Gas Laws: Stoichiometry

1. **Long Answer question**

Christine and Danine did a lab using Mg(s) and 4.0  HCl(aq) where they collected the H2(g) that was produced. The lab conditions were SATP. They made the following table of observations.

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| --- | --- | --- | --- | --- |
| Trial | Mass of Mg(s) | Volume of HCl(aq) | Volume of H2(g) collected | R value calculated |
| I | 0.100g | 10.0 mL | 130 mL |  |
| II | 0.100 g | 10.0 mL | 108 mL |  |
| III | 0.100 g | 10.0 mL | 102 mL |  |
| IV | 0.100 g | 10.0 mL | 92.0 mL |  |

* Which chemical reagent is the **limiting reagent?** (1 mark)
* Calculate the experimental value of the ideal gas constant ( R ) for each trial. (4 marks)
* Describe at least one procedural error that these girls may have made that would result in the R value being too small. (1 mark)
* Calculate the percentage yield for trial I. Express to the nearest tenth of a percent. (1 mark)

1. **Numerical response question**

Left justify your answer in the boxes provided below

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Use the following equation to answer this question

4 NH3(g) + 5 O2(g) 🡪 4 NO(g) + 6 H2O(g)

The first step in making nitric acid is to convert ammonia to nitrogen monoxide. This is done under constant conditions of high temperature and pressure and in the presence of a platinum catalyst.

A volume of \_\_\_\_\_ L of O2(g) is consumed per liter of NO(g) formed. Express your answer to the **nearest hundredth** of a litre.

1. **Numerical response question**

Left justify your answer in the boxes provided below

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Use the balanced reaction below to help answer this question.

N2(g) + 3H2(g) 🡪2 NH3(g)

If all gases are measured at the same temperature and pressure, what volume of NH3(g) is produced when 225 L H2(g) is consumed in the following reaction

1. What volume of O2(g) is consumed in the combustion of 75.6 L C3H8(g) if both gases are measured at STP?
2. 75.6
3. 126
4. 227
5. 378
6. Calculate the volume of H20(g), produced by 1.75 L of H2(g) in the following reaction. Assume all gases are under identical conditions

3 CO(g) + 7 H2(g) 🡪 C3H8(g) + 3 H2O(l)

1. 4.08 L
2. 1.75 L
3. 5.25 L
4. 0.750 L
5. **Numerical response question**

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Left justify your answer in the boxes provided.

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| The catalytic converter changes carbon monoxide to carbon dioxide as shown below.  **2CO(g) + O2(g) 🡪 2CO2(g)**  When 48.6 mL of CO(g) is consumed, then \_\_\_\_\_\_ mL of CO2(g) is produced. .Assume all gases are under identical conditions |

1. **Numerical response question**

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Left justify your answer in the boxes provided.

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| Butane lighters undergo combustion reactions according to the following balance chemical reaction.  **2C4H10(g) + 13O2(g) 🡪 8CO2(g) + 10H2O(g)**  If the lighter uses 115 mL of butane, the carbon dioxide produced by the lighter will be \_\_\_\_\_\_\_\_\_mL. Assume all gases are under identical conditions |
| 1. **Numerical response question**  |  |  |  |  | | --- | --- | --- | --- | |  |  |  |  |   Left justify your answer in the boxes provided.  A sample of methane gas undergoes complete combustion at SATP. If 40 g of methane is used, then \_\_\_\_\_ L of oxygen is consumed. Express the answer as a.b x 10c  L, where a,b,c are the first three boxes of the answer space.   1. **Numerical response question**  |  |  |  |  | | --- | --- | --- | --- | |  |  |  |  |   Left justify your answer in the boxes provided.  If 25.0 g of formaldehyde (CH2O(g) is formed from its elements, what volume of oxygen gas is consumed at 280 K and 100 kPa. Express the answer in Litres.   1. **Numerical response question**  |  |  |  |  | | --- | --- | --- | --- | |  |  |  |  |   Left justify your answer in the boxes provided.  Acetylene (C2H2(g)) undergoes complete combustion. If 50 g of the fuel is consumed what volume of carbon dioxide will form at 120 kPa and 300 K? Express the answer in Litres. |

Answers:

1. Magnesium is the limiting reagent

R values are 10.6, 8.81, 8.32 and 7.51

The magnesium may not have been all used up …. Or other reasonable answers

27.5 %

2. 1.25

3. 150

4. D

5. D

6. 48.6

7. 460

8. 122

9. 9.69

10. 79.8