Chemistry 141 Name key

Dr. Cary Willard

Quiz 6a (20 points) October 12, 2010

All work must be shown to receive credit. PV=nRT, R=0.0821 L atm/mol K = 62.4 L torr/mol K

760 torr = 1.00 atm, STP 0oC and 1atm

1. (4 points) Methane gas, CH4, is sold in a 43.8 L cylinder with a pressure of 15.5 atm. How many liters of methane will be produced at a pressure of 735 torr?

$$PV=nRT \rightarrow R=\frac{PV}{nT} \rightarrow P\_{1}V\_{1}=P\_{2}V\_{2}$$

$$V\_{2}=V\_{1}\left(\frac{P\_{1}}{P\_{2}}\right)=43.8L\left(\frac{15.5 atm}{0.967 atm}\right)=702 L$$

$$735 torr×\frac{1 atm}{760 torr}=0.967 atm$$

1. (4 points) What is the density of carbon dioxide at 35.0oC and 650 torr?

$$density= \frac{g}{L}=\frac{g}{mol}×\frac{mol}{L}=\left(\frac{44.01 g CO\_{2}}{1 mol CO\_{2}}\right)\left(\frac{0.0338 mol CO\_{2}}{L}\right)={1.49 g CO\_{2}}/{L}$$

$$PV=nRT \rightarrow \frac{n}{V}=\frac{P}{RT}=\frac{\left(650 torr\right)mol K}{\left(62.4 L torr\right)\left(308 K\right)}=\frac{0.0338 mol}{L}$$

1. (6 points) When 35.6 L of ammonia and 40.5 L of oxygen gas at STP burn, nitrogen monoxide and water are produced.

NH3(g) + O2(g) 🡪 NO(g) + H2O(g) (unbalanced)

After the products return to STP, how many L of nitrogen monoxide are produced?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | X=8.9 |  | X=8.1 |  |  |  |  |
|  | 4 NH3 | + | 5 O2 | 🡪 | 4 NO | + | 6 H2O |
| I | 35.6 L |  | 40.5 L |  | 0 L |  | 1. L
 |
|  | -4x |  | -5x |  | + 4x |  | + 6x |
| E | 35.6-4xL |  | 40.5-5xL |  | 4xL |  | 6xL |
|  |  |  |  |  | =37.4L |  |  |

How many grams of nitrogen monoxide are produced?

$$32.4L×\frac{1 mol}{22.414 L}=1.45 mol NO$$

$$1.45 mol NO×\frac{30.1 g NO}{1 mol NO}=43.6 g NO$$

1. (3 points) Which sample contains the most molecules: 1.00 L of O2 at STP, 1.00 L of air at STP, or 1.00 L of H2 at STP?

All the same

1. (3 points) Why does a helium filled balloon lose pressure faster than an air filled balloon?

$$rateα\sqrt{\frac{1}{MW}}$$

More mass means slower

Less mass means faster

Lower mass He will leak faster!

Chemistry 141 Name key

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Quiz 6b (20 points) October 12, 2010

All work must be shown to receive credit. PV=nRT, R=0.0821 L atm/mol K = 62.4 L torr/mol K

760 torr = 1.00 atm, STP 0oC and 1atm

1. (4 points) Methane gas, CH4, is sold in a 43.8 L cylinder with a pressure of 17.7 atm. How many liters of methane will be produced at a pressure of 735 torr?

$$PV=nRT \rightarrow R=\frac{PV}{nT} \rightarrow P\_{1}V\_{1}=P\_{2}V\_{2}$$

$$V\_{2}=V\_{1}\left(\frac{P\_{1}}{P\_{2}}\right)=43.8L\left(\frac{17.7 atm}{0.967 atm}\right)=802 L$$

$$735 torr×\frac{1 atm}{760 torr}=0.967 atm$$

1. (4 points) What is the density of carbon dioxide at 45.0oC and 550 torr?

$$density= \frac{g}{L}=\frac{g}{mol}×\frac{mol}{L}=\left(\frac{44.01 g CO\_{2}}{1 mol CO\_{2}}\right)\left(\frac{0.0277 mol CO\_{2}}{L}\right)={1.49 g CO\_{2}}/{L}$$

$$PV=nRT \rightarrow \frac{n}{V}=\frac{P}{RT}=\frac{\left(550 torr\right)mol K}{\left(62.4 L torr\right)\left(318 K\right)}=\frac{0.0277 mol}{L}$$

1. (6 points) When 45.6 L of ammonia and 30.5 L of oxygen gas at STP burn, nitrogen monoxide and water are produced.

NH3(g) + O2(g) 🡪 NO(g) + H2O(g) (unbalanced)

After the products return to STP, how many L of nitrogen monoxide are produced?

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | X=11.4 |  | X=6.1 |  |  |  |  |
|  | 4 NH3 | + | 5 O2 | 🡪 | 4 NO | + | 6 H2O |
| I | 45.6 L |  | 30.5 L |  | 0 L |  | 1. L
 |
|  | -4x |  | -5x |  | + 4x |  | + 6x |
| E | 45.6-4xL |  | 30.5-5xL |  | 4xL |  | 6xL |
|  |  |  |  |  | =24.4L |  |  |

How many grams of nitrogen monoxide are produced?

$$24.4L×\frac{1 mol}{22.414 L}=1.09 mol NO$$

$$1.09 mol NO×\frac{30.1 g NO}{1 mol NO}=32.8 g NO$$

1. (3 points) Which sample contains the most molecules: 1.00 L of O2 at STP, 1.00 L of air at STP, or 1.00 L of H2 at STP?

All the same

1. (3 points) Why does a helium filled balloon lose pressure faster than an air filled balloon?

$$rateα\sqrt{\frac{1}{MW}}$$

More mass means slower

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Lower mass He will leak faster!