

Blood Gas Analysis

Normal Values

	Acidosis	Normal	Alkalosis
pH	<7.35	7.35-7.45	>7.45
Co2	>45	35-45	<45
Hco3	<22	22-26	>26

OXYGENATION ASSESSMENT

PaO2 Interpretation		A-a Gradient	
Normal	80-100 mmHg	A-a Gradient = PAO2 - PaO2	
Mild hypoxemia	60-79 mmHg	Age	Normal Value
Moderate hypoxemia	40-59 mmHg	< 30	< 10 mmHg
Severe hypoxemia	< 40 mmHg	30-65	< 15 mmHg
		> 65	< 20 mmHg

INTERPRETATION STEPWISE APPROACH

1. Check the pH	Acidemia: pH < 7.35 Alkalemia: pH > 7.45
2. Determine Primary Disorder	Co2 → Respiratory Hco3 → Metabolic
3. Assess Compensation	Full Compensated: Normal pH, $\uparrow\downarrow$ Co2 and Hco3 Partial Compensated: $\uparrow\downarrow$ pH, Co2, and Hco3 Uncompensated: Normal Co2 or Hco3, $\uparrow\downarrow$ pH and (Co2 or Hco3)
4. Evaluate Oxygenation	Assess PaO, and SaO,

Example

pH 7.28 PaCO₂ 55 mmHg HCO₃⁻ 24 mEq/L PaO₂ 68 mmHg

1 Check the pH	Acidemia
2 Determine Primary Disorder	Respiratory ($\uparrow$ PaCO ₂)
3 Assess Compensation	Uncompensated (HCO ₃ ⁻ normal)
4 Evaluate Oxygenation	Mild hypoxemia

✓ Interpretation:
Uncompensated Respiratory Acidosis with Mild Hypoxemia

Winter's Formula

Used to determine if respiratory compensation is appropriate in metabolic acidosis.

$$\text{Expected PaCO}_2 = (1.5 \times \text{HCO}_3^-) + 8 \pm 2$$

- Measured PaCO₂ = Expected → Appropriate compensation
- Measured PaCO₂ > Expected → Concomitant respiratory acidosis
- Measured PaCO₂ < Expected → Concomitant respiratory alkalosis

EXAMPLE:

HCO₃⁻ = 10 mEq/L

PaCO₂ (measured) = 25 mmHg

$$\begin{aligned} \text{Expected PaCO}_2 &= (1.5 \times 10) + 8 \pm 2 \\ &= 23 \pm 2 \\ &= 21 - 25 \text{ mmHg} \end{aligned}$$

- ✓ Measured PaCO₂ 25 mmHg → Appropriate compensation