

Diffusion and exchange surfaces



Task 1: Describe diffusion

a) **Define** the term diffusion.

b) **Describe**, using ideas of diffusion, how you can smell food being cooked in a kitchen from other rooms of a house.

Task 2: Explain factors which affect the rate of diffusion

a) **Complete** the table summarising the factors affecting the rate of diffusion.

Factor	Explanation
increasing temperature	
increasing surface area to volume ratio	
increasing concentration gradient	


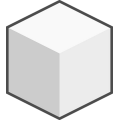
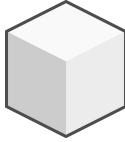
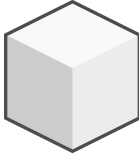
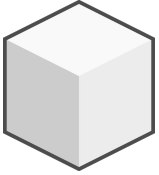
Name _____

Science Diffusion and exchange surfaces



Task 3: Calculate surface area to volume ratio

a) **Complete** the table for each cube.

Cube					
Side length	0.5cm	1.4cm	3cm	12cm	40cm
Surface area					
Volume					
SA : V					

b) **Describe** the trend in surface area to volume ratio as the cubes increase in size.

Task 4: Explain adaptations of diffusion

a) **Explain** how alveoli in the lungs are adapted for efficient gas exchange.

b) Smoking can cause a disease called emphysema. This damages the alveoli, resulting in fewer, larger air sacs instead of many smaller ones. **Explain** why this often leaves sufferers of emphysema breathless.

c) **Describe and explain** how the villi are adapted to maximise the rate of absorption of the products of digestion.

Diffusion and exchange surfaces



Task 1: Describe diffusion

a) **Define** the term diffusion.

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

b) **Describe**, using ideas of diffusion, how you can smell food being cooked in a kitchen from other rooms of a house.

Particles from the food enter the air around it. There is a high concentration of particles around the food. The particles move from an area of high concentration to an area of low concentration by diffusion.

Task 2: Explain factors which affect the rate of diffusion


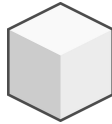
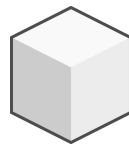
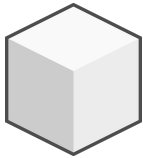
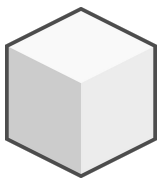
a) **Complete** the table summarising the factors affecting the rate of diffusion.

Factor	Explanation
increasing temperature	<i>Particles have more energy to move.</i>
increasing surface area to volume ratio	<i>Particles have more places to move through cell membranes.</i>
increasing concentration gradient	<i>Higher difference in concentration means particles will move quicker.</i>



Task 3: Calculate surface area to volume ratio

a) **Complete** the table for each cube.

Cube					
Side length	0.5cm	1.4cm	3cm	12cm	40cm
Surface area	1.5	11.76	54	864	9600
Volume	0.125	2.744	27	1728	64000
SA : V	12 : 1	4.3 : 1	2 : 1	0.5 : 1	0.15 : 1

b) **Describe** the trend in surface area to volume ratio as the cubes increase in size.

As the size of the cube increases, the surface area to volume ratio decreases.

Task 4: Explain adaptations of diffusion

a) **Explain** how alveoli in the lungs are adapted for efficient gas exchange.

Many tiny alveoli give the lungs a large surface area.

They have a good blood supply (lots of capillaries) to maintain a concentration gradient.

The walls are thin (one cell thick) to give a short diffusion distance for the gases.

Moist surfaces would also be acceptable.

b) Smoking can cause a disease called emphysema. This damages the alveoli, resulting in fewer, larger air sacs instead of many smaller ones. **Explain** why this often leaves sufferers of emphysema breathless.

The surface area of the lungs is reduced.

This means less oxygen can diffuse into the blood.

c) **Describe and explain** how the villi are adapted to maximise the rate of absorption of the products of digestion.

- *many villi provide large surface area*
- *many capillaries or good blood supply maintains a concentration or diffusion gradient*
- *thin wall or one cell thick surface gives a short distance for substances to travel*