Gas Laws Test Review

1. Understand the relationship between the variables of the following gas laws and how to work the problems.
2. Boyle’s
3. Charles’s
4. Gay-Lussac’s
5. Combined
6. Ideal (including calculations of molar mass and mass)
7. Graham’s Law of Effusion
8. Know pressure and temperature values at STP
9. Know the five assumptions of kinetic-molecular theory of gasses
10. Know the characteristics of gasses (compressibility, diffusion, etc.) and how they are explained by kinetic-molecular theory
11. What instrument measures:
12. Atmospheric pressure
13. The pressure of a gas in a closed container
14. Be able to do manometer problems (closed and open manometers). Rework all problems on worksheets.
15. What is pressure? How is it calculated? What causes gas pressure? Explain on a molecular level.
16. Does air pressure increase or decrease as altitude increases? As one descends under water? What about when it is rainy versus sunny?
17. What temperature scale is always used with gas laws and why?
18. Be able to explain scenarios using gas laws (including demonstrations shown in class)
19. Explain how and why atmospheric pressure changes with altitude.
20. Explain why a balloon increases in size as the atmospheric pressure decreases.
21. Explain why a soda can filled with a small amount of boiling water will collapse when placed upside down in cold water.
22. Explain how manometers and barometers work. Draw a picture of a barometer (Torricelli) and explain how it is used to find the atmospheric pressure.
23. Know conversions factors for three units of pressure: kilopascals, mmHg (also called torr) and atmospheres.
24. Solve problems using Dalton’s Law of Partial Pressure.
25. Know that one mole of any gas at STP occupies 22.4 liters. This is called Molar Volume!
26. Solve problems using Molar Volume of a Gas.

**Practice Problems: Do the following on a separate sheet of paper! Include list, formula, substitution, answer!**

1. A gas occupies 500. mL at 26.0 degrees Celsius. What volume will result at 0.0 degrees Celsius?
2. When a cylinder of oxygen is left standing out in the sun, the temperature of the gas reaches 42.0 degrees Celsius. The cylinder has a volume of 10.0 Liters and contains 128.0 g of oxygen. What is the pressure in atmospheres inside the cylinder?
3. Seaweed plants release oxygen gas during photosynthesis. A 0.10 mL bubble is released underwater at a pressure of 1.74 atm and a temperature of 10 degrees Celsius. What volume will this bubble occupy at the surface, where the temperature is 15 degrees Celsius and the pressure is 1.0 atm?
4. The gas in a balloon has a volume of 413.0 mL at 750. mmHg. The balloon is released into the atmosphere and the gas in it expands to a volume of 810.0 mL. What is the pressure on the balloon at the new volume?
5. The gas left in a used aerosol can is at a pressure of 735 mmHg at 38 degrees Celsius. If the can is thrown onto a fire, what will the internal pressure of the gas be when its temperature reaches 927 degrees Celsius?
6. A gas sample that has a mass of 7.02 g occupies 319 mL at 54 degrees Celsius and a pressure of 0.86 atm. Calculate the molar mass of the gas.
7. The pressure in an automobile tire is 210 kPa at a temperature of 25 degrees Celsius. At the end of a journey on a hot, sunny day the pressure has risen to 225 kPa. What is the temperature of the air in the tire? (Assume that the volume has not changed.)
8. A sample of carbon dioxide occupies 45.0 Liters at 751 K and 500.0 kPa. What is the volume of the gas at STP?
9. At a certain temperature, hydrogen molecules move at an average velocity of 1840 m/s. estimate the molar mass of a gas whose molecules have an average velocity of 312 m/s.
10. At 25 ºC, the average velocity of oxygen molecules is 420 m/s. what is the average velocity of helium atoms at the same temperature?
11. If the density of a gas is 0.998 g/L at 746. mmHg and 22 ºC, what is the molar mass of the gas?
12. What is the density of CO2 at 782 torr and 24 ºC?
13. The total pressure of a mixture of chlorine, hydrogen and oxygen gasses is 105.46 kPa. If Pchlorine equals 23.60 kPa and Poxygen is 76.90 kPa, what is the partial pressure of hydrogen gas?
14. Three flasks are connected to each other, separated only by a three-way valve. Flask 1 has a volume of 3.000 liters and holds helium gas at a pressure of 3.500 atmospheres. Flask 2 has a volume of 2.000 liters and holds nitrogen gas at a pressure of 2.000 atmospheres. Flask 3 has a volume of 1.800 liters and holds oxygen gas a pressure of 4.000 atmospheres. If the valve separating the flasks were to be opened, what the partial pressure of each gas in the apparatus be? What is the total pressure of the mixture?
15. If 0.515 grams of Mg is added to HCl, it produces hydrogen gas and magnesium chloride. What volume of hydrogen chloride will be produced at STP?
16. Nitrogen reacts with hydrogen to produce ammonia, NH3. How many grams of nitrogen gas are required to produce 1000.0 L of ammonia at 24 ºC and 350.0kPa?