Appendix C

CONCENTRATION RANGES OF COMMONLY MEASURED VARIABLES IN BLOOD

Variable	Traditional Units	SI Units
Blood gases		
P_{O_2} (arterial)	80–100 mmHg	11–13 kPa (kilopascals)
(*Note:* Arterial P_{O_2} declines with age, being close to 100 mmHg in childhood, and decreasing to 80 and even lower in old age.)		
P_{CO_2} (arterial)	35–45 mmHg	4.7–5.9 kPa
Electrolytes		
Ca^{2+}		
Total	9.0–10.5 mg/dL	2.2–2.6 mmol/L
Ionized	4.5–5.6 mg/dL	1.1–1.4 mmol/L
Cl^-		97–110 mmol/L
K^+		3.5–5.0 mmol/L
Na^+		135–146 mmol/L
Hormones		
Aldosterone	30–100 pg/mL	83–277 pmol/L
Cortisol		
8:00 A.M.	5–25 µg/dL	140–700 nmol/L
4:00 P.M.	1.5–12.0 µg/dL	40–320 nmol/L
Estradiol		
Women (early follicular phase)	20–100 pg/mL	73–367 pmol/L
Women (midcycle peak)	150–750 pg/mL	551–2755 pmol/L
Men	10–50 pg/mL	37–185 pmol/L
Insulin (fasting)	6–26 µU/mL	43–186 pmol/L
	(0.2–1.1 ng/mL)	
Insulin-like growth factor 1 (IGF-1)		
16–24 years old	182–780 ng/mL	182–780 µg/L
25–50 years old	114–492 ng/mL	114–492 µg/L
Parathyroid hormone (Intact)	10–75 pg/mL	1.1–8.0 pmol/L
Progesterone		
Women (luteal phase)	2–27 ng/mL	6–81 nmol/L
Women (pregnancy)	5–255 ng/mL	15–770 nmol/L
Men	0.2–1.4 ng/mL	0.6–4.3 nmol/L
Testosterone		
Women	9–55 ng/dL	0.3–1.9 nmol/L
Men	250–1000 ng/dL	9–35 nmol/L
Thyroid-stimulating hormone (TSH)	0.3–4.0 µU/mL	0.3–4.0 mU/L
Thyroxine (T_4) (adults)	5–11 µg/dL	64–140 nmol/L

Variable	Traditional Units	SI units
Nutrients (fasting)		
Glucose	70–110 mg/dL	4–6 mmol/L
FFA	72–240 mg/dL	0.3–1.0 mmol/L
Triglycerides	<160 mg/dL	<1.8 mmol/L
Proteins (major)		
Albumin	3.5–5.5 g/dL	35–55 g/L
Globulins	2.0–3.5 g/dL	20–35 g/L
Fibrinogen (clotting factor)	200–400 mg/dL	2–4 g/L
Other variables		
Red blood cell count	$4.1–5.4 \times 10^6/mm^3$	$4.1–5.4 \times 10^{12}/L$
Hematocrit		
Males	42%–52%	0.42–0.52
Females	37%–48%	0.37–0.48
Hemoglobin		
Males	14–18 g/dL	140–180 g/L
Females	12–16 g/dL	120–160 g/L
Iron	50–150 µg/dL	9–27 µmol/L
Leukocytes (total)	$4.3–10.8 \times 10^3/mm^3$	$4.3–10.8 \times 10^9/L$
Osmolarity	285–295 mOsmol/L	285–295 mOsmol/L
pH	7.38–7.45	7.38–7.45

Values are given in traditional units where appropriate, and in international system (SI) units adopted by much of the world. SI unit values for fatty acids and triglycerides are estimates based on an average molecular weight for each. Certain hormones have traditionally been measured in "units of activity," symbolized by the letter U (or sometimes "IU," for "international units"). All values are derived from a composite of numerous sources (notably, *Harrison's Principles of Internal Medicine,* 15th edition, and Greenspan, F. S., and Gardner, D. G., *Basic and Clinical Endocrinology,* 7th edition; both McGraw-Hill), and are not meant to be regarded as absolutes. Small variations in reference ranges occur due to several factors, including method of measurement.

English and Metric Units

	English	Metric
Length	1 foot = 0.305 meter	1 meter = 39.37 inches
	1 inch = 2.54 centimeters	1 centimeter (cm) = 1/100 meter
		1 millimeter (mm) = 1/1000 meter
		1 micron (µm) = 1/1000 millimeter
		1 nanometer (nm) = 1/1000 micron
***Mass**	1 pound = 453.59 grams	1 kilogram (kg) = 1000 grams = 2.2 pounds
	1 ounce = 28.3 grams	1 gram (g) = 0.035 ounce
		1 milligram (mg) = 1/1000 gram
		1 microgram (µg) = 1/1000 milligram
		1 nanogram (ng) = 1/1000 microgram
		1 picogram (pg) = 1/1000 nanogram
Volume	1 gallon = 3.785 liters	1 liter = 1000 cubic centimeters = 0.264 gallon
	1 quart = 0.946 liter	1 liter = 1.057 quarts
	1 pint = 0.473 liter	1 deciliter (dL) = 1/10 liter
	1 fluid ounce = 0.030 liter	1 milliliter (mL) = 1/1000 liter
	1 cup = 0.237 liter	1 microliter (µL) = 1/1000 milliliter

*A pound is actually a unit of force, not mass. The correct unit of mass in the English system is the slug. When we write 1 kg = 2.2 pounds, this means that one kilogram of mass will have a weight under standard conditions of gravity at the earth's surface of 2.2 pounds of force.