

CLIL module: **Lesson 1** (100min)

Diffusion, osmosis and transport of substances in cells

At the end of this CLIL lesson:

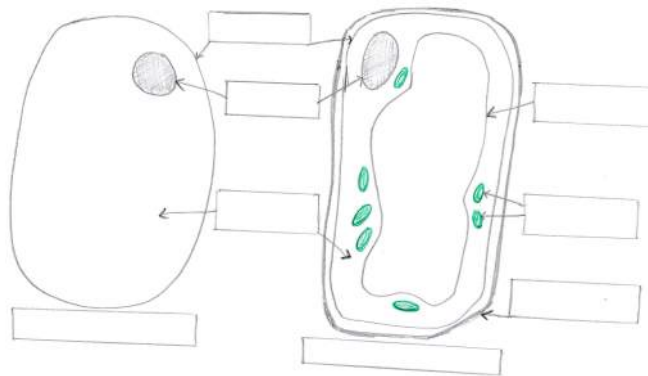
- You will be able to understand and communicate using scientific terms regarding the cell.
- You will see what happens and explain what is happening when cells are put into solutions with different salt or sugar concentrations
- You will watch English videos on the movement of substances across cell membranes and answer questions on them
- You will experiment in the lab and will talk as much as possible in English!

Lets learn a few **necessary scientific vocabulary**

Video on cells: <https://www.youtube.com/watch?v=URUJD5NEXC8>

Ex. 1 a. Insert the following words in the diagram below: Plant cell

Animal cell Cytoplasm Nucleus Vacuole Cell Membrane Cell wall chloroplasts



Ex. 1 b. Fill in the missing words: chloroplasts, wall, nucleus, photosynthesis

Plant cells have a cell..... and a vacuole which gives them rigidity. They also have small green organelles called necessary for

Animal cells seen under a microscope are much simpler because the only organelle we can see in the cell is the which contains DNA. All the other organelles are visible only with an electronic microscope!

Ex. 1 c. Match the opposites:

hot	exit
high	slow
fast	low
enter	cold
to speed up	to take in
to get rid of	to slow down

Cells need to take in substances and get rid of other substances to be able to live

Ex. 1 d. Can you think of what has to enter and exit animal and plant cells?

Substances that enter plant cells:

Substances that enter animal cells:

Substances that exit plant cells:

Substances that exit animal cells:

Experiment 1: on diffusion Before looking at cells, lets see how molecules move:

Procedure: Take one beaker with hot water and one with cold water and add a drop of ink to both beakers. Explain what happens.

Use present tenses and the following words to describe your observations:

Molecules of ink, hot water, cold water, water molecules, beaker, from an area of high concentration, to an area of low concentration. Molecules move fast, molecules move more slowly.

.....

.....

.....

.....

Watch this video and write the definition of diffusion below:

http://highered.mheducation.com/sites/0072495855/student_view0/chapter2/animation_how_diffusion_works.html

.....

.....

Experiment 2: the movement of water through cells: osmosis

Procedure: Prepare the following:

1. Beaker A: 10 g of sugar in 50 ml of water
2. Beaker B: 50 ml water
3. Weigh and measure the lengths of the 2 pieces (sticks) of potatoes and drop 1 in each beaker
4. Wait 15 min and then measure and weigh the pieces of potato

Before measuring and weighing the potato pieces talk together and try to hypothesize what you think will happen? **Remember that only water can move through the semipermeable cell membrane.** You can use most of the words used in the last experiment to describe diffusion.

.....

.....

Beaker	Potato weight at the start	Potato weight after 30-45 min	Potato length at the start	Potato length after 30-45 min
1				
2				

What has happened?

.....

.....

.....

How can you explain it?

.....

.....

VIDEO ON OSMOSIS:

http://highered.mheducation.com/sites/0072495855/student_view0/chapter2/animation_how_osmosis_works.html

Definition of osmosis:

.....
.....

Comparing the concentrations of two solutions

- If 2 solutions have the same concentration we say they are **isotonic**.
- If a solution is more concentrated than another one we say it is **hypertonic**
- If a solution is less concentrated than another one we say it is **hypotonic**

Image of hypotonic, hypertonic and isotonic solutions

http://www.phschool.com/science/biology_place/biocoach/biomembrane1/solutions.html

In the first image the solution is hypotonic to the cell and the solute concentration of the solution is lower than the solute concentration of the cytoplasm. Water will move into the cell where the water concentration is lower and the solute concentration is higher. The cell will grow.

In the second image the solution is isotonic

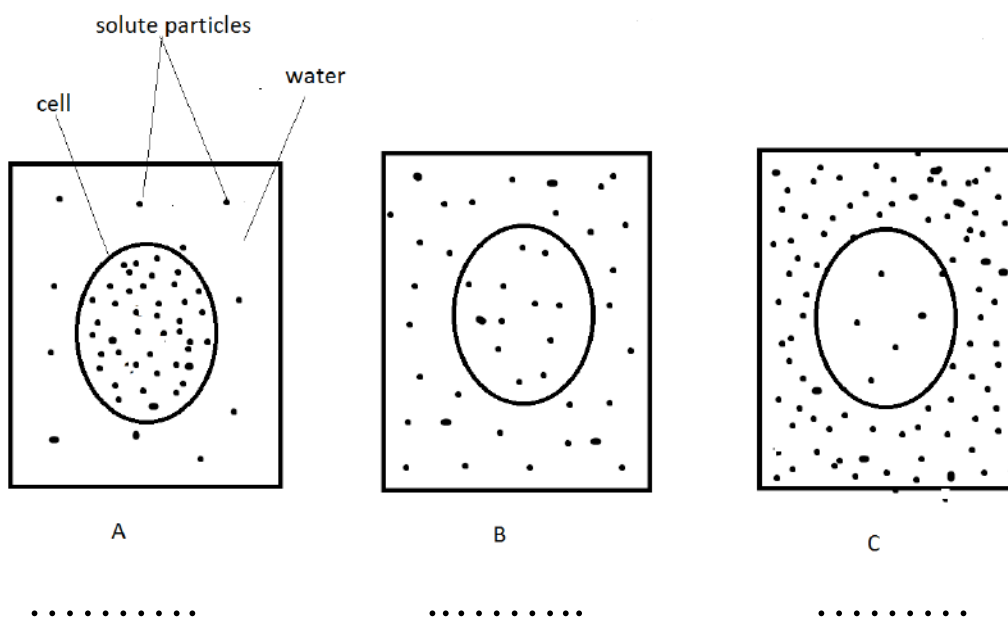
.....
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In the third image the solution is hypertonic

.....
.....

The three cells in the diagram below have been placed in different solutions.

- Label the 3 images with the terms : **hypertonic, hypotonic and isotonic solutions**
- **draw arrows** which indicate in which **direction water will move**



HOMEWORK: watch the video on osmosis and match the terms or phrases to their meanings in the table below:

http://highered.mheducation.com/sites/0072495855/student_view0/chapter2/animation_how_osmosis_works.html

1. Concentration gradient	a. Net movement of molecules along their concentration gradient
2. diffusion	b. Movement of water molecules through a semipermeable membrane to an area where there are more solute molecules
3. hypertonic	c. Solution with a lower concentration of solute
4. osmosis	d. Solution with a higher concentration of solute
5. hypotonic	e. Solution with the same concentration of solute
6. isotonic	f. Difference of concentration between two areas
7. solute	g. A liquid in which a solute is dissolved
8. solvent	h. When a salt, sugar or in general a solute splits* into its ions or molecules and is surrounded by water molecules
9. A solute dissolves	i. Salt, sugar or molecules that can dissolve in a solvent

WATCH THE VIDEO AGAIN AND COMPLETE THE FOLLOWING EXERCISE only one answer is correct for each question

1. Osmosis is best defined as the movement of:

- a. molecules from an area of high concentration to an area of lower concentration
- b. molecules from an area of low concentration to an area of higher concentration
- c. water molecules across a membrane from an area of low water to an area of higher concentration
- d. water molecules across a membrane from an area of high water concentration to an area of lower concentration
- e. water molecules inside a container

2. Which of the following will pass through a cell membrane most easily?

- a. small polar molecules
- b. small nonpolar molecules
- c. large polar molecules
- d. large nonpolar molecules
- e. large neutral molecules

3. A red blood cell placed in a hypertonic medium (or solution) will:

- a. expand
- b. burst*
- c. shrink*
- d. have no change in shape
- e. become a white blood cell.

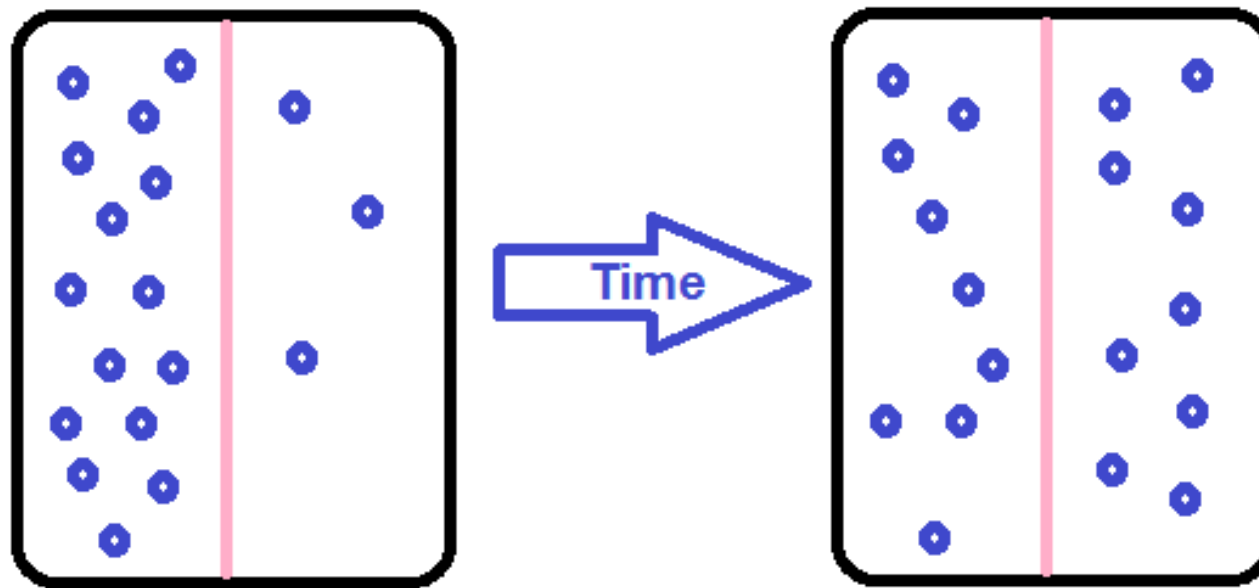
4. A 5% urea solution is hypotonic to a 10% urea solution. true/false

5. If a cell is placed in an isotonic medium, there will be no net movement of water. true/false

* Burst=scoppiare Shrink*= perdere acqua e raggrinzire splits= si separa

DIFFUSION

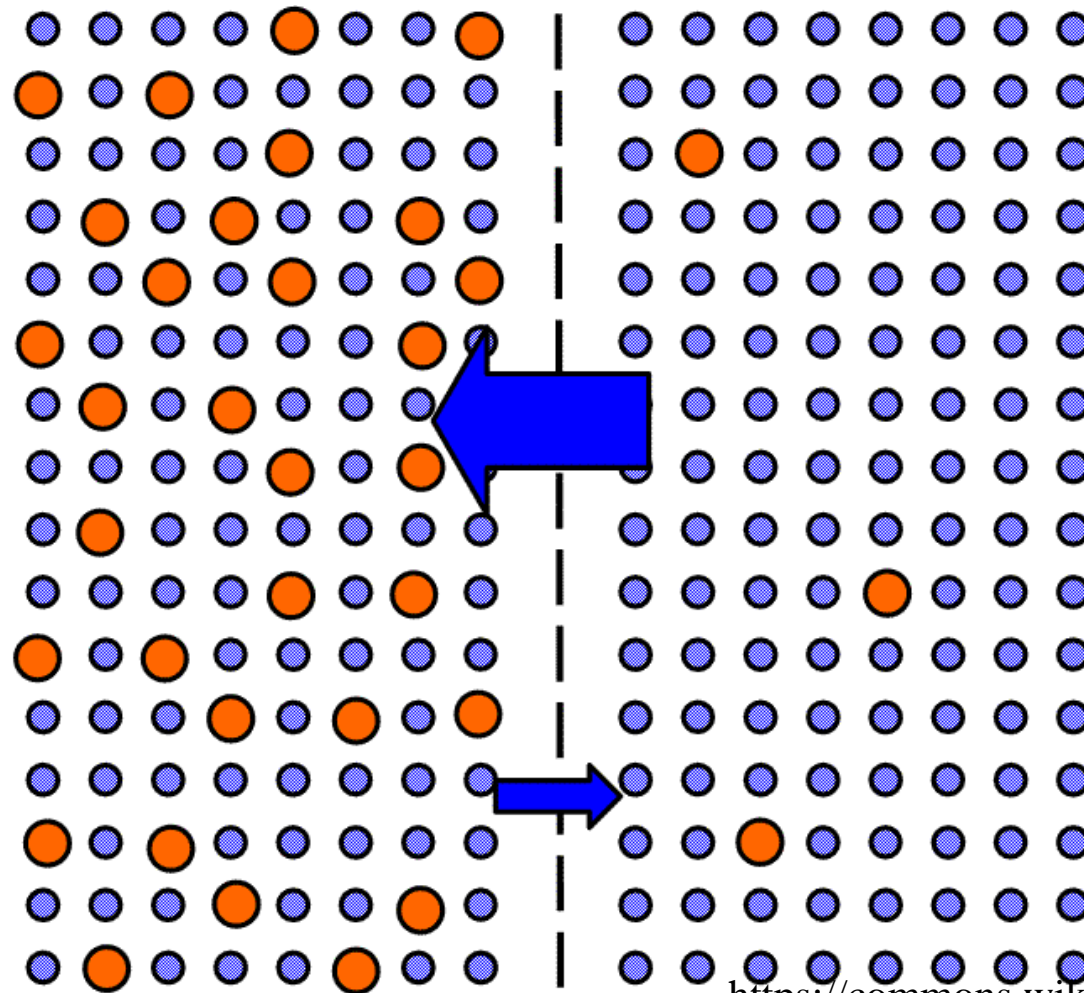
DIFFUSION OF WATER MOLECULES ACROSS A SEMIPERMEABLE MEMBRANE



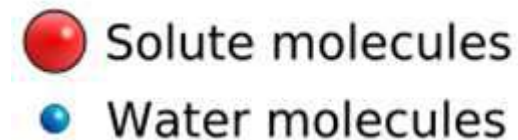
https://commons.wikimedia.org/wiki/File:Simple_Diffusion.png

MOLECULES DIFFUSE ALONG THEIR CONCENTRATION GRADIENT

there is a **net** movement of molecules from a region of high concentration to one of low concentration until they are **evenly distributed**



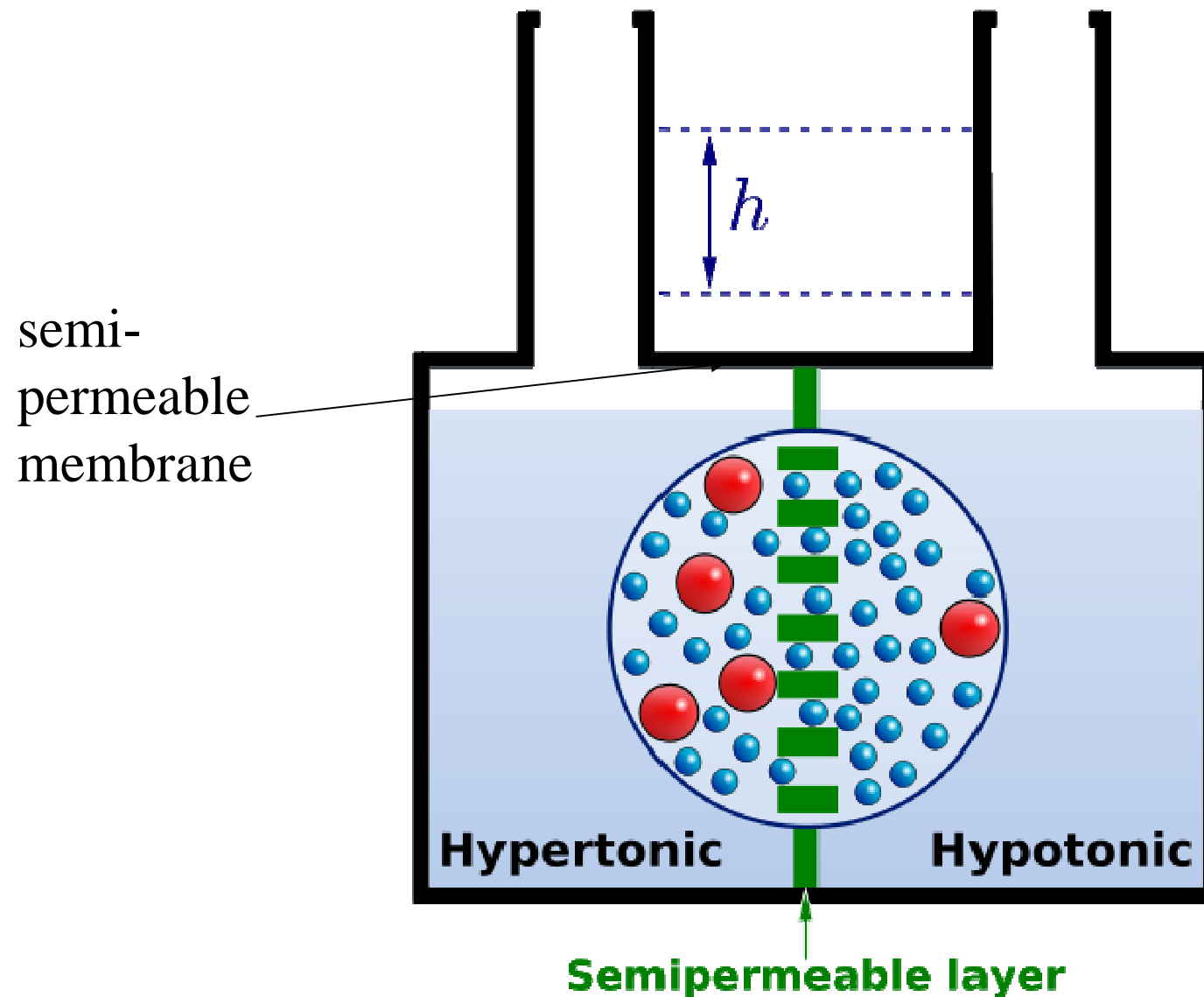
Osmosis is the movement of water through a semipermeable membrane from a region of **low solute concentration** to a region of **higher solute concentration**





https://commons.wikimedia.org/wiki/File:Osmose_plasmolyse.png

Watch the video on OSMOSIS:

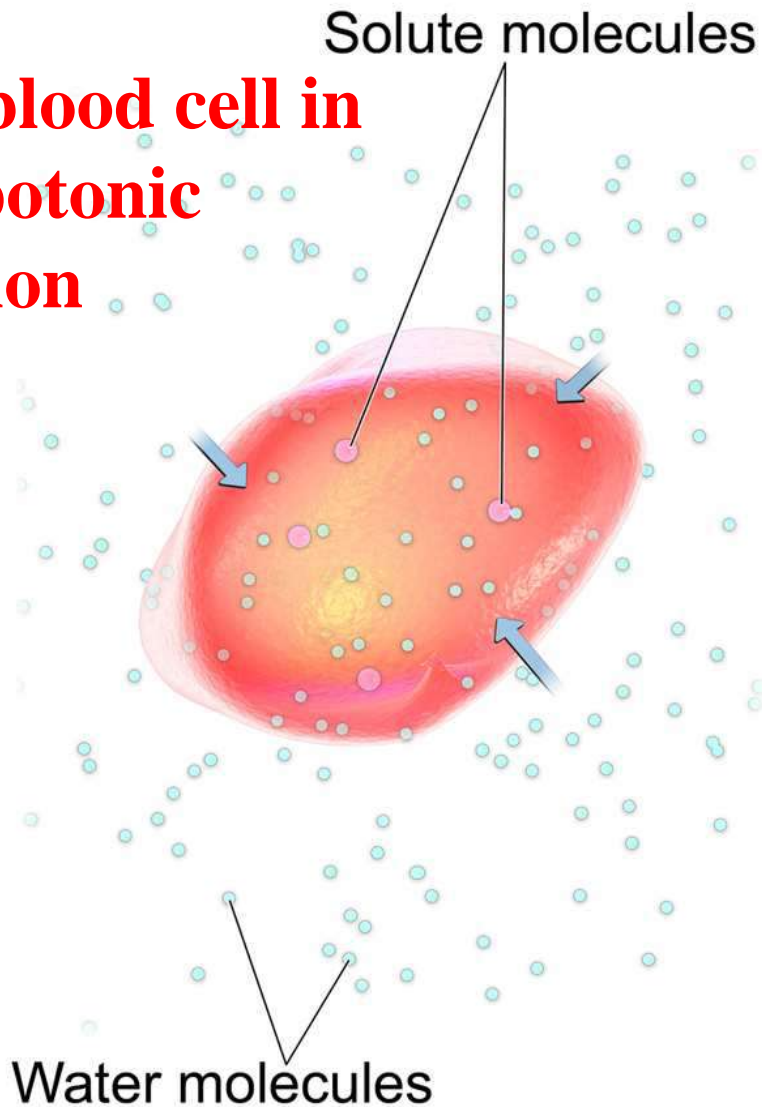
<http://www.stolaf.edu/people/giannini/flashanimat/transport/osmosis.swf>



-  Solute molecules
-  Water molecules

<https://commons.wikimedia.org/wiki/File:Osmosis.svg>

**Red blood cell in
a hypotonic
solution**



HYPOTONIC - Describes a solution with a lower solute concentration compared with the solution in the cell.

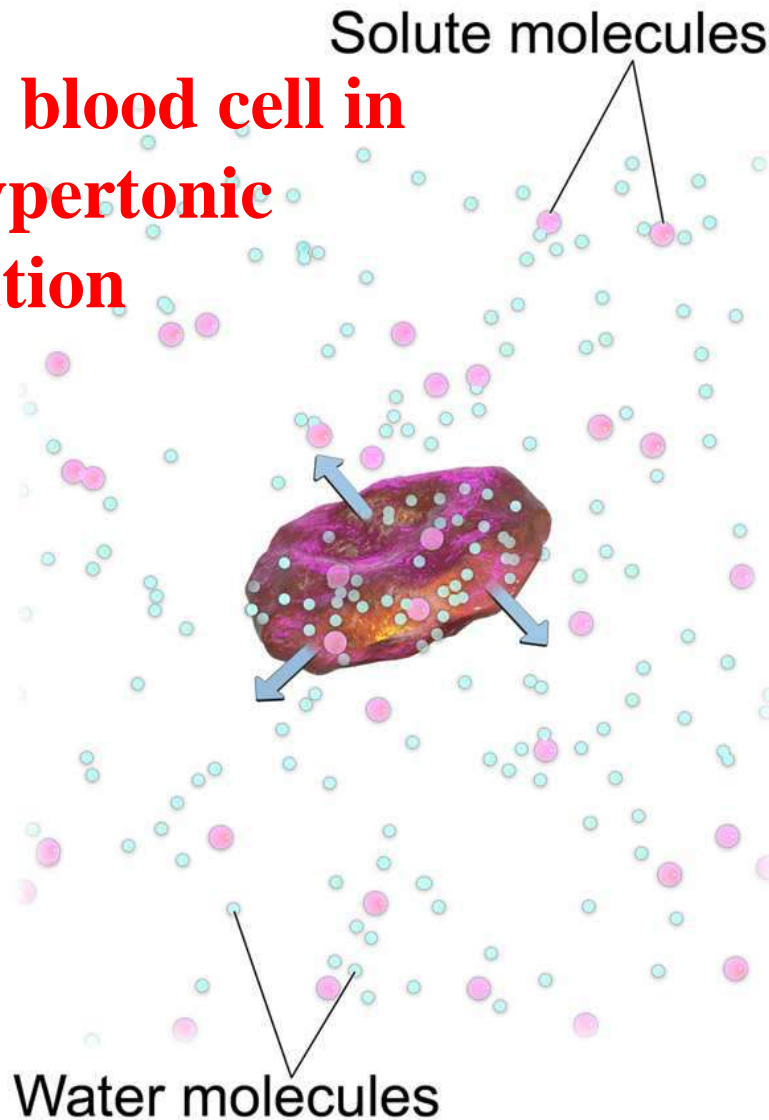
Water enters the cell

Cell grows and
bursts: **hemolysis**

**Hypotonic Solution
(Osmotic Flow into Cell)**

https://en.wikipedia.org/wiki/Tonicity#/media/File:Blausen_0683_OsmoticFlow_Hypertonic.png

**Red blood cell in
a hypertonic
solution**



HYPERTONIC-
Describes a
solution with a
higher solute
concentration
compared with the
solution in the cell

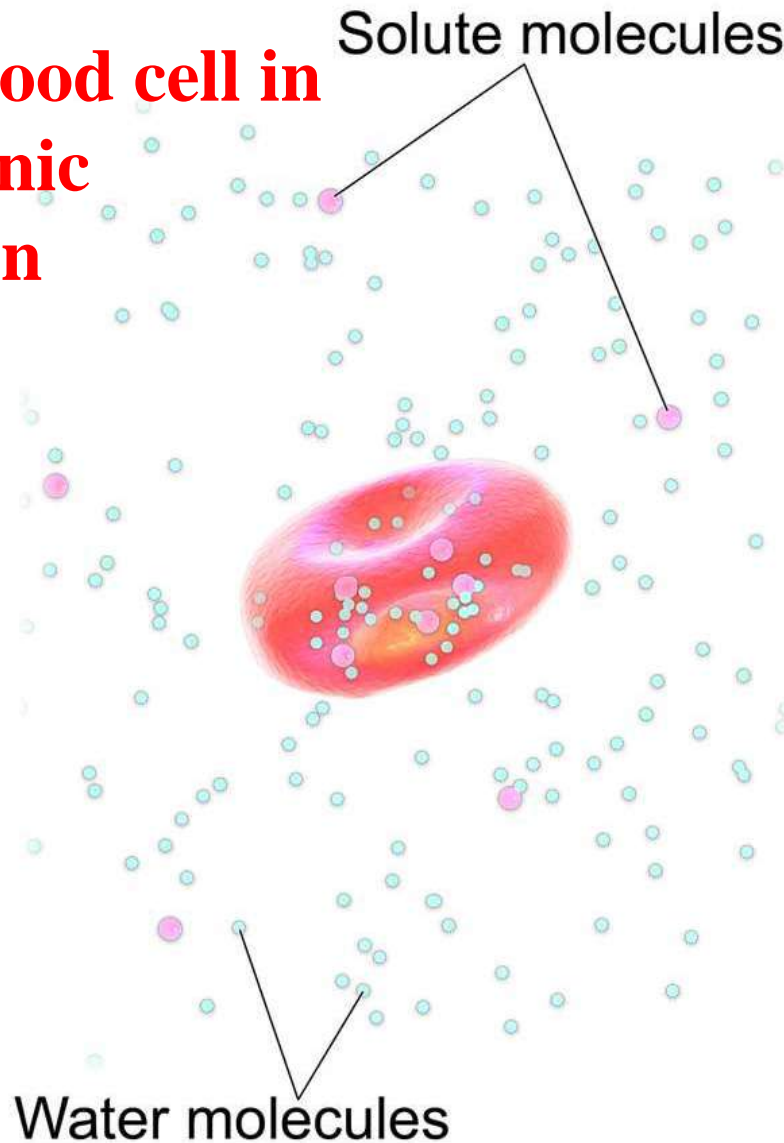
Water exits the cell

Cell **shrinks**

Hypertonic Solution
(Osmotic Flow out of Cell)

https://en.wikipedia.org/wiki/Tonicity#/media/File:Blausen_0683_OsmoticFlow_Hypertonic.png

**Red blood cell in
a isotonic
solution**



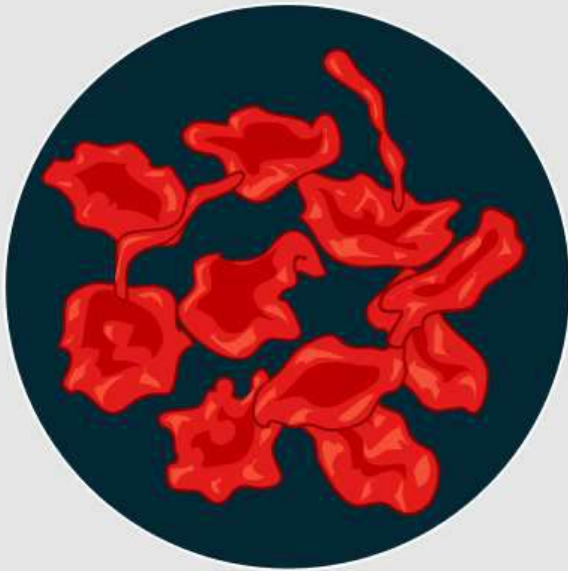
ISOTONIC -
Describes a fluid
with an equal
concentration to
another fluid; water
can diffuse equally
both in and out of
the cell.

Isotonic Solution
(No Osmotic Flow)

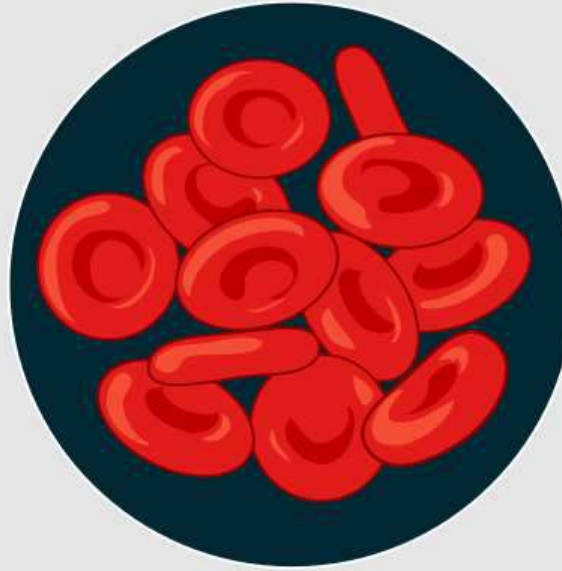
https://en.wikipedia.org/wiki/Tonicity#/media/File:Blausen_0685_OsmoticFlow_Isotonic.png

Animal cells in different solutions

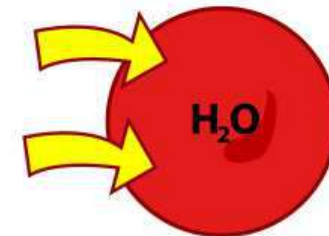
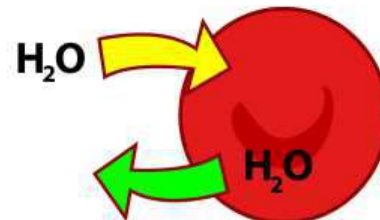
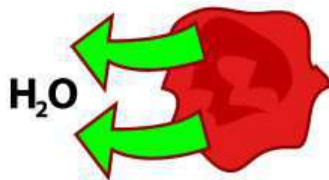
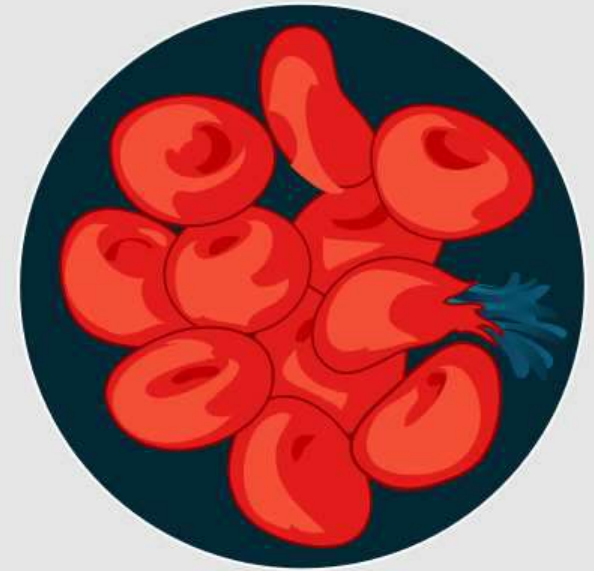
Hypertonic



Isotonic



Hypotonic



Plant cells in different solutions

