Mark-Klemik-Lectures -Notes to help pass NCLEX 2023-2024 - TRUSTED 100%

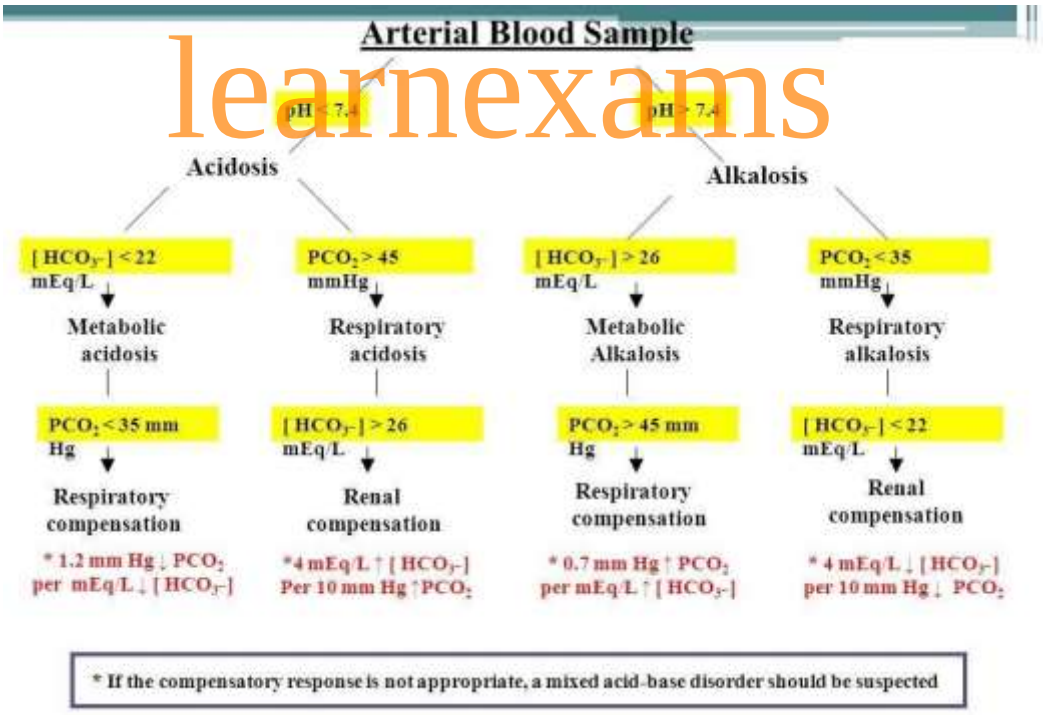
Rn Capstone Course (Chamberlain University)

MARK KLEMIK LECTURES

Acid-Base Balance

Rule of the Bs

- If the pH and the **b**icarb are **b**oth in the same direction, then it is meta**b**olic
- Just look at the pH and the bicarb
  - If the bicarb is 21 and the pH is 7.2, then you've got metabolic acidosis because the pH indicates acidosis and it's going in the same direction as the bicarb (down), so it's metabolic.
  - If the pH is 7.2 but the bicarb is 26 or over, then they are going in different directions and so it must be respiratory acidosis
  - If the pH is up and the bicarb is normal, then it would still fall under respiratory
- Ths would not work in the case of a mixed acid-base disorder, but boards won't test on a mixed acid-base disorder



Boards tests you on principles. And it does so by having you generate lists.
Ex: you know that opioids are CNS depressants (principle). Generally the symptoms of overdose or having a bit too much are all /down/ symptoms. Hyporeflexia not hyperreflexia, drowsiness not restlessness, constipation not diarrhea. So you can generate a list by knowing the principle.

As the pH goes, so goes the patient

- If the pH goes up, the patient's symptoms go up, they go hyper, they go excitatory, they go irritable
- If the pH goes down, the patient's symptoms go down, the systems shut down, things go depressed
- EXCEPT FOR POTASSIUM → if the pH goes up, symptoms go up but potassium level goes down, and vice versa
    - *Alkalosis (pH is up)*: reflexes 3+ or 4+ (reflex of +2 is normal, 1 is low), K^+ 3.3, restlessness, tachycardia, irritable, tachypnea, borborygmi (increased bowel sounds), seizures
    - *Acidosis (pH is down)*: reflexes 1+ or even 0, K^+ 5.2, drowsy/lethargic/obtunded, bradycardia, bradypnea, paralytic ileus/constipation, coma
- Another example: pts with acidosis require an ambu-bag at the bedside because they are most likely to have a resp arrest (decreased breathing), whereas alkalosis should maybe have a standing order for diazepam or another drug that can stop a seizure in its tracks, or a suction machine at the bedside because they're most likely to seize
- The base principle is that in an acidotic environment, chemical reactions slow or cease. Basic chemistry.

TIP: #1 mistake that people make with select-all-that-apply questions is that they select one more than they think they should (don't select any that you /think/ it might be)

Kussmaul's

- **Mac**Kussmaul → Kussmaul's is a compensatory respiratory mechanism only seen with one acid base disorder, which is **m**etabolic **ac**idosis (lungs compensate for acidosis by deep breathing and blowing off CO_2, which is acidic in the blood)

Causes of Acid-Base Imbalances

- Don't mistake causes for signs and symptoms. The S&S of acid-base imbalances are NOT their causes. Indeed it is often the opposite of a symptom that is the cause of something.
    - EX: a cause of acidosis is diarrhea - dehydration and electrolyte loss (loss of bicarb) results in acidosis. But a symptoms of acidosis is paralytic ileus and lack of movement in the bowel, which is pretty opposite to diarrhea.
- First question you ask re causation → IS IT LUNG?
    - Is there an issue with the lungs in the outlined scenario? Yes? Then it's **respiratory**.
    - Then, if it is lung → are they over or under ventilating?
        - Over Ventilating = alkalosis (blowing off acidic CO_2)
        - Under Ventilating = acidosis (retaining acidic CO_2)
    - *Remember* that ventilation has to do with gas-exchange being effective, NOT resp rate. A person with COPD is basically always under ventilating, despite basically always being tachypnic.
- If it's not lung, it's **metabolic**

- And then there's pretty much only one scenario in which you would pick metabolic alkalosis
    - Prolonged gastric fluid loss, either through vomiting or gastric suctioning
        - Gastric fluid is acidic, loss of it results in alkalosis
- Otherwise, it's all metabolic acidosis
    - This includes when prolonged vomiting or some such thing results in dehydration, flipping the problem to acidosis despite the pt likely having gone through a transient period of alkalosis

TIP: Pay more attention to the modifying phrase than the original noun eg a pt with OCD who is now psychotic (the psychosis is more important) OR a patient with vomiting who is now dehydrated (dehydration is more important)

Ventilators

Alarms

- *High pressure alarm*: goes off in response to increased resistance to air flow. The machine is having to push harder than it should in order to get air into the lungs
    - When you first set up a vent the pressure limits are manually input. Do not use more than x amount of pressure to get air in (ex 40mmHg), nor less than x amount, and the high pressure alarm goes off when pressure exceeds the former x amount.
    - Cause → **Obstructions**
        - *Type 1*: Kinks in the tubing → find the kink, unkink it
        - *Type 2*: Water condensing within the tube → empty the water from the tube
        - *Type 3*: Mucus secretions in the airway → turn (change position), cough deep breathe, and if that doesn't work, then you suction
            - Remember that suctioning is a double-edged sword that causes the body to produce more secretions, so avoid it when you can
- *Low pressure alarm*: goes off in response to decreased resistance to air flow. Machine is telling you it was way too easy.
    - Cause → **Disconnections**
        - *Type 1*: Disconnection of the main tubing → reconnect it
        - *Type 2*: Disconnection of the oxygen sensor tubing → this tube is a black coated wire, about half the diameter of a pen, and it piggybacks along the main tubing and hooks in at the airway to measure the FiO2. If it pops out, the air that's supposed to go in at the airway starts hissing out of this connection → reconnect it

Ventilators + Acid Base Disorders

- Mechanical over ventilation → respiratory alkalosis
    - Ventilator settings are too high
- Mechanical under ventilation → respiratory acidosis
    - Ventilator settings are too low