Demo: heating a corked test tube

Aim: How do we explain the behavior of gases? (Part II)

1. What's happening? {↑P, $V_{constant}$, ↑T}

a) In a rigid container the volume is constant, the pressure increases as the temperature increases; it's a "direct" relationship

b) **Lussac's Law**: At constant volume, the pressure of a gas is directly related to its **Kelvin** temperature.

c) **Why?** The **KMT** says, in a rigid container, as the temperature of a gas increases, its molecules collide against the walls of the container **more often & with greater force** which causes the pressure to increase.

2. Demo: steel bell with pressure gauge attached.

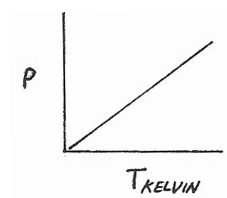
a) **DATA**

P	T	
15 kPa	25°C →	298 K
30	~~50~~ 323 °C ←	596 K

DO NOT FORGET TO CONVERT TO KELVIN

Double T, Double P

b) **GRAPH**



a "direct" relationship

c) **FORMULA**

$$\frac{P}{T} = \text{a constant number} \rightarrow \frac{P_1}{T_1} = \frac{P_2}{T_2}$$

3. Refer to Handout. Finish problems.

RCHEM1/Chille   Gay-LussacsLaw03.m&e

Gay-Lussac'sLaw - At constant V, P is directly related to T.

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

1) If the Kelvin temperature of a gas is doubled, at constant volume, what will happen to its pressure?

Double T, Double P ; Direct relationship

2) A gas, in a 100 ml rigid container, exerts 300 kPa at 10°C. What will be its pressure at 20 °C?

P_1 ; $T_1 = 10 + 273 = 283\ K$; $T_2 = 20 + 273 = 293 K$; $P_2 = ?$

Constant V → $\frac{P_1}{T_1} = \frac{P_2}{T_2}$ → $\frac{300}{283} = \frac{P_2}{293}$

$300 \cdot 293 = 283 \cdot P_2$

$\frac{300 \cdot 293}{283} = P_2$

$P_2 = 310.6$

→ 300 kPa