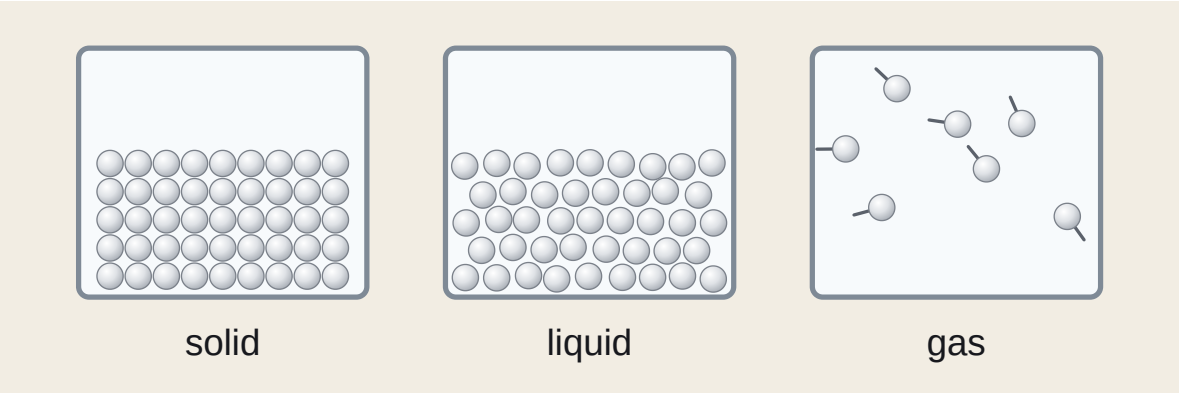
B6 · Why gases behave this way: kinetic molecular theory; ideal and real gases · Completed notes

Goals: State the main ideas of the kinetic molecular theory. Use the theory to explain gas pressure, Boyle's law and Charles's law. Compare an ideal gas with a real gas.

These are the completed notes. The blanks are filled in and each question is worked.

Slide 1 of 5 · The kinetic molecular theory

Lessons B3 to B5 gave you laws that say what a gas does. Today you learn why a gas does it.



Key ideas

In a gas the particles are **far apart**.

This picture of a gas is the **kinetic molecular theory**.

"Kinetic" means **moving**.

Hotter particles move **faster**.

Example

Name the three main ideas of the kinetic molecular theory.

1. Gas particles are far apart.
2. They move all the time, in straight lines.
3. Hotter particles move faster.

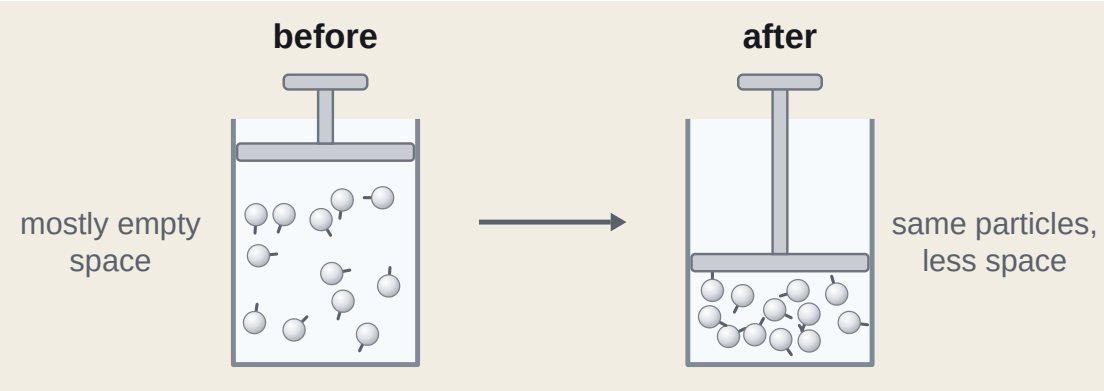
Try it

How are the particles in a gas different from the particles in a liquid?

1. In a gas the particles are far apart.
2. In a liquid the particles are close together.

Slide 2 of 5 · The theory explains squeezing and pressure

The last slide gave the three ideas of the theory. A good theory explains what we see.



Key ideas

Most of a gas is **empty space**.

A **solid** has almost no empty space.

Gas particles keep hitting the **walls**.

These hits are the **pressure**.

Example

Why can you squeeze a gas into a smaller space?

1. Gas particles are far apart, so most of a gas is empty space.
2. Squeezing pushes the particles into that empty space.

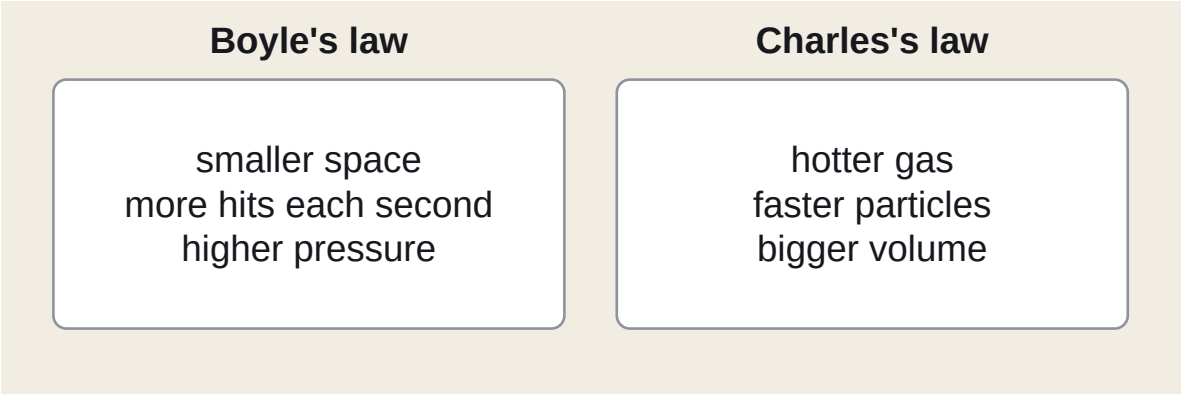
Try it

Which idea of the theory explains why a gas has pressure?

1. The particles move all the time.
2. So they keep hitting the walls, and the hits are the pressure.

Slide 3 of 5 · The theory explains Boyle's law and Charles's law

The last slide used the theory to explain pressure. It also explains the gas laws from lessons B3 and B4.



Key ideas

In half the space, each particle hits a wall **more often**.

More hits each second means more **pressure**.

Heat a gas and its particles move **faster**.

If the walls can move, the volume gets **bigger**.

Example

A gas is squeezed into half the space. Use particles to say why its pressure goes up.

1. The particles have less far to go between walls.
2. Each particle hits a wall more often.
3. More hits each second means more pressure.

Try it

A balloon is warmed. Use particles to say why it gets bigger.

1. The particles move faster.
2. They hit the balloon skin harder and more often.
3. The skin is pushed out, so the volume gets bigger.

Slide 4 of 5 · An ideal gas

The last slide explained two gas laws with particles. Those laws are exactly true only for an imaginary gas.



Key ideas

An **ideal gas** follows the gas laws exactly.

Its particles have no **size** of their own.

Its particles do not **attract** each other at all.

Example

Name the two special features of the particles of an ideal gas.

1. They have no size of their own.
2. They do not attract each other at all.

Try it

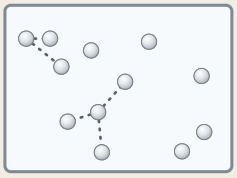
No real gas is ideal. Why do chemists still use the idea of an ideal gas?

1. It makes the math simple.
2. For most gases the answers are very close to the truth.

Slide 5 of 5 · Real gases

The last slide described an ideal gas, which is imaginary. Now compare it with the gases that really exist.

some size



a little attraction
(dotted lines)

	ideal gas	real gas
particle size	none	small
attraction	none	weak
follows the gas laws	always	nearly, most of the time
turns to a liquid	never	yes, if cold enough

Key ideas

A **real gas** is any gas that exists.

Its particles take up a little **space**.

Its particles **attract** each other a little.

At very low temperature a real gas turns into a **liquid**.

Example

Name two ways a real gas differs from an ideal gas.

1. Its particles take up a little space.
2. Its particles attract each other a little.

Try it

When does a real gas act least like an ideal gas?

1. At very high pressure, because the particles are crowded.
2. At very low temperature, because the particles are slow and attract each other.