

23. Convert each measurement to atm.

- (a) 1277 mm Hg
- (b) 2.38×10^5 Pa
- (c) 127 psi
- (d) 455 torr

29. The pressure in Denver, Colorado (5280-ft elevation), averages about 24.9 in. Hg. Convert this pressure to:

- (a) atmospheres
- (b) millimeters of mercury
- (c) pounds per square inch
- (d) pascals

33. A sample of gas has an initial volume of 3.95 L at a pressure of 705 mm Hg. If the volume of the gas is increased to 5.38 L, what is the pressure? (Assume constant temperature.)

39. A balloon with an initial volume of 3.2 L at a temperature of 299 K is warmed to 376 K. What is its volume at 376 K?

43. Use Charles's law to complete the table (assume pressure and number of moles of gas to be constant).

V_1	T_1	V_2	T_2
1.08 L	25.4 °C	1.33 L	_____
_____	77 K	228 mL	298 K
115 cm ³	_____	119 cm ³	22.4 °C
232 L	18.5 °C	_____	96.2 °C

45. A 0.12-mole sample of nitrogen gas occupies a volume of 2.55 L. What is the volume of 0.32 mol of nitrogen gas under the same conditions?

47. A balloon contains 0.128 mol of gas and has a volume of 2.76 L. If an additional 0.073 mol of gas is added to the balloon, what is its final volume?

51. A sample of gas with an initial volume of 28.4 L at a pressure of 725 mm Hg and a temperature of 305 K is compressed to a volume of 14.8 L and warmed to a temperature of 375 K. What is the final pressure of the gas?

55. A gas sample with a volume of 5.3 L has a pressure of 735 mm Hg at 28 °C. What is the pressure of the sample if the volume remains at 5.3 L but the temperature rises to 86 °C?

59. What is the volume occupied by 0.255 mol of helium gas at 1.25 atm and 305 K?

61. A cylinder contains 28.5 L of oxygen gas at a pressure of 1.8 atm and a temperature of 298 K. How many moles of gas are in the cylinder?

69. An experiment shows that a 248-mL gas sample has a mass of 0.433 g at a pressure of 745 mm Hg and a temperature of 28 °C. What is the molar mass of the gas?

75. A heliox deep-sea diving mixture delivers an oxygen partial pressure of 0.30 atm when the total pressure is 11.0 atm. What is the partial pressure of helium in this mixture?

81. A heliox deep-sea diving mixture contains 4.0% oxygen and 96.0% helium. What is the partial pressure of oxygen when this mixture is delivered at a total pressure of 8.5 atm?

83. Calculate the volume of each gas sample at STP.

- (a) 22.5 mol Cl₂
- (b) 3.6 mol nitrogen
- (c) 2.2 mol helium
- (d) 27 mol CH₄

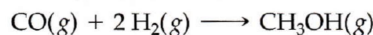
85. Calculate the volume of each gas sample at STP.

- (a) 73.9 g N₂
- (b) 42.9 g O₂
- (c) 148 g NO₂
- (d) 245 mg CO₂

87. Calculate the mass of each gas sample at STP.

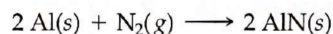
- (a) 178 mL CO₂
- (b) 155 mL O₂
- (c) 1.25 L SF₆

91. CH₃OH can be synthesized by the reaction:



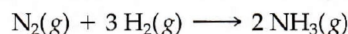
How many liters of H₂ gas, measured at 748 mm Hg and 86 °C, are required to synthesize 0.55 mol of CH₃OH? How many liters of CO gas, measured under the same conditions, are required?

93. Nitrogen reacts with powdered aluminum according to the reaction:



How many liters of N₂ gas, measured at 892 torr and 95 °C, are required to completely react with 18.5 g of Al?

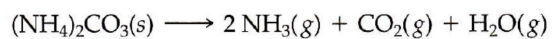
95. How many grams of NH₃ form when 24.8 L of H₂(g) (measured at STP) reacts with N₂ to form NH₃ according to this reaction?



99. Use the ideal gas law to show that the molar volume of a gas at STP is 22.4 L.

111. When hydrochloric acid is poured over a sample of sodium bicarbonate, 28.2 mL of carbon dioxide gas is produced at a pressure of 0.954 atm and a temperature of 22.7 °C. Write an equation for the gas evolution reaction and determine how much sodium bicarbonate reacted.

117. Ammonium carbonate decomposes upon heating according to the balanced equation:



Calculate the total volume of gas produced at 22 °C and 1.02 atm by the complete decomposition of 11.83 g of ammonium carbonate.