

Lesson 8.2 - Basic Gas Laws - Boyle's, Charles', Gay-Lussac's, and Combined Gas Law

Solve all problems – you must show your work (including units). The correct answer is given in parentheses at the end of the problem.

Boyle's Law

1. A gas sample contained in a cylinder equipped with a moveable piston occupied 300.0 mL at a pressure of 2.00 atm. What would be the final pressure if the volume were increased to 500.0 mL at constant temperature? (1.20atm)
2. A balloon that contains 1.50 L of air at 1.00 atm is taken underwater to a depth at which the pressure is 3.00 atm. Calculate the new volume of the balloon. Assume that the temperature remains constant. (0.500L)
3. A 50.0 L sample of gas collected in the upper atmosphere at a pressure of 18.3 torr is compressed into a 150.0 mL container at the same temperature. A. What is the new pressure, in atm? B. To what volume would the original sample have had to be compressed to exert a pressure of 10.0 atm? (A. 8.03atm; B. 0.120L)
4. A sample of krypton gas occupies 75.0 mL at 0.400 atm. If the temperature remained constant, what volume would the krypton occupy at A. 4.00 atm; B. 0.0400 atm; C. 765 torr; D. 4.00 torr; E. 3.50×10^{-2} torr? (A. 7.50mL, B. 750.mL, C. 29.7mL, D. 5.70L, E. 651L)

Charles' Law

1. Several balloons are inflated with helium to a volume of 0.75 L at 27°C. One of the balloons was found several hours later, the temperature had dropped to 22°C. What would be the volume of the balloon when found, if no helium has escaped? (0.74L)
2. A weather balloon is filled to the volume of 150.0 L on a day when the temperature is 10.0°C. If no gases escaped, what would be the volume of the weather balloon after it rises to an altitude where the temperature is -8.00°C? (140.L)

3. A fixed quantity of gas at 23.0°C exhibits a pressure of 748 torr and occupies a volume of 10.3 L. Calculate the volume the gas will occupy if the temperature is increased to 145°C while the pressure is held constant. (14.5L)
4. A sample of gas occupies a volume of 7.50 L at 0.988 atm and 28.0°C . At what temperature, in degrees Celsius, is the volume of the gas 4.00 L if the pressure is kept constant. (-112°C)
5. A gas occupies a volume of 100.0 mL at 27.0°C and 630.0 torr. At what temperature, in degrees Celsius, would a volume of 50.0 mL be at 630.0 torr? (-123°C)

Gay-Lussac's Law

1. A sample of gas occupies 10.0 L at 100.0 torr and 27.0°C . Calculate the pressure if the temperature is changed to 127°C while the volume remains constant. (133 torr)
2. The temperature of 200.0 mL of a gas originally at STP is changed to -25°C at constant volume. Calculate the pressure of the gas in atm. (0.91atm)
3. A gas occupies a volume of 50.0 mL at 27°C and 630 mmHg. At what temperature, in $^{\circ}\text{C}$, would the pressure be 101.3 kPa if the volume remains constant? (89°C)
4. A sample of gas occupies a volume of 5.00 L at 700. mmHg and 30.0°C . At what temperature, in $^{\circ}\text{C}$, would the pressure be 600. torr if the volume remains constant? (-13.3°C)
5. A sample of gas occupies 400.0 mL at STP. Under what pressure would this sample occupy 200.0 mL if the temperature were increased to 819°C ? (8.00atm)

Combined Gas Law

1. A 280.0 mL sample of neon exerts a pressure of 660.0 torr at 26.0°C . At what temperature, $^{\circ}\text{C}$, would it exert a pressure of 940. torr in a volume of 440.0 mL? (396°C)

2. A certain gas has a volume of 500.0 mL at 77.0°C and 600.0 torr. Calculate the temperature, °C, if the volume decreased to 400.0 mL and the pressure is increased to 1.00 atm. (81.9°C)
3. A given sample of gas has a volume of 4.20 L at 60.0°C and 1.00 atm pressure. Calculate its pressure if the volume is changed to 5.00 L and the temperature to 27°C. (0.76atm)
4. A gas has a volume of 240.0mL at 25.0°C and 600.0 mmHg. Calculate its volume at STP. (174mL)
5. A certain gas occupies a volume of 550.0 mL at STP. What would its volume be at 27.0°C and 125.0 kPa? (490.mL)