Test	Test Code	Sample Type (**Preferred**, Acceptable)*	Turn around time (hours)**	Sex	Age unit	Lower age limit	Upper age limit	Lower limit	Upper limit	Units	Source
Plasma 3-methoxy tyramine	3MT	**EDTA plasma,** lithium heparin plasma	240 hours	ALL	ALL	ALL	ALL	0	180	*pmol/L*	*Clin Chim Acta* 2010; 411:546-552
17-hydroxyprogesterone (blood)	17-OHP	Plain serum, gel serum, lithium heparin plasma	240 hours	Male	Years	N/A	Up to 1	None	≤2.4	nmol/L	Males and females up to 15 years: Bae YJ, Zeidler R, Baber R, Vogel M, Wirkner K, Loeffler M, Ceglarek U, Kiess W, Körner A, Thiery J, Kratzsch J. Reference intervals of nine steroid hormones over the life-span analyzed by LC-MS/MS: Effect of age, gender, puberty, and oral contraceptives. J Steroid Biochem Mol Biol. 2019 Oct;193:105409. doi: 10.1016/j.jsbmb.2019.105409. Females >15 years: Eisenhofer G, Peitzsch M, Kaden D, Langton K, Pamporaki C, Masjkur J, Tsatsaronis G, Mangelis A, Williams TA, Reincke M, Lenders JWM, Bornstein SR. Reference intervals for plasma concentrations of adrenal steroids
				Male	Years	1	Up to 5	None	≤2.6		
				Male	Years	5	Up to 10	None	≤2.1		
				Male	Years	10	Up to 15	None	≤3.9		
				Male	Years	15	Up to 20	1.3	6.9		
				Male	Years	20	Up to 40	0.9	6.3		
				Male	Years	40	Up to 60	0.7	5.2		
				Male	Years	60	Up to 80	0.7	4.4		
				Female	Years	N/A	Up to 1	None	≤2.3		

				Female	Years	1	Up to 5	None	≤1.9		measured by LC-MS/MS: Impact of gender, age, oral contraceptives, body mass index and blood pressure status. Clin Chim Acta. 2017 Jul; 470:115-124. doi: 10.1016/j.cca.2017.05.002. Epub 2017 May 4.
				Female	Years	5	Up to 10	None	≤1.8		
				Female	Years	10	Up to 15	None	≤7.2		
				Female	Years	15	unspecified	0.4	5		

25-Hydroxy Vitamin D	25VITD VITD2 VITD3	Plain serum, gel serum	1 week	autocomments: Thresholds for treatment are based on Total 25(OH)VitD i.e the sum of 25(OH)VitD2 and 25(OH)VitD3. For guidance refer to National Osteoporosis Society Guidelines (2018). Total 25(OH)VitD <25nmol/L: Consistent with VitD deficiency. Treatment with colecalciferol recommended. Total 25(OH)VitD 25-50 nmol/L: VitD status may be inadequate in some patient groups. Treatment with colecalciferol advised in high-risk groups. Total 25(OH)VitD >50 nmol/L: Adequate VitD status. Supplementation not usually required. Total 25(OH)VitD >375 nmol/L: VitD levels may be associated with toxicity.						nmol/L	National Osteoporosis Society guidelines (2018).
Alpha-1 antitrypsin (blood)	A1AT	plain serum, gel serum, lithium heparin plasma	96 hours	Both		All	All	0.9	2	g/L	0.9-2.0 g/L (Roche kit insert)
Adjusted Calcium	ACA	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	d	0	<14	1.9	2.8	mmol/L	Historical RMCH data for paeds based on Meites Crit Rev Clin Lab Sci 1975; 6: 1-18 and Soldin 5th
				Both	d	14	<28	2.2	2.7		
				Both	d	28	<18yrs	2.2	2.7		

				Both	yr	18	150	2.2	2.6		edition. Adults based on pathology Harmony Intention is to adopt the Wythenshawe adjusted Ca formula.
ACE (Angiotensin Converting Enzyme)	ACE	Plain serum, gel serum, lithium heparin plasma	72 hours	ALL	Y	0.5	18	29	112	*IU/L*	Buhlmann Kit insert
				ALL	Y	18		20	70		
				ALL	Y	0	0.5	NULL	NULL		
AFP (blood)	AFP	Plain serum, gel serum, lithium heparin plasma	24 hours	M+F	Day	0	<2	0	103990	kIU/L	Pead: Derived in house from Blohm et al Paed Haem Onc (1998) 15: 135-142 and Wu et al Pediatr Res (1981) 15:50-52 adult: Roche method sheet Ref. No. 04491742190 v5 07/02/17
				M+F	Day	≥2	<8	0	60750		
				M+F	Day	≥8	<15	0	48590		
				M+F	Day	≥15	<22	0	19000		
				M+F	Day	≥22	<29	0	5500		
				M+F	Week	≥5	<6	0	4750		
				M+F	Week	≥6	<8	0	1650		
				M+F	Month	≥2	<3	0	850		
				M+F	Month	≥3	<4	0	350		
				M+F	Month	≥4	<5	0	100		
				M+F	Month	≥5	<9	0	3		

				M+F	Month/Year	≥9	<18	0	5		
				M+F	Year	≥18	N/A	0	6		
Anti-hypertensive Medication Screen (urine)	AHTN	Spot urine	4 weeks	N/A						N/A	N/A
Albumin (blood)	ALB	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	D	0	28	25	35	g/L	ORC data children (Pathology Harmony for adults 60 – 80 g/L)
				Both	D	29	182	28	40		
				Both	D/Y	183	17	30	45		
				Both	Y	>17	18	34	48		
				Both	Y	>18		35	50		
Aldosterone	ALDO	Lithium heparin plasma, EDTA plasma	240 hours	Male	years	16	150	0	630	*pmol/L*	In-house comparison with Leeds. See Qpulse BI-F-MS-30. No paediatric data available. Paed samples sent to QEH, Birmingham Age 16 years chosen as cut-off as very similar to inhouse paed ref range data in 10-18 years (see CB-REP-MD-19)
				Female	years	16	150	0	630		
Aldosterone:	ALDOP	Plain serum, EDTA plasma	240 hours	M, F	days	0	30	139	4856	*pmol/L*	See CB-REP-MD-19 (literature review)
				M, F	months	1	Up to 12	139	2498		

Paediatric				M, F	years	1	Up to 2	194	1499		
				M, F	years	2	Up to 10	83	971		
				M, F	years	10	Up to 18	56	611		
Alkaline Phosphatase (blood)	ALP	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	D	0	7	75	300	U/L	Adult : Pathology Harmony Paediatrics: Up to 18mo / 540d, data from inpatient study (Q Pulse CB-REP-MD-36); Precise historical origin for older children is unclear, but is in broad consensus with data from Paediatric Reference Intervals (Fifth Edition) Soldin et al. AACC Press 2003. Adjusted slightly upwards following clinical feedback. Data for 2 years and above – CALIPER.
				Both	D	8	28	90	477		
				Both	D	8	28	90	477		
				Both	D	29	90	90	540		
				Both	D	91	180	77	540		
				Both	D	181	360	87	382		
				Both	D	361	540	69	434		
				Both	D	541	730	60	370		
				F	Y	2	< 10	60	320		
				M	Y	2	< 10	60	300		
				Both	Y	10	< 13	129	417		
				F	Y	13	< 15	57	254		
				M	Y	13	< 15	116	468		
				F	Y	15	< 17	50	117		
				M	Y	15	< 17	82	331		
				F	Y	17	< 18	45	87		
				M	Y	17	< 18	55	149		
				Both	Y	18	-	30	130		

Alkaline Phosphatase Isoenzymes (blood)	ALPISO	Plain serum, **gel serum**, lithium heparin plasma	3 weeks	N/A						N/A	N/A
Alanine aminotransferase (blood)	ALT	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	D	0	28		90	IU/L	Roche data for > 28 days. In house ORC data for ≤ 28 days
				F	D	29			35		
				M	D	29			50		
antimullerian hormone	AMH	Plain serum, gel serum, lithium heparin plasma	Same day	Male	Days	0	<3	68	523.7	pmol/L	Yates AP et al. Paediatric reference intervals for plasma anti-Müllerian hormone: comparison of data from the Roche Elecsys assay and the Beckman Coulter Access assay using the same cohort of samples. Ann Clin Biochem. 2019;56(5):536-547.
				Male	Days	3	<8	138.3	1023.7		
				Male	Days	8	<11	195.2	1200.9		
				Male	Days	11	<21	140.1	1130.9		
				Male	Days	21	<29	212	951.4		
				Male	Days	29	<365	203.8	971.7		
				Male	Years	1	<5	268.6	1229.9		
				Male	Years	5	<8	206.2	956.5		
				Male	Years	8	<12	84	976.4		
				Male	Years	12	<15	8.8	286.8		
				Male	Years	15	<18	16.8	130		
				Female	Days	0	<29		</= 6.7		
				Female	Days	29	<365		</= 31.2		
				Female	Years	1	<5	1.3	43.7		
				Female	Years	5	<8	1.4	39.5		

				Female	Years	8	<12	2.9	52.8		
				Female	Years	12	<15	3	46.6		
				Female	Years	15	<18	2.1	84.1		
Amikacin	AMIK	Plain serum, gel serum, lithium heparin plasma, EDTA plasma	Urgent 2 hours, routine 4 hours	autocomment on all: ONCE DAILY DOSING (O.D.D.): Trough level: less than 5 mg/L Peak levels not required to assess therapy. Non-tuberculosis mycobacterium (NTM) O.D.D. peak 25-35 mg/L MULTIPLE DAILY DOSING (M.D.D.): Trough level: less than 10 mg/L Peak level (1h post dose): <30 mg/L Non-tuberculosis mycobacterium (NTM) 3x/week peak: 65-80 mg/L						mg/L	SOPS and discussion with pharmacy
Ammonia (Blood)	AMM	EDTA plasma	4 hours	M/F	month	0	1	0	100	µmol/L	MetBionet
				M/F	month	1	>1	0	40		
Androstenedione	AND	Plain serum, gel serum (lithium hep plasma for WYTH only)	240 hours	Female	days	0	14	None	2.5	nmol/L	Kyriakopoulou L, Yazdanpanah M, Colantonio DA, et al. A sensitive and rapid mass spectrometric method for the simultaneous measurement of eight steroid hormones and
					days	15	364	None	5.7		
					months	12	24	None	<0.5		

					years	2	3 (+364 days)	None	<0.5		CALIPER pediatric reference intervals. Clinical Biochemistry 2013;46:642e51. DOI: 10.1016/j.clinbiochem.2013.01.002 Kushnir MM, Blamires T, Rockwood AL, Roberts WL, Yue B, Erdogan E, Bunker AM, Miekle AW. Liquid chromatography-tandem mass spectrometry assay for androstenedione, dehydroepiandrosterone, and testosterone with pediatric and adult reference ranges. Clin Chem 2010; 56: 1138 - 47
					years	4	5 (+364 days)	None	<0.6		
					Years	6	7 (+364 days)	0.1	1		
					Years	8	9 (+364 days)	0.1	1.5		
					years	10	11 (+364 days)	0.3	4.3		
					years	12	13 (+ 364 days)	0.8	6		
					years	14	15 (+364 days)	1.4	7		
					years	16	17 (+364 days)	1.2	7.4		
					years	>18 (pre-meno		0.9	7.5		

						pausal)					
					years	>18 (post-menopausal)		0.5	2.9		
				Male	days	0	14	None	2.5		
					days	15	364	None	5.7		
					months	12	24	None	<0.5		
					years	2	3 (+364 days)	None	<0.4		
					years	4	5 (+364 days)	None	<0.5		
					Years	6	7 (+364 days)	0.1	0.8		
					Years	8	9 (+364 days)	0.1	1		
					years	10	11 (+364 days)	0.2	1.4		

					years	12	13 (+ 364 days)	0.3	2.2		
					years	14	15 (+364 days)	0.6	3.3		
					years	16	17 (+364 days)	1	3.9		
					years	18	39 (+364 days)	1.2	4.7		
					years	40	67	0.8	3.1		
ANION GAP	ANION	Plain serum, gel serum, lithium heparin plasma, flouride oxalate plasma	4 hours	M/F	Y	0	150	12	16	mmol/L	?
Aldosterone:renin ratio	ARR	Lithium heparin plasma, EDTA plasma	240 hours	M, F	years	18	150			N/A	In house comparison with Leeds See: BI-F-MS-30, No ARR ref range but results >2000 c/w Conn's, 1000-2000 equivocal
Aspartate aminotransferase (blood)	AST	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	D	0	14	20	98	U/L	Roche data for > 28 days. In house ORC data for ≤ 28 days
				Both	D/Y	15	3	16	69		
				F	Y	>3			<35		
				M	Y	>3			<50		

Serum Vitamin B12	B12	Gel serum, lithium heparin plaqsma (paeds)	24 hours	All	All	All	All	197	771	ng/L	Wythenshawe reporting document - Roche kit insert
Ciclosporin	BCYC	Whole blood EDTA	24 hours	no ref ranges						ug/L	Transplant team
β-hydroxybutyrate (blood)	BHB	Plain serum, gel serum, lithium heparin plasma	2 weeks	No reference range						µmol/L	N/A
Blood bHCG	BHCG	Plain serum, gel serum, lithium heparin plasma	24 hours	F+M	months	0	3	0	50	IU/L	< 3 months: EJPed 1981 vol 136 p87-89 and medscape article plus Schneider DT, Calaminus G, Gobel U: Diagnostic value of alpha 1-fetoprotein and beta-human chorionic gonadotropin in infancy and childhood. Pediatr Hematol Oncol 2001;18:11-26 > 3 months: ?
				F+M	Year	0	150	0	4		
Breath Hydrogen Test – Lactulose	BHTLAC	Expired breath	Same week as appt	None (interpretative comments added)						ppm (parts per million)	AGIP Best practice HMBT

Breath Hydrogen Test – Lactose or Sucrose	BHTLS	Expired breath	Same week as appt	None (interpretative comments added)						ppm (parts per million)	AGIP Best practice HMBT
Bicarbonate (Blood)	BIC	Plain serum, gel serum, lithium heparin plasma	4 hours	M/F	Y	0	16	19	28	mmol/L	Pathology Harmony
				M/F	Y	16	150	22	29		
Total Bilirubin	BIL	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	D	0	28			µmol/L	Pathology Harmony ?Roche kit insert
				Both	D	>28			21		
Bile Acids (BILAC) (serum/plasma)	BILAC	Plain serum, gel serum	24 hours	all	y	18	150	0	14	µmol/L	https://www.rcog.org.uk/globalassets/documents/guidelines/gtg_43.pdf RCOG Green Top Guideline 43 'Obstetric Cholestasis' accessed 01/07/2021. Some centres use 0 to 10 mmol/L but levels in healthy pregnancy tend to be higher than in non-pregnant women, and the risk of complications increases by about 1% per 1 µmol/L increase above upper limit of RR. *Paediatric reference intervals are not separately described, and it is assumed that 'normal' values are the same as for adults. For a review of serum bile acids metabolism in
				all	y	0	18	*	*		

											paediatrics, click here: https://www.ncbi.nlm.nih.gov/labs/pmc/articles/PMC7214672/
NTproBNP (blood)	BNP	Plain serum, gel serum, lithium heparin plasma	Urgent 2 hours, routine 4 hours				4W	NA	NA	ng/L	https://link.springer.com/content/pdf/10.1007/s00246-008-9258-4.pdf . Nir et al Pediatric Cardiology, 303-8 (2009).
							1Y	37	646		
							2Y	39	413		
							6Y	23	289		
							14Y	22	157		
							18Y	6	158		
							150Y	0	400		

17-Hydroxyprogesterone – Blood Spot	BS17P. (Dynamic Function test code: 17BS)	Whole blood spot	1 month	no ref range						nmol/L	N/A
TSH – Blood spot	BSTSH	Whole blood spot	4 hours	All		All ages	0	3		mU/L	Unknown
Busulfan Pharmacokinetics (blood)	BUPK	EDTA plasma	Same day	There is no defined reference range for Busulfan. Rather, drug dosage is targetted according to the total area under the curve (AUC) of the Busulfan Pharmacokinetics profile. Target AUC values vary according to the indication for bone marrow transplant, co-adminsitered chemotherapeutics and clinical status of the patient. Target AUC ranges are described for a number of common scenarios on the Busulfan PK report, which were written by Prof Rob Wynn.						mg/L/hr	AUC target ranges reported on the Busulfan PK reports, agreed locally in conjunction with the Paediatric Bone Marrow Transplant team.
Calcium (serum/plasma)	CA	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	yr	0	<1	2.16	2.74	mmol/L	For total calcium, sources are CALIPER for paeds and Pathology Harmony for adults
				Both	yr	1	<18	2.31	2.64		
				Both	yr	18	-	2.2	2.6		

CA125	CA125	Plain serum, gel serum, lithium heparin plasma, EDTA plasma	Same day	F+M	Year	0	150	0	34	kU/L	Roche method sheet Ref. No. 11776223190 v1 23/09/16, NICE guidelines
Ca19-9 (blood)	CA19-9	Plain serum, gel serum, lithium heparin plasma, EDTA plasma	Same day	M+F	Year	0	150	0	33	kU/L	Roche kit insert
Caeruloplasmin (serum/plasma)	CAE	Plain serum, gel serum, lithium heparin plasma	1 week	All	Weeks	0	0 to 8weeks	45	213	mg/L	Neonates - Historical derivation. Reasonable agreement with Soldin 5th Ed (55 - 286). Paediatrics - <200 for diagnosis of Wilson's Disease: http://www.eurowilson.org/professional/diagnosis/index.phtml
				All	Weeks/Years	>8	8 weeks to 1 years	109	371		
				All	years	1	18	181	416		
				All	Years	18	18 to 150	200	600		
AFP (CSF)	CAFP	CSF, plain	24 hours	all	weeks	all	6	2	889	kU/L	
				All	W/M	6 weeks	2 months	0	13		
				All	M	>2 months		0	3kU/L		

Carbamazepine	CBZ	Plain serum, gel serum, lithium heparin plasma	Urgent 2 hours, routine 4 hours	Not age or gender specific 4.0 – 12.0 mg/L <25 mg/L not usually seriously toxic >26 mg/l associated with life threatening toxicity						Mg/L	Roche kit insert
Carcinoembryonic antigen (CEA)	CEA	Plain serum, gel serum, lithium heparin plasma	96 hours	M+F	Year	0	150	0	5	µg/L	Roche kit insert
Estimated GFR (Children's) and Patient height (cm)	CEGFR	Plain serum, gel serum, lithium heparin plasma	4 hours	No reference range						mL/min/1.73 m^2, cm (for height)	Schwartz et al. J Am Soc Nephrol (2009) 4: 1832-43.
CSF glucose	CGLU	Fluoride oxalate [F-EDTA / F-LiHep also OK]	4 hours	All	Years	1 year	150 years	2.2	4.4	mmol/L	PHE CSF analysis guideline
				All	Months	2 months	12 months	1.9	5		
				All	Days	29 days	58 days	1.6	5.6		
				All	Days	0 days	28 days	1.9	5.6		

Beta HCG (CSF)	CHCG	CSF, plain	4 hours	no ref range						IU/L	N/A
Creatine Kinase, total (CK) (Plasma/ serum)	CK	Plain serum, gel serum, lithium heparin plasma, EDTA plasma	4 hours	MALE	d	0	90	1	475	IU/L	Adult: Pathology harmony Paed: Ridefelt P *et al*. Pediatric reference intervals for general clinical chemistry components - merging of studies from Denmark and Sweden. Scand J Clin Lab Invest. 2018;78(5):365-372.
					m	3	12	1	250		
					y	1	150	40	320		
				FEMALE	d	0	90	1	475		
					m	3	12	1	250		
					y	1	150	25	200		
Chloride	CL	Plain serum, gel serum, lithium heparin plasma	4 hours	All	Y		150	95	108	mmol/ L	Pathology Harmony
CSF lactate	CLAC	Fluoride oxalate [F-EDTA / F-LiHep also OK]	Urgent 2 hours, routine 4 hours	all	all	all	All	1.1	2.4	mmol/ L	PHE CSF analysis guideline
Cobalt and Chromium (whole blood)	COCR	Whole blood EDTA	4 weeks	autocomment applied to all: MDA/2017/018: If metal ion levels in whole blood are equal to or greater than 119nmol/L (cobalt) or 135nmol/L (chromium) (i.e. seven parts per billion (ppb) for either metal ion), a second test should be performed 3 months after the first in order to identify patients who require closer surveillance, which may include cross sectional imaging.						nmol/ L	MHRA recommendation

				N.B. MHRA threshold does not apply to stemmed total hip replacements.							
Conjugated bilirubin (blood)	CONBIL	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	D	0	28	1	13	µmol/L	Discussion with paediatric consultants and NICE guidance – no need to phone but should be flagged to review
				Both	D/Y	29	18	1	8		
				Both	Y	>18			<5		
Cortisol	CORT CORTMS	Plain serum, **gel serum**, lithium heparin plasma, EDTA plasma	36 hours	No reference range autocomment on all: Reference range 08:30-11:30 AM 100-500 nmol/L						nmol/L	Reference range comment from Roche Elecsys Cortisol II 07027150500V4.
C-peptide (blood)	CPEP	Plain serum, gel serum, lithium heparin plasma	2 weeks					343	1803	pmol/L	Mercodia C-peptide ELISA Directions for Use Version 10.0
Creatinine Clearance	CRC	Gel serum, lithium heparin plasma, 24hour plain urine	24 hours	ALL	ALL	ALL	ALL	71	151	mL/min	Roche IFU Cat no. 04810716190 v20 March '20
CREATININE (blood)	CREA	Plain serum, gel serum, lithium heparin plasma	4 hours	M	days	0	14	27	81	µmol/L	Roche method sheet, Ref. No. 05168589190 v9 06/12/16 and National paediatric AKI group recommended reference ranges
				M	days	14	365	14	34		
				M	years	1	< 3	15	31		
				M	years	3	< 5	23	37		
				M	years	5	<7	25	42		
				M	years	7	<9	30	48		

				M	years	9	<11	28	57		
				M	years	11	11	36	64		
				M	years	12	12	36	67		
				M	years	13	13	38	76		
				M	years	14	14	40	83		
				M	years	15	15	47	98		
				M	years	16	16	54	99		
				M	years	16	19	55	104		
				M	years	19	150	59	104		
				F	days	0	14	27	81		
				F	days	14	365	14	34		
				F	years	1	< 3	15	31		
				F	years	3	< 5	23	37		
				F	years	5	<7	25	42		
				F	years	7	<9	30	48		
				F	years	9	<11	28	57		
				F	years	11	11	36	64		
				F	years	12	12	36	67		
				F	years	13	13	38	74		
				F	years	14	14	43	75		
				F	years	15	15	44	79		
				F	years	16	16	48	81		
				F	years	16	150	45	84		
	CRP		4 hours	All	Y	18	150	0.6	5	mg/L	

C-Reactive protein (CRP) (Plasma/ serum)		Plain serum, gel serum, lithium heparin plasma, EDTA plasma		All	Y	0	17	0.6	5		Roche IFU (lower limits not specified, but the lower limit of quantitation is 0.6 mg/L)
CSF total protein	CTP	CSF, plain	4 hours	All	Months/Years	2 months	150 years	0.15	0.45	g/L	Roche kit insert. Tietz textbook of clinical chemistry
				All	Weeks/Months	4 weeks	2 months	0.2	0.7		
				All	Days/weeks	7 days	4 weeks	0.2	0.8		
				All	Days	0 days	7 days	0.4	1.1		
CTx (C-terminal telopeptides)	CTX	EDTA plasma	1 week	M		All	All	38	724	ng/L	IDS ISYS CTX kit insert
				F	None - Reference range applied as an auto comment to all female patients						
Copper (serum)	CU	Plain serum	1 week	All	Months	0	<3	1.5	7	µmol/L	Lockitch G. Trace elements in pediatrics. J Internat Fed Clin Chem 1996;9(2):46-8, 50-1 Heitland et al J Trace Elements in medicine and biology v20 (2006) p253-262.
				All	Months	3	<6	4	17		
				All	Months	6	<12	8	20.5		
				All	Years	1	<6	12.5	23.5		

				All	Years	6	<10	13	21.5		
				All	Years	10	<14	12.5	19		
				All	Years	14	120	13	26		
Cystatin C	CYS C	Gel serum, lithium heparin plasma	Urgent 2 hours, routine 4 hours	ALL	Years	50	150	0.61	1.4	mg/L	Adults - Ann Clin Biochem. 2000 Jan;37 (Pt 1):49-59 and USNKF guidance; Paediatrics - study 1 quoted in Paediatric Reference Intervals (5th Ed). Soldin, Bugnara and Wong. AACC Press 2003; Premature babies Arch Dis Child 2000;82:71–75.
				ALL	Years	18	50	0.56	0.98		
				ALL	Years	1	17	0.56	1.3		
				ALL	Days	29	364	0.7	1.5		
				ALL	Days	0	28	0.8	2.3		
Dexamethasone	DEX	Plain serum, gel serum	360 hours	no ref range. Comment Concentrations <3.0 nmol/L suggest impaired absorption or excess metabolism of dexamethasone. Consider an alternative biochemical screening test to investigate hypercortisolism						nmol/L	Wythenshawe in-house validation & verification (V&V) data. Dexamethasone method validation data: Q-Pulse BI-F-MS-61; Hawley, J., et al. Annals of Clinical Biochemistry, vol. 55, no. 6, Nov. 2018, pp. 665–672; Ueland GA, et al. Eur J Endocrinol 2017; 176: 705–713.
Dehydroepiandrosterone Sulphate (DHEAS)	DHEAS	Plain serum, gel serum, (lithium heparin WYTH only)	240 hours	Female	years	0	4 (+364 days)	None	≤1.0	µmol/L	Source: Bae et al. Reference intervals of nine steroid hormone over the life-span analysed by LC-MS/MS: Effect of age, gender, puberty, and oral contraceptives. J Steroid Biochem Mol Biol (2019) DOI: 10.1016/j.jsbmb.2019.105409
					years	5	9 (+364 days)	None	≤2.8		
					years	10	14 (+364 days)	None	≤5.8		

					Years	15	19 (+364 days)	1.2	11		
					Years	20	39 (+364 days)	1.2	8		
					years	40	59 (+364 days)	None	≤6.5		
					years	60	80	None	≤4.8		
				Male	years	0	4 (+364 days)	None	≤1.0		
					Years	5	9 (+364 days)	None	≤2.7		
					Years	10	14 (+364 days)	None	≤6.8		
					years	15	19 (+364 days)	1.5	12		
					years	20	39 (+364 days)	1.8	12.8		

					years	40	59 (+364 days)	None	≤10.1		
					years	60	80	None	≤8.7		
Digoxin (Blood)	DIG	Plain serum, gel serum, lithium heparin plasma	Urgent 2 hours, routine 4 hours	Not age or gender specific 0.6-1.2 ug/L						mg/L	Roche kit insert
Estimated Glomerular Filtration Rate CKD-EPI 2012 (EGFR)	EGFR	Plain serum, gel serum, lithium heparin plasma	4 hours	all	Y	18	150	90*	none	ml/min/1.73 m2	https://kdigo.org/wp-content/uploads/2017/02/KDIGO_2012_CKD_GL.pdf
Faecal Elastase	ELAST	Faeces	336 hours	ALL	ALL	ALL	ALL	201	NONE	µg/g	Buhlmann kit insert
Blood Ethanol	ETOH	Gel serum	4 hours	No ref range						mg/L	N/A
Everolimus (Blood)	EVEROL	Whole blood EDTA	24 hours					3	8	µg/L	Discussion with transplant Physicians
Free Androge	FAI	Plain serum, gel serum, lithium heparin plasma	240 hours	Female	Years	18	49 + 364 days	0.3	5.6	%	Adults - Roche kit insert 07027915500, 2021-10, V3.0

n Index (FAI)					Years	50	150	0.2	3.6		
				Male	NA, not provided in males						
Fluid albumin	FALB	Fluid, plain	24 hours	No reference range						g/L	
Fluid Bilirubin	Fbil	Fluid, plain		No reference range						µmol/L	N/A
Fluid calcium	FCA	Fluid, plain		No reference range						mmol/L	
Faecal Calprotectin (faeces)	FCAL and FCAL1(primary care distinguished from secondary see comments	Faeces	2 weeks	<100 – negative 100-250 – equivocal >250 - positive						µg/g	Adopted from York group

	fields)										
Faecal Sugar Chromatography	FCHROM	Faeces	2 weeks	no ref range						N/A	N/A
Chloride (Fluids)	FCL	Fluid, plain		all	none	all	none	none	none	mmol/L	N/A
Iron	FE	Plain serum, gel serum, lithium heparin plasma	4 hours	all	W-Y	4	1	10	30	µmol/L	Soldin and Roche IFU
				all	Y	1	10	5	25		
				all	Y	10	18	10	25		
				all		18	150	5.8	34.5		
Fractional excretion of potassium	FEK	Plain serum, gel serum, lithium heparin plasma, spot urine		autocomment: >10% suggests renal cause for hypokalaemia, <10% suggests extra-renal cause						%	
Fractional Excretion of Sodium	FENA	Plain serum, gel serum, lithium heparin plasma, spot urine		autocomment: <1% suggests pre-renal cause for hyponatraemia, >1% renal wasting of sodium and >4% an obstructive cause						%	

Ferritin	FER	Gel serum, (lithium heparin plasma paeds)	24 hours	F	Years	0	5	12	150	µg/L	Roche kit insert
				F	years	5	120	15	150		
				M	years	0	5	12	400		
				M	years	5	120	15	400		
Free Fatty Acids (blood)	FFA	Plain serum, gel serum, lithium heparin plasma	2 weeks	No reference range						µmol/ L	N/A
FIB4 (blood)	FIB4	Plain serum, gel serum, lithium heparin plasma		Comment: Score <1.45 suggests low risk of liver fibrosis, A score between 1.45 and 2.67 identifies patients at moderate risk of liver fibrosis, A score of >2.67 is consistent with significant fibrosis. Suggest referral to hepatology if not already made.						none	https://cks.nice.org.uk/topics/non-alcoholic-fatty-liver-disease-nafld/
Faecal Immunological Testing (FIT; faeces)	FIT / FIT1 – FCAL comments are differentiated by loca	Faeces	7 days		y	18		10		µg Hb/g	SOP

	tion primary care = FIT, secondary care = FIT1										
Ca125 (Fluid)	FLCA125	Fluid, plain	96 hours	No reference Range						kU/L	N/A
CA19-9 (Fluid)	FLCA199	Fluid, plain	96 hours	No reference Range						kU/L	N/A
CEA (Fluid)	FLCEA	Fluid, plain	96 hours	No reference Range						µg/L	N/A
Cholesterol (Fluid)	FLCHOL	Fluid, plain	24 hours	No reference Range						mmol/L	N/A
Creatinine (Fluid)	FLCR	Fluid, plain		No reference Range						µmol/L	N/A
Fluid glucose	FLGLU	Fluid, flouride oxalate	24 hours	No reference Range						mmol/L	N/A

POTASSIUM (Fluid)	FLK	Fluid, plain		No reference Range						mmol/L	N/A
Lactate Dehydrogenase (Fluid)	FLLDH	Fluid, plain	24 hours	No Reference Interval; interpretation depends on other tests and clinical status. Light's criteria - Exudate if fluid to plasma lactate dehydrogenase (LDH)/serum LDH ratio is greater than 0.6. Exudate if LDH level greater than two-thirds the upper limit of the laboratory's reference range of serum LDH.						U/L	Pleural effusions: the diagnostic separation of transudates and exudates. Ann Intern Med. 1972; 77(4):507-13; Light RW; Macgregor MI; Luchsinger PC; Ball WC
Lipase (Fluid)	FLLPS	Fluid, plain	24 hours	No reference Range						U/L	N/A
Sodium (Fluid)	FLNA	Fluid, plain		No reference Range						mmol/L	N/A
Fluid Osmolality	FLOSM	Fluid, plain	36 hours	No reference Range						mmol/Kg	N/A
pH (Fluids, usually pleural fluid)	FLPH	Fluid, plain	24 hours	all	y	all	none	*	*	pH	https://acutecaretesting.org/en/articles/clinical-aspects-of-pleural-fluid-ph *Animal model data 7.60 to 7.66. One human study reported mean PF pH of 7.64
Fluid total protein	FLTP	Fluid, plain	24 hours	No reference Range - autocomment "Light's criteria: a pleural fluid : serum protein ratio >0.5 is suggestive of an exudative pleural effusion"						g/L	

Triglycerides (Fluid)	FLTRIG	Fluid, plain	24 hours	No reference Range						mmol/L	N/A
URATE (ASPIRATE)	FLUA	Fluid, plain		No reference Range						µmol/L	N/A
Fluid Urea	FLUR	Fluid, plain		No reference Range						mmol/L	N/A
Folate (blood)	FOL	Gel serum, (lithium heparin plasma paeds)	24 hours	All	All			3.9	20	µg/L	Wythenshawe reporting document NICE Clinical Knowledge Summary – summary of B12 and folate deficiency https://cks.nice.org.uk/topics/anaemia-b12-folate-deficiency/
Fluid Phosphate	FPHOS	Fluid, plain		no reference rrange						mmol/L	N/A
Free Monomeric Prolactin	FPROL	Gel serum, lithium heparin plasma	24 hours	Male	Years	18	150	67	251	mU/L	Work performed by Mike France found 77.5% recovery of free prolactin on re-analysis following PEG precipitation, hence ref range values for free monomeric prolactin equal the total prolactin ref ranges adjusted by this factor utilising the same age bands.
				Male	Years	12	17	50	502		
				Male	Years	9	11	47	581		
				Male	Years	5	8	53	460		
				Male	Years	2	4	64	749		
				Male	Years	1	1	72	824		
				Male	Months	9	12	115	856		

				Male	Months	6	8	94	1715		
				Male	Months	3	5	88	2180		
				Male	Days	61	90	117	2186		
				Male	Days	31	60	534	3261		
				Male	Days	0	30	698	5232		
				Female	Years	18	150	79	384		
				Female	Years	12	17	65	630		
				Female	Years	9	11	50	574		
				Female	Years	5	8	51	488		
				Female	Years	2	4	63	670		
				Female	Years	1	1	74	903		
				Female	Months	9	12	115	856		
				Female	Months	6	8	94	1715		
				Female	Months	3	5	88	2180		
				Female	Days	61	90	117	2186		
				Female	Days	31	60	534	3261		
				Female	Days	0	30	698	5232		
Follicle Stimulating	FSH	Plain serum, gel serum, lithium heparin plasma	24 hours	Male	years	18	150	1.5	12.4	IU/L	Roche kit insert 0702734500v2.2 08-2017
				Female	years	18	150	Depends on cycle-			

Hormone (FSH)								report as comment			
				Female	Follicular			3.5	12.5		
				Female	Mid - cycle			4.7	21.5		
				Female	Luteal			1.7	7.7		
				Female	Post menopausal			25.8	none		
Free T3	FT3	Plain serum, gel serum, lithium heparin plasma	72 hours	M&F	years	≥18	150	3.1	6.8	pmol/L	Roche Elecsys TFTs paediatric ranges 2007/8. Adult euthyroid range Roche IFU FT3III 09005803500V1.0
				M&F	years	≥11	<18	3.9	7.7		
				M&F	years	≥6	<11	3.9	8		
				M&F	years	≥1	<6	3.7	8.5		
				M&F	months	≥3	<12	3.3	9		
				M&F	days	≥4	<91	3	9.3		
Free T4	FT4	Plain serum, gel serum, lithium heparin plasma	4 hours	M&F	Years"	≥18	150	11.3	21.6	pmol/L	"In-house data analysis (Fiona Ivison 2021) *Elecsys Roche 2007/2008 ranges. **CALIPER ranges for Roche 2019 (altered to remove samples <3 days of age)
				M&F	Years*	≥12	<18	11.3	21.6		
				M&F	Years*	≥7	<12	12.5	21.5		

				M&F	Years	≥1	<7	12.3	22.8		
				M&F	Months**	≥1	<12	14	22		
				M&F	Days **	≥4	<30	18	31		
				M&F	days	≥0	≤3	No ranges - see autocomment to be added to results			
Gamma-Glutamyl Transferase (blood)	GGT	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	D	0	14	17	175	U/L	CALIPER. Ranges different in neonates and inappropriate extending to adults. Only used to 18 years and not 19. Ranges not continuous for ORC. Wythenshawe adult ranges added. Female 6-42 IU/L and male 10-71 IU/L (Clin Chem Lab Med 2005;43:A69)
				Both	D	15	364	5	101		
				Both	Y	1	<11	4	12		
				Both	Y	11	<18	4	16		
				M	Y	18		10	71		
				F	Y	18		6	42		

Gentamicin (Blood)	GENT	Plain serum, gel serum, lithium heparin plasma	urgent 2 hours, routine 4 hours	Comment: ONCE DAILY DOSING: Pre-dose: less than 1 mg/L Neonates, pre-dose: less than 2 mg/L MULTIPLE DAILY DOSING All patients (without endocarditis): Pre-dose: less than 2 mg/L 1 hr post-dose: 5-10 mg/L All patients (with endocarditis):						mg/L	Discussion with Pharmacy after comparing current comments
Globulin (blood)	GLOB	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	D	10	150	15	42	g/L	Roche data for > 28 days. In house ORC data for ≤ 28 days
Glucose, non-fasting random	GLU	Flouride oxalate, flouride EDTA plasma	4 hours	None. Comment added if glucose ≥11.0mmol/L "Random Glucose >11.0 mmol/L diagnostic of DM, if confirmed by repeat"						mmol/L	WHO
Fasting glucose	GLUF	Flouride oxalate, flouride EDTA plasma	4 hours	All	Years	18	150	4.1	5.6	mmol/L	Adults-Tietz textbook of clinical chemistry; paediatrics-Soldin 5th edition/ORC in-house ranges. Roche kit insert
				All	Days/ Years	8 days	17 years	3	6.5		
				All	Days	2 days	7 days	2.6	6.1		
				All	Days	0 days	6 days	2	6.1		

Glucose Tolerance Test (Blood)	GTT	Flouride oxalate, flouride EDTA plasma	4 hours	Comments: WHO Criteria for Diabetes Mellitus on Venous Plasma Normal - Fasting < 6.1mmol/L and 2hr < 7.8 mmol/L Impaired fasting glucose: Fasting 6.1 - 6.9 and 2h <7.8mmol/L Impaired glucose tolerance: Fasting glucose < 7.0 mmol/L and 2 hr plasma glucose between 7.8 and 11.0 mmol/L Diabetes: fasting >6.9 or 2hr > 11.0 mmol/L Fasting glucose <5.3 mmol/L and 120 minute value <8.5 mmol/L: comment: Results exclude gestational diabetes. Fasting glucose of ≥ 5.3 mmol/L and/or 120 minute value ≥ 8.5 mmol/l: Results consistent with gestational diabetes mellitus. Refer to MFT GDM (HAPO) guidelines 2021	mmol/L	MFT GDM (HAPO) guidelines 2021. WHO criteria
HbA1c for Diagnosis (blood)	HbA 1cD	EDTA whole blood	96 hours	20-41	mmol/mol	WHO guidance 2011 (Diagnostic)
HbA1c for Monitoring (blood)	HbA 1cM	EDTA whole blood	96 hours	No reference range quoted	mmol/mol	N/A

HDL – blood	HDL	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	Day	0	<15	0.2	1	mmol/L	Caliper range from the excel spreadsheet - adults: Male >1.0 mmol/L Female >1.2 mmol/L (JBS 2: Joint British Societies' guidelines on prevention of cardiovascular disease in clinical practice)
				Both	Day/ Year	15	<1	0	2		
				Both	Year	1	<4	0.7	1.7		
				Both	Year	4	<13	0.8	2		
				Female	Year	13	<16	0.7	2		
				Male	Year	13	<19	0.7	1.9		
Human Growth Hormone	HGH	Plain serum, gel serum	2 weeks	No reference ranges are provided. Interpretative comments added if part of DFT						µg/L	N/A
Insulin-like Growth Factor-1 (IGF-1)	IGF1	Plain serum, gel serum	2 weeks	extensive age and sex related reference ranges, see Beaker template for full details						µg/L	IDS: Insulin-like Growth Factor-I (IGF-I) Global Multicenter Reference Interval Study (adult ranges grouped into wider age bands). J Clin Endocrinol Metab, May 2014, 99(5): 1712-1721
IGF-Binding Protein 3 (IGF-BP3) – Serum	IGFBP3	Plain serum, gel serum	3 weeks	extensive age and sex related reference ranges, see Beaker template for full details						mg/L	Reference ranges derived from J Clin Endocrinol Metab, May 2014, 99(5): 1675-1686 . Full ranges were provided as a supplementary table from IDS in 6-monthly age bands for paediatrics and 1 year age bands for adults. These ranges were then amalgamated in-house to 1 year age bands for paediatrics and 3 separate age bands for adults

											(pragmatic decision as little change between the ages groups).
Insulin (blood)	INS	Plain serum, gel serum, lithium heparin plasma	2 weeks	No reference range						pmol/ L	N/A
Itraconazole	ITRA	Plain serum	1-2 days	All	ALL	ALL	ALL	1	2	*mg/L*	Mycology Department
Jejunal Biopsy Analysis (disaccharidases)	JBX	Jejunal tissue biopsy	3 weeks	M/F	ALL	N/A	N/A	Maltase 130 U/g protein Sucrase 30 U / g protein Lactase 6 / g protein	Maltase 456 U/g protein Sucrase 152 U / g protein Lactase 55 U / g protein	U/g protein	SOP from ORC

Potassium (serum/plasma)	K	Plain serum, gel serum, lithium heparin plasma	4 hours	All	years	18 years	150 years	3.5	5.3	mmol/L	Pathology Harmony; Clayton, Biochemistry of the sick child
				All	Weeks / years	4 weeks	17 years	3.5	5		
				All	Weeks	0 weeks	4 weeks	3.4	6		
Lactate (blood)	LACT	Flouride oxalate plasma	2 hours	M/F	y	0	150	0.6	2.5	mmol/L	Pathology Harmony
Lactate Dehydrogenase	LDH	Plain serum, gel serum, lithium heparin plasma	4 hours	ALL	Years	15	150	139	249	IU/L	Adult range = Roche IFU Cat no. 03004732122 v12 March 2020 Consensus values for males and females (adult range). Paediatric ranges = CALIPER Roche Elecsys.
				MALE	Years	10	14	163	279		
				FEMALE	Years	10	14	163	269		
				ALL	Years	1	9	196	314		
				ALL	Days	15	364	169	435		
				ALL	Days	0	14	30	1143		
LDL (blood)	LDL	Plain serum, gel serum, lithium heparin plasma	4 hours	M+F	Year	0	<18	1.3	2.9	mmol/L	National guidelines
Luteinising Hormone (LH)	LH	Plain serum, gel serum, lithium heparin plasma	24 hours	M	years	18	150	1.7	8.6	IU/L	Roche kit insert 0702734500v2.0 08-2017 No ref ranges for children
				F	Years	18	150				
						Follicular		2.4	12.6		
						Mid-cycle		14	95.6		
						Luteal		1	11.4		

						Post Meno pausal					
Blood Lithium	LI	Plain serum, gel serum	24 hours	M/F	<18			0.4	1	mmol/L	Pathology Harmony
				M/F	>18			0.4	1		
Lipase (Blood)	LIP	Plain serum, gel serum, lithium heparin plasma	4 hours	all	none	all	none	13	60	U/L	adult: Roche method sheet
Plasma metanephrine	MET	Lithium heparin plasma, **EDTA plasma**	240 hours	ALL	ALL	ALL	ALL	0	510	pmol/L	Clin Chim Acta 2010; 411:546-552
Mitra tacrolimus and creatinine	MITFK	Mitra collection device		No reference range. Autocomment "Tentative Target Range for Tacrolimus is 4-12 ug/l. Target ranges for heart and lung transplant patients ONLY. Please consult local specialist for other uses."						µg/L	TelePath validation and autocomments - transplant team
Magnesium	MG	Plain serum, gel serum, lithium heparin plasma	4 hours	all				0.7	1	mmol/L	Pathology Harmony
Mycophenolic acid	MPA	EDTA plasma	192 hours		ALL	ALL	ALL	2.5	4.5	mg/L	J Heart Lung Transplant 1999; 18:143
Blood Methotrexate	MTX	Plain serum	Same day (OOH following day)	No reference range						µmol/L	N/A

Sodium (serum/plasma)	NA	Plain serum, gel serum, lithium heparin plasma	4 hours	All	Weeks/years	4 weeks	150 years	133	146	mmol/L	Pathology Harmony and in-house ORC paediatric ranges.
				All	weeks	1 week	4 weeks	132	142		
				All	weeks	0 weeks	1 week	131	144		
Plasma normetanephrine	NMET	Lithium heparin plasma, **EDTA plasma**	240 hours	ALL	ALL	ALL	ALL	0	1180	pmol/L	Clin Chim Acta 2010; 411:546-552
NON HDL Cholesterol (Blood, calculation)	NON HDL	Plain serum, gel serum, lithium heparin plasma	4 hours	No reference range						mmol/L	N/A
Oestradiol	OEST	Plain serum, gel serum, lithium heparin plasma	24 hours immunoassay, 8 days lcms	Female	years	18	55			pmol/L	Adult ref range see Roche pack insert 06656021190v4 (Feb17). Paed ref range see CB-REP-MEA-169, Post menopausal (see OESTMS) Tanner stage data available via DB if required
				Female	Years	follicular		45	854		
						Mid-Cycle		151	1461		
						luteal		82	1251		
						Post menopausal			77		
				Female	Days	15	Up to 365		78		

					Years	1	Up to 9		19		
					Years	9	Up to 11		170		
					Years	11	Up to 12		354		
					Years	12	Up to 14	21	664		
					Years	14	Up to 18		996		
				Males	years	18	150	41	159		
					Days	15	Up to 365		78		
					Years	1	Up to 11		28		
					Years	11	Up to 13		82		
					Years	13	Up to 15		89		
					Years	15	Up to 18		132		
Oestradiol MS	OES TMS	Plain serum, gel serum, lithium heparin plasma	8 days	F	Years	18	150			*pmol/L*	BI-X-MS-2 (Kushnir et al AM J Clin Pathol 2008 129 530-539) – adult female,). Paed ref range see CB-REP-MEA-169
				F		Pre-menopausal		11	969		

						Post - meno pausal		7	77		
				Female	Days	15	Up to 365		78		
					Years	1	Up to 9		19		
					Years	9	Up to 11		170		
					Years	11	Up to 12		354		
					Years	12	Up to 14	21	664		
					Years	14	Up to 18		996		
				Male	Days	15	Up to 365		78		
					Years	1	Up to 11		28		
					Years	11	Up to 13		82		
					Years	13	Up to 15		89		
					Years	15	Up to 18		132		

Orosomucoid	OROSO	Gel serum, lithium heparin plasma	Same day	ALL	ALL	ALL	ALL	0.3	1.2	*g/L*	Historical range, Broadly in keeping with multiple sources e.g. Mayo Clinic In House RR (390 to 1150 mg/L); Clin Chem Lab Med. 2004;42(7):792-9 (RR 510 to 970 mg/L); Caliper 480 to 1140 mg/L (Abbott analyser). Roche method sheet, Ref. No. 11557602316 v11 04/07/16 quotes 500-1200 mg/L. Lower reference limit retained.
Osmolal Gap, serum/plasma	OSGAP	Plain serum, gel serum, lithium heparin plasma	4 hours	all	none	all	none	-10	10	mmol/kg	KW Choy et al. Clin Biochem Rev 37 (3) 2016 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5111243/pdf/cbr-37-113.pdf ; and G Liamis et al. Postgrad Med. 2017 May;129(4):456-459 https://www.tandfonline.com/doi/abs/10.1080/00325481.2017.1308210?journalCode=ipgm20
Osmolality (Blood)	OSM	Plain serum, gel serum, lithium heparin plasma	36 hours	all	Y		150	275	295	mmol/Kg	Pathology Harmony
Type 1 Procollagen N Peptide (P1NP) –	PINP	Plain serum, gel serum, lithium heparin plasma	2 weeks	BOTH		All ages		27	128	µg/L	IDS Kit insert: IS-4000PLV0 13-07-2012

Serum or plasma											
Type III Procollagen N Peptide (P3NP; Blood)	P3NP	Plain serum, gel serum, lithium heparin plasma	4 weeks	F	yrs	0	0.25	42.4	64.1	µg/L	Trivendi P et al. J Pediatr 1989: 114: 225-230
				M	yrs	0	0.25	46.5	77.6		
				F	yrs	0.25	0.5	31.3	37.8		
				M	yrs	0.25	0.5	24.6	43.3		
				F	yrs	0.5	0.75	16.2	23.2		
				M	yrs	0.5	0.75	14.9	21.4		
				F	yrs	0.75	1	13.7	26		
				M	yrs	0.75	1	11.5	18.9		
				F	yrs	1	2	11.2	15.7		
				M	yrs	1	2	7.4	16		
				F	yrs	2	3	7.2	12.5		
				M	yrs	2	3	5.9	11		
				F	yrs	3	10	5.6	9.9		
				M	yrs	3	10	5.6	9.9		
				F	yrs	10	11	5.5	10.6		
				M	yrs	10	11	6.2	9.4		
				F	yrs	11	12	8.2	14.2		
				M	yrs	11	12	5.1	9.4		
				F	yrs	12	13	7.1	14.6		
				M	yrs	12	13	6	11.9		
				F	yrs	13	14	3	8.7		
				M	yrs	13	14	7.7	18.8		

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<tr><td></td><td></td><td></td><td></td><td>F</td><td>yrs</td><td>15</td><td>16</td><td>7.2</td><td>7.5</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td>M</td><td>yrs</td><td>15</td><td>16</td><td>11.4</td><td>19.7</td><td></td><td></td></tr>
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<tr><td></td><td></td><td></td><td></td><td>M</td><td>yrs</td><td>17</td><td>18</td><td>3.8</td><td>5.9</td><td></td><td></td></tr>
<tr><td>Blood Paracetamol</td><td>PAR</td><td>Plain serum, gel serum, lithium heparin plasma</td><td>4 hours</td><td colspan="6">no reference range</td><td>mg/L</td><td>N/A</td></tr>
<tr><td>Procalcitonin</td><td>PCT</td><td>Plain serum, gel serum</td><td>Same day</td><td colspan="6">no reference range - autocomment "Consider stopping antibiotics if procalcitonin concentration has decreased by more than or equal to 80% from the PEAK concentration or is less than 0.5ug/L.
Review of antibiotics is STRONGLY encouraged if procalcitonin concentration is increasing AND >0.5ug/L.
Refer to microbiology for further advice on interpretation & antibiotic dosing."</td><td>µg/L</td><td></td></tr>
<tr><td>Phenytoin (blood)</td><td>PHEN</td><td>Plain serum, gel serum, lithium heparin plasma</td><td>Urgent 2 hours, routine 4 hours</td><td colspan="6">Not age or gender specific
5-20 mg/L</td><td>mg/L</td><td>Pathology Harmony</td></tr>
</table>

Blood Phenobarbital	PHENOB	Plain serum, gel serum, lithium heparin plasma	Urgent 2 hours, routine 4 hours	All	All			10	40	mg/L	Pathology Harmony
Phosphate (blood)	PHOS	Gel serum, lithium heparin plasma	4 hours	Both	month	0	<1 month	1.4	2.8	mmol/L	RMCH historic data but consistent with CALIPER. Adult from Pathology Harmony
				Both	Month/yr	1 month	<1 yr	1.2	2.2		
				Both	yr	1	<3	1.1	2		
				Both	yr	3	<12	1	1.8		
				Both	yr	12	<15	0.95	1.5		
				Both	yr	16	<18	0.8	1.4		
				Both	yr	18	-	0.8	1.5		
PLGF (Placental Growth Factor), SFLT (Soluble FMS Tyrosine Kinase-1), SFLT:PLGF ratio (blood)	PLGFP	Plain serum, gel serum	Same day	comment: Clinical decision points: sFlt:PLGF ratio is used in suspected pre-eclampsia not confirmed by clinical assessment <37 weeks. Clinical pathway includes clinical assessment of maternal symptoms, BP, proteinuria,other markers and foetal assessment in conjunction with sFlt:PLGF ratio: sFlt:PLGF ratio <38 pre-eclampsia excluded for next 7 days sFlt:PLGF ratio >38 to <85 Intermediate result, increased surveillance sFlt:PLGF ratio >85 diagnosis of pre-eclampsia/placental disease confirmed Note a positive ratio is not an isolated indication for delivery <37 weeks.						*none*	A to Z entry prepared by Kath Hayden, Feb 2021.

Post-Mortem Glucose (lab orderable only, not reported onto patient record)	PM GLU	Flouride oxlate	4 hours	No ref range	*mmol/L*	N/A
Post-Mortem Urea (lab orderable only, not reported onto patient record)	PM UR	Plain serum, gel serum, lithium heparin plasma	4 hours	No ref range	*mmol/L*	N/A
Posaconazole (Blood)	Posa	Plain serum	1-2 days	No reference range. Autocomment "The target pre-dose levels are 1.0 - 3.75 mg/L on therapy and 0.7 - 1.5 mg/L for prophylaxis."	*mg/L*	TelePath validation and autocomments.
Prednisolone	PRED	Plain serum, gel serum, lithium heparin plasma	192 hours	No reference range	*µg/L*	N/A

Progesterone	PROG	Gel serum, lithium heparin plasma	24 hours	No reference range, autocomment: Progesterone level >30 nmol/L on day 21/mid-luteal phase sample is consistent with ovulation						nmol/L	Hargreaves, T. B. & Mills, J. A. (1998) Investigating and managing infertility in general practice. BMJ 316; 1438-1441
Prolactin	PROL	Gel serum, lithium heparin plasma	24 hours	Male	Years	18	150	86	324	mU/L	Adult ranges = Roche kit insert 03203093190 v10 Sept-2020 Paeds ranges = From Annals paper with Siemens equipment, adjustment applied according to method bias in EQA scheme. See Beaker template (BC-CL-F-246) for details
					Years	12	17	65	648		
					Years	9	11	60	750		
					Years	5	8	69	593		
					Years	2	4	82	967		
					Years	1	1	93	1063		
					Months	9	12	148	1105		
					Months	6	8	121	2213		
					Months	3	5	113	2813		
					Days	61	90	151	2820		
					Days	31	60	689	4208		
					Days	0	30	900	6751		
				Female	Years	18	150	102	496		
					Years	12	17	84	813		
					Years	9	11	65	740		
					Years	5	8	66	630		
					Years	2	4	81	864		
					Years	1	1	96	1165		

					Months	9	12	148	1105		
					Months	6	8	121	2213		
					Months	3	5	113	2813		
					Days	61	90	151	2820		
					Days	31	60	689	4208		
					Days	0	30	900	6751		
Prostate Specific Antigen	PSA	Gel serum, lithium heparin plasma	24 hours	MALE	Years	18	39	NONE	NONE	µg/L	NICE NG12: Suspected cancer: recognition and referral. Roche kit insert
				MALE	Years	40	49	0	2.5		
				MALE	Years	50	59	0	3.5		
				MALE	Years	60	69	0	4.5		
				MALE	Years	70	79	0	6.5		
				MALE	Years	80	150	NONE	NONE		
Parathyroid Hormone	PTH	Lithium heparin plasma, **EDTA plasma**	24 hours	ALL	Years	19	150	1.6	6.9	pmol/L	Adult range = Roche IFU Cat no. 11972103122 v27 March 2020. Paediatric ranges = CALIPER Roche Elecsys.
					Years	11	<19	1.6	7.2		
					Years	1	<11	1.2	6.3		
					Months	1	<12	0.9	6.5		
					Days	0	31	0.7	6.3		
Renin activity	RENINA	Lithium heparin plasma, EDTA plasma	240 hours	M,F	years	18	150	0.3	2.2	*nmol/L/hour*	In house comparison with Leeds. See: BI-F-MS-30, No paediatric ref ranges available
		EDTA plasma			D	0	up to 7	0	312	mU/L	

Renin Concentration (blood)	RENINC		240 hours		D & Y	7 days	up to 1 year	31.2	109.2		Clinical Paediatric Endocrinology 5th Edition, Chapter 25, Lesley J. Tetlow and Peter E. Clayton
					Y	1	up to 2	32.4	93.6		
					Y	2	up to 10	22.8	62.4		
					Y	10	up to unspecified	12	31.2		
Serum 5HIAA	S5HIAA	Plain serum, gel serum	240 hours	All	ALL	ALL	ALL	0	140	nmol/L	Ann Clin Biochem 2016; 53:554
Blood Salicylate	SAL	Plain serum, gel serum, lithium heparin plasma	4 hours	No reference range						mg/L	N/A
Salivary cortisol	SALCOR	**Saliva salivette tube**, saliva passive drool	240 hours	No reference range . Comment "Salivary cortisol reference range: 8-9 am = 5-46 nmol/L Late night = < 2.6 nmol/L"						nmol/L	DeBono et al. Home waking salivary cortisone to screen for adrenal insufficiency. NEJM Evid 2023, 2(2). DOI: 10.1056/EVIDoa2200182
Salivary cortisone	SALCORN	**Saliva salivette tube**, saliva passive drool	240 hours	No reference range. Comment "Salivary cortisone reference range: 9 am = 18-47 nmol/L Late night = < 18 nmol/L", "Waking salivary cortisone less than 7.0 nmol/L , adrenal insufficiency is highly likely and requires prompt review. Waking salivary cortisone 7.0 nmol/L to 17.0 nmol/L, adrenal insufficiency cannot be excluded, arrange for a synacthen test. Waking salivary cortisone greater than 17.0 nmol/L , adrenal function likely normal. "						nmol/L	DeBono et al. Home waking salivary cortisone to screen for adrenal insufficiency. NEJM Evid 2023, 2(2). DOI: 10.1056/EVIDoa2200182

Selenium (serum)	SEL	Plain serum	2 weeks	F	Days	0	<28	0.25	0.82	µmol/L	Heitland et al J Trace Elements in medicine and biology v20 (2006) p253-262. In-house data: Selenium by ICP-MS - Method and Paediatric Reference Intervals (CB-REP-REP-23)
				F	Months	1	<12	0.11	0.92		
				F	Years	1	<5	0.26	1.27		
				F	Years	5	<14	0.45	1.24		
				M	Days	0	<28	0.18	0.9		
				M	Months	1	<12	0.11	0.76		
				M	Years	1	<5	0.32	1.19		
				M	Years	5	<14	0.43	1.25		
				All	Years	14	120	0.8	1.5		
Sex Hormone Binding Globulin (SHBG)	SHGB	Plain serum, gel serum, lithium heparin plasma	240 hours	Female	days	4	31	14	120	nmol/L	Adults - Roche kit insert 07258496190, 2017-08, V1.0 Paediatrics – Konforte D, Shea JL, Kyriakopoulou L, Colantonio D, Cohen AH, Shaw J, Bailey D, Chan MK, Armbruster D, Adeli K. Complex biological pattern of fertility hormones in children and adolescents: a study of healthy children from the CALIPER cohort and establishment of pediatric reference intervals. Clin Chem 2013; 59:1215-27.
					months	1	12	36	229		
					years	1	7 + 364 days	42	189		
					Years	8	10 +364 days	26	162		
					Years	11	12 + 364 days	15	108		
					years	13	14 +364 days	11	98		

					years	15	16 + 364 days	10	84		Paediatrics – Sex Hormone Binding Globulin (SHBG) paediatric reference range review (Q Pulse Identifier: CB-REP-MEA-257)
					years	17	17 + 364 days	11	155		
					years	18	49 + 364 days	32	128		
					years	≥50		27	128		
				Male	days	4	31	14	120		
					months	1	12	36	229		
					years	1	7 + 364 days	42	189		
					Years	8	10 + 364 days	26	162		
					Years	11	12 + 364 days	15	108		
					years	13	14 + 364 days	11	98		

					years	15	17 + 364 days	10	50		
					years	18	49 + 364 days	18	54		
					years	≥50		21	77		
Sirolimus	SIRO	EDTA whole blood	24 hours					4	12	µg/L	Discussion with transplant Physicians
Salivary cortisol & cortisone -short synacthen test	SSTSAL	**Saliva salivette tube**, saliva passive drool	240 hours	No reference range						nmol/L	
Salivary testosterone	STEST	Saliva passive drool	1 month	Male	All	All	All	70	340	pmol/L	STEST SOP - 70-340 pmol/L (Clin Chem 2011; 57:774)
				Female	All	All	All	6	46		
Calculus studies (stone)	Stone	Stone	17 days	No reference range						N/A	N/A
Sweat Test	Sweat Test	Sweat	Same week as patient	Male	Months	0	6 months	0	29	mmol/L	Guideline for the performance of the sweat test for the investigation

(sweat chloride)			appointment	Female	Months	0	6 months	0	29		of cystic fibrosis 2nd Version (ACB 2014)
				Male		6 months	100 years	0	39		
				Female		6months	100 years	0	39		
Tacrolimus	TACRO	Whole blood EDTA	24 hours					3	8	µg/L	Discussion with transplant Physicians
Total cholesterol to HDL ratio (blood)	TCHDL	Plain serum, gel serum, lithium heparin plasma	4 hours	No reference range						N/A	
Total Cholesterol (Blood)	TCHOL	Plain serum, gel serum, lithium heparin plasma	4 hours	Female	Day	0	14	1.3	3.2	mmol/L	Caliper range
				Male	Day	0	14	1.2	2.8		
				Both	Days/ Year	15	<1	1.7	6.1		
				Both	Years	1	<19	2.9	5.4		
Teicoplanin	TEICO	Plain serum, **gel serum**, lithium heparin plasma	120 hours	no ref range. Autocomment "In severe Staph. aureus infections including infective endocarditis, pre dose target range is 20 - 60 mg/L. For other severe infections, target levels 10 - 60 mg/L"						mg/L	TelePath validation and autooomments. Antimicobial pharmacist
Testosterone (Roche)	Testosterone	Gel serum, lithium heparin plasma	240 hours	Male	years	18	49 + 364 days	8.6	29	nmol/L	Roche kit insert 07027915500, 2021-10, V3

					Years	≥50		6.7	25.7		
Testosterone by LC/LC-MS (blood)	Testosterone (LC-MS/MS)	Plain serum, gel serum, (lithium heparin plasma WYTH only)	240 hours	Female	days	0	14	None	<0.4	nmol/L	Source: Kyriakopoulou L, Yazdanpanah M, Colantonio DA, et al. A sensitive and rapid mass spectrometric method for the simultaneous measurement of eight steroid hormones and CALIPER pediatric reference intervals. Clinical Biochemistry 2013;46:642e51. DOI: 10.1016/j.clinbiochem.2013.01.002 Source: Kushnir MM, Blamires T, Rockwood AL, Roberts WL, Yue B, Erdogan E, Bunker AM, Miekle AW. Liquid chromatography-tandem mass spectrometry assay for androstenedione, dehydroepiandrosterone, and testosterone with pediatric and adult reference ranges. Clin Chem 2010; 56: 1138 - 47 For adult males 18 and above: Source: Roche kit insert 07027915500, 2021-10, V3
					days	15	364	None	<0.2		
					months	12	24	None	<0.3		
					years	2	3 (+364 days)	None	<0.5		
					years	4	5 (+364 days)	None	0.7		
					Years	6	7 (+364 days)	None	0.2		
					Years	8	9 (+364 days)	None	0.4		
					years	10	11 (+364 days)	0.1	1.1		
					years	12	13 (+364 days)	0.2	1.7		
					years	14	15 (+364 days)	0.2	1.8		

					years	16	17 (+364 days)	0.3	2		
					years	>18 (pre-menopausal)		0.3	1.9		
					years	>18 (post-menopausal)		0.2	1.1		
				Male	days	0	14	0.3	6.3		
					days	15	364	None	<8.9		
					months	12	24	None	<1.0		
					years	2	3 (+364 days)	None	<0.5		
					years	4	5 (+364 days)	None	<0.6		
					Years	6	7 (+364 days)	None	<0.5		

					Years	8	9 (+364 days)	0.1	0.3		
					years	10	11 (+364 days)	0.1	5.7		
					years	12	13 (+364 days)	0.1	21.5		
					years	14	15 (+364 days)	1.1	25.4		
					years	16	17 (+364 days)	5.5	28.6		
					Years	18	49(+364days)	8.6	29		
					Years		≥50	6.7	25.7		
Theophylline (Blood)	THEO	Plain serum, gel serum, lithium heparin plasma, EDTA plasma	Urgent 2 hours, routine 4 hours	Not age or gender specific 10-20 mg/L						mg/L	Roche kit inert
Thiopental (blood)	THIO	Plain serum, gel serum, lithium heparin plasma	By arrangement only through DB	autocomment: It is recommended that brain-stem testing should not be undertaken if the concentration is >5mg/L (AoMRC Code of practice for the diagnosis and confirmation of death (2008)).						mg/L	AoMRC Code of practice for the diagnosis and confirmation of death (2008))

Thiopurine metabolites (whole blood)	TMET XTMET	Whole bood EDTA	2 weeks	6-TGN: 235-450 pmol 6TGN/8x10^8 cells: maximum drug efficacy in IBD. >1000 pmol 6TGN/8x10^8 cells: increased risk of myelosuppression 6-MMPN: >5700 pmol 6MMPN/8x10^8 cells: Increased risk of hepatotoxicity							SOP (Adopted from Birmingham City)
TmP/GFR	TMPGFR	Gel serum, lithium heparin plasma		Both		0	<3 months	1.43	3.43		Adapted from RB Payne. Ann Clin Biochem 1998; 35: 201-6
				Both		3 months	<6 months	1.48	3.3		
				Both		6 months	<2 years	1.15	2.6		
				Both		2 years	<18 years	1.15	2.44		
				Male		18 years	<35 years	1	1.35		
				Male		35 years	<65 years	0.9	1.35		
				Female		18 years	<35 years	0.96	1.44		
				Female		35 years	<65 years	0.88	1.42		
				Both		65 years	150 years	0.8	1.35		

Troponin T	TNT	Gel serum, lithium heparin plasma	2 hours	ALL	ALL	ALL	ALL	0	14	ng/L	Roche method sheet Ref. No. 05092744190 v8 March '20
Tobramycin (Blood)	TOBR	Plain serum, gel serum, lithium heparin plasma	4 hours	comment on all: ONCE DAILY DOSING: Trough level: less than 1mg/L Peak levels not required to assess therapy.						mg/L	Discussion with Pharmacy
Triglycerides (blood)	TRIG	Plain serum, gel serum, lithium heparin plasma	4 hours	M+F	Day	0	<15	1	3.3	mmol/L	Caliper range from the excel spreadsheet - adults Roche
				M+F	Day/ Year	15	<1	0.7	3.2		
				M+F	Year	1	<18	0.5	2.5		
				M+F	Year	18	150		1.6		
Thyroid Stimulating Hormone (TSH)	TSH	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	Years *	≥18	150	0.27	4.2	mu/L	"In-house data analysis (Fiona Ivison 2021) *Elecsys Roche 2007/2008 ranges. **CALIPER ranges for Roche 2019 (altered to remove samples <3 days of age)
				Both	Years *	≥12	<18	0.27	4.2		
				Both	Years *	≥7	<12	0.6	4.84		
				Both	Years *	≥1	<7	0.7	5.97		
				Both	Months**	≥1	<12	1.02	6.8		
				Both	Days **	≥4	<30	1.23	9.7		
				Both	days	≥0	≤3	No ranges - see autocomment to be added to results			

Total protein (blood)	TP	Plain serum, gel serum, lithium heparin plasma	4 hours	Both	D	0	<15	51	80	g/L	CALIPER (Pathology Harmony for adults 60 – 80 g/L)
				Both	D/Y	15	<1	43	69		
				Both	Y	1	<6	59	73		
				Both	Y	6	<9	62	75		
				Both	Y	9		63	78		
Thiopurine Methyl Transferase (blood)	TPMT	Whole blood EDTA	10 days	Deficient activity less than 10 mU/L Low activity 20 - 85 mU/L Normal activity 85 - 185 mU/L High activity > 185 mU/L						mU/L	Paediatric DB SOP, ORC.
Thiopurine Methyl Transferase Genotype (blood)	TPMTG	Whole blood EDTA	2 weeks	No reference range						N/A	Qualitative test Reporting guide from Mol Gen laboratory
Thyroid Peroxidase Antibodies	TPO	Plain serum, gel serum, lithium heparin plasma	96 hours	ALL	ALL	ALL	ALL	0	34	IU/mL	Adult range = Roche IFU Cat no. 06368590190 v9 Nov 2020.
Transferrin	TRF	Plain serum, gel serum, lithium heparin plasma	4 hours	All	M-Y	2	1	1.04	2.24	g/L	historical but in keeping with Caliper/Roche IFU
				All	Y	1	17	2.2	3.37		
				All	Y	17	150	2	3.6		

Transferrin saturation	TRFSAT	Plain serum, gel serum, lithium heparin plasma	4 hours	All	Y	0	150	15	45	%	Hereditary Haemochromatosis. BMJ 2016; 353:i3128
Trans-Tubular Potassium Gradient	TTKG	Plain serum, gel serum, lithium heparin plasma, spot urine		autocomment: Valid if urine osm >serum osm and urine sodium >20mmol/L and normal diet. <4% to 5% indicates a lack of aldosterone effect at the corticol collecting duct if hyperkalaemic at the time. If hypokalaemic, >2 to 3% would indicate renal losses. Comparison after a trial of mineralocorticoid is useful to differentiate deficiency (increases within 4-6h post dose) or resistance (no increase).						%	8-9%, applied to all ages and genders. Ref from ORC
Urine 5HIAA	U5HIA	24hour acidified urine	240 hours	All	ALL	ALL	ALL	4	46	µmol/24 hours	Ann Clin Biochem 1997; 34: 424
URATE (Blood)	UA	Plain serum, gel serum, lithium heparin plasma	4 hours	M/F	D	0	15	158	748	µmol/L	Paed -Historical range, Caliper (Roche) confirms that higher values are expected in neonates, and that slightly lower values are observed in early to late childhood. Exact Caliper values slightly different than RMCH.
				M/F	D	15	365	88	370		
				F	Y	1	12	100	282		
				F	Y	12	19	147	342		
				F	Y	19	150	140	360		
				M	Y	1	12	100	282		
				M	Y	12	19	150	446		
				M	Y	19	150	200	430		
Albumin to Creatinin	UARC	Spot urine	24 hours	Any	Any	N/A	N/A		<3	mg/mmol	NICE CG182 CKD: use of ACR in monitoring progression of renal disease.

e Ratio (Urine)											
Urine Calcium (spot)	UCA	Spot urine	4 hours	No reference range						mmol/L	N/A
urine calcium:creatinine ratio	UCA CR	Spot urine	24 hours	Both	yr	0	<1 yr	0	1.49	mmol/mmol Cr	Paediatric age related cutoffs taken from paper M.P.Metz 2006 for urinary ca/cre. Adults Roche kit inset
				Both	yr	1 yr	<2 yrs	0	1.24		
				Both	yr	2 yr	<5 yrs	0	0.99		
				Both	yr	5 yr	<10 yrs	0	0.69		
				Both	yr	10 yr	<18 yrs	0	0.59		
				Both	yr	18	150yrs	0	0.52		
Urine Calcium Excretion	UCA EX	24hour acidified urine	24 hours	Both	yr	0	<18	Reference interval 0 to 0.1mmol/kg/24hrs AND SO REQUIRES CONSIDERATION OF PATIENT WEIGHT to interpret		mmol/24hrs	Paediatric from Alon US. Pediatr Nephrol 2009 24:2129-2135 Adult from Pathology Harmony

					yr	18	150	2.5	7.5		
Catecholamine metabolites (urine) - urine VMA/creatinine ratio	UCATSMUVMAC	Spot urine	7 days	Any	M	0	6	N/A	17	(µmol/mmol)	In-house data. (Paediatric upper limit determined as 97.5 percentile value in 24 hr urines from 505 hospitalised children who did not have a neuroblastoma).
						>6	12		15		
						>12	24		10		
						>24	36		9		
						>36	48		8		
						>48	72		7		
						>72	96		6		
						>96	144		5.5		
						>144	192		5		
Catecholamine metabolites (urine) - urine HVA/Creatinine ratio	UCATSMUHVAC	Spot urine	7 days	Any	M	0	6	N/A	23	(µmol/mmol)	In-house data. (Paediatric upper limit determined as 97.5 percentile value in 24 hr urines from 505 hospitalised children who did not have a neuroblastoma).
						>6	12		21		
						>12	24		17.5		
						>24	36		15		
						>36	48		13		
						>48	60		11		
						>60	72		10		
						>72	96		8		
						>96	120		7		
						>120	156		6		
						>156	192		5		

urine calcium:creatinine clearance ratio (spot)	UCCCR	Spot urine	24 hours	autocomments, depending on results: Ca/Cr clearance ratio <0.02: In the presence of hypercalcaemia, suggest CaSR gene analysis to rule in/out familial hypocalciuric hypercalcaemia. Ca/Cr clearance ratio >0.02: In the presence of hypercalcaemia, Calcium:creatinine clearance ratio is suggestive of primary hyperparathyroidism.						mmol/mmol	inhouse database states Roche kit insert. Beaker template states: Paediatric age related cutoffs taken from paper M.P.Metz 2006 for urinary ca/cre. Adult from NICE. Hyperparathyroidism (primary): diagnosis, assessment and initial management.
Urine citrate (24 hour)	UCIT	24 hour acidified urine	240 hours	All	Year	18 years	ALL	1680	6450	umol/24 hours	Ann Clin Biochem 2001; 38: 180
Chloride (Urine)	UCL	24 hour plain urine	24 hours	No reference range						mmol/L	N/A
Urine cotinine	UCOT	Spot urine	192 hours	No ref range autocomment added: <5 µg/L - Results consistent with a non-smoker; 5-50 µg/L - Result consistent with passive smoking; >50 µg/L - Results consistent with active smoking						µg/L	Simultaneous Analysis of Nicotine, And Metabolites. Moyer et al. Clin. Chem (2002) 48:9 1460-1471.
Urine Creatinine excretion	UCREA		24 hours	No reference range						mmol/L	Adults - Male 9-21 mmol/24 hrs Female 7-14 mmol/24hrs (Clin Chim Acta 2004;344:137-148)
Urine Creatinin	UCRO	24 hour plain urine	24 hours		years	3	8	1	6	mmol/24h	Paed: Soldin 5th Ed adult: Roche method sheet Ref.No, 06407137190 v12 12/12/16
					years	9	12	1.5	12.5		
					years	13	17	2.6	16.6		

e excretion				Female				7	14		
				Male				9	21		
Urine Copper Excretion	UCUO	24 hour plain urine	4 weeks	All	Years	0	120	0	1	µmol/ 24hr	Ryan et al. Biomarkers for diagnosis of Wilson's disease (review). Cochrane Library, 2019. Barth et al. Biochemical Investigations in Laboratory Medicine. ACB Venture Publications, 2001. EASL Clinical Practice Guidelines: Wilson's disease. J Hepatol, 2012. Muller et al, Re-evaluation of the penicillamine challenge test in the diagnosis of Wilson's disease in children. J Hepatol, 2007.
Urine cystine	UCYST	24 hour plain urine	240 hours	All	ALL	ALL	ALL	0	99	mg/24 hours	Canadian Medical Association Journal 166, 213-218 (2002)
Drugs of Abuse Panel (Urine)	UDOA	Spot urine	14 days	N/A							SOP: BC-SP-S-101, based on EWDTS guidelines
Urine free cortisol	UFC	**24 hour plain**, 24hour acidified	192 hours	All	ALL	ALL	ALL	0	164	nmol/ 24h	Ann Clin Biochem 2005; 42:112-8

Potassium (Urine)	UK	24 hour plain, spot urine	24 hours	no ref range						mmol/L	Roche kit insert
Urine potassium excretion	UKO	24 hour plain	24 hours	All	Y	0	150	25	125	mmol/24 hours	Roche kit insert
Magnesium (urine)	UMG	24 hour acidified, spot urine	24 hours	no ref range						mmol/L	NICE
Magnesium urine excretion	UMGO	24 hour acidified urine	24 hours	all				2.4	6.5	mmol/L/24h	Adult: Pathology harmony
Urine Sodium	UNA	Spot urine	24 hours	no ref range						mmol/L	N/A
Urine Sodium Excretion	UNAO	24hour plain urine	24 hours	ALL	ALL	0	150	40	220	mmol/L/24h	Roche IFU: Cat no 03246353001 v5 July 2020
Urine oxalate excretion (adult)	UOX	24hour acidified urine	240 hours	Male	Year	18	ALL	80	490	umol/24 hours	BI-X-oxalate_Val
				Female	Year	18	All	40	320		
Urine pH	UPH	Spot urine		ALL	ALL	ALL	ALL	4	9	none	Literature

Urine Phosphate (Spot)	UPHOS	Spot urine	24 hours	No reference range						mmol/L	N/A
Urine Phosphate Excretion	UPHOSEX	24hour acidified urine	24 hours	Male	0 yrs	< 2 yrs		None readily available		mmol/kg/24 hrs	Paediatric from Acta Paediatr. 2017, 106:1170-1175 Adult from Pathology Harmony.
					2 yrs	6 yrs	0.3	1			
					7 yrs	10 yrs	0.25	0.9			
					11 yrs	14 yrs	0.2	0.8			
					15 yrs	18 yrs	0.15	0.7			
				Female	0 yrs	< 2 yrs		None readily available			
					2 yrs	6 yrs	0.3	1.1			
					7 yrs	10 yrs	0.25	1			
					11 yrs	14 yrs	0.2	0.7			
					15 yrs	18 yrs	0.15	0.55			
				Both	yr	18	150	15	50	mmol/24hrs	
Urea (Blood)	UR		4 hours	M/F	M	0	1	2	5	mmol/L	Paed source – Historical range, broadly in keeping with Caliper
				M/F	M	1	12	2.5	6		

		Plain serum, gel serum, lithium heparin plasma		M/F	Y	1	12	2.5	6.5		(Roche). Exact Caliper values slightly different than RMCH. Adult – pathology harmony
				M/F	Y	12	18	3	7.5		
				M/F	Y	18	150	2.5	7.8		
Urine total protein	UTP	Spot urine	24 hours	no ref range						mg/L	Roche kit insert
Urine Protein Creatinine Ratio (PCR)	UTP CR	Spot urine	24 hours	M/F				0	29	mg/mmol	Urine PCR in pregnancy (NICE NG133) and NICE CG182 2008 (updated 2014)
Urine protein excretion	UTP O	24 hour plain urine	24 hours	All	All				OR&T and Wythenshawe <140 mg/24 hrs	mg/24 h	Roche kit insert
Urine Urate Creatinine Ratio	UUA CRR	Spot urine	24 hours	no ref range						µmol/mmol creatinine	N/A
Urine Urate	UUA	Spot urine	24 hours	no ref range						mmol/L	1.5-4.5 mmol / 24hr (Roche kit insert, Tietz textbook)

Urine Urate Excretion	UUAO	24 hour plain urine	24 hours	ALL	ALL	ALL	ALL	1.5	4.5	mmol/24 hr	Pathology Harmony
Urea (Urine)	UUR	24 hour plain urine		no ref range						mmol/L	Roche kit insert
Urea urine excretion	UURO	24 hour plain urine		all	Y		150	428	714	mmol/L/24h	Roche IFU.
Blood Valproate	VAL	Plain serum, gel serum, lithium heparin plasma	Urgent 2 hours, routine 4 hours	All	<18			50	100	mg/L	
				All	>18			50	100		
Vancomycin	VANC	Plain serum, gel serum, lithium heparin plasma	Urgent 2 hours, routine 4 hours	autocomment:" Trough level: 10 - 15 mg/L Trough level: 15 - 20 mg/L for bacteraemia, endocarditis, osteomyelitis, meningitis, hospital acquired pneumonia. Post dose levels not required. Continuous infusion - adult critical care areas only: 15-24.9mg/L Very rarely, immunoglobulin interference may lead to unreliable vancomycin results.						mg/L	Discussion with Pharmacy
Vitamin A	VITA	**Plain serum**, lithium heparin plasma	2 weeks	M/F	Y	0	≤1	0.5	1.5	µmol/L	Source: < 1 years old = Scottish trace elements lab - (Lockitch G. Trace elements in pediatrics. J Internat Fed Clin Chem 1996;9(2):46-8, 50-1.).
						>1	≤7	0.7	1.4		
						>7	≤13	0.91	1.71		
						>13	≤20	0.91	2.51		
						>20	≤120	1.05	2.8		

1,25-Dihydroxy Vitamin D	VITDM	Plain serum, gel serum	4 weeks	ALL		ALL	ALL	43	144	*pmol/L*	Literature review performed by FI documented in method implementation checklist. See Reporting guielines BC-CL-G-57
Vitamin E	VITE	**Plain serum**, lithium heparin plasma	2 weeks	M/F (ORC)	W	0	≤4	2.3	11.6	VITE µmol/L, CHOL mmol/L, VITECHOL µmol/mmol	VITE conc = Burtis C A, Ashwood E R, Bruns D E. (eds). Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 5th edn. St Louis, USA: Elsevier, 2012
						>4 weeks	≤13 years	7	21		
					Y	>13	≤20	14	23		
					Y	>20	≤120	12	42		
				VITE:Chol ratio	Y	0	120	3.5	9.5		
Voriconazole	VORI	Plain serum	96 hours	All	ALL	ALL	ALL	1.3	5.7	mg/L	Mycology Department
Xanthochromia Screen (CSF)	XANTH	CSF plain	Analysed 8am-8pm (OOH sent to external lab if urgent)	interpretive comments							Revised national guidelines for analysis of cerebrospinal fluid for bilirubin in suspected subarachnoid haemorrhage, 2008

Zinc	ZN	Plain serum	1 week	All	Months	0	1	10	22	µmol/L	Heitland et al J Trace Elements in medicine and biology v20 (2006) p253-262. Alimonti et al CCA v292 (2000) p163-173 for newborns (largely agree with the values quoted). Yanagisawa JMAJ 2004, 47 p362.
				All	Months/years	>1	12	10	18		
				All	Year	>12	120	10	22		