Section 10 / Chapter 1 - Normal Laboratory Values

Table 1 - Clinical Chemistry

Analyte	Specimen	Units Used at MGH*	SI Units
Acetoacetate	P	< 1 mg/dl	< 100 umol/L
Albumin	S	3.5-5.5 g/dl	35-55 g/L
Aldolase	S	0-6 U/L	0-100 nkat/L
Alpha$_1$-antitrypsin	S	85-213 mg/dl	0.8-2.1 g/L
Alpha-fetoprotein	S	< 15 ng/ml	< 15 ug/L
Aminotransferases	S		
Aspartate (AST, SGOT)		0-35 U/L	0-0.58 ukat/L
Alanine (ALT, SGPT)		0-35 U/L	0-0.58 ukat/L
Ammonia, as NH_3	P	10-80 ug/dl	6-47 umol/L
Amylase	S	60-180 U/L	0.8-3.2 ukat/L
Angiotensin-converting enzyme (ACE)	S	< 40 U/L	< 670 nkat/L
Anion gap	S	7-16 mmol/L	7-16 mmol/L
Apolipoprotein	S		
Apolipoprotein A1		119-240 mg/dl	1.2-2.4 g/L
Apolipoprotein B		52-163 mg/dl	0.52-1.63 g/L
Apolipoprotein B-to-apolipoprotein A1 ratio		0.35-0.98	0.35-0.98
Arterial blood gases, sea level	WB, arterial		
Bicarbonate (HCO_3^-)		21-30 mEq/L	21-28 mmol/L
Partial pressure of carbon dioxide (PCO_2)		35-45 mm Hg	4.7-5.9 kPa
pH		7.38-7.44	7.38-7.44
Partial pressure of oxygen (PO_2)		80-100 mm Hg	11-13 kPa
β-Hydroxybutyrate	P	< 3 mg/dl	< 300 umol/L
β_2-Microglobulin	S	1.2-2.8 mg/L	1.2-2.8 mg/L
	U	≤ 200 ug/L	≤ 200 ug/L
Bilirubin	S		
Total		0.3-1.0 mg/dl	5.1-17.0 umol/L
Direct		0.1-0.3 mg/dl	1.7-5.1 umol/L
Indirect		0.2-0.7 mg/dl	3.4-12.0 umol/L
Brain natriuretic peptide (BNP)	P	< 167 pg/ml (age- and sex-dependent)	< 167 ng/L (age- and sex-dependent)
Calcium	S	9.0-10.5 mg/dl	2.2-2.6 mmol/L
Calcium, ionized	WB	4.5-5.6 mg/dl	1.1-1.4 mmol/L
CA15-3	S	0-30 U/ml	0-30 kU/L
CA19-9	S	0-37 U/ml	0-37 kU/L
CA27-29	S	0-32 U/ml	0-32 kU/L

CA125	S	0-35 U/ml	0-35 kU/L
Calcitonin	S		
Male		3-26 pg/ml	3-26 ng/L
Female		2-17 pg/ml	2-17 ng/L
Carbon dioxide			
Content, sea level	P	21-30 mEq/L	21-30 mmol/L
Partial pressure (PCO_2), sea level	WB, arterial	35-45 mm Hg	4.7-5.9 kPa
Carbon monoxide content	WB		Symptoms with 20% saturation of hemoglobin
Carcinoembryonic antigen (CEA)	S	0-3.4 ng/ml	0-3.4 ug/L
Ceruloplasmin	S	27-37 mg/dl	270-370 mg/L
Cholinesterase	S	5-12 U/ml	5-12 kU/L
Chloride	S	98-106 mEq/L	98-106 mmol/L
Cholesterol	P		
Low-density lipoprotein (LDL) cholesterol			
Optimal		< 100 mg/dl	< 2.59 mmol/L
Near or above normal		100-129 mg/dl	2.59-3.34 mmol/L
Borderline high		130-159 mg/dl	3.36-4.11 mmol/L
High		160-189 mg/dl	4.13-4.88 mmol/L
Very high		≥ 190 mg/dl	≥ 4.91 mmol/L
High-density lipoprotein (HDL) cholesterol			
Low		< 40 mg/dl	< 1.03 mmol/L
High		≥ 60 mg/dl	≥ 1.55 mmol/L
Total cholesterol			
Desirable		< 200 mg/dl	< 5.17 mmol/L
Borderline high		200-239 mg/dl	5.17-6.18 mmol/L
High		≥ 240 mg/dl	≥ 6.18 mmol/L
Copper	S	70-140 ug/dl	11-22 umol/L
	U	3-35 ug/24 hr	0.047-0.55 umol/24 hr
Coproporphyrins, types I and III	U	100-300 ug/24 hr	150-460 umol/24 hr
C-peptide	S	0.5-2.0 ng/ml	0.17-0.66 nmol/L
Creatine kinase	S		
Total			
Female		40-150 U/L	0.67-2.50 ukat/L
Male		60-400 U/L	1.00-6.67 ukat/L
MB isoenzyme	S	0-7 ng/ml	0-7 ug/L
Relative index[a]	S	Method-dependent	Method-dependent
Creatinine	S	< 1.5 mg/dl	< 133 umol/L

Erythropoietin	S	5-36 IU/L	5-36 IU/L
Fatty acids, free (nonesterified)	P	< 8-25 mg/dl	0.28-0.89 mmol/L
Fibrinogen and fibrinogen-degradation products [*see under* Hematology and Coagulation]			
Folic acid	RBC	150-450 ng/ml/cells	340-1,020 nmol/L/cells
γ-Glutamyltransferase	S	1-94 U/L	1-94 U/L
Glucose	P		
Fasting			
Normal		75-115 mg/dl	4.2-6.4 mmol/L
Diabetes mellitus		> 125 mg/dl	> 7.0 mmol/L
2-hr postprandial	P	120 mg/dl	< 6.7 mmol/L
Hemoglobin A_{1c}	WB	3.8%-6.4%	0.038-0.064 hemoglobin fraction
Homocysteine	P	4-12 umol/L	4-12 umol/L
Hydroxyproline	U	0-1.3 mg/24 hr	0-10 umol/24 hr
Iron	S	50-150 ug/dl	9-27 umol/L
Iron-binding capacity	S	250-370 ug/dl	45-66 umol/L
Iron-binding capacity, saturation	S	20%-45%	0.2-0.45
Ketone (acetone)	S, U	Negative	Negative
Lactate	P, venous	5-15 mg/dl	0.6-1.7 mmol/L
Lactate dehydrogenase	S	100-190 U/L	1.7-3.2 ukat/L
Lactate dehydrogenase isoenzymes	S		
Fraction 1 (of total)		14%-26%	0.14-0.25
Fraction 2		29%-39%	0.29-0.39
Fraction 3		20%-26%	0.20-0.25
Fraction 4		8%-16%	0.08-0.16
Fraction 5		6%-16%	0.06-0.16
Lead (adult)	S	< 10-20 ug/dl	< 0.5-1 umol/L
Lipase	S	0-160 U/L	0-2.66 ukat/L
Lipids, triglyceride [*see* Triglycerides]			
Lipoprotein(a)	S	0-30 mg/dl	0-300 mg/L
Magnesium	S	1.8-3.0 mg/dl	0.8-1.2 mmol/L
Mercury	WB	0.6-59 ug/L	3.0-294 nmol/L
	U, 24 hr	< 20 ug/L	< 99.8 nmol/L
Microalbumin	U		
24-hr		< 20 mg/L or < 31 mg/24 hr	< 0.02 g/L or < 0.031 g/24 hr
Spot, morning		< 0.03 mg albumin/mg creatinine	< 0.03 g albumin/g creatinine
Myoglobin	S		

Male			19-92 ug/L
Female			12-76 ug/L
5´-Nucleotidase	S	0-11 U/L	0.02-0.18 ukat/L
Osmolality	P	285-295 mOsm/kg serum water	285-295 mmol/kg serum water
	U	300-900 mOsm/kg	300-900 mmol/kg
Oxygen			
Content, sea level	WB, arterial	17-21 vol%	
	WB, venous (arm)	10-16 vol%	
Saturation, sea level	WB, arterial	97%	0.97 mol/mol
	WB, venous (arm)	60%-85%	0.60-0.85 mol/mol
Partial pressure (PO_2)	WB	80-100 mm Hg	11-13 kPa
pH	WB	7.38-7.44	
Parathyroid hormone-related peptide	S	< 1.3 pmol/L	< 1.3 pmol/L
Phosphatase			
Acid	S	0-5.5 U/L	0.90 nkat/L
Alkaline	S	30-120 U/L	0.5-2.0 nkat/L
Phosphorus, inorganic	S	3-4.5 mg/dl	1.0-1.4 mmol/L
Porphobilinogen	U	None	None
Potassium	S	3.5-5.0 mEq/L	3.5-5.0 mmol/L
Prealbumin	S	19.5-35.8 mg/dl	195-358 mg/L
Prostate-specific antigen (PSA)	S		
Female		< 0.5 ng/ml	< 0.5 ug/L
Male			
≤ 40 yr		0-2.0 ng/ml	0-2.0 ug/L
> 40 yr		0-4.0 ng/ml	0-4.0 ug/L
PSA, free (men 45-75 yr with PSA values between 4 and 20 ng/ml)		> 25% associated with benign prostastic hyperplasia	> 0.25 associated with benign prostatic hyperplasia
Protein			
Total	S	5.5-8.0 g/dl	55-80 g/L
Fractions	S		
Albumin		3.5-5.5 g/dl (50%-60%)	35-55 g/L
$Alpha_1$		0.2-0.4 g/dl (4.2%-7.2%)	2-4 g/L
$Alpha_2$		0.5-0.9 g/dl (6.8%-12%)	5-9 g/L
Beta		0.6-1.1 g/dl (9.3%-15%)	6-11 g/L
Gamma		0.7-1.7 g/dl (13%-23%)	7-17 g/L
Globulin		2.0-3.5 g/dl (40%-50%)	20-35 g/L
Pyruvate	P, venous	0.5-1.5 mg/dl	60-170 umol/L