

Analyte (measured in serum, plasma or whole blood unless otherwise stated)	Units	Reference range / Target range / Cut-off value / Comment	Source of reference range	Section
25OH Vitamin D	nmol/L	<25 nmol/L - deficient 25-49 nmol/L - insufficient 50-99 nmol/L - sufficient 100-250 nmol/L - advise review vitamin D intake >250 nmol/L - suggests vitamin D toxicity	Expert opinion and in-line with NICE and Adult Endocrine team guidelines. Implemented Nov 2020.	LGI Biochem
Adrenocorticotropic hormone (ACTH)	ng/L	<47	Siemens Immulite IFU stated range (Rev.17 2015).	LGI Biochem
Alanine amino-transferase (ALT)	U/L	<26 wk 27 wk - 4 yr 4 wk - 12 yr 12 - 14 yr 14 - 16 yr 16 - 19 yr >19 yr  <55 <60 <50 F: <45, M: <70 F: <45, M: <60 F: <45, M: <55 <40	Siemens IFU stated range based on Tietz Clinical Guide to Laboratory Tests, 4th ed. 2000.	Biochem (cross-site)
Albumin	g/L	<1 yr 1 - 17 yr >17 yr  30 - 45 30 - 50 35 - 50	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)
Albumin (CSF)		No normal range	NA	Biochem (cross-site)
Albumin (fluid)		No normal range	NA	Biochem (cross-site)
Albumin (Urine)	mg/L	No normal range	NA	Biochem (cross-site)
Albumin:Creatinine Ratio (Urine)	mg Alb/mmol Creat	Urine Albumin Creatinine Ratio (mg Alb/mmol creat): Female 0-3.5; Male 0-2.5	NICE Guideline on the management of type 2 diabetes 2008 (CG87)	Biochem (cross-site)
Alkaline Phosphatase (ALP)	U/L	Age <14 days 15 days to 1 yr 1 to 10 yrs 10 to 13 yrs 13 to 15 yrs 15 to 17 yrs 17 to 18 yrs Adult  Female 82-249 122-473 142-336 128-420 55-255 19-116 43-86  Male 82-249 122-473 142-336 128-420 115-471 81-333 53-149  30 - 130	ALP changes quite markedly throughout life with peaks in childhood and puberty (and pregnancy). Harmony ranges implemented Feb 2016. For patients ages 0-18yrs the CALIPER reference ranges have been adopted (Feb 2016).	Biochem (cross-site)
Alpha fetoprotein (AFP) (serum)	kU/L	<7	Siemens IFU stated range for Centaur XP implemented 2008 with confirmation of assay comparability via V&V for XPT in 2016 and Atellica in 2019	Biochem (cross-site)
Ammonia	umol/L	pre-term / sick neonate term <5 wk >5 wk  <150 <100 <50	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)
Amylase	U/L	<110	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Amylase (fluid)	U/L	No normal range	NA	Biochem (cross-site)

Angiotensin converting enzyme (ACE)	U/L	20-70	Manufacturer stated ranges implemented Feb 2016 - ACE Buhlman IFU (Rev 2012)	LGI Biochem
Activated partial thromboplastin time (APTT) (Synthesil)	s	23.5 - 37.5	Locally determined - validation of original TOP 2006 re-checked and amended 2012	Haematology (cross-site)
Aspartate aminotransferase (AST)	U/L	<40	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Basophils	10 <sup>9</sup> /L	<0.1	Based on Hall and Malia, Medical Laboratory Haematology (1984). Reviewed using Dacie & Lewis Practical Haematology 10th edn (2006)	Haematology (cross-site)
Bicarbonate	mmol/L	>17 yr <17 yr	22 - 29 19 - 28	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>
Bicarbonate (fluid)	mmol/L	No normal range		NA
Bile acids	umol/L	<14	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Bilirubin (total)	umol/L	2 - 21	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)
Bilirubin (total, fluid)	umol/L	No normal range		NA
Bilirubin - conjugated (direct)	umol/L	<4	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Blood urea nitrogen (BUN)	mg/dL	Not reported at LTHT. BUN (mg/dL) = urea (mmol/L) x 2.8		NA
C-reactive protein (CRP)	mg/L	<10	Siemens IFU stated range in use (XPT Rev E; Atellica Rev 01).	Biochem (cross-site)
CA 15-3	kU/L	<30	See Tietz Textbook of Clinical Chemistry 4th ed 2006 & NACB CRC Panel recommendations	Biochem (cross-site)
CA 19-9	kU/L	<33	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
CA125	kU/L	<35	See NICE CG122 April 2012	Biochem (cross-site)
Calcium (total)	mmol/L	<5 wk >5 wk	2.00 - 2.70 2.25 - 2.60	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>
Calcium (adjusted)	mmol/L	2.20 - 2.60		Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>
Calcium (fluid)	mmol/L	No normal range		NA
Calcium (urine)	mmol/L	No normal range		NA
Calcium:creatinine Ratio (Urine)	mmol/mmol creat	<1 yr 1 to 2 yrs 2 to 5 yrs 5 to 10 yrs 10 to 18 yrs >18 yrs	<1.50 <1.25 <1.00 <0.70 <0.60 <0.45	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)
				Biochem (cross-site)

Calcium (24hr Urine)	mmol/day	2.50 - 7.50	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Carbamazepine	mg/L	4 - 12	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)
Carcinoembryonic antigen (CEA)	µg/L	<5	See Tietz Textbook of Clinical Chemistry 4th ed 2006 & NACB CRC Panel Recommendations	Biochem (cross-site)
Chloride	mmol/L	95 - 108	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Chloride (CSF)	mmol/L	No normal range	NA	Biochem (cross-site)
Chloride (fluid)	mmol/L	No normal range	NA	Biochem (cross-site)
Chloride (urine)	mmol/L	No normal range	NA	Biochem (cross-site)
Cholesterol (total)	mmol/L	To interpret see published guidelines e.g. the risk tables at the rear of BNF, Q-risk online calculator.	NA	Biochem (cross-site)
Cholesterol (HDL)	mmol/L	To interpret see published guidelines e.g. the risk tables at the rear of BNF, Q-risk online calculator.	NA	Biochem (cross-site)
Cholesterol (LDL)	mmol/L	LDL cholesterol (LDL) is calculated according to the formula: LDL = Total chol - HDL - (trigs/2.29)	NA	Calculated
Cholesterol (total, fluid)	mmol/L	No normal range	NA	Biochem (cross-site)
Cortisol	nmol/L	9AM cortisol <140nmol/L: suggestive of adrenal insufficiency. 9AM cortisol 140-400nmol/L: does not exclude adrenal insufficiency. 9AM cortisol >400nmol/L: adrenal insufficiency is unlikely.	Expert clinical opinion in line with Leeds Health Pathways guidance and local evaluations of the Siemens assay (Implemented 2019)	Biochem (cross-site)
Creatine kinase (CK)	U/L	Male Female 40 - 320 25 - 200	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)
Creatinine	umol/L	<15 days 15 d - 8 wk 8 wk - 1 yr 1 - 3 yr 3 - 5 yr 5 - 7 yr 7 - 9 yr 9 - 11 yr 11 - 13 yr 13 - 15 yr >15 yr male >15 yr female 27 - 81 14 - 34 15 - 31 23 - 37 25 - 42 30 - 48 28 - 57 37 - 63 40 - 72 64 - 104 49 - 90 Clinical judgement (no data)	Method change from O'Leary to enzymatic 03/10/2011 Reference: Ceriotti et al. (2008) Clin Chem 54: 559-66	Biochem (cross-site)
Creatinine (fluid)		No normal range	NA	Biochem (cross-site)
Creatinine (urine)	mmol/L	No normal range	NA	Biochem (cross-site)
Creatinine (24hr Urine)	mmol/Day	Male 5.0-16.0 Female 7.0-18.0	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Creatinine clearance	mL/min	Calculated parameter. No reference ranges provided.	NA	Biochem (cross-site)

DDimer Level	ng/mL	Cut off of 230 ng/mL for use as a negative predictive indicator of a VTE.	Cut-off determined by the manufacturer for the FDA.	Haematology (cross-site)
Digoxin	ug/L	0.5 - 1.0 (post-dose)	ESC guidelines for diagnosis and treatment of heart failure 2008 & Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)
Enhanced liver fibrosis score (ELF)	-	Calculated from HA, TIMP-1 and PIIINP results. ELF score interpretation: <7.7 = none to mild liver fibrosis 7.7 - 9.8 = moderate liver fibrosis >9.8 = severe liver fibrosis	Siemens IFU stated range for Centaur XPT and Atellica (Rev.B 2016 & Rev.01 2022).	Biochem (cross-site)
Eosinophils	x10 <sup>9</sup> /l	0.2-0.9 up to day 14 then 0.04-0.4	Based on Hall and Malia, Medical Laboratory Haematology (1984). Reviewed using Dacie & Lewis Practical Haematology 10th edn (2006)	Haematology (cross-site)
Erythrocyte sedimentation rate (ESR)	mm/hr	Male <10 Female <15	Based on NCCLS Reference and selected procedures for the ESR test (2000) and MDA Evaluation report 00050 (2000). Reviewed using Dacie & Lewis Practical Haematology 10th edn (2006)	LGI Haematology
Erythropoietin (EPO)	mIU/mL	5.45 - 28.35	Ranges derived from those described in the Atellica IM EPO IFU (rev 04).	SJUH Biochem
Estimated glomerular filtration rate (eGFR)	mL/min/1.73m <sup>2</sup>	Calculated parameter, using the MDRD equation. No reference range provided; results should be interpreted on a patient-by-patient basis.	NA	Biochem (cross-site)
Ethanol	mg/dL	-	NA	Biochem (cross-site)
Ethanol (urine)	mg/dL	< 20	NA	SJUH Biochem
Factor VIII (one stage)	iU/dL	50 - 150	Locally determined before 2000	SLM (SJUH)
Factor VIII ReFacto (one stage)		ReFacto Factor VIII is a recombinant FVIII product used to treat haemophilia A patients. The assay is used to measure peaks and troughs levels of the product, so as such it has no normal range.	NA	SLM (SJUH)
Factor IX assay (one stage)	iU/dL	50 - 150	Locally determined before 2000	SLM (SJUH)
Factor XI (one stage)	iU/dL	60 - 150	Locally determined before 2000	SLM (SJUH)
Ferritin	ug/L	10-322	Siemens IFU stated ranges in use (combined male and female) (Cenatur XPT Rev 9; Atellica Rev 02)	Biochem (cross-site)
Fibrinogen (Clauss) (QFA)	g/L	1.5 - 5.8	Locally determined 2006	Haematology (cross-site)
Fibrinogen (derived)	g/L	1.6 - 5.9	Locally determined 2006	Haematology (cross-site)
Folate	ug/L	5.4 - 24.0	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Free T4	pmol/L	10-20	Local evaluation January 2011	Biochem (cross-site)
FSH	IU/L	Prepubertal children of both sexes tend to have FSH > LH and both < 2 IU/L. Females (aged 14-40) follicular and luteal phases: FSH 1 - 8 IU/L, LH 1 - 10 IU/L. Males (aged 14-40) FSH 1 - 9 IU/L, LH 1 - 9 IU/L.	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
		Age	Male	Female
				Locally determined RR: deemed still

Gamma glutamyl transferase (GGT)	U/L	<27 wk 27 wk - 2 yr 2 - 13 yr 13 - 19 yr >19 yr	10 - 120 <40 <25 <40 <90	15 - 135 <40 <25 <25 <50	Locally determined RCV, deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Gentamicin	mg/L	The therapeutic range for gentamicin is variable and dependent on the regimen used (i.e. once daily or multi-dose) and the condition being treated.		NA		Biochem (cross-site)
Glucose (plasma)	mmol/L	fasting 3.5 - 6.0. Impaired fasting glucose: 6.1 - 6.9 mmol/L Diabetes: fasting glucose $\geq$ 7.0 mmol/L		WHO Definition and diagnosis of diabetes mellitus and intermediate hyperglycaemia, Report of a WHO/IDF consultation. WHO, Geneva, 2006		Biochem (cross-site)
Glucose (CSF)	mmol/L	No normal range		NA		Biochem (cross-site)
Glucose (fluid)	mmol/L	No normal range		NA		Biochem (cross-site)
Glucose-6-phosphate dehydrogenase (G6PD) activity	iU/g Hb	10.10 - 14.19		Sentinel diagnostics IFU stated range (Rev F57 v1.0)		Haematology (SJUH)
Growth hormone (GH)	ug/L	There is no set reference range for growth hormone and results should be interpreted in light of stimulation tests.		NA		LGI Biochem
Haemoglobin	g/L	< 14 days 2 - 13 weeks 13 weeks - 1 yr 1 to 10 yr 10 to 16 yr > 16 yr (Female) > 16 yr (Male)	130 - 206 95 - 140 105 - 140 115 - 150 115 - 150 115 - 160 135 - 180	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.		Haematology (cross-site)
Haemoglobin A1c	mmol/mol	Diabetes is defined by an HbA1c >48 mmol/mol and optimal glycaemic control by an HbA1c <59 mmol/mol.		WHO Guidance 2011.		LGI Biochem
Human chorionic gonadotrophin (hCG) (serum)	U/L	<5		Local evaluation in 2012 verified assay performance against Siemens stated range of 2U/L. Subsequent evaluation in 2014 increased the functional sensitivity to 5 u/L		Biochem (cross-site)
Immunoglobulin A (IgA)	g/L	Age D001 (Cord) 2-14 days 2-6 weeks 6-12 weeks 3-6 months 6-9 months 9-12 months 1-2 years 2-3 years 3-6 years 6-9 years 9-12 years 12-45 years Over 45 years	0.0 – 0.02 0.01 – 0.08 0.02 – 0.15 0.05 – 0.4 0.1 – 0.5 0.15 – 0.7 0.2 – 0.7 0.3 – 1.2 0.3 – 1.3 0.4 – 2.0 0.5 – 2.4 0.7 – 2.5 0.8 – 2.8 0.8 – 4.0	PRU 2007		Biochem (CfLM)
		Age D001 (Cord) 2-14 days 2-6 weeks 6-12 weeks	5.2 – 18 5.0 – 17 3.9 – 13 2.1 – 7.7			

Immunoglobulin G (IgG)	g/L	3-6 months 6-9 months 9-12 months 1-2 years 2-3 years 3-6 years 6-9 years 9-12 years 12-15 years Over 15 years	2.4 – 8.8 3.0 – 9.0 3.0 – 10.9 3.1 – 13.8 3.7 – 15.8 4.9 – 16.1 5.4 – 16.1 5.4 – 16.1 5.4 – 16.1 6.0 – 16.0	PRU 2007	Biochem (CfLM)
Immunoglobulin M (IgM)	g/L	Age D001 (cord) 2 - 14 days 2 - 6 weeks 6 - 12 weeks 3 - 6 months 6 - 9 months 9 - 12 months 1 - 3 years 3 - 4 years 4 - 10 years 10 - 15 years 15 - 20 years 20 - 40 years 40 - 60 years 60 - 80 years 80 - 99 years	Male 0.02 - 0.2 0.05 - 0.2 0.08 - 0.4 0.15 - 0.7 0.2 - 1.0 0.4 - 1.6 0.6 - 2.1 0.5 - 2.2 0.5 - 2.0 0.36 - 1.86 0.38 - 1.83 0.39 - 2.2 0.33 - 2.34 0.28 - 2.35 0.23 - 2.32 0.20 - 2.2	Female 0.44 - 2.23 0.52 - 2.63 0.50 - 2.69 0.49 - 2.96 0.36 - 2.89 0.28 - 2.67 0.23 - 2.57	Locally derived RR in collaboration with the Northern Immunology and Allergy Network (2022) Biochem (CfLM)
Insulin-like growth factor 1 (IGF-1)	nmol/L	Age 0-3 yrs 4-6 yrs 7-9 yrs 10-11 yrs 12-13 yrs 14-15 yrs 16-18 yrs 19-21 yrs 22-24 yrs 25-29 yrs 30-34 yrs 35-39 yrs 40-44 yrs 45-49 yrs 50-54 yrs 55-59 yrs 60-64 yrs 65-69 yrs 70-79 yrs 80-90 yrs	Male <2.0-16.8 2.9-27.0 5.2-33.2 8.9-41.1 18.6-65.8 23.0-65.9 22.5-53.8 15.2-42.0 12.8-37.6 10.9-33.7 9.3-30.4 8.2-29.0 7.6-28.5 6.9-28.0 6.3-27.2 5.8-27.3 5.6-28.6 5.2-29.3 4.6-28.1 4.0-27.0	Female 2.4-22.4 4.6-30.2 7.4-36.0 15.3-58.2 22.1-68.5 24.8-64.5 24.7-55.8	Siemens revised ranges for Immulite XPi implemented as of November 2017 - see IFU (Rev.A 2016) LGI Biochem
International normalised ratio (INR)	-	The INR is a ratio of the prothrombin time. It is used to control warfarin therapy. Although the range for non anti-coagulated patients is 0.8 - 1.3, the range for patients that are anticoagulated varies dependant on clinical details; this is usually between 2.0 - 4.0.			NA Haematology (cross-site)
		Negative	<1.20	Expected ranges as stated in Barkman Annex	

Intrinsic factor antibodies (IFAB)	AU/mL	Equivocal Positive	1.2-1.52 1.53	Expected ranges as stated in document access IFU (rev J)	LGI Biochem
Iron	umol/L	Male	14 -31	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
		Female	11 - 29		
Lactate	mmol/L		0.6 - 2.5	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)
Lactate (CSF)			No normal range	NA	Biochem (cross-site)
Lactate dehydrogenase (LDH)	iU/L		120-246	Siemens IFU stated ranges in use as of 2019 (Chemistry XPT Rev. G; Atellica Rev. 03 )	Biochem (cross-site)
Lactate dehydrogenase (LDH) (CSF)	iU/L		No normal range	NA	Biochem (cross-site)
Lactate dehydrogenase (LDH) (fluid)	iU/L		No normal range	NA	Biochem (cross-site)
Large unstained cells (LUC)	x10 <sup>9</sup> /L		<0.6	Based on Hall and Malia, Medical Laboratory Haematology (1984). Reviewed using Dacie & Lewis Practical Haematology 10th edn (2006)	Haematology (cross-site)
Lithium	mmol/L		0.4 - 1.0 (12 hr post-dose)	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)
Low molecular weight (LMW) Heparin Assay (Anti Xa)	IU/mL		Therapeutic range 0.5 - 1.2	Therapeutic ranges vary between 0.05 - 1.2 IU/mL dependant on clinical details. British society of haematology (BSH) Guidelines.	Haematology (cross-site)
Luteinising hormone (LH)	IU/L	Prepubertal children of both sexes tend to have FSH > LH and both < 2 IU/L. Females (aged 14-40) follicular and luteal phases: FSH 1 - 8 IU/L, LH 1 - 10 IU/L. Males (aged 14-40) FSH 1 - 9 IU/L, LH 1 - 9 IU/L.		Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Lymphocytes	x10 <sup>9</sup> /L	0 - 2 weeks 2 - 13 weeks 14 weeks - 2 years 2 - 4 years 4 - 7 years 7 - 11 years >11 years	2.0 - 16.0 4.0 - 12.0 4.0 - 10.0 2.5 - 8.0 2.0 - 8.0 1.5 - 4.5 1.0 - 4.5	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.	Haematology (cross-site)
Magnesium	mmol/L	<5 wk >5 wk	0.6 - 1.0 0.7 - 1.0	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)
Magnesium (fluid)	mmol/L		No normal range	NA	Biochem (cross-site)
Magnesium (urine)	mmol/L		No normal range	NA	Biochem (cross-site)
Magnesium:Creatinine ratio	mmol/mmol creat	>16 yrs	0.18-1.05	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)

Magnesium (24hr Urine)	mmol/Day	2.40-6.50	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Mean corpuscular haemoglobin (MCH)	pg	<15 days 15 days - 2 years 2 - 13 years >13 years	32-39 23-31 24-30 27-32	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.
Mean corpuscular haemoglobin concentration (MCHC)	g/L		310 - 370	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.
Mean corpuscular volume (MCV)	fL	< 15 days 15 days - 14 weeks 14 weeks - 2 years 2 years - 5 years 5 years - 12 years > 12 years	100-115 85-105 71-90 71-90 77-94 78-100	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.
Mean platelet volume (MPV)	fL	No normal range		NA
Methotrexate	umol/L	No stated range. Local LTHT algorithms in use by clinical teams for interpretation.		NA
Monocytes	x10 <sup>9</sup> /L	< 14 days 2 weeks to 1 yr 1 to 6 yrs 6 to 10 yrs >10 yrs	0.3 - 1.5 0.2 - 1.5 0.2 - 1.5 0.2 - 1.5 0.2 - 0.8	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.

N-terminal pro B-type natriuretic peptide (NT-pro BNP)	ng/L (equivalent to pg/mL)	<p>&lt; 400 ng/L: Low result which indicates a low probability of heart failure syndrome. Consider alternative diagnosis to explain patient's symptoms/signs. Do not refer to the heart failure service based on this result.</p> <p>400 - 2000 ng/L: Intermediate result which is associated with a 25% chance of heart failure syndrome. Please refer to the heart failure service. Do not request Direct Access Echo as this will lead to a delay in diagnosis.</p> <p>&gt;2000 ng/L: HIGH result which is associated with a 50% chance of heart failure syndrome. Please refer urgently to the heart failure service.</p>	NICE Chronic Heart Failure in adults:management guideline (CG108). Comments as per LTHT Consultant Cardiologist advice.	LGI Biochem																
Neutrophils	x10 <sup>9</sup> /L	<table> <tr> <td>&lt; 14 days</td><td>1. 5 - 10.0</td></tr> <tr> <td>2 to 13 weeks</td><td>1.5 - 7.0</td></tr> <tr> <td>13 weeks to 1 yr</td><td>1.5 - 7.0</td></tr> <tr> <td>1 to 6 yrs</td><td>2.0 - 6.0</td></tr> <tr> <td>6 to 10 yrs</td><td>2.0 - 6.0</td></tr> <tr> <td>&gt;10 yrs</td><td>2.0 - 7.5</td></tr> </table>	< 14 days	1. 5 - 10.0	2 to 13 weeks	1.5 - 7.0	13 weeks to 1 yr	1.5 - 7.0	1 to 6 yrs	2.0 - 6.0	6 to 10 yrs	2.0 - 6.0	>10 yrs	2.0 - 7.5	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.	Haematology (cross-site)				
< 14 days	1. 5 - 10.0																			
2 to 13 weeks	1.5 - 7.0																			
13 weeks to 1 yr	1.5 - 7.0																			
1 to 6 yrs	2.0 - 6.0																			
6 to 10 yrs	2.0 - 6.0																			
>10 yrs	2.0 - 7.5																			
Oestradiol	pmol/L	<p>Oestradiol reference ranges for female patients are provided as report comments, with further interpretation as appropriate.</p> <table> <tr> <td>Females &lt; 8 yrs</td><td>&lt;10</td></tr> <tr> <td>Pre-pubertal females</td><td>&lt;10</td></tr> <tr> <td>Post-pubertal, pre-menopausal females</td><td>Follicular phase 72 - 529 Ovulatory phase 235 - 1309 Luteal phase 205 - 786</td></tr> <tr> <td>Post-menopausal females</td><td>&lt; 118</td></tr> <tr> <td>Males</td><td>&lt; 150</td></tr> </table>	Females < 8 yrs	<10	Pre-pubertal females	<10	Post-pubertal, pre-menopausal females	Follicular phase 72 - 529 Ovulatory phase 235 - 1309 Luteal phase 205 - 786	Post-menopausal females	< 118	Males	< 150	Updated October 2022 in line with Siemens stated ranges (See IFU for Centaur XPT Rev M and Atellica Rev 05)	Biochem (cross-site)						
Females < 8 yrs	<10																			
Pre-pubertal females	<10																			
Post-pubertal, pre-menopausal females	Follicular phase 72 - 529 Ovulatory phase 235 - 1309 Luteal phase 205 - 786																			
Post-menopausal females	< 118																			
Males	< 150																			
Osmolality	mOsmol/kg	275 - 295	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)																
Osmolality (Fluid)	mOsmol/kg	No normal range	NA	Biochem (cross-site)																
Osmolality (Urine)	mOsmol/kg	No normal range	NA	Biochem (cross-site)																
Packed Cell Volume (PCV, equivalent to haematocrit, HCT)	(no units)	<table> <tr> <td>&lt;2 weeks</td><td>0.42-0.6</td></tr> <tr> <td>2 - 14 weeks</td><td>0.32-0.44</td></tr> <tr> <td>14-52 weeks</td><td>0.33-0.44</td></tr> <tr> <td>1-5 yr</td><td>0.36-0.44</td></tr> <tr> <td>5-12 yr</td><td>0.35-0.45</td></tr> <tr> <td>&gt;12 yr (Female)</td><td>0.37-0.47</td></tr> <tr> <td>&gt;12 yr (Male)</td><td>0.40-0.52</td></tr> <tr> <td>&gt;12 yr (Unknown)</td><td>0.37-0.52</td></tr> </table>	<2 weeks	0.42-0.6	2 - 14 weeks	0.32-0.44	14-52 weeks	0.33-0.44	1-5 yr	0.36-0.44	5-12 yr	0.35-0.45	>12 yr (Female)	0.37-0.47	>12 yr (Male)	0.40-0.52	>12 yr (Unknown)	0.37-0.52	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.	Haematology (cross-site)
<2 weeks	0.42-0.6																			
2 - 14 weeks	0.32-0.44																			
14-52 weeks	0.33-0.44																			
1-5 yr	0.36-0.44																			
5-12 yr	0.35-0.45																			
>12 yr (Female)	0.37-0.47																			
>12 yr (Male)	0.40-0.52																			
>12 yr (Unknown)	0.37-0.52																			
Paracetamol	mg/L	-	NA	Biochem (cross-site)																

Parathyroid hormone (PTH)	pmol/L	1.5-7.6 (should be interpreted in the light of adjusted calcium result)	Siemens stated ranges in use as of 2008 (See IFU for Centaur XPT & Atellica, Revs E & .02)	Biochem (cross-site)
Phenobarbitone	mg/L	10 - 40	See LTHT Health Pathways Medicines Information Service. Harmony ranges implemented Sept 2011. <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)
Phenytoin	mg/L	5 - 20	See LTHT Health Pathways Medicines Information Service. Harmony ranges implemented Sept 2011. <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)
Phosphate	mmol/L	<u>Age</u> <u>Male</u> 0 - 1y 1.36 - 2.49 1y - 5y 1.42 - 1.99 5y -13y 1.29 - 1.84 13y - 16y 1.05 - 1.82 16y - 19y 0.87 - 1.57 19y and above 0.80 - 1.50 <u>Female</u> 0 - 1y 1.36 - 2.49 1y - 5y 1.42 - 1.99 5y -13y 1.29 - 1.84 13y - 16y 1.05 - 1.68 16y - 19y 0.87 - 1.57 19y and above 0.80 - 1.50	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a> Caliper ranges for paediatric patients implemented August 2020	Biochem (cross-site)
Phosphate (fluid)	mmol/L	No normal range	NA	Biochem (cross-site)
Phosphate (urine)	mmol/L	No normal range	NA	Biochem (cross-site)
Phosphate (24hr Urine)	mmol/Day	15.0-50.0	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Plasma Viscosity (PV)	m.Pa.s	1.50-1.72	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Haematology (cross-site)
Platelets	x10 <sup>9</sup> /L	150-400	Based on 'Dacie & Lewis Practical Haematology 10th edn (2006) adult range.	Haematology (cross-site)
Potassium	mmol/L	<5 wk 3.4 - 6.0 5 wk - 2 yr 3.5 - 5.7 2 - 17 yr 3.5 - 5.0 >17 yr 3.5 - 5.3	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)
Potassium (fluid)	mmol/L	No normal range	NA	Biochem (cross-site)
Potassium (urine)	mmol/L	No normal range	NA	Biochem (cross-site)
Potassium (24hr Urine)	mmol/Day	35-90	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Potassium (CSF)	mmol/L	No normal range	NA	Biochem (cross-site)
Procalcitonin (PCT)	ng/mL	<0.1. Local algorithms in use for interpretation and monitoring of PCT and management of antibiotic therapy.	Manufacturer stated ranges used (Rev.G 2017) (Siemens recommended range based on the BRAHMS PCT sensitive KRYPTOR assay information provided by Thermo Fisher)	Biochem (cross-site)

Procollagen type III (PIIINP)	ug/L	3.2-6.0 µg/L. Indications for considering liver biopsy are: - If pre-treatment PIIINP >10 µg/L, If PIIINP > 6 µg/L on 3 occasions in a 1yr period, If PIIINP > 10 µg/L on 2 consecutive occasions.	Local evaluation of Siemens assay vs established Orion Diagnostics RIA (2013)	Biochem (cross-site)
Progesterone	nmol/L	Females: A serum progesterone >35 nmol/L is consistent with ovulation if sample taken on day 21 of a 28 day menstrual cycle, or 7 days before a menstrual period in irregularly cycling women. Males 0.89-3.88 nmol/L	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Prolactin	mU/L	Males <550  Females <600	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Prostate specific antigen (PSA)	µg/L	Males ≤ 49 years < 2.5 Males 50 - 59 years < 3.5 Males 60 - 69 years < 4.5 Males ≥ 70 years < 6.5	Updated October 2022 in line with NICE guidance NG12 and by agreement of the Urology Group at West Yorkshire & Harrogate Cancer Alliance.	Biochem (cross-site)
Protein (serum total)	g/L	60 - 80	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)
Protein (CSF)	g/L	0.2 - 0.4		Biochem (cross-site)
Protein (fluid)	g/L	No normal range	NA	Biochem (cross-site)
Protein (urine)	g/L	No normal range	NA	Biochem (cross-site)
Protein:creatinine ratio (urine)	mg/mmol	<13	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Protein (24hr Urine)	g/Day	<0.14	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Prothrombin time (PT)	s	9.0 - 14.0	Locally determined 2006	Haematology (cross-site)
Red Cell Count (RBC)	x10 <sup>12</sup> /L	< 14 days 4.0 - 6.0 2 to 13 weeks 3.2 - 4.8 13 weeks to 1 yr 3.6 - 5.2 1 to 4 yrs 4.1 - 5.5 4 to 12 yrs 4.0 - 5.4 > 12 yrs male 4.5 - 6.5; female 3.8 - 5.8	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.	Haematology (cross-site)
Red Cell Distribution (RDW)	CV%	11.5-15.0	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Haematology (cross-site)
Reptilase time	s	13.5 - 22.0	Local evaluation Jan 2017 - New reagent introduced	Haematology (cross-site)

Reticulocytes (absolute)	x10 <sup>9</sup> /L	20 - 80	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Haematology (cross-site)
Reticulocytes	%	0.8-1.8	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Haematology (cross-site)
Rheumatoid Factor (RF)	iU/mL	<14 (male and female)	Siemens IFU for Advia Chemistry XPT (Rev F)	Biochem (cross-site)
Ristocetin co-factor (Automated)	iU/dL	54 - 158	Locally determined 2012	SLM (SJUH)
Salicylate	mg/L	-	NA	Biochem (cross-site)
Sex hormone binding globulin (SHBG)	nmol/L	Male Female (pre-menopausal)	14.55 - 113.3 10.84 - 180 Siemens stated ranges for Centaur XPT as described in IFU Rev D (2020)	LGI Biochem
Sodium	mmol/L	133 - 146	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)
Sodium (CSF)	mmol/L	No normal range	NA	Biochem (cross-site)
Sodium (fluid)	mmol/L	No normal range	NA	Biochem (cross-site)
Sodium (urine)	mmol/L	No normal range	NA	Biochem (cross-site)
Sodium (24hr Urine)	mmol/Day	130-260	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Teicoplanin	mg/L	Target range will depend on clinical indication for prescription.	NA	LGI Biochem
Testosterone	nmol/L	Male Female	8-27 0-2.8 Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Theophylline	mg/L	10 - 20 (adult) 5 - 10 (neonate)	See LTHT Health Pathways Medicines Information Service. Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>	Biochem (cross-site)
Thrombin time	s	10 -17	Locally determined 2006	Haematology (cross-site)
Thyroglobulin	ug/L	Thyroglobulin is only useful in the follow-up of patients with thyroid cancer. Values should be less than 0.1 ug/L after thyroidectomy and radio-iodine.	See Beckman Access IFU (Rev J), stated limit of detection of 0.1 ug/L used.	LGI Biochem
Thyroglobulin antibodies	iU/mL	<4.0	See Beckman Access IFU (Rev K).	LGI Biochem
Thyroid peroxidase antibodies (TPOAb)	IU/mL	Action limit >13.8	See Siemens IFU for Atellica IM (Revision Rev. 02, 2025-05)	Biochem (cross-site)
Thyroid stimulating hormone (TSH)	mU/L	0.2-4.0	Local evaluation January 2011	Biochem (cross-site)
TmP/GFR (Phosphate excretion)	mmol/L	>16 yrs 0.80-1.35	See Tietz Textbook of Clinical Chemistry 4th ed 2006.	Biochem (cross-site)

Tobramycin	mg/L	The therapeutic range for tobramycin is variable and dependent on the regimen used (i.e. once daily or multi-dose) and the condition being treated.	NA	Biochem (cross-site)
Total Iron Binding Capacity (TIBC)	umol/L	54-80	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)	Biochem (cross-site)
Total T3 (TT3)	nmol/L	0.9-2.5	Local evaluation January 2011	Biochem (cross-site)
Triglycerides	mmol/L	fasting <2.3	Based upon the European Atherosclerosis Societies recommendations (Europ Heart J 1987; 8: 77-88)	Biochem (cross-site)
Triglycerides (fluid)	mmol/L	No normal range	NA	Biochem (cross-site)
Troponin I (high sensitivity)	ng/L	Siemens high sensitivity troponin I assay in use. If clinically relevant, myocyte damage is indicated by a >20% change in troponin level on samples taken at least 3h apart, with at least one value greater than 37 ng/L (females) or 57 ng/L (males) (99th percentile).	Based on manufacturer stated 99th percentile value for the assay and clinical discussion with LTHT users.	Biochem (cross-site)
Urate (uric acid)	umol/L	Male Female	200 - 430 140 - 360	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>
Urate (fluid)	umol/L		No normal range	NA
Urate (urine)	mmol/L		No normal range	NA
Urate:Creatinine ratio (urine)	mmol/mmol creat	up to 1 year 1-2 yrs 2-6 yrs 6-10 yrs >10 yrs	0.43 - 1.52 0.57 - 1.26 0.36 - 0.83 0.15 - 0.67 0.17 - 0.45	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)
Urate (24hr Urine)	mmol/day		1.50-4.50	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)
Urea	mmol/L	<5 wk 5 wk - 2 yr 2 - 17 yr >17 yr	0.8 - 5.5 1.0 - 5.5 2.5 - 6.5 2.5 - 7.8	Harmony ranges implemented Sept 2011 <a href="http://www.pathologyharmony.co.uk">www.pathologyharmony.co.uk</a>
Urea (CSF)			No normal range	NA
Urea (urine)	mmol/L		No normal range	NA
Urea (24hr Urine)	mmol/Day		250-900	Locally determined RR: deemed still representative of current patient population Under review by clinical scientist team as a quality improvement action (original source data unavailable)
Valproate	mg/L	None quoted - for compliance only	NA	Biochem (cross-site)
Vancomycin	mg/L	Normal pre-dose Vancomycin therapeutic range is 10 to 20 mg/L	BNF recommendations (checked 2017)	Biochem (cross-site)
Vitamin B12	ng/L	211-911	Siemens stated ranges used as of 2008 (Confirmed in Centaur XPT and Atellica IFU Revs T & .01)	Biochem (cross-site)

von Willebrands Factor Antigen	iU/dL	50.2 - 153.8	Locally determined, checked in 2003	Haematology (cross-site)																		
White cell count (WBC)	x10 <sup>9</sup> /L	<table> <tr><td>&lt; Day 1</td><td>10.0 - 25.0</td></tr> <tr><td>Day 1-3</td><td>9.0 - 15.0</td></tr> <tr><td>Day 3-7</td><td>5.0 - 21.0</td></tr> <tr><td>Weeks 1-6</td><td>7.0 - 15.0</td></tr> <tr><td>Weeks 6-14</td><td>6.0 - 15.0</td></tr> <tr><td>&lt;1 yr</td><td>6.0 - 16.0</td></tr> <tr><td>1-6 yr</td><td>6.0 - 14.0</td></tr> <tr><td>6-11 yr</td><td>4.5 - 13.5</td></tr> <tr><td>&gt; 11yr</td><td>4.0 - 11.0</td></tr> </table>	< Day 1	10.0 - 25.0	Day 1-3	9.0 - 15.0	Day 3-7	5.0 - 21.0	Weeks 1-6	7.0 - 15.0	Weeks 6-14	6.0 - 15.0	<1 yr	6.0 - 16.0	1-6 yr	6.0 - 14.0	6-11 yr	4.5 - 13.5	> 11yr	4.0 - 11.0	Based on Hall and Malia, Medical Laboratory Haematology (1984) with additional method specific paediatric ranges as described by Hinchcliffe and Lilleyman, Practical Paediatric Haematology: A laboratory Worker's guide to blood disorders in children (1987). Reviewed using Dacie & Lewis, Practical Haematology 10th edn (2006). Comparability assessed with V&V 2016.	Haematology (cross-site)
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White Cell Count (CSF)		No normal range	NA	Haematology (cross-site)																		
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