

Gas Laws Worksheet: Boyle, Charles, and Combined Gas Laws

Boyle's Law Problems:

$$P_1V_1 = P_2V_2$$

$$1 \text{ atm} = 760.0 \text{ mm Hg} = 101.3 \text{ kPa} = 760.0 \text{ torr}$$

1. If 22.5 L of nitrogen at 748 mm Hg are compressed to 725 mm Hg at constant temperature. What is the new volume?
2. A gas with a volume of 4.0L at a pressure of 205kPa is allowed to expand to a volume of 12.0L. What is the pressure in the container if the temperature remains constant?
3. What pressure is required to compress 196.0 liters of air at 1.00 atmosphere into a cylinder whose volume is 26.0 liters?

Charles' Law Problems:

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

$$1 \text{ atm} = 760.0 \text{ mm Hg} = 101.3 \text{ kPa} = 760.0 \text{ torr}$$

4. Calculate the decrease in temperature when 6.00 L at 20.0 °C is compressed to 4.00 L.
5. A container containing 5.00 L of a gas is collected at 100 K and then allowed to expand to 20.0 L. What must the new temperature be in order to maintain the same pressure (as required by Charles' Law)?

6. If 15.0 liters of neon at 25.0 °C is allowed to expand to 45.0 liters, what must the new temperature be to maintain constant pressure?

Combined Gas Law Problems:

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\text{atm} = 760.0 \text{ mm Hg} = 101.3 \text{ kPa} = 760.0 \text{ torr}$$

7. A gas balloon has a volume of 106.0 liters when the temperature is 45.0 °C and the pressure is 740.0 mm of mercury. What will its volume be at 20.0 °C and 780.0 mm of mercury pressure?
8. If 10.0 liters of oxygen at STP are heated to 512 °C, what will be the new volume of gas if the pressure is also increased to 1520.0 mm of mercury?
9. A gas is heated from 263.0 K to 298.0 K and the volume is increased from 24.0 liters to 35.0 liters by moving a large piston within a cylinder. If the original pressure was 1.00 atm, what would the final pressure be?