

Acid Base Disorders

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Arterial blood gas (ABG)

- pH 7.35-7.45
- $p\text{CO}_2$ 35-45 mmHg
- HCO_3^- 22-26 mEq/L
- $p\text{O}_2$ 75-100 mmHg

Process

Acidosis

Alkalosis

H⁺ concentration in blood is increasing

HCO₃⁻ concentration in blood is decreasing

H⁺ concentration in blood is decreasing

HCO₃⁻ concentration in blood is increasing

Acidemia

Alkalemia

Excess H⁺ in blood
pH <7.35

Excess HCO₃⁻ in blood
pH >7.45



vs



Base

Acid

Kidney

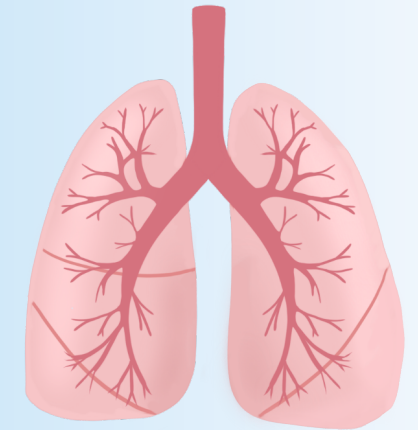
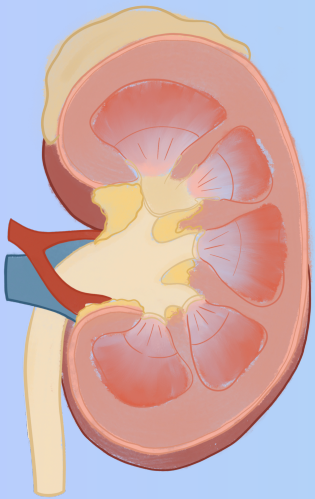
Lungs

Metabolic

Respiratory

Days

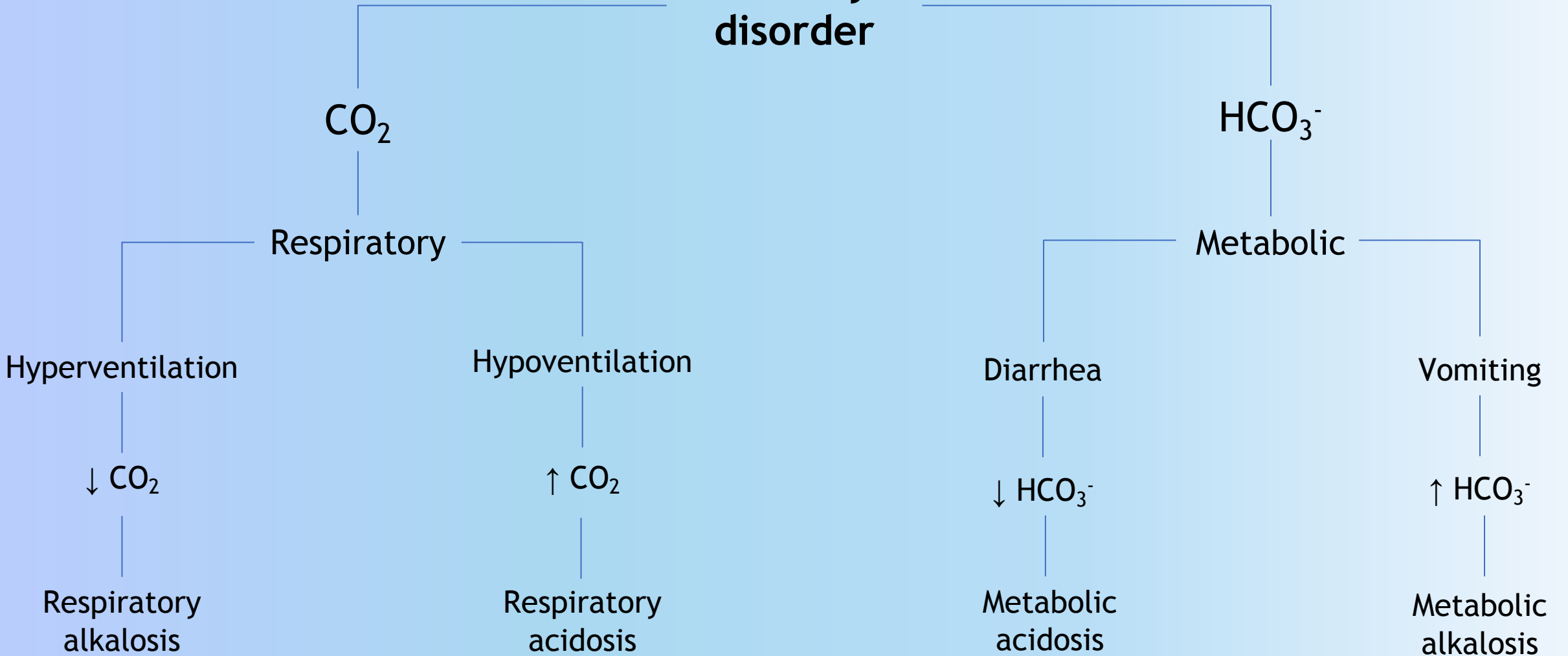
Minutes



3-step ABG interpretation

1. Identify if it is **acidosis** or **alkalosis** (pH)
2. Identify if it is **respiratory** or **metabolic** ($\text{CO}_2/\text{HCO}_3^-$)
3. Identify it if is **compensated** (partially or fully) or **uncompensated**

Primary disorder



ABG:

pH 7.20

pCO₂ 40

HCO₃⁻ 15

pH 7.35-7.45

pCO₂ 35-45 mmHg

HCO₃⁻ 22-26 mEq/L

ABG:

pH 7.50

pCO₂ 31

HCO₃⁻ 24

pH 7.35-7.45

pCO₂ 35-45 mmHg

HCO₃⁻ 22-26 mEq/L

ABG:

pH 7.31

pCO₂ 28

HCO₃⁻ 18

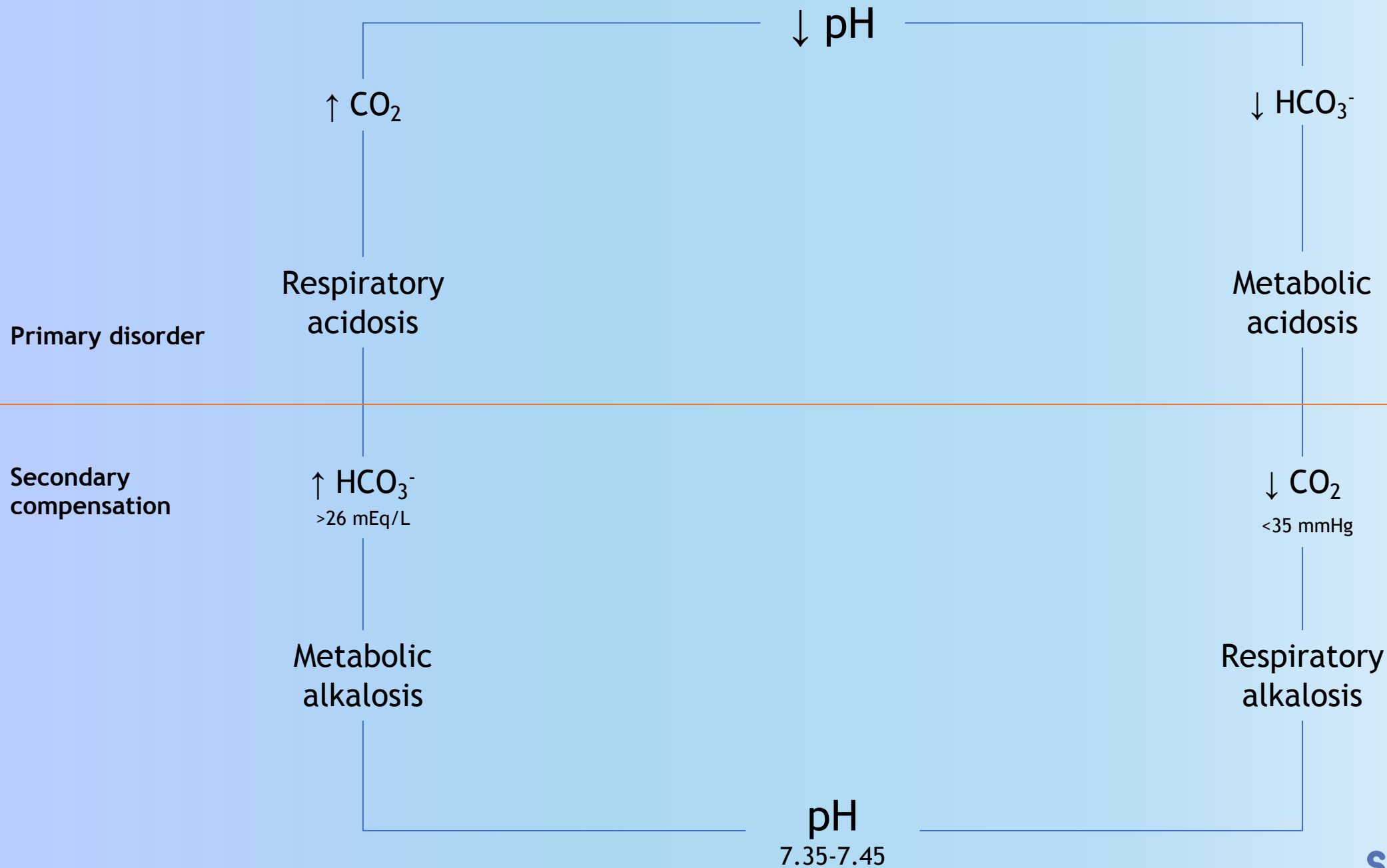
pH 7.35-7.45

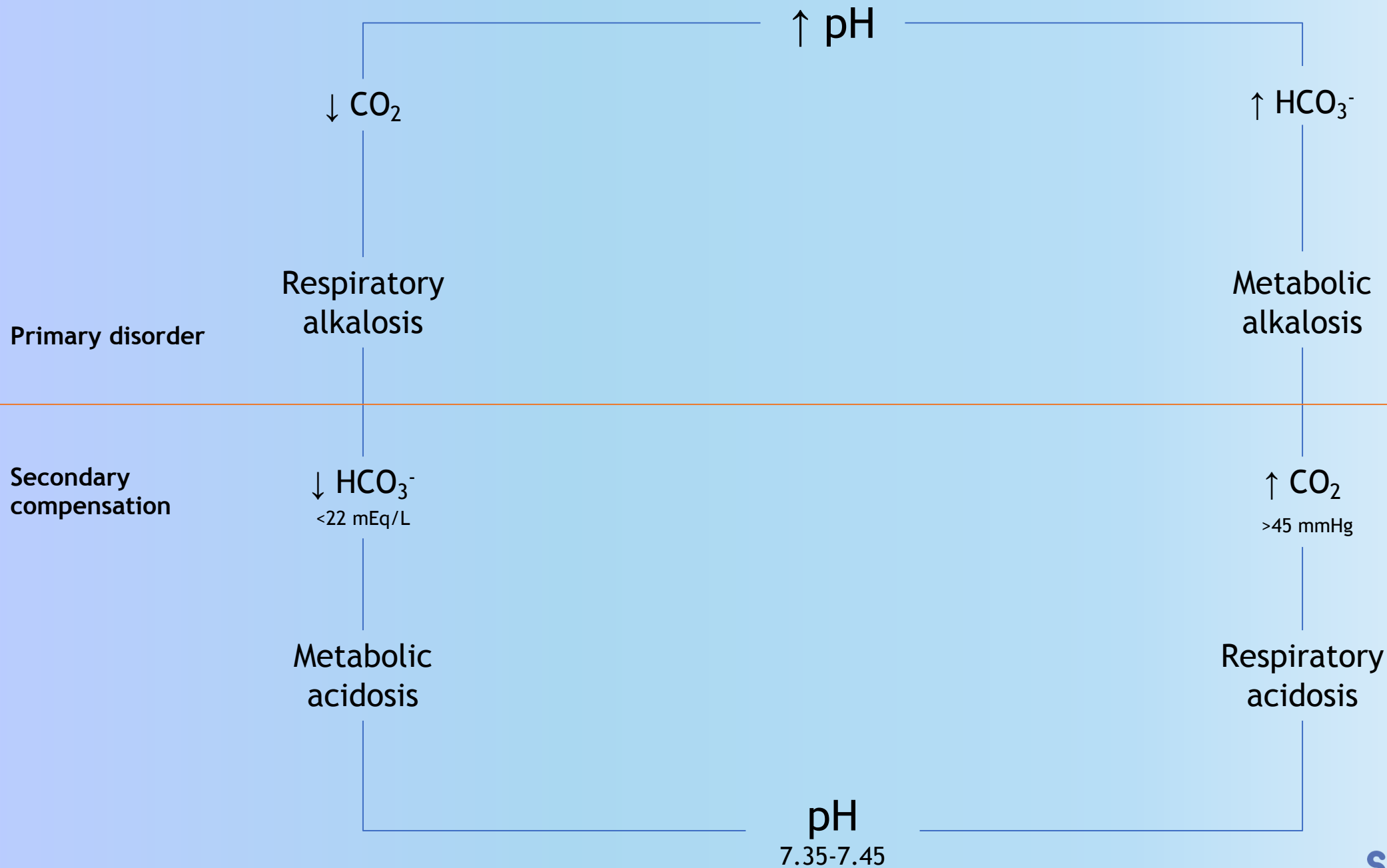
pCO₂ 35-45 mmHg

HCO₃⁻ 22-26 mEq/L

3-step ABG interpretation

1. Identify if it is **acidosis** or **alkalosis** (pH)
2. Identify if it is **respiratory** or **metabolic** ($\text{CO}_2/\text{HCO}_3^-$)
3. Identify it if is **compensated** (partially or fully) or **uncompensated**





ABG:

pH 7.31

pCO₂ 28

HCO₃⁻ 18

pH 7.35-7.45

pCO₂ 35-45 mmHg

HCO₃⁻ 22-26 mEq/L

ABG:

pH 7.5

pCO₂ 51

HCO₃⁻ 28

pH 7.35-7.45

pCO₂ 35-45 mmHg

HCO₃⁻ 22-26 mEq/L

ABG:

pH 7.35

pCO₂ 49

HCO₃⁻ 30

pH 7.35-7.45

pCO₂ 35-45 mmHg

HCO₃⁻ 22-26 mEq/L

Full compensation:

- pH is normal
- CO_2 and HCO_3^- levels are abnormal

Acidic side / alkaline side

- 7.35, 7.36, 7.37, 7.38, 7.39 - Acidic side
- 7.41, 7.42, 7.43, 7.44, 7.45 - Alkaline side

ABG:

pH 7.35

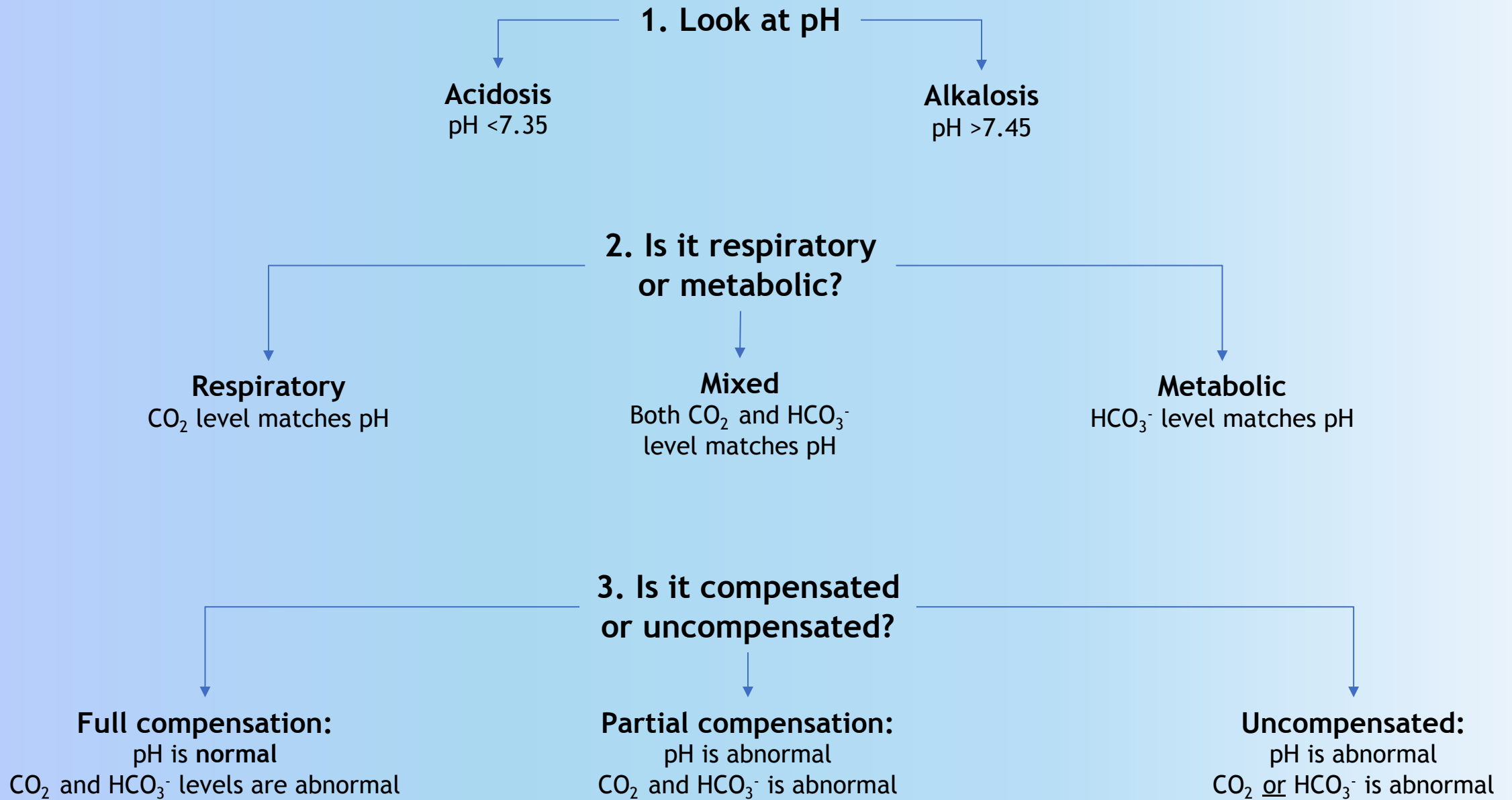
pCO₂ 49

HCO₃⁻ 30

pH 7.35-7.45

pCO₂ 35-45 mmHg

HCO₃⁻ 22-26 mEq/L



George W. Bush is diagnosed with peptic ulcer disease, which he takes antacids for. He visits you, his private doctor, and presents with confusion and hypoventilation. You take an ABG sample, which reveals:

pH 7.42

pCO₂ 50

HCO₃⁻ 33

How would you classify the acid base status?



pH 7.35-7.45

pCO₂ 35-45 mmHg

HCO₃⁻ 22-26 mEq/L

Frank Løke is coming down from the summit of Mount Everest. At an altitude of 8,400 meters, he has a blood gas drawn while breathing ambient air as part of a research project.

Arterial blood gas reveals:

pH 7.55

pCO₂ 12

HCO₃⁻ 10.5



How would you classify the acid base status?

	Definition	Compensation	Arterial blood gas
Metabolic acidosis	pH <7.35 caused by ↓ HCO ₃ ⁻ concentration in blood	Hyperventilation ↓ CO ₂ Compensation occurs within minutes	↓ pH ↓ HCO ₃ ⁻ ↓ CO ₂ (compensation)
Metabolic alkalosis	pH >7.45 caused by ↑ HCO ₃ ⁻ concentration in blood	Hypoventilation ↑ CO ₂ Compensation occurs within minutes	↑ pH ↑ HCO ₃ ⁻ ↑ CO ₂ (compensation)
Respiratory acidosis	pH <7.35 caused by ↑ CO ₂ concentration in blood	↑ renal reabsorption of HCO ₃ ⁻ Compensation occurs within hours to days	↓ pH ↑ CO ₂ ↑ HCO ₃ ⁻ (compensation)
Respiratory alkalosis	pH >7.45 caused by ↓ CO ₂ concentration in blood	↓ renal reabsorption of HCO ₃ ⁻ Compensation occurs within hours to days	↑ pH ↓ CO ₂ ↓ HCO ₃ ⁻ (compensation)

<https://abg.ninja/abg>



WEB

- 1 Connect to www.wooclap.com/ACIDBASE
- 2 You can participate