

PLACE

PLATFORM OF LABORATORIES FOR ADVANCES IN CARDIAC EXPERIENCE

ROMA

Centro Congressi
di Confindustria

Auditorium
della Tecnica

9ª Edizione

30 Settembre

1 Ottobre

2022

**Mission impossible
in 10'!**

TEN MINUTES ANSWERS IN CARDIOLOGIA D'URGENZA (II)

**"THE EASY (AND THE BEST) WAY TO...
INTERPRETARE E CORREGGERE
L'EQUILIBRIO ACIDO-BASE ED ELETTROLITICO**

Mauro Mennuni



- Carlo, 73 anni,
- In DEA per dispnea ingravescente
- CMD, DAI
- Bisoprololo, Furosemide 125 mg, Sartano, Spironolattone
- Furosemide a 250 mg = no effetto

• EO: PA 100/85, FC 70, FR 28, T° 36.4, SpO₂ 92 in VM 35%. Edemi declivi, vasocostretto, rantoli su tutto l'ambito

• EGA.....



Alcalosi respiratoria
Acidosi metabolica AG
Alcalosi metabolica

Niente di ché!
pH 7.38: è normale!

POC BLOOD ANALYSIS	
pH	7.3
pCO ₂ mmHg	30
pO ₂ mmHg	78
HCO ₃ mmol/L	18
Hbc g/dL	11.8
Na ⁺ mmol/L	143
K ⁺ mmol/L	3.6
Cl ⁻ mmol/L	

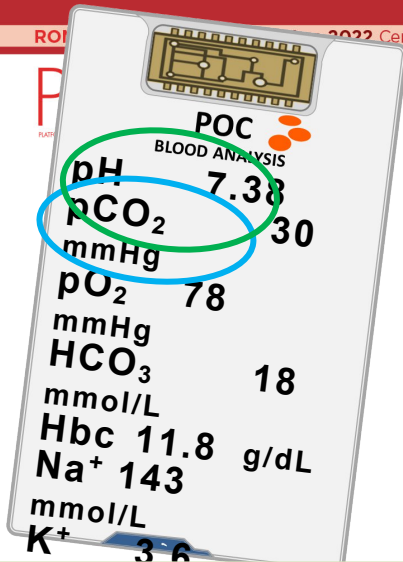
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L'emogasanalisi
Tutti i segreti in 20 casi clinici



Bestseller di Amazon

EGA «normale» =
pH, PaCO₂, AG normali!



FiO_2 0.35

PaO_2 attesa: $35 \times 5 = 175$

$PaCO_2 < 38$

Grave mismatch
Iperventilazione

Cosa Ti aspetti?

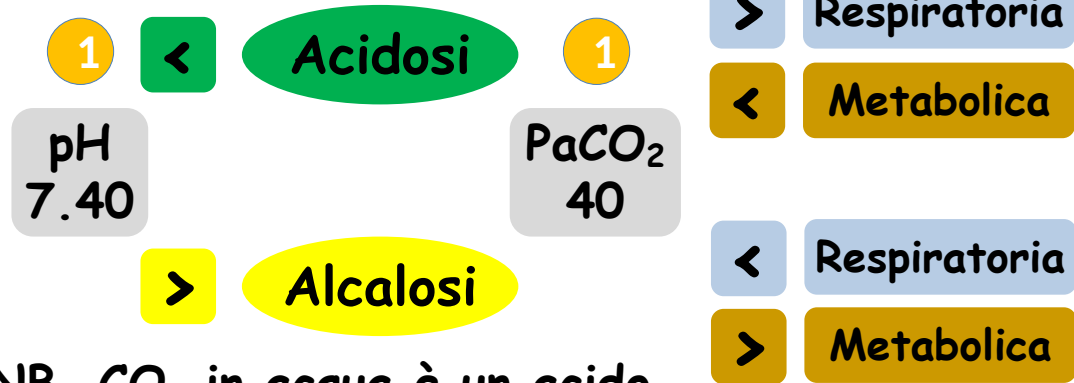
Insuff. cardiaca acuta su cronica
Diuretici in cronico

Acidosi metabolica
Alcalosi metabolica

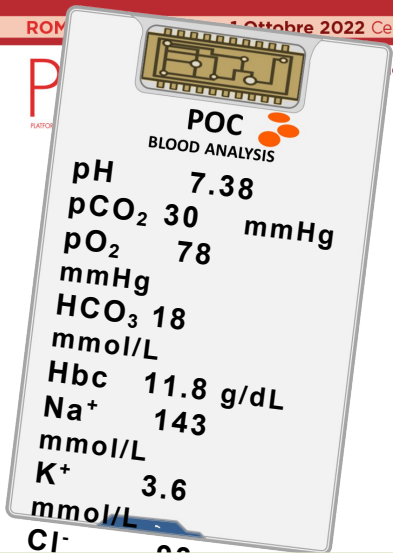
Equilibrio Acido-Base: pH 7.38, $PaCO_2$ 30, HCO_3^- 18

1. pH e $PaCO_2$?
2. R.O.M.A?
3. Compensazione?
4. Anion Gap?
5. Δgap ?

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NB. CO_2 in acqua è un acido



2

- 🧠 R. espiratoria
- 🧠 O. pposta
- 🧠 M. etabolica
- 🧠 A. naloga

Acidosi	pH	pCO ₂
Respiratoria	Δ	♻️
Metabolica	Δ	Δ
Alcalosi	pH	pCO ₂
Respiratoria	♻️	Δ
Metabolica	♻️	♻️

1. pH e PaCO₂?
2. R.O.M.A?
3. Compensazione?
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Equilibrio Acido-Base: pH 7.38, PaCO₂ 30, HCO₃⁻ 18

pH < 7.40 PaCO ₂ < 40 HCO ₃ ⁻ < 24	Analoghi	Acidosi Metabolica
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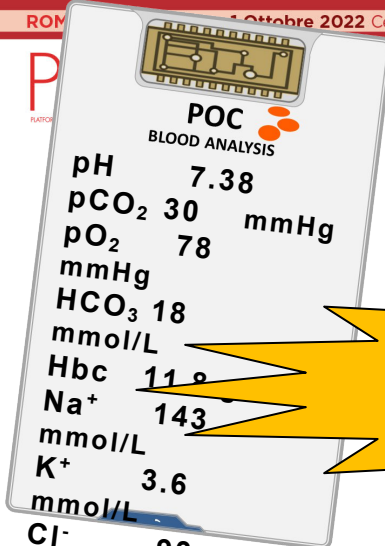
Le 6 Regole del compenso



Alterazione primaria	Compensazione attesa
Acidosi Metabolica	$P_aCO_2 = 1.5 \times [HCO_3^-] + 8 \pm 2$
Alcalosi Metabolica	$P_aCO_2 = 0.7 \times [HCO_3^-] + 20 \pm 5$
Alterazione primaria	Compensazione attesa
Acidosi Respiratoria	
• Acuta	$\delta [HCO_3^-] = 1 \times 10 \quad \delta PCO_2$
• Cronica	$\delta [HCO_3^-] = 4 \times 10 \quad \delta PCO_2$
Alcalosi Respiratoria	
• Acuta	$\Delta [HCO_3^-] = 2 \times 10 \quad \Delta PCO_2$
• Cronica	$\Delta [HCO_3^-] = 5 \times 10 \quad \Delta pCO_2$



Equilibrio Acido-Base: pH 7.38, PaCO₂ 30, HCO₃⁻ 18



pH <7.40
 PaCO₂ <40
 HCO₃⁻ <24

Analoghi

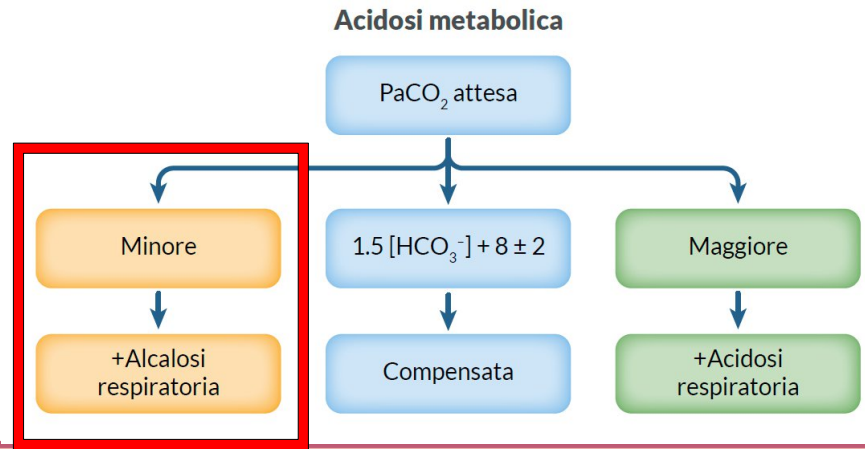
Acidosi
 Metabolica

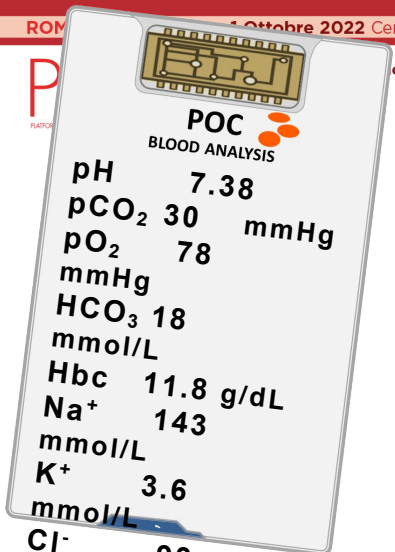
Mai
«Ipercompensazione»!

3 PaCO₂ attesa = 1.5x [HCO₃³⁻] + 8 = 35_{±2}

1. pH e PaCO₂?
2. R.O.M.A?
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Equilibrio Acido-Base: pH 7.38, PaCO₂ 30, HCO₃⁻ 18

pH <7.40
 PaCO₂ <40
 HCO₃⁻ <24

Analoghi

Acidosi
 Metabolica

Compensazione: PaCO₂ 30, HCO₃⁻ 18

$$PaCO_2 \text{ attesa} = 1.5 \times 18 + 8 = 35_{\pm 2}$$

Associata Alcalosi
 Respiratoria

Anion Gap: Na⁺-Cl⁻-HCO₃⁻

1. pH e PaCO₂?
2. R.O.M.A?
3. Compensazione?
4. Anion Gap?
5. Δgap?

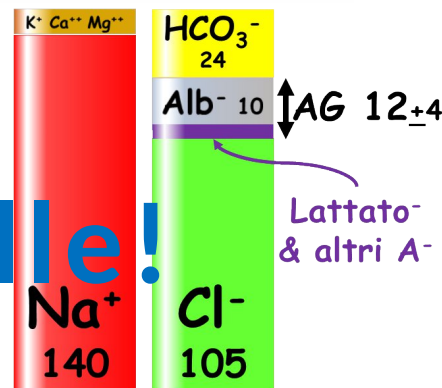
4 AG

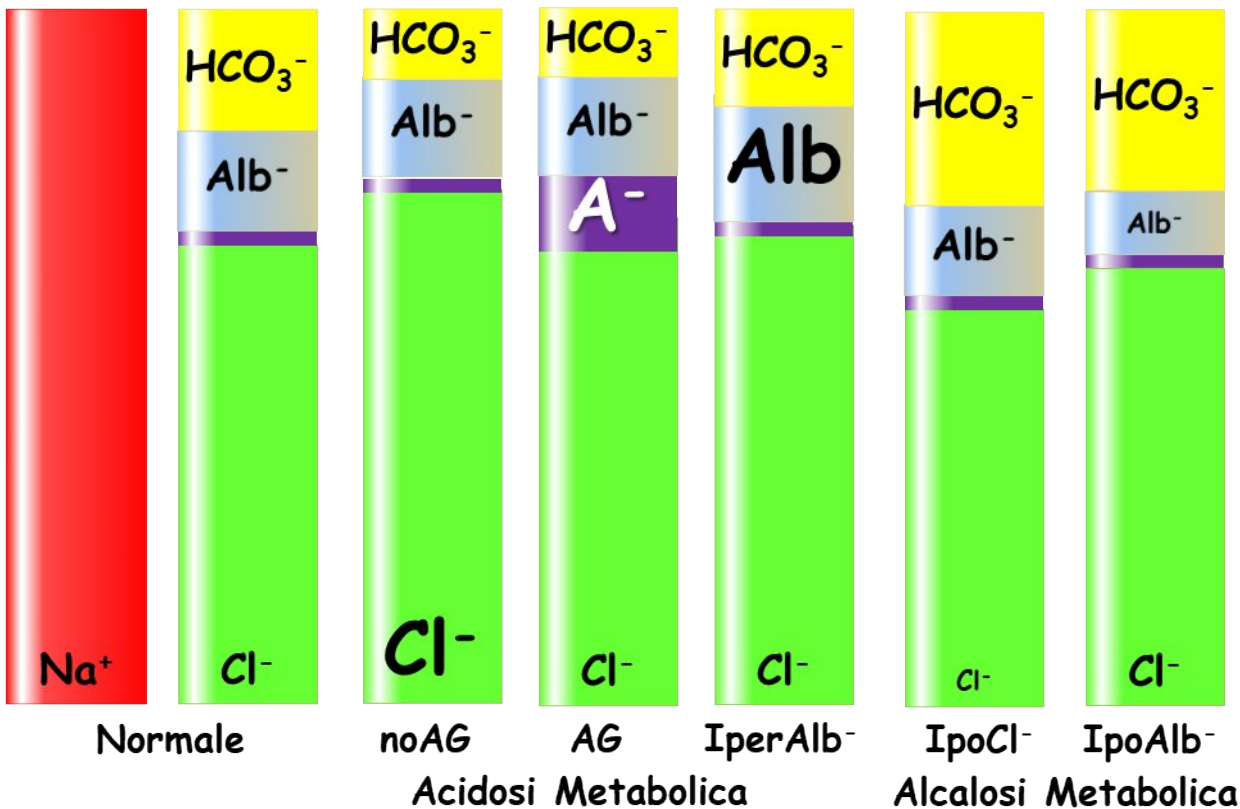
$$[Na^+] - [Cl^-] - [HCO_3^-] = 12_{\pm 4}$$

No scintille!

Equazione di Elettro-neutralità

Cationi = Anioni





Effetto
«Acido»

Effetto
«Base»

[Cl⁻]_s ⚡

[Cl⁻]_s Δ

[Alb⁻]_s ⚡

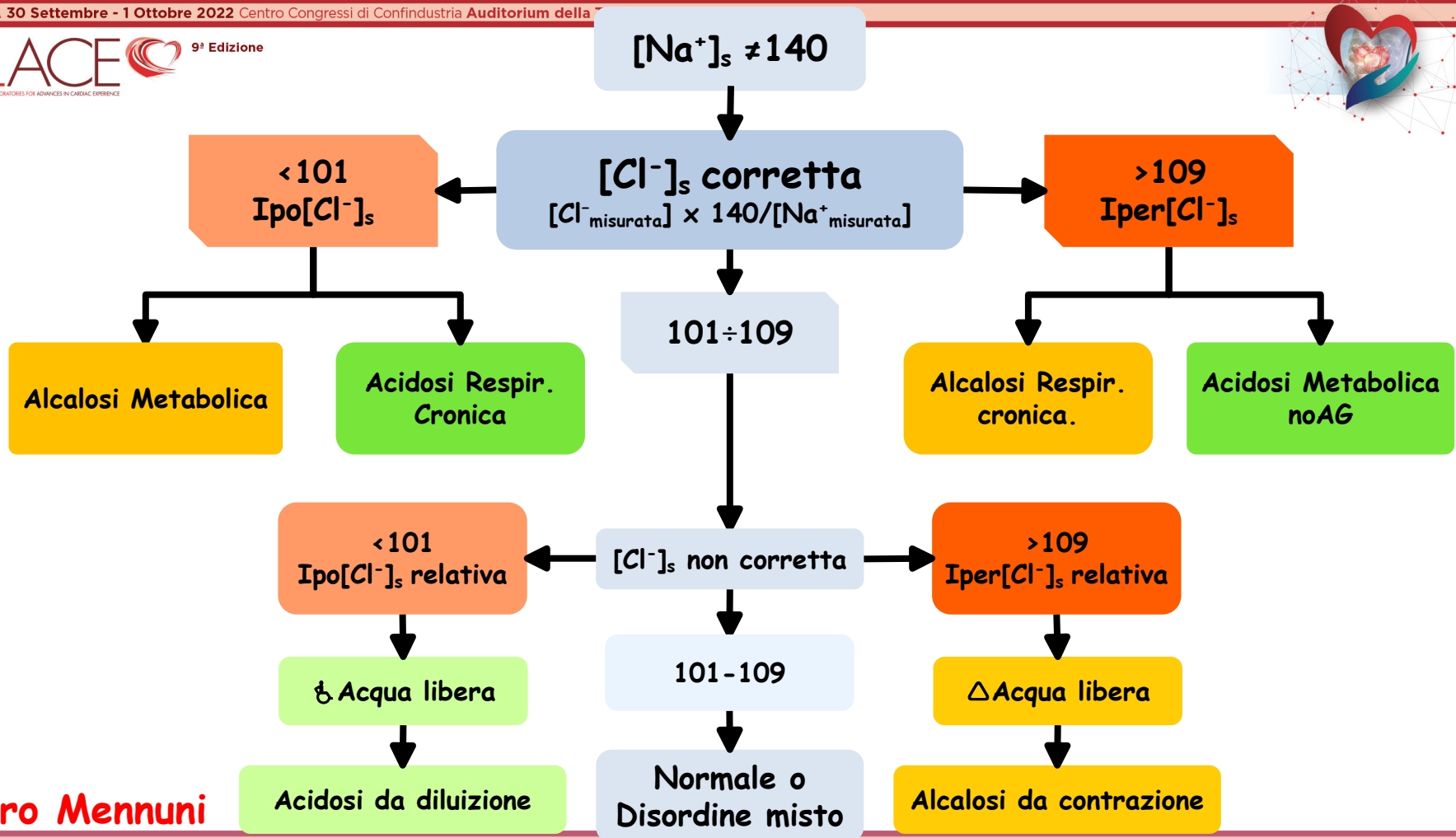
[Alb⁻]_s Δ

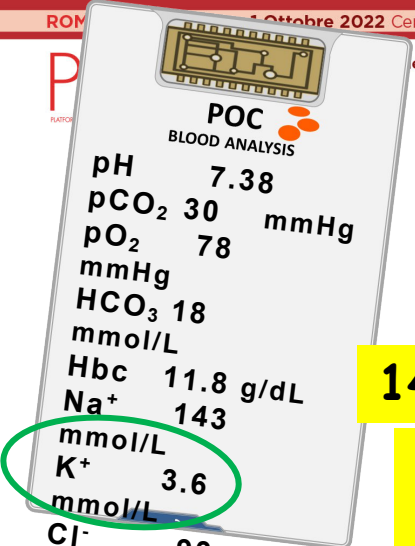
[Lac⁻]_s ⚡

[HCO₃⁻]_s Δ

[HCO₃⁻]_s ⚡

$$AG_{\text{corretto}} = AG_{\text{misurato}} + 2.5(4 - Alb_{g/dL})$$





Anion Gap: $Na^+ - Cl^- - HCO_3^-$

$143 - 93 - 18 = 33$

Alto AG

- Acidosi Metabolica AG
- Alcalosi Respiratoria

$143 - 93 - 36 = 14$

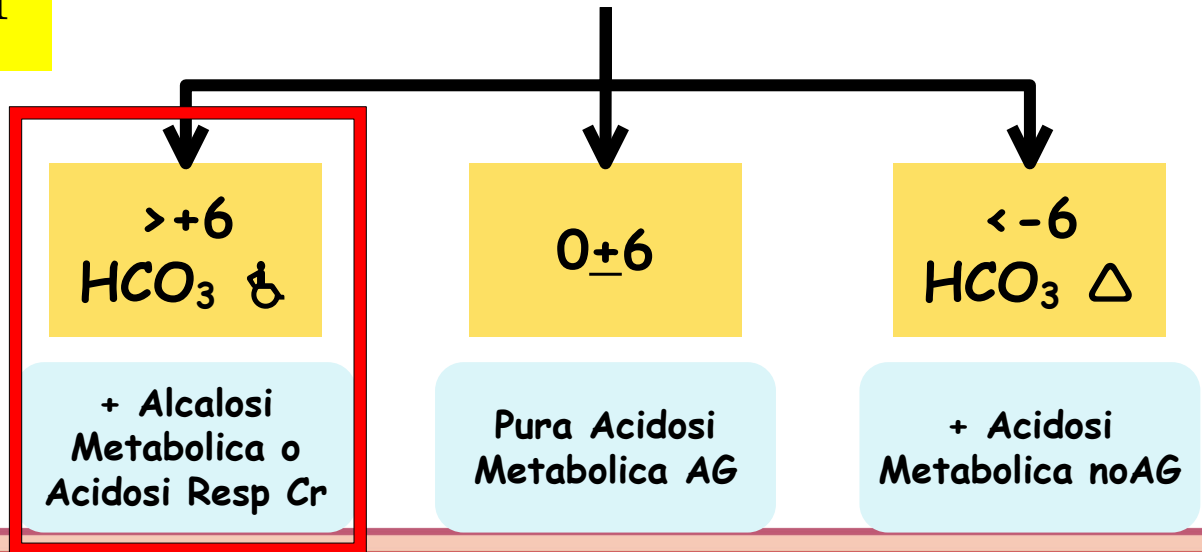
$\frac{140}{143} \times 93 = 91$

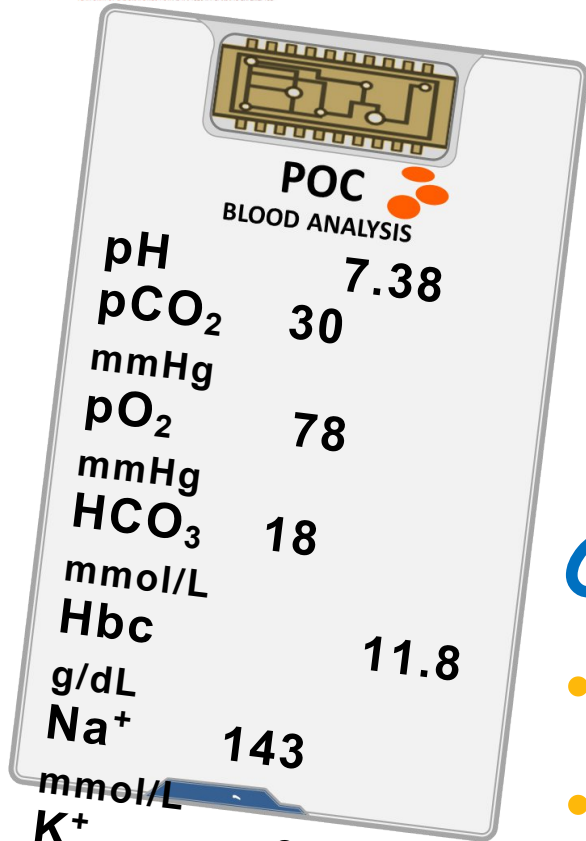
5 Delta gap: $+1AG = -1HCO_3^-$
 $(Na^+ - \cancel{HCO_3^-} - Cl^- - 12) - (24 - \cancel{HCO_3^-})$

$\Delta gap = [Na^+] - [Cl^-] - 36$

1. pH e PaCO₂?
2. R.O.M.A?
3. Compensazione?
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Conclusione:

Acidosi metabolica AG (lattati, ipossia), associata a alcalosi respiratoria (ipossia) e metabolica ipocloremica (diuretici).



Alto mismatch polmonare.

Conclusioni:

- Sii metodico/a e completo
- Sii aderente al quadro clinico

