

Tests	Units	Reference Ranges	Methodology	Instruments
Chemistry				
24 Hour Urine Creatinine	mg/24 hr	800 - 2000 (Male) 600 - 1800 (Female)	Kinetic Alkaline Picrate (Jaffe Reaction) for Creatinine	Beckman Coulter AU5800
24 hour Urine Creatinine Clearance (Creatinine Clearance)	mL/min/1.73m ²	85-125 (Male) 75 - 115 (Female)	Kinetic Alkaline Picrate (Jaffe Reaction) for Creatinine	Beckman Coulter AU5800
24 Hour Urine Urea Nitrogen	g/24 hr	7 - 16	Urease/GLDH	Beckman Coulter AU5800
A/G Ratio	Ratio	> 0.9; high ratio is usually clinically insignificant	Calculation	Beckman Coulter AU5800
Albumin	g/dL	3.6 - 5.4	Bromocresol Green (BCG)	Beckman Coulter AU5800
Alkaline Phosphatase	IU/L	40 - 105	p-Nitrophenyl Phosphate; IFCC	Beckman Coulter AU5800
ALT (SGPT)	IU/L	7-52	UV/NADH; IFCC	Beckman Coulter AU5800
Aluminum	µg/L	1 - 20	Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	Agilent 7800
Anion Gap	mEq/L	3-14	Calculation	Beckman Coulter AU5800
AST (SGOT)	IU/L	13 - 38	UV/NADH; IFCC	Beckman Coulter AU5800
Bilirubin, Direct	mg/dL	0.0 - 0.2	Diazonium Salt, DPD	Beckman Coulter AU5800
Bilirubin, Total	mg/dL	0.2 - 1.2	Diazonium Salt, DPD	Beckman Coulter AU5800
BUN (Blood Urea Nitrogen)	mg/dL	7 - 25	Urease/GLDH	Beckman Coulter AU5800
Calcium	mg/dL	8.6 - 10.3	Arsenazo III	Beckman Coulter AU5800
Calcium, Adjusted Total (with Albumin)	mg/dL	8.6 - 10.3	Calculation	Beckman Coulter AU5800
Calcium Phosphorus Product (CA*PO ₄)	mg ² /dL ²	<55.0	Calculation	Beckman Coulter AU5800
Calcium Phosphorus Product, Adjusted (CA*PO ₄ , Adjusted)	mg ² /dL ²	<55.0	Calculation	Beckman Coulter AU5800
Calcium, Ionized	mmol/L	1.13 - 1.32	Ion Selective Electrode (ISE), Direct (Undiluted)	Nova 8
Chloride	mEq/L	98-107	Ion Selective Electrode (ISE), Indirect (Diluted)	Beckman Coulter AU5800
Cholesterol	mg/dL	Normal: 136 - 190 Optimal: < 200 Borderline: 200 - 239 Higher Risk: > 239	Enzymatic	Beckman Coulter AU5800
Cholesterol/HDL Ratio	Ratio	Optimal: < 3.3 Higher Risk: > 6.2	Calculation	Beckman Coulter AU5800
CO ₂ (Bicarbonate or Carbon Dioxide)	mEq/L	21 - 31	Enzymatic (Phosphoenolpyruvate Carboxylase)	Beckman Coulter AU5800
C-Reactive Protein (CRP)	mg/L	0.0 - 4.9	Immunoturbidimetric	Beckman Coulter AU5800
Creatine Kinase (CPK)	IU/L	30 - 223	UV/NADPH; IFCC (Creatine Phosphate/NADPH)	Beckman Coulter AU5800

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Creatinine	mg/dL	See Table Below	Kinetic Alkaline Picrate (Jaffe Reaction)	Beckman Coulter AU5800																																										
<table><tr><th>Age</th><th>Males</th><th>Females</th></tr><tr><td>0 - 2 days</td><td>0.79 - 1.58</td><td>0.79 - 1.58</td></tr><tr><td>3 - 28 days</td><td>0.35 - 1.23</td><td>0.35 - 1.23</td></tr><tr><td>1 month - 9 yrs.</td><td>0.20 - 0.73</td><td>0.20 - 0.73</td></tr><tr><td>10 - 12 years</td><td>0.30 - 0.78</td><td>0.30 - 0.78</td></tr><tr><td>13 - 15 years</td><td>0.40 - 1.05</td><td>0.40 - 1.00</td></tr><tr><td>16 - 17 years</td><td>0.60 - 1.20</td><td>0.50 - 1.00</td></tr><tr><td>18 - 19 years</td><td>0.60 - 1.26</td><td>0.50 - 1.00</td></tr><tr><td>20 - 49 years</td><td>0.60 - 1.35</td><td>0.50 - 1.10</td></tr><tr><td>50 - 59 years*</td><td>0.70 - 1.33</td><td>0.50 - 1.05</td></tr><tr><td>60 - 69 years*</td><td>0.70 - 1.25</td><td>0.50 - 0.99</td></tr><tr><td>70 - 79 years*</td><td>0.70 - 1.18</td><td>0.60 - 0.93</td></tr><tr><td>> or = 80 years*</td><td>0.70 - 1.11</td><td>0.60 - 0.88</td></tr><tr><td colspan="3">*The following message will report for patients > or = 50 years of age: <i>The upper reference limit for Creatinine is approximately 13% higher for people identified as African-American.</i></td></tr></table>					Age	Males	Females	0 - 2 days	0.79 - 1.58	0.79 - 1.58	3 - 28 days	0.35 - 1.23	0.35 - 1.23	1 month - 9 yrs.	0.20 - 0.73	0.20 - 0.73	10 - 12 years	0.30 - 0.78	0.30 - 0.78	13 - 15 years	0.40 - 1.05	0.40 - 1.00	16 - 17 years	0.60 - 1.20	0.50 - 1.00	18 - 19 years	0.60 - 1.26	0.50 - 1.00	20 - 49 years	0.60 - 1.35	0.50 - 1.10	50 - 59 years*	0.70 - 1.33	0.50 - 1.05	60 - 69 years*	0.70 - 1.25	0.50 - 0.99	70 - 79 years*	0.70 - 1.18	0.60 - 0.93	> or = 80 years*	0.70 - 1.11	0.60 - 0.88	*The following message will report for patients > or = 50 years of age: <i>The upper reference limit for Creatinine is approximately 13% higher for people identified as African-American.</i>		
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Ferritin	ng/mL	Male: 22 - 322 Female: 10 - 291	Chemiluminescence	Siemens Atellica IM-1600/Siemens Centaur XPT																																										
Folate	ng/mL	>5.38 Indeterminate: 3.38-5.38 ng/mL Deficient: 0.56-3.37 ng/mL	Chemiluminescence	Siemens Atellica IM-1600																																										
Gamma Glutamyl Transferase (GGT)	IU/L	9 - 64	Glutamyl-carboxy-p-nitroanilide; IFCC	Beckman Coulter AU5800																																										
Globulin	g/dL	2.3 - 3.5	Calculation	Beckman Coulter AU5800																																										
Glucose	mg/dL	70 - 105	Hexokinase-UV/NAD	Beckman Coulter AU5800																																										
HDL	mg/dL	Male: 30-70 mg/dL; Female: 30-85 mg/dL Desirable: > 59 Higher Risk: < 40	Direct - No Pretreatment, Enzymatic (Accelerator Selective Detergent)	Beckman Coulter AU5800																																										
Hemoglobin A1C (Glycohemoglobin)	%	4.0 - 6.0	High-Performance Liquid Chromatography (HPLC)	Bio-Rad D-100																																										
Iron	µg/dL	50 - 212	TPTZ (Tripyridyltriazine)	Beckman Coulter AU5800																																										
Kt/V Jindal	N/A	The HD Adequacy Work Group feels this formula should not be used to measure delivered dose of Hemodialysis.	Calculation - Jindal Formula	Beckman Coulter AU5800																																										
Kt/V Natural Log	N/A	The K/DOQI recommendations are: Prescribed dose of hemodialysis - Kt/V of 1.3 Delivered dose of hemodialysis - Kt/V > 1.2	Calculation - Daugirdas II Formula	Beckman Coulter AU5800																																										
Kt/V Equilibrated	N/A	See Kt/V Standard for recommendations	Calculation - Leypoldt Formula	Beckman Coulter AU5800																																										
Kt/V Standard	N/A	The K/DOQI recommendations are: Minimum Kt/V Standard of 2.0 per week	Calculation - Leypoldt Formula	Beckman Coulter AU5800																																										

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Chemistry				
LDH, Plasma	IU/L	189 - 501	Lactate-Pyruvate (NAD); IFCC	Beckman Coulter AU5800
LDL, Calc	mg/dL	Optimal: < 100 Above Optimal: 100 - 129 Borderline High: 130 - 159 High: 160 - 189 Very High: > 189	Calculation - Friedewald Formula	Beckman Coulter AU5800
Magnesium	mg/dL	1.9 - 2.7	Colorimetric (Xylidyl Blue)	Beckman Coulter AU5800
nPNA	g/Kg/day	Providers should strive to achieve an nPNA of greater than or equal to 0.9 g/Kg/day. nPNA valid only if protein loss <15 a/dav.	Calculation - Modified Bergstrom Formula	Beckman Coulter AU5800
Phosphorus	mg/dL	2.5 - 5.0	UV; Phosphomolybdate Complex	Beckman Coulter AU5800
Potassium (K)	mEq/L	3.4 - 5.0	Ion Selective Electrode (ISE), Crown-Ether Membrane	Beckman Coulter AU5800
Prealbumin	mg/dL	17.0 - 34.0	Immunoturbidimetric	Beckman Coulter AU5800
Protein, Total	g/dL	6.1 - 8.4	Biuret; Blanked	Beckman Coulter AU5800
Protein, Total, 24 hr Urine w/ Creatinine	mg/g Creatinine	0 - 84	Calculation	Beckman Coulter AU5800
Protein, Total, Random Urine w/ Creatinine	mg/dL	Urine Protein, Random: 5 - 25 (Male) Urine Protein, Random: 5 - 24 (Female)	Pyrogallol Red	Beckman Coulter AU5800
	mg/g Creatinine	Urine Protein, Random with Creatinine: 21 - 161	Calculation	
PSA, Total	ng/mL	0.0 - 4.0	Chemiluminescence	Siemens Atellica IM-1600
PTH, Intact	pg/mL	160 - 721 Suggested (KDIGO) ESRD maintenance range is two to nine times the upper normal limit (80.1 pg/mL) for the laboratory.	Chemiluminescence	Siemens Atellica IM-1600/Siemens Centaur XPT
Recirculation Study	%	Recirculation results should average zero (-5% to +5%) in patients with unimpaired accesses. Recirculation exceeding 10% should prompt investigation of its cause. If access recirculation values exceed 20%, correct placement of needles should be confirmed before conducting further studies. Elevated levels of access recirculation should be investigated using angiography (fistulography) to determine whether stenotic lesions are impairing access blood flow.	Calculation	Beckman Coulter AU5800
Residual Urea Clearance (KrU)	mL/min	N/A	Calculation	Beckman Coulter AU5800
Sodium (NA)	mEq/L	136 - 145	Ion Selective Electrode (ISE), Crown-Ether Membrane	Beckman Coulter AU5800
T3, Free	pg/mL	2.3 - 4.2	Chemiluminescence	Siemens Atellica IM-1600
T3, Total	ng/dL	60 - 181	Chemiluminescence	Siemens Atellica IM-1600

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Chemistry																
T4, Free (FT4)	ng/dL	0.89 - 1.76 Hypothyroid: < 0.89 Hyperthyroid: > 1.76	Chemiluminescence	Siemens Atellica IM-1600												
T4, Total (Thyroxine)	ug/dL	4.5 - 10.9	Chemiluminescence	Siemens Atellica IM-1600												
Thyroid Stimulating Hormone (TSH), Ultrasensitive	μIU/mL	0.55 - 4.78	Chemiluminescence	Siemens Atellica IM-1600												
TIBC, Calculated	ug/dL	211 - 406	Calculation	Beckman Coulter AU5800												
Transferrin	mg/dL	260 - 400	Immunoturbidimetric	Beckman Coulter AU5800												
Transferrin Saturation	%	22 - 52	Calculation	Beckman Coulter AU5800												
Triglycerides	mg/dL	Optimal: < 150 Borderline High: 150 - 199 High: 200 - 499 Very High: > 499	Enzymatic (Glycerol Phosphate Oxidase); Colorimetric (without Glycerol Blank with Serum Blank)	Beckman Coulter AU5800												
URR (Urea Reduction Rate), Calculation	%	The K/DOQI recommendations are: Prescribed dose of hemodialysis - URR > or = to 70% Delivered dose of hemodialysis - URR > or = to 65%	Calculation	Beckman Coulter AU5800												
Uric Acid	mg/dL	4.4 - 7.6 (Male) 2.3 - 6.6 (Female)	Uricase	Beckman Coulter AU5800												
Urine Creatinine (Random)	mg/dL	N/A	Kinetic Alkaline Picrate (Jaffe Reaction)	Beckman Coulter AU5800												
Urine Protein (Random)	mg/dL	see 24-hour urine Total Protein	Pyrogallol Red	Beckman Coulter AU5800												
Urine Protein, Random with Creatinine	mg/g Creatinine	see 24-hour urine Total Protein	Pyrogallol Red for Urine Protein	Beckman Coulter AU5800												
Urine Urea Nitrogen (Random)	mg/dL	N/A	Urease/GLDH	Beckman Coulter AU5800												
Vitamin B12	pg/mL	211 - 911 Deficient: 32 - 246	Chemiluminescence	Siemens Atellica IM-1600/Siemens Centaur XPT												
Vitamin D 25-OH (Vitamin D, 25-Hydroxy)	ng/mL	See Table Below	Chemiluminescence	Siemens Atellica IM-1600/Siemens Centaur XPT												
VLDL Cholesterol	mg/dL	<table><tr><td>Vitamin D Status</td><td>Adult (≥ 21 years old)</td><td>Pediatric (≤20 years old)</td></tr><tr><td>Deficiency</td><td><20 ng/mL</td><td><15 ng/mL</td></tr><tr><td>Insufficiency</td><td>20 - 29 ng/mL</td><td>15 - 19 ng/mL</td></tr><tr><td>Sufficiency</td><td>30 - 100 ng/mL</td><td>20 - 100 ng/mL</td></tr></table>	Vitamin D Status	Adult (≥ 21 years old)	Pediatric (≤20 years old)	Deficiency	<20 ng/mL	<15 ng/mL	Insufficiency	20 - 29 ng/mL	15 - 19 ng/mL	Sufficiency	30 - 100 ng/mL	20 - 100 ng/mL	Calculation	Beckman Coulter AU5800
Vitamin D Status	Adult (≥ 21 years old)	Pediatric (≤20 years old)														
Deficiency	<20 ng/mL	<15 ng/mL														
Insufficiency	20 - 29 ng/mL	15 - 19 ng/mL														
Sufficiency	30 - 100 ng/mL	20 - 100 ng/mL														
Zinc	μg/L	405 - 1000	Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	Agilent 7800												

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Hematology				
Basophils	%	0.2 - 1.2 (Male) 0.1 - 1.2 (Female)	Fluorescent Flow Cytometry	Sysmex XN 9100
Eosinophils	%	0.8 - 7.0 (Male) 0.7 - 5.8 (Female)	Fluorescent Flow Cytometry	Sysmex XN 9100
Fluid Cell Count	WBC/ μ L	<50	Fluorescent Flow Cytometry and Manual Differential	Sysmex XN 9100
Hematocrit (HCT)	%	40.1 - 51.0 (Male) 34.1 - 44.9 (Female)	Direct Current Sheath Flow	Sysmex XN 9100
Hemoglobin (HGB)	g/dL	13.7 - 17.5 (Male) 11.2 - 15.7 (Female)	Cyanide-free Sodium Lauryl Sulfate (SLS) Hemoglobin	Sysmex XN 9100
Immature Granulocytes (IG)	%	0.0 - 1.0	Fluorescent Flow Cytometry	Sysmex XN 9100
HGB x 3	g/dL	42.0 - 54.0 (Male) 36.0 - 48.0 (Female)	Calculation	Sysmex XN 9100
Lymphocytes	%	21.8 - 53.1 (Male) 19.3 - 51.7 (Female)	Fluorescent Flow Cytometry	Sysmex XN 9100
MCH	pg	25.7 - 32.2 (Male) 25.6 - 32.2 (Female)	Calculation	Sysmex XN 9100
MCHC	g/dL	32.3 - 36.5 (Male) 32.2 - 35.5 (Female)	Calculation	Sysmex XN 9100
MCV	fL	79.0 - 92.2 (Male) 79.4 - 94.8 (Female)	Calculation	Sysmex XN 9100
Monocytes	%	5.3 - 12.2 (Male) 4.7 - 12.5 (Female)	Fluorescent Flow Cytometry	Sysmex XN 9100
Neutrophils	%	34.0 - 67.9 (Male) 34.0 - 71.1 (Female)	Fluorescent Flow Cytometry	Sysmex XN 9100
Platelets	K/ μ L	163 - 337 (Male) 182 - 369 (Female)	Fluorescent Flow Cytometry, Direct Current Sheath Flow	Sysmex XN 9100
RBC	M/ μ L	4.63 - 6.08 (Male) 3.93 - 5.22 (Female)	Direct Current Sheath Flow	Sysmex XN 9100
RDW	%	11.6 - 14.4 (Male) 11.7 - 14.4 (Female)	Calculation	Sysmex XN 9100
Reticulocytes	%	0.5 - 1.8 (Male) 0.5 - 1.7 (Female)	Fluorescent Flow Cytometry	Sysmex XN 9100
Reticulocyte HE	pg	28.2 - 35.7	Fluorescent Flow Cytometry	Sysmex XN 9100
WBC	K/ μ L	4.2 - 9.1 (Male) 4.0 - 10.0 (Female)	Fluorescent Flow Cytometry	Sysmex XN 9100

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Coagulation				
Prothrombin Time (PT)	seconds	9.7 - 11.4	Optical Clot Detection	Sysmex CS-2500/CA-1500
INR	Ratio	0.94 - 1.09	Calculation	Sysmex CS-2500/CA-1500
		Therapeutic Ranges		
		Low Dose Anticoagulant: 2.0 - 3.0		
		High Dose Anticoagulant: 2.5 - 3.5		
Immunology / Serology				
Hep B Surface Ab Quant	mIU/mL	>=10: Antibodies present (Probable Immunity) <10: Antibodies not present (No Immunity)	Chemiluminescent Sandwich Immunoassay	Siemens Atellica IM-1600/Siemens Centaur XPT
Hep B Surface Ag	N/A	Negative	Chemiluminescent Sandwich Immunoassay	Siemens Atellica IM-1600/Siemens Centaur XPT
Hep B Core Ab, IgM	N/A	Negative	Chemiluminescent Sandwich Immunoassay	Siemens Atellica IM-1600
Hep B Core Ab, Total	N/A	Negative	Chemiluminescent Sandwich Immunoassay	Siemens Atellica IM-1600/Siemens Centaur XPT
Hep C Virus Ab	N/A	Non-Reactive	Chemiluminescent Sandwich Immunoassay	Siemens Atellica IM-1600/Siemens Centaur XPT
HIV12 Ab and p24 Ag	N/A	Non-Reactive	Chemiluminescent Sandwich Immunoassay	Siemens Atellica IM-1600
Therapeutic Drugs (TDMs)				
Digoxin	ng/mL	0.8 - 2.0	Enzyme Immunoassay	Beckman Coulter AU5800
Phenytoin, Total (Dilantin)	µg/mL	10.0 - 20.0	Enzyme Immunoassay	Beckman Coulter AU5800
Vancomycin, Peak	µg/mL	20.0 - 40.0	Enzymatic Mediated Immuno Technique (EMIT)	Beckman Coulter AU5800
Vancomycin, Random	µg/mL	Peak: 20.0 - 40.0 Trough: 5.0 - 10.0	Enzymatic Mediated Immuno Technique (EMIT)	Beckman Coulter AU5800
Vancomycin, Trough	µg/mL	5.0 - 10.0	Enzymatic Mediated Immuno Technique (EMIT)	Beckman Coulter AU5800
KDOQI Guidelines for Chronic Kidney Disease:				
GFR (Glomerular Filtration Rate)	mL/min/1.73 m2	Stage 1: >89 Stage 2: 60-89 Stage 3: 30-59 Stage 4: 15-29 Stage 5: <15	Formula based on four parameter MDRD (Modification of Diet in Renal Disease) equation using an IDMS (Isotope Dilution Mass Spectrometry) - Traceable Calibration for Creatinine	Beckman Coulter AU5800