



Online Physiology 2130 – Fluids

Introduction

Dear Student,

Thank you for opening this resource for Physiology 2130, and welcome. This resource has been created by the Education Team at WebStraw. The Education Team consists of students that have previously taken and/or students that are currently taking Physiology 2130.

Purpose

This resource focuses on key concepts that are important for students to understand to succeed within this course. This resource was created by students for other students. Our goal is to help students (1) further develop their understanding of course content and (2) achieve greater academic success. (3) Our resource is also open access meaning there are no financial or legal barriers to students who wish to access and use our resource.

Instructions

These study resources consists of several parts. The first part includes a condensed review of the major takeaways from each physiology module. This is followed by a series of questions and fill in the blank worksheets that should be completed after you have gone through the module and course material, in order to verify your understanding.

Disclaimer

WebStraw is not affiliated with Western University. This resource is supplementary to your course content and is not meant to (1) replace any of the resources provided to you by your instructor nor is it meant to (2) be used as a tool to learn the course material from scratch. We assume that students who use this resource will have a basic understanding of the course content. This resource does not contain everything you need to know for your evaluations. Please refer to the course material provided by your instructors if there are any discrepancies between our resource and your course content.

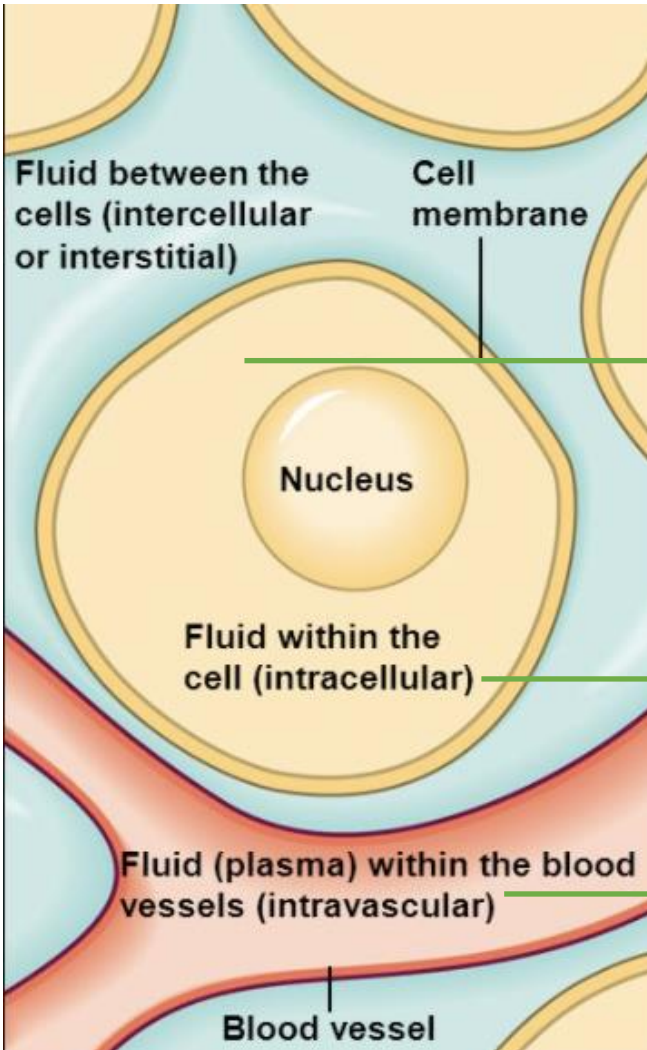
We wish you the best of luck on your exams!

The WebStraw Team

Note to Instructors: If this resource has been created for your course and you would like to collaborate with us, please email us at team@webstraw.ca

Module 2 - Fluids

Chemical Composition of The Compartments



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Intracellular Fluid Compartment

- Sodium ions
 - 15 mOsm/L H₂O
- Potassium ions
 - 150 mOsm/L H₂O
- Calcium ions
 - 0 mOsm/L H₂O
- Chloride ions
 - 9 mOsm/L H₂O
- Proteins
 - 4 mOsm/L H₂O

Interstitial Fluid Compartment

- Sodium ions
 - 150 mOsm/L H₂O
- Potassium ions
 - 5 mOsm/L H₂O
- Calcium ions
 - 2.4 mOsm/L H₂O
- Chloride ions
 - 125 mOsm/L H₂O
- Proteins
 - 0.2 mOsm/L H₂O

Plasma Fluid Compartment

- Sodium ions
 - 148 mOsm/L H₂O
- Potassium ions
 - 4.8 mOsm/L H₂O
- Calcium ions
 - 2.5 mOsm/L H₂O
- Chloride ions
 - 102 mOsm/L H₂O
- Proteins
 - 1.2 mOsm/L H₂O

Relative Size of The Compartments

- For an average 154 lb person, the percent of **total body water (TBW)** in the following compartments are:
 - Intracellular Fluid Compartment
 - 67% of TBW
 - Interstitial Fluid Compartment:
 - 26.4% of TBW
 - Plasma Compartment
 - 6.6% of TBW

Differences in the Chemical Composition

- Differences in the ionic composition are caused by the cell membrane
 - The cell membrane is **selectively permeable**
 - Some molecules can cross easily while others cannot
 - The cell membrane contains **channels, pores and transport systems** that **regulate** molecules that pass through the cell membrane

Review Questions

1. Which of the following is false?
 - a. Na^+ is highest in the intracellular fluid
 - b. Na^+ is highest in the plasma fluid
 - c. Cl^- is highest in the interstitial fluid
 - d. Both A and C are false

2. What causes differences in the ionic composition of compartments?
 - a. Pores, channels and transport systems
 - b. A permeable cell membrane
 - c. A semi-permeable cell membrane
 - d. Both A and C

Answers

1. D 2. D

Fill in the blanks.

1. _____ Fluid Compartment

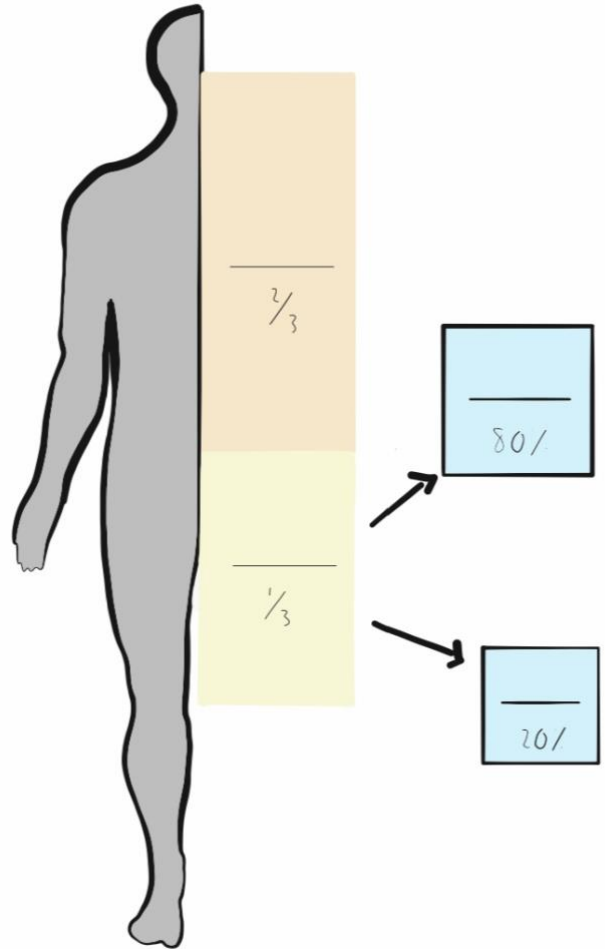
- Sodium ions: 15 mOsm/L H₂O
- _____ ions: 150 mOsm/L H₂O
- Calcium ions: 0 mOsm/L H₂O
- _____ ions: 4 mOsm/L H₂O
- _____ ions: 9 mOsm/L H₂O

2. _____ Fluid Compartment

- _____ ions: 150 mOsm/L H₂O
- _____ ions: 2.4 mOsm/L H₂O
- Chloride ions: 125 mOsm/L H₂O
- Potassium ions: 5 mOsm/L H₂O
- _____ ions: 0.2 mOsm/L H₂O

3. _____ Fluid Compartment

- _____ ions: 148 mOsm/L H₂O
- _____ ions: 2.5 mOsm/L H₂O
- Chloride ions: 102 mOsm/L H₂O
- _____ ions: 4.8 mOsm/L H₂O
- Protein ions: 1.2 mOsm/L H₂O



Relative Size of The Compartments

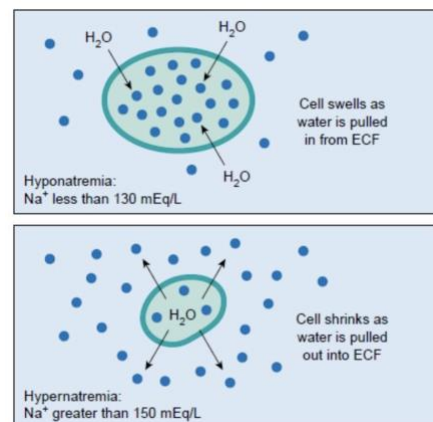
- _____ Fluid Compartment
 - 67% of TBW
- _____ Fluid Compartment
 - 26.4% of TBW
- Plasma Fluid Compartment
 - _____ of TBW

Relative Size of The Compartments

- Differences in the _____ composition are caused by the _____
- The _____ is _____
- The _____ contains channels, _____ and _____ systems that _____ molecules that _____ through the cell membrane

Real World Application – Hypernatremia

Hypernatremia is a medical condition in which levels of Na⁺ in the blood are too high leading to dehydration. Symptoms include diarrhea, kidney disorders, disorders within the adrenal glands, and much more. Hypernatremia is an electrolyte problem in which Na⁺ levels rise above 150 mOsm/L H₂O and is when the total body water **decreases** relative to the total Na⁺ content in the body. Individuals with hypernatremia die if the condition is severe as there are effects on hyperosmolality on the brain.



Conceptual Questions:

1. Which of the following is NOT a mechanism used to balance plasma, intracellular fluid, and interstitial fluid?
 1. Exchange of fluids amongst compartments within the body.
 2. Regulation of fluid input.
 3. Regulation of fluid output.
 4. Sodium-potassium pump.
 - a) 1, 2, and 3 only
 - b) 1 and 3 only
 - c) 2 and 4 only
 - d) 4 only
 - e) None of the above

2. How does blood pressure in the capillary affect water movement in the plasma fluid compartment and the interstitial fluid compartment? **HINT:** Think about blood volume.

Answers:

1. E