

CHEMISTRY 123-01

Practice exam #3

October 05, 2007

PART I: MULTIPLE CHOICE

- Which of the following is/are characteristic(s) of gases?
 - High compressibility
 - Relatively large distances between molecules
 - Formation of homogeneous mixtures regardless of the nature of gases
 - High compressibility AND relatively large distances between molecules
 - High compressibility, relatively large distances between molecules AND formation of homogeneous mixtures regardless of the nature of gases
- A sample of nitrogen gas has a volume of 32.4 L at 20°C. The gas is heated to 220°C at constant pressure. What is the final volume of nitrogen?
 - 2.94 L
 - 19.3 L
 - 31.4 L
 - 54.5 L
 - 356 L
- If the pressure of a gas sample is quadrupled and the absolute temperature is doubled, by what factor does the volume of the sample change?
 - 8
 - 2
 - 1/2
 - 1/4
 - 1/8
- 0.820 mole of hydrogen gas has a volume of 2.00 L at a certain temperature and pressure. What is the volume of 0.125 mol of this gas at the same temperature and pressure?
 - 0.0512 L
 - 0.250 L
 - 0.305 L
 - 4.01 L
 - 19.5 L
- Calculate the volume occupied by 35.2 g of methane gas (CH₄) at 25°C and 1.0 atm ($R = 0.0821 \text{ L} \cdot \text{atm}/\text{K} \cdot \text{mol}$).
 - 0.0186 L
 - 4.5 L
 - 11.2 L
 - 49.2 L
 - 53.7 L
- A gas evolved during the fermentation of sugar was collected at 22.5°C and 702 mmHg. After purification its volume was found to be 25.0 L. How many moles of gas were collected?
 - 0.95 mol
 - 1.05 mol
 - 12.5 mol
 - 22.4 mol
 - 724 mol
- Calculate the density, in g/L, of CO₂ gas at 27°C and 0.50 atm pressure.
 - 0.89 g/L
 - 1.12 g/L
 - 9.93 g/L
 - 46.0 g/L
 - 2.17 kg/L

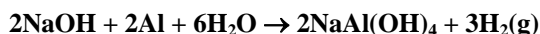
8. Which of the following gases will have the greatest density at the same specified temperature and pressure?
- H₂
 - CClF₃
 - CO₂
 - C₂H₆
 - CF₄
9. Two moles of chlorine gas at 20.0°C are heated to 350°C while the volume is kept constant. The density of the gas
- increases.
 - decreases.
 - remains the same.
 - Not enough information is given to correctly answer the question.
10. A 0.271 g sample of an unknown vapor occupies 294 mL at 140°C and 847 mmHg. The empirical formula of the compound is CH₂. What is the molecular formula of the compound?
- CH₂
 - C₂H₄
 - C₃H₆
 - C₄H₈
 - C₆H₁₂
11. 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?
- 0.258 atm
 - 301 mmHg
 - 356 mmHg
 - 5,345 mmHg
 - 8,020 mmHg
12. A sample of carbon monoxide gas was collected in a 2.0 L flask by displacing water at 28°C and 810 mmHg. Calculate the number of CO molecules in the flask. The vapor pressure of water at 28°C is 28.3 mmHg.
- 5.0×10^{22}
 - 5.2×10^{22}
 - 3.8×10^{23}
 - 5.4×10^{23}
 - 3.8×10^{25}
13. How many liters of chlorine gas at 25°C and 0.950 atm can be produced by the reaction of 12.0 g of MnO₂?
- $$\text{MnO}_2(\text{s}) + 4\text{HCl}(\text{aq}) \rightarrow \text{MnCl}_2(\text{aq}) + 2\text{H}_2\text{O}(\text{l}) + \text{Cl}_2(\text{g})$$
- 5.36×10^{-3} L
 - 0.138 L
 - 0.282 L
 - 3.09 L
 - 3.55 L
14. When active metals such as magnesium are immersed in acid solution, hydrogen gas is evolved. Calculate the volume of H₂(g) at 30.1°C and 0.85 atm that can be formed when 275 mL of 0.725 M HCl solution reacts with excess Mg to give hydrogen gas and aqueous magnesium chloride.
- 3.4×10^{-3} L
 - 2.2 L
 - 2.9 L
 - 5.8 L
 - 11.7 L
15. Which statement is *false*?
- The average kinetic energies of molecules from samples of different "ideal" gases is the same at the same temperature.
 - The molecules of an ideal gas are relatively far apart.
 - All molecules of an ideal gas have the same kinetic energy at constant temperature.

- D. Molecules of a gas undergo many collisions with each other and the container walls.
E. Molecules of greater mass have a lower average speed than those of less mass at the same temperature.
16. Complete this sentence: The molecules of different samples of an ideal gas have the same average kinetic energies, at the same _____.
A. pressure
B. temperature
C. volume
D. density
17. Which gas has molecules with the *greatest average molecular speed* at 25°C?
A. CH₄
B. Kr
C. N₂
D. CO₂
E. Ar
18. A spacecraft is filled with 0.500 atm of O₂ and 0.500 atm of He. If there is a very small hole in the side of this craft such that gas is lost slowly into outer space,
A. He is lost 2.8 times faster than O₂ is lost.
B. He is lost 8 times faster than O₂ is lost.
C. He is lost twice as fast as O₂ is lost.
D. O₂ is lost 2.8 times faster than He is lost.
E. O₂ is lost 8 times faster than He is lost.
19. A sample of mercury(II) oxide is placed in a 5.00 L evacuated container and heated until it decomposes entirely to mercury metal and oxygen gas. After the container is cooled to 25°C, the pressure of the gas inside is 1.73 atm. What mass of mercury(II) oxide was originally placed into the container?
A. 913 g
B. 76.6 g
C. 1.51 g
D. 45.6 g
E. 153 g

PART II: CALCULATION PROBLEMS (Show your work in its entirety. Do not provide just a single number! Pay attention to significant figures!).

20. What is the density, in molecules per cubic centimeter, of N₂ gas at 25°C and 650 mmHg?

21. What volume of H₂ is formed at STP when 6.0 g of Al is treated with excess NaOH?



22. What is V in the table below?

	<u>P</u>	<u>V</u>	<u>T</u>
initial:	1,420 torr	75 mL	200 K
final:	760 torr	V	360 K

23. Ammonium nitrite undergoes decomposition to produce only gases as shown below. How many liters of gas will be produced by the decomposition of 32.0 g of NH_4NO_2 at 525°C and 1.5 atm?

