Name: _____   Block: _____

Gas Laws

1. A sample of 6.02×10^{23} molecules of oxygen at 50.0°C and 98 600 Pa occupies what volume?

0.0272 m^3

2. A sample of 2.56×10^{24} molecules of hydrogen at 20.0°C occupies a volume of 0.025 m^3. Under what pressure is this sample?

$414\,044 \text{ Pa}$

3. When the pressure in a certain gas cylinder with a volume of 0.0045 m^3 reaches 500. bar, the cylinder is likely to explode. What would the pressure in this cylinder be if it contained 4.82×10^{25} atoms of argon gas at 25.0°C? Would it explode?

440 bar
No.

4. 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 5.0 m^3 tank that will withstand a pressure of 100. bar. The tank will be kept at a constant temperature of 2.0°C throughout the trip.

   (a) How many molecules of chlorine gas can you safely ship?

1.32×10^{28}

   (b) If one molecule of chlorine has a mass of $1.18 \times 10^{-25} \text{ kg}$, how many kilograms of chlorine is this?

$1\,558 \text{ kg}$

5. A sample of oxygen gas occupies a volume of $0.250\,\text{m}^3$ at a pressure of $1.75\,\text{bar}$. What volume will it occupy at $2.50\,\text{bar}$?

$\boxed{0.175\,\text{m}^3}$

6. H_2 gas was cooled from $150.°C$ to $50.°C$. Its new pressure is $75\,000\,\text{Pa}$. What was its original pressure?

$\boxed{98\,220\,\text{Pa}}$

7. A sample of air has a volume of $60.0\,\text{m}\ell$ at $1.00\,\text{bar}$ and $0.0°C$. What volume will the sample have at $55.0°C$ and $0.95\,\text{bar}$?

$\boxed{75.88\,\text{m}\ell}$

8. A scuba diver's $10.\,\ell$ air tank is filled to a pressure of $210\,\text{bar}$ at a dockside temperature of $32.0°C$. The water temperature is $8.0°C$, the diver is swimming at a depth of $11.3\,\text{m}$, and the barometric (atmospheric) pressure is $1.013\,\text{bar}$. The density of sea water is $1025\,\frac{\text{kg}}{\text{m}^3}$.

   (a) What is the total pressure on the diver?

$\boxed{214\,890\,\text{Pa}}$

   (b) How many liters of air does the diver use?

$\boxed{899.9\,\ell}$

   (c) If the diver uses air at the rate of $8.0\,\ell/\text{min}$, how long will the diver's air last?

$\boxed{112.5\,\text{min}}$