

CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
Acetaminophen (Paracetamol)	mg/L		NO RANGE	
Albumin	g/L	0 to 4 days	28 - 44	
		4 days to 14 years	38 - 54	
		Adult	35 - 50	
		60 - 90 years	32 - 46	
		>90 years	29 - 45	
Alpha-fetoprotein (AFP)	klU/L		< 7	
Alkaline Phosphatase (ALP)	U/L	< 4 weeks	70 - 380	
		> 4 weeks to 16 years	60 - 425	
		Adult	30 - 130	
Alanine transaminase (ALT)	U/L		0 - 55	
Alpha-1-Antitrypsin (a1AT)	g/L		0.9 - 2.0	
Amikacin	mg/L		4 – 8 (Trough)	Recommended sampling time: pre-dose
Ammonia	µmol/L		<50	
Amylase	U/L	0 - 14 days	3 - 10	
		15 days < 13 weeks	2 - 22	
		13 weeks - < 1 year	3 - 50	
		1 year - 18 years	25 -101	
		Adult	28 - 100	

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Angiotensin converting enzyme (ACE)	U/L		20 - 70	
Anion gap	mmol/L		08 - 17	
AMH	pmol/L	Male		
		< 3 months	570 - 1468	
		3 - 12 months	301 - 1062	
		12 months - 16 years	301 - 1015	
		> 16 years	5.5 - 103	
		Female		
		< 3 months	4.2 - 23.2	
		3 - 12 months	3.1 - 15.2	
		12 months - 20 years	2.3 - 44.2	
		20 -24 years	8.7 - 83.6	
		25 - 29 years	6.4 - 70.3	
		30 - 34 years	4.1 - 58.0	
		24 - 39 years	1.1 - 53.5	
		40 - 44 years	0.2 - 39.1	
45 - 50 years	0.1 - 19.3			
Apolipoprotein A1	g/L	0 to 1 year		
		Male	0.61 - 1.64	

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		Female	0.59 - 1.69	
		> 1 to 12 years		
		Male	0.93 - 1.72	
		Female	0.86 - 1.79	
		> 12 to 60 years		
		Male	0.95 - 1.86	
		Female	1.01 - 2.23	
		> 60 years		
		Male	0.73 - 1.86	
		Female	0.91 - 2.24	
Apolipoprotein B	g/L	0 to 1 year		
		Male	0.16 - 1.24	
		Female	0.17 - 1.20	
		> 1 to 12 years		
		Male	0.48 - 1.25	
		Female	0.51 - 1.26	
		> 12 to 60 years		
		Male	0.49 - 1.73	
		Female	0.53 - 1.82	
		> 60 years		

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		Male	0.54 - 1.63	
		Female	0.64 - 1.82	
Aspartate transaminase (AST)	U/L		5 - 34	
AST:ALT ratio	N/A		NO RANGE	AST:ALT ratio > 1.0 has 49 % sensitivity and 87 % specificity for predicting cirrhosis in liver disease (NHS HTA 2015)
AST to platelet ratio Index (APRI)	N/A		NO RANGE	APRI > 0.75 – 1.0 has 75 % sensitivity and 78 % specificity for predicting cirrhosis in liver disease (NHS HTA 2015)
B-hydroxybutyrate (BOHB)	mmol/L		NO RANGE	Interpreted in light of concurrent glucose result
Bicarbonate	mmol/L	0 - 16 years	19 - 28	
		Adult	22 - 29	
Bile Acids	µmol/L	Fasting	1.0 - 6.0	
Bilirubin, total	µmol/L	>14 days to Adult	< 21	
CA 125	klU/L	Female	< 35	
CA 153	klU/L		< 31	
CA 199	klU/L		< 37	

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Caeruloplasmin	g/L		0.2 - 0.6	
Calcium and albumin adjusted calcium	mmol/L	< 4 weeks	2.00 - 2.70	Adjusted calcium not available if: - Children < 4 weeks – ionised calcium preferred Children >4 weeks and < 1 year with albumin < 30 g/L Adults with albumin < 20 g/L
		> 4 weeks to 16 years	2.20 - 2.70	
		Adult	2.20 - 2.60	
Carbamazepine	mg/L		4 – 12 (Trough)	Recommended sampling time: pre-dose
Carcinoembryonic antigen (CEA)	µg/L		< 3 (Non-smokers)	
			< 5 (Smokers)	
Chloride	mmol/L		95 - 108	
Cholesterol, total	mmol/L		NO RANGE	Total cholesterol >4.0 mmol/L is associated with increased cardiovascular risk
Complement C3	g/L	1 to 14 years		
		Male	0.80 - 1.70	
		Female	0.82 - 1.73	
		> 14 to 80 years		
		Male	0.82 - 1.85	
		Female	0.83 - 1.93	

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Complement C4	g/L	1 to 14 years		
		Male	0.14 - 0.44	
		Female	0.13 - 0.46	
		> 14 to 80 years		
		Male	0.15 - 0.53	
		Female	0.15 - 0.57	
Conjugated bilirubin	µmol/L		0.0 - 8.6	
Cortisol	nmol/L		102 – 535 (Before 10 am)	
			80 – 477 (After 5 pm)	
C-Peptide	pmol/L		258 – 1718 (Fasting)	
Creatine Kinase (CK)	U/L	Male	40 - 320	
		Female	25 - 200	
Creatinine (enzymatic)	µmol/L	0 to 15 days	29 - 82	
		15 days to 2 years	9 - 32	
		2 to 5 years	18 - 38	
		5 to 12 years	27 - 54	
		12 to 15 years	40 - 72	
		15 to 19 years		
		Male	55 - 96	
		Female	43 - 74	

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Test	Units	Age / Gender	Reference Range	Additional information
		> 19 years		
		Male	64 - 104	
		Female	49 - 90	
Creatinine clearance	mL/min		70 - 140	
C-Reactive Protein (CRP)	mg/L		< 5	
CTX	µg/L	Male	0.05 - 0.60	
		Female	0.05 - 0.45	
Digoxin	µg/L		0.5 - 2.0	Recommended sampling time: 6 - 8 h pre-dose. Assay must be at least 8 hours after previous dose. We suggest you assay before morning tablet is taken. Always interpret drug levels according to clinical context.
Estimated glomerular filtration (eGFR)	mL/min	Adult	No range	CKD-EPI (2009) minus ethnicity (NG203)
Ethanol	mg/L		Drink drive limit 800 mg/L	
Ferritin	µg/L		22 – 275	
Follicle stimulating hormone (FSH)	IU/L	Male	1.0 - 12.0	
		Female		
			3.0 - 8.1 (Follicular Phase)	
			2.6 - 16.7 (Mid-Cycle Phase)	

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Test	Units	Age / Gender	Reference Range	Additional information
			1.4 - 5.5 (Luteal Phase)	
			26.7-133.4 (Postmenopausal)	
Free PSA	µg/L		0.0 - 0.5	
Free androgen index	%	Male		
		21 to 49 years	24.5 – 113.3	
		> 50 years	19.3 -118.4	
		Female		
		21 to 49 years	0.7 – 8.7	
		> 50 years	0.5 – 4.7	
Free triiodothyronine (FT3)	pmol/L		2.4 - 6.0	
Free thyroxine (FT4)	pmol/L		9.0 - 19.1	
Fructosamine	µmol/L	Adult	205 - 285	
Gamma-glutamyl transferase (GGT)	U/L	Male	<55	
		Female	<38	
Gentamicin	mg/L		< 1.0 (Trough)	
			> 4.0 (Toxic)	
Glucose	mmol/L		NO RANGE	Fasting glucose > 6.9 or Random glucose > 11 suggests diabetes mellitus.

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Test	Units	Age / Gender	Reference Range	Additional information
				Fasting glucose 6.1 – 6.9 suggests impaired fasting glycaemia.
Haptoglobin	g/L	0 to 1 year		
		Male	0.00 - 3.00	
		Female	0.00 - 2.35	
		> 1 to 12 years		
		Male	0.03 - 2.70	
		Female	0.00 - 2.20	
		> 12 to 60 years		
		Male	0.14 - 2.58	
		Female	0.35 - 2.50	
		> 60 years		
		Male	0.40 - 2.68	
		Female	0.63 - 2.73	
HbA1c	mmol/mol		20 - 41	
HDL Cholesterol	mmol/L		NO RANGE	HDL <1.0 mmol/L associated with increased cardiovascular risk

CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
Human chorionic gonadotrophin (HCG)	IU/L	Non-pregnant female	<5	Reference range for Abbott Alinity ci-Series
Human chorionic gonadotrophin (HCG) - Tumour marker	IU/L	Female		Reference range for Roche Cobas 8000
		Non-pregnant, pre-menopause female	≤ 1	
		Post-menopause female	≤ 7	
		Male	0 – 2	
Immunoglobulin A (IgA)	g/L	0 to 3 months		
		Male	0.01 - 0.34	
		Female	0.01 - 0.34	
		> 3 months to 1 year		
		Male	0.08 - 0.91	
		Female	0.08 - 0.91	
		> 1 to 12 years		
		Male	0.21 - 2.91	
		Female	0.21 - 2.82	
		> 12 to 60 years		
		Male	0.63 - 4.84	
		Female	0.65 - 4.21	
		> 60 years		

CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
		Male	1.01 - 6.45	
		Female	0.69 - 5.17	
Immunoglobulin G (IgG)	g/L	0 to 1 month		
		Male	3.97 - 17.65	
		Female	3.91 - 17.37	
		> 1 month to 1 year		
		Male	2.05 - 9.48	
		Female	2.03 - 9.34	
		> 1 to 2 years		
		Male	4.75 - 12.10	
		Female	4.83 - 12.26	
		> 2 to 80 years		
		Male	5.40 - 18.22	
		Female	5.52 - 16.31	
Immunoglobulin M (IgM)	g/L	< 3 months		
		Male	0.06 - 0.21	
		Female	0.06 - 0.21	
		3 months to 1 year		
		Male	0.17 - 1.43	
		Female	0.17 - 1.50	

CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
		> 1 to 12 years		
		Male	0.41 - 1.83	
		Female	0.47 - 2.40	
		> 12 years		
		Male	0.22 - 2.40	
		Female	0.33 - 2.93	
Insulin	pmol/L		NO RANGE	
Iron	µmol/L	Male	11.6 to 31.3	
		Female	9.0 to 30.4	
Lactate	mmol/L		0.50 - 2.20	
Lactate dehydrogenase (LDH)	U/L		125 - 220	
LDL Cholesterol (Direct)	mmol/L		NO RANGE	
Lipoprotein(a)	nmol/L		NO RANGE	Cardiovascular risk increases with Lp(a) > 75 nmol/L
Lithium	mmol/L		0.4 - 1.0	Recommended sampling time: 12 h post-dose
Luteinising hormone (LH)	IU/L	Male	0.6 - 12.1	
		Female		
			1.8 - 11.8 (Follicular Phase)	
			7.6 - 89.1 (Mid-Cycle Phase)	

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Test	Units	Age / Gender	Reference Range	Additional information
			0.6 - 14.0 (Luteal Phase)	
			5.2 - 62.0 (Postmenopausal)	
Macroprolactin	mIU/L	Male	32-309	
		Female	39-422	
Magnesium	mmol/L	< 4 weeks	0.6 - 1.0	
		> 4 weeks to Adult	0.7 - 1.0	
Methotrexate	µmol/L		NO RANGE	Local procedure
Neuron specific enolase (NSE)	µg/L		< 11.1	
Non-esterified fatty acids (NEFA)	mmol/L		NO RANGE	Results interpreted in light of concurrent glucose result
Non-HDL cholesterol	mmol/L		NO RANGE	Non-HDL cholesterol > 2.5 mmol/L associated with increased cardiovascular risk
NT pro BNP	ng/L		Outpatients	
			< 400 (Heart Failure Unlikely)	
			400 – 2000 (Echo within 6 weeks)	
			> 2000 (Echo within 2 weeks)	
			Inpatients	
			< 400 (Heart Failure Unlikely)	
			400 – 2000 (Outpatient Echo)	
			> 2000 (Inpatient Echo)	

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Test	Units	Age / Gender	Reference Range	Additional information
		0 to <1 year	29.6 - 1594	CALIPHER paediatric reference ranges for the Abbott Alinity assay. Source: PMID: 37021828
		1 to <19 years	11 - 214.0	
Oestradiol	pmol/L	Male	40 - 162	
		Female		
			77 – 921 (Follicular Phase)	
			140 – 2383 (Mid-Cycle Phase)	
			77 – 1145 (Luteal Phase)	
		< 103 (Postmenopausal)		
Osmolality (serum)	mOsm/kg		280 – 295	
Osmolality (urine)	mOsm/kg		NO RANGE	Results should be interpreted in conjunction with serum osmolality result
P1NP	µg/L	Male	28 - 80	
		Female	15 - 59	
Parathyroid hormone (PTH)	ng/L		15.0 - 68.3	
Phenobarbitone	mg/L		10 - 40	

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Test	Units	Age / Gender	Reference Range	Additional information
Phenytoin	mg/L		5 - 20	Timing of assay not important but we suggest you assay before next dose. Always interpret drug levels according to clinical context. Some patients are well controlled with levels of 3 mg/L while others show no toxic signs with levels of 20 mg/L.
Phosphate	mmol/L	< 4 weeks	1.3 - 2.6	
		> 4 weeks to 1 year	1.3 - 2.4	
		1 to 16 years	0.9 - 1.8	
		Adult	0.8 - 1.5	
Potassium	mmol/L	< 4 weeks	3.4 - 6.0	
		> 4 weeks to 1 year	3.5 - 5.7	
		1 to 16 years	3.5 - 5.0	
		Adult	3.5 - 5.3	

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Test	Units	Age / Gender	Reference Range	Additional information
Procalcitonin	µg/L	Male	0.0 - 0.08	See below Probability of bacterial infection (Schuetz et al 2019, Clin Chem Lab Med): Bacterial infection: UNCERTAIN PCT < 0.25 (< 0.5 in ICU) Low; bacterial infection unlikely PCT ≥ 0.25 (≥ 0.5 in ICU) High; bacterial infection likely Bacterial infection: HIGHLY SUSPECTED PCT <0.25 (< 0.5 in ICU) Low; bacterial infection possible PCT ≥ 0.25 (≥ 0.5 in ICU) High; bacterial infection highly likely
		Female	0.0 - 0.05	
Progesterone	nmol/L	Male	0.3 - 0.6	
		Female		
			0.3 - 0.6 (Follicular Phase)	
			3.8 - 50.6 (Luteal Phase)	
			0.3 - 0.6 (Postmenopausal)	

CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
Prolactin	mIU/L	Male	73 - 407	
		Female	109 - 557	
PSA (Total)	µg/L	<40 years	NO RANGE	
		40 - 49 years	< 2.49	
		50 - 59 years	< 3.50	
		60 - 69 years	< 4.50	
		70 - 79 years	< 6.50	
		≥ 79 years	NO RANGE	
Salicylate	mg/L		NO RANGE	
Sex hormone binding globulin (SHBG)	nmol/L	Male	17.1 - 77.6	
		Female		
			34.3 - 147.7 (Premenopausal)	
			26.4-118.0 (Postmenopausal)	
Sodium	mmol/L		133 - 146	
Testosterone	nmol/L	Male		
		< 12 months	0.4 - 15.1	
		1 - 5 years	0.3 - 1.5	
		6 - 10 years	0.5 - 2.0	
		11 - 14 years	0.7 - 19.3	
		15 - 20 years	4.7 - 41.7	

CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
		20 - 49 years	8.3 - 30.2	
		≥ 50 years	7.7 - 24.8	
		Female		
		< 49 years	0.5 - 1.9	
		≥ 50 years	0.4 - 1.2	
Theophylline	mg/L		10 - 20	
Thyroid stimulating hormone (TSH)	mIU/L		0.35 - 4.94	
TSH receptor antibodies (TRAb)	IU/L		NO RANGE	Negative < 3.10 Positive ≥ 3.10
Total Protein	g/L	Premature	36 to 60	
		Newborn	46 to 70	
		Cord	48 to 80	
		1 week	44 to 76	
		7 months to 1 year	51 to 73	
		1 to 3 years	56 to 75	
		> 3 years to Adult	60 to 80	
Transferrin	g/L	1 to 14 years		
		Male	1.86 - 3.88	
		Female	1.80 - 3.91	

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		> 14 to 60 years		
		Male	1.74 - 3.64	
		Female	1.80 - 3.82	
		> 60 to 80 years		
		Male	1.63 - 3.44	
		Female	1.73 - 3.60	
Transferrin Saturation	%		20 - 45	
Triglycerides	mmol/L		NO RANGE	Fasting triglycerides > 1.70 mmol/L are associated with increased cardiovascular risk
Troponin I (High Sensitivity)	ng/L	Male	< 35	CALIPHER paediatric reference ranges for the Abbott Alinity assay. Source: PMID: 37021828
		Female	< 16	
		0 to <6months	≤ 55.8	
		6 months to <19 years	≤ 5.5	
Urea	mmol/L	< 4 weeks	0.8 -5.5	
		> 4 weeks to 1 year	1.0 - 5.5	
		1 to 16 years	2.5 -6.5	
		Adult	2.5 - 7.8	
Uric acid (Urate)	µmol/L	Male	200 - 430	
		Female	140 - 360	

CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
Valproate	mg/L		50 – 100 (Therapeutic)	
Vancomycin	mg/L		5 – 10 (Trough)	Recommended sampling time: pre-dose. Post dose levels are unnecessary. See intranet guidance or contact ward pharmacist for further advice

CHEMISTRY - CSF REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
CSF Protein	g/L		0.15 - 0.40	
CSF Glucose	mmol/L		NO RANGE NB: CSF glucose values should be approximately 60% of the plasma values.	Requires plasma glucose for complete interpretation.
CSF Lactate	mmol/L		1.0 - 2.20	

CHEMISTRY - URINE REFERENCE RANGES				
Test	Units	Age / Gender / Random or 24h	Reference Range	Additional information
Urine albumin	mg/L	Random	NO RANGE	Results should be interpreted with urine creatinine (i.e. urine ACR)
	mg/24h	24h Urine	< 30	
Urine albumin:creatinine ratio (ACR)	mg/mmol	Calculated	< 3 (normal - mildly increased) 3 – 30 (moderately increased) > 30 (severely increased)	NICE guideline [NG203]
Urine amylase	U/L	Random		
		Male	16 - 491	
		Female	21 - 447	
		24h Urine	170 - 2000	
Urine calcium	mmol/L	Random	NO RANGE	Results should be interpreted with urine creatinine (i.e. urine calcium:creatinine ratio CACR; urine calcium/creatinine clearance ratio for FHH)
	mmol/24h	24h Urine	2.5 - 7.5	
Urine calcium:creatinine ratio (CACR)	mmol/mmol	0 – 1 years	0.05 – 1.50	Calcium creatinine ratio reported in mmol/mmol creatinine. In the presence of
		1 – 2 years	0.05 – 1.25	

CHEMISTRY - URINE REFERENCE RANGES				
Test	Units	Age / Gender / Random or 24h	Reference Range	Additional information
		2 – 5 years	0.05 – 1.00	hypocalcaemia a value greater than 0.3 is considered inappropriate.
		5 – 10 years	0.05 – 0.70	
		10 – 18 years	0.05 – 0.60	
		18 – 150 years	0.20 – 0.60	
Urine calcium/creatinine clearance ratio for FHH	No units		UCCR is often <0.01 in familial hypocalciuric hypercalcaemia (FHH); a UCCR >0.02 is typical of primary hyperparathyroidism	UCCR calculated as (urine calcium X serum creatinine) / (serum calcium X urine creatinine).
Urine chloride	mmol/L		NO RANGE	Results should be interpreted with serum chloride
Urine creatinine (enzymatic)	mmol/L	Random		
		Male	5.1 - 14.2	
		Female	3.9 - 9.4	
	mmol/24h	24h Urine		
		Male	7.7 - 21.3	
		Female	5.9 - 14.1	
Urine magnesium	mmol/L	Random	NO RANGE	Results should be interpreted with serum magnesium
	mmol/24h	24h Urine	2.4 - 6.5	
Urine phosphate	mmol/L	Random	NO RANGE	

CHEMISTRY - URINE REFERENCE RANGES					
Test	Units	Age / Gender / Random or 24h	Reference Range	Additional information	
	mmol/24h	24h Urine	15 - 60		
Urine potassium	mmol/L	Random	NO RANGE	Results should be interpreted with serum potassium	
		24h Urine	25 - 125		
Urine protein	mg/L	Random	NO RANGE	Results should be interpreted with urine creatinine (i.e. urine PCR)	
	mg/24h	24h Urine	0 - 150		
Urine protein:creatinine ratio (PCR)	mg/mmol	Random	0 - 15		
Urine sodium	mmol/L	Random	NO RANGE	Results should be interpreted with serum sodium	
		24h Urine	Male		40 - 220
			Female		27 - 287
Urine uric acid (urate)	mmol/24h		1.5 - 4.5		
Urine urea	mmol/L	Random	NO RANGE	Random urine urea measurements have limited clinical value.	
	mmol/24h	24h Urine	428 - 714		