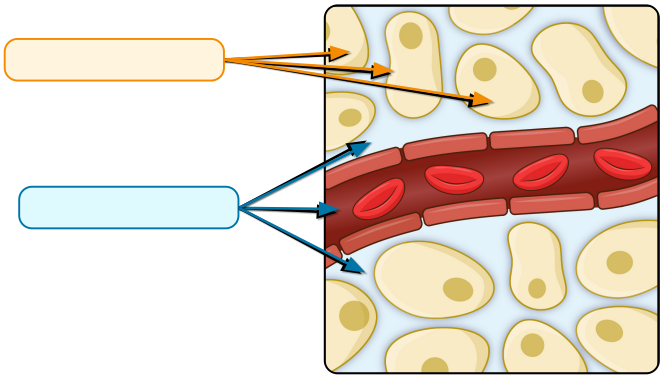
TOPIC: WATER

Introduction to Body Fluids

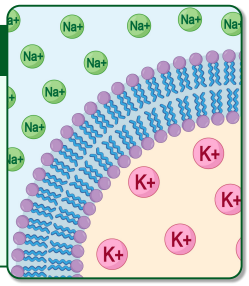


- Body is _____% water → varies by:
  - Body composition: _____ tissue >> fat.
  - _____: generally, males > females.
  - Age: young people > older people.
- Water in the body can be divided into two groups:
  - _____cellular: _____ the cell → 2/3 of body fluid.
  - _____cellular: _____ the cell → 1/3 of body fluid.
    - Mostly fluid _____ cells (interstitial fluid); also blood and lymph.

- Water in the body has several functions:

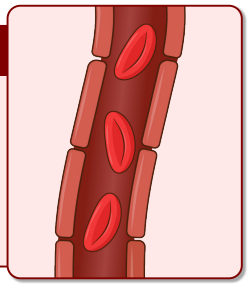
Universal solvent:

Virtually all cellular functions occur _____ in water.



Transport:

Nutrients, _____, and other substances move through the body via fluids (e.g., oxygen).

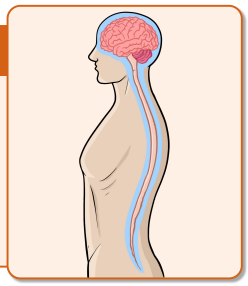


Body temperature:

- Water has high heat _____ resists temp. changes.
- _____ cools you down.

Tissue protection:

_____ and lubricates tissues to move easily (e.g., cerebral spinal fluid).



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PRACTICE

Which of the following individuals is most likely to have the highest percent composition of fluid?

a) A lean 25-year-old male.

b) An overweight 25-year-old male.

c) A lean 25-year-old female.

d) An overweight 25-year-old female.

PRACTICE

True or False: if false, choose the answer that best corrects the statement.

Most of the fluid in the body is found in the blood.

a) True.

b) False, most of the fluid is found in the extracellular fluid.

c) False, most of the fluid is found inside the cells of the body.

d) False, most of the fluid is found in the combined reserve of blood and lymph.

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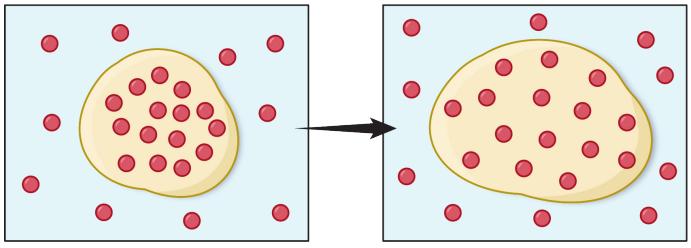
Osmosis

◆ **Osmosis:** diffusion of water from area of low _____ concentration to _____ solute concentration.

- Water is _____; moves through cell membranes easily.

High solute conc. _____ cell.

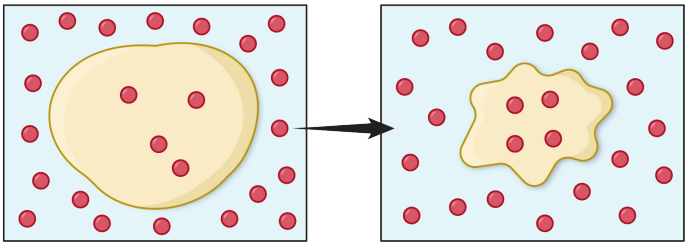
Water moves _____ cell.



Where salt goes water flows.

High solute conc. _____ cell.

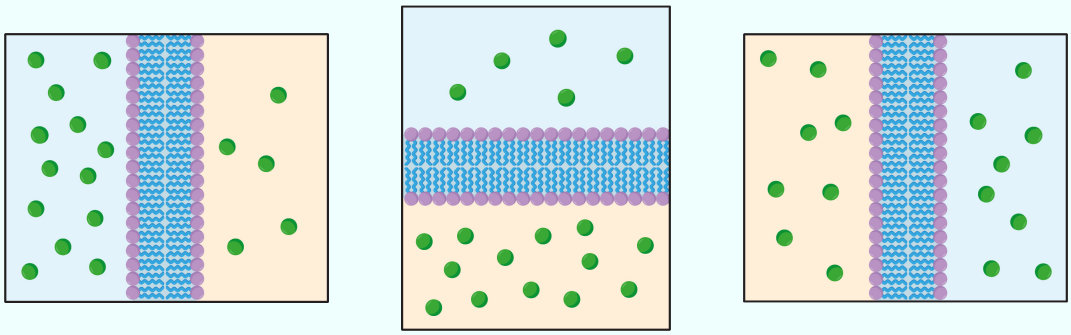
Water moves _____ cell.



- Regulating water and _____ levels will maintain fluid balance.

EXAMPLE

In each image below, the green dots represent dissolved particles in an aqueous solution either inside or outside a cell. Draw an arrow indicating which direction the water will move.



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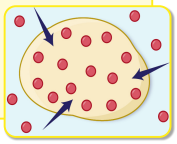
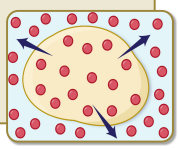
Hydration

◆ If hydration levels are out of balance, it can be dangerous.

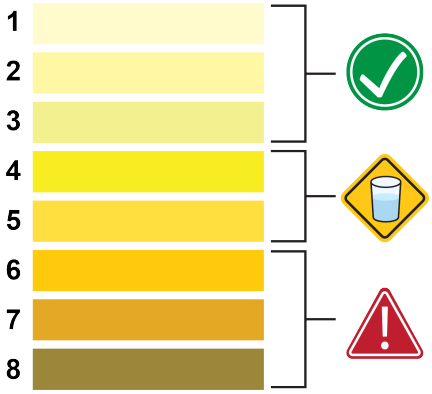
- **Overhydration:** can lead to dangerous _____ imbalances.
  - Water leaves blood and enters _____ by osmosis.
  - Can lead to water _____ (_____natremia).
  - Extreme cases cause _____ swelling and death.



- **Dehydration:** water will leave cells and enter _____ by osmosis.
  - Symptoms: discolored _____, strong thirst, loss of appetite, & general discomfort. Extreme cases can be fatal.
  - Elderly and _____ are at increased risk.



Hydration can be monitored by color of _____.



EXAMPLE

There are no recorded cases of people dying from dehydration while running a marathon. However, there are several known cases of deaths from hyponatremia.

a. What is the main cause of hyponatremia? _____

b. Hyponatremia literally means "low sodium". But it's most commonly caused by an imbalance in fluid intake. How is this related to sodium levels? _____

c. Briefly explain how hyponatremia can lead to death.

_____

d. Why do you think people running marathons may end up with hyponatremia?

_____

PRACTICE

Which population(s) are most at risk for dehydration?

I) Elderly individuals.

II) Individuals who menstruate.

III) Infants.

a) I & II. b) II & III. c) I & III. d) I, II, & III.

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Fluid Balance

◆ To maintain body functions, we have to _____ our fluid intake and loss.

◆ **Fluid intake:** water in fluids we drink & in the food we eat.

◆ **Fluid Loss: sensible** (urine & _____) & insensible (skin & _____).

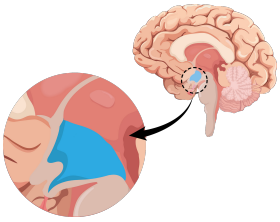
Fluid Balance:

Monitored by the _____.

- ___ blood sodium & ___ volume indicate low body fluid.

◆ **Thirst:**

_____ mechanism causes concious desire to drink.



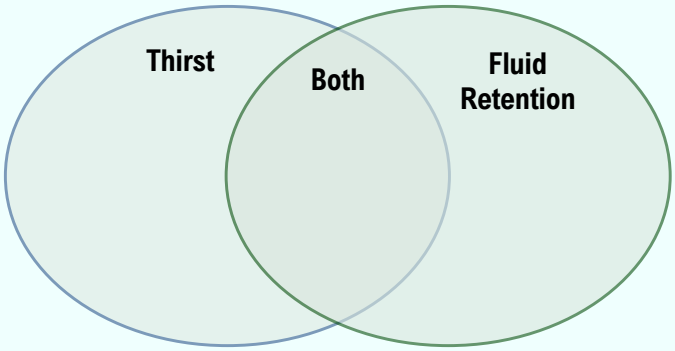
◆ **Retain Fluid:**

Antidiuretic hormone (____) from pituitary causes _____ to retain water.

◆ **Diuretic:** chemical that _____ urine production - leads to excess water loss (e.g. alcohol).

EXAMPLE

Using the statements in the box, fill in the Venn diagram about thirst and fluid retention.



Statements

a. Involves the hypothalamus.
b. Prevents fluid loss.
c. Triggered by high blood sodium.
d. Mechanism of maintaining fluid balance.
e. Involves antidiuretic hormone.
f. Limits dehydration.

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PRACTICE

What is a major way that hydration levels are measured by the body?

a) Potassium content of blood measured by the hypothalamus.

b) Potassium content of blood measured by the kidneys.

c) Sodium content of blood measured by the hypothalamus.

d) Sodium content of blood measured by the kidneys.

PRACTICE

Which of the following statements about antidiuretic hormone are correct?

I) Antidiuretic hormone acts on the kidneys.

II) Antidiuretic hormone is released in response to high blood solute concentration.

III) Antidiuretic hormone reduces urine output.

a) I & II. b) II & III. c) I & III. d) I, II, & III.

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Water Requirements

RDA (Males 19-50): ____ Liters
RDA (Females 19-50): ____ Liters

- 8 glasses of water/day: _____.
- Needs are based on age, sex, environment, & _____ level.
  - RDA includes water from ~80% _____ and from ~20% _____.
- Most water should come from _____, but other fluids will also aid in hydration:

Plain, Coffee & Tea	Typically contains caffeine (diuretic effect is _____). Contain _____chemicals.
Milk	High in protein & _____(Ca). Some alternative milks offer similar nutritional value.

Sports Drinks	_____ sugars & electrolytes; appropriate for _____ athletes.
Specialty Waters	Often contain additives to boost health → _____/no health impact.

Sugary Drinks	Sodas, _____, flavored drinks, energy drinks & sweetened coffee/tea. Contain _____ sugars → associated with obesity.

EXAMPLE

Fill in the table below with pros and cons for each of the beverages listed. Some have been filled in for you.

	Pros	Cons
Coffee		
Energy Drinks	Count towards fluid consumption.	
Juice		
Sports Drinks		Can be unnecessarily high in sugar and electrolytes.

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Which of the following would increase the amount of water an individual needs to consume?

I) Living in a hot climate.

II) Pregnancy status.

III) Participating in a cardio exercise class.

a) I & II. b) I & III. c) II & III. d) I, II, & III.

PRACTICE

True or False: if false, choose the answer that best corrects the statement.

Sugary and caffeinated beverages should be counted towards the RDA for water.

a) True.

b) False, the excess calories from sugar and the diuretic effect of caffeine means that neither should be counted towards water intake.

c) False, water from caffeinated beverages can be counted but not water from beverages with high amounts of added sugar.

d) False, water from caffeinated beverages cannot be counted because it is a diuretic, but water from sugary beverages can be counted.