

CHAPTER 03

TRANSPORT ACROSS A MEMBRANE

The stuff you need to know in this chapter:

3.1 Diffusion

Core:

- Define diffusion as the net movement of particles from a region of their higher concentration to a region of their lower concentration down a concentration gradient, as a result of random movement
- Describe the importance of diffusion of gases and solutes
- State that substances move into and out of cells by diffusion through the cell membrane

Extended:

- State that the energy for diffusion comes from the kinetic energy of random movement of molecules and ions
- Investigate the factors that influence diffusion, limited to surface area, temperature, concentration gradients and distance

3.2 Osmosis

Core:

- State that water diffuses through partially permeable membranes by osmosis
- State that water moves in and out of cells by osmosis through the cell membrane
- Investigate and describe the effects on plant tissues of immersing them in solution of different concentrations
- State that plants are supported by the pressure of water inside the cells pressing outwards on the cell wall
- Define osmosis as the net movement of water molecules from a region of higher water potential (dilute solution) to a region of lower water potential (concentrated solution), through a partially permeable membrane
- Explain the effects on plant tissues of immersing them in solutions of different concentrations by using the terms turgid, turgor pressure, plasmolysis and flaccid
- Explain the importance of water potential and osmosis in the uptake of water by plants
- Explain the importance of water potential and osmosis on animal cells and tissues



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- Explain how plants are supported by the turgor pressure within cells, in terms of water pressure acting against an inelastic cell wall

3.3 Active transport

Core:

- Define active transport as the movement of particles through a cell membrane from a region of lower concentration to a region of higher concentration using energy from respiration
- Discuss the importance of active transport as a process for movement across membranes: e.g. ion uptake by root hairs and uptake of glucose by epithelial cells of villi and kidney tubules
- Explain how protein molecules move particles across a membrane during active transport



3.1 DIFFUSION

1. Fill in the blanks to summarise diffusion

In order for substances to get into our out of a cell they passed pass across the _____ . One way this can happen is by diffusion. This is a _____ process, meaning it does not require energy.

In order for things to diffuse, they must move from an area of a _____ concentration to an area of _____ concentration, which means they move down the concentration _____ .

2. Write the definition for "diffusion"

3. List four things that affect the rate of diffusion

1. _____
2. _____
3. _____
4. _____



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4. Complete the boxes below to show how concentration gradient affects rate of diffusion. Write a brief explanation next to it.

Outside of cell	Inside cell	Explanation
		_____ _____ _____ _____ _____
		_____ _____ _____ _____ _____

5. Draw a diagram of an alveolus and a single blood vessel. Label the diagram to show the diffusion of gases.

6. BONUS QUESTION: Use your diagram to help you - how many plasma membrane does an oxygen molecule pass through to get from air into a blood cell?



3.2 OSMOSIS

1. Complete the sentences to describe osmosis

Osmosis is a special type of diffusion. It involves any _____ but we will focus on water. The water goes from a place where there is a higher percentage of water to a place where there is a lower percentage. We say it goes from an area of high _____ to an area of low _____. While diffusion can happen anywhere (like a smell moving across a room), osmosis can only happen if a _____ membrane is there. It happens because large substances in a cell like proteins are too _____ to fit through the membrane, but water molecules are small enough.

In the roots of plants, water moves into the _____ cells. These have a lower _____ than the soil because the plant is constantly taking water up through its stem out of the roots.

2. Write the definition for "osmosis"



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3. Complete the table to summarise the state of cells in tissues that are immersed in different concentrations of salt.

Salt concentration of solution	Much higher than cell (enough for plant cell plasmolysis)	Equivalent to cell	Much lower than cell
Water potential of cell	Cell water potential higher than solution		
Direction of movement		No movement	
Word to describe solution			Hypotonic
Texture of plant cell after 15 minutes			Turgid
Plant cell diagram (palisade cell)			
Animal cell diagram			



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4. Animal cells can burst in hypotonic solutions. Explain why this is not true for animal cells.

5. Explain what is meant by plasmolysis

6. Complete the sentences below:

Plant cells are supported by "_____ pressure", which is pressure that results from water pushing against an inelastic (not stretchy) cell _____.



3.3 ACTIVE TRANSPORT

1. Diffusion is "passive". State what this means.

2. Active transport, as its name implies, is "active". State what this means.

3. Write the definition for active transport.

4. What process supplies the energy for active transport? (And the energy for everything else living things do!)

5. Complete the sentences to describe some important examples of active transport.

The concentration of glucose molecules in the _____ of the small intestine is _____ than the concentration inside the intestinal villi. This means that glucose would _____ from the villi into the lumen, but this can't happen because the body needs to take in the glucose, not lose it. Instead, special _____ proteins in the cell membrane use _____ to move the glucose into the villi against its _____ gradient.

Similarly, the amount of glucose inside of the blood in the kidneys is _____ than it is in the tubule, but it must move out of the tubule. Glucose moves into the blood by _____.

