

1. Electrolytes

a. Cations:

b. Anions:

c. Electroneutrality

i. Charge balance

d. Electrolyte Functions:

i.

ii.

iii.

iv.

v.

e. Electrolyte Requirements

i. Daily Required Intake

- ii. Excretion

- iii. Unusual losses

## 2. Electrolytes in the lab

- a. Routine Electrolytes

- b. Anion Gap

- i. Where is the gap? What about electroneutrality

- ii. Anion Gap Increases

- iii. Anion Gap Decreases

### 3. Sodium

a. \_\_\_\_\_ of ECF cations

b. \_\_\_\_\_% of osmolality

c. Roles:

d. Homeostasis

i. Absorbed from GI



ii. Return of the reabsorption!

iii. Regulation

1. Aldosterone

a. Adrenal insufficiency (Addison's)

b. Adrenal hyperproduction (Cushing's)

2. Hyponatremia



a. Pseudohyponatremia

3. Hypernatremia

iv. Methods

1. ISE Potentiometry

a. Glass Membrane

b. Crown Ether

c. Direct vs. Indirect

d. ISE issues?

e. Potassium

i. \_\_\_\_\_ Cation

ii. Roles:

1. Homeostasis:

a. Excretion

b. Why can we afford to excrete so much?

2. Hypokalemia:

3. Hyperkalemia:

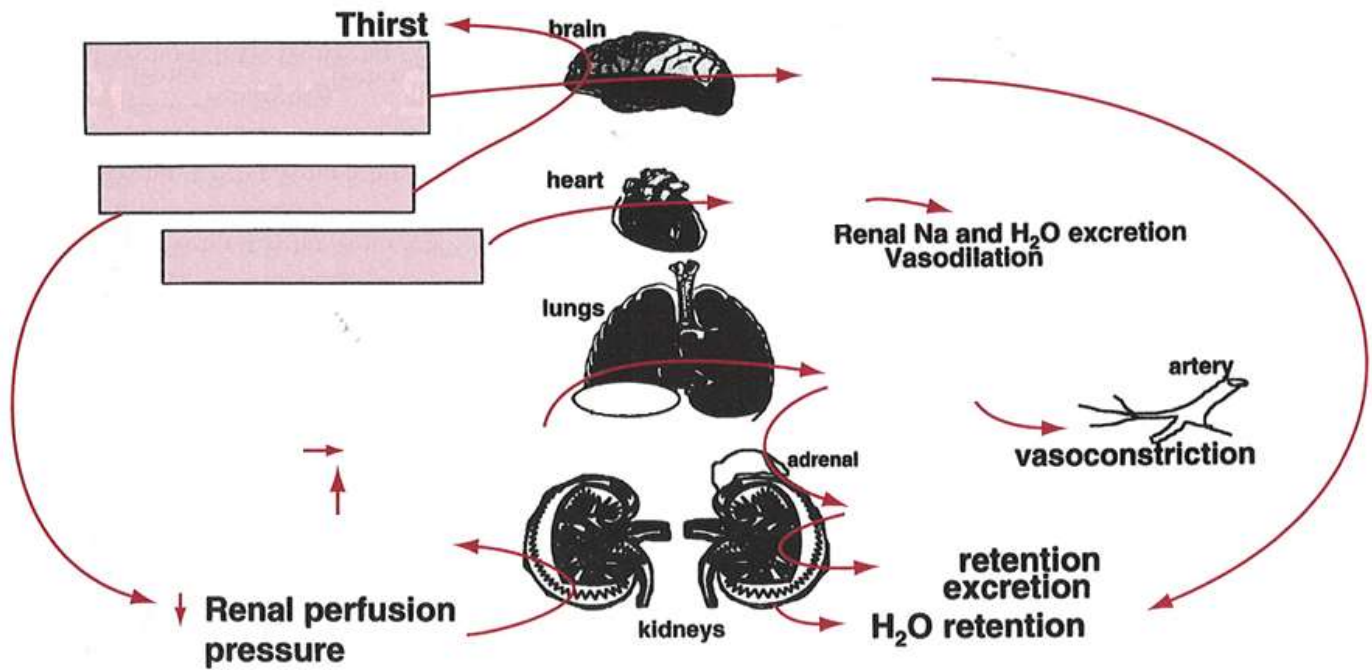
4. Methods of analysis:

a. ISE

i. Valinomycin

ii. Crown Ether

#### 4. Water Balance



#### 5. Chloride

a. \_\_\_\_\_ Anion

b. Functions:

c. Homeostasis

d. Importance?

e. Hypochloremia

Hyperchloremia

- i. Cystic Fibrosis

- 1. Iontophoresis

- 2. Analysis: Coulometric Titration

- f. Methods

- i. ISE

- ii. Mercurimetric Titration

- iii. Coulometric Titration

- 6. Bicarbonate

- a. \_\_\_\_\_ Anion

- b. What are we really talking about.....

- c. Re-visit

- i. Increased Levels

- ii. Decreased levels

### iii. Measurement

#### 1. PCO<sub>2</sub> Electrode

#### 2. Enzymatic

### 7. Calcium Magnesium and Phosphorus

#### a. Why all 3?

#### b. Calcium

##### i. Major reserve in bones and teeth

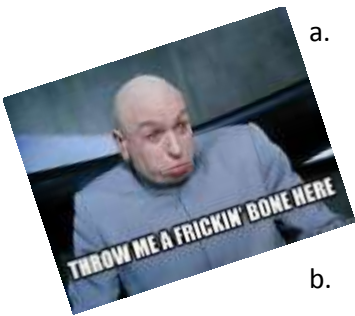
##### ii. Functions:

##### iii. 3 States of circulation

#### 1. Free (ionized)

#### 2. Protein Bound

#### 3. Complexed





iv. pH effect on ICA

1. Alkalosis

2. Acidosis

v. Homeostasis

1. Dietary Sources

2. Excretion

3. Regulation

vi. PTH

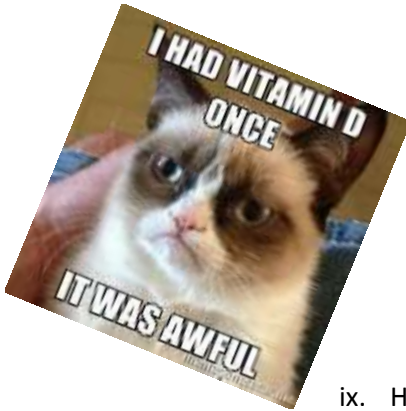
1. Short half-life ~4min

2. Functions:

vii. Calcitonin

1. The Thyroid's ANTI PTH

viii. Vitamin D



1. 25-hydroxycholecalciferol      23-OH-D<sub>3</sub>

2. 1,25-dihydroxycholecalciferol      1,25-[OH]<sub>2</sub>-D<sub>3</sub>

ix. Hypocalcemia

Hypercalcemia

x. Methods

1. Spectrophotometric

2. Titration

3. ISE

#### Components of AA Spectrophotometer:

#### 4. Atomic Absorption Spectroscopy



#### c. Magnesium

##### i. Functions:

##### ii. Hypomagnesemia

##### Hypermagnesemia

##### iii. Methods

##### 1. AAS

##### 2. Spectrophotometric

##### a. Dye-binding

##### b. EGTA

d. Phosphorus

i. Distribution:

ii. Functions:

1. Hypophosphatemia

Hyperphosphatemia

iii. Methods

1. Ammonium phosphomolybdate

2. Circadian Rhythm

8. Ammonia

a. Ammonium pKa 9.25

i. Sources

- ii. Elimination

- iii. High Ammonia Causes

- b. Methods:

- i. Ion Exchange Column

- ii. Enzymatic method

- iii. ISE

- c. Considerations for Ammonia

## 9. Serum Osmolality

- a. Represents:
- b. Freezing Point Depression
- c. Osmolal gap?