

Gas Laws Practice Worksheet

Boyle's Law: $P_1V_1 = P_2V_2$

Calculate the unknown quantity in each of the following measurements of gases.

| | P1 | V1 | P2 | V2 |
|----|-----------|-----------|-----------|------------------------|
| 1. | 3 atm | 25 mL | 6 atm | ? mL |
| 2. | 99.97 kPa | 550 mL | ? kPa | 275 mL |
| 3. | 0.89 atm | ? L | 3.56 atm | 20 L |
| 4. | ? kPa | 800 mL | 500 kPa | 160 mL |
| 5. | 0.04 atm | ? L | 250 atm | 1.0×10^{-2} L |

- A sample of neon gas occupies a volume of 2.8 L at 1.8 atm. What will its volume be at 1.2 atm?
- To what pressure would you have to compress 48.0 L of oxygen gas at 99.3 kPa in order to reduce its volume to 16.0 L?
- A chemist collects 59.0 mL of sulfur dioxide gas on a day when the atmospheric pressure is 0.989 atm. On the next day, the pressure has changed to 0.967 atm. What will the volume of the SO₂ gas be on the second day?
- 2.2 L of hydrogen at 6.5 atm pressure is used to fill a balloon at a final pressure of 1.15 atm. What is its final volume?

Charles's Law: $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

Calculate the unknown quantity in each of the following measurements of gases.

| | V1 | T1 | V2 | T2 |
|-----|-----------|-----------|-----------|-----------|
| 10. | 40.0 mL | 280 K | ? mL | 350 K |
| 11. | 0.606 L | 300 K | 0.404 L | ? K |
| 12. | ? mL | 292 K | 250 mL | 365 K |
| 13. | 100 mL | ? K | 125 mL | 305 K |
| 14. | 0.0024 L | 22°C | ? L | -14°C |

- A balloon full of air has a volume of 2.75 L at a temperature of 18°C. What is the balloon's volume at 45°C?
- A sample of argon has a volume of 0.43 mL at 24°C. At what temperature in degrees Celsius will it have a volume of 0.57 mL?

Gay Lussac's Law:
$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

Calculate the unknown quantity in each of the following measurements of gases.

| | P1 | T1 | P2 | T2 |
|-----|-----------------------------|-----------|-----------------------------|-----------|
| 17. | 1.50 atm | 273 K | ? atm | 410 K |
| 18. | 0.208 atm | 300 K | 0.156 atm | ? K |
| 19. | ? kPa | 52°C | 99.7 kPa | 77°C |
| 20. | 5.20 atm | ? °C | 4.16 atm | -13°C |
| 21. | 8.33 x 10 ⁻⁴ atm | -84°C | 3.92 x 10 ⁻³ atm | ? °C |

22. A cylinder of compressed gas has a pressure of 4.882 atm on one day. The next day, the same cylinder of gas has a pressure of 4.690 atm, and its temperature is 8°C. What was the temperature on the previous day in °C?

23. A mylar balloon is filled with helium gas to a pressure of 107 kPa when the temperature is 22°C. If the temperature changes to 45°C, what will be the pressure of the helium in the balloon?

Combined Gas Law:
$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

Calculate the unknown quantity in each of the following measurements of gases.

| | P1 | V1 | T1 | P2 | V2 | T2 |
|-----|------------|-----------|-----------|------------|-----------|-----------|
| 24. | 99.3 kPa | 225 mL | 15°C | 102.8 kPa | ? mL | 24°C |
| 25. | 0.959 atm | 3.50 L | 45°C | ? Atm | 3.70 L | 37°C |
| 26. | 0.0036 atm | 62 mL | 373 K | 0.0029 atm | 64 mL | ? K |
| 27. | 100 kPa | 43.2 mL | 19°C | 101.3 kPa | ? mL | 0°C |

28. A student collects 450. mL of HCl(g) hydrogen chloride gas at a pressure of 100. kPa and a temperature of 17°C. What is the volume of the HCl at 0°C and 101.3 kPa?

29. A scientist has a sample of gas that was collected several days earlier. The sample has a volume of 392 cm³ at a pressure of 0.987 atm and a temperature of 21°C. On the day the gas was collected, the temperature was 13°C and the pressure was 0.992 atm. What volume did the gas have on the day it was collected?

30. Hydrogen gas is collected by water displacement. Total volume collected is 0.461 L at a temperature of 17°C and a pressure of 0.989 atm. What is the pressure of dry hydrogen gas collected?