

# Active Transport

**Answer the questions below.**

1. Define diffusion.

**The net movement of particles of a liquid or gas from an area of high concentration to an area of low concentration.**

2. Explain what is meant by a concentration gradient.

**The difference in concentration between two areas.**

3. Describe what happens to a plant cell when placed in a hypertonic solution.

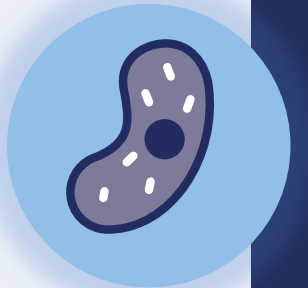
**Water moves out of the cell and it can become flaccid.**

4. Describe where cells get energy.

**From (aerobic) respiration in the mitochondria.**

5. Explain what organisms need energy for.

**Organisms need energy to carry out life processes, such as growth, reproduction, and movement.**



# Active Transport

B3.1.11

Science  
**Mastery**

B3.1.1 Prior Knowledge Review  
B3.1.2 Eukaryotic and Prokaryotic Cells  
B3.1.3 Aseptic Technique  
B3.1.4 Growth of Bacteria  
B3.1.5 Microscopes  
B3.1.6 Observing Cells  
B3.1.7 Diffusion

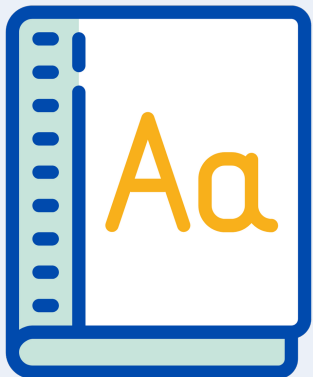
B3.1.8 Diffusion in Living Things  
B3.1.9 Osmosis  
B3.1.10 Osmosis Investigation  
➤ **B3.1.11 Active Transport**  
B3.1.12 Cell Division  
B3.1.13 Cancer  
B3.1.14 Stem Cells



## Following this lesson, students will be able to:

- Define active transport
- Describe the difference between passive and active processes
- Explain why active transport is required in the small intestine

### Key Words:



**active transport**

**concentration gradient**

**passive**

**dilute**

**concentrated**

# This is the fix-it portion of the lesson

The **fix-it** is an opportunity to respond to gaps in knowledge, especially those identified by the previous lesson's exit ticket.

- The teacher should customise this slide as needed, to facilitate
  - **reteach, explanation, demonstration** or **modelling** of ideas and concepts that students have not yet grasped or have misunderstood.
  - **practise** answering specific questions or of key skills.
  - **redrafting** or **improving** previous work.

## Exit ticket

1. What was the independent variable in this experiment?

- ☐ Mass of potato cylinder
- ☒ Concentration of sugar solution
- ☐ Change in mass of potato cylinder

2. What would you expect to happen if a piece of onion was left in a hypertonic solution?

- ☐ The onion would disappear as the cells would lyse
- ☒ The onion would decrease in mass.
- ☐ The onion would increase in mass.

3. What would you expect to happen if a sample of animal cells were left in a hypotonic solution?

- ☐ They would expand and become turgid
- ☒ They would expand and burst
- ☐ They would become shrivelled

## General Definition

Adjective:

- Accepting or allowing what others do without active response
- Offering no resistance

## Scientific Definition

The movement of substances without requiring energy.

# Passive

**'Progress rarely comes as a result of being passive'**  
**Marc Morial**

## Synonyms

Neutral  
Patient  
Inactive

## Antonyms

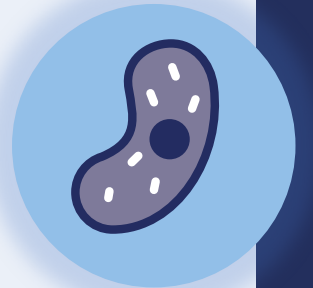
Active  
Assertive

## General Examples

Teachers get annoyed when students are passive observers in the lesson.  
Passive resistance is a method of non-violent protest.

## Scientific Examples

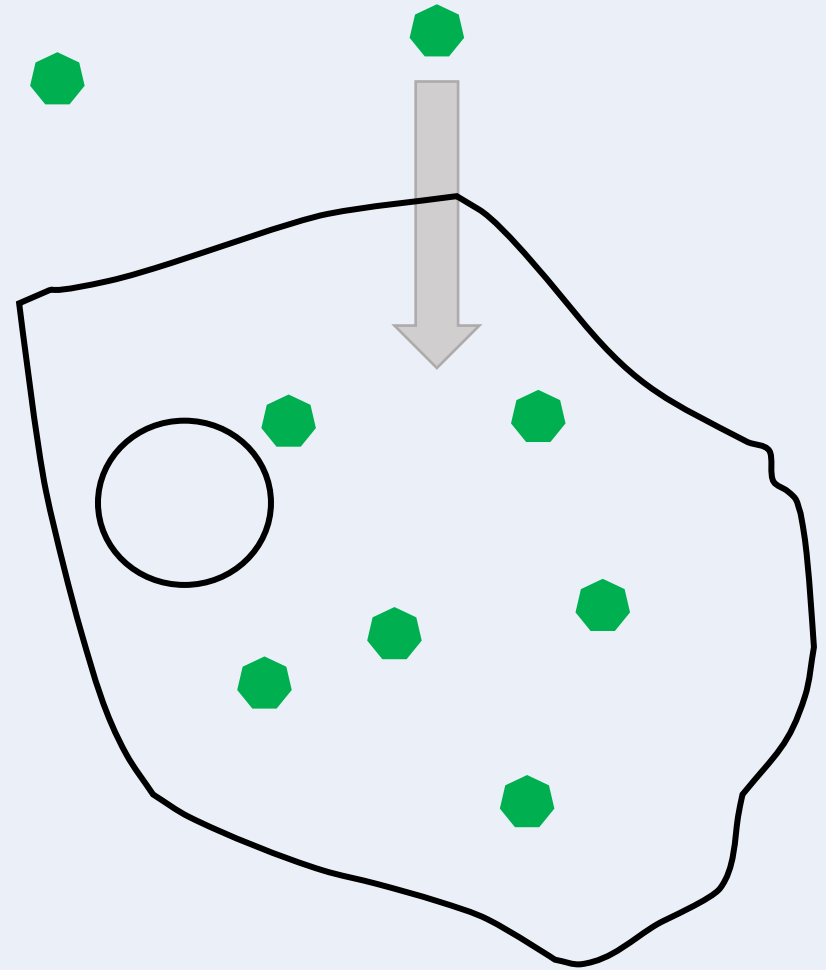
Diffusion is an example of passive process.



# Active Transport

**Active transport** is the movement of substances from a more **dilute** solution to a more **concentrated** solution, **requiring energy** from respiration

Active transport works **against the concentration gradient**

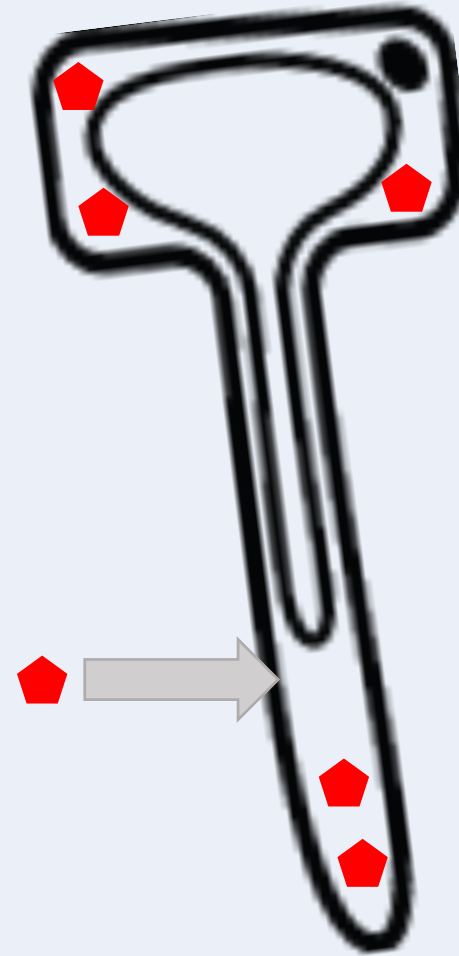


# Active transport in root hair cells

Active transport is used in **root hair cells** to absorb **mineral ions** from the soil

Concentration of mineral ions in the soil is **lower** than inside the cell

◆ = Mineral ion



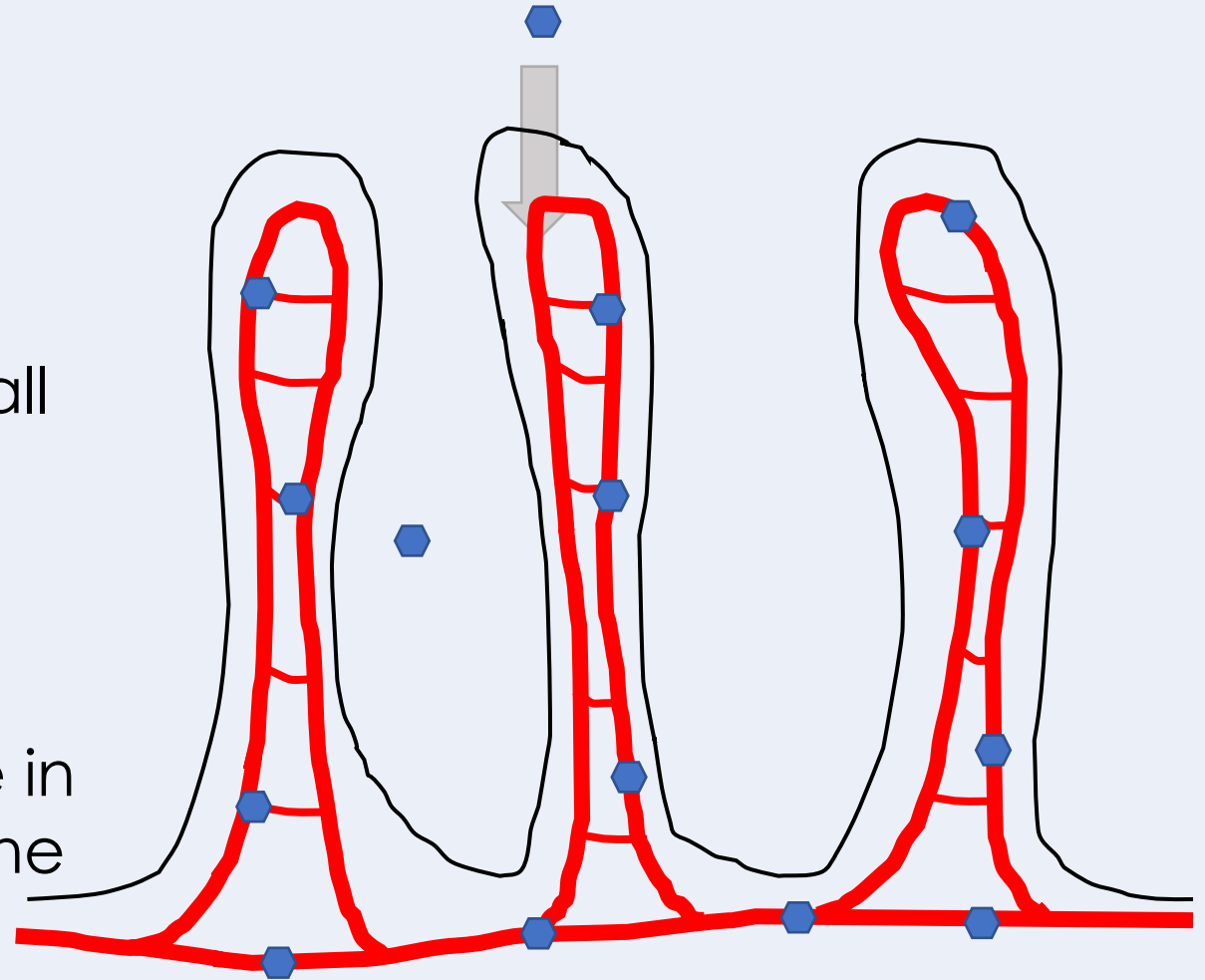
# Active transport in the small intestine

 = Glucose

Active transport is used in the **villi** in the **small intestine** to transport **glucose** from the inside of the small intestine into blood vessels.

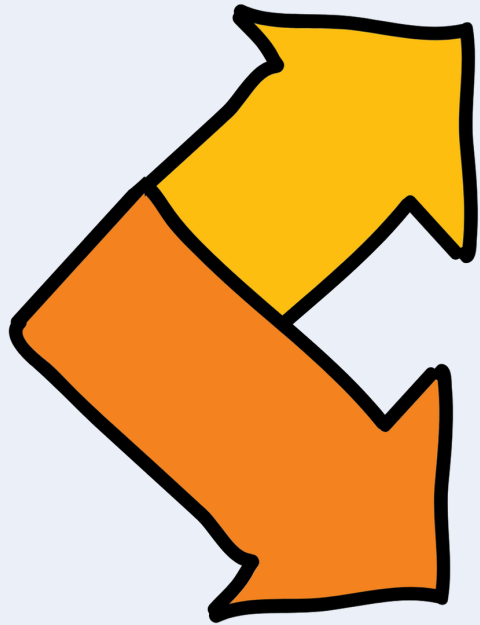
This takes place when the concentration of glucose in the small intestine is **lower** than the concentration of glucose in the blood.

When the concentration of glucose in the small intestine is higher than in the blood (such as soon after eating), glucose travels to the blood through diffusion.





Can you explain the difference between these two terms?



Active transport

Diffusion

## Quick Quiz

Choose the correct answer for each question:

1. Active transport occurs when...
  - ☐ A. molecules move in the direction of the concentration gradient
  - ☒ B. molecules move in the opposite direction of the concentration gradient
  - ☐ C. there is no concentration gradient
2. Active transport is required in the small intestine when...
  - ☒ A. the concentration of glucose is higher in the bloodstream than the small intestine
  - ☐ B. the concentration of glucose is higher in the small intestine than the bloodstream
  - ☐ C. the concentration of oxygen is higher in the small intestine than the bloodstream
3. Which best explains the difference between diffusion and active transport?
  - ☒ A. Active transport requires energy from respiration but diffusion does not
  - ☐ B. Active transport occurs in the direction of the concentration gradient but diffusion does not
  - ☐ C. Active transport is the movement of water molecules, diffusion is the movement of all solute molecules

# Drill

1. Define active transport
2. Where in a plant does active transport take place?
3. Where in the human digestive system does active transport take place?
4. Is diffusion the movement of particles **down or against** the concentration gradient?
5. Is active transport the movement of molecules **down or against** the concentration gradient?
6. Which cellular process provides the energy required for active transport to take place?

# Drill answers

1. **Active transport** is the movement of substances from a more **dilute** solution to a more **concentrated** solution, **requiring energy** from respiration
2. **In the root hair cells**
3. **The small intestine (villi)**
4. **Down the concentration gradient**
5. **Against the concentration gradient**
6. **Respiration**

# I: Explain using *scientific understanding* to make something clear or *state the reason* for something happening

Example question:

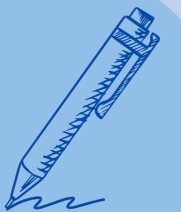
**Explain** why root hair cells contain many mitochondria.

Model answer:

- Active transport requires energy as molecules are moving **against** the concentration gradient
- Energy comes from respiration, so many mitochondria are needed

To 'explain' your answer should:

- Begin with a **scientific statement**.
- Use 'this means that', 'because' or 'so' **to link your statement to the question**.



# **We: Explain using scientific understanding to make something clear or state the reason for something happening**

Example question:

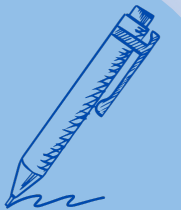
**Explain** why the cells in the small intestine have many mitochondria.

Model answer:

- Active transport requires energy as molecules are moving **against** the concentration gradient
- Energy comes from respiration, so many mitochondria are needed

To 'explain' your answer should:

- Begin with a **scientific statement**.
- Use 'this means that', 'because' or 'so' **to link your statement to the question**.



# You: *Explain using scientific understanding to make something clear or state the reason for something happening*

Example question:

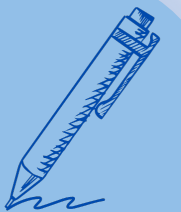
**Explain** why the concentration of oxygen in the cells in the small intestine can affect the rate of active transport of glucose into the blood.

Model answer:

- Active transport requires energy as molecules are moving **against** the concentration gradient
- Energy comes from respiration which requires oxygen, so the greater the oxygen concentration present, the greater the rate of respiration

To 'explain' your answer should:

- Begin with a **scientific statement**.
- Use 'this means that', 'because' or 'so' **to link your statement to the question**.



## Answer the questions below.

1. Active transport is...

- ☐ A. When molecules go the wrong way round and need energy to give them a push
- ☐ B. When molecules go from low to high concentration, releasing energy
- ☒ C. The movement of molecules from low to high concentration, requiring energy

2. When would active transport take place?

- ☐ A. When a person has eaten a couple of hours ago and has lots of glucose in their gut
- ☒ B. When a plant takes in important minerals for growth through the soil
- ☐ C. When a plant takes in water for photosynthesis

3. Diffusion does not require energy because...

- ☒ A. Molecules are travelling in the same direction as the concentration gradient
- ☐ B. Molecules are travelling in the opposite direction to the concentration gradient
- ☐ C. It is more important that the cell keeps the energy to use in respiration



## Lesson B3.1.11

What was good about this lesson?

What can we do to improve this lesson?

[Send us your feedback by clicking this link](#)  
or by emailing [sciencemastery@arkonline.org](mailto:sciencemastery@arkonline.org)  
Thank you!