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Mulroney: Netter's Essential Physiology

Chapter 01: The Cell and Fluid Homeostasis

Test Bank

Multiple Choice

1. A normal, healthy 23-year-old man weighs 90 kg. What is the most likely value of the volume of his interstitial fluid?

A. 54 L

B. 36 L

C. 18 L

D. 13.5 L

E. 4.5 L

ANS: D; body water = 90 kg × 60% × 1 L/kg = 54 L, extracellular fluid = 1/3 × 54 L = 18 L, interstitial fluid (3/4 of extracellular fluid) = 3/4 × 18 L = 13.5 L (page 6).

2. Which of the following statements concerning body water and electrolytes is true?

A. Na^+ is the primary extracellular anion.

B. The Na^+/K^+ ATPase pumps Na^+ into and K^+ out of the cell.

C. Leakage of K^+ contributes to the resting membrane potential.

D. Osmosis involves movement of a solute across a membrane.

E. Cerebral capillaries have greater permeability than glomerular capillaries.

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ANS: C (page 4); (A) Na^+ is a cation, (B) Na^+ is pumped out and K^+ is pumped into the cell (page 3), (D) osmosis involves movement of water (page 5), and (E) glomerular capillaries have greater permeability than cerebral capillaries (page 8).

3. What is the filtration pressure in a capillary where capillary hydrostatic pressure is 30 mm Hg, interstitial hydrostatic pressure is 12 mm Hg, capillary oncotic pressure is 8 mm Hg, and interstitial oncotic pressure is 0 mm Hg? Assume the capillary is impermeable to proteins.

A. 42 mm Hg

B. 26 mm Hg

C. 10 mm Hg

D. –10 mm Hg

E. –34 mm Hg

ANS: C; filtration pressure = (30 – 12) – 1.0 × (8 – 0) = 10 mm Hg (pages 7, 9).

4. The subject in Question 1 consumes 1.2 L of pure water. Assuming the water is absorbed and not excreted, what is the increase in the volume of extracellular fluid (ECF) when steady state is achieved?

A. 1.2 L

B. 0.8 L

C. 0.6 L

D. 0.4 L

E. 0.2 L

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ANS: D; when steady state is achieved, the osmolarity of body compartments must be equal. Since pure water contains no solutes, the water will distribute to body compartments in proportion to the osmoles in the compartment. Hence, the ECF will receive 1/3 of the water, or 0.4 L (page 8).

5. A subject receives injections of 12 mg of inulin and 12 mg of Evans blue dye. A short time later the concentration of inulin is 1 mg/L and the concentration of Evans blue dye is 4 mg/L. What are the volumes of interstitial fluid (ISF) and plasma?

A. ISF = 9 L, plasma = 3 L

B. ISF = 12 L, plasma = 3 L

C. ISF = 9 L, plasma = 4 L

D. ISF = 12 L, plasma = 6 L

E. ISF = 4 L, plasma = 8 L

ANS: A; inulin distributes through the extracellular compartment so the volume is 12 mg/(1 mg/L) = 12 L, while Evans blue dye distributes through the plasma and thus the volume is 12 mg/(4 mg/L) = 3 L. Interstitial volume is ECF – plasma = 12 L – 3 L = 9 L (page 11).

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