Combined Gas Law

Summary of Relationships

Boyle's Law $V \propto \frac{1}{P}$ or $P_1 V_1 = P_2 V_2$ (inverse) P⇧, V⇩ / P⇩, V⇧

Gay-Lussacs Law $P \propto T$ or $\frac{P_1}{T_1} = \frac{P_2}{T_2}$ (direct) P⇧, T⇧ / P⇩, T⇩

Charles' Law $V \propto T$ or $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ (direct) V⇧, T⇧ / V⇩, T⇩

Combine these relationships to get the following:

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

The Combined Gas Law

T must be in Kelvin

e.g. a given mass of gas occupies 6.3L at 101kPa and 0°C. What volume will it occupy at 143kPa and 113°C?

V_1= 6.3L V_2= ?

P_1= 101kPa P_2= 143kPa

T_1= 273K T_2= 386K

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \quad \frac{(101kPa)(6.3L)}{273K} = \frac{(143kPa)(V_2)}{386K}$$

$$V_2 = 6.3L$$