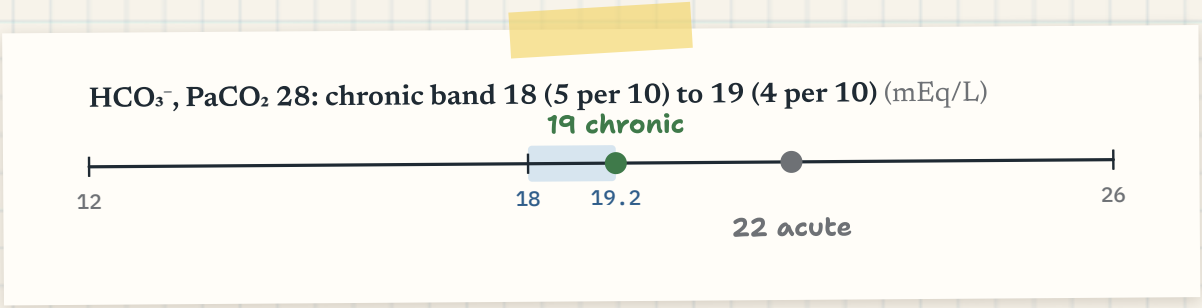
Respiratory alkalosis: acute vs chronic

How far does bicarbonate fall?



Step by step

1. Fall in $PaCO_2$: 40 – measured
2. Divide by 10
3. Multiply by 2 (acute) or 4 (chronic)
4. Subtract from 24
5. Lower than expected: suspect a second problem, a metabolic acidosis

	Acute	Chronic
Timing	Minutes	2–3 days
Mechanism	Buffers release H^+	Kidneys excrete less acid
HCO_3^- fall per 10 mm Hg	About 2	About 4
Rough floor	About 18	About 12–15

Two waves of compensation

EXPECTED HCO_3^-

$$24 - \text{slope} \times (40 - PaCO_2) / 10$$

slope 2 if acute (sources 1–2), 4 if chronic (sources 4–5)

Rule of thumb

Chronic is about twice acute: 4 vs 2 per 10

$PaCO_2$ 28: acute about 22, chronic about 19

The kidneys need days

Exam traps

- In very recent hyperventilation, bicarbonate can still be close to 24.
- A bicarbonate lower than expected points to a second problem, a metabolic acidosis.
- Sources differ: acute slope 1–2, chronic 4–5.

Respiratory alkalosis compensation: acute vs chronic

Video, written lesson, practice question and sources: medservatory.com/usmle-step-1/renal-acid-base/respiratory-alkalosis-compensation

For exam study only, not medical advice. Follow local guidelines and your lab's ranges.
© 2026 Medservatory, a project of ADMR Solutions Ltd. Free to print and share for personal study.