



# To describe how particles diffuse

# Keywords

Particle: a small object or a tiny piece of matter

Substance: is a form of physical matter containing certain properties

Concentration: is the amount of particles in a substance

Diffusion: is the movement of a substance from an area of high concentration to an area of lower concentration

**Reviewing last lesson**

# States of matter

**States of matter** describe how **particles** appear, move or behave in different substances.

- There are three different types of states of matter:
  - **Solids**
  - **Liquids**
  - **Gases**

# Properties of solids, liquids and gases

## Solids

- Have a fixed shape and volume
- Take up a fixed amount of space and are generally not able to be compressed.
- Most can't be poured

## Liquids

- Have a fixed volume but no fixed shape
- The shape of a liquid changes to the container it is kept in.
- Similar to solids, liquids will fill a fixed amount of space

## Gases

- Spread out and will not stay in a container unless it has a lid.
- Take up all of the available space
- Can be compressed

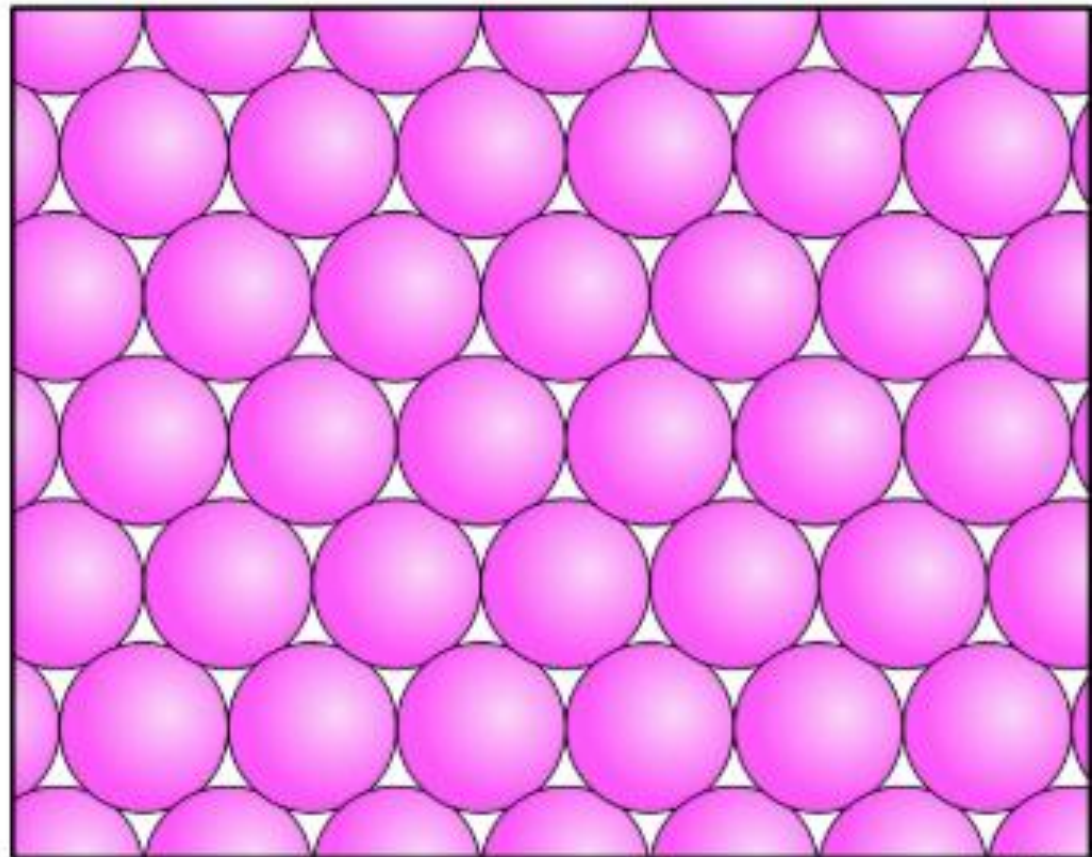
# The particle model

The **particle model** is used to explain the properties of different states of matter.

- When we describe each of the states of matter, we describe how the particles are arranged or how close or far away they sit between each other. Sometimes this is referred to as **attraction**, or how tightly bonded particles are.

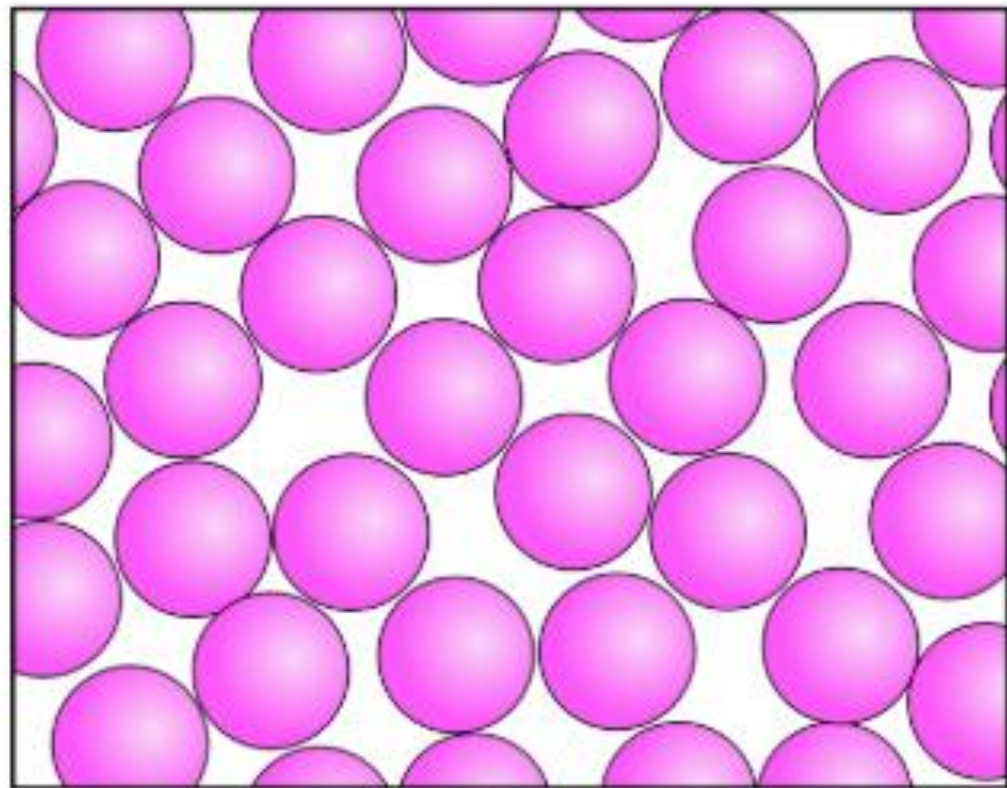
# Arrangement and movement of solids

1. Particles are **very close together** and that is why they cannot be compressed or move freely
2. Particles form a **consistent shape** that cannot easily be changed. This is because there are strong bonds between the particles.



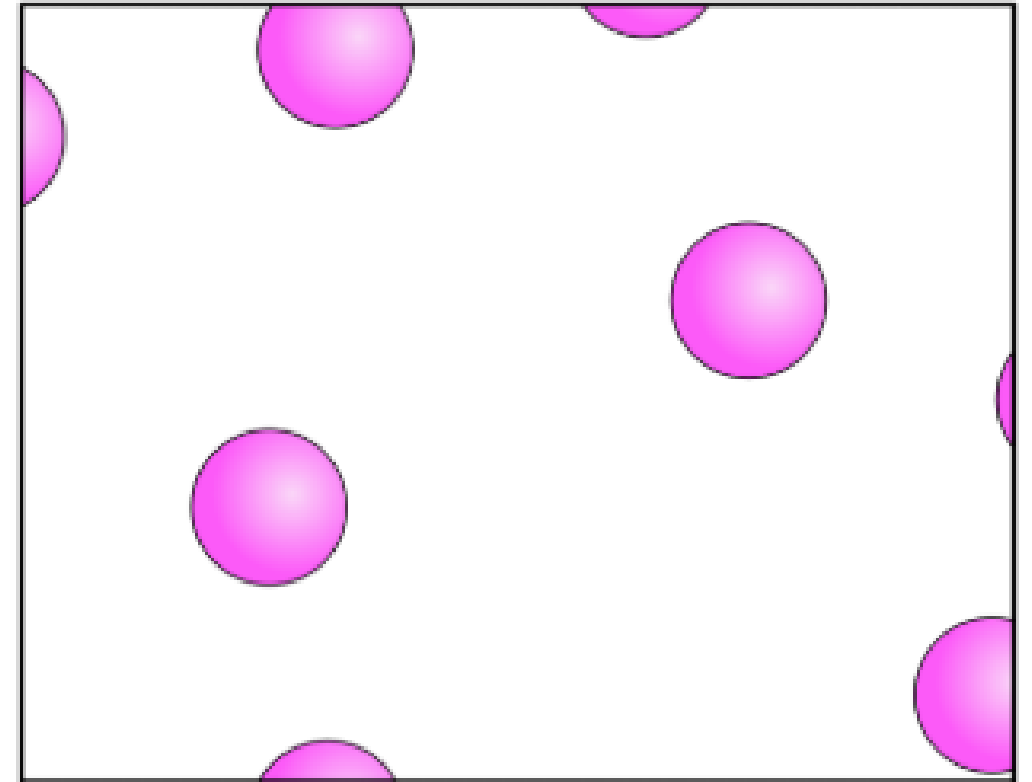
## Arrangement and movement of liquids

1. The bonds between the particles are **not as strong as solids**. This allows them to move around slightly and fill up the container.
2. They **have a fixed volume but no fixed shape** because the particles are able to move.



# Arrangement and movement of gases

1. Have **more energy** than liquids or solids as they are in constant motion because of the weak attraction between the particles.
2. Have **no fixed shape or volume** because they can spread out.
3. Due to the large space between the particles, the gases can be **compressed**.



**Concentration**

# Concentration

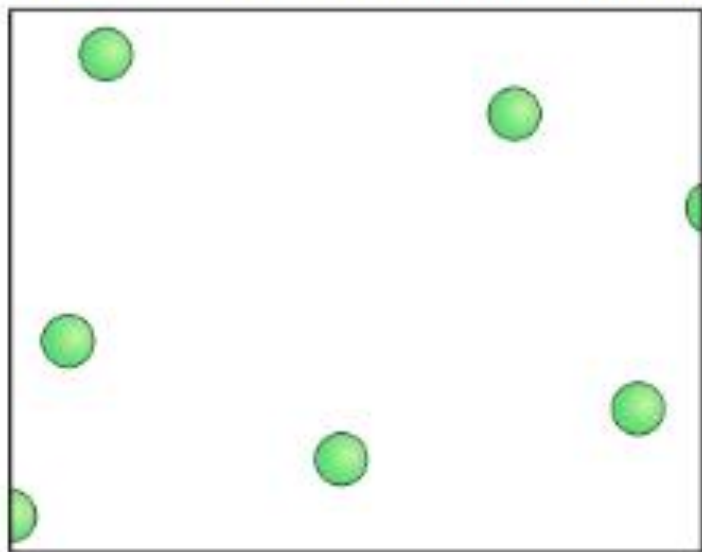
**Concentration** is the measure of how many particles are in a substance at a given period of time. It can also be described as how saturated or full something is of another substance.

Substances are measured as **high** concentration or **low** concentration.

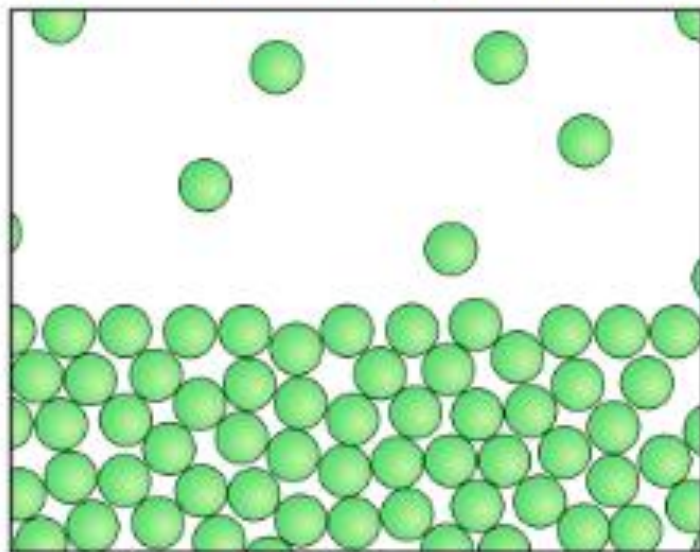
# Low versus high concentration

A high concentration means that there are **lots** of particles in a particular volume.

A low concentration means that there are **few** particles in a particular volume.

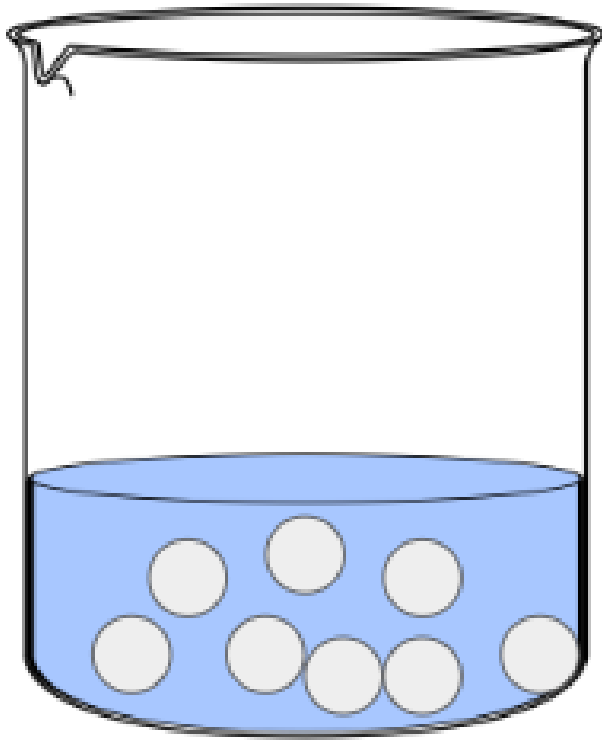
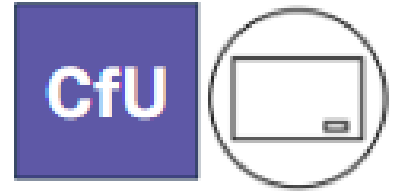


Low concentration

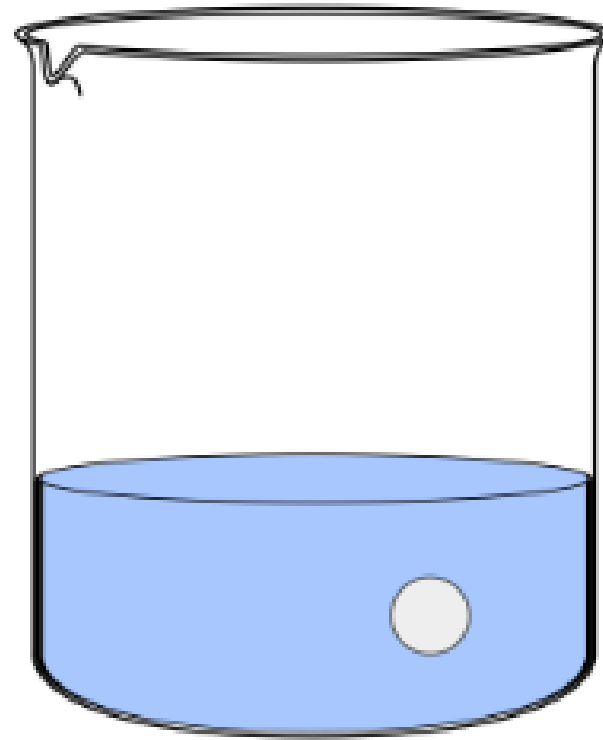


High concentration

# Which jar has the highest concentration?



High concentration



Low concentration

# Diffusion

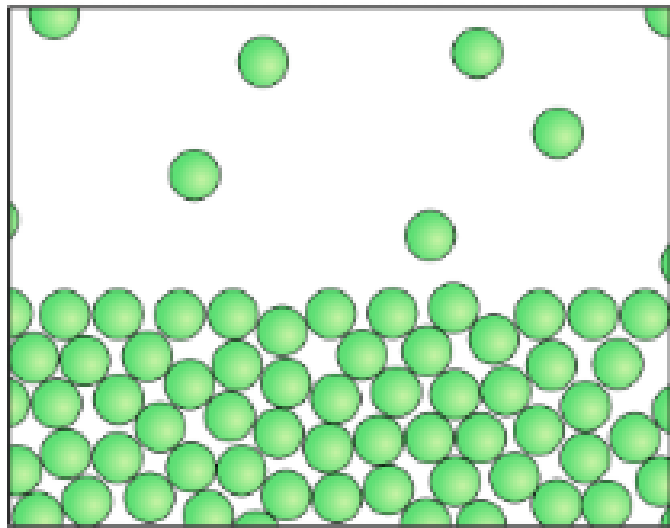
# Diffusion

**Diffusion** is the movement of one substance through another due to a movement of particles; for example, from a region of higher concentration to lower concentration.

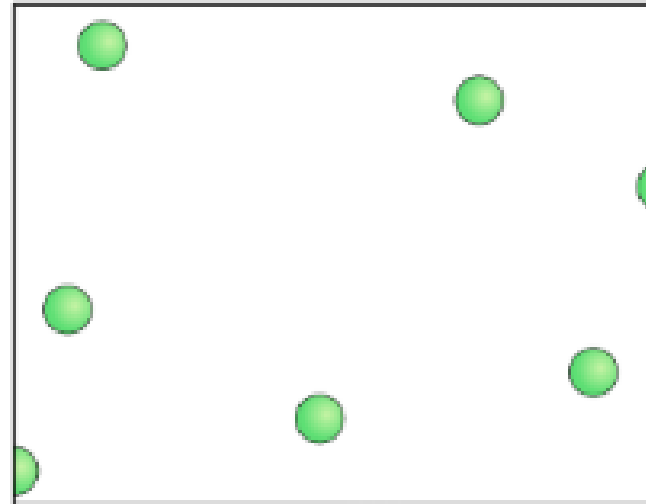
Diffusion can also be referred to as 'the spreading out of a substance.' It can only happen when one substance can spread through the particles of another substance.

# How particles diffuse

Particles travel from an area of high concentration to an area of low concentration



High concentration

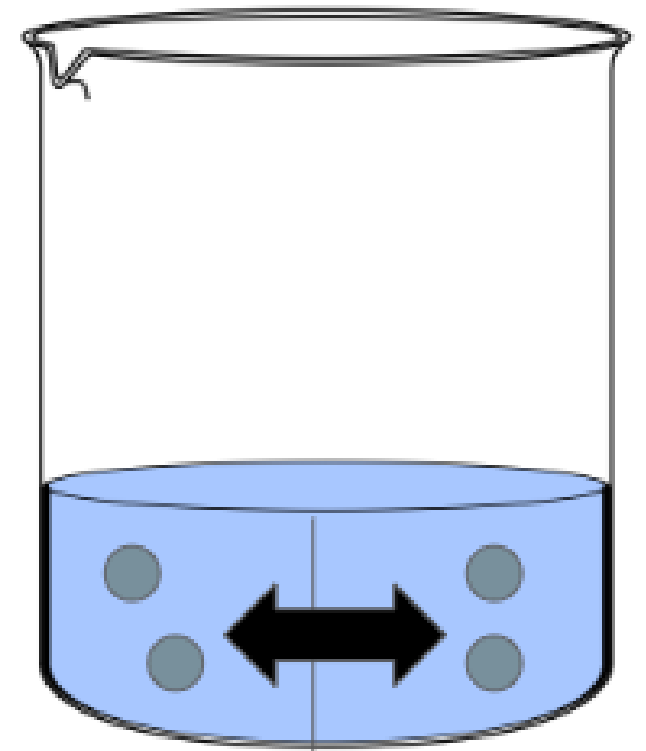


Low concentration

# Equilibrium

Equilibrium is when there is **an even or balanced** concentration of particles in both substances.

The particles can still move around in the space but the concentrations do not change.

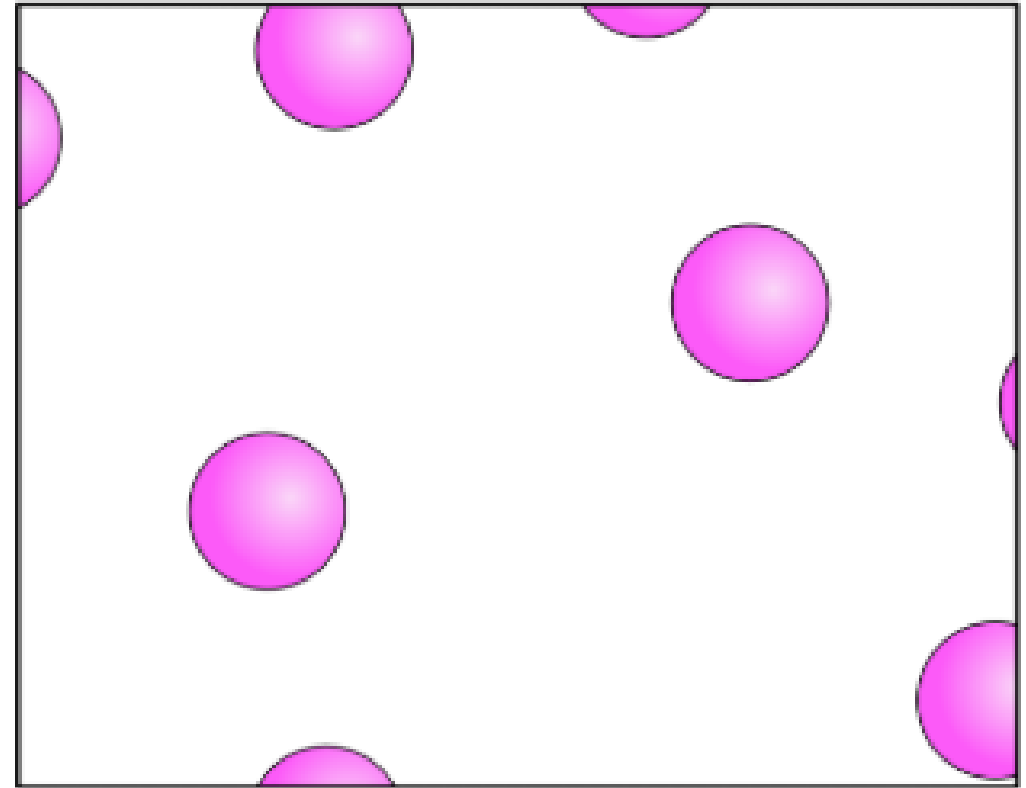


# Diffusion in the particle model

# Diffusion in gases

Diffusion **can** happen in gases because the particles are free to move around.

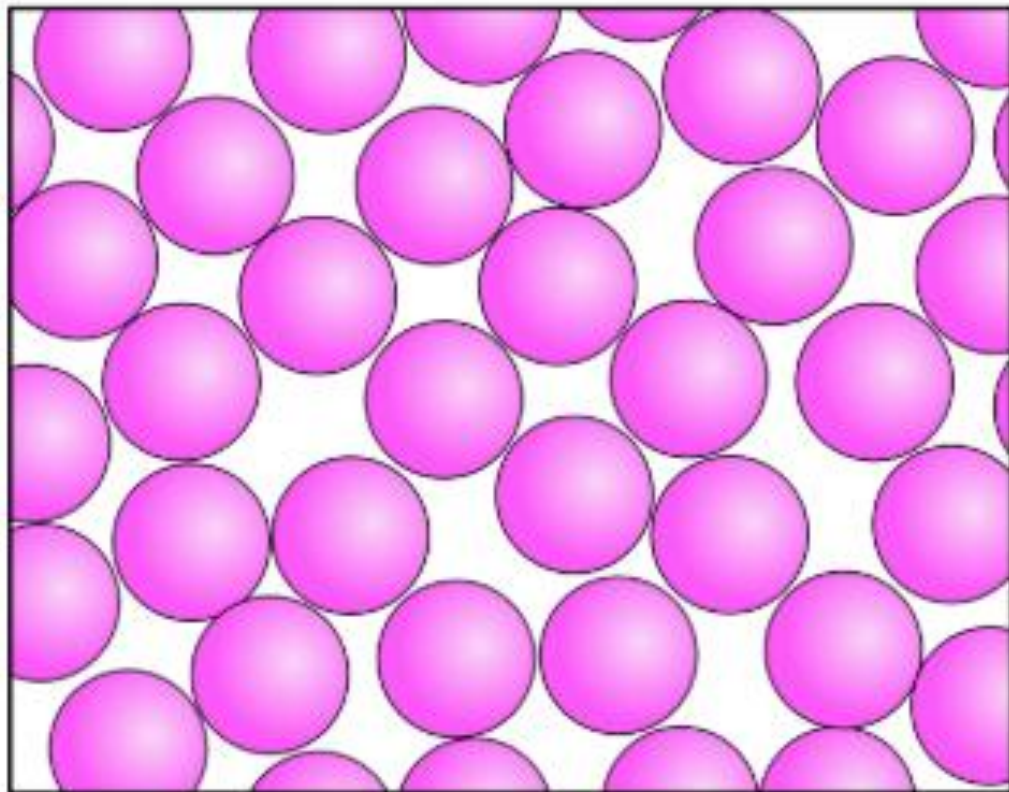
Diffusion is **fastest** in gases because the particles move faster since they have **more energy**.



# Diffusion in liquids

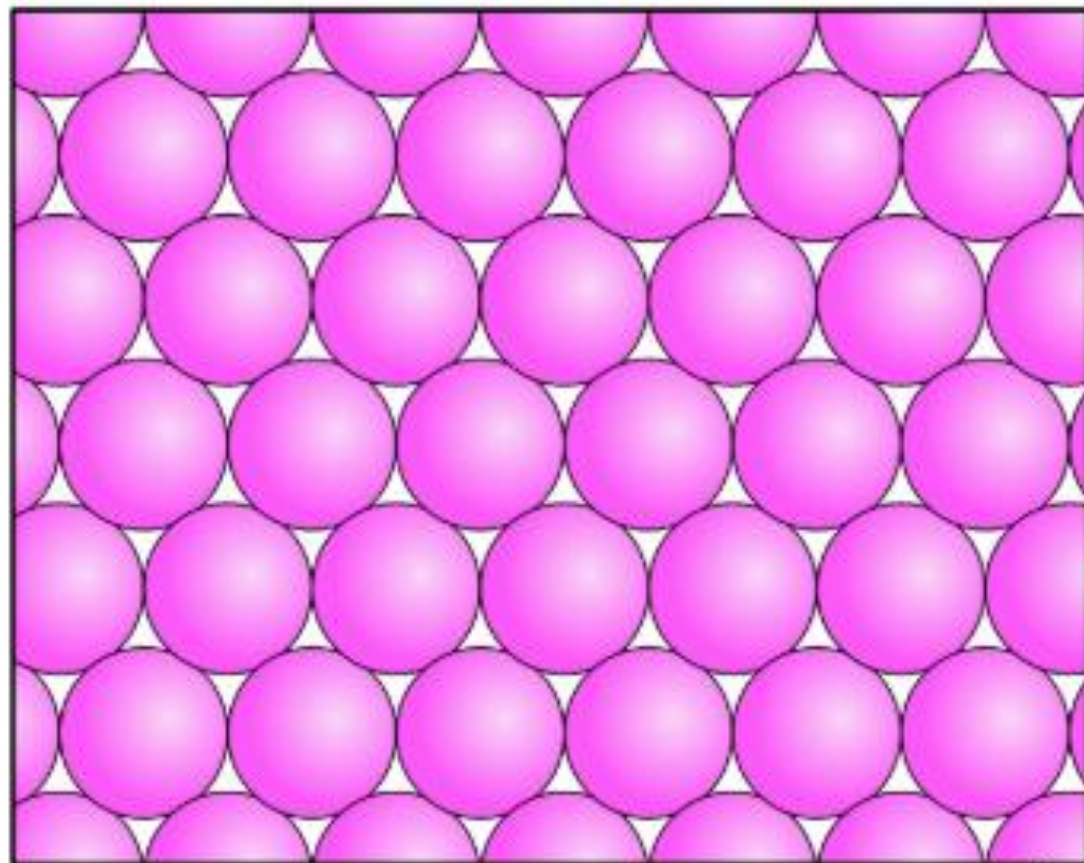
Diffusion **can** happen in liquids because the particles are free to move around.

However, the **particles move more slowly in liquids** than in gases.



# Diffusion in solids

Diffusion **cannot** happen in solids as the particles are in a fixed position.



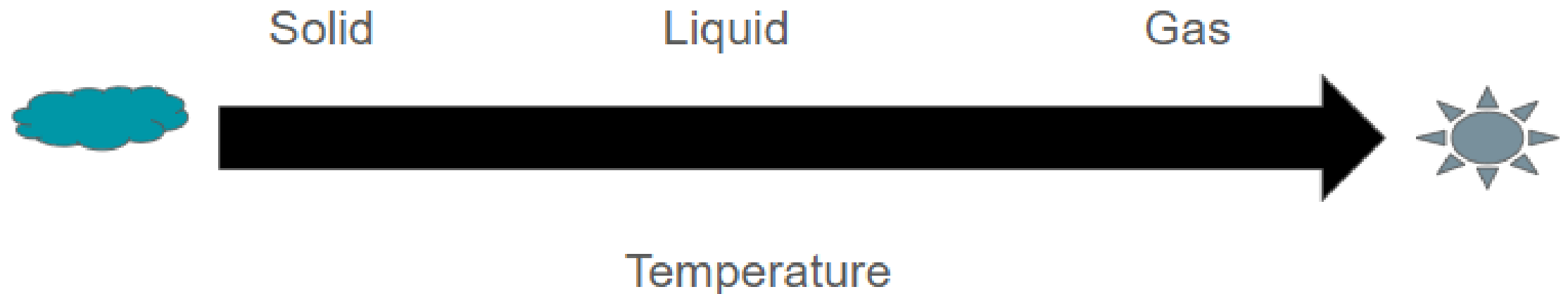
Is diffusion possible in solids, liquids and gases?

|                               | <b>Solid</b> | <b>Liquid</b> | <b>Gas</b> |
|-------------------------------|--------------|---------------|------------|
| <b>Is diffusion possible?</b> | No           | Yes           | Yes        |

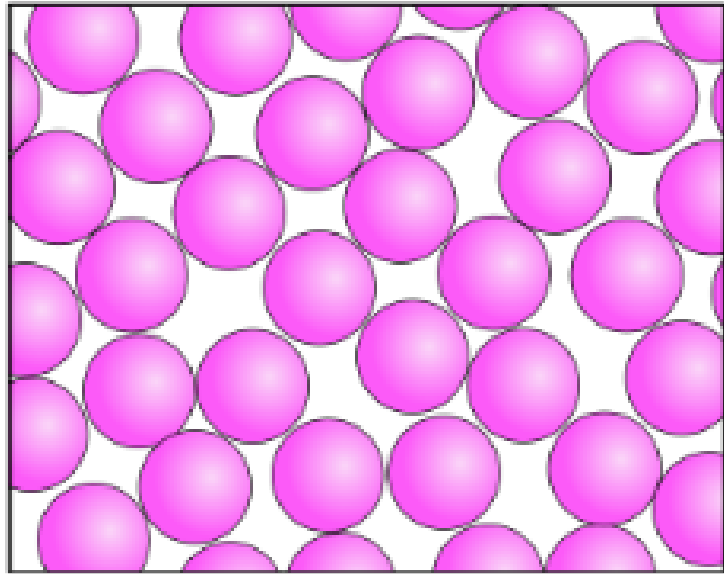
# Diffusion and temperature

Particles move continuously based on the following conditions:

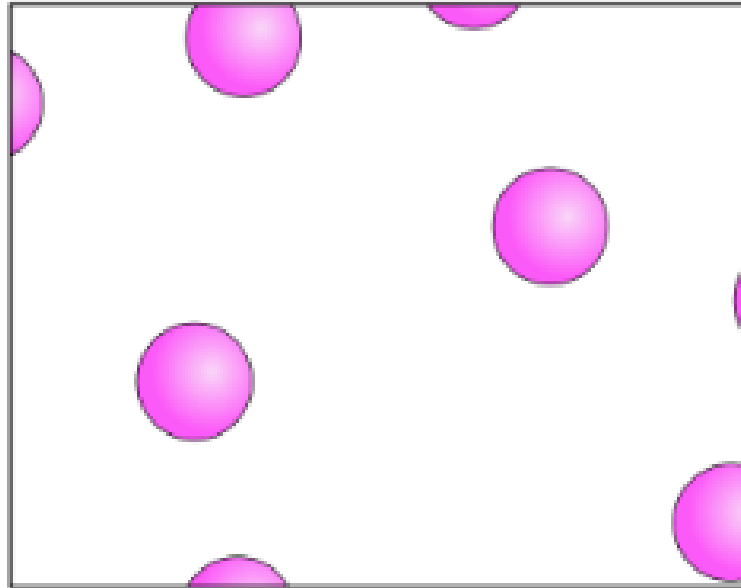
- As temperature **decreases**, the particles move more **slowly** because the particles have **less energy**.
- As temperature **increases**, the particles move **faster** because they have **more energy**.



In which image is diffusion happening the slowest?



20 °C



40 °C