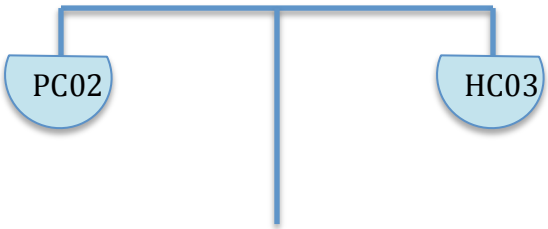
PRIMED Educational Associates Easy Guide to Acid Base Computation

PRIMED
Using the ROME approach to Acid Base imbalance calculations:

*Disclaimer: This method is a way for students to compute the answer to an acid- base imbalance question. This will NOT provide you with a full explanation of the underlying process that is occurring in your patients. PRIMED did not create this method, and information regarding it can be found online on various websites. *Remember, if you are able to calculate and understand acid base imbalance already, you do not need to review this.*

Firstly, it is important to conceptualize Acid Base in the human body appropriately. The PH of the body is determined by both the HC03 and PC02 concentration- in relation to one another.

Think about it like a scale:



The scale can tip in either direction depending on 2 things:
1: The addition of C02 or HC03
2: The loss of C02 or HC03

Different clinical conditions can cause the body to either: retain or lose acid, or retain or lose bicarbonate, thereby shifting the PH of the body from its normal homeostatic range to an abnormal state of acid-base imbalance.

Acid Base Imbalance

1. When preparing to compute acid base imbalance questions for the CRNE you need to know the normal values as identified by the Canadian Nurses Association. Please note, some booklets and guidelines may present you with slightly different values, but we strongly recommend students memorize:

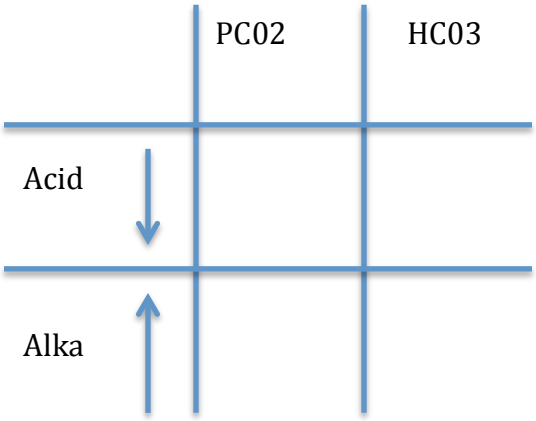
    a. **PH**: 7.35-7.45
    b. **PC02**: 35-45 mmHg
    c. **HCO3**: 22-26 mmol/L

*Trick: You only need to really memorize 2 values. **35-45** and **22-26** (since the normal PH is 7.**35**-7.**45** and the normal PC02 = **35**-**45**)*

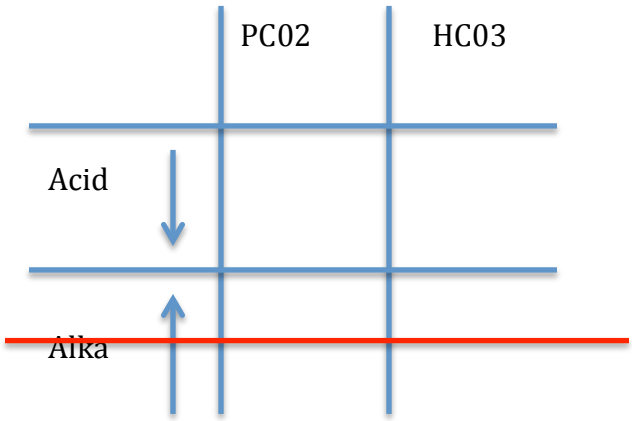
2. Next you need to know the following Acronym: ROME
    a. **R**espiratory = **O**pposite

b. **M**etabolic = **E**qual

3. Next you want to draw a small chart: and label it as indicated below:



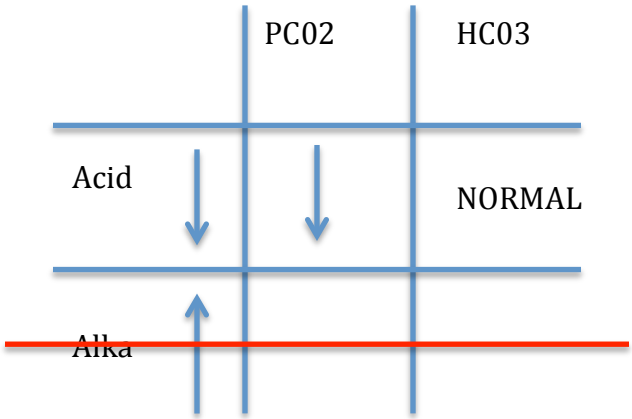
4. When presented with an acid base imbalance question, first, you will look at your PH value. If the PH is lower than normal this would indicate = ACIDOSIS. The pH is higher than normal, this would indicate = ALKALOSIS.
    a. Once you have determined if the value represents Acidosis or Alkalosis, circle the indicator on the chart or cross out the non-relevant value. For example, a PH of 7.31 would indicate ACIDOSIS, therefore the alkalosis component of the chart is crossed off.



*Tip: If you only can memorize the PH value, you will now be able to determine that the value above indicates **ACIDOSIS**. Likely you would now be able to guess with up to a 50% accuracy the answer on the exam (by eliminating the options indicating ALKALOSIS).*

5. Now you insert your values, and note with arrows the direction of the any abnormal values. For example, if the PC02 was lower than the normal value (lower than 35) you would place a DOWN arrow in the C02 box.

Values: PH = 7.31
PC02= 30
HC03 = 24



6. Finally, you compare the direction of the arrows using the ACRONYM **ROME!**
   a. Respiratory = Opposite
   b. Metabolic = Equal

Always compare the arrow in the PC02-HC03 VS the arrow in the direction of the PH. So in the above scenario you would compare the DOWN facing arrow of the PH (ACIDIC) with the DOWN facing arrow of the PC02 (since the value was LOWER than normal).

Because the values go in EQUAL directions you have a METABOLIC disorder.

Therefore the above scenario represents METABOLIC ACIDOSIS!!

Compensated Acid Base Imbalance

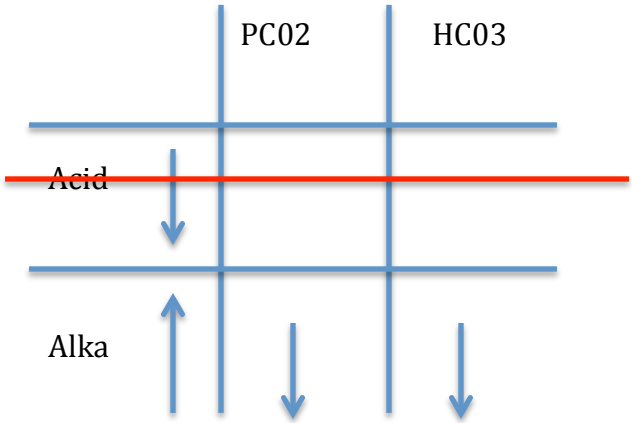
Whenever possible the body will try and correct the acid base imbalance by compensatory mechanisms. For example, if a person was experiencing metabolic acidosis, the respiratory system might try to compensate by blowing off C02 (which is highly acidic) to remove acid from the system.

A value is considered partially compensated when the PH is still abnormal.
A value is considered fully compensated when the PH returns within a normal value.

Let's look at the below scenario:

PH: 7.48
PC02: 25
HC03: 20

First: Determine if this is Acidosis or Alkalosis
Second: Place the arrows regarding high or low values for PC02 and HC03 in the appropriate boxes.



1. You are looking at an elevate PH, indicating **ALKALOSIS**.
2. Next, look at the PC02, this would indicate a **LOWER** than normal value
3. Next, look at the HC03, this would also indicate a **LOWER** than normal value

Go back to the **ROME** Acronym.

Remember you are comparing the direction of the PH arrow (which indicates acidosis or alkalosis) with the direction of the other arrow. In this scenario, both the PC02 and the HC03 arrows face down, indicating there is some level of compensation occurring in the body.

Note: The arrow of the PH and the PC02/ HC03 go in **OPPOSITE** directions.

Answer: RESPIRATORY ALKALOSIS with partial compensation.

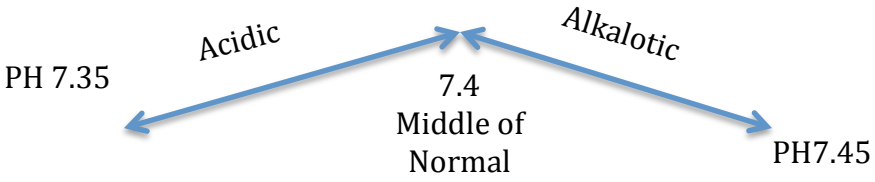
What is occurring if the arrows of the HC03 and the PC02 go in opposite directions?

In this scenario, the patient would have a mixed respiratory and metabolic disorder (either alkalosis or acidosis) depending on the PH.

You would follow the same ROME method outlined above, however you would use the value (either HCO3 or PC02) that is furthest from normal guidelines.

What do you do if your PH is within normal, but your HC03 and PC02 are abnormal?

It is important to remember that the normal PH is a range.
For example:



When the body is experiencing an acid base imbalance it will try to compensate through either the respiratory or metabolic system.
Sometimes it will be able to "fully compensate" or return the PH to within a normal range.

In this case, the PH generally sits closer to one end of the "normal" range shown above.

For example, a PH of 7.36 with an abnormal HC02 and PC02 may indicate that this was "Acidosis" but that the body was able to compensate and return the PH to a "normal" value. In these situations, look at where the PH falls within normal.

If it falls closer to the Acidic end, this was likely a primary acidosis. If it falls closer to the alkaline end, this was likely a primary alkalosis.

You would proceed to use the ROME method, assuming the PH was initially either elevated (Alkalosis) or decreased (Acidosis) and use the same grid and arrow placement as indicated in the description of the ROME method.

Clinical Examples:

Another helpful way to think about Acid Base Imbalance is to think of it in terms of disease. Here are 2 examples of clinical conditions that can result in acid-base imbalance, as well as notes regarding the mechanism.

Opioid Overdose = Respiratory Acidosis
-Opioids are respiratory depressants and depressing respirations can cause the patients to retain CO2, which is highly acidic.

Persistent Vomiting = Metabolic Alkalosis
-Severe persistent vomiting causes the patients to lose a significant amount of stomach acid, resulting in increasing the PH and putting the patient into an acute alkaloid state.