

12 • Gases and Their Properties

PRACTICE TEST

- A pressure of 745 mmHg corresponds to ____ kPa.
c) 99.3 kPa
 $745 \text{ mmHg} \times (101.3 \text{ kPa}/760 \text{ mmHg})$
- Liquid nitrogen has a boiling point of -196°C this corresponds to...
b) 77 K $-196 + 273$
- 1.20 atm is the same pressure as:
c) 912 mmHg $1.20 \text{ atm} \times (760 \text{ mmHg}/1 \text{ atm})$
- For an ideal gas, which pair of variables are inversely proportional to each other (if all other factors remain constant)?
a) P, V
- A real gas would act most ideal at
d) 0.5 atm and 546 K
low pressure & high temperature
- One mole of hydrogen, H_2 , occupies 61.2 L at
e) 100°C and .500 atm
calculated by trial and error
- A 31.0 mL sample of gas is collected at a temperature of 37°C and pressure of 720 mmHg. What is its volume at 17°C and 580 mmHg.
c) 36 mL
 $31 \text{ mL} \times (290/310) \times (720/580)$
- The coldest possible temperature of a gas is:
d) -273°C (actually -273.15°C)
- The pressure of 4.0 L of an ideal gas in a flexible container is decreased to one-third of its original pressure and its absolute temperature is decreased by one-half. The volume then is
c) 6.0 L $4 \text{ L} \times (3/1) \times (1/2)$
- A given mass of gas in a rigid container is heated from 100°C to 300°C . Which of the following best describes what will happen to the pressure of the gas? The pressure will...
c) increase by a factor less than three.
increase by ($573 \text{ K}/373 \text{ K}$)
- What is the pressure exerted by some nitrogen gas collected in a tube filled with water on a day when the room temperature is 18.0°C and the room pressure is 750.0 mmHg? [The partial pressure of water at 18°C is 15.5 mmHg.]
c) 734.5 mmHg $P_{\text{N}_2} = 750 - 15.5$
- As the average kinetic energy of the molecules of a sample increases, the temperature of the sample
b) increases T is proportional to ave. KE
- If a gas that is confined in a rigid container is heated, the pressure of the gas will...
a) increase
- A mixture of gases at 810 kPa pressure contains:
3.0 moles of oxygen gas,
2.0 moles of helium gas, and
4.0 moles of carbon dioxide gas.
What is the partial pressure of helium gas, P_{He} .
e) 180 kPa ($2 \text{ mol He}/9 \text{ mol total}$) $\times 810 \text{ kPa}$

15. If a gas has a pressure of 2.0 atm, which one of the following equations will express its pressure after...
- the number of moles has been increased to three times the original amount,
 - the absolute temperature (K) has been reduced to half, and
 - the volume has been tripled?
- b) $P_2 = 2.0 \text{ atm} \times \frac{3}{1} \times \frac{1}{2} \times \frac{1}{3}$
16. A sample of gas occupies 30.0 L at 0.800 atm and 298 K. How many moles of gas are in the sample?
- b) 0.981 $PV=nRT$ $n=PV/RT$
 $n = (.8)(30)/(.0821)(298)$
17. When ammonium nitrite undergoes decomposition, only gases are produced according to the equation:

$$\text{NH}_4\text{NO}_2(\text{s}) \rightarrow \text{N}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g})$$
What is the total volume of gases produced at 819K and 1.00 atm pressure when 128 g of ammonium nitrite undergoes the above decomposition reaction?
M of $\text{NH}_4\text{NO}_2 = 64 \text{ g/mol}$
403 L 128 g $\text{NH}_4\text{NO}_2 = 2$ moles reactant
so, there are 6 moles of product gases.
 $PV=nRT$ $V = nRT/P = (6)(.0821)(819)/(1) = \mathbf{403}$
L
18. At STP, it was found that 1.12 L of a gas had a mass of 2.78 g. Its molar mass is
- c) 55.6 g/mol STP means $P=1 \text{ atm}$; $T=273 \text{ K}$
first, use 1.12 L at STP to calculate moles
 $PV = nRT$ $n = PV/RT = (1)(1.12)/(.0821)(273)$
 $n = .04997$ moles molar mass = $2.78\text{g}/.04997 \text{ mol}$
19. A mixture of gases, nitrogen, oxygen, and carbon dioxide at 27 °C and 0.50 atmospheres pressure occupied a volume of 492 mL. How many moles of gas are there in this sample?
- a) 0.010 watch your units!
 $PV=nRT$ $n=PV/RT = (.5)(.492)/(.0821)(300)$
20. At a given temperature, gaseous ammonia molecules (NH_3) have a velocity that is _____ gaseous sulfur dioxide molecules (SO_2).
- a) greater than smaller = faster
21. The ratio of the average velocities of $\text{SO}_2(\text{g})$ to $\text{CH}_4(\text{g})$ at 300 K is
- b) 1:2 $\sqrt{(64/16)} = \sqrt{(4)} = 2$ CH_4 twice as fast as SO_2 , question asks for $\text{SO}_2:\text{CH}_4$
22. A sealed flask contains 1 molecule of hydrogen for every 3 molecules of helium at 20 °C. If the total pressure is 400 kPa, the partial pressure of the hydrogen is...
- a) 100 kPa $\frac{1}{4} \times 400 \text{ kPa}$
23. A given mass of a gas occupies 5.00 L at 65 °C and 480 mmHg. What is the volume of the gas at 630 mmHg and 85 °C?
- c) $5.00 \times \frac{358}{338} \times \frac{480}{630}$
24. Which statement best explains why a confined gas exerts pressure?
- d) the molecules collide with the container walls
25. CH_4 gas and O_2 gas are together in a container. Which statement correctly describes the **velocities** of the two molecules.
- c) The CH_4 is moving **faster**, but **not twice as fast** as the O_2 . faster by $\sqrt{(32/16)} = \sqrt{2}$