RESPIRATORY

BLOOD GAS ANALYSIS

A structured approach with some easy steps allows fast interpretation of most blood gases.

1. Is the patient hypoxic?

Normal PaO2 is > 10.6 kPa

2. Is the patient acidotic or alkalotic?

Normal H+ is 35 – 45

A normal value doesn't rule out a respiratory or metabolic disorder – there may be respiratory or metabolic compensation for an acid-base problem.

	H+	
<35	35 – 45	>45
Alkalosis	Normal or compensated	Acidosis

3. Is the carbon dioxide normal? This assesses the respiratory component.

Normal PaCO2 is 4.5 – 6 kPa

High PaCO2 causes acidosis

Low PaCO2 causes alkalosis

4. Is the bicarbonate normal? This assesses the metabolic component.

Normal HCO3- is 22 – 26

High HCO3- causes alkalosis

Low HCO3- causes acidosis

5. Is the acid-base disorder is caused by a respiratory or metabolic problem?

Match either the respiratory or metabolic component to the hydrogen ions. For example a high CO2 fits with an overall acidosis and indicates respiratory acidosis. By contrast a normal HCO3 doesn't fit with an overall acidosis so metabolic acidosis is not the cause.

H+ high & CO2 high = **respiratory acidosis**	H+ low & CO2 low = **respiratory alkalosis**
H+ high & HCO3- low = **metabolic acidosis**	H+ low & HCO3- high = **metabolic alkalosis**

There is a mixed picture if both CO2 and HCO3- match the overall acid-base disorder.

6. Is there compensation?

The body tries to maintain PH at a narrow range and will use either respiratory or metabolic mechanisms to mitigate deviations from this range. Compensation is evident if either the CO2 or HCO3- show a change opposite to the overall acid-base disorder. If compensation is complete then H+ will be normal.

If there is a metabolic acidosis increased ventilation increases CO2 excretion which helps to raise PH. CO2 will be low.

If there is a respiratory acidosis retention of bicarbonate by the kidneys helps to raise PH. HCO3- will be high.

Compensation for alkalosis is possible but less common.

Respiratory Acidosis

H+: 70 – acidosis
CO2: 17 – respiratory acidosis
HCO3: 33 – compensatory alkalosis

Respiratory Alkalosis

H+: 32 – alkalosis
CO2: 3.4 – respiratory alkalosis
HCO3: 23 – normal, no compensation

Metabolic Acidosis

H+: 70 – acidosis
CO2: 3.3 – respiratory compensation
HCO3: 10 – metabolic acidosis

Metabolic Alkalosis

H+: 30 – alkalosis
CO2: 5.9 – normal, no compensation
HCO3: 34 – metabolic alkalosis