

Gas Volume and Temperature

Since temperature relates directly to kinetic energy, at lower temperatures gas molecules slow down and press less on the walls of the container. If you have an expandable container, as temperature decreases the volume decreases.

Jacques Charles discovered for each °C increase, gases expand by $1/273^{\text{rd}}$ of their volume at 0°C.

See Figure 11.17 on pg 440

Kelvin: a temperature scale with -273 °C as 0 K

$$K = ^{\circ}\text{C} + 273$$

Ex 1. Convert each quantity into Kelvin

- a) 0 °C
- b) 100 °C
- c) -72 °C

Charles' Law: The volume of a fixed mass of gas is proportional to its Kelvin temperature when pressure is kept constant.

Ex 1. A balloon is inflated with $37\text{ }^{\circ}\text{C}$ air, then dipped into liquid nitrogen ($-195.8\text{ }^{\circ}\text{C}$). What is the final volume of the balloon?

Ex 2. A sealed Ziplock bag contains 36 ml of air in the fridge ($5\text{ }^{\circ}\text{C}$). The bag is taken out and left on the counter for the day. If the bag now contains 42 ml of air, what is the temperature of the room?