday)	Y

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Phosphate		Inorganic phosphate testing can be helpful in people who are malnourished or who are being treated for ketoacidosis. A phosphate test is often requested to help diagnose diseases and conditions that cause problems with the body's utilisation of calcium. The test may help in the diagnosis of problems with hormones, such as parathyroid hormone (PTH) and Vitamin D, which regulate the body's calcium concentration and, to a lesser degree, phosphate. Phosphate testing may be requested when symptoms or other tests suggest kidney and/or disorders of the digestive system.	0 up to 1 Month 1.30 - 2.60 1 Month up to 1 Year 1.30 - 2.40 1 Year up to 16 Year 0.90 - 1.80 16 Years up to Unspecified 0.80 - 1.50	mmol/L	Serum	Lithium heparin or EDTA plasma	Y	Y			1 day	Y
Plasma Glucose (grey)		Most of the body's cells require glucose for energy production; the brain and nervous system cells rely on glucose for energy. Glucose measurements are used in the diagnosis and monitoring of carbohydrate metabolism disorders including diabetes mellitus, neonatal hypoglycaemia, idiopathic hypoglycaemia, and pancreatic islet cell carcinoma.	Fasting: 3.0 – 5.5 Random: 3.0 – 7.8	mmol/L	Floride Oxalate Plasma		Y	Y			1 day	Y

Test/Profile Name	Abbre-viation	Test information and clinical indications	Reference range	Units	Preferred sample type	Alternative sample type	Add on		Sampling and sample handling information for the requestor/patient	Sampling and sample handling information within the laboratory	Time to result (from receipt of sample)	UKAS Accredited
							Secondary care (Hospital)	Primary care (GP locations)				
Potassium		Potassium is the predominant intracellular cation and has numerous functions particularly in neuronal function and muscle contraction. Potassium excretion depends upon aldosterone, glomerular filtration rate, pH and sodium and water excretion. Hyperkalaemia may be seen in patients with acute or end stage renal disease and in states that cause it to be released from the intracellular space. Certain drugs can also induce hyperkalaemia such as ACE inhibitors, angiotensin receptor blockers and non steroidal anti-inflammatory drugs (NSAIDs). Spurious causes of raised potassium may be due to delayed sample separation, haemolysis or EDTA contamination. A common cause of hypokalaemia is due to thiazide diuretics, GI losses due to prolonged vomiting and diarrhoea or the misuse of laxative and redistribution from the intracellular to the extracellular space	0 up to 1 Month 3.4 - 6.0 1 Month up to 1 Year 3.5 - 5.7 1 Year up to 16 Year 3.5 - 5.0 16 Years up to Unspecified 3.5 - 5.3	mmol/L	Serum	Lithium heparin plasma	Y (if sample separated within 8 hours of collection)	Y (if sample separated within 8 hours of collection)	Unseparated samples must be received in the laboratory within 8 hours of collection. High platelets or white cells can cause false elevations in potassium and the use of a lithium heparin sample is recommended in these cases		1 day	Y
Procalcitonin		Procalcitonin is made during the process of producing the thyroid hormone calcitonin. The procalcitonin test may be requested with other tests, when a seriously ill person has symptoms that suggest that they may have sepsis or severe bacterial infection. Other reasons for increased procalcitonin include infection from other causes, tissue damage due to events such as trauma, surgery, pancreatitis, burns,	No ranges quoted on Torbay reports. International clinical algorithms state that values <0.5 ug/L suggest that bacterial sepsis is unlikely in high acuity ICU patients.	ug/L	Serum		Y (if sample <2 hours old)	N			1 day	N

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							Secondary care (Hospital)	Primary care (GP locations)				
		heart attack; and rapid and severe organ (kidney, heart, lung etc) transplant rejection.										
Progesterone		Progesterone measurements can determine if and when a woman has ovulated (released an egg from the ovary). Progesterone concentrations may be measured as part of an infertility assessment, when a woman is having trouble getting pregnant and the doctor wants to verify that she is ovulating normally. The timing of sampling will depend on the length of the menstrual cycle. Progesterone may also be measured to determine if and when ovulation has occurred following drug therapy to induce ovulation, as part of fertility treatment. Interpretation of progesterone test results requires accurate knowledge of where a woman is in her menstrual cycle or pregnancy.	Reference range provided are for females on day 21 of their cycle (or 7 days before their next menstrual period.) <15 = Anovulation 15-30L = Equivocal >30 = Ovulation	mmol/L	Serum	Lithium heparin or EDTA plasma	Y	Y	Take samples on day 21 of cycle or 7 days before patients next menstrual period is using to assess fertility		1 day	Y

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Prolactin		Prolactin is a hormone produced by the anterior pituitary gland. Its main role is to promote lactation (breast milk production). Prolactin may be requested when a patient has symptoms of a prolactinoma. It may also be requested, along with other tests, when a woman is experiencing infertility or irregular menses (menstrual periods); or when a man has symptoms such as: a decreased sex drive, galactorrhoea, or infertility. Prolactin concentrations are also often requested in men as a follow-up to a low testosterone result. When a patient has a prolactinoma, prolactin concentrations may be used to monitor the growth of the tumour and its response to treatment.	Female: 102 - 496 Male : 86 - 324	mU/L	Serum	Lithium heparin or EDTA plasma	Y	Y			1 day	Y
Prostate Specific Antigen	PSA	PSA is a protein produced mainly by cells in the prostate gland and can be a useful indicator of prostate cancer. Raised levels may indicate an infection of the prostate gland (prostatitis), benign prostate enlargement or prostate cancer. PSA is also used to monitor the response to treatment in those diagnosed with prostate cancer.	0 up to 50 Years <2.50 50 Years up to 60 Years <3.50 60 Years up to 70 Years <4.50 70 Years up to unspecified <6.50	ug/L	Serum	Lithium heparin or EDTA plasma	Y	Y			1 day run routinely Mon-Fri	Y

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Protein electrophoresis	EEPS	Serum protein electrophoresis is used to identify patients with multiple myeloma and other serum protein disorders. A homogeneous spike-like peak in a focal region of the gamma-globulin zone indicates a monoclonal gammopathy (paraprotein). Monoclonal gammopathies are associated with a clonal process that is malignant or potentially malignant, including multiple myeloma, Waldenström's macroglobulinemia, solitary plasmacytoma, smouldering multiple myeloma, monoclonal gammopathy of undetermined significance, plasma cell leukaemia, heavy chain disease, and amyloidosis.	No reference range - Qualitative interpretation provided. Paraprotein quantitation will be given in g/L		Serum		Y	Y			4 days	Y
Renal Profile		Made up of sodium, potassium and creatinine. Calculated eGFR also generated if the patient is >18 years old					Y	Y			1 day	Y
Rheumatoid Factor	RF	The rheumatoid factor (RF) test is used to help diagnose rheumatoid arthritis and to distinguish it from other forms of arthritis and other conditions that cause similar symptoms of joint pain, inflammation, and stiffness. This is not a diagnostic test for RA, it is possible to have a significantly positive RF and not have RA.	<20 : Negative, 20-100 : Weak Positive 100-400 : Moderate Positive >400 : Strong Positive	IU/mL	Serum	Lithium heparin or EDTA plasma	Y	Y			1 day run routinely Mon-Fri	Y

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Salicylate		Salicylate is a common drug used in many formulations due to its analgesic and anti-inflammatory properties. Salicylate overdose can cause metabolic acidosis with a high anionic gap, gastrointestinal and central nervous system disturbances, as well as encephalopathy and renal failure	No reference range	mg/L	Serum	Lithium heparin or EDTA plasma	Y	Y			1 day	Y
Serum Folate		Folate is part of the B complex of vitamins (Vitamin B9). Folate is found in leafy green vegetables, citrus fruits, dry beans and peas, liver, and yeast. Folate is necessary for red cell formation, tissue and cellular repair, and DNA synthesis. A deficiency can lead to macrocytic anaemia. Folate can be requested as follow-up test (usually with vitamin B12) when large red cells and a decreased haemoglobin concentration are found during a FBC test. Folate and vitamin B12 may be used to help evaluate the nutritional status of a patient with signs of significant malnutrition or malabsorption.	>3	ug/L	Serum		Y	Y			1 day	Y
Serum free light chains		Measures the amount of free kappa and free lambda in the blood. In healthy individuals there is usually a small amount of free light chains released into the bloodstream that can be detected. Most patients with multiple myeloma produce high levels of either kappa or lambda free light chains, which can be measured in blood. This test may be used to monitor progression and/or treatment.	Free Kappa 3.3-19.4 Free Lambda 5.71-26.3 Free kappa free lambda ratio 0.26-1.65	mg/L	Serum		Y	N	Under the direction of haematology only	Place in batch rack	Weekly (Thursday)	Y

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Serum glucose		Most of the body's cells require glucose for energy production; the brain and nervous system cells rely on glucose for energy. Glucose measurements are used in the diagnosis and monitoring of carbohydrate metabolism disorders including diabetes mellitus, neonatal hypoglycaemia, idiopathic hypoglycaemia, and pancreatic islet cell carcinoma.	Fasting: 3.0 – 5.5 Random: 3.0 – 7.8	mmol/L	Serum		Y (if sample <4 hours old)	N	Plasma (grey top fluoride oxalate tube) preferred. Results for serum glucose not reported if sample is greater than 4 hours old		1 day	Y
Serum immunofixation	IFE	Used to confirm presence or absence of a potential paraprotein detected by electrophoresis and its type.	No reference range - Qualitative interpretation provided		Serum		Y	Y			7 days	Y
Serum immunotyping	IT	Used to confirm presence or absence of a potential paraprotein detected by electrophoresis and its type.	No reference range - Qualitative interpretation provided		Serum		Y	Y			7 days	Y
Serum osmolality		Paired serum and urine osmolality are measured in patients with abnormal sodium or water balance as the relative values can help identify the likely cause of low blood sodium, high blood sodium, high or low urine output and excessive thirst. Differences between measured and calculated blood osmolality are particularly useful in investigating suspected poisoning. Serum and urine osmolality may be tested in patients with a low serum sodium concentration, a high serum sodium concentration, an unusually high urine output, an unusually low urine output or excessive thirst.	275-295	mOsm/Kg	Serum		Y	Y			1 day	Y

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Sex Hormone Binding Globulin	SHBG	SHBG is a protein that is produced by the liver. SHBG binds tightly to the hormones testosterone, dihydrotestosterone (DHT), and oestradiol and transports them in the blood in an inactive form. The amount of SHBG in the circulation is affected by age and sex, by decreased or increased testosterone or oestrogen production. It is also affected by certain diseases and conditions such as liver disease, hyperthyroidism or hypothyroidism, by obesity, and by anticonvulsant drugs like phenytoin and phenobarbitone.	0 up to 50 Years 24.6-122.0 (F) 16.5-55.9 (M) 50 Years up to unspecified 17.3-125.0 (F) 19.3-76.4 (M)	nmol/L	Serum	Lithium heparin plasma	Y	Y			1 day run routinely Mon-Fri	Y
Sodium		Major extracellular ion. Sodium concentration is kept in a narrow range by producing hormones that can increase (such as natriuretic peptides) or decrease (such as aldosterone) sodium losses in urine, producing a hormone that prevents water losses (antidiuretic hormone) and controlling thirst. Hyponatremia is the most common electrolyte disorder as may be due to relative loss of sodium or relative gain of water. Hyponatremia should be interpreted alongside hydration status. Pseudohyponatremia may occur when measuring sodium by indirect ISE due to raised lipid or protein concentration. Hypernatremia is less common and can occur in a person who becomes water deficient relative to sodium. This can occur is a number of	133-146	mmol/L	Serum	Lithium heparin plasma	Y	Y			1 day	Y

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							Secondary care (Hospital)	Primary care (GP locations)				
		conditions including gastrointestinal losses, burns or dehydration										
Soluble fms-like tyrosine kinase-1 (sFlt-1) and placental growth factor (PlGF)	sFlt-1/ PlGF ratio	Preeclampsia (PE) is a serious complication of pregnancy characterised by hypertension and proteinuria after 20 weeks of gestation. PE occurs in 3-5% of pregnancies and results in substantial maternal and foetal or neonatal mortality and morbidity. Serum levels of placental growth factor (PlGF) and soluble fms-like tyrosine kinase-1 (sFlt-1) (also known as VEGF receptor-1) are altered in women with PE. In women who develop PE, sFlt-1 levels have been found to be higher and PlGF levels have been found to be lower than in normal pregnancy. The ratio of sFlt-1 to PlGF has been shown to be a better predictor of PE than either measure alone.	No reference ranges quoted on the reports. National guidance/Roche data indicates that a sFlt-1/PlGF ratio of <38, at 20-34+6 weeks of pregnancy, has a very high negative predictive value for the rule-out of pre-eclampsia within the next week.	pg/mL	Serum		Y	N	Only requestable by maternity		Ad hoc	Y

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Testosterone		Testosterone is a steroid hormone (androgen) made by the testes and adrenal glands in males, and by the peripheral tissues, adrenal glands and ovaries in females. In males, testosterone has a role in reproductive health, facial and body hair, muscle mass and sex drive. In females, testosterone levels are about one tenth of those in males. In combination with oestrogen, testosterone in females has a role in bone health, sex drive and reproductive health.	20 Years up to 50 Years <1.7 (F) 8.6-29.0 (M) 50 Years up to unspecified <1.4 (F) 6.7-25.7 (M)	nmol/L	Serum	Lithium heparin or EDTA plasma	Y	Y	Fasted, 9am sample for males preferable		1 day run routinely Mon-Fri	Y
Theophylline		Bronchodilators used to treat Asthma, Chronic obstructive pulmonary disorder (COPD) and neonatal apnoea	10-20	mg/L	Serum		N	N	Immediately before oral dose, if continuous i.v. infusion then sample at 12 and 24 hours	Place in batch rack	Run twice weekly (Tuesday & Friday)	Y
Thyroid Stimulating Hormone	TSH	First line investigation for thyroid dysfunction and in monitoring thyroid treatment of replacement. TSH secreted in the pituitary acts upon the thyroid gland to promote the release of thyroid hormones free T3 and free T4. If the TSH is abnormal (either below or above the reference interval), then a free thyroxine (fT4) test is automatically added on to aid interpretation.	0.35-4.5	mU/L	Serum		Y	Y	When requesting please accurately select the following: No thyroid problem Hypothyroid (on treatment) Hyperthyroid Hypopituitarism Thyroid cancer Prescribed amiodarone On Carbimazole or PTU Other This helps direct testing and interpretation		1 day	Y
Tobramycin		Tobramycin is an aminoglycoside antibiotic used to treat several types of bacterial infections.	Target of < 1 mg/L for next dose if required	mg/L	Serum		N	N	Take samples pre dose (trough) level		Ad hoc-phone laboratory with advance warning	Y

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											sample is coming	
Total Bilirubin	TBIL	Final break down product of haemoglobin. Total bilirubin measured both conjugated and unconjugated forms. May be raised in liver diseases such as cirrhosis, hepatitis, or gallstones, due to haemolytic anaemia or in transient physiological jaundice of the new born.	For neonates up to 14 days NICE provide thresholds for phototherapy which are quoted on reports 0 Hours up to 24 hours 100 24 Hour up to 48 Hours 200 24 Hours up to 72 Hours 300 96 Hours up to 14 Days 350 _____ _____ 14 Days up to Unspecified <21	umol/L	Serum	Lithium heparin plasma	Y	Y			1 day	Y
Total cholesterol		Refers to the overall level of cholesterol (LDL&HDL). Used to help determine risk of developing cardiovascular disease or to monitor response to lipid lowering drugs.	No reference range, suggested target of <5	mmol/L	Serum	Lithium heparin or EDTA plasma	Y	Y	Patient preferably fasted		1 day	Y
Total protein		The total protein test is a rough measure of all of the proteins in the plasma portion of the body, the major proteins being albumin and immunoglobulins. Low total protein may be seen in disorders of the liver or kidney, in malnourished patients or patients with malabsorption or patients deficient in immunoglobulins. High total protein	0 up to 15 Days 51-80 15 Days up to 1 Years 43-69 1 Years up to 6 Years 59-73 6 Years up to 9 Years 62-75 9 Years up to 19 Years 63-78	g/L	Serum	Lithium heparin plasma	Y	Y			1 day	Y

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		can be seen in states of dehydration and in cancers such a myeloma (due to the abnormal accumulation of immunoglobulins)	19 Years up to 150 Years 60-80									
Transferrin		Transport protein for iron, made in the liver. Used in an equation with iron to calculate transferrin saturation. Transferrin will be high in iron deficiency and low in hemochromatosis. Transferrin saturation will be low in iron deficiency and high in hemochromatosis	2-3.6	g/L	Serum	Lithium heparin plasma	Y	Y			1 day	Y
Transferrin Saturation	TSAT	A calculated parameter using iron and transferrin measurements to represent the amount of transferrin that is saturated with iron. Transferrin saturation (%) = ((iron (µmol/L)/(transferrin (g/L)) x 3.98 High transferrin saturation is seen in hereditary haemochromatosis, as well as iron loading anaemia. Low saturation is seen in iron deficiency.	20-55	%	Serum	Lithium heparin plasma					1 day	N
Triglycerides	Trigs	Raised triglycerides are associated with increased cardiovascular risk. May be raised secondary to diabetes, smoking, high blood pressure or obesity. Very high triglyceride concentrations may lead to pancreatitis.	Target of <2.3	mmol/L	Serum	Lithium heparin or EDTA plasma	Y	Y	Patient preferably fasted		1 day	Y

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Troponin T	TNT	Present in striated muscle, a distinct Mw form of Troponin T is present in the myocardium. It is released when cardiac muscle is damaged for instance during a myocardial infarction. Chronic elevations of cTnT can be detected in clinically stable patients such as patients with ischaemic or non-ischaemic heart failure, in patients with different forms of cardiomyopathy, renal failure, sepsis and diabetes.	<14	ng/L	Serum		Y (if sample <24 hours old)	Y (if sample <24 hours old)			1 day	Y
Urate (Uric acid)		Uric acid is the final product of purine metabolism. Uric acid measurements are used in the diagnosis and treatment of numerous renal and metabolic disorders, including renal failure, gout, leukaemia, psoriasis, starvation or other wasting conditions, and of patients receiving cytotoxic drug	Up to 15 Days 158-748 15 Days up to 1 Year 88-370 1 Year up to 12 Years 100-282 1 Year up to 12 Years 100-282 12 Years up to 19 Years 147-342 (F) 150-466 (M) 19 Year up to Unspecified 140 - 360 (F) 200-430 (M)	umol/L	Serum		Y	Y	If patient is on rasbucanase uric acid result will be falsely low. Once commenced on rasbucanase repeat uric acid sampling is not usually required. If uric acid level required samples must be taken, put on ICE and bought straight to the laboratory for testing		1 day	Y
Urea		The final breakdown product of the amino acids found in proteins. Nitrogen in the form of ammonia is produced in the liver when protein is broken down. The nitrogen combines with other chemicals in the liver to form the waste product urea where it is filtered by the kidneys and excreted in the urine. May be low in significant liver damage or disease and high in	Up to 4 weeks 0.80-5.50 4 Weeks up to 1 year 1-5.5 1 Year up to 16 Years 2.50-6.50 16 Years up to Unspecified 2.50-7.80	mmol/L	Serum	Lithium heparin plasma	Y	Y			1 day	Y

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		kidney disease and in cases if dehydration.										
Urine Albumin	ACR/ UMA	Urine albumin (also sometimes called urine microalbumin) is present in very small concentration in health and is raised in chronic kidney conditions and secondary to some other diseases such as diabetes . Albuminuria is defined as a urine albumin:creatinine ratio (ACR) >3. In insulin-dependent diabetes the presence of microalbuminuria (ACR >3 but less than 30 mg/mmol) indicates that the early stages of diabetic nephropathy are present	<3	mg/mmol	Urine		Y	Y	Preferably early morning sample		1 day	Urine albumin Y ACR N
Urine Amphetamines		Qualitative assay to detect the class of drugs.	1000 =Positive (Qualitative result only)	ng/mL	Urine		Y	N	Urine toxicology requirements should be discussed with the laboratory prior to a sample being sent. Urine creatinine should be >2 mmol/L. These assays are qualitative only and are subjected to both positive and negative interference so can not be used for medicolegal purposes.		Ad Hoc	Y

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Urine Amylase		Amylase is one of the few proteins that can freely pass through the kidneys; consequently mild inflammation of the pancreas can be missed by measuring the blood levels of amylase due to this "clearing". In these cases urinary amylase levels will show raised excretion. Similarly, renal patients who develop pancreatitis may present with normal or moderately increased serum levels whilst the urine may show extremely high levels.	No reference range	u/L	Urine		Y	Y			Ad Hoc	Y
Urine Benzodiazepine		Qualitative assay to detect the class of drugs.	300 = Positive (Qualitative result only)	ng/mL	Urine		Y	N	Urine toxicology requirements should be discussed with the laboratory prior to a sample being sent. Urine creatinine should be >2 mmol/L. These assays are qualitative only and are subjected to both positive and negative interference so can not be used for medicolegal purposes.		Ad Hoc	Y
Urine Calcium including Calcium:Creatinine Ratio		Evaluation of urine calcium excretion levels can aid in the differential diagnosis of recurrent renal calculi, as well as in the differentiation of familial hypocalciuric hypercalcemia from asymptomatic primary hyperparathyroidism.	No reference range	mmol/L	Urine		Y	Y			1 day run routinely Mon-Fri	Y

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Urine Cannabinoids		Qualitative assay to detect the class of drugs.	50 = Positive (Qualitative result only)	ng/mL	Urine		Y	N	Urine toxicology requirements should be discussed with the laboratory prior to a sample being sent. Urine creatinine should be >2 mmol/L. These assays are qualitative only and are subjected to both positive and negative interference so can not be used for medicolegal purposes.		Ad Hoc	Y
Urine Chloride		Urinary chloride can be used to define the site of chloride loss in metabolic alkalosis and other electrolyte disturbances when it is not obvious clinically. Patients with a metabolic alkalosis and an associated urine chloride level of < 10 mmol/L are usually chloride deficient from gut or sweat loss	No reference range	mmol/L	Urine		Y	Y			1 day	Y
Urine Cocaine		Qualitative assay to detect the class of drugs.	300 = Positive (Qualitative result only)	ng/mL	Urine		Y	N	Urine toxicology requirements should be discussed with the laboratory prior to a sample being sent. Urine creatinine should be >2 mmol/L. These assays are qualitative only and are subjected to both positive and negative interference so can not be used for medicolegal purposes.		Ad Hoc	Y
Urine Creatinine		Urine creatinine is often used in the calculation of ratios in random urine samples. It is also used to measure	No reference range	mmol/L	Urine		Y	Y			1 day	Y

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		glomerular function as part of the creatinine clearance test.										
Urine electrophoresis (BJP)		Normally there is no protein, or only a small amount of protein in the urine. An abnormally high amount of protein in the urine can be a sign of many different disorders. Urine electrophoresis (Bence-Jones Proteins) is primarily requested in patients with suspected myeloma to detect free monoclonal light chain paraproteins.	No reference range - Qualitative interpretation provided		Urine		Y	Y			4 days	Y
Urine immunofixation		This test is most often used to check for the presence of certain proteins called monoclonal immunoglobulins. These proteins are linked to multiple myeloma and Waldenström macroglobulinemia. The test is also done with a blood test to check for a monoclonal immunoglobulin in the serum.	No reference range - Qualitative interpretation provided		Urine		Y	Y			7 days	Y
Urine Magnesium		Measurement can be useful in the diagnosis and investigation of magnesium deficiency. Low urine magnesium levels may result from decreased renal excretion e.g. dehydration or reduced magnesium intake e.g. malnutrition/ malabsorption. Increased urine magnesium may be seen in hyperaldosteronism, drug therapy (e.g. cisplatin), osmotic diuresis and chronic glomerulonephritis. The detection of significant urine magnesium in the presence of a low serum magnesium suggests renal loss as the cause of hypomagnesaemia.	No reference range	mmol/ L	Urine		Y	Y			1 day run routinely Mon-Fri	Y

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Urine Opiates		Qualitative assay to detect the class of drugs.	300 = Positive (Qualitative result only)	ng/mL	Urine		Y	N	Urine toxicology requirements should be discussed with the laboratory prior to a sample being sent. Urine creatinine should be >2 mmol/L. These assays are qualitative only and are subjected to both positive and negative interference so can not be used for medicolegal purposes.		Ad Hoc	Y
Urine Osmolality		Serum and urine osmolality may be measured together to investigate the cause of a low serum sodium concentration (hyponatraemia), high serum sodium concentration (hypernatremia), a high or low urine output or excessive thirst. Urine osmolality is a measure of the kidney's ability to concentrate urine; the more concentrated the urine is, the higher its osmolality. Urine osmolality is largely due to the presence of urea and creatinine. If serum and urine osmolality are not in keeping with each other this may indicate a problem with water balance which may manifest in abnormal sodium results.	No reference range	mOsm/kg	Urine		Y	Y			1 day	Y
Urine Phosphate		Urinary phosphate analysis is useful in the differential diagnosis of hyper and hypophosphatemia and in the diagnosis and monitoring of renal calculi.	No reference range	mmol/L	Urine		Y	Y			1 day run routinely Mon-Fri	Y

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							Secondary care (Hospital)	Primary care (GP locations)				
Urine Potassium		Urinary potassium may be ordered in the workup of hypokalaemia. In case of GI loss of potassium, the urine potassium will be low. In case of renal loss of potassium, the urine potassium levels will be high. Decreased levels of urine potassium are also seen in hypoaldosteronism and adrenal insufficiency.	Random urine 20-80	mmol/L	Urine		Y	Y			1 day	Y
Urine Protein Creatinine Ratio	UPCR	Proteinuria is an important indicator of kidney disease and its risk of progression. Protein:creatinine ratio (PCR), rather than ACR, should be requested where non-albumin proteinuria is suspected.	Up to 18 Years <20 18 Years up to Unspecified <15	mg/mmol	Urine		Y	Y	Preferably early morning sample		1 day	Y
Urine Sodium		Urinary sodium, together with assessment of volume status, is useful in the differential diagnosis of hyponatremia. Urinary sodium levels are also frequently ordered during the workup of acute renal failure with the fractional excretion of sodium used as an important marker in distinguishing pre-renal from post-renal failure. A urinary sodium of <20mmol/L in a dehydrated patient is consistent with functional renal tubules which will respond to rehydration whilst a urinary sodium of >20mmol/L is indicative of SIADH. It is also used to monitor compliance with a low salt diet in hypertensive patients.	Random urine 54-190	mmol/L	Urine		Y	Y			1 day	Y
Urine Urate		Evaluation of urinary urate excretion may assist in the selection of appropriate treatment for hyperuricaemia and aid in the	No reference range	mmol/L	Urine		Y	Y			1 day	Y

Test/Profile Name	Abbre-viation	Test information and clinical indications	Reference range	Units	Preferred sample type	Alternative sample type	Add on		Sampling and sample handling information for the requestor/patient	Sampling and sample handling information within the laboratory	Time to result (from receipt of sample)	UKAS Accredited
							Secondary care (Hospital)	Primary care (GP locations)				
		differential diagnosis and monitoring of recurrent renal calculi.										
Urine Urea		Measurement of urine urea is useful for the assessment of protein intake and/ or nitrogen balance and in the diagnosis and monitoring of kidney disease. Factors which tend to increase urea excretion include increases in glomerular filtration rate, increased dietary protein intake, protein catabolic conditions, and water diuretic states. Factors which reduce urea excretion include low protein intake and conditions which result in low urine output (eg, dehydration).	No reference range	mmol/L	Urine		Y	Y			1 day	Y
Valproate		Sodium valproate or valproic acid. Sodium valproate is a medicine mainly used to treat epilepsy and bipolar disorder (fitting disorders). This test measures the amount of valproic acid in the blood. Valproic acid levels in the blood must be maintained within certain limits. Too little and the patient may have more symptoms (seizures, mood swings, or migraines); too much and the patient may have increased side effects.	50-100	mg/L	Serum		N	N	Take samples pre dose (trough) level	Place in batch rack	Run twice weekly (Tuesday & Friday)	Y
Vancomycin		This test measures the concentration of vancomycin in the blood. Vancomycin is an antibiotic that is used to treat serious infections caused by gram-positive bacteria, such as septicaemia (infection of the blood), endocarditis (infection of the membrane surrounding the heart),	Locally derived interpretation provided on reports	mg/L	Serum		N	N	Vancomycin levels must be taken 2-4 hours before the 4th dose. Do the levels approximately every 3 days.		Ad Hoc	Y

Test/Profile Name	Abbre-viation	Test information and clinical indications	Reference range	Units	Preferred sample type	Alternative sample type	Add on		Sampling and sample handling information for the requestor/patient	Sampling and sample handling information within the laboratory	Time to result (from receipt of sample)	UKAS Accredited
							Secondary care (Hospital)	Primary care (GP locations)				
		osteomyelitis (infection of the bone), some pneumonias, and meningitis (infection of the spinal cord). Measurement of blood levels is usually requested at times that reflect the lowest concentration (trough) and the highest concentration (peak) to evaluate the effectiveness of therapy.										
Vitamin B12	B12	Vitamin B12 is necessary for normal red cell formation, tissue and cellular repair, DNA synthesis and nerve health. A deficiency in B12 can lead to macrocytic anaemia and can also result in varying degrees of neuropathy. In severe vitamin B12 deficiency, a more serious nerve damage may occur known as subacute combined degeneration of the cord. The human body stores several years' worth of vitamin B12 in the liver. Vitamin B12 is widely available in non-vegan foods, so a dietary deficiency of this vitamin is rare. It may be seen sometimes with general malnutrition, and in vegan diets. An autoimmune disorder called pernicious anaemia, the most common cause of vitamin B12 deficiency. Normally a molecule called intrinsic factor is made by parietal cells that line the stomach. B12 binds to intrinsic factor in the stomach, and the resulting complex is absorbed in the small intestines (ileum). With pernicious anaemia, antibodies attack parietal cells, reducing intrinsic factor production,	>178	ng/L	Serum		Y	Y			1 day	Y

Test/Profile Name	Abbre-viation	Test information and clinical indications	Reference range	Units	Preferred sample type	Alternative sample type	Add on		Sampling and sample handling information for the requestor/patient	Sampling and sample handling information within the laboratory	Time to result (from receipt of sample)	UKAS Accredited
							Secondary care (Hospital)	Primary care (GP locations)				
		or attack intrinsic factor, blocking its action, in either case preventing the efficient absorption of B12.										
Vitamin D		The main role of vitamin D is to help regulate the absorption of calcium and phosphate from the gut. Vitamin D is vital for the growth and health of bones and plays an important role in musculoskeletal health. 25-hydroxyvitamin D is the most useful indicator of vitamin D status in individuals, and is the form most commonly measured in routine analysis. This is because 25-hydroxyvitamin D remains in the blood longer and is present at much higher concentrations than 1,25-dihydroxyvitamin D. Testing of vitamin D levels is not routinely recommended as if patients thought to be deficient then they should be treated with supplements unless there is evidence of malabsorption	<25 deficient 25-50 insufficient >50 adequate	nmol/L	Serum		Y (<8 hours old)	Y (<8 hours old)	Vitamin D levels not usually required unless evidence of malabsorption. If patient thought to be Vitamin D deficient then the guidance is to treat with supplements		1 day run routinely Mon-Fri	Y

Test/Profile Name	Abbre-viation	Test information and clinical indications	Reference range	Units	Preferred sample type	Alternative sample type	Add on		Sampling and sample handling information for the requestor/patient	Sampling and sample handling information within the laboratory	Time to result (from receipt of sample)	UKAS Accredited
							Secondary care (Hospital)	Primary care (GP locations)				
Xanthochromia		Analysis of CSF is used as a second line investigation in those patients whose CT scan was negative where there is a strong clinical suspicion of SAH as well as in those patients who present late. Haemoglobin and bilirubin do not normally cross the blood brain barrier except through haemorrhage. Following the appearance of blood in the CSF the erythrocytes lyse and liberate oxyhaemoglobin which is then converted to bilirubin. Oxyhaemoglobin can be associated with recent bleeding into CSF and trauma during the lumbar puncture. The presence of oxyhaemoglobin and bilirubin in CSF is suggestive of SAH.	Interpretive comment provided on report		CSF		N	N	The lumbar puncture (LP) should only be performed >12h after the onset of presenting symptoms. Whenever possible, collect four sequential CSF specimens. Always ensure that the last CSF sample taken is sent for xanthochromia analysis. Protect the CSF from light and avoid vacuum tube transport systems.	Analyse immediately	Ad hoc	N

*All unaccredited assays have been fully verified and determined fit for use within the laboratory. Due to a change in ISO standards (15189:2022) calculated components are required to be added to scope. Laboratory extension to scope is pending.

3.2 Dynamic Function Tests

Some of the more commonly used dynamic function tests are given below.

Oral Glucose Tolerance Test: For the Diagnosis of gestational diabetes
Overnight Dexamethasone suppression test
Screening Test - Short Synacthen Test
Creatinine Clearance Test

3.3 Toxicology

Locally performed assays

Salicylate
Paracetamol
Alcohol (clinical not medico-legal)
Carboxyhemoglobin
Urine toxicology

Urine Drug Screens are available to detect the presence of other drugs taken in overdose. In house testing is produce a qualitative and can pick up classes of drugs rather than specific drugs. Please contact the Duty Biochemist (Ext 55218/231 in hours) to discuss requirements prior to sending a sample

3.4 Therapeutic Drug Monitoring

Drug assays run locally are

Digoxin	**Lithium**
Phenytoin	**Methotrexate**
Carbamazepine	**Tobramycin**
Valproate	**Gentamicin**
Theophylline	**Vancomycin**

Other drugs are available by referral - Please contact lab for availability and sampling requirements.

3.5 Referred Tests

Contact the laboratory on 55250 or 55218 if you have any questions relating to tests that are referred to other laboratories. List of referred tests is available on the intranet.

4.0 Quality Assurance

4.1 Accreditation

UKAS MEDICAL
8915

Accredited to
ISO 15189:2022

Accreditation provides assurance that the laboratory is working to international standards and providing results that are of the highest possible quality.
The Clinical Biochemistry department is a UKAS accredited medical laboratory No: 8915, which is accredited to standard ISO15189 (2022).The full scope of the tests that are accredited can be viewed on https://www.ukas.com/download-schedule/8915/Medical/ ..

The department has extensive Quality Management System and Governance procedures in place to control all the processes within the laboratory. If you require any further information, please contact the Laboratory Manager / Deputy Manager.

4.2 Providing feedback

The department is committed to continually improving the service it provides to patients and users. The department has a quality policy which all members of staff are aware of and strive to follow. This combined with a detailed quality improvement policy and complaint management process ensures the department is continually focused on the level of service it provides.

If you wish to provide feedback, compliments, or complaints regarding the service provided by Clinical Biochemistry, please do not hesitate to contact a member of the relevant laboratory team.

4.3 Complaints and Compliments

The views of our users are very important to the service we provide. Information on how to raise complaints can be found by conducting a search on the Trust Intranet Site for the Trust Policy Page or by going via the Trust Policies & Procedures Icon on the main Trust Homepage. Any laboratory-based complaints should be directed to the Laboratory Manager / Deputy Manager.

4.4 Protection of Personal Information

We support the Torbay and South Devon NHS Foundation Trust in continuous compliance with legislation of data processing and handling of sensitive information.

Our vision is to create an environment of confidentiality, integrity and quality of information with the organisation; we achieve this by providing a high-quality service within a framework of tools that enables new ways of working and the provision of high-quality care.
We work to ensure the right information is available to the right people when and where it is required. Information is shared only when required for patient care, for example sending information to another laboratory when further specialised testing is required.

4.4 Measurement Uncertainty

In medical laboratory testing there are potential uncertainties that can affect the results, such as poor specimen collection or transport, patient related factors of other interfering factors. The laboratory process and examination of the sample is subjected to some degree of variability to which the department regularly monitors by the use of internal quality control and EQA schemes.

5.0 Requests and Sample Identification

Requesting on ICE is strongly recommended wherever possible to ensure rapid and efficient turnaround of sample results.

Requests received into the laboratory require the below details:
Patient's full name, Patient's date of birth, Patient's hospital (or NHS) number, Date and time of sample collection, Tests required, Relevant clinical details (to aid interpretation of results)

Please Note: ICE requests where labels have been printed but orders have not been marked as collected will not be processed. Samples will be rejected, and requestors will have 24 hours to mark sample as collected **and** inform the laboratory you have done so before samples are disposed of.

Paper requesting: When filling out the Pathology Request Forms, please ensure you have provided the patient information listed below.

Please Note: Failing to provide enough information on the Pathology Request Form (and sample) may result in the sample you have provided being rejected.

Minimum Demographics to be provided on Pathology Request Forms:

- In-patient: Name (First and surname), NHS or Hospital number and preferably DOB
- GP patients: Name (First and surname), NHS number or hospital number (if available) and preferably DOB
- GUM Patients: GUM number and DOB
- Occupational Health: Occupational Health number, name and DOB

Add on requests: Please make add on requests via tsdft.biochemistryaddons@nhs.net
Add on requests will be processed providing the pre analytical requirements for the analyte has been met. Samples are routinely kept for 3 days, if your sample is older than this, we may be unable to process your add on request. Please ensure your add on request has the following information, the request will not be processed otherwise: patient's name, date of birth, NHS or hospital number, the date and time the sample was collected, and the test(s) you would like to add.

Target turnaround times for routine (non-batched) tests from time of receipt of sample into the laboratory: A&E: 1 hour
Inpatient: 2 hours

GP: 6 hours
The full laboratories repertoire is not analysed every day, whilst most routine high-volume tests are assayed daily Monday-Friday, some low volume tests may be run on set days. A core profile of tests are run over the weekend.
Locally performed toxicology and therapeutic drug monitoring assays can be run urgently for ?toxicity phone the laboratory to discuss (55218 or 55250 OOH). Assays marked as Ad Hoc will require the laboratory to be phoned (55218 or 55250 OOH) ahead of the sample being taken to inform assay is required if possible.

5.1 Consent

It is the responsibility of the requestor to first verify the identity of the patient, before obtaining the patient's consent to take a sample.
It is the responsibility of the clinician to ensure the patient understands the reason for making the request for the examination and the range of tests that may be involved. The reason for investigation should be explained clearly to the patient.

5.2 Sample Acceptance Criteria

Requests received into the laboratory require the below details:
Patient's full name, Patient's date of birth, Patient's hospital (or NHS) number, Date and time of sample collection, Tests required, Relevant clinical details (to aid interpretation of results).

5.3 Factors Affecting Examination and Interpretation of Results

The following is a list of factors known to significantly adversely affect the performance of examination and interpretation of results:

- Failure to follow sample acceptance criteria will result in a delay in specimen processing and reporting.
- Failure to supply adequate clinical information may result in a delay requesting sample investigations and reporting.
- Failure to follow instructions for the specific sample requirements will prevent necessary examinations from being performed.

Should any of these factors affect the issuing of a final report, then an incident may be raised on the Laboratory's CA/PA system and where applicable also the Trust's DATIX reporting system.

5.4 Urgent Requests

Where possible, any request for urgent work must be arranged in advance and must be stated clearly on the request form. Urgent samples will be done as soon as possible upon receipt in the laboratory within service hours.

6.0 Reports

All reports issued by the department are available on the relevant Trusts' electronic systems.

Generic contact details	Location	Telephone Number	Information
Report Enquires	Clinical Biochemistry	55250	Bleep 220 Out Of Hours

Departmental nhs.net Email address			tsdft.biochemistryenquiries@nhs.net

Please note – Clerical staff **WILL NOT** give report details over the telephone.

7.0 Referral Laboratories

Referral laboratories used by the laboratory are selected on several criteria, including:

- Known laboratory expertise and availability of interpretative advice
- Recognised Regional Hub
- Turnaround time
- Accreditation Status

In general, NHS accredited laboratories or recognised laboratories with conditional status are used. This provides an indication of a particular quality of service.

The UKAS accreditation status of each laboratory used is checked on the UKAS Website https://www.ukas.com/find-an-organisation to ensure that the laboratory has maintained its accreditation status. The scope of each provider or potential provider can also be viewed to ensure the tests required are included in the referral laboratory's scope of practice.

8.0 Risk Management

The department manages risks associated with laboratory examinations (pre-examination, examination and post-examination) primarily for the patient but also our staff, equipment and environment by:

- Reviewing our work processes
- Evaluating the impact of potential failures on examination results
- Modifying the process to reduce or eliminate the identified risks
- Documenting the decisions and actions taken

The department has an agreed Risk Management Procedure and will identify, eliminate, control and monitor the risks through:

- Risk assessment
- Complaints
- Internal Audit
- Corrective and Preventative Action (Recorded and Monitored on QMS)
- Minor Errors Record
- Trend Analysis
- Safety Checklists
- Quality Control
- Management Review – performed yearly

This is implemented both through regular audit, and by filling out of the incident-reporting system – DATIX, available to staff on Hospital intranet.

- A wrong report
- Any patient-related incident