

Normal Values: Laboratory investigations, BP, and BMI (USMLE-friendly)

		Reference Range	
		Conventional Units	SI Units
Serum Nonelectrolytes			
Amylase, serum	25-125 U/L		
Phosphatase (alkaline), serum (p-NPP at 30EC)	20-70 U/L		
Alanine aminotransferase (ALT at 30EC)	8-20 U/L (ALT = SGPT = Serum Glutamic-Pyruvic Transaminase)		
Aspartate aminotransferase (AST at 30EC)	8-20 U/L (AST = SGOT = Serum Glutamic-Oxaloacetic Transaminase)		
Lactate dehydrogenase, serum	45-90 U/L		
Bilirubin, serum (adult) Total // Direct	0.1-1.0 mg/dL // 0.0-0.3 mg/dL.....		2-17 µmol/L // 0-5 µmol/L
Lipoprotein levels - Adult Treatment Panel (ATP) III Classification of LDL, Total, & HDL Cholesterol (mg/dL): <i>Cholesterol mmol/L (Total, LDL, & HDL) = mg/dL ÷ 38.6</i> <i>Triglyceride mmol/L = mg/dL ÷ 88.5</i>	LDL Cholesterol (Primary target of therapy): <ul style="list-style-type: none"> <100: Optimal 100-129: Near optimal/above optimal 130-159: Borderline high 160-189: High ≥190: Very high Serum Triglycerides: <ul style="list-style-type: none"> <150: Normal 150-199: Borderline high 200-499: High ≥500: Very high Total Cholesterol: <ul style="list-style-type: none"> <200: Desirable/Recommen. 200-239: Borderline high ≥240: High HDL Cholesterol: <ul style="list-style-type: none"> <40: Low ≥60: High 		
Creatine kinase, serum	M: 25-90 U/L // F: 10-70 U/L		
Creatinine, serum (source: Medscape)	Up to 12 yr: 0.0-0.7 mg/dL // M: 0.5-1.2 mg/dL // F: 0.4-1.1 mg/dL (µmol/L=mg/dL×88.4)		
Osmolality, serum	275-295 mOsmol/kg (Osmolality= 2x[Na] + [Glucose]/18 + [BUN]/2.8)		
Urea nitrogen, serum	Cord blood: 21-40 // Premature (1 wk): 3-25 // Newborn: 3-12 // Infant or child: 5-18 // Thereafter: 7-18 mg/dL	Thereafter: 2.5-6.4 mmol/L [BUN (mmol/L) = BUN (mg/d)/2.8]	
Uric acid, serum	3.0-8.2 mg/dL // 0.18-0.48 mmol/L		
Glucose, serum	Fasting: 70-99 mg/dL (USMLE: 110 mg/dL) (3.8-5.6) mmol/L 2-h postprandial: < 120 mg/dL (6.6 mmol/L)		
Categories of increased risk for diabetes (prediabetes):	FPG: 100-125 mg/dL (5.6-6.9 mmol/L); IFG OR 2-h plasma glucose in the 75-g OGTT: 140-199 mg/dL (7.8-11.0 mmol/L); IGT OR A1C: 5.7-6.4%		
Diabetes can be diagnosed with either one of the following four criteria: <i>(Source: Standards of Medical Care in Diabetes 2011, American Diabetes Association)</i> <i>Glucose (mmol) = Glucose (mg/dL)/18</i>	<ol style="list-style-type: none"> A1C ≥ 6.5%. The test should be performed in a laboratory using a method that is NGSP certified & standardized to the DCCT assay. * FPG ≥ 126 mg/dL (7.0 mmol/L). Fasting is defined as no caloric intake for at least 8 h. * 2-h plasma glucose ≥ 200 mg/dL (11.1 mmol/L) during an OGTT. The test should be performed as described by the World Health Organization, using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water. * In a patient with classic symptoms of hyperglycemia or hyperglycemic crisis, a random plasma glucose ≥ 200 mg/dL (11.1 mmol/L) * (*In the absence of unequivocal hyperglycemia, result should be confirmed by repeat testing.) 		
Iron	50-170 µg/dL.....		9-30 µmol/L
Ferritin, serum	M: 15-200 ng/mL..... F: 12-150 ng/mL.....		M: 15-200 µg/L F: 12-150 µg/L
Serum proteins	Total (recumbent)		6.0-7.8 g/dL..... // 60-78 g/L
	Albumin		3.5-5.5 g/dL..... // 35-55 g/L
	Globulin		2.3-3.5 g/dL..... // 23-35 g/L
Serum immunoglobulins, serum	IgA	76-390 mg/dL.....	0.76-3.90 g/L
	IgE	0-380 IU/mL.....	0-380 kIU/L
	IgG	650-1500 mg/dL.....	6.5-15 g/L
	IgM	40-345 mg/dL.....	0.4-3.45 g/L
Serum hormones			
Cortisol, serum	0800 h: 5-23 µg/dL // 1600 h: 3-15 µg/dL // 2000 h: < 50% of 0800 h		138-635 nmol/L // 82-413 nmol/L // Fraction of 0800 h: < 0.50
TSH, serum or plasma	0.5-5.0 µU/mL		
Thyroidal iodine (123I) uptake	8%-30% of administered dose/24 h		0.08-0.30/24 h
Thyroxine (T4), serum	5-12 µg/dL..... // 64-155 nmol/L		
Triiodothyronine (T3), serum (RIA)	115-190 ng/dL..... // 1.8-2.9 nmol/L		
Triiodothyronine (T3) resin uptake	25%-35%..... // 0.25-0.35		
LH, serum/plasma <i>(Range in SI units: Same but in U/L)</i>	M: 6-23 mIU/mL // F: follicular phase 5-30 mIU/mL // midcycle 75-150 mIU/mL // postmenopause 30-200 mIU/mL		
PTH, serum, N-terminal	230-630 pg/mL (Pico=10 ⁻¹⁵).....		230-630 ng/L (Nano=10 ⁻⁹)
Prolactin, serum (hPRL)	<20 ng/mL..... // <20 µg/L		
Estril, total, serum (in pregnancy)	24-28 wks // 32-36 wks	30-170 ng/mL // 60-280 ng/mL..... // 104-590 nmol/L // 208-970 nmol/L	
	28-32 wks // 36-40 wks	40-220 ng/mL // 80-350 ng/mL..... // 140-760 nmol/L // 280-1210 nmol/L	
FSH, serum/plasma <i>(Range in SI units: Same but in U/L)</i>	M: 4-25 mIU/mL // F: premenopause 4-30 mIU/mL // midcycle peak 10-90 mIU/mL // postmenopause 40-250 mIU/mL		
GH - arginine stimulation <i>(Range in SI units: Same but in ug/L)</i>	Fasting: <5 ng/mL // Provocative stimuli: >7 ng/mL		
Serum Electrolytes			
1. Sodium (Na ⁺).....	136-145 mEq/L.....		136-145 mmol/L
2. Potassium (K ⁺).....	3.5-5.0 mEq/L.....		3.5-5.0 mmol/L
3. Chloride (Cl ⁻).....	95-105 mEq/L.....		95-105 mmol/L
4. Calcium, serum (Ca ²⁺).....	8.4-10.2 mg/dL.....		2.1-2.8 mmol/L
5. Magnesium (Mg ²⁺).....	1.5-2.0 mEq/L.....		0.75-1.0 mmol/L
6. Bicarbonate (HCO ₃ ⁻).....	20-28 (24 ± 4) mEq/L.....		20-28 (24 ± 4) mmol/L
7. Phosphorus (inorganic), serum..	3.0-4.5 mg/dL.....		1.0-1.5 mmol/L
Arterial Blood Gases (ABG) (room air)			
pH.....	7.35-7.45 (7.40 ± 0.05).....		[H ⁺] = 36-44 nmol/L
PaCO ₂	35-45 (40 ± 5) mm Hg.....		4.7-6.0 kPa
PaO ₂	75-105 mm Hg.....		10.0-14.0 kPa

Hematological				
Erythrocyte count	M: 4.3-5.9 million/mm ³ F: 3.5-5.5 million/mm ³	M: 4.3-5.9 x 10 ¹² /L F: 3.5-5.5 x 10 ¹² /L		
ESR (Westergren method) (mm/hr) <i>(Source: Medscape)</i>	NB: 0-2 // NB to puberty: 3-13 // M under 50: < 15 // F under 50: < 20 // M over 50: < 20 // F over 50: < 30			
Hematocrit or PCV (Packed red cell volume) (V RBC/v whole blood cells × 100)	M: 41%-53%..... F: 36%-46%.....	M: 0.41-0.53 F: 0.36-0.46		
Hemoglobin, blood	0-30 days: 15.0-24.0 g/dL..... 1-23 mo: 10.5-14.0 g/dL..... Until 18: 11.5-16.1 M // 15.0 F..... M >18: 13.5-17.5 g/dL..... F >18: 12.0-16.0 g/dL.....		0-30 days: 2.32-3.72 mmol/L 1-23 mo: 1.63-2.17 mmol/L Until 18: 1.78-2.50 M // 2.32 F M>18: 2.09-2.71 mmol/L F>18: 1.86-2.48 mmol/L	
	Hemoglobin, plasma		0.16-0.62 mmol/L	
Reticulocyte count	0.5%-1.5% of RBC.....		0.005-0.015	
MCH	25.4-34.6 pg/cell.....		0.39-0.54 fmol/cell	
MCHC	31%-36% Hb/cell.....		4.81-5.58 mmol Hb/L	
MCV (Lower normal limit = 70 + age (yrs) until 80 fl (adult standard) (Toronto Notes)	0-30 days: 99-115 µm ³ Adult: 80-100 µm ³		80-100 fl (Femto = 10 ⁻¹⁵)	
RDW_CV (Coefficient of Variation)	11.6-14.6% in adult (Source: Medscape)			
RDW_SD (Standard Deviation)	39-46 fl (Source: Medscape)			
Platelet count	NB: 84-478. After 1 wk, same as adult: 150-400×10 ³ /mm ³		150-400 x 10 ⁹ /L	
Partial thromboplastin time	Activated: 25-40 s Nonactivated: 60-85 s			
Prothrombin time	11-15 s			
INR	1.0-1.1			
Bleeding time (template)	2-7 minutes			
Thrombin time	<2s deviation from control			
Leukocyte count & differential				
Leukocyte count (cells/mm ³) (WCC: White Cell Count)	0-30 d: 9.1-34.0 // 1-23 mo: 6.0-14.0 // 2-9: 4.0-12.0 // ≥10: 4.0-10.5		≥ 10 yr: 4.0-10.5 x 10 ⁹ /L	
1. Neutrophils (segmented) 2. Lymphocytes..... 3. Monocytes..... 4. Eosinophils..... 5. Basophils..... 6. Neutrophils (bands).....	54%-62%..... 25%-33%..... 3%-7%..... 1%-3%..... 0%-0.75%..... 3%-5%.....		0.54-0.62 0.25-0.33 0.03-0.07 0.01-0.03 0.0-0.0075 0.03-0.05	
	Volume	Plasma	M: 25-43 mL/kg F: 28-45 mL/kg.....	M: 0.025-0.043 L/kg F: 0.028-0.045 L/kg
		Red cell	M: 20-36 mL/kg F: 19-31 mL/kg.....	M: 0.020-0.036 L/kg F: 0.019-0.031 L/kg
	Sweat			
	Chloride	0-35 mmol/L (↓ in CF, Ald deficiency, or pseudohypoaldosteronism)		
	Sodium	5-40 mmol/L		
Urine				
Oxalate	8-40 µg/mL.....		90-445 µmol/L	
Proteins, total	<150 mg/24 h.....		<0.15 g/24 h	
Calcium	100-300 mg/24 h.....		2.5-7.5 mmol/24 h	
Osmolality	50-1400 mOsmol/kg			
Specific gravity	1.002-1.030			
Sodium, potassium, chloride, & uric acid	Vary with intake/diet			
Creatinine clearance	M: 97-137 mL/min // F: 88-128 mL/min			
Estril, total (in pregnancy): • 30 wks • 35 wks • 40 wks	6-18 mg/24 h.....		21-62 µmol/24 h	
	9-28 mg/24 h.....		31-97 µmol/24 h	
	13-42 mg/24 h.....		45-146 µmol/24 h	
17-Hydroxycorticosteroids	M: 3.0-10.0 mg/24 h..... F: 2.0-8.0 mg/24 h.....		8.2-27.6 µmol/24 h 5.5-22.0 µmol/24 h	
17-Ketosteroids, total	M: 8-20 mg/24 h..... F: 6-15 mg/24 h.....		28-70 µmol/24 h 21-52 µmol/24 h	
Urinary protein dipstick (mg/dL)	Trace: 10-20 // 1+: 30 // 2+: 100 // 3+: 300 // 4+: 1,000-2,000			
CSF				
Cell count (PMN cells are always abnormal in a child, but 1-2/mm ³ may be present in a normal neonate)	NB: Can have as many as 15/mm ³ >NB: 0-5 cells/mm ³ .		0-5 x 10 ⁶ /L	
Chloride	118-132 mEq/L..... // 118-132 mmol/L			
Gamma globulin	3-12% total proteins..... // 0.03-0.12			
Glucose (The CSF glucose content is about 60% of the blood glucose in a healthy child)	40-70 mg/dL.....		2.2-3.9 mmol/L	
Proteins, total (CSF protein falls to the normal childhood range by 3 mo)	NB: Up to 120 mg/dL >NB: 10-40 mg/dL		<0.40 g/L	
Pressure (mm Hg = mm H ₂ O / 13.595) (mm H ₂ O = mm Hg×13.595)	NB: 90-120 mm H ₂ O // Young children: 60-180 mm H ₂ O Older children & adults: 12-120 mm (USMLE: 70-180 mm H ₂ O = 5.15-13.2 mm Hg)			
BP Classification (Source: Seventh report of the JNC, 2003, American Heart Association)				
	Normal	SBP (mm Hg) <120	DBP (mm Hg) <80	
	Prehypertension	120-139	or 80-89	
	Stage 1 Hypertension	140-159	or 90-99	
	Stage 2 Hypertension	≥160	or ≥100	
Body Mass Index (BMI) (kg/m²) (Source: WHO) (BMI = Weight (kg) / Height(m)²)				
Underweight: <18.5 // Normal: 18.5-24.99 // Overweight: 25-29.99 // Obese: ≥ 30				
• 1 m ³ = 10 ³ dm ³ = 10 ⁶ cc = 10 ⁹ mm ³ // 1 cubic meter = 1,000 cubic decimeter = 1,000,000 cubic cm = 1,000,000,000 cubic mm = 1,000,000,000 uL // 1 L = 10 ³ cc = 10 ⁶ mm ³ = 10 ⁶ uL // 1 uL = 1 mm ³				

We teach our students that they should not believe us... Do not believe your professors! Dr. Kevin Hanratty, University of Glasgow, UK. If some professors, somewhere, are teaching their students not to trust them, how come that you trust a colleague of yours? Therefore, and in order to be "standing on the shoulders of giants", the source of the above information: Unless specified, most of the values are from "Step 1: Content Description & General Information 2012", p. 22, www.usmle.org/pdfs/step-1/2012content_step1.pdf. The remaining few are from "Reference Intervals for Laboratory Tests & Procedures", ch.708, Nelson Textbook of Pediatrics, 19th ed, 2011.