Worksheet #7
Review Gas Laws

1. A gas occupies a volume of 30.0 cm^3 at 73.5°C. If the pressure is held constant and the temperature is changed to 22.5°C, what will the new volume be?

$V_1 = 30.0\ cm^3$ $\quad T_1 = 73.5°C + 273 = 346.5K$

$V_2 = ?$ $\quad T_2 = 22.5°C + 273 = 295.5K$

T↓ V↓

$30.0\ cm^3 \frac{295.5\ K}{346.5\ K} = 25.6\ cm^3$

2. A gas exerts a pressure of 730 mm Hg at -25.5°C. If the volume is held constant, what will the new temperature be at standard pressure?

$P = 730\ mm\ Hg$ $\quad T_1 = -25.5°C + 273 = 247.5K$

$P = 760\ mm\ Hg$ $\quad T_2 = x$

P↑ T↑

$247.5K \frac{760\ mm\ Hg}{730\ mm\ Hg} = 257.7K - 273 = -15.3°C$

3. A gas in a 5.2 L container exerts a pressure of 0.25 atm. If the temperature is held constant, what will the new volume be at standard pressure?

$V_1 = 5.2\ L$ $\quad P_1 = 0.25\ atm$

$V_2 = x$ $\quad P_2 = 1.00\ atm$

P↑ V↓

$5.2\ L \frac{0.25\ atm}{1.00\ atm} = 1.3\ atm$

4. Fluorine gas exerts a pressure of 800 torr. When the pressure is changed to 700 torr, its volume is 3.0 L. What was the original volume?

↑ ($P_1 = 800$ torr $\quad V_1 = x$) ↓ L

$P_2 = 700$ torr $\quad V_2 = 3.0\ L$

$3.0\ L \frac{700\ torr}{800\ torr} = 2.6\ L$

5. A 22.4 dm^3 balloon is at −20°C and 500 torr. If the balloon rises into the atmosphere, the temperature and pressure will change to STP. What will be the new volume of the balloon?

$V_1 = 22.4\ dm^3$ $P_1 = 500\ torr$ $T_1 = -20^\circ C + 273 = 293K$

$V_2 = x$ $P_2 = 760\ torr$ $T_2 = 273K$

$22.4\ dm^3 \frac{500\ torr}{760\ torr} \frac{273K}{293K} = 13.7\ dm^3$

P↑ V↓ T↓ V↓

6. A chemist collects 372 cm^3 of gas over water at 25°C and 111.0 kPa. What volume would the dry gas occupy at 2°C and 98.0 kPa. (Water vapor pressure at 25°C is 3.2 kPa)

7. How many moles of oxygen gas occupy a 0.486 L flask at 11°C and 66.7 kPa? How many grams of oxygen gas do you have?

$V = 0.486\ L$

$T = 11^\circ C + 273 = 284K$

$P = 66.7\ kPa$

$R = 8.31 \frac{kPa \cdot L}{mol \cdot K}$

$\frac{PV}{RT} = \frac{nRT}{RT}$

$n = \frac{PV}{RT} = \frac{(66.7\ kPa)(0.486\ L)}{(8.31 \frac{kPa \cdot L}{mol \cdot K})(284K)}$

$n = 0.0194\ mole\ O_2$ $\frac{32.00g\ O_2}{1\ mole\ O_2} = 0.449g\ O_2$

8. A 10.0 L sample of oxygen gas exerts a pressure of 103 kPa at standard temperature. What is the mass of the oxygen gas?

$V = 10.0\ L$

$P = 103\ kPa$

$T = 273K$

$R = 8.31 \frac{kPa \cdot L}{mol \cdot K}$

$\frac{PV}{RT} = \frac{nRT}{RT}$

$n = \frac{PV}{RT} = \frac{(103\ kPa)(10.0\ L)}{(8.31 \frac{kPa \cdot L}{mol \cdot K})(273K)}$

$n = 0.45\ mole\ O_2$ $\frac{32.00g\ O_2}{1\ mole\ O_2} = 14.5g\ O_2$