UNIT 4 REVIEW: GASES

Text: chapters 9 – 10. Note: for the test you will be given the following information: a periodic table, a table of vapor pressures, and the numbers 8.31, 22.4, 24.8, 101.325, 273, 760, 6.02×10^{23}.

1. Distinguish between the 3 states of matter using shape and compressibility as criteria.
2. What 3 types of molecular motion exist? What types are found in a) solids, b) liquids, c) gases?
3. Use the kinetic molecular theory to explain a) why evaporation causes a decrease in a liquid's temperature, b) why gases are more easily compressed than solids and liquids, c) why an elevated temperature increases the pressure exerted on the inside of a container?
4. A small sample of gas is released in a corner of the room and starts to diffuse to the other side. If the room pressure is increased, will the gas diffuse faster, slower, or at the same speed? Explain.
5. What do the letters STP and SATP stand for? Give the values associated with each.
6. 360 kPa = __ atm = __ mmHg
7. Sketch what a graph of volume vs. temperature would look like for any gas. What is the most important point on the graph? Why does this point apply to ideal gases only?
8. 200 K = __ °C, 30 °C = __ K, 0 K = __ °C
9. What mathematical equations are related to a) Charles' law, b) Boyle's law, c) the combined gas law, d) the ideal gas law?
10. Give the units for all variables in the ideal gas law. What units must be used in the other gas laws?
11. A piston holds 10 mL of H_2. The pressure is 100 kPa. If the piston's volume is reduced to 2.0 mL, what is the new pressure (assume no change in T)?
12. A balloon at 22°C holds 2.00 L. If the balloon is heated to 90°C, what will the balloon's volume be?
13. An aerosol can originally at 200 kPa and 20°C was heated to 300°C. What is the pressure in the can?
14. An air bubble is released at the bottom of a lake where the temperature is 4°C and the pressure is 3.40 atm. If the bubble was 10.0 mL to start, what will it's volume be at the surface, where the water temperature is 12°C and the pressure is 103 kPa?
15. What changes in temperature and/or atmospheric pressure would cause a balloon to expand?
16. What affect does an increase in temperature have on a gas in a fixed volume?
17. 10.0 g of a gas occupies 2.0 L at 20 °C and 90 kPa. a) How many moles are present? b) How many molecules? c) What is the molar mass of the gas?
18. What is the temperature of 0.70 moles of a gas that occupies 0.47 L at a pressure of 150 kPa?
19. What 4 gases account for nearly 100% of dry air? Give the approximate percentage of each.
20. A beaker with water at 30°C is placed in a bell jar attached to a vacuum pump. The pressure in the jar begins to decrease as air is pumped out. At what pressure will the water boil? Explain.
21. State Dalton's law of partial pressures.
22. A flask contains 2.00 moles of O_2 and 8.00 moles of N_2 gas. The total pressure of the flask is 200 kPa. What are the partial pressures of each gas?
23. If a gas is collected over water, what corrections need to be made when calculating the volume of the dry gas at STP?
24. 500 mL of O_2 is collected over water (the level of water inside and outside the container is equal). Atmospheric pressure is 101.0 kPa, and the temperature of the water is 22°C. What is the volume of the dry gas at STP?
25. How many litres does 1 mol of a gas occupy at STP? Based on this information, calculate the density of O_2 at STP (density has units in g/L).
26. Calculate the number of liters that 0.730 mole of CO_2 occupies at STP.
27. State Avogadro's theory. On what law are his ideas based?
28. Explain why gases at the same temperature and pressure have different densities (in g/L)?
29. Given the equation $C_3H_8 + O_2 \rightarrow CO_2 + H_2O$. a) Balance the equation. b) If 50 g of C_3H_8 is burned in excess O_2, what volume of CO_2 gas can be collected at 30°C and 90 kPa?
30. $2\,ZnS(s) + 3\,O_2(g) \rightarrow 2\,ZnO(s) + 2\,SO_2(g)$ a) what volume of O_2 at SATP is required for the reaction of 1.46 g of ZnS? b) What volume of SO_2 at SATP will be produced from the reaction in a)?