# Diffusion of colour in water: Johnstone's triangle

## Learning objectives

1 Describe the process of diffusion.

2 Explain diffusion using the particle model.

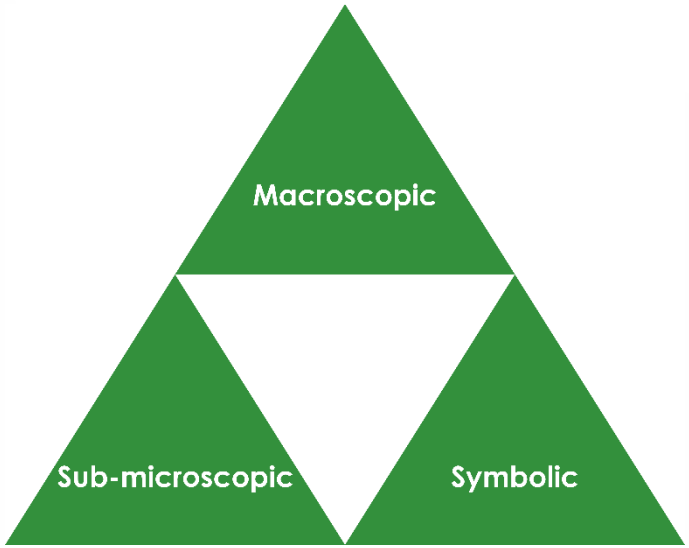
## Introduction

Diffusion happens all around us all the time. We can use coloured compounds to visualise the movement of particles.

## Johnstone's triangle

In chemistry we make sense of the things that we can see by representing what we can't see using formulas, equations, diagrams and models.

Johnstone's triangle is a way of thinking about these different concepts as different corners of a triangle:



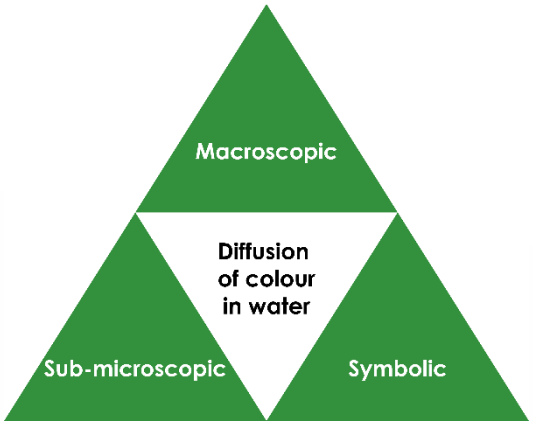

- Macroscopic – what we can see. Think about the properties we can observe, measure and record.
- Sub-microscopic – smaller than we can see. Think about the particle or atomic level.
- Symbolic – representations. Think about how we represent chemical ideas, including symbols and diagrams.

Being able to connect and move between these three different levels is important for scientific understanding.

## Macroscopic – what we can see

Watch the demonstration. Describe what you observe.

Image adapted from: © Shutterstock / NARUDON ATSAWALARPSAKUN




## Sub-microscopic – smaller than we can see

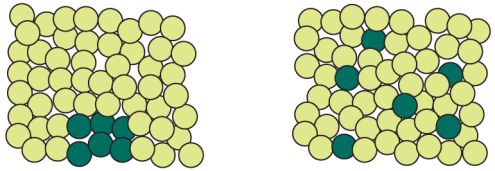
Complete the sentence:

Particles in a liquid _____ randomly. When they collide with each other they _____ direction. This means that, over time, they _____ until they are evenly distributed through the solvent.

Before particles in a solid can diffuse the solid has to dissolve. Describe the difference between **dissolving** and **diffusion**.

## Symbolic – representations

The diffusion of particles can be presented by using diagrams as shown below:



before diffusion  after diffusion

Describe what these diagrams show happening during diffusion.