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## DEPARTMENTAL INFORMATION

The Department of Clinical Biochemistry at the Bristol Royal Infirmary is accredited to ISO15189 (UKAS reference [8061](#)). It comprises three sections:

- Automated Biochemistry
- Immunochemistry
- Metabolic, Neuroendocrine and Nutrition Lab

## How to contact the department

During core hours (Mon-Fri 9-5):

- Please contact the Helpdesk for general enquiries: 0117 342 3080 (x23080 from within the Trust).
- Clinical advice can be obtained from the Duty Biochemist: 0117 342 7834 (x27834) or for non-urgent advice email [biochemadvce@uhbw.nhs.uk](mailto:biochemadvce@uhbw.nhs.uk)
- There is a Paediatric / Metabolic Biochemist available x21299

Out of hours:

- The laboratory is staffed 24/7 and can be contacted on bleep 2331
- For urgent clinical advice there is an on-call Clinical Biochemist who can be contacted via switchboard

For full staff list and more detailed information please refer to the [Intranet](#) page.

## SPECIMEN CONTAINERS

For blood samples, there are several different bottles available, and different tests may stipulate different bottles. The majority of biochemistry analytes are measured on either a serum sample (SST, yellow or brick red top) or a lithium heparin plasma sample (PST, light green top).

### SERUM (SST) GEL)

### LITHIUM HEPARIN (PST)

### EDTA

### FLUORIDE OXALATE

### SERUM (NO GEL)

### LITHIUM HEPARIN (NO



## TEST DIRECTORY FOR ON SITE TESTING

- Sample volume for routine biochemistry tests marked with an asterix: \*Usually up to 20 routine biochemistry tests can be analysed on the same tube.
- For further information about individual laboratory tests please contact the department as above.
- In addition the following online resources are useful:

<https://labtestsonline.org.uk/>

Assays – Supra-Regional Assay Service ([sas-centre.org](http://sas-centre.org))

<http://www.toxbase.org/>

Test Name	Sample type	Container	Volume	Test information	TAT	Reference range / Results interpretation						
5-Hydroxyindoleacetic acid (5HIAA)	Urine	24h bottle (acetic acid only)	n/a	Avoid bananas, pineapple, walnuts prior to test. If high priority please phone the duty metabolic biochemist on 21299 to discuss	2 weeks	<4 mmol/mol creatinine						
Adrenocorticotrophic hormone (ACTH)	Blood	EDTA tube	Min vol 1 mL	Poor <i>in vitro</i> stability - sample must be sent on ice to lab immediately.	24 hours	7.2 – 63.3 ng/L Early morning range (7-11am)						
Alanine transaminase (ALT)	Blood	Serum (SST) or LiHep (PST)	One tube*	Part of Liver Function Test ALT is primarily a marker of hepatocellular damage, although it can be raised due to release from other tissues such as in rhabdomyolysis.	6 hours	10 – 50 U/L						
Albumin	Blood	Serum (SST) or LiHep (PST)	One tube*	Albumin is produced by the liver, and is important in maintaining vascular fluid balance.	6 hours	Age <1 year 30 – 45 g/L Age 1 year+ 35 – 50 g/L						
	Fluid	Universal pot	Min vol 1 mL	Not validated in this sample type	6 hours							
	Urine	Universal pot	Min vol 1 mL	Albumin : creatinine ratio (ACR) is calculated. Also known as ‘microalbumin’ or ‘microalbuminuria’	6 hours	Confirmed ACR 3 mg/mmol or more is clinically important. ACR 3-70 mg/mmol should be confirmed on early morning urine. If haematuria present and ACR 30 mg/mmol or more, specialist referral is indicated.						
Alkaline phosphatase (ALP)	Blood	Serum (SST) or LiHep (PST)	One tube*	Part of Liver Function Test ALP can be elevated due to bone pathology and hepatobiliary disease. ALP is also produced by the placenta and results will be higher in pregnancy.	6 hours	Sex	Age		LRL	URL		
						B	0	13 days	90	273	U/L	
						B	14 days	11 months	134	518	U/L	
						B	1 year	9 years	156	369	U/L	
						B	10 years	12 years	141	460	U/L	
						F	13 years	14 years	62	280	U/L	
						M	13 years	14 years	127	517	U/L	

# Department of Clinical Biochemistry Test Handbook

Document Reference: MF-BIO-BRI-UserHandbook

						<table><tr><td>F</td><td>15 years</td><td>16 years</td><td>54</td><td>130</td><td>U/L</td></tr><tr><td>M</td><td>15 years</td><td>16 years</td><td>89</td><td>365</td><td>U/L</td></tr><tr><td>F</td><td>17 years</td><td>18 years</td><td>54</td><td>130</td><td>U/L</td></tr><tr><td>M</td><td>17 years</td><td>18 years</td><td>59</td><td>164</td><td>U/L</td></tr><tr><td>B</td><td>19 years +</td><td></td><td>30</td><td>130</td><td>U/L</td></tr></table>	F	15 years	16 years	54	130	U/L	M	15 years	16 years	89	365	U/L	F	17 years	18 years	54	130	U/L	M	17 years	18 years	59	164	U/L	B	19 years +		30	130	U/L												
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B	19 years +		30	130	U/L																																											
Alkaline phosphatase isoenzymes	Blood	Serum (SST) or LiHep (PST)	One tube *	Only indicated if total ALP activity is elevated. Can confirm the diagnosis of benign transient hyperphosphatasaemia (BTH).	2 weeks	Qualitative report of major ALP isoform(s) present: Liver, Bone, Intestinal, Placental and BTH																																										
Alpha-1-Antitrypsin (A1AT)	Blood	Serum (SST) or LiHep (PST)	One tube *	A1AT phenotype is automatically added if: Age <16 years, <i>or</i> Total A1AT <1.0 g/L	24 hours	<table><tr><td>Sex</td><td>Age</td><td></td><td>LRL</td><td>URL</td><td></td></tr><tr><td>B</td><td>0</td><td>25 weeks</td><td>0.8</td><td>1.8</td><td>g/L</td></tr><tr><td>B</td><td>26 weeks</td><td>51 weeks</td><td>1.1</td><td>2</td><td>g/L</td></tr><tr><td>B</td><td>1 year</td><td>4 years</td><td>1.1</td><td>2.2</td><td>g/L</td></tr><tr><td>B</td><td>5 years</td><td>9 years</td><td>1.4</td><td>2.3</td><td>g/L</td></tr><tr><td>B</td><td>10 years</td><td>14 years</td><td>1.2</td><td>2</td><td>g/L</td></tr><tr><td>B</td><td>15 years +</td><td></td><td>0.9</td><td>2</td><td>g/L</td></tr></table>	Sex	Age		LRL	URL		B	0	25 weeks	0.8	1.8	g/L	B	26 weeks	51 weeks	1.1	2	g/L	B	1 year	4 years	1.1	2.2	g/L	B	5 years	9 years	1.4	2.3	g/L	B	10 years	14 years	1.2	2	g/L	B	15 years +		0.9	2	g/L
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Alpha-1-antitrypsin phenotype	Blood	Serum (SST) or LiHep (PST)	One tube *	For diagnosis of A1AT deficiency	2 weeks	The Protease Inhibitor (PI) type is reported: PI M, PI MZ, PI MS, PI Z, PI S, PI SZ																																										
Alpha-fetoprotein (AFP)	Blood	Serum (SST) or LiHep (PST)	One tube *	AFP tumour marker ONLY. For antenatal Downs syndrome screening use special paper request form.	24 hours (Mon-Fri)	<6 kIU/L																																										
	CSF	Universal pot	Min vol 0.1 mL	Not validated in this sample type	24 hours (Mon-Fri)																																											
Ammonia	Blood	EDTA tube	Min vol 0.5 mL	Ammoniogenesis occurs <i>in vitro</i> , leading to falsely high results. Sample must be sent on ice to lab immediately.	2 hours	Age <1 month <100 µmol/L Age 1 month+ <50 µmol/L Delay in analysis causes artefactual increase																																										
Amphetamines (urine)	Urine	Universal pot	Min vol 1 mL	Usually remains detectable in urine for 24-72 hours. Care should be taken to avoid tampering with the sample and that the sample is fresh and from the correct individual	24 hours (Mon-Fri)	Positive / negative Cut-off 1000 ug/L																																										
Amylase	Blood	Serum (SST) or LiHep (PST)	One tube *	Please request Lipase as the first line screen for acute pancreatitis	24 hours	28 – 100 U/L																																										
	Fluid	Universal pot	Min vol 1 mL	Not validated in this sample type	24 hours																																											
	Urine	Universal pot	Min vol 1 mL	Amylase is a small protein and is predominantly renally cleared. For calculation of amylase:creatinine clearance ratio (ACCR)	24 hours	Urine amylase <300 U/L ACCR <1% is suggestive of macroamylasaemia																																										
Angiotensin Converting Enzyme (ACE)	Blood	Serum (SST) or LiHep (PST)	One tube *	Patients on ACE inhibitors will give falsely low results.	2 days	8 – 52 U/L																																										
	CSF	Universal pot	Min vol 0.1 mL	Not validated in this sample type	2 days	<3 U/L																																										

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Anion Gap	Blood	Serum (SST) or LiHep (PST)	One tube *	Anion gap = Sodium - (Chloride + bicarbonate)	6 hours	6 – 14 mmol/L																													
Anti-SARS-CoV-2 (covid) nucleocapsid antibodies	Blood	Serum (SST) or LiHep (PST)	One tube *	This assay has limited clinical utility. Positivity suggests prior exposure to SARS-CoV-2 but does not necessarily imply protective immunity	6 hours	Reported as positive / negative																													
Anti-SARS-CoV-2 (covid) spike protein antibodies	Blood	Serum (SST) or LiHep (PST)	One tube *	Please see <a href="http://nww.avon.nhs.uk/dms/download.aspx?did=25702">http://nww.avon.nhs.uk/dms/download.aspx?did=25702</a> for indications for this test	6 hours	Reported as positive / negative																													
Aspartate transaminase (AST)	Blood	Serum (SST) or LiHep (PST)	One tube *	AST is used as a marker of hepatocellular damage, but due to poor specificity for liver tissue has largely been superseded by the use of ALT.	24 hours	<table><tr><td>Age</td><td></td><td>URL</td><td></td><td></td></tr><tr><td>0</td><td>5 weeks</td><td>121</td><td>U/L</td><td></td></tr><tr><td>6 weeks</td><td>51 weeks</td><td>70</td><td>U/L</td><td></td></tr><tr><td>1 year</td><td>4 years</td><td>51</td><td>U/L</td><td></td></tr><tr><td>5 years +</td><td></td><td>49</td><td>U/L</td><td></td></tr></table>					Age		URL			0	5 weeks	121	U/L		6 weeks	51 weeks	70	U/L		1 year	4 years	51	U/L		5 years +		49	U/L	
Age		URL																																	
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6 weeks	51 weeks	70	U/L																																
1 year	4 years	51	U/L																																
5 years +		49	U/L																																
Benzodiazepine (urine)	Urine	Universal pot	Min vol 1 mL	Request if only benzodiazepines required, otherwise request urine drug screen (Opiates, methadone and benzodiazepines). Care should be taken to avoid tampering with the sample and that the sample is fresh and from the correct individual	24 hours (Mon-Fri)	Positive / negative Cut-off 200 ug/L																													
Bicarbonate	Blood	Serum (SST) or LiHep (PST)	One tube *	Cannot be added on to an existing request; bicarbonate rapidly equilibrates with CO <sub>2</sub> in the atmosphere.	6 hours	22 – 29 mmol/L																													
Bile Acids	Blood	Serum (SST) or LiHep (PST)	One tube *	Bile acids are used as a marker of obstetric cholestasis and are not a routine marker of liver function.	24 hours	<10 µmol/L (non-fasting) NOTE: UDCA will cause positive interference																													
Bilirubin (total)	Blood	Serum (SST) or LiHep (PST)	One tube *	Bilirubin is the breakdown product of haem, and is cleared by the liver in a two-step process; conjugation followed by excretion. Increased bilirubin can be due to liver damage, cholestasis, or increased haem breakdown e.g. haemolysis.	6 hours	<21 µmol/L (outside of neonatal period)																													
Bilirubin (conjugated / direct)	Blood	Serum (SST) or LiHep (PST)	One tube *	Increased conjugated fraction is often a sign of cholestasis. Most useful for investigation of ?Gilbert's.	24 hours	No range for conjugated bilirubin quoted. In Gilbert's, the hyperbilirubinaemia is predominately unconjugated, % conjugated is usually <20%																													
Bilirubin (Fluid)	Fluid	Universal pot	Min vol 1 mL	Not validated in this sample type	6 hours																														
CA 125	Blood	Serum (SST) or LiHep (PST)	One tube *	Primarily a marker of ovarian cancer. See NICE guideline CG 122 for further information. Use with caution for diagnosis as also increased significantly in many benign conditions.	24 hours (Mon-Fri)	<35 kIU/L																													
CA 15-3	Blood	Serum (SST) or LiHep (PST)	One tube *	CA15-3 is used to monitor treatment for breast cancer. Not indicated for diagnosis.	24 hours (Mon-Fri)	<25 kIU/L																													
CA 19-9	Blood	Serum (SST) or LiHep (PST)	One tube *	CA19-9 is frequently raised in pancreatic cancer. However it can also be raised due to other abdominal pathologies, such as	24 hours (Mon-Fri)	<35 kIU/L																													

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				cholestasis and jaundice, and consequently is not advised for diagnosis without supporting imaging.				
Calcium	Blood	Serum (SST) or LiHep (PST)	One tube *	The albumin adjusted calcium will also be automatically calculated from calcium and albumin. Can be falsely reduced due to contamination from EDTA - observe correct order of draw.	6 hours	Age <1 month 2.0 – 2.7 mmol/L Age 1 month – 15 years 2.2 – 2.7 mmol/L Age 16 years+ 2.2 – 2.6 mmol/L		
	Urine	Universal pot	Min vol 1 mL	Reported as calcium : creatinine ratio on a spot sample. Random urine samples are acceptable from children, but in adults a 24h collection is preferred.	6 hours	Age	Range	
		24h bottle (acid)	n/a		6 hours	2.5 – 7.5 mmol/day		
Carbamazepine	Blood	Serum (SST) or LiHep (PST)	One tube *	Pre dose sample.	24 hours	5 – 12 mg/L		
Carcinoembryonic antigen (CEA)	Blood	Serum (SST) or LiHep (PST)	One tube *	Used to monitor treatment and recurrence of colorectal cancer. Not suitable for use in diagnosis as it may not be raised in cancer, and can be raised due to a variety of other pathologies.	24 hours	<5 µg/L		
	Fluid	Universal pot	Min vol 1 mL	Not validated in this sample type	24 hours			
Chloride	Blood	Serum (SST) or LiHep (PST)	One tube *	Not part of routine electrolytes	6 hours	95 – 108 mmol/L		
	Urine	Universal pot	Min vol 1 mL	Not part of routine urine electrolytes.	6 hours			
Cholesterol	Blood	Serum (SST) or LiHep (PST)	One tube *		6 hours			
Ciclosporin / cyclosporine	Blood	EDTA tube	Min vol 1 mL	A separate EDTA tube is required, sample should be taken as pre-dose	24 hours	70 – 160 µg/L Reference range applies only to samples taken 10 hours post dose (trough level) for matched sibling and unrelated BMT. For other indications see local guidelines.		
Cocaine (urine)	Urine	Universal pot	Min vol 1 mL	Usually remains detectable in urine for 24-72 hours. Not part of routine drugs of abuse screen. Care should be taken to avoid tampering with the sample and that the sample is fresh and from the correct individual	24 hours (Mon-Fri)	Positive / negative Cut-off 300 ug/L		

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Complement (C3 & C4)	Blood	Serum (SST) or LiHep (PST)	One tube *		24 hours	C3: 0.9 – 1.8 g/L C4: 0.1 – 0.4 g/L				
Cortisol	Blood	Serum (SST) or LiHep (PST)	One tube *	Cortisol shows a strong diurnal rhythm, and a randomly timed cortisol is limited diagnostic utility. Dynamic function tests are the best way to formally exclude or diagnose adrenal disease, although early morning (9am) or midnight cortisol can be useful. Please ring x27834 to discuss investigation.	6 hours	For investigation of adrenal insufficiency: <150 nmol/L Suggest short Synacthen test to confirm adrenal insufficiency 150-350 nmol/L Indeterminate cortisol, repeat at 9am >350 nmol/L Adrenal insufficiency extremely unlikely Interpret with care if patient taking other steroids, or if hyperestrogenic state				
	Urine	24h bottle (plain)	n/a	Also known as urine free cortisol (UFC). Useful in diagnosis of hypercortisolism	2 weeks	Normal: <120 nmol/24h Cushing’s likely: >300 nmol/24h				
	Saliva	Salivette	n/a	Salivettes available from the laboratory. Recommended to send paired early morning and late evening samples. Both cortisol and cortisone are measured. Useful in diagnosis of hypercortisolism.	4 weeks	Early morning cortisol 3 – 22 nmol/L Early morning cortisone 12 – 45 nmol/L Late evening cortisol <2 nmol/L Late evening cortisone 2 – 12 nmol/L				
C-Peptide	Blood	EDTA tube	Min vol 0.5 mL	Serum (SST) or lithium heparin (PST) also acceptable, but have reduced <i>in vitro</i> stability	24 hours (Mon-Fri)	Interpretation depends on clinical indication and concomitant blood glucose. Contact lab for more information x27834				
	Urine	Boric acid pot	Min vol 2 mL	Universal pot also acceptable, but reduced <i>in vitro</i> stability	24 hours (Mon-Fri)	For investigation of patients with established DM (>3 years): >0.6 nmol/mmol: Substantial insulin secretion. Associated with type 2 DM & MODY and absence of absolute insulin requirement. 0.2-0.6 nmol/mmol: Intermediate insulin secretion. <0.2 nmol/mmol: Severe insulin deficiency. Manage as type 1 DM.				
C-reactive protein (CRP)	Blood	Serum (SST) or LiHep (PST)	One tube *	Used as a non-specific marker of inflammation.	6 hours	<5 mg/L Values above 200 mg/L frequently indicate septicaemia				
Creatine kinase (CK)	Blood	Serum (SST) or LiHep (PST)	One tube *	Creatine kinase is released in large amounts from muscle when tissue damage occurs, although a raised CK can be a sign of tissue damage anywhere in the body.	6 hours	Male: 40 – 320 U/L Female: 25 – 200 U/L Values >10x ULN may indicate rhabdomyolysis				
Creatinine	Blood	Serum (SST) or LiHep (PST)	One tube *	Creatinine is produced at a relatively constant rate by the body, and cleared by the kidneys. It is therefore a useful marker for glomerular filtration rate, and used to calculate eGFR. At the BRI, an enzymatic assay is used to give greater accuracy of creatinine results.	6 hours	Sex	Age	LRL	URL	
						B	0 – 13 days	27	77	µmol/L
						B	2 – 51 weeks	14	34	µmol/L
						B	1 – 2 years	15	31	µmol/L
						B	3 – 4 years	23	37	µmol/L
						B	5 – 6 years	25	42	µmol/L
						B	7 – 8 years	30	47	µmol/L
						B	9 – 10 years	29	56	µmol/L
						B	11 years	36	64	µmol/L

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						<table><tr><td>B</td><td>12 years</td><td>36</td><td>67</td><td>μmol/L</td></tr><tr><td>M</td><td>13 years</td><td>38</td><td>76</td><td>μmol/L</td></tr><tr><td>F</td><td>13 years</td><td>38</td><td>74</td><td>μmol/L</td></tr><tr><td>M</td><td>14 years</td><td>40</td><td>83</td><td>μmol/L</td></tr><tr><td>F</td><td>14 years</td><td>43</td><td>75</td><td>μmol/L</td></tr><tr><td>M</td><td>15 years</td><td>47</td><td>98</td><td>μmol/L</td></tr><tr><td>F</td><td>15 years</td><td>44</td><td>79</td><td>μmol/L</td></tr><tr><td>M</td><td>16 years</td><td>54</td><td>99</td><td>μmol/L</td></tr><tr><td>F</td><td>16 years</td><td>48</td><td>81</td><td>μmol/L</td></tr><tr><td>M</td><td>17 years +</td><td>59</td><td>104</td><td>μmol/L</td></tr><tr><td>F</td><td>17 years +</td><td>45</td><td>84</td><td>μmol/L</td></tr></table>	B	12 years	36	67	μmol/L	M	13 years	38	76	μmol/L	F	13 years	38	74	μmol/L	M	14 years	40	83	μmol/L	F	14 years	43	75	μmol/L	M	15 years	47	98	μmol/L	F	15 years	44	79	μmol/L	M	16 years	54	99	μmol/L	F	16 years	48	81	μmol/L	M	17 years +	59	104	μmol/L	F	17 years +	45	84	μmol/L
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F	17 years +	45	84	μmol/L																																																									
eGFR	Blood	Serum (SST) or LiHep (PST)	One tube *	Calculated according to the CKD-EPI 4 variable equation	6 hours	>90 mL/min/1.73m <sup>2</sup>																																																							
Digoxin	Blood	Serum (SST) or LiHep (PST)	One tube *	Samples should be taken 6-8 hours post dose	24 hours	0.8 – 2.0 μg/L																																																							
Estradiol (E2)	Blood	Serum (SST) or LiHep (PST)	One tube *	Some, but not all, exogenous oestrogens can cross react in the assay. Results may be unreliable if patient is on HRT or an oral contraceptive, depending on the formulation.	6 hours	Follicular phase: 60 – 850 pmol/L Luteal Phase: 80 – 1250 pmol/L Post-menopause: <500 pmol/L																																																							
Faecal Calprotectin	Faeces	Stool pot			2 weeks	<100 μg/g IBD unlikely 100 – 250 μg/g Indeterminate. Repeat & consider referral >250 μg/g Organic pathology likely, suggest urgent referral																																																							
FIB-4	Blood	Serum (SST) and EDTA	BOTH serum and EDTA	Calculated score generated from age, AST, ALT and platelet count.	24 hours	Please refer to abnormal liver blood test algorithm: <a href="https://remedy.bnssgccg.nhs.uk/adults/hepatology/liver-disease/">https://remedy.bnssgccg.nhs.uk/adults/hepatology/liver-disease/</a>																																																							
Follicle stimulating hormone (FSH)	Blood	Serum (SST) or LiHep (PST)	One tube *		24 hours	Follicular phase: 3.5 – 12.5 IU/L Luteal phase: 1.7 – 7.7 IU/L Post-menopause: >30 IU/L Adult male: 1.5 – 12.4 IU/L																																																							
Gamma-glutamyl transferase (GGT)	Blood	Serum (SST) or LiHep (PST)	One tube *	Gamma glutamyl transpeptidase is increased in cholestasis. It can also be induced secondary to many medications and ethanol use.	6 hours	<table><tr><td>&lt;3 weeks</td><td>&lt;165 U/L</td></tr><tr><td>3-12 weeks</td><td>&lt;177 U/L</td></tr><tr><td>3-11 months</td><td>&lt;145 U/L</td></tr><tr><td>1-14 years</td><td>&lt;37 U/L</td></tr><tr><td>Male 15 years +</td><td>10 – 71 U/L</td></tr><tr><td>Female 15 years+</td><td>6 – 42 U/L</td></tr></table>	<3 weeks	<165 U/L	3-12 weeks	<177 U/L	3-11 months	<145 U/L	1-14 years	<37 U/L	Male 15 years +	10 – 71 U/L	Female 15 years+	6 – 42 U/L																																											
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Gentamycin	Blood	Serum (SST) or LiHep (PST)	One tube *	Please refer to Trust guidelines on DMS	6 hours	<1 mg/L				
Globulin	Blood	Serum (SST) or LiHep (PST)	One tube *	Globulin = Total protein - Albumin. Raised results may indicate monoclonal or polyclonal raised immunoglobulins. Low results may indicate low immunoglobulins.	6 hours	22 – 36 g/L				
Glucose	Blood	Fluoride oxalate tube	Min vol 0.5 mL	Serum (SST) or lithium heparin (PST) also acceptable if sample received promptly in the lab. Glucose is rapidly metabolised <i>in vitro</i> unless fluoride oxalate tube used	6 hours	Fasted range: 3.0 – 6.0 mmol/L A result of 7.0 mmol/L if fasted or 11.1 mmol/L if random is consistent with diabetes mellitus A result of 2.6 mmol/L and below is consistent with hypoglycaemia				
	CSF	Fluoride oxalate tube	Min vol 0.5 mL	A plain pot is also acceptable if sample received promptly in the lab.	6 hours	The ratio of CSF:Plasma glucose is typically in the range 0.5-0.8				
Growth Hormone	Blood	Serum (SST) or LiHep (PST)	One tube *	A random GH measurement is of low clinical utility. Best used as part of stimulation or suppression testing. See also IGF1	24 hours	The normal response to a glucose tolerance test is suppression of GH to 0.1 µg/L or lower. The normal response to stimulation testing is GH 5 µg/L or higher.				
Haptoglobin	Blood	Serum (SST) or LiHep (PST)	One tube *		24 hours	Male: 0.5 – 2.0 g/L Female: 0.4 – 1.6 g/L				
HDL Cholesterol	Blood	Serum (SST) or LiHep (PST)	One tube *		6 hours					
Human Chorionic Gonadotrophin (hCG)	Blood	Serum (SST) or LiHep (PST)	One tube *	HCG can be used as a tumour marker when germ cell tumours are suspected. HCG is secreted by the placenta in pregnancy, and therefore also provides the basis for urine pregnancy testing. For patients under the care of the Early Pregnancy Unit, HCG can be used to monitor progression of a pregnancy, but blood should not routinely be used for pregnancy testing.	6 hours	Diagnosis of pregnancy: <ul style="list-style-type: none"><li>Female &lt;5 IU/L</li></ul> Germ cell tumour: <ul style="list-style-type: none"><li>Male &lt;2 IU/L</li><li>Female pre-menopausal &lt;3 IU/L</li><li>Female post-menopausal &lt;12 IU/L</li></ul>				
	CSF	Universal pot	Min vol 0.5 mL	Not validated in this sample type	6 hours					
IgA	Blood	Serum (SST) or LiHep (PST)	One tube *		1 week					
						Age	LRL	URL	units	
						<2 weeks		0.08	g/L	
						2 – 5 weeks		0.2	g/L	
						6 – 11 weeks	0.05	0.4	g/L	
						3 – 5 months	0.1	0.5	g/L	
						6 – 8 months	0.15	0.7	g/L	
						9 – 11 months	0.2	0.7	g/L	
						1 – 2 years	0.3	1.3	g/L	
3 – 5 years	0.4	2	g/L							

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						6 – 11 years	0.5	2.5	g/L	
						12 – 44 years	0.8	2.8	g/L	
						45 years +	0.8	4	g/L	
<b>IgG</b>	Blood	Serum (SST) or LiHep (PST)	One tube *		1 week	Age	LRL	URL	units	
						<2 weeks	5	18	g/L	
						2 – 5 weeks	3.9	13	g/L	
						6 – 11 weeks	2.7	7.7	g/L	
						3 – 5 months	2.4	8.8	g/L	
						6 – 8 months	3	9	g/L	
						9 – 11 months	3	10.9	g/L	
						1 year	3.1	13.8	g/L	
						2 years	3.7	15.8	g/L	
						3 years +	6	16	g/L	
<b>IgM</b>	Blood	Serum (SST) or LiHep (PST)	One tube *		1 week	Age	LRL	URL	units	
						<2 weeks		0.2	g/L	
						2 – 5 weeks	0.08	0.4	g/L	
						6 – 11 weeks	0.15	0.7	g/L	
						3 – 5 months	0.2	1	g/L	
						6 – 8 months	0.4	1.6	g/L	
						9 – 11 months	0.6	2.1	g/L	
						1 year +	0.5	2	g/L	
<b>IgE</b>	Blood	Serum (SST) or LiHep (PST)	One tube *		24 hours (Mon-Fri)	Age	Range	units		
						<1 year	<15	klU/L		
						1 – 4 years	<60	klU/L		
						5 – 8 years	<90	klU/L		
						9 – 14 years	<200	klU/L		
						15 years +	<100	klU/L		
<b>IGF-1</b>	Blood	Serum (SST) or LiHep (PST)	One tube *	This is the screening test for disorders of growth hormone deficiency or excess	24 hours (Mon-Fri)	Age group	Female range	Male range		
						0-2 years	2.2-12.8	1.6-12.5		
						3-5 years	5.7-24.2	3.5-17.6		
						6-9 years	10.6-40.0	8.2-30.8		
						10 years	14.7-52.1	11.2-44.9		
						11 years	16.1-55.9	12.3-51.4		
						12 years	17.3-59.1	13.2-56.9		
						13 years	18.3-61.3	14.1-61.2		

							14 years	19.1-62.9	15.1-64.1	
							15 years	19.8-63.5	15.7-65.6	
							16 years	20.2-63.5	16.4-65.9	
							17 years	20.4-62.7	16.9-64.8	
							18 years	20.4-61.0	17.3-62.4	
							19 years	20.3-58.8	17.6-59.0	
							20 years	19.9-56.2	17.8-55.2	
							21-25 years	18.1-49.1	17.8-45.6	
							26-30 years	15.5-39.7	16.4-35.5	
							31-35 years	13.6-33.4	14.9-32.4	
							36-40 years	12.4-30.3	13.5-30.7	
							41-45 years	11.3-29.1	12.1-29.0	
							46-50 years	10.3-28.6	10.8-27.4	
							51-55 years	9.4-27.5	9.5-26.2	
							56-60 years	8.5-25.4	8.3-25.3	
							61-65 years	7.6-23.1	7.7-24.6	
							66-70 years	7.1-21.5	7.3-24.2	
							71-120 years	7.0-21.0	6.9-24.1	
Insulin	Blood	Serum (SST) or LiHep (PST)	One tube *	For investigation of hypoglycaemia	24 hours	During confirmed hypoglycaemia, insulin result: <ul style="list-style-type: none"><li>&lt;1 mIU/L indicates normal suppression</li><li>&gt;3 mIU/L is highly suggestive of hyperinsulinism</li></ul> In fasted, but not hypoglycaemic, healthy individuals, insulin is typically 3 – 35 mIU/L				
Iron	Blood	Serum (SST) or LiHep (PST)	One tube *	For investigation of suspected overdose	24 hours	6 – 35 µmol/L				
Transferrin Saturation	Blood	Serum (SST) or LiHep (PST)	One tube *	This test should generally be requested only for the investigation of iron overload. Request ferritin frontline to investigate iron deficiency	24 hours (Mon-Fri only)	16 – 40 % (female) 16 – 50 % (male)				
Lactate	Blood	Fluoride oxalate tube	Min vol 0.5 mL	Lactate is rapidly produced by cells <i>in vitro</i> , and samples should always be in a fluoride tube (Adult grey top or paed yellow top)	24 hours	0.5 – 2.2 mmol/L				
	CSF	Fluoride oxalate tube	Min vol 0.5 mL		24 hours	Age	LRL	URL	units	
						<3 days	1.1	6.7	mmol/L	
						3 – 9 days	1.1	4.4	mmol/L	
						10 days – 16 years	1.1	2.8	mmol/L	
						17 years +	1.1	2.4	mmol/L	

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Lactate Dehydrogenase (LDH)	Blood	Serum (SST) or LiHep (PST)	One tube *		24 hours	Age	URL	units	
						< 2 weeks	1130	U/L	
						2 weeks – 11 months	420	U/L	
						1 – 9 years	310	U/L	
						10 – 14 years	270	U/L	
						15 years +	250	U/L	
	CSF	Universal pot	Min vol 0.5 mL		24 hours				
Lipase	Blood	Serum (SST) or LiHep (PST)	One tube *	The first line screen for acute pancreatitis	6 hours	13 – 60 U/L			
Lipoprotein (a)	Blood	Serum (SST) or LiHep (PST)	One tube *		1 week	<75 nmol/L			
Lipoprotein Electrophoresis	Blood	Serum (SST) only	One tube *	Samples should be collected ideally after a 12 hour fast	2 weeks	Reported as Fredrickson classification: Type 1, 2a, 2b, 3, 4, 5			
	Pleural fluid	universal pot	Min vol 1 mL	For diagnosis of chylothorax. Triglycerides will be measured first: A value <0.5 mmol/L excludes chylothorax, and a value >1.2 mmol/L confirms chylothorax.	2 weeks	Reported as either presence or absence of chylomicrons			
Lithium	Blood	Serum (SST) only	One tube *	Serum sample required. Lithium heparin plasma is NOT suitable. Samples for therapeutic monitoring should be taken 12 hours post dose.	24 hours	0.4 – 1.0 mmol/L			
Luteinising hormone (LH)	Blood	Serum (SST) or LiHep (PST)	One tube *		24 hours (Mon-Fri)	Follicular phase: 2.4 – 12.6 IU/L Luteal phase: 1 – 11.4 IU/L Adult male: 1.7 – 8.6 IU/L			
Magnesium	Blood	Serum (SST) or LiHep (PST)	One tube *	Can be falsely reduced due to even slight contamination from EDTA tubes - observe correct order of draw.	6 hours	0.7 – 1.0 mmol/L			
	Urine	Universal pot	Min vol 1 mL		6 hours				
Methadone metabolite (urine)	Urine	Universal pot	Min vol 1 mL	Care should be taken to avoid tampering with the sample and that the sample is fresh and from the correct individual	24 hours (Mon-Fri)	Positive / negative Cut-off 100 ug/L			
Methotrexate	Blood	Serum (SST) or LiHep (PST)	One tube *	ONLY for monitoring of high dose treatment. Methotrexate levels do not need to be measured routinely in patients on long term therapy.	24 hours	Follow trust protocol			
Neurone Specific Enolase (NSE)	Blood	Serum (SST) only	One tube *	A marker of neuronal damage. Also can be raised in non-small cell lung cancer and neuroendocrine tumours.	24 hours	For neuroprognostication post-OHCA, measure NSE on admission and 48h later and calculate the change ΔNSE48: ≤0 µg/L Low probability of poor neurological outcome. 1-10 Moderate probability of poor neurological outcome. >10 Very high probability of poor neurological outcome.			

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						A single result >60 µg/L at 48-72 hours post-ROSC indicates high probability of poor neurological outcome. For tumour marker indication: reference range <17 µg/L																									
NT-proBNP	Blood	Serum (SST) or LiHep (PST)	One tube *		24 hours	>2000 ng/L: Refer urgently to heart failure clinic. 400 – 2000 ng/L: Refer to heart failure clinic & initiate treatment if high clinical suspicion. <400 ng/L: Heart failure unlikely. Review for alternative causes. If suspicion of heart failure remains discuss with cardiology through advice and guidance.																									
Opiates (urine)	Urine	Universal pot	Min vol 1 mL	Care should be taken to avoid tampering with the sample and that the sample is fresh and from the correct individual. Not specific for morphine – codeine will produce a positive result. If confirmation is required please contact the lab.	24 hours (Mon-Fri)	Positive / negative Cut-off 300 ug/L																									
Osmolality	Blood	Serum (SST) or LiHep (PST)	One tube *		24 hours	275 – 290 mOsmol/Kg																									
	Urine	Universal pot	Min vol 1 mL	Paired serum osmolality required for interpretation. If investigating hyponatraemia, it is recommended to additionally request urine sodium.	24 hours	A result of 750 mOsmol/kg or above indicates that the kidney is able to concentrate urine adequately.																									
Paracetamol	Blood	Serum (SST) or LiHep (PST)	One tube *		6 hours	Please refer to the treatment nomogram																									
Parathyroid hormone (PTH)	Blood	EDTA tube	Min vol 1 mL	A concurrent calcium result is required for interpretation.	24 hours	1.6 – 6.9 pmol/L																									
Phenobarbitone	Blood	Serum (SST) or LiHep (PST)	One tube *	Pre dose sample	24 hours	10 – 40 mg/L																									
Phenytoin	Blood	Serum (SST) or LiHep (PST)	One tube *	Pre dose sample. Adjusted phenytoin is also calculated according to the Sheiner-Tozer equation - please use this latter parameter in patients with hypoalbuminaemia	24 hours	10 – 20 mg/L																									
Phosphate	Blood	Serum (SST) or LiHep (PST)	One tube *		6 hours	<table><tr><td>Age</td><td>LRL</td><td>URL</td><td>units</td><td></td></tr><tr><td>&lt;1 month</td><td>1.3</td><td>2.6</td><td>mmol/L</td><td></td></tr><tr><td>1 – 11 months</td><td>1.3</td><td>2.4</td><td>mmol/L</td><td></td></tr><tr><td>1 – 15 years</td><td>0.9</td><td>1.8</td><td>mmol/L</td><td></td></tr><tr><td>16 years +</td><td>0.8</td><td>1.5</td><td>mmol/L</td><td></td></tr></table>	Age	LRL	URL	units		<1 month	1.3	2.6	mmol/L		1 – 11 months	1.3	2.4	mmol/L		1 – 15 years	0.9	1.8	mmol/L		16 years +	0.8	1.5	mmol/L	
Age	LRL	URL	units																												
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1 – 11 months	1.3	2.4	mmol/L																												
1 – 15 years	0.9	1.8	mmol/L																												
16 years +	0.8	1.5	mmol/L																												
Potassium	Blood	Serum (SST) or LiHep (PST)	One tube *	Potassium leaks from cells over time, and so samples should be received in the laboratory or separated within twelve hours. Cold temperatures accelerates this effect. In vitro haemolysis raises serum potassium, and difficult venesection can cause a high potassium. EDTA contamination will also cause falsely raised	6 hours	Neonates: 3.4 – 6.0 mmol/L Babies <1y: 3.5 – 5.7 mmol/L 1 year + 3.5 – 5.3 mmol/L																									

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				results; please observe correct order of draw.		
<b>Procalcitonin (PCT)</b>	Blood	Serum (SST) or LiHep (PST)	One tube *	Please contact microbiology for advice on interpretation	6 hours	<0.25 µg/L
<b>Progesterone</b>	Blood	Serum (SST) or LiHep (PST)	One tube *	For confirmation of ovulation in mid luteal phase (approx. day 21 of a 28 day cycle)	24 hours (Mon-Fri)	Female follicular phase: <4 nmol/L Female luteal phase: ≥30 nmol/L Male: <1 nmol/L
<b>Prolactin</b>	Blood	Serum (SST) or LiHep (PST)	One tube *		24 hours (Mon-Fri)	<700 mIU/L Elevated results will be screened for macroprolactin (unless previously shown to be negative)
<b>Prostate-specific antigen (PSA)</b>	Blood	Serum (SST) or LiHep (PST)	One tube *		24 hours (Mon-Fri)	Please refer to Remedy for cut-offs: <a href="https://remedy.bnssg.icb.nhs.uk/adults/urology/prostate-including-psa/">https://remedy.bnssg.icb.nhs.uk/adults/urology/prostate-including-psa/</a>
<b>Protein Electrophoresis</b>	Blood	Serum (SST) only	Min vol 1 mL	Screening for myeloma <u>must</u> include both serum and urine electrophoresis	1 week	Reported as either the absence of presence of a monoclonal protein. Monoclonal proteins will be isotyped at first presentation only and quantified on every sample.
	Urine	Universal pot	Min vol 2 mL	Also known as Bence Jones Protein (BJP). Minimum 5 mL early morning urine - no preservative required, boric acid tube unsuitable. See also serum free light chains.	1 week	Reported as either the absence of presence of a BJP. Monoclonal proteins will be isotyped at first presentation only. Quantitation not available.
<b>Rheumatoid factor (RF)</b>	Blood	Serum (SST) or LiHep (PST)	One tube *		24 hours	<20 IU/mL
<b>Salicylate</b>	Blood	Serum (SST) or LiHep (PST)	One tube *	For investigation of aspirin overdose	6 hours	
<b>Serum Free Light Chains</b>	Blood	Serum (SST) or LiHep (PST)	One tube *	For use in the diagnosis and monitoring of plasma cell dyscrasia	1 week	Interpretation of kappa:lambda ratio Normal renal function: 0.26 – 1.65 Confirmed CKD (eGFR<60): 0.37 – 3.10 <0.1 or >7.0 is significantly abnormal and urgent referral to haematology is recommended.
<b>Sex Hormone Binding Globulin (SHBG)</b>	Blood	Serum (SST) or LiHep (PST)	One tube *		24 hours (Mon-Fri)	Male: 20 – 75 nmol/L Female: 20 – 130 nmol/L
<b>Sodium</b>	Blood	Serum (SST) or LiHep (PST)	One tube *		6 hours	133 – 146 mmol/L
<b>Sweat Test</b>	Sweat			Please email SweatTestBookings@UHBristol.nhs.uk with Patient ID (Name, DOB, T number, NHS number), clinical indication for test, requesting Consultant and contact number for patient (Parent/Guardian's, Carer or Patient's own). The Duty Paediatric Biochemist will review your request and get back to you to confirm the booking or discuss further. If your request is urgent	1 week	Sweat chloride: <40 mmol/L (<30 if age <6months): Not elevated 40 – 60 mmol/L: Intermediate >60 mmol/L: Elevated

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				please phone x21299 to discuss.							
Tacrolimus	Blood	EDTA tube	Min vol 1 mL	A separate EDTA tube is required, sample should be taken as pre-dose	24 hours	Target ranges for tacrolimus blood concentration are indication-specific. Please refer to local guidelines or specialty advice.					
Testosterone	Blood	Serum (SST) or LiHep (PST)	One tube *	Note that some exogenous steroids such as norethisterone can cause falsely raised results. Significantly elevated results in females can be confirmed using a more specific method if required.	24 hours (Mon-Fri only)	Sex	Age	LRL	URL	units	
						M	<2 year	0.1	1.3	nmol/L	
						M	2 – 7 years	0.2	1.7	nmol/L	
						M	8 – 11 years	0.3	10	nmol/L	
						M	12 – 13 years	0.3	22	nmol/L	
						M	14 – 15 years	3.1	20	nmol/L	
						M	16 years +	8.6	29	nmol/L	
						F	<2 years	0.2	0.5	nmol/L	
						F	2 – 7 years	0.2	1	nmol/L	
						F	8 – 11 years	0.2	1.3	nmol/L	
F	12 years +	0.3	1.7	nmol/L							
Free androgen index	Blood	Serum (SST) or LiHep (PST)	One tube *	For investigation of ?hyperandrogenism in adult females	24 hours (Mon-Fri)	Age 18 – 49 0.3 – 5.6 % Age 50+ 0.2 – 3.6 %					
Calculated free testosterone	Blood	Serum (SST) or LiHep (PST)	One tube *	For investigation of ?hypogonadism in adult males. Vermeulen equation used.	24 hours (Mon-Fri)	0.20 – 0.62 nmol/L					
Theophylline	Blood	Serum (SST) or LiHep (PST)	One tube *	Pre dose sample	24 hours	5 – 10 mg/L					
Thyroid peroxidase antibodies (TPO)	Blood	Serum (SST) or LiHep (PST)	One tube *	TPO positivity may indicate a slightly higher likelihood of progression from sub-clinical to overt hypothyroidism.	24 hours (Mon-Fri)	<34 kIU/L					
Thyroid stimulating hormone (TSH)	Blood	Serum (SST) or LiHep (PST)	One tube *		6 hours	0 – 5 days 1.8 – 28 mIU/L 6 – 13 days 1.8 – 12.6 mIU/L 14 days+ 0.27 – 4.2 mIU/L					
Free T3	Blood	Serum (SST) or LiHep (PST)	One tube *	Only requestable by laboratory. Please request TFT and provide full clinical details. Assay will be performed if indicated.	6 hours	0 – 5 days 2.6 – 9.6 pmol/L 6 – 13 days 3.0 – 9.2 pmol/L 14 days+ 3.1 – 6.8 pmol/L					
Free T4	Blood	Serum (SST) or LiHep (PST)	One tube *	Included as part of TFT in children, in known/suspected pituitary disease, and if TSH is abnormal. Please provide clinical details.	6 hours	0 – 5 days 11 – 32 pmol/L 6 – 13 days 11.5 – 28.3 pmol/L 14 days+ 12 – 22 pmol/L					
Tissue transglutaminase IgA (coeliac screen)	Blood	Serum (SST) or LiHep (PST)	One tube *	Anti-tissue transglutaminase (TTG) is the most useful biochemical test for the diagnosis of coeliac. Total IgA will also be measured. In conjunction with European guidelines (NICE/BSG/ESPGHAN) HLA DQ2/DQ8 is available as a separate request in children with	1 week	Normal <4 IU/mL Results of 4 IU/mL or more will be confirmed with IgA anti-endomysial Abs. If total IgA <0.3 g/L IgG anti-endomvsial Abs will be					

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				strong positive coeliac serology to avoid the need for biopsy. Patients must be on a normal (gluten-containing) diet for at least one month before testing.		performed (regardless of TTG result)																													
Tobramycin	Blood	Serum (SST) or LiHep (PST)	One tube *		24 hours	<1 mg/L																													
Total protein	Blood	Serum (SST) or LiHep (PST)	One tube *		6 hours	60 – 80 g/L																													
	CSF	Universal pot	Min vol 0.5 mL		6 hours	< 1 month: 0.15 – 1.30 g/L 1 month+ <0.54 g/L																													
	Urine	24h bottle (plain)		A plain bottle is required (acid collection is UNSUITABLE)	6 hours	<0.15 g/24h																													
	Urine	Universal pot	Min vol 1 mL	For calculation of protein:creatinine ratio (PCR). Note that ACR is recommended in preference to PCR for proteinuria screening in patients with risk factors for the development of CKD	6 hours	PCR of 50 mg/mmol or more (30 mg/mmol in pregnancy) is clinically important proteinuria. PCR of 100 mg/mmol or more: Unless previously known and appropriately managed, consider referral for renal opinion. If diabetic, manage according to diabetes pathway. PCR of 300 mg/mmol or more: Nephrotic range proteinuria. Unless previously known and appropriately managed, an urgent renal referral is indicated.																													
Triglyceride	Blood	Serum (SST) or LiHep (PST)	One tube *		6 hours	<3 months: 1.1 – 2.3 mmol/L 3 months – 13 years: 0.4 – 1.2 mmol/L 14 years + 0.5 – 1.7 mmol/L																													
	Fluid	Universal pot	Min vol 1 mL	Not validated in this sample type	6 hours	Pleural fluid triglyceride result: <0.5 mmol/L excludes chylothorax >1.2 mmol/L confirms chylothorax 0.5 – 1.2 please request fluid lipoprotein electrophoresis																													
Troponin T	Blood	Serum (SST) or LiHep (PST)	One tube *	Please refer to the Trust ACS protocol	6 hours	99 <sup>th</sup> percentile is 14 ng/L																													
Urea	Blood	Serum (SST) or LiHep (PST)	One tube *		6 hours	<table><tr><td>Age</td><td>LRL</td><td>URL</td><td>units</td><td></td></tr><tr><td>&lt;1 month</td><td>0.8</td><td>5.5</td><td>mmol/L</td><td></td></tr><tr><td>1 – 11 months</td><td>1</td><td>5.5</td><td>mmol/L</td><td></td></tr><tr><td>1 – 15 years</td><td>2.5</td><td>6.5</td><td>mmol/L</td><td></td></tr><tr><td>16 years +</td><td>2.5</td><td>7.8</td><td>mmol/L</td><td></td></tr></table>					Age	LRL	URL	units		<1 month	0.8	5.5	mmol/L		1 – 11 months	1	5.5	mmol/L		1 – 15 years	2.5	6.5	mmol/L		16 years +	2.5	7.8	mmol/L	
Age	LRL	URL	units																																
<1 month	0.8	5.5	mmol/L																																
1 – 11 months	1	5.5	mmol/L																																
1 – 15 years	2.5	6.5	mmol/L																																
16 years +	2.5	7.8	mmol/L																																
Uric Acid / Urate	Blood	Serum (SST) or LiHep (PST)	One tube *		6 hours	<table><tr><td>Sex</td><td>Age</td><td>LRL</td><td>URL</td><td>units</td><td></td></tr><tr><td>B</td><td>&lt;8 years</td><td>60</td><td>240</td><td>μmol/L</td><td></td></tr><tr><td>M</td><td>8 – 10 years</td><td>70</td><td>350</td><td>μmol/L</td><td></td></tr></table>					Sex	Age	LRL	URL	units		B	<8 years	60	240	μmol/L		M	8 – 10 years	70	350	μmol/L								
Sex	Age	LRL	URL	units																															
B	<8 years	60	240	μmol/L																															
M	8 – 10 years	70	350	μmol/L																															



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						F	8 – 10 years	130	370	μmol/L																																								
						M	11 – 15 years	120	460	μmol/L																																								
						F	11 – 15 years	150	390	μmol/L																																								
						F	16 – 49 years	190	360	μmol/L																																								
						M	16 years +	200	430	μmol/L																																								
						F	50 years +	140	360	μmol/L																																								
	Urine	Universal pot	Min vol 1 mL		6 hours	Urate:creatinine ratio: <2 years      0.30 – 1.5 2 – 15 years    0.30 – 1.0 F 16 years +   0.25 – 0.35 M 16 years +   0.30 – 0.45																																												
		24h collection (plain)	n/a		6 hours	24h urate excretion: 1.5 – 4.5 mmol/24h																																												
Vancomycin	Blood	Serum (SST) or LiHep (PST)	One tube *	Please refer to Trust guideline	24 hours	10 – 15 mg/L																																												
Vitamin A & E	Blood	Serum (SST) or lithium heparin (PST)	Min vol 1 mL		2 weeks	<table><tr><td>Group</td><td>Vit A (umol/L)</td><td>Vit E (umol/L)</td></tr><tr><td>&lt;4 years</td><td>0.5 – 1.6</td><td rowspan="4">10.2 – 39.0</td></tr><tr><td>4 – 17 years</td><td>0.8 – 2.2</td></tr><tr><td>18+ Male</td><td>1.1 – 3.4</td></tr><tr><td>18+ Female</td><td>0.8 – 3.0</td></tr></table>					Group	Vit A (umol/L)	Vit E (umol/L)	<4 years	0.5 – 1.6	10.2 – 39.0	4 – 17 years	0.8 – 2.2	18+ Male	1.1 – 3.4	18+ Female	0.8 – 3.0																												
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Vitamin D (25-OH-vitD)	Blood	Serum (SST) or LiHep (PST)	One tube *	<a href="https://remedy.bnssgccg.nhs.uk/media/3244/ssg-adult-vitamin-d-prescribing-guidance.pdf">https://remedy.bnssgccg.nhs.uk/media/3244/ssg-adult-vitamin-d-prescribing-guidance.pdf</a>	24 hours (Mon-Fri)	<25 nmol/L      Deficiency 25 – 50 nmol/L    Insufficiency >50 nmol/L        Adequate (but sub-optimal in children) >75 nmol/L        Optimal (in children)																																												
VMA & HVA (Neuroblastoma investigations)	Urine	Universal pot	Min vol 0.25 mL  (ideally more)	May not be possible to provide result if very dilute sample. If high priority please phone the duty metabolic biochemist on 21299 to discuss	1 week	<table><tr><td>Age</td><td>HVA (mmol/mol creatinine)</td><td></td><td>Age</td><td>VMA (mmol/mol creatinine)</td></tr><tr><td>0 - 1 y</td><td>&lt; 16.8</td><td></td><td>0 - 6 m</td><td>&lt; 13.2</td></tr><tr><td>1 - 2 y</td><td>&lt; 14.9</td><td></td><td>6 m - 1 y</td><td>&lt; 11.3</td></tr><tr><td>2 - 3 y</td><td>&lt; 10.4</td><td></td><td>1 - 2 y</td><td>&lt; 10.7</td></tr><tr><td>3 - 5 y</td><td>&lt; 8.7</td><td></td><td>2 - 6 y</td><td>&lt; 7.0</td></tr><tr><td>5 - 7 y</td><td>&lt; 7.8</td><td></td><td>6 - 10 y</td><td>&lt; 5.1</td></tr><tr><td>7 - 12 y</td><td>&lt; 5.5</td><td></td><td>10 - 15 y</td><td>&lt; 4.4</td></tr><tr><td>&gt; 12 y</td><td>&lt; 4.1</td><td></td><td>&gt; 15 y</td><td>&lt; 2.7</td></tr></table>					Age	HVA (mmol/mol creatinine)		Age	VMA (mmol/mol creatinine)	0 - 1 y	< 16.8		0 - 6 m	< 13.2	1 - 2 y	< 14.9		6 m - 1 y	< 11.3	2 - 3 y	< 10.4		1 - 2 y	< 10.7	3 - 5 y	< 8.7		2 - 6 y	< 7.0	5 - 7 y	< 7.8		6 - 10 y	< 5.1	7 - 12 y	< 5.5		10 - 15 y	< 4.4	> 12 y	< 4.1		> 15 y	< 2.7
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> 12 y	< 4.1		> 15 y	< 2.7																																														
Xanthochromia (CSF pigments)	CSF	Universal pot	Min vol 0.5 mL	CSF must be collected according to protocol and protected from light. If sent outside core hours (8am-7pm, 7 days a week),	24 hours	The presence of bilirubin (with or without oxyhaemoglobin) is suggestive of SAH.																																												

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				results will routinely be reported the next morning. Please contact the on-call Biochemist if results are required more urgently. Refer to <a href="http://www.avon.nhs.uk/dms/download.aspx?did=12956">http://www.avon.nhs.uk/dms/download.aspx?did=12956</a> for more information.		
<b>Amino Acids</b>	Plasma	Lithium heparin tube	Min vol 0.6 mL	Clinical information is essential	2 weeks	Please contact the duty metabolic biochemist for interpretation x21299
	CSF	Universal pot	Min vol 0.5 mL	Paired plasma amino acids required. Blood-stained CSF unsuitable.	2 weeks	
	Urine	Universal pot	Min vol 0.5 mL	For first line investigation of a metabolic disorder, plasma amino acids and urine organic acids are recommended.	2 weeks	
<b>Organic Acids (urine)</b>	Urine	Universal pot	Min vol 2 mL		2 weeks	
<b>Biotinidase</b>	Blood	EDTA tube	1 tube	Sample must be received in lab within 6 hours of collection.	2 weeks	2.6 – 7.0 µmol/L/min
<b>Chitotriosidase</b>	Blood	EDTA tube	1 tube	Screening test for lysosomal storage disorder (e.g. Gaucher, Niemann-Pick C). Included in white cell enzymes screen, also used for monitoring ERT in Gaucher	4 weeks	<150 µmol/L/hour
<b>Alpha-galactosidase (Fabry Screen)</b>	Blood	EDTA tube	1 tube	Samples should be received in lab by 3 pm Mon-Fri. If high priority please phone the duty metabolic biochemist on 21299 to discuss	6 weeks	
<b>Gaucher Screen</b>	Blood	EDTA tube	1 tube	Samples should be received in lab by 3 pm Mon-Fri. If high priority please phone the duty metabolic biochemist on 21299 to discuss	5 weeks	0 – 2 weeks <165 U/L 3 – 12 weeks <177 U/L 3 – 11 months <145 U/L 1 – 14 years <37 U/L Male 15+ 10 – 71 U/L Female 15+ 6 – 42 U/L
<b>Homocysteine</b>	Blood	Special tube available from laboratory	Min vol 1 mL	Sample must either be collected on ice and transported to the laboratory within 30minutes, or alternatively a special tube is required: EDTA tube with 3-DAD preservative added. Available from Biochemistry.	2 weeks	Male <14.3 µmol/L Female <11.3 µmol/L
<b>White Cell Enzymes / Lysosomal Enzymes Screen</b>	Blood	EDTA tube	Min vol 2 mL	Please note: This test should not be requested between 12:00 Friday and 18:00 Sunday. It is NOT possible to process samples received during this time. If high priority please phone the duty metabolic biochemist on 21299 to discuss	4 weeks	
<b>MPS Enzymes</b>	Blood	EDTA tube	Min vol 2 mL	Samples should be received in lab by 3 pm Mon-Fri. MPS screen composed of 2 parts. 1st part quantitative screen 2 weeks TAT. If 2D GAG electrophoresis reflexed this will be an additional 3-4	Up to 6 weeks	

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				weeks.		
<b>Mucopolysaccharide Screen (MPS) (urine)</b>	Urine	Universal pot	Min vol 2 mL	Clinical information is essential.	2 weeks	
<b>Duodenal Disaccharidase</b>	Duodenal biopsy	Universal pot			4 weeks	

## REFERRED INVESTIGATIONS

- Samples for these tests are sent to other laboratories for analysis.
- Turnaround time will be much longer than for in house testing. If a result is required more urgently, please contact the lab to discuss this.

Test Name	Sendaway location	Sample type	Sample container	Volume	Test information	Target TAT
<b>1,25 Vitamin D</b>	Norfolk and Norwich University Hospital	Blood	Serum (SST) only	Min vol 1 mL	Must contact the laboratory prior to sending sample, as serum needs to be frozen on day of collection. Lithium heparin NOT suitable.	4 weeks
<b>11-Deoxycortisol</b>	St. Thomas' Hospital, London	Blood	Serum (SST) or lithium heparin (PST)	Min vol 1 mL	For diagnosis of 11-hydroxylase CAH	4 weeks
<b>17-OH Progesterone (17OHP)</b>	University Hospital of Wales, Cardiff	Blood	Serum (SST) or lithium heparin (PST)	Min vol 0.5 mL	Screening test for Congenital Adrenal Hyperplasia. Please phone lab if urgent. This test is NOT suitable for children under 2 days old.	1 week
<b>17-OH Progesterone in blood spot</b>	Southmead Hospital	Blood spot	Guthrie card (DBS)		Monitoring CAH	2 weeks
<b>17-OH progesterone in saliva</b>	University Hospital of Wales, Cardiff	Saliva	contact lab for salivette		Monitoring CAH	2 weeks
<b>5-Alpha-Dihydrotestosterone</b>	St James University Hospital, Leeds	Blood	Serum (SST) or lithium heparin (PST)	Min vol 0.6 mL	For investigation of 5-alpha-reductase deficiency	4 weeks
<b>7-Dehydroxycholesterol (SLOS screen)</b>	Biochemical Genetics, Southmead	Blood	Lithium heparin tube	Min vol 0.6 mL	Sample should be protected from light	2 weeks
<b>Acetyl Choline Receptor Antibodies</b>	Immunology, Southmead	Blood	Serum (SST) or lithium heparin (PST)	Min vol 1 mL	Screening test for Myasthenia Gravis	2 weeks
<b>Acyl Carnitine (Blood Spot)</b>	Paediatric Chemistry, Sheffield Children's Hospital	Blood spot	Guthrie card / DBS		Urgent samples can be prioritised and turned around more quickly. Please phone the duty metabolic biochemist on 21299 to discuss.	3 weeks
<b>Acyl Carnitine (Plasma)</b>	Paediatric Chemistry, Sheffield Children's Hospital	Blood	Lithium heparin tube	Min vol 1 mL	Urgent samples can be prioritised and turned around more quickly. Please phone the duty metabolic biochemist on 21299 to discuss.	3 weeks
<b>Adrenal Antibodies</b>	Immunology, Southmead	Blood	Serum (SST) only	Min vol 1 mL		2 weeks
<b>Aldosterone and renin (for ARR)</b>	Kings College Hospital, London	Blood	EDTA tube	Min vol 2 mL	Must be received and processed by the laboratory within 3 hours of sample collection. A number of antihypertensive medications interfere with this test, please contact the laboratory to discuss.	4 weeks
<b>Allopurinol</b>	Purine Research Laboratory,	Blood	EDTA tube	1 tube		4 weeks

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	St Thomas' Hospital, London	Urine	24h bottle (thymol)	n/a		4 weeks
<b>Alpha aminoadipic semi-aldehyde (urine)</b>	Institute of Child Health, London	Urine	Universal pot	Min vol 2 mL	Send urgently needs to be frozen on receipt	4-6 weeks
<b>Alpha subunit</b>	Queen Elizabeth Hospital, Birmingham	Blood	Serum (SST) only	1 tube	For investigation of TSHoma and thyroid hormone resistance	4 weeks
<b>Alpha-1-antitrypsin (Faeces)</b>	St Thomas' Hospital, London	Faeces	Stool pot		For investigation of protein losing enteropathy	2 weeks
<b>Aluminium</b>	Southmead Hospital	Blood	Trace element tube	1 tube		4 weeks
<b>Aluminium (urine)</b>	Trace Elements Lab, Guildford	Urine	Universal pot	Min vol 10 mL	Sample MUST be collected into 20mL white topped sterile pot. Containers with metal lids are unsuitable.	4 weeks
<b>Amiodarone</b>	Cardiff Toxicology Laboratories, Llandough	Blood	Serum (SST) or lithium heparin (PST)	Min vol 2 mL	Pre dose sample	2 weeks
<b>Amitriptyline</b>	Cardiff Toxicology Laboratories, Llandough	Blood	EDTA tube	Min vol 2 mL		2 weeks
<b>Amphetamine confirmation (urine)</b>	Cardiff Toxicology Laboratories, Llandough	Urine	Universal pot	Min vol 1 mL		2 weeks
<b>Anaphylaxis Studies (Mast cell tryptase)</b>	Immunology, Southmead	Blood	Serum (SST) only	Min vol 2 mL	Ensure samples are taken at the correct time after event	2 weeks
<b>Androstenedione</b>	University Hospital of Wales, Cardiff	Blood	Serum (SST) or lithium heparin (PST)	Min vol 1 mL	Androstenedione and DHEAS are analysed and reported together	2 weeks
<b>Anti-basal ganglia antibodies</b>	Neuroimmunology and CSF unit, NHNN, UCLH	Blood	Serum (SST) only	1 tube	Neurology. Sydenham's chorea, tics, Tourette's	4 weeks
<b>Anti-enterocyte Abs</b>	Protein Reference Unit, Sheffield	Blood	Serum (SST) only	1 tube		4 weeks
<b>Anti-GAD Abs (for neurology indications)</b>	Churchill Hospital, Oxford	Blood	Serum (SST) only	Min vol 1 mL	For investigation of Stiff-person syndrome	4 weeks
<b>Anti-glycine receptor antibodies</b>	Churchill Hospital, Oxford	Blood	Serum (SST) only	1 tube		4 weeks
<b>Anti-mullerian hormone (AMH)</b>	Southmead Hospital	Blood	Serum (SST) or lithium heparin (PST)	Min vol 0.5 mL	Beckman-Coulter AMH. AMH levels vary with age, results should be interpreted in light of clinical context. AMH levels in the range 6.5 - 19.8 pmol/L predict a normal response to controlled ovarian stimulation.	1 week
<b>Anti-neutrophil antibodies</b>	NHS blood & transplant, Filton	Serum & EDTA blood	Serum (SST) and EDTA	2 tubes	Sample must arrive in lab in the morning. We require both a serum and an EDTA whole blood tube	4 weeks

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<b>Anti-retinal antibodies</b>	Neuroimmunology and CSF unit, NHNN, UCLH	Blood	Serum (SST) only	1 tube		4 weeks
<b>Anti-TNF monoclonal antibody therapy monitoring</b>	Exeter	Blood	Serum (SST) or lithium heparin (PST)	1 tube	Please state which drug (or biosimilar) is prescribed. E.g. Infliximab/inflectra Adalimumab/remsuma	2 weeks
<b>AP50</b>	Immunology, Southmead	Blood	Serum (SST) only	Min vol 1 mL		2 weeks
<b>Apolipoprotein A1</b>	St Thomas' Hospital, London	Blood	Serum (SST) or lithium heparin (PST)	Min vol 1 mL		2 weeks
<b>Apolipoprotein B</b>	St Thomas' Hospital, London	Blood	Serum (SST) or lithium heparin (PST)	Min vol 1 mL		2 weeks
<b>Apolipoprotein E genotype</b>	University Hospital of Wales, Cardiff	Blood	EDTA tube	1 tube		4 weeks
<b>Aquaporin 4 Antibodies</b>	Churchill Hospital, Oxford	Blood	Serum (SST) or lithium heparin (PST)	Min vol 1 mL		4 weeks
<b>Arsenic</b>	Trace Elements Lab, Guildford	Blood	Trace element tube	1 tube	No seafood to be consumed for 72hrs prior.	4 weeks
		Urine	Universal pot	Min vol 10 mL	No seafood to be consumed for 72hrs prior.	4 weeks
<b>Arylsulphatase C (steroid sulphatase screen)</b>	Willink Laboratory, Manchester	Blood	EDTA tube	Min vol 0.2 mL	Samples should be sent Mon-Thur to reach lab by 3 pm. Inform lab in advance.	4 weeks
<b>Aspartylglucosaminidase</b>	Willink Laboratory, Manchester	Blood	EDTA tube	1 tube	Sample must be separated and frozen within 24h	4 weeks
<b>Aspergillus (IgG)</b>	Immunology, Southmead	Blood	Serum (SST) or lithium heparin (PST)	Min vol 1 mL		2 weeks
<b>Barbiturate Screen (Urine)</b>	Birmingham City Hospital	Urine	Universal pot	Min vol 1 mL		2 weeks
<b>Benzodiazepine Confirmation (urine)</b>	Birmingham City Hospital	Urine	Universal pot	Min vol 1 mL		2 weeks
<b>Beta-2-Microglobulin (Serum)</b>	Immunology, Southmead	Blood	Serum (SST) only	Min vol 1 mL		2 weeks
<b>Beta-2-Microglobulin (urine)</b>	Protein Reference Unit, Sheffield	Urine	Universal pot	Min vol 2 mL		2 weeks

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<b>Beta-Carotene</b>	St Helier Hospital, Surrey	Blood	Serum (SST) or lithium heparin (PST)	Min vol 1 mL		2 weeks
<b>Beta-Hydroxybutyrate &amp; free fatty acids</b>	Sheffield Children's Hospital	Blood	Fluoride oxalate tube	Min vol 0.2 mL	AKA non-esterified fatty acids	3 weeks
<b>Bile Acids (urine)</b>	Paediatric Chemistry, Sheffield Children's Hospital	Urine	Universal pot	Min vol 5 mL	For investigation of peroxisomal disorders and disorders of bile acid synthesis and metabolism.	4-6 weeks
<b>Bone specific ALP</b>	Northern General Hospital, Sheffield	Blood	Serum (SST) only	Min vol 2 mL	Monitoring response to therapy in osteoporosis, Paget's disease, metabolic bone disease	4 weeks
<b>Bone Turnover Markers</b>	Royal Liverpool University Hospital	Blood	EDTA tube	1 tube	This test requires a 9 AM overnight fasted sample	4 weeks
<b>Bone Turnover Markers (urine)</b>	Northern General Hospital, Sheffield	Urine	Universal pot	Min vol 5 mL	Second void morning urine	4 weeks
<b>Bromide</b>	Birmingham City Hospital	Blood	Serum (SST) or lithium heparin (PST)	Min vol 2 mL	For patients on bromide therapy only	4 weeks
<b>Busulfan</b>	Chemical Pathology, Great Ormond Street	Blood	EDTA tube		Please inform the lab in advance. Samples need to come to laboratory urgently	24 hours (Mon-Fri only)
<b>C-1-Esterase Inhibitor</b>	Immunology, Southmead	Blood	Serum (SST) only	Min vol 1 mL	Screening test for hereditary angio-oedema. A separate serum sample is required for this test. Will not be processed in the presence of normal C4 concentrations.	2 weeks
<b>Cadmium</b>	Trace Elements Lab, Guildford	Blood	EDTA tube	1 tube	For acute exposure or suspected toxicity.	4 weeks
		Urine	Universal pot	Min vol 20 mL	For monitoring of long-term exposure. Should not be requested in acute toxicity, as urine concentrations are often misleadingly low until threshold concentration reached.	4 weeks
<b>Caeruloplasmin</b>	Southmead Hospital	Blood	Serum (SST) or lithium heparin (PST)	Min vol 0.5 mL	Request copper and caeruloplasmin if Wilsons disease is suspected.	2 weeks
<b>Calcitonin</b>	Kings College Hospital, London	Blood	Serum (SST) only	Min vol 1 mL	Sample MUST be packed in ice for dispatch to the laboratory.	2 weeks
<b>Calcium Gated Channel Antibodies</b>	Oxford Immunology	Blood	Serum (SST) only	Min vol 1 mL		4 weeks
<b>Calculi</b>	Special Chemistry, UCLH	Stone	Universal pot			2 weeks
<b>Cannabinoids (urine)</b>	Southmead Hospital	Urine	Universal pot	Min vol 1 mL	Normally detectable for up to 2-3 days after acute exposure but up to 2-3 weeks after chronic use. Care should be taken to avoid tampering with the sample and that the sample is fresh and from the correct individual	1 week

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<b>Carbohydrate Deficient Transferrin (for atypical glycoforms)</b>	Institute of Neurology, London	Blood	Serum (SST) or lithium heparin (PST)	Min vol 0.5 mL	For investigation of congenital disorders of glycosylation	4 weeks
<b>Carbohydrate Deficient Transferrin (adult)</b>	King's College Hospital, London	Blood	Serum (SST) only	Min vol 2 mL	For investigation of alcohol excess.	2 weeks
<b>Cardiolipin (Barth syndrome test)</b>	Amsterdam Medical Centre	Blood	EDTA tube	1 tube	Samples need to be received in the laboratory Monday-fri, by 3 pm at the latest. Samples can be prioritised: phone 21299	4-6 weeks
<b>Carnitine (urine)</b>	Paediatric Chemistry, Sheffield Children's Hospital	Urine	Universal pot	Min vol 5 mL	For the investigation of primary carnitine deficiency (carnitine transporter deficiency). For total/free carnitine request plasma acylcarnitines.	4 weeks
<b>CH50</b>	Immunology, Southmead	Blood	Serum (SST) only	Min vol 1 mL		2 weeks
<b>Cholinesterase</b>	Southmead Hospital	Blood	EDTA tube	1 tube	Screening test for Suxamethonium sensitivity (Scoline Apnoea). Full clinical details including family history (where known) are essential.	4 weeks
<b>Chromium &amp; cobalt</b>	Southmead Hospital	Blood	EDTA tube	1 tube	Used in patients with suspected toxicity following exposure or for monitoring of metal-on-metal hip transplants by orthopaedic surgeons.	4 weeks
<b>Chromogranins (A &amp; B)</b>	SAS Laboratory, Charing Cross Hospital	Blood	EDTA tube	Min vol 2 mL	Sample on ice sent to lab immediately.	4 weeks
<b>Citrate (urine)</b>	Special Chemistry, UCLH	Urine	24h bottle (acid)	n/a		2 weeks
			Universal pot	Min vol 8 mL		2 weeks
<b>CK isoenzymes / macro-CK</b>	Special Chemistry, UCLH	Blood	Serum (SST) only			4 weeks
<b>Clozapine</b>	Cardiff Toxicology Laboratories, Llandough	Blood	EDTA tube	Min vol 1 mL	Samples should normally sent via clozapine monitoring service	2 weeks
<b>Cocaine Confirmation (urine)</b>	Birmingham City Hospital	Urine	Universal pot	Min vol 1 mL		2 weeks
<b>Complement anti-C1q antibodies</b>	University Hospital of Wales, Cardiff	Blood	Serum (SST) only	1 tube	For investigation of SLE with renal involvement	4 weeks
<b>Complement C5-9 (CD-25, soluble complement)</b>	University Hospital of Wales, Cardiff	Blood	EDTA tube		Sample must be snap frozen in lab ASAP. Please arrange in advance with the paediatric duty biochemist.	4 weeks
<b>Copeptin</b>	Freeman Hospital, Newcastle	Blood	Serum (SST) only	Min vol 1 mL	Only for use in confirmation of nephrogenic DI, or as part of a saline stimulation test for diagnosis of cranial DI.	2 weeks
<b>Copper</b>	Southmead Hospital	Blood	Trace element tube	Min vol 0.5 mL	ADULTS: Trace element tube only. PAEDS: Lithium heparin tube acceptable.	2 weeks
<b>Copper (liver)</b>	Trace Elements Lab, Cardiff	Liver biopsy	Universal pot		Should arrive in lab immediately after collection, wrapped in foil, inside a plain universal container	4 weeks
<b>Copper (urine)</b>	Trace Elements Lab,	Urine	24h bottle (plain)		Plain or acid collections both acceptable.	4 weeks



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	Guildford					
<b>Creatine (plasma) and Guanidinoacetate (urine)</b>	Clinical Biochemistry, Cambridge	Blood and urine	Lithium heparin (PST) and universal pot	Min 1 mL blood & 1 mL urine	Send urgently needs to be frozen on receipt	4 weeks
<b>Cryoglobulin</b>	Southmead Hospital	Blood	Serum (SST) only	1 tube	Laboratory staff must be present at the time of blood collection to ensure sample kept at 37°C - please contact Biochemistry x 22291.	2 weeks
<b>CSF Neurotransmitters</b>	Neurometabolic Unit, National Hospital, London	CSF	Special tubes provided by the lab		Referred investigation. Samples can be prioritised. Please phone the duty metabolic biochemist on 21299 to discuss. CSF must be immediately flash-frozen in liquid nitrogen post sampling - contact laboratory for details.	4-6 weeks
<b>Cyanide</b>	Cardiff Toxicology Laboratories, Llandough	Blood	EDTA tube	Min vol 0.5 mL		1 week
<b>Cystatin C</b>	Kings College Hospital, London	Blood	Serum (SST) or lithium heparin (PST)	Min vol 2 mL		2 weeks
<b>Cystine in White blood cells</b>	St James University Hospital, Leeds	Blood	Lithium heparin (NO GEL)	Min vol 3 mL	Inform lab in advance. Samples to be sent Mon-Thur only. Collect 5ml sample into gel-free heparin tube (Dark green top). Send to lab before 3pm.	4 weeks
<b>DHEA Sulphate</b>	University Hospital of Wales, Cardiff	Blood	Serum (SST) or lithium heparin (PST)	Min vol 1 mL	Androstenedione and DHEAS are analysed and reported together	2 weeks
<b>Diabetes antibodies (GAD, IA2, ZnT8)</b>	Kings College Hospital, London	Blood	Serum (SST) only	Min vol 1 mL	For differential diagnosis of type 1 and type 2 diabetes mellitus	2 weeks
<b>Dimethylglycine (urine)</b>	Paediatric Chemistry, Sheffield Children's Hospital	Urine	Universal pot	Min vol 2 mL		4 weeks
<b>DPD-SFU</b>	Southmead Hospital	Blood	EDTA tube	1 tube		4 weeks
<b>Eculizumab</b>	Cambridge Biomedical	Blood			Please contact the lab prior to taking the sample. A specific bottle is required	4 weeks
<b>ELF (Enhanced liver fibrosis) test</b>	Southmead Hospital	Blood	Serum (SST) only	Min vol 1 mL	Calculated score generated from TIMP-1, P3NP, HA. Please refer to abnormal liver blood test algorithm on remedy <a href="https://remedy.bnsgccg.nhs.uk/adults/hepatology/liver-disease/">https://remedy.bnsgccg.nhs.uk/adults/hepatology/liver-disease/</a>	2 weeks
<b>Epimerase</b>	Southmead Hospital	Blood	Lithium heparin (NO GEL) only	Min vol 0.5 mL		2 weeks
<b>Endomysial Antibodies</b>	Immunology, Southmead	Blood	Serum (SST) or lithium heparin (PST)	Min vol 1 mL		2 weeks

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<b>Essential fatty acids</b>	Biolab Medical Unit, London	Blood	EDTA tube		Must arrive on Mon-Thur	4 weeks
<b>Ethanol</b>	Southmead Hospital	Blood	Fluoride oxalate tube	Min vol 1 mL	Serum ethanol measurement is rarely helpful. Discuss with lab in advance. Fluoride oxalate sample is required.	24 hours (Mon-Fri only)
<b>Ethylene Glycol</b>	Southmead Hospital	Blood	Fluoride oxalate tube	Min vol 0.5 mL	Laboratory MUST be informed of request by telephone (ext. 23430 or bleep on call biochemist out of hours).	24 hours (Mon-Fri only)
<b>Faecal elastase</b>	Southmead Hospital	Faeces	Stool pot		Faecal elastase is the preferred test for exocrine pancreatic function	2 weeks
<b>Fibroblast growth factor 23 (FGF23)</b>	Norfolk & Norwich University Hospitals	Blood	EDTA tube	1 tube	Please ensure that the sample is delivered immediately to the lab (this is an unstable analyte)	4 weeks
<b>Flecainide</b>	Cardiff Toxicology Laboratories, Llandough	Blood	EDTA tube	Min vol 2 mL	Pre dose sample	2 weeks
<b>Free Fetal DNA</b>	NHS blood & transplant, Filton	Blood	Crossmatch sample	1 tube		2 weeks
<b>Free Phenytoin</b>	TDM Unit, National Society for Epilepsy, Buckinghamshire	Blood	Serum (SST) or lithium heparin (PST)	Min vol 2 mL	Pre dose sample	2 weeks
<b>Fructosamine</b>	Royal United Hospital, Bath	Blood	Serum (SST) or lithium heparin (PST)	Min vol 1 mL	Only indicated for monitoring of diabetes in patients with haemoglobin variants	2 weeks
<b>Gal-1-PUT (galactosaemia screen)</b>	Biochemical Genetics, Southmead	Blood	Lithium heparin (NO GEL)	Min vol 0.5 mL	Collect sample into heparin tube. Place tube inside plain universal pot and label pot 'Do Not Spin'.	1 week
<b>Galactitol (urine)</b>	Biochemical Genetics, Southmead	Urine	Universal pot	Min vol 2 mL		4 weeks
<b>Galactokinase</b>	Biochemical Genetics, Southmead	Blood	Lithium heparin tube	Min vol 2 mL		4 weeks
<b>Ganglioside Antibodies</b>	Queen Elizabeth Hospital, Glasgow	Blood	Serum (SST) only	Min vol 1 mL		4 weeks
<b>Gastrin</b>	SAS Laboratory, Charing Cross Hospital	Blood	EDTA tube	Min vol 2 mL	Sample on ice sent to lab immediately. Patient must off proton pump inhibitors for 2 weeks, patient should be fasted	4 weeks
<b>Glomerular Basement Membrane Antibodies</b>	Immunology, Southmead	Blood	Serum (SST) only	Min vol 1 mL		1 week
<b>Glucagon</b>	SAS Laboratory, Charing Cross Hospital	Blood	EDTA tube	Min vol 2 mL	Sample must be collected and delivered to laboratory on ice.	4 weeks
<b>Gut Hormones</b>	SAS Laboratory, Charing Cross Hospital	Blood	EDTA tube	1 tube	Sample on ice sent to lab immediately. Patient must off proton pump inhibitors for 2 weeks, patient should be fasted	4 weeks

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<b>HLH profile</b>	Immunology, GOSH	Blood	EDTA tube	Min vol 3 mL	Please contact the metabolic biochemist prior to taking sample	4 weeks
<b>HPRT activity</b>	Purine Research Laboratory, St Thomas' Hospital, London	Blood	EDTA tube	Min vol 4 mL	Hypoxanthine Phosphoribosyltransferase deficiency causes Lesch-Nyhan syndrome	4 weeks
<b>Human Leukocyte Antigen (HLA)-B27</b>	Immunology, Southmead	Blood	EDTA tube	Min vol 1 mL	Only available for Paediatric patients at request of Hospital Consultant	2 weeks
<b>IgD</b>	Protein Reference Unit, Sheffield	Blood	Serum (SST) only		Periodic fever / Mevalonic aciduria/ Hyper IgD syndrome	4 weeks
<b>IGF BP3</b>	Kings College Hospital, London	Blood	Serum (SST) or lithium heparin (PST)	Min vol 1 mL		2 weeks
<b>IGF-2</b>	SAS Peptide Laboratory, Guildford	Blood	Serum (SST) or lithium heparin (PST)	Min vol 1 mL		2 weeks
<b>IgG Subclasses</b>	Immunology, Southmead	Blood	Serum (SST) only	Min vol 2 mL	For investigation of IgG4 related disease	1 week
<b>Inhibin</b>	Protein Reference Unit, Sheffield	Blood	Serum (SST) or lithium heparin (PST)	Min vol 1 mL		4 weeks
<b>Insulin Antibodies</b>	SAS Peptide Laboratory, Guildford	Blood	Serum (SST) only	Min vol 1 mL		2 weeks
<b>Interferon alpha</b>	Hospital Cochin Service de Virologie, Paris	CSF	Universal pot	Min vol 1 mL		4 weeks
<b>Iron (liver)</b>	Trace Elements Lab, Cardiff	Liver biopsy	Universal pot		Should arrive in lab immediately after collection, wrapped in foil, inside a plain universal container	4 weeks
<b>Lamotrigine</b>	Cardiff Toxicology Laboratories, Llandough	Blood	Lithium heparin tube	Min vol 1 mL	Pre dose sample	2 weeks
<b>Laxative Screen (urine)</b>	Birmingham City Hospital	Urine	Universal pot	Min vol 15 mL		4 weeks
<b>Lead</b>	Southmead Hospital	Blood	Trace element tube	1 tube	Blood lead should be requested if symptoms of toxicity are present.	2 weeks
		Urine	Universal pot	Min vol 2 mL	Random urine sample required with NO preservative.	2 weeks
<b>Levetiracetam (Keppra)</b>	Cardiff Toxicology Laboratories, Llandough	Blood	EDTA tube		Trough sample required	4 weeks
<b>Lysergic Acid Diethylamide (LSD) (urine)</b>	Birmingham City Hospital	Urine	Universal pot	Min vol 5 mL		2 weeks

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<b>Lyso GB3</b>	Chemical Pathology, Great Ormond Street	Blood and urine	Lithium heparin (PST) and universal pot		For Fabry patient monitoring	4 weeks
<b>M2 Western Blot</b>	Immunology, Southmead	Blood	Serum (SST) only	Min vol 1 mL		2 weeks
<b>Mag Antibodies</b>	Oxford Immunology	Blood	Serum (SST) only	Min vol 1 mL		2 weeks
<b>MOG antibodies</b>	Oxford Immunology	Blood or CSF	Serum (SST) or plain pot	1 tube		2 weeks
<b>Manganese</b>	Kings College Hospital, London	Blood	Trace element tube	1 tube		4 weeks
<b>Manganese (urine)</b>	Trace Elements Lab, Guildford	Urine	Universal pot	Min vol 1 mL		4 weeks
<b>Mannose Binding Lectin</b>	University Hospital of Wales, Cardiff	Blood	Serum (SST) only	Min vol 2 mL		2 weeks
<b>Mercury</b>	Trace Elements Lab, Guildford	Blood	Trace element tube	Min vol 1 mL		4 weeks
		Urine	Universal pot	Min vol 1 mL		4 weeks
<b>Metanephrines (plasma)</b>	Freeman Hospital, Newcastle	Blood	EDTA tube	1 tube	Must be received on ice and processed by the laboratory within 60mins of collection.	2 weeks
<b>Metanephrines (urine)</b>	Freeman Hospital, Newcastle	Urine	24h bottle (acid)		For investigation of pheochromocytoma or paraganglioma	2 weeks
<b>Methadone (urine)</b>	Southmead Hospital	Urine	Universal pot	Min vol 1 mL	Not part of routine drugs of abuse screen. Care should be taken to avoid tampering with the sample and that the sample is fresh and from the correct individual	2 weeks
<b>Methanol</b>	Southmead Hospital	Blood	Fluoride oxalate tube	Min vol 1 mL	Laboratory MUST be informed of request by telephone (x 23430 or bleep on call biochemist out of hours).	24 hours (Mon-Fri only)
<b>Methylmalonic acid (MMA)</b>	Southmead Hospital	Urine	Universal pot		Urine MMA is preferred. Blood MMA can also be measured, sample sent to Cardiff	2 weeks
<b>Mexiletine</b>	Cardiff Toxicology Laboratories, Llandough	Blood	EDTA tube		No gel tubes	4 weeks
<b>Musk Antibodies</b>	Churchill Hospital, Oxford	Blood	Serum (SST) only	Min vol 1 mL		4 weeks
<b>Mycophenolate</b>	Kings College Hospital, London	Blood	EDTA tube	Min vol 1 mL	Pre dose sample	2 weeks

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<b>Myositis Antibody Panel</b>	Immunology, RUH	Blood	Serum (SST) only	1 tube	Myositis, dermatomyositis, ILD, polymyositis, anti-synthetase syndrome	4 weeks
<b>Neuronal Antibodies</b>	Protein Reference Unit, Sheffield	Blood	Serum (SST) only	Min vol 1 mL		2 weeks
<b>Neutrophil Function Tests</b>	Southmead Hospital	Blood	Lithium heparin (NO GEL)	Min vol 1 mL, 7 mL ideally	Must also send a normal control sample. Please arrange the test with NBT in advance x48396	4 weeks
<b>NMDA receptor Abs</b>	Churchill Hospital, Oxford	Serum and CSF	Serum (SST) and universal pot	1 tube / pot		4 weeks
<b>NTBC / nitisinone monitoring</b>	Birmingham Children's Hospital	Blood	Lithium heparin (PST) and Guthrie card (DBS)			4 weeks
<b>Oestradiol Confirmation</b>	St James University Hospital, Leeds	Blood	Serum (SST) or lithium heparin (PST)	Min vol 1 mL		2 weeks
<b>Oligoclonal Bands</b>	Southmead Hospital	CSF and blood (BOTH)	Universal pot for CSF and SST for blood		Paired serum and CSF required	2 weeks
<b>Oligosaccharides (urine)</b>	St James University Hospital, Leeds	Urine	Universal pot	Min vol 2 mL	Screening test for some lysosomal storage disorders. Lysosomal enzyme screen (white cell enzyme screen) preferred. Please provide clinical details.	4 weeks
<b>Opiate Confirmation (urine)</b>	Southmead Hospital	Urine	Universal pot	Min vol 1 mL	To confirm if morphine or codeine present	1 week
<b>Orexin</b>	Churchill Hospital, Oxford	CSF	Universal pot	Min vol 2 mL	Narcolepsy	4 weeks
<b>Orotic Acid Quantitation (urine)</b>	Paediatric Chemistry, Sheffield Children's Hospital	Urine	Universal pot	Min vol 5 mL		3 weeks
<b>Ovarian Antibodies</b>	Immunology, Southmead	Blood	Serum (SST) only	Min vol 1 mL		4 weeks
<b>Oxalate (plasma)</b>	Birmingham Children's Hospital	Blood	EDTA tube	Min vol 2 mL	Sample must be collected and delivered to the laboratory on ice.	4 weeks
<b>Oxalate (urine)</b>	UCLH	Urine	24h bottle (acid)		A random urine is also acceptable from paediatrics	2 weeks
<b>Oxypurinol</b>	Purine Research Laboratory, St Thomas' Hospital, London	Blood	EDTA tube	1 tube		2 weeks
<b>Oxysterol</b>	Willink Laboratory, Manchester	Blood	EDTA tube	1 tube	Sample must be received by lab ASAP to be separated and frozen	4 weeks
<b>Pancreatic polypeptide</b>	SAS Laboratory, Charing Cross Hospital	Blood	EDTA tube	Min vol 1 mL		4 weeks

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<b>Paraquat and Diaquat (urine)</b>	Southmead Hospital	Urine	Universal pot	Min vol 15 mL		1 week
<b>Pemphigoid or Pemphigus</b>	Immunology, Southmead	Blood	Serum (SST) only	Min vol 1 mL		4 weeks
<b>Pentagastrin</b>	SAS Laboratory, Charing Cross Hospital	Blood	EDTA tube	Min vol 1 mL	Sample must be collected and delivered to the laboratory on ice.	2 weeks
<b>Pipecolic Acid</b>	Paediatric Chemistry, Sheffield Children's Hospital	Blood and urine	Lithium heparin (PST) and universal pot	Min vol 1 mL		4 weeks
<b>PML RARA</b>	Guy's Hospital	Blood / bone marrow	EDTA tube			4 weeks
<b>Pompe Screen</b>	GOSH	Blood	EDTA tube	1 tube	Samples should be received in lab by 3 pm Mon-Fri. Samples can be prioritised. Please phone the duty metabolic biochemist on 21299 to discuss.	6 weeks
<b>Porphyryn Screen</b>	University Hospital of Wales, Cardiff	Blood and urine (BOTH)	EDTA tube for blood, universal pot for urine, both protected from the light		Protect sample from the light. For diagnosis of porphyria. Please provide clinical information regarding the patient's symptoms and the type of porphyria (acute or cutaneous) suspected. A complete set of samples (EDTA blood and urine) is recommended to ensure a more rapid and accurate diagnosis.	1 week
<b>Porphyryns (Faeces)</b>	University Hospital of Wales, Cardiff	Faeces	Stool pot		Protect sample from the light. Faecal porphyryns are used for the differentiation of some types of porphyria.	2 weeks
<b>Potassium Gated Channel Antibodies</b>	Churchill Hospital, Oxford	Blood	Serum (SST) only	Min vol 1 mL		2 weeks
<b>Prednisolone</b>	Birmingham Heartlands Hospital	Blood	Serum (SST) only	1 tube		4 weeks
<b>Pro Collagen-3-Peptide (P3NP)</b>	Kings College Hospital, London	Blood	Serum (SST) only	Min vol 1 mL		2 weeks
<b>PSA (free to total)</b>	Protein Reference Unit, Sheffield	Blood	Serum (SST) only	Min vol 1 mL		2 weeks
<b>PTH-related peptide</b>	Norfolk & Norwich University Hospitals	Blood	EDTA tube	Min vol 2 mL	Special EDTA tube with Trasylol preservative required. Sample must be collected and transported to the laboratory on ice.	4 weeks
<b>Purines and Pyrimidines</b>	Purine Research Laboratory, St Thomas' Hospital, London	Blood or urine	EDTA tube	Min vol 2 mL		4 weeks
<b>Pyruvate Kinase</b>	Kings College Hospital, London	Blood	EDTA tube	1 tube		4 weeks
<b>Specific IgE (allergens)</b>	Immunology, Southmead	Blood	Serum (SST) only	Min vol 1	Please state required allergen in the test information	2 weeks

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	PRU, Sheffield			mL		
<b>Red cell enzymes for GSDIII</b>	GOSH	Blood	Lithium heparin (NO GEL)	Min vol 5 mL	Send only Mon-Thur	4 weeks
<b>Red cell plasmalogens</b>	Sheffield Children's Hospital	Blood	EDTA tube	Min vol 2 mL		4 weeks
<b>Renin</b>	Kings College Hospital, London	Blood	EDTA tube	Min vol 1 mL	Must be received and processed by the laboratory within 3 hours of sample collection. A number of antihypertensive medications interfere with this test, please contact the laboratory to discuss.	4 weeks
<b>Respiratory Chain Enzymes</b>	Newcastle Mitochondrial NCG Lab	Muscle biopsy	Special collection kit provided by lab	2 x lemon-pip sized	Must be flash frozen at bedside, and transported to the laboratory, in liquid nitrogen. Samples can be prioritised. Please phone the duty metabolic biochemist on 21299 to discuss.	8-12 weeks
<b>RET mutation</b>	Molecular Genetics, Royal Devon & Exeter Hospital	Blood	EDTA tube	1 tube		2 weeks
<b>Retinol Binding Protein (serum)</b>	Protein Reference Unit, Sheffield	Blood	Serum (SST) only	Min vol 4 mL		2 weeks
<b>Retinol Binding Protein (urine)</b>	Protein Reference Unit, Sheffield	Urine	Universal pot	Min vol 1 mL		2 weeks
<b>Selenium</b>	Southmead Hospital	Blood	Trace element tube	Min vol 1 mL	ADULTS: Trace element tube only. PAEDS: Lithium heparin tube acceptable.	2 weeks
<b>Serum Amyloid A</b>	National Amyloidosis Centre, Royal Free Hospital	Blood	Serum (SST) only	1 tube		4 weeks
<b>Sialyloligosaccharides (urine)</b>	St James University Hospital, Leeds	Urine	Universal pot	Min vol 2 mL	Screening test for some lysosomal storage disorders. Lysosomal enzyme screen (white cell enzyme screen) preferred. Please provide clinical details.	4 weeks
<b>Sirolimus</b>	Southmead Hospital	Blood	EDTA tube	Min vol 1 mL	Pre dose sample	24 hours (Mon-Fri only)
<b>Skeletal antibodies</b>	Immunology, Southmead	Blood	Serum (SST) only	Min vol 1 mL		2 weeks
<b>SLCO1B1 genotyping</b>	Russells Halls Hospital, Birmingham	Blood	EDTA tube	1 tube		4 weeks
<b>Somatostatin</b>	SAS Laboratory, Charing Cross Hospital	Blood	EDTA tube	Min vol 1 mL	Sample on ice sent to lab immediately.	4 weeks
<b>Steroid Profile (urine)</b>	Kings College School of Medicine, London	Urine	24h bottle (plain)		A random urine is also acceptable from paediatrics	4 weeks
<b>Sulphonylurea</b>	SAS Peptide Laboratory,	Blood	Serum (SST) only	Min vol 1		2 weeks

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	Guildford			mL		
<b>T Cell Subsets</b>	Immunology, Southmead	Blood	EDTA tube			2 weeks
<b>Testes Antibodies</b>	Immunology, Southmead	Blood	Serum (SST) only	Min vol 1 mL		2 weeks
<b>Testosterone confirmation by LCMS</b>	Leeds Infirmary	Blood	Serum (SST) or lithium heparin (PST)	Min vol 1 mL		2 weeks
<b>Thallium (urine)</b>	Trace Elements Lab, Guildford	Urine	Universal pot	Min vol 20 mL		4 weeks
<b>Thioguanine nucleotides (TGN &amp; 6MP)</b>	Purine Research Laboratory, St Thomas' Hospital, London	Blood	EDTA tube	1 tube		1 week
<b>Thiopentone</b>	Cardiff Toxicology Laboratories, Llandough	Blood	Serum (SST) only	Min vol 4 mL		2 weeks
<b>Thiopurine methyl transferase (TPMT)</b>	Purine Research Laboratory, St Thomas' Hospital, London	Blood	EDTA tube	1 tube		1 week
<b>Thymidine Phosphorylase</b>	Purine Research Laboratory, St Thomas' Hospital, London	Blood	EDTA tube	Min vol 4 mL	Send only Mon-Thur	4 weeks
<b>Thyroglobulin</b>	University Hospital of Wales, Cardiff	Blood	Serum (SST) only	Min vol 1 mL	Test is susceptible to interference from endogenous antibodies	2 weeks
<b>Tissue transglutaminase IgG</b>	Protein Reference Unit, Sheffield	Blood	Serum (SST) or lithium heparin (PST)	Min vol 1 mL	Please order Tissue transglutaminase (IgA) as the front line test. In cases of low total IgA the lab will automatically reflex further appropriate testing. Patients must be on a normal (gluten-containing) diet for at least one month before testing.	4 weeks
<b>Toluene</b>	Southmead Hospital	Blood	EDTA tube	1 tube		2 weeks
<b>Transferrin Immunoblotting (nasal fluid)</b>	Southmead Hospital	Nasal fluid	Universal pot			2 weeks
<b>Trichloroethylene (urine)</b>	Southmead Hospital	Urine	Universal pot	Min vol 1 mL		4 weeks
<b>Trimethylamine (urine)</b>	Paediatric Chemistry, Sheffield Children's Hospital	Urine	Universal pot	Min vol 1 mL		2 weeks
<b>TSH Receptor Antibodies</b>	Protein Reference Unit, Sheffield	Blood	Serum (SST) or lithium heparin (PST)	Min vol 1 mL		2 weeks
<b>TSH Receptor Mutation</b>	University Hospital of Wales, Cardiff	Blood	EDTA tube	1 tube		4 weeks
<b>Urine drug screen for statins</b>	Leicester Royal Infirmary	Urine	Universal pot	Min vol	Detects Atorvastatin and Rosuvastatin	4 weeks



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				10 mL		
<b>Vacuolated Lymphocytes</b>	GOSH	Blood	EDTA tube	Min vol 2 mL	Send only Mon-Thur	4 weeks
<b>Valproate</b>	Kings College Hospital, London	Blood	Serum (SST) only	Min vol 1 mL	Valproate levels correlate poorly with clinical effect and measurement is rarely indicated. Please give full clinical details.	4 weeks
<b>Vasoactive interstitial peptide</b>	SAS Laboratory, Charing Cross Hospital	Blood	EDTA tube	Min vol 1 mL	Sample on ice sent to lab immediately.	4 weeks
<b>Very Long Chain Fatty Acids (VLCFA)</b>	Southmead Hospital	Blood	Lithium heparin tube	Min vol 1 mL		3 weeks
<b>Vitamin B1 / Thiamine</b>	Nutristasis Unit, St Thomas' Hospital	Blood	EDTA tube	1 tube	Protect from light and send to lab ASAP	4 weeks
<b>Vitamin B6 / pyridoxine</b>	Glasgow Royal Infirmary	Blood	EDTA tube	1 tube	Red cell pyridoxine is for nutritional monitoring (e.g. in Barth syndrome). Plasma pyridoxine is for ?hypophosphatasia. Sample MUST be protected from the light	4 weeks
<b>Warfarin</b>	University Hospital of Wales, Cardiff	Blood	Serum tube (NO GEL - red top)	Min vol 1 mL		2 weeks
<b>Zinc</b>	Southmead Hospital	Blood	Trace element tube	Min vol 1 mL	ADULTS: Trace element tube only. PAEDS: Lithium heparin tube acceptable.	2 weeks