Name_____

Practice Problems- Unit 3B
Gas Laws

1. Define the following:

Law	
Theory	

2. What is the difference between a law and theory?

3. What is wrong with the following statement: "Laws are a statement of fact, while theories are a statement of opinion in science." Why do you think this misconception exist?

4. Kinetic Molecular Theory-

5. Boyle's Law shows the relation between pressure and volume. Describe this relationship.

6. Gay-Lussac's Law shows the relation between pressure and temperature. Describe this relationship.

7. Charles' Law shows the relation between temperature and volume. Describe this relationship.

8. What does Dalton's Law of Partial pressures state?

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9. Rank the pressures in decreasing order of magnitude (largest → smallest): 300 torr, .60 atm, 350 mmHg, 12.8 psi. (conversion factor: 1 atm =14.7psi)

10. A gas mixture containing oxygen, nitrogen, and carbon dioxide gas a total pressure of 32.9 atm. If the pressure of the oxygen gas is 6.6 atm and pressure of the nitrogen gas is 23.0 atm, what is the pressure of the carbon dioxide?

11. A 30.0 L sample of nitrogen inside a rigid, metal container at 20.0 ˚C is placed inside an oven. The pressure is 3.00 atm and increases to 3.3 atm while in the oven. What is the oven temperature in Kelvin and Celsius?

12. Atmospheric pressure on the peak of Mt. Everest can be as low as 0.2 atm, which is why climbers need to bring oxygen tanks for the last part of the climb. If the climbers carry 10.0 liter tanks with an internal gas pressure of 40 atm, what will be the volume of the gas when it is released from the tanks?

13. If I have an unknown quantity of gas at a pressure of 1.2 atm, a volume of 31 liters, and a temperature of 87 ^{0}C, how many moles of gas do I have?

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14. An airtight container with a volume of 4.25×10^4 L, an internal pressure of 1.00 atm, and an internal temperature of 15.00 C is washed off the deck of a ship and sinks to a depth where the pressure is 175 atm and the temperature is 3.000 C. What will the volume of the gas inside be when the container breaks under the pressure at this depth?

15. If I have 4 moles of a gas at a pressure of 5.6 atm and a volume of 12 liters, what is the temperature?

16. On hot days, you may have noticed that potato chip bags seem to "inflate", even though they have not been opened. If I have a 250 mL bag at a temperature of 19 ^{0}C, and I leave it in my car which has a temperature of 60^0 C, what will the new volume of the bag be?

17. Blast furnaces give off many unpleasant and unhealthy gases. If the total air pressure is 0.99 atm, the partial pressure of carbon dioxide is 0.05 atm, and the partial pressure of hydrogen sulfide is 0.02 atm, what is the partial pressure of the remaining air?

18. A gas takes up a volume of 17 liters, has a pressure of 2.3 atm, and a temperature of 299 K. If I raise the temperature to 350 K and lower the pressure to 1.5 atm, what is the new volume of the gas?

19. Ammonia gas occupies a volume of 450 mL as a pressure of 0.8 atm. What voume will it occupy at standard pressure?

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20. A gas that has a volume of 28 liters, a temperature of 45 ^{0}C, and an unknown pressure has its volume increased to 34 liters and its temperature decreased to 35 ^{0}C. If I measure the pressure after the change to be 2.0 atm, what was the original pressure of the gas **in torr**?

21. A sample containing 0.35 mol argon gas at a temperature of 13ºC and a pressure of 2.3 atm is heated to 56ºC and a pressure of 1.4 atm. Calculate the change in volume that occurs.

22. A sample of diborane gas (B2H6), a substance that bursts into flame when exposed to air, has a pressure of 345 torr at a temperature of -15ºC and a volume of 3.48 L. If conditions are changed so that the temperature is 36ºC and the pressure is 468 torr, what will be the volume of the sample?

23. A 22.4 L glass bulb has a total pressure of 760 Torr at 0.0˚C and contains three different gases, nitrogen, helium and argon. If the partial pressure of nitrogen is 250 Torr and the partial pressure of argon is 130 Torr, what is the number of moles of helium in the tank?

24. A student is doing experiments with $CO_2(g)$. Originally, a sample of the gas is in a rigid container at 299 K and 0.70 atm. The student increases the temperature of the $CO_2(g)$ in the container to 425 K.
    a. Describe the effect of raising the temperature on the motion of the $CO_2(g)$ molecules.

    b. Calculate the pressure of the $CO_2(g)$ in the container at 425 K.

    c. In terms of kinetic molecular theory, briefly explain why the pressure of the $CO_2(g)$ in the container changes as it is heated to 425 K.

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