

Additional Teacher Background

Chapter 1, Lesson 5, p.49

Contracting and expanding happens differently for a gas than it does for liquids and solids.

Cooling a liquid or solid

When a liquid or solid is cooled, the particles (atoms or molecules) slow down. The slower motion allows the attractions between the particles to pull themselves closer together causing the liquid or solid to contract.

Cooling a gas

But it works differently for gases. When a gas in a flexible container like a balloon or bubble is cooled, its atoms or molecules also slow down. But the attractions between the particles of a gas are so weak that they cannot pull themselves closer together like in a liquid or solid. Instead, the slower-moving molecules hit the inside of the balloon or bubble less frequently and with less force. This results in a lower pressure inside the bubble than outside. The higher pressure on the outside pushes on the bubble, making it contract.

Heating a liquid or solid

When a liquid or solid is heated, the particles it is made of move faster. This increased motion competes with the attractions the particles have for each other causing them to move slightly further apart.

Heating a gas

When a gas is heated, the particles also move faster but they do not have to compete with significant attractions. The particles hit the inside of the bubble more frequently and with more force. This results in a higher pressure inside the bubble than outside. The higher pressure on the inside pushes on the bubble, making it expand.