

**Vanderbilt University Medical Center**  
**Emergency General Surgery Service**  
Surgical Residency Rotation and Curriculum

**UNIT 4      ACID-BASE HOMEOSTASIS**

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**UNIT OBJECTIVES:**

1. Demonstrate an understanding of the biochemistry and physiology of acid-base homeostasis.
2. Demonstrate the ability to diagnose and effectively treat complex disorders of acid-base balance.

**COMPETENCY-BASED KNOWLEDGE OBJECTIVES:**

1. Explain hydrogen ion biochemistry and physiology to include:
  - a. The Henderson-Hasselbalch equation
    - (1) Ventilatory component ( $p\text{CO}_2$ )
    - (2) Renal component ( $\text{HCO}_3^-$ )
2. Classify metabolic acidosis, including "anion gap" and hyperchloremic acidosis.
3. Identify specific causes of metabolic acidosis.
4. Given values for pH,  $p\text{CO}_2$ , and  $\text{HCO}_3^-$ , distinguish between metabolic acidosis, respiratory acidosis, metabolic alkalosis, respiratory alkalosis, and mixed abnormalities; derive a differential diagnosis for each.
5. Predict the importance of primary diseases and their complications to the evaluation of patient risk for:
  - a. Shock
  - b. Bowel obstruction
  - c. Sepsis
6. Analyze the acid-base problem and its cause in specific clinical situations, and determine an appropriate course of therapy for the following conditions:
  - a. "Medical" problems such as:
    - (1) Diabetic ketoacidosis
    - (2) Lactic acidosis
    - (3) Renal tubular acidosis
    - (4) Renal insufficiency
    - (5) Respiratory failure
  - b. "Surgical" problems such as:
    - (1) Gastric outlet obstruction
    - (2) Fistulas
    - (3) Shock

**COMPETENCY-BASED PERFORMANCE OBJECTIVES:**

1. Diagnose and treat acid-base disturbances of all types.
2. Diagnose and treat complex and combined problems in acid-base disturbances as a component of overall care.
3. Manage complex situations in the intensive care unit where acid-base

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abnormalities coexist with other metabolic derangements, including:

- a. Fluid and electrolytes
- b. Renal disease
- c. Total parenteral nutrition
- d. Pulmonary disease