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VCE Chemistry $\frac{3}{4}$
Gas Calculations & Stoichiometry [1.3]
Test

20 Marks. 2 Minutes Reading. 18 Minutes Writing.

Results:

Test	_____ / 15
Extension	_____ / 5



Section A: Test (15 Marks)

INSTRUCTION: 15 Marks. 1 Minute Reading. 12 Minutes Writing.



Question 1 (4 marks)

Tick whether the following statements are **true** or **false**.

Statement	True	False
a. In complete combustion, the oxygen is assumed to be the limiting reagent.		
b. If the efficiency of a spirit burner experiment is 30%, then 70% of the energy released by the fuel was lost to the environment.		
c. Experimental ΔH values are typically greater than theoretical ones.		
d. The energy released by a fuel in a spirit burner is never less than the energy absorbed by the water being heated.		
e. Volume-volume stoichiometry may only be used if the temperature and pressure are constant at SLC.		
f. At Standard Laboratory Conditions (SLC), one mole of every ideal gas occupies 24.8 L of volume.		
g. In a chemical reaction, the limiting reagent determines the maximum amount of product that can be formed.		
h. If 5 moles of hydrogen gas reacts with 2 moles of oxygen gas, the reaction will produce 4 moles of water.		

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Question 2 (4 marks)

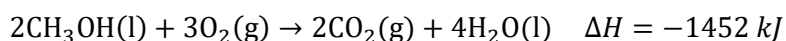
Ethyne, C_2H_2 , is a chemical compound that can be used as a fuel. Upon combustion of one mole of ethyne at SLC, 1300 kJ of energy is released.

- a. Write the balanced thermochemical equation for the complete combustion of C_2H_2 . (2 marks)

- b. Calculate the volume of CO_2 produced when 200.0 L of C_2H_2 is completely combusted at standard laboratory conditions (SLC). Justify your working with appropriate steps or reasoning. (2 marks)

Question 3 (1 mark)

How many kilojoules of energy would be released from the production of 49.6 L of carbon dioxide at 25°C and 100 kPa based on the following thermochemical equation?



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Question 4 (6 marks)

A sample of butan-1-ol ($\text{C}_4\text{H}_9\text{OH}$) on a spirit burner which initially weighs 78.70 g undergoes complete combustion. After the combustion is complete, it is found that the spirit burner weighs 74.92 g . The heat energy released is used to heat 350 mL of water at SLC. The temperature of the water rises to 53.20°C .

- a. Calculate the molar heat of combustion of butan-1-ol. (4 marks)

- b. Given that the process carried out is known to be 65.0% efficient, find the new calculated heat of combustion. (1 mark)

- c. Propose a major reason as to why the experiment was not 100% efficient. (1 mark)

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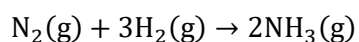
Section B: Extension (5 Marks)

INSTRUCTION: 5 Marks. 1 Minute Reading. 6 Minutes Writing.



Question 5 (5 marks)

A reaction between nitrogen gas and hydrogen gas produces ammonia (NH_3) according to the balanced equation:



If 5.00 moles of nitrogen and 12.0 moles of hydrogen are reacted:

- a. Calculate the volume of NH_3 produced. (3 marks)

- b. Determine the amount, in g , of the excess reagent left over. (2 marks)

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VCE Chemistry $\frac{3}{4}$

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