

GCSE Combined Science: Trilogy

Worksheet: Diffusion

TIME 35 min	TOTAL 31 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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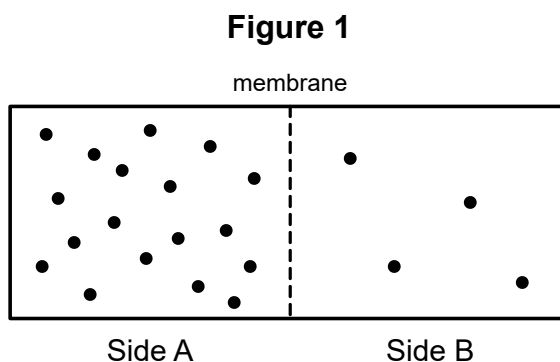
Topics: Diffusion

NAME _____ **CLASS** _____ **DATE** _____

- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

Figure 1 shows particles of a substance on each side of a membrane. The particles can pass through the membrane.



0 1 . 1

In which direction will there be a net movement of particles?

Tick (✓) **one** box.

From side A to side B

☐

From side B to side A

☐

There will be no net movement

☐

[1 mark]

0 1 . 2

Name the process by which the particles move.

.....

.....

.....

.....

[1 mark]

0 1 . 3

Describe what the arrangement of particles will be after a long time.

.....

.....

[1 mark]

0 1 . 4

Which change would increase the rate of diffusion?

Tick (✓) **one** box.

Decreasing the temperature

☐

Increasing the temperature

☐

Making the membrane thicker

☐

Making the concentration the same on both sides

☐

[1 mark]

0 1 . 5

Name **one** gas that diffuses from the air in the lungs into the blood.

.....

.....

.....

.....

[1 mark]

0 2

A student made a cube of agar jelly with sides of 3 cm to model a cell.

0 2 . 1

Calculate the surface area : volume ratio of the cube.

Give your answer in the form x : 1

.....

.....

.....

.....

.....

[3 marks]

0 3

A student investigated diffusion using a purple dye in water and cubes of agar jelly.

0 3 . 1

A crystal of the dye was placed in a dish of water. The edge of the purple colour moved 24 mm away from the crystal in 20 minutes.

Calculate the mean rate of diffusion in mm per minute.

.....

.....

.....

Rate = mm per minute

[1 mark]

0 3 . 2

An agar cube took 240 s to lose its colour in acid.

Calculate the rate using the equation: rate = $1000 \div \text{time}$

Give your answer to 3 significant figures.

.....

.....

.....

Rate =

[1 mark]

0 3 . 3

Give **one** factor, other than time, that affects the rate of diffusion.

.....

.....

[1 mark]

0 4

Substances move into and out of cells by diffusion.

0 4 . 1

What is meant by **diffusion**?

.....

.....

.....

.....

[2 marks]

0 4 . 2

Which substance diffuses out of body cells into the blood plasma so that it can be excreted by the kidneys?

Tick (✓) **one** box.

Glucose

☐

Oxygen

☐

Starch

☐

Urea

☐

[1 mark]

0 4 . 3

Give **two** factors that affect the rate of diffusion.

.....

.....

.....

.....

[2 marks]

0 5

A student made two cubes of agar jelly containing a pink indicator, one with sides of 5 mm and one with sides of 6 mm. The indicator loses its colour when acid diffuses into the agar.

0 5 . 1

Calculate the surface area : volume ratio of each cube.

Give your answers in the form $x : 1$

.....

.....

.....

.....

.....
[2 marks]

0 5 . 2

Both cubes were put into acid at the same time.

Predict which cube lost all its colour first.

Explain your answer.

.....

.....

.....

.....

[2 marks]

0 6

A student put agar cubes of three sizes, containing an alkali and a pink indicator, into acid. The student timed how long each cube took to lose all its pink colour.

Table 1 shows the results.

Table 1

Length of side of cube in cm	1	2	3
Time for colour to disappear in s	160	480	830

0 6 . 1

Calculate the rate for the 3 cm cube.

Use the equation: $\text{rate} = 1000 \div \text{time}$

Give your answer to 3 significant figures.

.....

.....

.....

Rate =

[1 mark]

0 6 . 2

Describe the relationship between the size of the cube and the time taken for the colour to disappear.

.....

.....

[1 mark]

0 6 . 3

Explain this relationship.

Use the idea of surface area : volume ratio in your answer.

.....

.....

.....

.....

[2 marks]

0 7

A student used cubes of agar jelly to model cells of different sizes.
Table 2 shows information about the cubes.

Table 2

Length of side in cm	Surface area in cm ²	Volume in cm ³	Surface area : volume ratio
1	6	1	6 : 1
2			
3	54	27	2 : 1

0 7 . 1

Calculate the surface area : volume ratio of the cube with sides of 2 cm.

.....

.....

.....

.....

.....
[2 marks]

0 7 . 2

The agar contained a coloured indicator. The student put each cube into acid and timed how long it took for all of the colour to disappear.
Predict which cube lost all its colour first.
Give a reason for your answer.

.....

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.....

.....

[2 marks]

0 7 . 3

Explain why a single-celled organism does not need a transport system, but a large multicellular organism does.

.....

.....

.....

.....

.....

.....

[3 marks]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Diffusion · 31 marks

Question 1 (5 marks)

01.1 [1 mark]

Correct: From side A to side B

01.2 [1 mark]

Answer: diffusion

- diffusion (1)
-

01.3 [1 mark]

- the particles will be evenly spread / the concentration will be the same on both sides (1)

Notes: Allow 'there will be no net movement'.

01.4 [1 mark]

Correct: Increasing the temperature

01.5 [1 mark]

Answer: oxygen

- oxygen (1)
-

Question 2 (3 marks)

02.1 [3 marks]

Answer: 2 : 1

- surface area = $6 \times 3^2 = 54 \text{ (cm}^2\text{)}$ (1)
- volume = $3^3 = 27 \text{ (cm}^3\text{)}$ (1)
- 2 : 1 (1)

Notes: Allow 54 : 27 for 2 marks.

Question 3 (3 marks)

03.1 [1 mark]

Answer: 1.2 mm per minute

- $(24 \div 20 =) 1.2$ (mm per minute) (1)

03.2 [1 mark]

Answer: 4.17

- $(1000 \div 240 =) 4.17$ (1)

03.3 [1 mark]

- temperature / difference in concentration (concentration gradient) / surface area (of the membrane) (1)

Question 4 (5 marks)

04.1 [2 marks]

- the (net) movement / spreading out of particles (of a gas or a substance in solution) (1)
- from an area of higher concentration to an area of lower concentration (1)

04.2 [1 mark]

Correct: Urea

04.3 [2 marks]

- difference in concentration / concentration gradient (1)
- temperature (1)
- surface area (of the membrane) (1)

Any 2 of the points above.

Notes: Allow thickness of the membrane / diffusion distance.

Question 5 (4 marks)

05.1 [2 marks]

Answer: 5 mm cube: $1.2 : 1$; 6 mm cube: $1 : 1$

- 5 mm cube: $150 \div 125 = 1.2 : 1$ (1)
 - 6 mm cube: $216 \div 216 = 1 : 1$ (1)
-

05.2 [2 marks]

- the 5 mm cube (1)
 - it has the larger surface area : volume ratio / the acid has a shorter distance to diffuse to the centre (1)
-

Question 6 (4 marks)

06.1 [1 mark]

Answer: 1.20

- $(1000 \div 830 =) 1.20$ (1)
-

06.2 [1 mark]

- the larger the cube, the longer the time taken (1)
-

06.3 [2 marks]

- larger cubes have a smaller surface area : volume ratio (1)
 - so the acid has further to diffuse to reach the centre / less surface for the volume of agar, so it takes longer (1)
-

Question 7 (7 marks)

07.1 [2 marks]

Answer: 3 : 1

- surface area = 24 cm^2 and volume = 8 cm^3 (1)
- 3 : 1 (1)

07.2 [2 marks]

- the 1 cm cube (1)
- it has the largest surface area : volume ratio / the shortest distance for the acid to diffuse to the centre (1)

07.3 [3 marks]

- a single-celled organism has a (relatively) large surface area : volume ratio (1)
- so diffusion across its surface is enough to meet its needs (1)
- a large organism has a small surface area : volume ratio (1)
- and diffusion distances to cells inside the body are too long, so it needs exchange surfaces and a transport system (1)

Any 3 of the points above.
