Name: _____

Block: _____

Ideal Gas Law Problems

1. A sample of 1.00 moles of oxygen at 50.0°C and 98.6 kPa occupies what volume?

2. A sample of 4.25 moles of hydrogen at 20.0°C occupies a volume of 25.0 ℓ. Under what pressure is this sample?

3. If a steel cylinder with a volume of 1.50 ℓ contains 10.0 moles of oxygen, under what pressure is the oxygen if the temperature is 27.0°C?

4. When the pressure in a certain gas cylinder with a volume of 4.50 ℓ reaches 500. atm, the cylinder is likely to explode. What would the pressure in this cylinder be if it contained 40.0 moles of argon gas at 25.0°C? Would it explode?

5. How many milliliters of nitrogen, N_2, would have to be collected at 99.19 kPa and 28°C to have a sample containing 0.015 moles of N_2?

6. Oxygen has a molar mass of $32.0\,\frac{\text{g}}{\text{mol}}$. What volume is occupied by $0.250\,\text{g}$ of O_2 measured at 25.0°C and 100.66 kPa?

7. Helium gas has a molar mass of $4.00\,\frac{\text{g}}{\text{mol}}$. A balloon is to be filled with 30.0 kg of helium gas. What volume can be filled to a pressure of 1.15 atm if the temperature is 20.0°C?

8. In a gas thermometer, the pressure needed to fix the volume of $0.050\,\text{mol}$ of helium at $0.500\,\ell$ is 113.30 kPa. What is the temperature?

9. You want to send a tank of chlorine gas, Cl_2, safely from Boston to Los Angeles. Chlorine gas is poisonous and corrosive. You have a $5,000.\,\ell$ tank that will withstand a pressure of 100. atm. The tank will be kept at a constant temperature of 2.00°C throughout the trip. How many moles of chlorine gas can you safely ship?

10. You want to ship an "empty" $2,250,000\,\ell$ tank from Boston to New York. The truck carrying the tank comes to a bridge, and the truck is 2.0 tonnes (2,000 kg) too heavy for the bridge. You realize that gas has mass, and you suggest pumping air (which has an average molar mass of $28.8\,\text{g/mol}$) out of the tank to lighten the load. If the temperature is 25°C and the pressure in the tank starts out at 1.0 atm, what would the new pressure inside the tank be after removing $2.0 \times 10^6\,\text{g}$ of air? (Hint: find the pressure you would have in the tank from $2.0 \times 10^6\,\text{g}$ of air and subtract that from the 1.0 atm you started with.)