

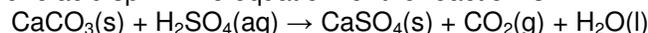
PV = nRT where R = 0.08206 L atm/ mol K 760 torr = 760 mmHg = 1 atm 0C = 273K

1. A sample of chlorine gas occupies a volume of 946 mL at a pressure of 726 mmHg. What is the pressure of the gas (in mmHg) if the volume is reduced at constant temperature to 154 mL?
2. A sample of carbon monoxide gas occupies 3.20 L at 125 °C. At what temperature will the gas occupy a volume of 1.54 L if the pressure remains constant?
3. What is the volume (in liters) occupied by 49.8 g of HCl at STP?
4. What is the volume of CO₂ produced at 37° C and 1.00 atm when 5.60 g of glucose are used up in the reaction:
$$\text{C}_6\text{H}_{12}\text{O}_6 (s) + 6\text{O}_2 (g) \rightarrow 6\text{CO}_2 (g) + 6\text{H}_2\text{O} (l)$$
5. A sample of natural gas contains 8.24 moles of CH₄, 0.421 moles of C₂H₆, and 0.116 moles of C₃H₈. If the total pressure of the gases is 1.37 atm, what is the partial pressure of propane (C₃H₈)?
6. Argon is an inert gas used in lightbulbs to retard the vaporization of the filament. A certain lightbulb containing argon at 1.20 atm and 18 °C is heated to 85 °C at constant volume. What is the final pressure of argon in the lightbulb (in atm)?
7. Which of the following is/are characteristic(s) of gases?
 - A. High compressibility
 - B. Relatively large distances between molecules
 - C. Formation of homogeneous mixtures regardless of the nature of gases
8. A gas sample has a volume of 9.8 L at 720 torr. If the temperature is constant, what volume does the gas sample have at 1.5 atm?
9. A gas has a volume of 255 mL at 725 torr. What volume will the gas occupy at 365 torr if the temperature of the gas does not change?
10. A gas has a volume of 3.86 L at a temperature of 45 °C. What will the volume of the gas be if its temperature is raised to 80 °C while its pressure is kept constant?
11. A sample of a gas has a pressure of 850 torr at 285 °C. To what Celsius temperature must the gas be heated to double its pressure if there is no change in the volume of the gas?

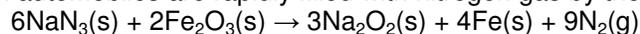
12. A sample of helium at a pressure of 740 torr and in a volume of 2.58 L was heated from 24.0 to 75.0 °C. The volume of the container expanded to 2.81 L. What was the final pressure in torr of the helium?
13. What must be the new volume of a sample of nitrogen (in L) if 2.68L at 745 torr and 24 °C is heated to 375 °C under conditions that let the pressure change to 760 torr?
14. A 2.50-L sample of neon has a pressure of 1.59 atm at 45.0°C. What volume would the sample have if the pressure is 725 Torr and the temperature 22.0°C?

15. What is the volume (in L) of 20.0 g of oxygen gas at 39°C and 2.13 atm?

16. What volume of CO₂(g) at 25°C and 760 Torr is produced when 1.00 kg of calcium carbonate is used to neutralize a sulfuric acid spill? The equation for the reaction is



17. Air bags used in automobiles are rapidly filled with nitrogen gas by the reaction below.



How many moles of NaN₃ are required to produce 40.00 L of N₂(g) at 20.00°C and 800.0 Torr?

18. Standard temperature and pressure, STP, refer to

- A. 0°C and 1 atm
- B. 0°C and 202 kPa
- C. 25°C and 1 atm
- D. 0°C and 1 Pa
- E. 298 K and 760 Torr

19. Calculate the volume of carbon dioxide produced at STP by the combustion of 1.25 moles of propane, C₃H₈(g).

20. A gas mixture contains 0.0500 moles of hydrogen, 0.0400 moles of carbon dioxide, and 0.0325 moles of nitrogen in a 2.00 L flask. If the total pressure in the flask is 1000.0 Torr, what is the partial pressure of carbon dioxide?

21. A 750-mL sample of nitrogen was collected by displacement of water from a container at 30°C and an atmospheric pressure of 742 Torr. If the vapor pressure of water at 30°C is 31.8 Torr, calculate the number of moles of nitrogen gas produced.

22. A mixture of three gases has a total pressure of 1,380 mmHg at 298 K. The mixture is analyzed and is found to contain 1.27 mol CO₂, 3.04 mol CO, and 1.50 mol Ar. What is the partial pressure of Ar?

23. Deviations from the ideal gas law are greater at

- A. low temperatures and low pressures.
- B. low temperatures and high pressures.
- C. high temperatures and low pressures.
- D. high temperatures and high pressures.

Answers:

1. $P_1 V_1 = P_2 V_2$ $P_2 = \frac{P_1 V_1}{V_2} = \frac{(726 \text{ mm Hg})(946 \text{ mL})}{(154 \text{ mL})} = 4460 \text{ mm Hg}$

2. $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ Rearranging: $T_2 = \frac{V_2 T_1}{V_1} = \frac{(1.54 \text{ L})(398.15 \text{ K})}{3.2 \text{ L}} = 192 \text{ K}$
TEMPERATURE MUST BE IN KELVIN

3. $PV = nRT$ $P = 1 \text{ atm}$ $T = 0^\circ \text{C}$ or 273 K
rearranging $V = \frac{nRT}{P}$ $n = 49.8 \text{ g} \times \frac{1 \text{ mol HCl}}{36.5 \text{ g}} = 1.37 \text{ mol}$
 $V = 30.6 \text{ L}$

4. $\text{g C}_6\text{H}_{12}\text{O}_6 \rightarrow \text{mol C}_6\text{H}_{12}\text{O}_6 \rightarrow \text{mol CO}_2 \rightarrow V \text{ CO}_2$
 $5.60 \text{ g C}_6\text{H}_{12}\text{O}_6 \times \frac{1 \text{ mol C}_6\text{H}_{12}\text{O}_6}{180 \text{ g C}_6\text{H}_{12}\text{O}_6} \times \frac{6 \text{ mol CO}_2}{1 \text{ mol C}_6\text{H}_{12}\text{O}_6} = 0.187 \text{ mol CO}_2$

$V = \frac{nRT}{P} = 4.76 \text{ L}$

5. $P_i = X_i P_T$ $P_T = 1.37 \text{ atm}$
 $X_i = \frac{0.116}{8.24 + 0.421 + 0.116} = 0.0137$
 $P_i = 0.0181 \text{ atm}$

6. 1.48 atm

7. 7. A, B and C

8. 8. 6.2 L

9. 507 mL

10. 4 L (T MUST BE IN K)

11. 840 °C

12. 8.0×10^2 torr

13. 5.7 L

14. 3.9 L

15. 7.5 L

16. 244 L

17. 1.167 Mol NaN_3

18. A

19. 84.0 L

20. 0.430 atm

21. 0.0282 mol

22. 356 mmHg

23. A