

Gas Laws: Stoichiometry

1. Long Answer question

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

Trial	Mass of Mg(s)	Volume of HCl(aq)	Volume of H ₂ (g) collected	R value calculated $\frac{LkPa}{Kmol}$
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	

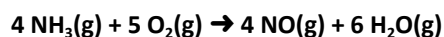
- Which chemical reagent is the **limiting reagent?** (1 mark)
- Calculate the experimental value of the ideal gas constant (R) for each trial. (4 marks)
- Describe at least one procedural error that these girls may have made that would result in the R value being too small. (1 mark)
- Calculate the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

2. Numerical response question

Left justify your answer in the boxes provided below

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Use the following equation to answer this question



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.

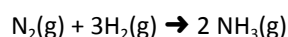
A volume of _____ L of O₂(g) is consumed per liter of NO(g) formed. Express your answer to the **nearest hundredth** of a litre.

3. 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.



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

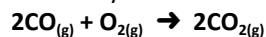
4. What volume of $O_2(g)$ is consumed in the combustion of 75.6 L $C_3H_8(g)$ if both gases are measured at STP?
- 75.6
 - 126
 - 227
 - 378
5. Calculate the volume of $H_2O(g)$, produced by 1.75 L of $H_2(g)$ in the following reaction. Assume all gases are under identical conditions
- $$3 CO(g) + 7 H_2(g) \rightarrow C_3H_8(g) + 3 H_2O(l)$$
- 4.08 L
 - 1.75 L
 - 5.25 L
 - 0.750 L

6. **Numerical response question**

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Left justify your answer in the boxes provided.

The catalytic converter changes carbon monoxide to carbon dioxide as shown below.



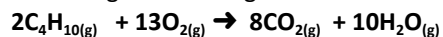
When 48.6 mL of $CO_{(g)}$ is consumed, then _____ mL of $CO_{2(g)}$ is produced. Assume all gases are under identical conditions

7. **Numerical response question**

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Left justify your answer in the boxes provided.

Butane lighters undergo combustion reactions according to the following balance chemical reaction.



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

8. **Numerical response question**

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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 $a.b \times 10^c$ L, where a,b,c are the first three boxes of the answer space.

9. **Numerical response question**

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Left justify your answer in the boxes provided.

If 25.0 g of formaldehyde ($\text{CH}_2\text{O(g)}$) is formed from its elements, what volume of oxygen gas is consumed at 280 K and 100 kPa. Express the answer in Litres.

10. **Numerical response question**

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Left justify your answer in the boxes provided.

Acetylene ($\text{C}_2\text{H}_2\text{(g)}$) 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