Interactive Physiology Fluids and Electrolytes Worksheets

Use Interactive Physiology online or CD

Fluid, Electrolyte, and Acid-Base Balance: Introduction to Body Fluids

1. a. Where are fluids absorbed? _____

   b. Where are excess fluids and electrolytes lost?_____

2. Name four of the six functions of water.

   a.

   b.

   c.

   d.

3. a. The amount of water in the body depends on the amount of _____.

   b. From the CD, list the person with the highest and lowest percentage of water and give the percentage.

      1. Highest _____ _____%

      2. Lowest _____ _____%

4. List the three fluid compartments and the percentage of total body water in each.

   a. _____ _____%

   b. _____ _____%

   c. _____ _____%

5. Give an example of each of the following solutes:

   a. Ions/electrolytes _____

   b. Colloids _____

   c. Nonelectrolytes _____

6. List the major extracellular and intracellular cations and anions

   a. Extracellular cations: _____ anions: _____

b. Intracellular cations: _____ anions: _____

7. Within a fluid compartment, the total number of _____

must be equal to the total number of _____.

8. Name four of the seven functions given for electrolytes:

a.

b.

c.

d.

9. Osmosis: When more solute particles are added to one side of a container with a semipermeable membrane, which way will the water move?

10. What happens to a patient's red blood cells when the following solutions are given:

a. Hypotonic solution _____

b. Hypertonic solution _____

c. Isotonic solution _____

Fluid, Electrolyte, and Acid-Base Balance: Water Homeostasis

1. Below are listed the four examples of disturbances in water homeostasis. Indicate if there is an increase (I), decrease (D), or no change (NC) in volume and osmolarity. Give an example of each.

Disturbance	Volume	Osmolarity	Example
Hypervolemia			
Hypovolemia			
Overhydration			
Dehydration			

2. What are the four primary mechanisms to regulate fluid homeostasis?

   a.

   b.

   c.

   d.

3. Answer the following questions on antidiuretic hormone (ADH):

   a. What is the major stimulus? _____

   b. What is the direct effect of the hormone?
   _____

   c. What effect will this have on plasma volume and osmolarity?
   _____

   d. What effect will this have on urine volume and osmolarity?
   _____

4. List three ways dehydration leads to increased thirst:

   a.

   b.

   c.

5. Answer the following questions on the Renin-Angiotensin-Aldosterone System.

   a. What enzyme is released from the kidney in response to decreased

   blood pressure? _____

   b. What enzyme converts angiotensin I to angiotensin II?
   _____

   c. What are two effects of angiotensin II?

d. How does aldosterone cause more sodium to be reabsorbed in the kidney?

e. As a result, what happens to blood volume and blood pressure?

_____

6. a. A decrease in blood volume and blood pressure will lead to a/an

_____ in the sympathetic nervous system (SNS).

b. This will result in a decrease (D), and increase (I), or no change (NC) in the following:

1. _____ Afferent arteriolar constriction
2. _____ Blood flow to the glomerulus
3. _____ Urine loss
4. _____ Renin release

7. a. Diabetes insipidus is due to _____.

b. What will happen to the following:

1. _____ Urine output
2. _____ Plasma sodium
3. _____ Plasma osmolarity
4. _____ Thirst

8. (Page 10.) Classify the following as problems associated with either hypervolemia, overhydration, hypovolemia, or dehydration.
   a. Blood loss
   b. Infusion of isotonic intravenous fluid
   c. Sweating
   d. Drinking too much water

Electrolyte Homeostasis

1. (Page 17.) Which is the normal concentration range for sodium in the plasma?
   a. 9 and 11 milligrams per 100 milliliters
   b. 136 - 145 milliequivalents per liter
   c. 3.5 to 5.1 milliequivalents per liter

2. (Page 28.) Which is the normal concentration range for potassium in the plasma?
   a. 9 and 11 milligrams per 100 milliliters
   b. 136 - 145 milliequivalents per liter
   c. 3.5 to 5.1 milliequivalents per liter

3. Causes and Symptoms of Hypernatremia
   - You have learned that the normal plasma sodium level is 136 to 145 milliequivalents per liter. Hypernatremia occurs when the plasma sodium level is greater than 145 milliequivalents per liter. You have seen what happens to cells when the sodium concentration rises too high.
   - Let's use the marathon runner to see the effect of hypernatremia on the body. The plasma sodium concentration may increase for two reasons:
     1. Too much water is lost from the blood without a corresponding loss of sodium.
     2. Too much sodium is added to the blood without adding more water.
   - Which of these reasons would most likely cause hypernatremia in the marathon runner?
     ____ Too much sodium added
     ____ Too much water lost
   - Although the runner would lose sodium, he would lose far more water from sweating. Plasma sodium concentration rises resulting in hypernatremia.
   - Notice that the runner appears to be confused and disoriented. Symptoms of hypernatremia include non-specific signs of central nervous system dysfunction such as confusion and lethargy, and in severe cases, seizures and death.
   - What do you think causes these symptoms?
     ___ Neurons shrink
     ___ Neurons swell
   - Because the osmolarity of the extracellular fluid is higher than that of the intracellular fluid, water will be drawn out of cells, including neurons, to balance the concentration.
   - From your knowledge of water homeostasis, see if you can determine what symptoms the runner will exhibit.
   - What will happen to thirst?
     ___ Thirst increases
     ___ Thirst decreases
   - The high plasma sodium will trigger the thirst mechanism prompting the runner to drink more.
   - What will happen to urine output?
     ___ Increase
     ___ Decreases
   - When plasma osmolarity increases, antidiuretic hormone is released, resulting in reabsorption of water and decreased urine output.
   - Remember that water movement is greatly influenced by sodium. Many of the symptoms our runner would experience are also a result of dehydration.

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Fluid, Electrolyte and Acid-Base Balance: Acid-Base Homeostasis

1. List the three important buffer systems in the body:

   a.

   b.

   c.

2. Write the equation showing the relationship of CO2 and H2O levels with bicarbonate and hydrogen ion levels:

   $CO_2 + H_2O$ _____ _____

3. A decrease in respiration will result in _____ CO_2 and will shift the equation

   to the _____, resulting in an increase in _____ ions, making the plasma

   more _____.

4. a. Normal arterial pH is _____ to _____.

   b. What is the pH in alkalosis? _____

   c. What is the pH in acidosis? _____

5. With ketoacidosis, show what happens to the following:

   a. _____ Plasma pH

   b. _____ (*Left* or *right*) shift of the carbonic acid/bicarbonate system

   c. _____ Bicarbonate levels

   d. _____ Respiratory rate

   e. _____ Renal excretion of H+

6. With metabolic alkalosis, show what happens to the following:

   a. _____ Plasma pH

   b. _____ (*Left* or *right*) shift

c. _____ Bicarbonate levels

d. _____ Respiratory rate

e. _____ Renal excretion of bicarbonate

7. With respiratory acidosis, show what happens to the following:

a. _____ Plasma pH

b. _____ (*Left* or *right*) shift

c. _____ Respiratory rate

d. _____ Renal excretion of bicarbonate

e. _____ Renal excretion of H+

8. With respiratory alkalosis, show what happens to the following:

a. _____ Plasma pH

b. _____ (*Left* or *right*) shift

c. _____ Respiratory rate

d. _____ Renal excretion of bicarbonate

e. _____ Renal excretion of H+