

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)	kiU/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	Trough	4 - 8	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	

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Test	Units	Age / Gender	Reference Range	Additional information
		Adult	28 - 100	
Angiotensin converting enzyme (ACE)	U/L		20 - 70	
Anion gap	mmol/L		08 - 17	
AMH	pmol/L	<b>Male</b>		
		< 3 months	570 - 1468	
		3 - 12 months	301 - 1062	
		12 months - 16 years	301 - 1015	
		> 16 years	5.5 - 103	
		<b>Female</b>		
		< 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	
AMH (continued)				

CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
		45 - 50 years	0.1 - 19.3	
Apolipoprotein A1	g/L	<b>0 to 1 year</b>		
		Male	0.61 - 1.64	
		Female	0.59 - 1.69	
		<b>&gt; 1 to 12 years</b>		
		Male	0.93 - 1.72	
		Female	0.86 - 1.79	
		<b>&gt; 12 to 60 years</b>		
		Male	0.95 - 1.86	
		Female	1.01 - 2.23	
		<b>&gt; 60 years</b>		
		Male	0.73 - 1.86	
		Female	0.91 - 2.24	
Apolipoprotein B	g/L	<b>0 to 1 year</b>		
		Male	0.16 - 1.24	
		Female	0.17 - 1.20	
		<b>&gt; 1 to 12 years</b>		
		Male	0.48 - 1.25	
		Female	0.51 - 1.26	

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Test	Units	Age / Gender	Reference Range	Additional information
		<b>&gt; 12 to 60 years</b>		
		Male	0.49 - 1.73	
		Female	0.53 - 1.82	
		<b>&gt; 60 years</b>		
		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)  APRI (continued)	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	µmol/L	0 - 16 years	19 - 28	
		Adult	22 - 29	
Bile Acids	µmol/L	Fasting	1.0 - 6.0	
Bilirubin, total	mmol/L	>14 days to Adult	< 21	

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CA 125 (Dual reporting using Abbott Alinity ci-Series and Roche Cobas 8000)	kIU/L		< 35	Reference range for Abbott Alinity ci-Series
	kU/L	Female	< 35	Reference range for Roche Cobas 8000
CA 153	kIU/L		< 31	
CA 199 (Dual reporting using Abbott Alinity ci-Series and Roche Cobas 8000)	kIU/L		< 37	Reference range for Abbott Alinity ci-Series
	kU/L		< 27	Reference range for Roche Cobas 8000
Caeruloplasmin	g/L		0.2 - 0.6	
Calcium and albumin adjusted (corrected) calcium	mmol/L	< 4 weeks	2.0 - 2.7	
		> 4 weeks to 16 years	2.2 - 2.7	
		Adult	2.2 - 2.6	
Carbamazepine	mg/L	Trough	4 - 12	Recommended sampling time: pre-dose
Carcinoembryonic antigen (CEA)	µg/L	Non-smokers	< 3	
		Smokers	< 5	
Chloride	mmol/L		95 - 108	
Cholesterol, total	mmol/L		NO RANGE	Total cholesterol >4.0 mmol/L is associated with increased cardiovascular risk

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Test	Units	Age / Gender	Reference Range	Additional information
Complement C3	g/L	<b>1 to 14 years</b>		
		Male	0.80 - 1.70	
		Female	0.82 - 1.73	
		<b>&gt; 14 to 80 years</b>		
		Male	0.82 - 1.85	
		Female	0.83 - 1.93	
Complement C4 Complement C4 (continued)	g/L	<b>1 to 14 years</b>		
		Male	0.14 - 0.44	
		Female	0.13 - 0.46	
		<b>&gt; 14 to 80 years</b>		
		Male	0.15 - 0.53	
		Female	0.15 - 0.57	
Conjugated bilirubin	µmol/L		0.0 - 8.6	
Cortisol	nmol/L	Before 10 am	102 - 535	
		After 5 pm	80 - 477	
C-Peptide	pmol/L	Fasting	258 - 1718	
Creatine Kinase (CK)	U/L	Male	40 - 320	
		Female	25 - 200	
Creatinine (enzymatic)	µmol/L	Male	64 - 104	

CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
		Female	49 - 90	
Creatinine clearance	mL/min		70 - 140	
C-Reactive Protein (CRP)	mg/L		< 5	
CTX	µg/L	Male	0.05 - 0.60	
CTX (continued)		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.

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Test	Units	Age / Gender	Reference Range	Additional information	
Estimated glomerular filtration (eGFR)	mL/min	Adult	70 – 130	<p>Estimated GFR expressed as ml/min/1.73 sqm, only values &lt; 90 are of clinical significance in the evaluation of renal impairment. In African and Caribbean patients, multiply by 1.21, may not be accurate in over or under-weight patients and in pregnancy.</p> <p>Formula used MDRD applies only to adults (&gt; 18 Years) and GFR does not correlate well when the eGFR is &gt; 90 ml/min. Therefore any value greater than this, should be reported as &gt; 90 and not the absolute value.</p>	
Ethanol	mg/L		Drink drive limit 800 mg/L		
Ferritin	µg/L		22 - 275		
Follicle stimulating hormone (FSH)	IU/L	<b>Male</b>	1.0 - 12.0		
		<b>Female</b>			
		Follicular Phase	3.0 - 8.1		
		Mid-Cycle Phase	2.6 - 16.7		
		Luteal Phase	1.4 - 5.5		
		Postmenopausal	26.7 - 133.4		



CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
Free PSA	µg/L		0 - 0.5	
Free testosterone index	%	<b>Male</b>		
		21 to 49 years	24.5 – 113.3	
		> 50 years	19.3 -118.4	
		<b>Female</b>		
		21 to 49 years	0.7 – 8.7	
		> 50 years	0.5 – 4.7	
Free triiodothyronine (FT3)	pmol/L		2.9 - 4.9	
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	Trough	< 1.0	
		Toxic	> 4.0	
Globulins	g/L		20 – 38	
Glucose	mmol/L		NO RANGE	Fasting glucose > 6.9 or Random glucose > 11 suggests diabetes mellitus. Fasting glucose 6.1 – 6.9 suggests impaired fasting glycaemia.

CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
Haptoglobin           Haptoglobin (continued)	g/L	<b>0 to 1 year</b>		
		Male	0.00 - 3.00	
		Female	0.00 - 2.35	
		<b>&gt; 1 to 12 years</b>		
		Male	0.03 - 2.70	
		Female	0.00 - 2.20	
		<b>&gt; 12 to 60 years</b>		
		Male	0.14 - 2.58	
		Female	0.35 - 2.50	
		<b>&gt; 60 years</b>		
		Male	0.40 - 2.68	
		Female	0.63 - 2.73	
HbA1c	%		4.0 – 5.9	
	mmol/mol		20 - 41	
HDL Cholesterol	mmol/L		NO RANGE	HDL <1.0 mmol/L associated with increased cardiovascular risk
Human chorionic gonadotrophin (HCG)	IU/L	<b>Non-pregnant female</b>	<5	Reference range for Abbott Alinity ci-Series
	IU/L	<b>Female</b>		

CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
Human chorionic gonadotrophin (HCG) - Tumour marker		Non-pregnant, pre-menopause	≤ 1	Reference range for Roche Cobas 8000
		Post-menopause	≤ 7	
		<b>Male</b>	0 – 2	
Immunoglobulin A (IgA)	g/L	<b>0 to 3 months</b>		
IgA (continued)		Male	0.01 - 0.34	
		Female	0.01 - 0.34	
		<b>&gt; 3 months to 1 year</b>		
		Male	0.08 - 0.91	
		Female	0.08 - 0.91	
		<b>&gt; 1 to 12 years</b>		
		Male	0.21 - 2.91	
		Female	0.21 - 2.82	
		<b>&gt; 12 to 60 years</b>		
		Male	0.63 - 4.84	
		Female	0.65 - 4.21	
		<b>&gt; 60 years</b>		
		Male	1.01 - 6.45	
		Female	0.69 - 5.17	

CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
Immunoglobulin G (IgG)  IgG (continued)	g/L	<b>0 to 1 month</b>		
		Male	3.97 - 17.65	
		Female	3.91 - 17.37	
		<b>&gt; 1 month to 1 year</b>		
		Male	2.05 - 9.48	
		Female	2.03 - 9.34	
		<b>&gt; 1 to 2 years</b>		
		Male	4.75 - 12.10	
		Female	4.83 - 12.26	
		<b>&gt; 2 to 80 years</b>		
		Male	5.40 - 18.22	
		Female	5.52 - 16.31	
		Immunoglobulin M (IgM)	g/L	<b>&lt; 3 months</b>
Male	0.06 - 0.21			
Female	0.06 - 0.21			
<b>3 months to 1 year</b>				
Male	0.17 - 1.43			
Female	0.17 - 1.50			
<b>&gt; 1 to 12 years</b>				

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Test	Units	Age / Gender	Reference Range	Additional information
		Male	0.41 - 1.83	
		Female	0.47 - 2.40	
		<b>&gt; 12 years</b>		
		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	LDL > 2 mmol/L associated with increased cardiovascular risk
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	<b>Male</b>	0.6 - 12.1	
		<b>Female</b>		
		Follicular Phase	1.8 - 11.8	
		Mid-Cycle Phase	7.6 - 89.1	

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Test	Units	Age / Gender	Reference Range	Additional information
		Luteal Phase	0.6 - 14.0	
		Postmenopausal	5.2 - 62.0	
Macroprolactin	mIU/L		< 430	
Magnesium	mmol/L	< 4 weeks	0.6 - 1.0	
		> 4 weeks to 16 years	0.7 - 1.0	
		Adult	0.7 - 1.0	
Methotrexate	µmol/L		NO RANGE	Local procedure
Neuron specific enolase (NSE) (Dual reporting using Abbott Alinity ci-Series and Roche Cobas 8000)	µg/L		< 11.1	Reference range for Abbott Alinity ci-Series
			< 16.3	Reference range for Roche Cobas 8000
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	<b>Outpatients</b>		
		Heart Failure Unlikely	< 400	
		Echo within 6 weeks	400 - 2000	

CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
NT pro BNP (continued)		Echo within 2 weeks	> 2000	
		<b>Inpatients</b>		
		Heart Failure Unlikely	< 400	
		Outpatient Echo	400 - 2000	
		Inpatient Echo	> 2000	
Oestradiol	pmol/L	<b>Male</b>	40 - 162	
		<b>Female</b>		
		Follicular Phase	77 - 923	
		Mid-Cycle Phase	140 - 2383	
		Luteal Phase	77 - 1145	
		Postmenopausal	< 103	
Osmolality (serum)	mOsm/kg		285 – 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	

CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
Phenobarbitone	mg/L		10 - 40	
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	
Procalcitonin	µg/L	Male	0.0 - 0.08	See below



CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
Procalcitonin (continued)		Female	0.0 - 0.05	<p>Probability of bacterial infection (Schuetz et al 2019, Clin Chem Lab Med):</p> <p>Bacterial infection: <b>UNCERTAIN</b>            PCT &lt; 0.25 (&lt; 0.5 in ICU) Low;            bacterial infection unlikely            PCT ≥ 0.25 (≥ 0.5 in ICU) High;            bacterial infection likely</p> <p>Bacterial infection: <b>HIGHLY SUSPECTED</b>            PCT &lt; 0.25 (&lt; 0.5 in ICU) Low;            bacterial infection possible            PCT ≥ 0.25 (≥ 0.5 in ICU) High;            bacterial infection highly likely</p>
Progesterone	nmol/L	<b>Male</b>	0.3 - 0.6	
		<b>Female</b>		
		Follicular Phase	0.3 - 0.6	
		Luteal Phase	3.8 - 50.6	
		Postmenopausal	0.3 - 0.6	
Prolactin	mIU/L	Male	73 - 407	
		Female	109 - 557	
PSA	µg/L	<40 years	NO RANGE	See below
		40 - 49 years	< 2.5	

CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
PSA (continued)		50 - 59 years	< 3.5	Please note: a different reference range applies to patients during or after treatment for prostate cancer.
		60 - 69 years	< 4.5	
		70 - 79 years	< 6.5	
		≥ 79 years	NO RANGE	
Salicylate	mg/L		NO RANGE	
Sex hormone binding globulin (SHBG)	nmol/L	<b>Male</b>	17.1 - 77.6	
		<b>Female</b>		
		Premenopausal	34.3 - 147.7	
		Postmenopausal	26.4 - 118.0	
Sodium	mmol/L		133 - 146	
Testosterone  Testosterone (continued)	nmol/L	<b>Male</b>		
		< 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	
		20 - 49 years	8.3 - 30.2	
		≥ 50 years	7.7 - 24.8	
		<b>Female</b>		

CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
		< 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	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	<b>1 to 14 years</b>		
Transferrin (continued)		Male	1.86 - 3.88	
		Female	1.80 - 3.91	
		<b>&gt; 14 to 60 years</b>		
		Male	1.74 - 3.64	
		Female	1.80 - 3.82	

CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
		<b>&gt; 60 to 80 years</b>		
		Male	1.63 - 3.44	
		Female	1.73 - 3.60	
Transferrin Saturation	% saturation	Male	> 45%	A transferrin saturation (> 45% females, > 50% male) with a raised ferritin (> 200 mg/L in females, > 300 mg/L in males) suggests iron overload (EASL 2010 HFE Hemochromatosis).
		Female	> 50%	
Triglycerides	mmol/L		NO RANGE	Fasting triglycerides > 1.70 mmol/L are associated with increased cardiovascular risk
Troponin I	ng/L	Male	< 35	
		Female	< 16	
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	
Valproate	mg/L	Therapeutic	50 - 100	

CHEMISTRY - BLOOD REFERENCE RANGES				
Test	Units	Age / Gender	Reference Range	Additional information
Vancomycin	mg/L	Trough	5 - 10	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
Protein	g/L		0.15 - 0.40	
Glucose	mmol/L		NO RANGE NB: CSF glucose values should be approximately 60% of the plasma values.	Requires plasma glucose for complete interpretation.
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		NO RANGE	Results should be interpreted with urine creatinine (i.e. urine ACR)

CHEMISTRY - URINE REFERENCE RANGES					
Test	Units	Age / Gender / Random or 24h	Reference Range	Additional information	
Urine albumin:creatinine ratio (ACR)	g/mol		< 3 Normal 3 - 30 Microalbuminuria > 30 Macroalbuminuria		
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)  CACR (continued)	mmol/mmol	0 – 1 years	0.05 – 1.50	Calcium creatinine ratio reported in mmol/mmol creatinine. In the presence of hypocalcaemia a value greater than 0.3 is considered inappropriate.	
		1 – 2 years	0.05 – 1.25		
		2 – 5 years	0.05 – 1.00		
		5 – 10 years	0.05 – 0.70		
		10 – 18 years	0.05 – 0.60		
		18 – 150 years	0.20 – 0.60		

CHEMISTRY - URINE REFERENCE RANGES				
Test	Units	Age / Gender / Random or 24h	Reference Range	Additional information
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	<b>Random</b>		
		Male	5.1 - 14.2	
		Female	3.9 - 9.4	
	mmol/24h	<b>24h Urine</b>		
		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	
	mmol/24h	24h Urine	15 - 60	

CHEMISTRY - URINE REFERENCE RANGES					
Test	Units	Age / Gender / Random or 24h	Reference Range	Additional information	
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		