**Assignment 4 – The Gas Laws Name: ………………………………**

|  |  |
| --- | --- |
| $$\frac{P\_{1}V\_{1}}{T\_{1}}=\frac{P\_{2}V\_{2}}{T\_{2}}$$ | $$pV=nRT$$$$pV=NkT$$ |
| $$R=8.31 J/mol kg$$ | $$1 atm=1.01×10^{5} Pa$$ |
| $$k=1.38×10^{23} J/K$$ | $$N\_{A}=6.63×10^{23}$$ |

*You don’t always need to convert pressure or volume – but temperature must ALWAYS be in kelvins*.

1. One mole of oxygen gas is at a pressure of 6.00 atm and a temperature of 27.0 °C.
2. If the gas is heated at constant volume until the pressure triples, what is the final temperature?
3. If the gas is heated so that both the pressure and volume are doubled, what is the final temperature?

1. Gas is contained in an 8.0 litre vessel at a temperature of 20°C and a pressure of 9.0 atm.
2. Determine the number of moles of gas in the vessel.

b) How many molecules are in the vessel?

1. An ideal gas occupies a volume of 1.0 cm3 at 20°C and atmospheric pressure.
2. Determine the number of molecules of gas in the container.
3. b) If the pressure of the 1.0 cm3 volume is reduced to 1.0 × 10-11 Pa (an extremely good vacuum) while the temperature remains constant, how many moles of gas remain in the container?
4. A cylinder with a movable piston contains gas at a temperature of 27.0 °C, a volume of 1.50 m3, and an absolute pressure of 0.200 × 105 Pa. What will be its final temperature if the gas is compressed to 0.700 m3 and the absolute pressure increases to 0.800 × 105 Pa.
5. Gas is confined in a tank at a pressure of 10.0 atm and a temperature of 15.0 °C. If half of the gas is withdrawn and the temperature is raised to 65.0 °C, what is the new pressure in the tank?
6. A weather balloon is designed to expand to a maximum radius of 10 m when in flight at its working altitude, where the air pressure is 0.030 atm and the temperature is 200 K. If the balloon is filled at atmospheric pressure and 300 K, what is the radius at lift off?



1. The density of helium gas at *T* = 0 °C and atmospheric pressure is 0.179 kg/m3. The temperature is then raised to *T* = 100°C, but the pressure is kept constant. Assuming that helium is ideal, calculate the new density of the gas.