General Chemistry I
Dr. M. J. Wieder
Examination #2

Name _____

(24) 1. Complete the following statements to make them correct:

a) Real gases can be liquefied under conditions of (high, low) pressure and (high, low) temperature.
b) A real gas (can, cannot) be liquefied above its critical temperature, T_c.
c) Real gases behave most like ideal gases under conditions of (high, low) pressure and (high, low) temperature.
d) The (lower, higher) the critical temperature, T_c, of a gas, the more difficult it is to liquefy.
e) Under identical conditions, the pressure of a real gas will be (higher than, lower than, equal to) that of an ideal gas.
f) (Ideal, Real) gas behavior is best described by the following equation:

$$(P + an^2/V^2)(V-nb) = nRT$$

(4) 2. Which one of the following gases would have a density of 2.86 g/liter at STP?

a) CO b) CO_2 c) N_2O d) SO_2 e) SO_3

(4) 3. A 250.0 ml container of ammonia, $NH_3(g)$, exerts a pressure of 833.0 torr at 42.4°C. What mass of ammonia, $NH_3(g)$, is in the container?

a) 0.180 g b) 1.80 g c) 8.10 g d) 18.0 g e) 81.0 g

(4) 4. Cyclopropane-Oxygen gas mixtures are often used in anesthesia. If, in a gas cylinder containing such a mixture, the partial pressure of cyclopropane is 170 torr and that of oxygen is 570 torr, what is the **mole fraction of oxygen** in the mixture?

a) 0.19 b) 0.23 c) 0.30 d) 0.39 e) 0.77

(4) 5. The volume of a fixed quantity of gaseous neon will be greatest at:

a) STP b) 100°K & 2 atm c) 273°K & 2 atm d) -73°C & 1 atm

e) The density of neon is the same under each of the above conditions

(4) 6. If 1.0 liter of $CO_2(g)$ molecules is compared to 1.0 liter of $H_2(g)$ molecules, both at 25°C and one atmosphere, then:

a) the mass of 1.0 liter of $CO_2(g)$ molecules equals the mass of 1.0 liter of $H_2(g)$ molecules.
b) there are more $H_2(g)$ molecules than $CO_2(g)$ molecules.
c) there are equal numbers of $H_2(g)$ and $CO_2(g)$ molecules.
d) there are more $CO_2(g)$ molecules than $H_2(g)$ molecules.

(4) 7. If **equal masses** of $H_2(g)$ and He(g) are placed in separate containers of equal volume at the same temperature, which one of the following statements will be true?

a) Both containers will have identical numbers of gas molecules.
b) The gas pressure inside the hydrogen container will be greater than that inside the helium container.
c) The gas pressure inside the helium container will be greater than that inside the hydrogen container.
d) Molecules of gas in the helium container will be moving faster, on average, than those in the hydrogen container.

(4) 8. To increase the volume of a fixed quantity of gas from 100 ml to 200 ml:

a) increase the temperature from 25°C to 50°C at constant pressure.
b) increase the pressure from 1.0 atm to 2.0 atm at constant temperature.
c) reduce the temperature from 400°K to 200°K at constant pressure.
d) reduce the pressure from 608 torr to 0.40 atm at constant temperature.

(4) 9. A sample of He gas occupies 600 ml at 27°C and 570 torr. The volume is reduced to 450 ml and the sample is cooled until the pressure is 380 torr. What is the final temperature in °C?

a) -17°C b) -53°C c) -123°C d) -150°C e) -193°C

(4) 10. An unknown gaseous compound composed of carbon, hydrogen and chlorine, effuses through a pinhole 0.411 times as fast as neon gas. The correct molecular formula for the unknown compound is:

a) C_2HCl_3 b) CH_3Cl c) CH_2Cl_2 d) $CHCl_3$ e) $C_2H_2Cl_2$

(4) 11. A gas mixture contains 2.0 moles of $O_2(g)$ and 4.0 moles of $N_2(g)$. If the gas mixture exerts a pressure of 18.0 atm, what is the **partial pressure of $O_2(g)$?**

a) 12.0 atm b) 9.0 atm c) 6.0 atm d) 4.0 atm e) 2.0 atm

(4) 12. The volume correction term in the van der Waals equation is present because:

a) barometers are inaccurate
b) real gas molecules are diatomic
c) real gas molecules attract each other
d) real gas molecules repel each other
e) real gas molecules cannot be considered point-masses

(4) 13. The addition of 2.0 g He(g) at 25°C to a 10.0 liter vessel containing $O_2(g)$ at 25°C and 740 torr will:

a) cause the final gas pressure to be between 1.0 to 2.0 atm
b) cause the final gas pressure to be between 2.0 to 3.0 atm
c) cause the final gas pressure to be between 3.0 to 4.0 atm
d) cause the final gas pressure to exceed 4.0 atm
e) have no effect on the final gas pressure

(4) 14. What is the density of a $F_2(g)$ sample that exerts a pressure of 95.0 torr at 0°C?

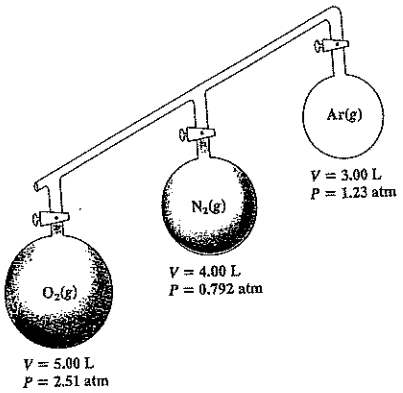
a) 0.21 g/liter b) 0.26 g/liter c) 0.34 g/liter

d) 1.2 g/liter e) 1.7 g/liter

(4) 15. Which one of the following statements is not part of the kinetic molecular theory of gases?

a) Molecules of a gas act independently of one another.
b) Molecules of a gas are small compared to the volume they occupy.
c) Molecules of a gas are in constant, random motion at any temperature above absolute zero.
d) Molecules of a gas are attracted to the walls of the container in which they are kept.
e) All of the above statements are valid.

(8) 16. Consider the experimental set-up shown below. Determine the total pressure in the system when the stopcocks are opened. **Note that the volume of the connecting tube (not specified in the diagram) is 1.0 liter.** Show all work in the space provided.



(6) 17. In interplanetary space, the gas pressure is estimated to be 1.0×10^{-17} torr (not a perfect vacuum). This corresponds to a density of 4 atoms or molecules of gas per milliliter of space. Determine the temperature of interplanetary space based on the data provided. **Hint:** Use the ideal gas law, and pay strict attention to the units of the given information.
Show all work in the space provided below.

(6) 18. A mixture of 4.0 g of H_2 and an unknown mass of O_2 is maintained at STP. If the volume occupied by the mixture is 100 liters, what is the mass of O_2 in the mixture? Show all work in the space provided below.