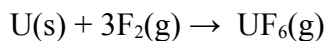


**CHM 110 – Gases – Practice Problems SOLUTIONS****Solve the problems.**

1) 17.5 g of uranium is converted to the gas uranium (VI) fluoride in the following reaction:



What volume of gas is produced at 0.983 atm by this reaction if the temperature is 50.0 °C?

- 1.98 L UF<sub>6</sub> gas produced.

Complete solution:

First, find out how many moles of UF<sub>6</sub> gas are produced using the formula weight of uranium and stoichiometry.

$$17.5 \text{ g U} \times \frac{1 \text{ mol}}{238.0 \text{ g}} \times \frac{1 \text{ mol UF}_6}{1 \text{ mol U}} = 0.0735294 \text{ mol UF}_6$$

Next, use the ideal gas law,  $PV=nRT$ , to find the volume.

$$P = 0.983 \text{ atm}$$

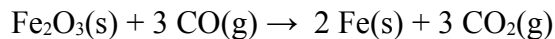
$$V = ?$$

$$n = 0.0735294 \text{ mol}$$

$$T = 50^\circ\text{C} = 323 \text{ K}$$

$$V = \frac{(0.0735294 \text{ mol}) \times (0.08206 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}}) \times (323 \text{ K})}{(0.983 \text{ atm})} = 1.98 \text{ L}$$

2) One method for refining iron ore (primarily  $\text{Fe}_2\text{O}_3$ ) involves using a blast furnace to react the iron ore with carbon monoxide to produce iron.



What volume of carbon dioxide gas (at 2.50 atm and 300.0°C) is produced when 6413 grams of pure Fe is made?

- 3240 L of  $\text{CO}_2$  is produced.

Complete solution:

First, find the number of moles of carbon dioxide gas produced using the formula weight of iron and stoichiometry.

$$6413 \text{ g Fe} \times \frac{1 \text{ mol}}{55.85 \text{ g}} \times \frac{3 \text{ mol CO}_2}{2 \text{ mol Fe}} = 172.2381 \text{ mol CO}_2$$

Next, use the ideal gas law to find the volume of the  $\text{CO}_2$  gas.

$$\begin{aligned} P &= 2.50 \text{ atm} \\ V &= ? \end{aligned}$$

$$\begin{aligned} n &= 172.2381 \text{ mol} \\ T &= 300.0^\circ\text{C} = 573.2 \text{ K} \end{aligned}$$

$$V = \frac{(172.2381 \text{ mol}) \times (0.08206 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}}) \times (573.2 \text{ K})}{(2.50 \text{ atm})} = 3240 \text{ L}$$

3) What pressure would be produced by 15.5 grams of chlorine gas ( $\text{Cl}_2$ ) contained in a 10.0L container kept at 21.0 °C?

- 0.528 atm pressure from the  $\text{Cl}_2$ .

Complete solution:

Use the formula weight to find out how many moles of  $\text{Cl}_2$  gas are present, then use  $PV=nRT$  to find the pressure.

$$15.5 \text{ g Cl}_2 \times \frac{1 \text{ mol Cl}_2}{70.90 \text{ g}} = 0.21862 \text{ mol Cl}_2$$

$$P = ?$$

$$V = 10.0 \text{ L}$$

$$n = 0.21862 \text{ mol}$$

$$T = 21.0^\circ\text{C} = 294.2 \text{ K}$$

$$P = \frac{(0.21862 \text{ mol}) \times (0.08206 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}}) \times (294.2 \text{ K})}{(10.0 \text{ L})} = 0.528 \text{ atm}$$