

**Your teacher may watch to see if you can:**

- measure accurately
- work carefully.

In this practical you will investigate **diffusion** in agar, as a model for how cell size affects diffusion in cells.

**Aim**

To investigate the effect of cube size on the rate of diffusion through agar.

**Method**

Apparatus			Safety
<ul style="list-style-type: none"> <li>• agar cubes: 1 large, 1 medium, 1 small</li> <li>• ruler</li> <li>• beaker</li> </ul>	<ul style="list-style-type: none"> <li>• forceps</li> <li>• dilute hydrochloric acid</li> <li>• paper towel</li> <li>• rinsing water</li> </ul>	<ul style="list-style-type: none"> <li>• white tile</li> <li>• knife</li> <li>• stopclock or watch</li> <li>• eye protection</li> </ul>	<p><b>!</b> Wear eye protection and rinse splashes from skin. Take care when using the knife.</p>

- Measure the length of one side of each cube, and record these values in a copy of the table below.
- Use the forceps to place the agar cubes into the beaker.
- Pour enough hydrochloric acid over the cubes to cover them and start the clock.
- After five minutes, remove all cubes from the beaker with the forceps. Rinse the cubes in water, then blot them dry with the paper towel and place them on the white tile.
- Using the knife, carefully cut each cube in half. You should see that some or all the inside of the cube has changed from the original colour.
- Measure the distance that the colour has changed from the edge of the cube and record those values in your table.

**Recording your results**

- Use a copy of this table to record your measurements and complete the calculations.

Length of one side of cube (cm)	Volume of cube (cm <sup>3</sup> )	Distance acid diffused into block from edge in 5 min (mm)	Rate of diffusion into agar block (mm/min)

- Complete the volume column in the table, by calculating the volume of each cube from the length of one side using the formula:  

$$\text{volume of a cube} = \text{side length}^3 (\text{length} \times \text{width} \times \text{height})$$
- Complete the rate of diffusion column in the table using the formula:  

$$\text{rate (mm/min)} = \frac{\text{distance diffused in 5 min}}{5 \text{ min}}$$
- Draw a graph of the rate of diffusion against the volume of each cube using the values in your table.

**Considering your results**

- Describe any pattern shown in your graph.
- The agar cubes are models for cells. What do your results suggest about the effect of cell volume on the rate of diffusion of substances into and out of cells?