

Diffusion in Living Things

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. State the factors that would increase the rate of diffusion.
Increasing temperature, increasing surface area and increasing concentration gradient.
3. What is a concentration gradient?
The difference in concentration of a substance between two areas.
4. Explain how the structure of root hair cells helps them carry out their function.
They have a long shape giving them a large surface area, which helps them to absorb water.
5. Explain why diffusion could not occur in a solid.
The particles in a solid can only vibrate from their positions, they cannot move freely.



Diffusion in Living Things

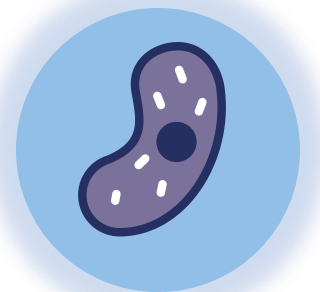
B3.1.8

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**

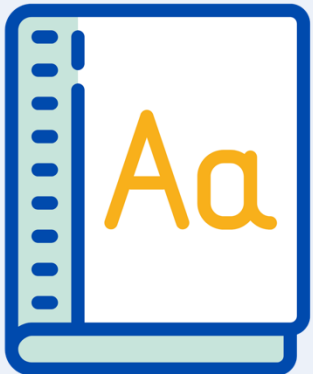
B3.1.9 Osmosis
B3.1.10 Osmosis Investigation
B3.1.11 Active Transport
B3.1.12 Cell Division
B3.1.13 Cancer
B3.1.14 Stem Cells



Following this lesson, students will be able to:

- State the effect of surface area to volume ratio on exchange
- Describe how multicellular organisms are adapted to allow the efficient exchange of substances
- Explain why unicellular organisms do not need these adaptations in order to survive

Key Words:



adaptation

diffusion

efficient blood supply

alveoli

surface area to volume ratio

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

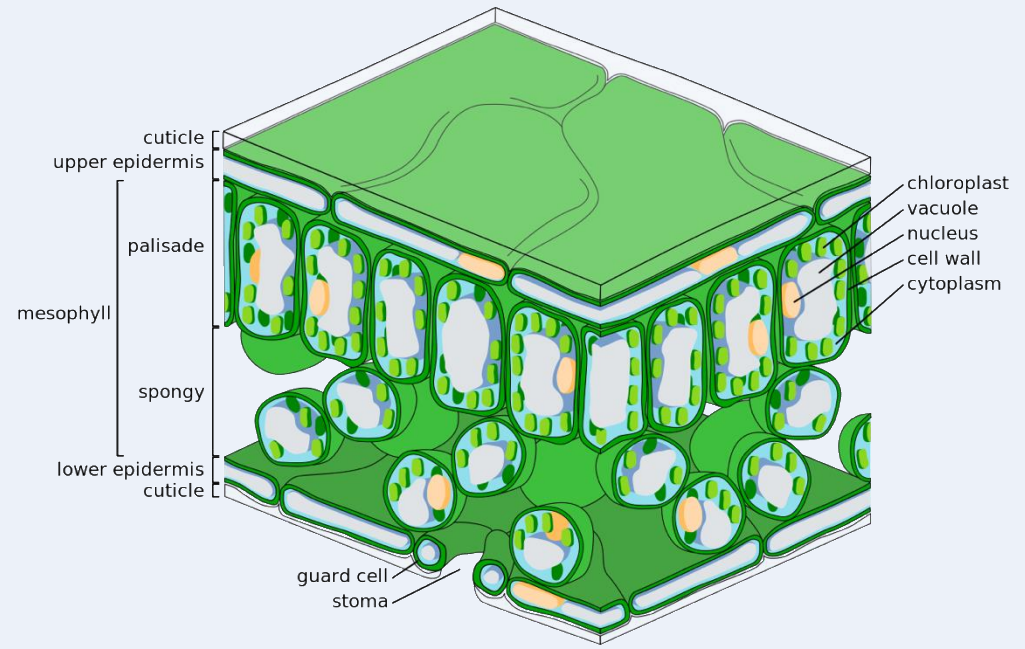
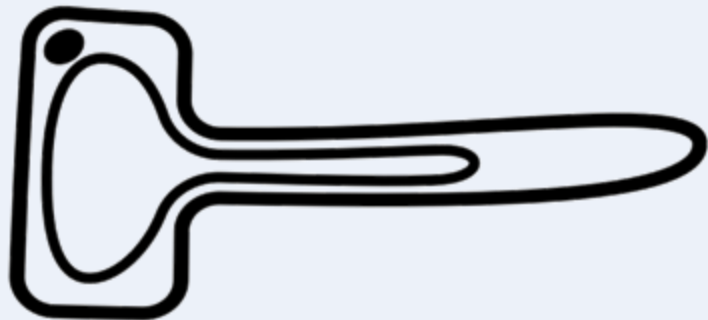
1. Which is the best definition for diffusion?
☒ A. Spreading out of liquid or gas particles resulting in net movement from high concentration to low concentration.
☐ B. Spreading out of particles resulting in net movement from a low concentration to high concentration.
☐ C. Bits of liquid or gas moving around to make the concentration the same everywhere
2. Which of these changes would not increase the rate of diffusion?
☐ A. Increasing temperature
☐ B. Increasing surface area
☒ C. Decreasing concentration gradient
3. Which of these correctly states a stage in the process of gas exchange?
☒ A. Oxygen diffuses from the alveoli into the bloodstream.
☐ B. Carbon dioxide diffuses from the alveoli into the bloodstream.
☐ C. Urea diffuses from the bloodstream into cells.

Diffusion in Living Things

Unicellular organisms have a relatively **high surface area to volume ratio**, which allows efficient diffusion of required substances



Large multicellular organisms generally have a lower surface area to volume ratio but many have **adaptations** that increase their surface area to allow more efficient diffusion



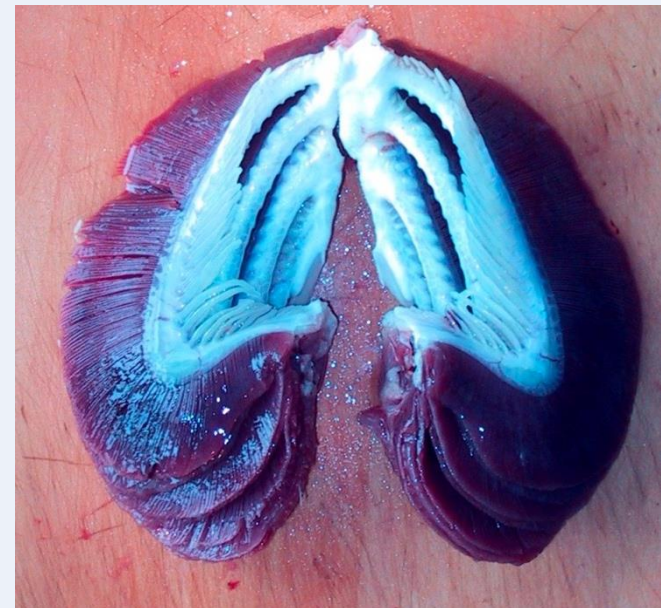
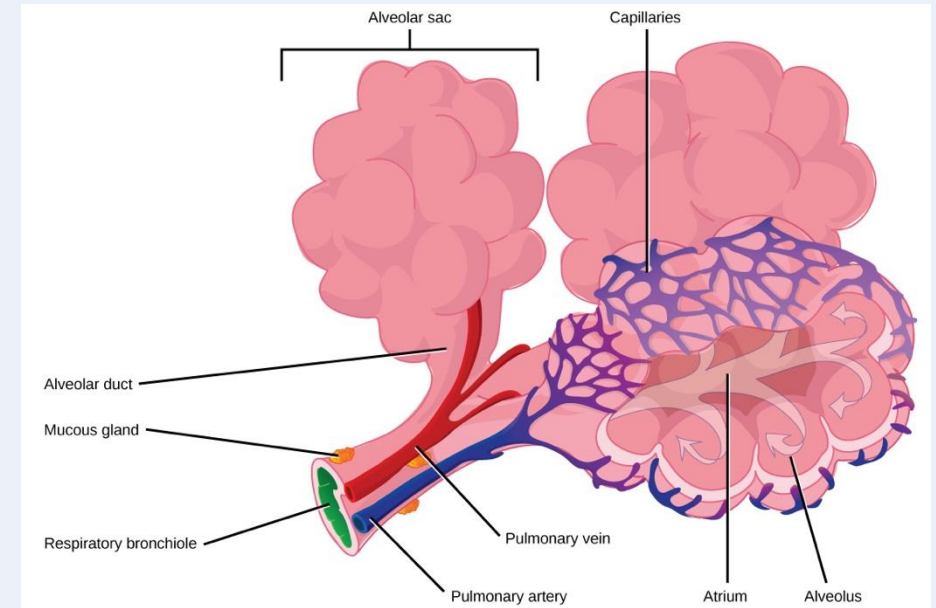
Diffusion in Living Things

Cell membranes are often very **thin**, creating a very **short path for diffusion**

Alveoli in the lungs maximise the surface area

Gills are also structured to have a large surface area

Alveoli and gills both have an **efficient blood supply**, which helps to maintain a **large concentration gradient** as substances are carried away quickly



Quick Quiz

Choose the correct answer for each question:

1. Why are unicellular organisms usually able to allow efficient diffusion?

- ☐ A. They always have a large surface area
- ☐ B. They have a small surface area to volume ratio
- ☒ C. They have a large surface area to volume ratio

2. What do alveoli and gills have in common?

- ☒ A. They both have a large surface area and efficient blood supply
- ☐ B. They both allow organisms to breathe
- ☐ C. They both allow carbon dioxide to diffuse in and oxygen to diffuse out

3. Which is an example of an adaptation to increase efficiency of diffusion?

- ☐ A. Red blood cells having a large volume so they can carry a lot of oxygen
- ☒ B. Root hair cells have a large surface area so a lot of water can be absorbed
- ☐ C. Spongy mesophyll cells having lots of chloroplasts to absorb sunlight

Drill

1. Name the type of organism with a large surface area:volume ratio
2. State the function of alveoli and gills.
3. State and explain how the following structures have adapted to maximise efficient diffusion in larger multicellular organisms:
 - a) Cell membranes
 - b) Blood supply
 - c) Structures with projections/finger like shape
4. State where oxygen diffuses to, from the alveoli, during inhalation.
5. Describe the shape of a villi in the small intestine
6. Explain why this shape helps diffusion to take place

Drill answers

1. Unicellular organism
2. Gas exchange
3.
 - a) Thin membrane for short diffusion pathway
 - b) Good blood supply to maintain concentration gradient
 - c) These structures have a large surface area for maximum diffusion
4. Capillaries/the blood
5. Finger-like projection
6. Increases surface area

I: Explain *using scientific understanding to make something clear*

Example question:

Explain how the human respiratory system is adapted to maximise the rate of gas exchange (give three adaptations).

Model answer:

- Large number of **alveoli** to increase **surface area**
- Alveoli/capillaries have **thin walls** to reduce diffusion distance
- **Good blood supply** to maintain concentration gradient
- All of these adaptations increase the rate of diffusion, which means there is a greater rate of gas exchange

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*

Example question:

Explain how gills in fish are adapted to maximise the rate of gas exchange.

Model answer:

- Gill filament shape provides a **large surface area**
- Gill cell membranes have **thin walls** to reduce diffusion distance
- **Good blood supply** to maintain concentration gradient
- All of these adaptations increase the rate of diffusion, which means there is a greater rate of gas exchange

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*

Example question:

Explain how the small intestine is adapted for efficient absorption of nutrients into the blood by diffusion.

Model answer:

- Villi folds provide a **large surface area**
- **Walls** of villi are **thin** to reduce diffusion distance
- **Good blood supply** to maintain concentration gradient
- All of these adaptations increase the rate of diffusion

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. Which describes an example of diffusion?
 - ☐ A. Oxygen molecules moving from an area of low concentration in the bloodstream to an area of high concentration in the cells
 - ☒ B. Glucose molecules moving from an area of high concentration in the small intestine to an area of lower concentration in the bloodstream
 - ☐ C. Gills taking in water molecules to allow respiration in fish

2. Which would be useful adaptations to increase the rate of diffusion?
 - ☐ A. A long path for diffusion and thick blood vessels
 - ☐ B. A short path for diffusion and thick blood vessels
 - ☒ C. A short path for diffusion and an efficient blood supply

3. Unicellular organisms generally allow efficient diffusion because...
 - ☐ A. They are very small so don't need many molecules to have a high concentration
 - ☒ B. They have a relatively large surface area compared to their volume
 - ☐ C. They have a relatively large volume compared to their surface area

Lesson B3.1.8

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
Thank you!