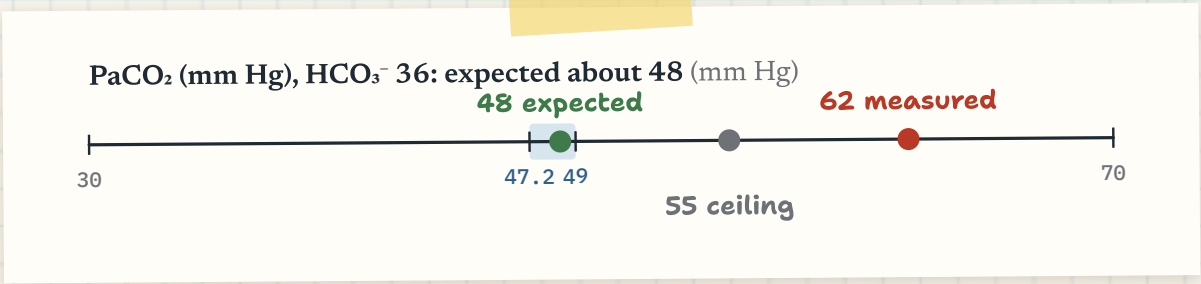
Metabolic alkalosis: expected $PaCO_2$

Is the compensation appropriate?



Step by step

1. Find the rise: HCO_3^- − 24
2. Multiply by 0.7
3. Add to 40
4. Compare with the measured $PaCO_2$

EXPECTED $PACO_2$

$$40 + 0.7 \times (HCO_3^- - 24)$$

slope about 0.7 mm Hg per 1 mEq/L (range 0.6–0.75); ceiling about 55 (some sources 55–60)

Measured $PaCO_2$	Meaning
Higher than expected	+ respiratory acidosis
Lower than expected	+ respiratory alkalosis
Inside the window	Appropriate compensation, one disorder

Measured vs expected $PaCO_2$

Rule of thumb

Alkalosis slope 0.7; acidosis slope (Winters') 1.5

Lungs breathe less, so CO_2 rises

HCO_3^- 36: rise 12, × 0.7 = 8.4, expect about 48

Exam traps

- Do not use Winters' formula (1.5) for metabolic alkalosis.
- Compensation is weak and variable between patients.
- Sources differ: slope 0.6–0.75, ceiling 55 or 55–60.

Metabolic alkalosis compensation: the expected $PaCO_2$

Video, written lesson, practice question and sources: medservatory.com/usmle-step-1/renal-acid-base/metabolic-alkalosis-compensation-expected-pco2

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.