

Chapter 5 TEST: Gases

- 1) Gases generally have
 - A) low density
 - B) high density
 - C) closely packed particles
 - D) no increase in volume when temperature is increased
 - E) no decrease in volume when pressure is increased

- 2) The SI unit of pressure is the
 - A) ampere
 - B) kilojoule
 - C) newton
 - D) gram
 - E) pascal

- 3) A physics experiment is conducted at a pressure of 14.4 kPa. What is this pressure in mmHg?
 - A) 18.9 mmHg
 - B) 1.92 mmHg
 - C) 1.44×10^4 mmHg
 - D) 108 mmHg
 - E) 1.89×10^{-2} mmHg

- 4) Boyle's law states that:
 - A) Equal amounts of gases occupy the same volume at constant temperature and pressure.
 - B) The volume of a fixed amount of gas is inversely proportional to its pressure at constant temperature.
 - C) The volume of a fixed amount of gas is directly proportional to its temperature in Kelvin at constant pressure.
 - D) The total pressure of a mixture of gases is the simple sum of the partial pressure of all of the gaseous compounds.
 - E) The rates of effusion of gases are inversely proportional to the square roots of their molar masses.

- 5) A gas sample is held at constant pressure. The gas occupies 3.62 L of volume when the temperature is 21.6°C. Determine the temperature at which the volume of the gas is 3.42 L.
 - A) 312 K
 - B) 278 K
 - C) 20.4 K
 - D) 295 K
 - E) 552 K

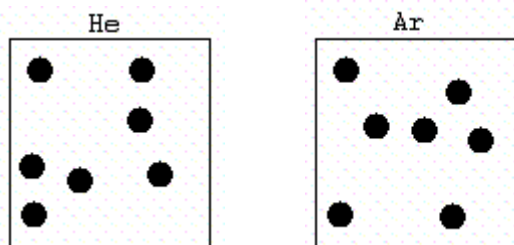
- 6) Body temperature is about 309 K. On a cold day, what volume of air at 276 K must a person with a lung capacity of 2.2 L breathe in to fill the lungs?
- A) 2.46 L
 - B) 1.97 L
 - C) 2.08 L
 - D) 3.93 L
 - E) none of these
- 7) A gas sample is heated from -20.0°C to 57.0°C and the volume is increased from 2.00 L to 4.50 L. If the initial pressure is 0.140 atm, what is the final pressure?
- A) 0.0477 atm
 - B) -0.177 atm
 - C) 0.411 atm
 - D) 0.242 atm
 - E) 0.0811 atm
- 8) A sample of 35.1 g of methane gas has a volume of 3.11 L at a pressure of 2.70 atm. Calculate the temperature.
- A) 2.92 K
 - B) 46.8 K
 - C) 320 K
 - D) 32.4 K
 - E) 35.0 K

Four identical 1.0-L flasks contain the gases He, Cl_2 , CH_4 , and NH_3 , each at 0°C and 1 atm pressure.

- 9) For which gas do the molecules have the highest average velocity?
- A) He
 - B) Cl_2
 - C) CH_4
 - D) NH_3
 - E) all gases the same
- 10) For which gas are the molecules diatomic?
- A) He
 - B) Cl_2
 - C) CH_4
 - D) NH_3
 - E) all gases the same
- 11) For which gas do the molecules have the smallest average kinetic energy?
- A) He
 - B) Cl_2
 - C) CH_4
 - D) NH_3
 - E) all gases the same

- 12) What volume of carbon dioxide measured at STP will be formed by the reaction of 1.47 mol of oxygen with 0.900 mol of ethyl alcohol, $\text{CH}_3\text{CH}_2\text{OH}$?
- A) 40.3 mL
 - B) 22.0 L
 - C) 32.9 L
 - D) 49.4 L
 - E) 0.980 L
- 13) What volume does 40.5 g of N_2 occupy at STP?
- A) 64.8 L
 - B) 1.81 L
 - C) 32.4 L
 - D) 50.7 L
 - E) none of these
- 14) A mixture is prepared from 15.0 L of ammonia and 15.0 L chlorine measured at the same conditions; these compounds react according to the following equation:
- $$2\text{NH}_3(\text{g}) + 3\text{Cl}_2(\text{g}) \rightarrow \text{N}_2(\text{g}) + 6\text{HCl}(\text{g})$$
- When the reaction is completed, what is the volume of each gas (NH_3 , Cl_2 , N_2 , and HCl , respectively)? Assume the final volumes are measured under identical conditions.
- A) 0.00 L, 5.00 L, 7.50 L, 45.0 L
 - B) 5.00 L, 0.00 L, 5.00 L, 30.0 L
 - C) 0.00 L, 0.00 L, 7.50 L, 45.0 L
 - D) 0.00 L, 0.00 L, 5.00 L, 30.0 L
 - E) 0.00 L, 10.0 L, 15.0 L, 90.0 L
- 15) An excess of sodium hydroxide is treated with 26.5 L of dry hydrogen chloride gas measured at STP. What is the mass of sodium chloride formed?
- A) 1.55 kg
 - B) 1.69 g
 - C) 0.138 kg
 - D) 69.1 g
 - E) 13.3 g
- 16) The standard temperature for gases is
- A) 100°C
 - B) 0°C
 - C) 32°C
 - D) 212°F
 - E) 0°F

- 17) Standard pressure for gases is
- 0 atm
 - 1 atm
 - 100 atm
 - dependent upon temperature
 - none of the above
- 18) A 142-mL sample of gas is collected over water at 22°C and 753 torr. What is the volume of the dry gas at STP? (The vapor pressure of water at 22°C = 20. torr)
- 122 mL
 - 162 mL
 - 136 mL
 - 111 mL
 - none of these
- 19) The valve between a 5-L tank containing a gas at 9 atm and a 10-L tank containing a gas at 6 atm is opened. Calculate the final pressure in the tanks.
- 3 atm
 - 4 atm
 - 7 atm
 - 15 atm
 - none of these
- 20) Consider the following containers, one with helium at 27°C and the other with argon at 27°C.



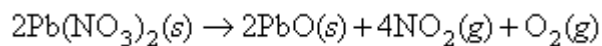
Which of the following statements are true?

- The speed of each atom of helium is 926 m/s.
 - The rms speed of the He and the Ar atoms are the same.
 - The average kinetic energy of the two samples are equal.
 - All of the above are true.
 - None of the above are true.
- 21) Which of the following would have a higher rate of effusion than C₂H₂?
- N₂
 - O₂
 - Cl₂
 - CH₄
 - CO₂

- 22) Hydrogen and chlorine gases react to form HCl. You and a friend are on opposite sides of a long hallway, you with H₂ and your friend with Cl₂. You both want to form HCl in the middle of the room. Which of the following is true?
- A) You should release the H₂ first.
 - B) Your friend should release the Cl₂ first.
 - C) You both should release the gases at the same time.
 - D) You need to know the length of the room to answer this question.
 - E) You need to know the temperature to answer this question.
- 23) A sample of gas occupies 20.0 liters at 32 °C when the pressure is 0.750 atm. What temperature in °C is required to increase the volume to 25.0 liters at a pressure of 0.680 atm?
- A) -3.90 °C
 - B) 309 °C
 - C) 72.7 °C
 - D) 346 °C
 - E) 36.1 °C
- 24) Consider the reaction between ethane (C₂H₆) and oxygen gas (O₂) to produce carbon dioxide and water, as shown. What volume of carbon dioxide will be produced at STP from the reaction of 4.00 L of ethane with 7.00 L of oxygen?
- A) 2.00 L CO₂
 - B) 3.00 L CO₂
 - C) 4.00 L CO₂
 - D) 6.00 L CO₂
 - E) 8.00 L CO₂

BONUS

A 3.31-g sample of lead nitrate, Pb(NO₃)₂, molar mass = 331 g/mol, is heated in an evacuated cylinder with a volume of 2.37 L. The salt decomposes when heated, according to the equation:



Assuming complete decomposition, what is the pressure in the cylinder after decomposition and cooling to a temperature of 300. K? Assume the PbO(s) takes up negligible volume.

- A) 0.260 atm
- B) 0.208 atm
- C) 0.0519 atm
- D) 0.364 atm
- E) 34.4 atm

Go VIKINGS!!