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.	Biochemistry (cross-site)
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 F: ≤45 F: ≤45 ≤40	 M: ≤70 M: ≤60 M: ≤55 	Siemens IFU stated range based on Tietz Clinical Guide to Laboratory Tests, 4th ed. 2000.	Biochemistry (cross-site)
Albumin	g/L	<1 yr 1 - 16 yr 17+ yr	30 - 45 30 - 50 35 - 50		WYAAT RR harmonisation 2024 & Pathology Harmony 2011 www.pathologyharmony.co.uk	Biochemistry (cross-site)
Albumin (CSF)		No normal range			NA	Biochemistry (cross-site)
Albumin (fluid)		No normal range			NA	Biochemistry (cross-site)
Albumin (Urine)	mg/L	No normal range			NA	Biochemistry (cross-site)
Albumin:Creatinine Ratio (Urine)	mg Alb/mmol Creat	<3.0			WYAAT RR Harmonisation 2024. NICE NG203	Biochemistry (cross-site)
Alkaline Phosphatase (ALP)	U/L	≤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	82-249 122-473 142-336 128-420 55-255 19-116 43-86 30 - 130	82-249 122-473 142-336 128-420 115-471 81-333 53-149	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).	Biochemistry (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	Biochemistry (cross-site)
Ammonia	umol/L	pre-term / sick neonate term <5 wk >5 wk	<150 <100 <50		Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochemistry (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)	Biochemistry (cross-site)

Amylase (fluid)	U/L	No normal range		NA	Biochemistry (cross-site)
Angiotensin converting enzyme (ACE)	U/L	20-70		Manufacturer stated ranges implemented Feb 2016 - ACE Buhlman IFU (Rev 2012) deemed comparable with Sentinel assay implemented August 2025.	Biochemistry (SJUH)
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	<35		WYAAT RR harmonisation 2024 IFCC range based on 2010 study.	Biochemistry (cross-site)
Basophils	10^9/L	0.00 - 0.20		Based on Hall and Malia, Medical Laboratory Haematology (1984). Reviewed using Dacie & Lewis Practical Haematology 10th edn (2006). Comparability assessed with V&V 2025	Haematology (cross-site)
Bicarbonate	mmol/L	<17 yr 17+ yr	19 - 28 22 - 29	Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochemistry (cross-site)
Bicarbonate (fluid)	mmol/L	No normal range		NA	Biochemistry (cross-site)
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)	Biochemistry (cross-site)
Bilirubin (total)	umol/L	<21		Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochemistry (cross-site)
Bilirubin (total, fluid)	umol/L	No normal range		NA	Biochemistry (cross-site)
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)	Biochemistry (cross-site)
C-reactive protein (CRP)	mg/L	<10		Siemens IFU stated range in use (XPT Rev E; Atellica Rev 01).	Biochemistry (cross-site)
CA 15-3	kU/L	<30		See Tietz Textbook of Clinical Chemistry 4th ed 2006 & NACB CRC Panel recommendations	Biochemistry (cross-site)
CA 19-9	kU/L	<37		Siemens IFU stated range (Atellica; 2025)	Biochemistry (cross-site)
CA125	kU/L	<35		See NICE CG122 April 2012	Biochemistry (cross-site)
Calcium (total)	mmol/L	0-28d 29d-16yrs >16 yrs	2.0 - 2.7 2.2 - 2.7 2.2 - 2.6	WYAAT RR harmonisation 2024 Pathology Harmony www.pathologyharmony.co.uk	Biochemistry (cross-site)
Calcium (adjusted)	mmol/L	0-28d 29d-16yrs >16 yrs	2.0 - 2.7 2.2 - 2.7 2.2 - 2.6	WYAAT RR harmonisation 2024 Pathology Harmony www.pathologyharmony.co.uk	Biochemistry (cross-site)
Calcium (fluid)	mmol/L	No normal range		NA	Biochemistry (cross-site)
Calcium (urine)	mmol/L	No normal range		NA	Biochemistry (cross-site)
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	<1.50 <1.25 <1.00 <0.70 <0.60	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)	Biochemistry (cross-site)

		>18 yrs	<0.45		
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)	Biochemistry (cross-site)
Carbamazepine	mg/L	4 - 12		Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochemistry (SJUH)
Carcinoembryonic antigen (CEA)	µg/L	<5		See Tietz Textbook of Clinical Chemistry 4th ed 2006 & NACB CRC Panel Recommendations	Biochemistry (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)	Biochemistry (cross-site)
Chloride (CSF)	mmol/L	No normal range		NA	Biochemistry (cross-site)
Chloride (fluid)	mmol/L	No normal range		NA	Biochemistry (cross-site)
Chloride (urine)	mmol/L	No normal range		NA	Biochemistry (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	Biochemistry (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	Biochemistry (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	Biochemistry (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)	Biochemistry (cross-site)
Creatine kinase (CK)	U/L	Male Female	40 - 320 25 - 200	Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochemistry (cross-site)
Creatinine	umol/L	0-14 d 15d-1yr 2-4yrs 5-9yrs 10-14yrs 15-17yrs 18+ yrs	25 - 73 13 - 27 18 - 40 27 - 58 35 - 65 F: 43 - 74; M: 45 - 86 F: 49 - 90; M: 62 - 115	WYAAT RR Harmonisation 2024 & CALIPER paediatric ranges	Biochemistry (cross-site)
Creatinine (fluid)		No normal range		NA	Biochemistry (cross-site)
Creatinine (urine)	mmol/L	No normal range		NA	Biochemistry (cross-site)
Creatinine (24hr Urine)	mmol/Day	Male Female	5.0 - 16.0 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)	Biochemistry (cross-site)
Creatinine clearance	mL/min	Calculated parameter. No reference ranges provided.		NA	Biochemistry (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 www.pathologyharmony.co.uk	Biochemistry (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).	Biochemistry (SJUH)
Eosinophils	$x10^9/l$	0.2 - 0.9 up to day 14 then 0.00 - 0.50		Based on Hall and Malia, Medical Laboratory Haematology (1984). Reviewed using Dacie & Lewis Practical Haematology 10th edn (2006). Comparability assessed with V&V 2025	Haematology (cross-site)
Erythrocyte sedimentation rate (ESR)	mm/hr	Male	<10	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
		Female	<15		
Erythropoietin (EPO)	mIU/mL	5.45 - 28.35		Ranges derived from those described in the Atellica IM EPO IFU (rev 04).	Biochemistry (cross-site)
Estimated glomerular filtration rate (eGFR)	$mL/min/1.73m^2$	Calculated parameter, using the MDRD equation. No reference range provided; results should be interpreted on a patient-by-patient basis.		NA	Biochemistry (cross-site)
Ethanol	mg/L	No normal range		NA	Biochemistry (cross-site)
Ethanol (urine)	mg/dL	No normal range		NA	Biochemistry (SJUH)
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	30 - 337		WYAAT RR Harmonisation 2024 based on Yorkshire data. Lower limit of 30 from NICE CKS Anaemia - iron deficiency.	Biochemistry (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)	Biochemistry (cross-site)
Free T4	pmol/L	10 - 20		Local evaluation January 2011	Biochemistry (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)	Biochemistry (cross-site)
Gamma glutamyl transferase (GGT)	U/L	Female: 6-40 Male: 12-68		WYAAT RR Harmonisation 2024 based on IFCC 2010 study.	Biochemistry (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	Biochemistry (cross-site)
Glucose (plasma)	mmol/L	fasting 3.5 - 6.0. Impaired fasting glucose: 6.1 - 6.9 mmol/L Diabetes: fasting glucose ≥7.0 mmol/L		WHO Definition and diagnosis of diabetes mellitus and intermediate hyperglycaemia, Report of a WHO/IDF consultation. WHO, Geneva, 2006	Biochemistry (cross-site)
Glucose (CSF)	mmol/L	No normal range		NA	Biochemistry (cross-site)
Glucose (fluid)	mmol/L	No normal range		NA	Biochemistry (cross-site)
Glucose-6-phosphate dehydrogenase (G6PD) activity	iU/g Hb	> 16yr 10.10 - 14.19		Sentinel diagnostics IFU stated range (Rev F57 v1.0)	Haematology (cross-site)
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 - 150 120 - 160 130 - 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 2025. Subsequent review against NICE guidelines for diagnosis of IDA in adults 2026.	Haematology (cross-site)
Haemoglobin A1c	mmol/mol	<42 Diabetes is defined by an HbA1c >48 mmol/mol and optimal glycaemic control by an HbA1c <59 mmol/mol.		WHO Guidance 2011.	Biochemistry (SJUH)
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	Biochemistry (cross-site)
Immunoglobulin A (IgA)	g/L	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	0.0 – 0.02 0.01 – 0.08 0.02 – 0.15 0.05 – 0.40 0.10 – 0.50 0.15 – 0.70 0.20 – 0.70 0.30 – 1.20 0.30 – 1.30 0.40 – 2.00 0.50 – 2.40 0.70 – 2.50 0.80 – 2.80	PRU 2007	Biochemistry (SJUH)

		Over 45 years	0.80 – 4.00		
Immunoglobulin G (IgG)	g/L	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 12-15 years Over 15 years	5.2 – 18 5.0 – 17 3.9 – 13 2.1 – 7.7 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	Biochemistry (SJUH)
Immunoglobulin M (IgM)	g/L	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	0.02 - 0.2 0.05 - 0.2 0.08 - 0.4 0.15 - 0.7 0.20 - 1.0 0.40 - 1.6 0.60 - 2.1 0.50 - 2.2 0.50 - 2.0 M: 0.36 - 1.86 F: 0.44 - 2.23 M: 0.38 - 1.83 F: 0.52 - 2.63 M: 0.39 - 2.20 F: 0.50 - 2.69 M: 0.33 - 2.34 F: 0.49 - 2.96 M: 0.28 - 2.35 F: 0.36 - 2.89 M: 0.23 - 2.32 F: 0.28 - 2.67 M: 0.20 - 2.20 F: 0.23 - 2.57	Locally derived RR in collaboration with the Northern Immunology and Allergy Network (2022)	Biochemistry (SJUH)
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)
Iron	umol/L	Female Male	9.0 - 30.4 11.6 - 31.3	Siemens IFU stated range for Atellica (2024)	Biochemistry (cross-site)
Lactate	mmol/L	0.5 - 2.0		WYAAT RR Harmonisation 2024. Group consensus based on Pathology Harmony and NICE NG51	Biochemistry (cross-site)
Lactate (CSF)		No normal range		NA	Biochemistry (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)	Biochemistry (cross-site)
Lactate dehydrogenase (LDH) (CSF)	iU/L	No normal range		NA	Biochemistry (cross-site)

Lactate dehydrogenase (LDH) (fluid)	iU/L	No normal range		NA	Biochemistry (cross-site)
Lithium	mmol/L	0.4 - 1.0 (12 hr post-dose)		Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochemistry (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)	Biochemistry (cross-site)
Lymphocytes	$x10^9/L$	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 2025.	Haematology (cross-site)
Magnesium	mmol/L	<5 wk >5 wk	0.6 - 1.0 0.7 - 1.0	Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochemistry (cross-site)
Magnesium (fluid)	mmol/L	No normal range		NA	Biochemistry (cross-site)
Magnesium (urine)	mmol/L	No normal range		NA	Biochemistry (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)	Biochemistry (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)	Biochemistry (cross-site)
Mean corpuscular haemoglobin (MCH)	pg	<15 days 15 days - 2 years 2 - 13 years >13 years (Female) >13 years (Male)	32 - 39 23 - 31 24 - 30 27 - 32 27 - 34	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 2025.	Haematology (cross-site)

Mean corpuscular haemoglobin concentration (MCHC)	g/L	320 - 350		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 2025.	Haematology (cross-site)
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 (Female) > 12 years (Male)	100 - 115 85 - 105 71 - 90 71 - 90 77 - 94 78 - 100 80 - 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 2025.	Haematology (cross-site)
Mean platelet volume (MPV)	fL	No normal range		NA	Haematology (cross-site)
Methotrexate	umol/L	No stated range. Local LTHT algorithms in use by clinical teams for interpretation.		NA	Biochemistry (cross-site)
Monocytes	$x10^9$/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 2025.	Haematology (cross-site)
N-terminal pro B-type natriuretic peptide (NT-pro BNP)	ng/L (equivalent to pg/mL)	< 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. 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. >2000 ng/L: HIGH result which is associated with a 50% chance of heart failure syndrome. Please refer urgently to the heart failure service.		NICE Chronic Heart Failure in adults:management guideline (CG108). Comments as per LTHT Consultant Cardiologist advice.	Biochemistry (cross-site)

Neutrophils	$x10^9$/L	< 14 days 2 to 13 weeks 13 weeks to 1 yr 1 to 6 yrs 6 to 10 yrs >10 yrs	1. 5 - 10.0 1.5 - 7.0 1.5 - 7.0 2.0 - 6.0 2.0 - 6.0 1.5 - 7.0	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 2025.	Haematology (cross-site)
Oestradiol	pmol/L	Oestradiol reference ranges for female patients are provided as report comments, with further interpretation as appropriate. Females < 8 yrs Pre-pubertal females Post-pubertal, pre-menopausal females Post-menopausal females Males	 <10 <10 Follicular phase 72 - 529 Ovulatory phase 235 - 1309 Luteal phase 205 - 786 < 118 < 150	Updated October 2022 in line with Siemens stated ranges (See IFU for Centaur XPT Rev M and Atellica Rev 05)	Biochemistry (cross-site)
Osmolality	mOsmol/kg	275 - 295		Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochemistry (cross-site)
Osmolality (Fluid)	mOsmol/kg	No normal range		NA	Biochemistry (cross-site)
Osmolality (Urine)	mOsmol/kg	No normal range		NA	Biochemistry (cross-site)
Packed Cell Volume (PCV, equivalent to haematocrit, HCT)	(no units)	<2 weeks 2 - 14 weeks 14-52 weeks 1-5 yr 5-12 yr >12 yr (Female) >12 yr (Male) >12 yr (Unknown)	0.42 - 0.60 0.32 - 0.44 0.33 - 0.44 0.36 - 0.44 0.35 - 0.45 0.36 - 0.48 0.40 - 0.52 0.36 - 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 2025.	Haematology (cross-site)
Paracetamol	mg/L	No normal range		NA	Biochemistry (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)	Biochemistry (cross-site)
Phenobarbitone	mg/L	10 - 40		See LTHT Health Pathways Medicines Information Service. Harmony ranges implemented Sept 2011. www.pathologyharmony.co.uk	Biochemistry (SJUH)
Phenytoin	mg/L	5 - 20		See LTHT Health Pathways Medicines Information Service. Harmony ranges implemented Sept 2011. www.pathologyharmony.co.uk	Biochemistry (SJUH)

Phosphate	mmol/L	<1yr 1y - 4yrs 5y -12yrs 13y - 15yrs 16y - 18yrs 19+ yrs	M: 1.36 - 2.49 M: 1.42 - 1.99 M: 1.29 - 1.84 M: 1.05 - 1.82 M: 0.87 - 1.57 M: 0.80 - 1.50	F: 1.36 - 2.49 F: 1.42 - 1.99 F: 1.29 - 1.84 F: 1.05 - 1.68 F: 0.87 - 1.57 F: 0.80 - 1.50	Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk CALIPER ranges for paediatric patients implemented August 2020	Biochemistry (cross-site)
Phosphate (fluid)	mmol/L	No normal range			NA	Biochemistry (cross-site)
Phosphate (urine)	mmol/L	No normal range			NA	Biochemistry (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)	Biochemistry (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	$x10^9$/L	150 - 400			Based on 'Dacie & Lewis Practical Haematology 10th edn (2006) adult range. Comparability assessed with V&V 2025	Haematology (cross-site)
Potassium	mmol/L	<5 wk 5 wk - 2 yr 2 - 17 yr >17 yr	3.4 - 6.0 3.5 - 5.7 3.5 - 5.0 3.5 - 5.3		Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochemistry (cross-site)
Potassium (fluid)	mmol/L	No normal range			NA	Biochemistry (cross-site)
Potassium (urine)	mmol/L	No normal range			NA	Biochemistry (cross-site)
Potassium (24hr Urine)	mmol/Day	25 - 125			WYAAT RR Harmonisation 2024. Siemens & Beckman IFU stated ranges.	Biochemistry (cross-site)
Potassium (CSF)	mmol/L	No normal range			NA	Biochemistry (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)	Biochemistry (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)	Biochemistry (SJUH)
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)	Biochemistry (cross-site)

Prolactin	mU/L	Males Females	<550 <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)	Biochemistry (cross-site)
Prostate specific antigen (PSA)	µg/L	Males ≤ 49 years Males 50 - 59 years Males 60 - 69 years Males ≥ 70 years	< 2.5 < 3.5 < 4.5 < 6.5	Updated October 2022 in line with NICE guidance NG12 and by agreement of the Urology Group at West Yorkshire & Harrogate Cancer Alliance.	Biochemistry (cross-site)
Protein (serum total)	g/L	60 - 80		Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochemistry (cross-site)
Protein (CSF)	g/L	0.2 - 0.4			Biochemistry (cross-site)
Protein (fluid)	g/L	No normal range		NA	Biochemistry (cross-site)
Protein (urine)	g/L	No normal range		NA	Biochemistry (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)	Biochemistry (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)	Biochemistry (cross-site)
Prothrombin time (PT)	s	9.0 - 14.0		Locally determined 2006	Haematology (cross-site)
Red Cell Count (RBC)	$x10^{12}$/L	< 14 days 2 to 13 weeks 13 weeks to 1 yr 1 to 4 yrs 4 to 12 yrs > 12 yrs (Female) > 12 yrs (Male)	4.0 - 6.0 3.2 - 4.8 3.6 - 5.2 4.1 - 5.5 4.0 - 5.4 3.8-5.8 4.5-6.5	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 2025.	Haematology (cross-site)
Red Cell Distribution (RDW)	CV%	12.0 - 15.0		Locally determined RR: Comparability assessed with V&V 2025	Haematology (cross-site)
Reptilase time	s	13.5 - 22.0		Local evaluation Jan 2017 - New reagent introduced	Haematology (cross-site)
Reticulocytes (absolute)	$x10^{9}$/L	29 - 106		Locally determined RR: Representative of current patient population. Comparability assessed with V&V 2025	Haematology (cross-site)
Reticulocytes	%	0.64 - 2.52		Locally determined RR: Representative of current patient population. Comparability assessed with V&V 2025	Haematology (cross-site)
Rheumatoid Factor (RF)	iU/mL	<14 (male and female)		Siemens IFU for Advia Chemistry XPT (Rev F)	Biochemistry (cross-site)
Ristocetin co-factor (Automated)	iU/dL	54 - 158		Locally determined 2012	SLM (SJUH)

Salicylate	mg/L	No normal range		NA	Biochemistry (cross-site)
Sex hormone binding globulin (SHBG)	nmol/L	Male <20 yrs Male 20+ yrs Female 20-46 yrs Female 47-91 yrs	No range quoted 13.3 - 89.5 18.2 - 135.2 16.8 - 125.2	WYAAT RR Harmonisation 2024. Beckman IFU plus extension of male range above 50 yrs supported by Siemens IFU data.	Biochemistry (cross-site)
Sodium	mmol/L	133 - 146		Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochemistry (cross-site)
Sodium (CSF)	mmol/L	No normal range		NA	Biochemistry (cross-site)
Sodium (fluid)	mmol/L	No normal range		NA	Biochemistry (cross-site)
Sodium (urine)	mmol/L	No normal range		NA	Biochemistry (cross-site)
Sodium (24hr Urine)	mmol/Day	40 - 220		WYAAT RR Harmonisation 2024. Siemens & Beckman IFU stated ranges.	Biochemistry (cross-site)
Teicoplanin	mg/L	Target range will depend on clinical indication for prescription.		NA	Biochemistry (SJUH)
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)	Biochemistry (cross-site)
Theophylline	mg/L	10 - 20 (adult) 5 - 10 (neonate)		See LTHT Health Pathways Medicines Information Service. Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochemistry (SJUH)
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.		Diagnosis and management of thyroid carcinoma: a focus on serum thyroglobulin: Expert Review of Endocrinology & Metabolism: Vol 4 , No 1	Biochemistry (SJUH)
Thyroglobulin antibodies	iU/mL	<4.5		See Siemens Atellica IFU (Rev. 02 2023-01).	Biochemistry (SJUH)
Thyroid peroxidase antibodies (TPOII)	IU/mL	<13.8		See Siemens IFU for Atellica IM (Revision Rev. 02, 2025-05)	Biochemistry (cross-site)
Thyroid stimulating hormone (TSH)	mU/L	0.2 - 4.3		Local evaluation January 2011	Biochemistry (cross-site)
TmP/GFR (Phosphate excretion)	mmol/L	0-2 months 3-5 months 6 m -1yr 2 - 15 yrs 16+ yrs	1.43 - 3.43 1.48 - 3.30 1.15 - 2.60 1.15 - 2.44 0.80 - 1.35	WYAAT RR Harmonisation 2024. Payne RB. Renal Tubular reabsorption of phosphate (TmP/GFR): indications and interpretation. Ann Clin Biochem. 1998; 35: 201-206	Biochemistry (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	Biochemistry (cross-site)
Total Iron Binding Capacity (TIBC)	umol/L	45 - 76		Siemens IFU stated range for Atellica (2024)	Biochemistry (cross-site)

free T3 (fT3)	pmol/L	3.5 - 6.8		WYAAT consensus & Siemens IFU stated range for Atellica (Rev.04,2023-03).	Biochemistry (cross-site)
Triglycerides	mmol/L	fasting <2.3		Based upon the European Atherosclerosis Societies recommendations (Europ Heart J 1987; 8: 77-88)	Biochemistry (cross-site)
Triglycerides (fluid)	mmol/L	No normal range		NA	Biochemistry (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.	Biochemistry (cross-site)
Urate (uric acid)	umol/L	Male Female	200 - 430 140 - 360	Harmony ranges implemented Sept 2011 www.pathologyharmony.co.uk	Biochemistry (cross-site)
Urate (fluid)	umol/L	No normal range		NA	Biochemistry (cross-site)
Urate (urine)	mmol/L	No normal range		NA	Biochemistry (cross-site)
Urate:Creatinine ratio (urine)	mmol/mmol creat	up to 1 year 1-2 yrs 2-6 yrs 6-10 yrs >10 yrs	0.43 - 1.52 057 - 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)	Biochemistry (cross-site)
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)	Biochemistry (cross-site)
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 www.pathologyharmony.co.uk	Biochemistry (cross-site)
Urea (CSF)		No normal range		NA	Biochemistry (cross-site)
Urea (urine)	mmol/L	No normal range		NA	Biochemistry (cross-site)
Urea (24hr Urine)	mmol/Day	430 - 710		WYAAT RR Harmonisation 2024. Siemens & Beckman IFU stated ranges.	Biochemistry (cross-site)
Valproate	mg/L	None quoted - for compliance only		NA	Biochemistry (SJUH)
Vancomycin	mg/L	Normal pre-dose Vancomycin therapeutic range is 10 to 20 mg/L		BNF recommendations (checked 2017)	Biochemistry (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)	Biochemistry (cross-site)
von Willebrands Factor Antigen	iU/dL	50.2 - 153.8		Locally determined, checked in 2003	Haematology (cross-site)
White cell count (WBC)	$x10^9$/L	< Day 1 Day 1-3 Day 3-7 Weeks 1-6 Weeks 6-14	10.0 - 25.0 9.0 - 15.0 5.0 - 21.0 7.0 - 15.0 6.0 - 15.0	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	Haematology (cross-site)

		<1 yr 1-6 yr 6-11 yr > 11yr	6.0 - 16.0 6.0 - 14.0 4.5 - 13.5 3.5 - 10.0	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 2025.	
White Cell Count (Fluid)		No normal range		NA	Haematology (cross-site)