1 What is a gas?

Gases are made of small PARTICLES that spread out to fill any space.

Ever wondered why a balloon makes a loud bang when it is popped? The answer is that the air rushes out of the hole at the speed of sound (Picture 1).

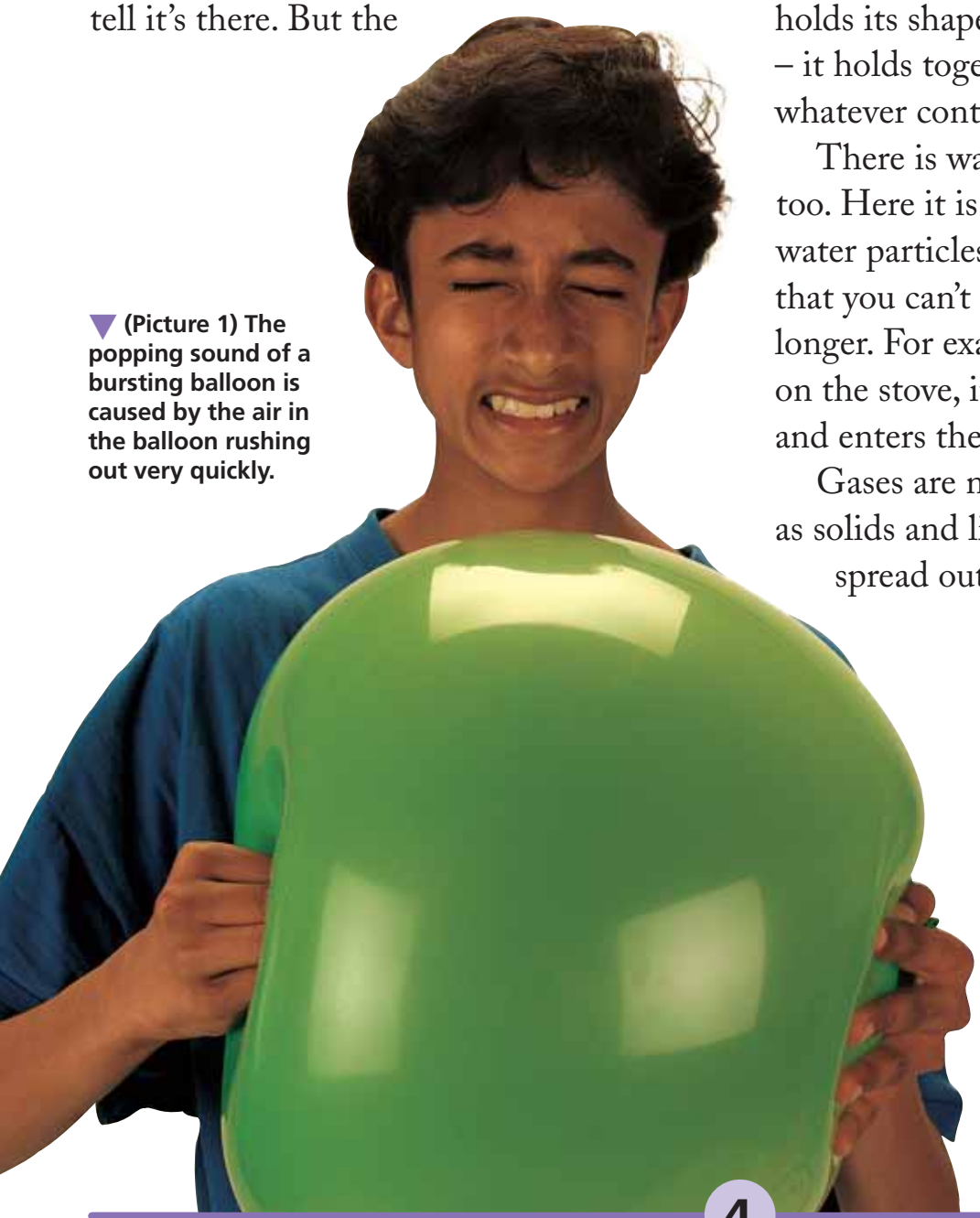
Air is a **GAS**. A gas is a **SUBSTANCE** that is spread so thinly you usually can't tell it's there. But the bursting balloon should convince you that gas is real enough!

Gas is very different from a **SOLID** or a **LIQUID**. Think about water, and you will see how different gas really is.

The water in an ice cube is solid – it holds its shape. Water can also be a liquid – it holds together, but takes the shape of whatever container it is in.

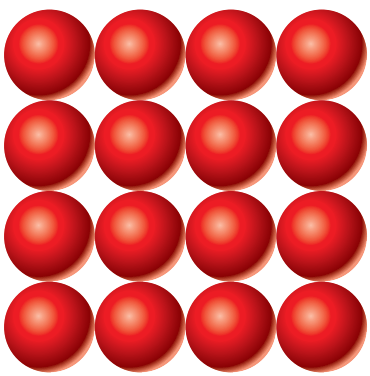
There is water in the air around you too. Here it is a gas. In this form, the water particles are spread out so thinly that you can't see or touch the water any longer. For example, when you boil water on the stove, it turns into a gas (steam) and enters the air.

Gases are made of the same substances as solids and liquids, but they are able to spread out to fill any space.



▼ **(Picture 1) The popping sound of a bursting balloon is caused by the air in the balloon rushing out very quickly.**

In a solid, all of the particles are locked together. They can't move, so the solid can't change shape without being pulled or pushed.



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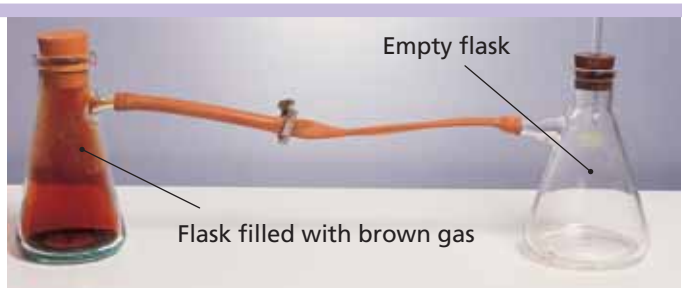
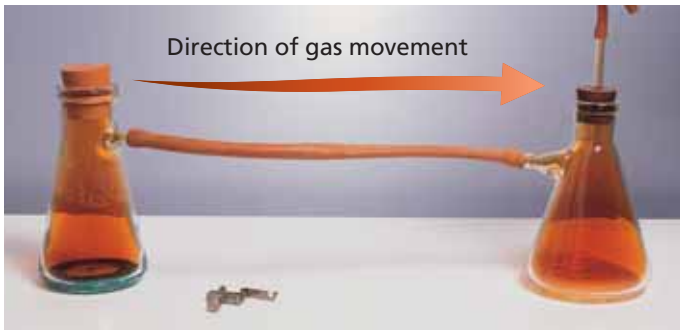




▲ (Picture 2) Gases will rush to fill any space left empty. (Top) The flasks are kept separated by the clamp on the tube. (Bottom) As soon as the clamp was removed, the gas rushed from one flask to the other in less than a thousandth of a second.

How gases move

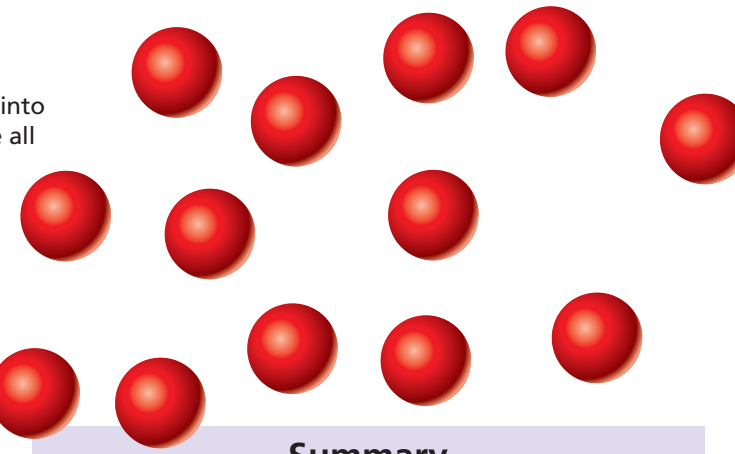
It's hard to see what air does because it is colourless. But scientists can show how gases move with a demonstration using a coloured gas (Picture 2).

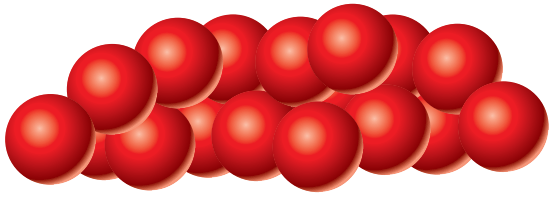
At the start of the demonstration, there are two glass flasks connected by a tube. The tube is clamped so that nothing can get from one flask to the other. In one glass flask the scientist puts a dark brown gas. All of the air in the other flask is pumped out, so it is completely empty.

What you see next seems to happen almost by magic. When the scientist takes the clamp off, in an instant both flasks are full of brown gas. The gas particles moved at 500 metres per second!

Both flasks are now completely full and exactly the same colour. But the gas in each flask is now a paler shade of brown, so the gas must be more thinly spread than when it was all trapped in just one flask. This tells us that the brown gas is now shared equally between the flasks and is less **CONCENTRATED**.

In a gas, the particles are no longer attached to one another, but are moving freely around. They bounce into one another, pushing each other apart, until they are all evenly spaced. The more space there is for them to fill, the farther apart the particles will spread. A gas has no fixed size or shape and it can always take up more space than a solid or a liquid – usually a great deal more space.





In a liquid, all of the particles can slide past one another, so they have no fixed shape. Nevertheless, they take up about the same amount of space as the solid.

Summary

- **Gases are made of particles that continually bounce off one another.**
- **Gases fill any space they can.**
- **When gases fill more space they become more spread out.**