

Combined Gas Law Problems

Use the combined gas law to solve the following problems:

- 1) If I initially have a gas at a pressure of 12 atm, a volume of 23 liters, and a temperature of 200 K, and then I raise the pressure to 14 atm and increase the temperature to 300 K, what is the new volume of the gas?

- 2) A gas takes up a volume of 17 liters, has a pressure of 2.3 atm, and a temperature of 299 K. If I raise the temperature to 350 K and lower the pressure to 1.5 atm, what is the new volume of the gas?

- 3) A gas that has a volume of 28 liters, a temperature of 45 °C, and an unknown pressure has its volume increased to 34 liters and its temperature decreased to 35 °C. If I measure the pressure after the change to be 2.0 atm, what was the original pressure of the gas?

- 4) A gas has a temperature of 14 °C, and a volume of 4.5 liters. If the temperature is raised to 29 °C and the pressure is not changed, what is the new volume of the gas?

- 5) If I have 17 liters of gas at a temperature of 67°C and a pressure of 88.89 atm, what will be the pressure of the gas if I raise the temperature to 94°C and decrease the volume to 12 liters?
- 6) I have an unknown volume of gas at a pressure of 0.5 atm and a temperature of 325 K. If I raise the pressure to 1.2 atm, decrease the temperature to 320 K, and measure the final volume to be 48 liters, what was the initial volume of the gas?
- 7) If I have 21 liters of gas held at a pressure of 78 atm and a temperature of 900 K, what will be the volume of the gas if I decrease the pressure to 45 atm and decrease the temperature to 750 K?
- 8) If I have 2.9 L of gas at a pressure of 5 atm and a temperature of 50°C , what will be the temperature of the gas if I decrease the volume of the gas to 2.4 L and decrease the pressure to 3 atm?
- 9) I have an unknown volume of gas held at a temperature of 115 K in a container with a pressure of 60 atm. If by increasing the temperature to 225 K and decreasing the pressure to 30 atm causes the volume of the gas to be 29 liters, how many liters of gas did I start with?

Name: _____ Date: _____ Period: _____

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

Boyle's Law Problems:

$$P_1V_1 = P_2V_2$$

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?
4. A 40.0 L tank of ammonia has a pressure of 12.7 kPa. Calculate the volume of the ammonia if its pressure is changed to 8.4 kPa while its temperature remains constant.

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Charles' Law Problems:

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

5. Calculate the decrease in temperature when 6.00 L at 20.0 °C is compressed to 4.00 L.

6. 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)?

7. A gas occupies 900.0 mL at a temperature of 27.0 °C. What is the volume at 132.0 °C?

8. 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?

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Combined Gas Law Problems:

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

9. 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?
10. 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?
11. 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?
12. The pressure of a gas is reduced from 1200.0 mm Hg to 850.0 mm Hg as the volume of its container is increased by moving a piston from 85.0 mL to 350.0 mL. What would the final temperature be if the original temperature was 90.0 °C?