

Definitions	
Acid	CO ₂ ; proton donor
Base	HCO ₃ ⁻ ; proton acceptor
Acidemia	pH < 7.35
Alkalemia	pH > 7.45
Acidosis	Process that results in decreased blood pH
Alkalosis	Process that results in increased blood pH
Respiratory regulation	Regulates CO ₂ ; compensation occurs in min to hrs
Renal regulation	Regulates HCO ₃ ⁻ ; compensation takes up to 1wk

Consequences of Alkalemia	
Hypokalemia	Arteriolar constriction
Reduced coronary blood flow	Decreased plasma ionized [Ca]
Decreased Mg and PO ₄	Reduced cerebral blood flow
Tetany, seizures	

Consequences of Acidemia	
Hyperkalemia	Impaired cardiac contractility
Reduced ATP synthesis	Impaired response to catecholamines
Reduced cardiac output	Insulin resistance
Coma	

Primary Disorders			
	pH	PaCO ₂	HCO ₃ ⁻
Respiratory Acidosis	decreased	increased	normal
Respiratory Alkalosis	increased	decreased	normal
Metabolic Acidosis	decreased	normal	decreased
Metabolic Alkalosis	increased	normal	increased

Partially Compensated States			
	pH	PaCO ₂	HCO ₃ ⁻
Respiratory Acidosis	decreased	increased	increased
Respiratory Alkalosis	increased	decreased	decreased
Metabolic Acidosis	decreased	decreased	decreased
Metabolic Alkalosis	increased	increased	increased

Fully Compensated States			
	pH	PaCO ₂	HCO ₃ ⁻
Respiratory Acidosis	Normal, but < 7.40	increased	increased
Respiratory Alkalosis	Normal, but > 7.40	decreased	decreased
Metabolic Acidosis	Normal, but < 7.40	decreased	decreased
Metabolic Alkalosis	Normal, but > 7.40	increased	increased

Arterial Blood Gas Ranges	
pH	7.35-7.45
PaCO ₂	35-45mmHg
PaO ₂	80-100mmHg
HCO ₃ ⁻	22-26 mEq/L
SaO ₂	>95%

Anion Gap (AG)	
Definition	Concentration of unmeasured anions in plasma
Unmeasured anions	Sulfates, phosphates, blood proteins such as albumin
Use	Determines type of metabolic acidosis
Equation	[Na ⁺] - ([Cl ⁻] + [HCO ₃ ⁻])
Normal AG	12 mEq/L; range of 8-16 acceptable
Elevated AG	>20 mEq/L
Metabolic alkalosis	Excess AG+HCO ₃ > normal HCO ₃ ⁻
Metabolic acidosis	Excess AG+HCO ₃ < normal HCO ₃ ⁻

AG: Difference in electrical charge between cations and anions in blood.

Causes of Elevated Anion Gap			
Methanol	Uremia	Diabetic ketoacidosis	Propylene glycol
Isoniazid	Lactic acidosis	Ethylene glycol	Renal Failure

✎MUDPILES

Diagnosing Acid/Base Disorders	
1. Determine if patient is acidic or basic	
2. Determine if it is an anion gap acidosis (normally due to MUDPILES)	
3. Determine if metabolic alkalosis or non-anion gap acidosis	

