

GCSE Biology A (Gateway)

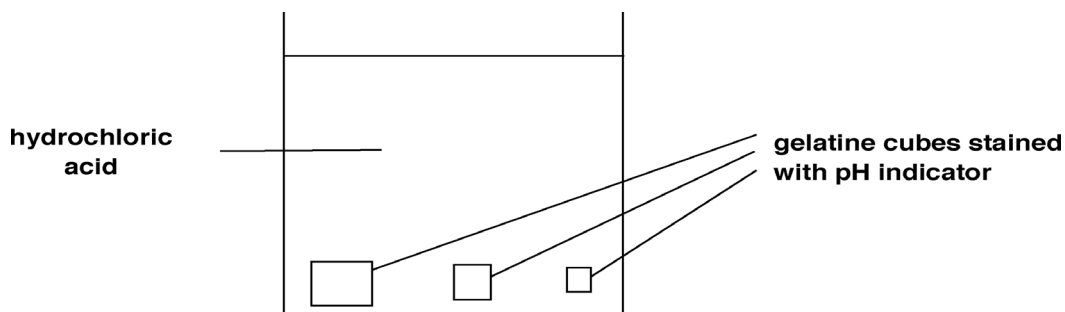
J247/03 B1-B3 and B7 Higher (Higher Tier)

Question Set 7

1

Some students investigate how the rate of diffusion in animal cells is affected by the surface area: volume ratio.

1. They use three different sized gelatine cubes stained blue with pH indicator.
2. They put the cubes into a beaker of hydrochloric acid.
3. They measure the time for each cube to completely change colour.



The table shows their results.

Length of one side of cube (cm)	surface area: volume ratio	Time to completely change colour (seconds)
1	132
2	3:1	328
3	2:1	673

- (a) (i) Calculate the surface area: volume ratio for the cube with sides of 1 cm.

[1]

- (ii) Calculate the rate of colour change for each of the three cubes.

- Write your answers in the table below.
- Show your answers in standard form.

Length of one side of cube (cm)	Rate of colour change (s^{-1})
1
2
3

[2]

(iii) Use the results and your calculations in parts **(i)** and **(ii)**.

Explain why most large multi-cellular organisms need transport systems, such as the blood system, but most single celled organisms do **not**.

[2]

(iv) Explain why using gelatine spheres instead of cubes might be more biologically accurate but suggest why the students used cubes instead.

[2]

(b) Oxygen enters red blood cells by diffusion.

Describe and explain how red blood cells are adapted for the efficient uptake and transport of oxygen.

[5]

Total Marks for Question Set 7: 12

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