

Transport in and out of cells

Cells must take in useful substances like glucose and oxygen for respiration, and remove waste substances such as carbon dioxide and urea. Cells must also control how much water they contain. The cells use three transport processes to do this: **diffusion**, **osmosis** and **active transport**.

Diffusion

Particles move around randomly. They bump into each other and this moves them all around.



Diffusion is the net movement of particles from an area of high concentration to an area of low concentration down a concentration gradient.

(+ Use the diagram to the left to help you remember this important definition)

Factors that affect the rate of diffusion include:

| | |
|---------------------------------|---|
| Temperature | An increase in temperature causes particles to move around more quickly and increases the rate of diffusion. |
| Surface Area | If the diffusion surface has folds in it then it has a larger surface area over which diffusion can take place. This increases the rate of diffusion. |
| The difference in concentration | The bigger the difference in concentration, the steeper the concentration gradient, and the faster the rate of diffusion. |

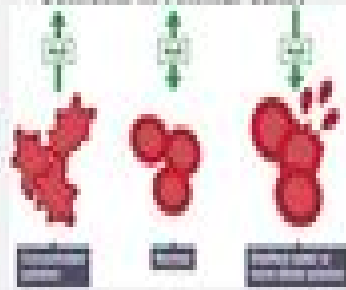
Osmosis

Osmosis is the diffusion of water molecules across a partially permeable membrane.

Osmosis is the diffusion of water molecules from a dilute solution to a concentrated solution across a partially permeable membrane.



Osmosis in Animal cells:



Exchanging substances if your big

Large multicellular organisms (anything bigger than a worm) aren't able to get the nutrients they need just by diffusion from their surroundings because they have a **small surface area to volume ratio**. Instead, they have adaptations to increase the rate of diffusion. Exchange surfaces (like the lungs, the intestines and gills in fish) have adaptations to increase diffusion. They normally have:

- A large surface area
- A thin membrane (to provide a short diffusion distance)
- Having an efficient blood supply
- Are well ventilated (animal lungs)

You will learn about specific adaptations of these in B3 and B4.

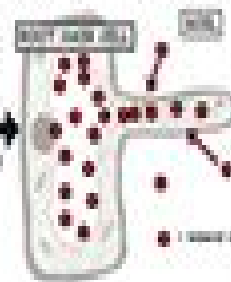
Active transport

Active transport moves substances from an area of low concentration to an area of high concentration against a concentration gradient. It requires energy from respiration.

Active transport allows:

- mineral ions to be absorbed into plant root hairs from very dilute (low concentration) solutions in the soil. Plants require ions for healthy growth.
- glucose molecules to be absorbed from the lower concentrations in the gut into the blood which has a higher glucose concentration.

This is achieved by special 'protein pumps' found in the cell membranes.



Osmosis in Plant cells:



This is what happens at the microscopic level of the cells, but you can do lab experiments with whole tissues, such as in this topic's osmosis required practical involving whole potato chips.

B1 Knowledge Organiser

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Jianjun Gao



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Table of Contents January 2013 Biology Higher B1

1. Understanding the eBook January 2013 Biology Higher B1
 - The Rise of Digital Reading January 2013 Biology Higher B1
 - Advantages of eBooks Over Traditional Books
2. Identifying January 2013 Biology Higher B1
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an January 2013 Biology Higher B1
 - User-Friendly Interface
4. Exploring eBook Recommendations from January 2013 Biology Higher B1
 - Personalized Recommendations
 - January 2013 Biology Higher B1 User Reviews and Ratings
 - January 2013 Biology Higher B1 and Bestseller Lists
5. Accessing January 2013 Biology Higher B1 Free and Paid eBooks
 - January 2013 Biology Higher B1 Public Domain eBooks
 - January 2013 Biology Higher B1 eBook Subscription Services
 - January 2013 Biology Higher B1 Budget-Friendly Options

6. Navigating January 2013 Biology Higher B1 eBook Formats
 - ePub, PDF, MOBI, and More
 - January 2013 Biology Higher B1 Compatibility with Devices
 - January 2013 Biology Higher B1 Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of January 2013 Biology Higher B1
 - Highlighting and Note-Taking January 2013 Biology Higher B1
 - Interactive Elements January 2013 Biology Higher B1
8. Staying Engaged with January 2013 Biology Higher B1
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers January 2013 Biology Higher B1
9. Balancing eBooks and Physical Books January 2013 Biology Higher B1
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection January 2013 Biology Higher B1
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine January 2013 Biology Higher B1
 - Setting Reading Goals January 2013 Biology Higher B1
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of January 2013 Biology Higher B1
 - Fact-Checking eBook Content of January 2013 Biology Higher B1
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements

- Interactive and Gamified eBooks

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