

Gas Pressure, Temperature, and Volume Answer Key

- If V decreases, then P increases. The pressure would increase by two times.
- The experiment illustrates Boyle's law.
 - Use $P_1V_1 = P_2V_2$ to solve for the missing pressure values.

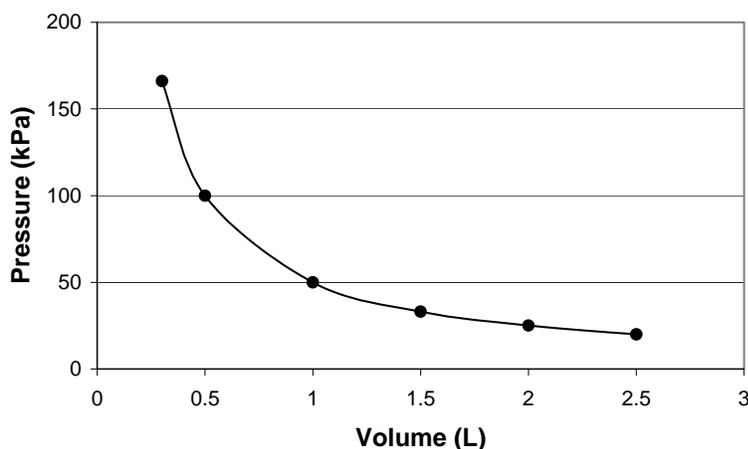
$$P_2 = 1.0 \times 10^2 \text{ kPa}$$

$$P_3 = 25 \text{ kPa}$$

(b)

Volume (L)	Pressure (kPa)
0.30	1.7×10^2
0.50	1.0×10^2
1.0	50
1.5	33
2.0	25
2.5	20

(c)



(d) This graph shows an indirect relationship between volume and pressure.

(e) To make the graph linear, you must plot volume and $\frac{1}{\text{pressure}}$.

- (a) $V_{\text{total}} = 0.5 \text{ L} + 1.5 \text{ L} = 2.0 \text{ L}$

(b) $V_1P_1 = V_2P_2$

$$1.5 \text{ L} \times 3.0 \text{ atm} = 2.0 \text{ L} \times P_2$$

$$P_2 = 2.3 \text{ atm}$$

(c) Molecules move and take up more space after the valve is opened. The volume of gas increases, there are fewer collisions per unit area, and the pressure decreases.

Gas Pressure, Temperature, and Volume Answer Key (continued)

4. This experiment illustrates Charles's Law.

(a) Use $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ to solve for the missing volumes. You must first convert all temperatures to Kelvin.

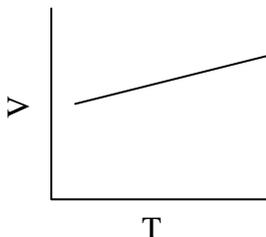
$$V_2 = 0.92 \text{ L}$$

$$V_3 = 1.6 \text{ L}$$

(b)

Temperature (°C)	Temperature (K)	Volume (L)
0	273	0.92
25	298	1.0
200	473	1.6

(c)



(d) There is a direct relationship between the two variables.

5. $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$$\frac{0.80 \text{ mL}}{298.15 \text{ K}} = \frac{V_2}{450 \text{ K}}$$

$$V_2 = 1.2 \text{ mL}$$

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

$$\frac{450 \text{ kPa}}{293.15 \text{ K}} = \frac{P_2}{308.15 \text{ K}}$$

$$P_2 = 473 \text{ kPa}$$

7. $P_1V_1 = P_2V_2$

$$(2.0 \times 10^6 \text{ atm})(1.0 \times 10^{-5} \text{ L}) = (0.275 \text{ atm})V_2$$

$$V_2 = 73 \text{ L}$$

Gas Pressure, Temperature, and
Volume Answer Key (continued)

8. (a) $T = 37\text{ }^{\circ}\text{C} + 273.15 = 310\text{ K}$
(b) $T = 801\text{ }^{\circ}\text{C} + 273.15 = 1074\text{ K}$
(c) $T = -196\text{ }^{\circ}\text{C} + 273.15 = 77\text{ K}$

9. $P_1V_1 = P_2V_2$
 $(101\text{kPa})(5.0\text{L}) = (91\text{kPa})V_2$
 $V_2 = 5.5\text{L}$

10. The hot water bath causes the air inside the flask to expand. When the flask is submerged upside down in the ice water bath, the air cools and contracts, taking up less space, and then draws water into the flask to make up for the decrease in volume of air.

11. $P_1V_1 = P_2V_2$
 $(3.0\text{atm})(15.0\text{L}) = (1.0\text{atm})V_2$
 $V_2 = 45\text{L}$

12. $\frac{V_1}{T_1} = \frac{V_2}{T_2}$
 $\frac{15.0\text{L}}{573.15\text{K}} = \frac{7.50\text{L}}{T_2}$
 $T_2 = 287\text{ K or } 13.8\text{ }^{\circ}\text{C}$