

Applecross Senior High School AECHE 2017

Enthalpy Changes and Combustion of Fuels Investigation Validation Test

Name: Solu	tions			Mark	c:/	26 =	%
Time Allowed: 5	5 minutes						# ************************************
Formulae and Da	ata						d Project
∆H = mc∆T n = m M c _{water} = Specific h	neat of wa	iter = 4.18	8 Jg ⁻¹ K ⁻¹				
Show all working	in your o	calculatio	ons			3	
Background Inform A group of student two fuels - hexane	s perform	ed an inve nol. Their	estigation table of re	to find the eresults is show	nthalpy cha wn below:	ange during	the combustion of
	Fuel Used	Initial temp/°C	Final temp/°C	Volume of water in conical flask	Initial mass of burner/g	Final mass of burner/g	
	Hexane	14°C	94 °C	150 mL	37.77 g	36.62 g	
	Methanol	15° C	74°C	150 mL	37.25 g	35.50	
							v 2. 5.
1. Identify the inde				stigation.			
The	fuel	typ	e				
2. Identify the depe				igation			[1 mark]
The vis	e in	temp	erature	e of	150m	L of wa	ate
The vis	mass	of 1	Guel	used			[1 mark]

[Assume that 1.00g of water = 1mL of water]	
Im/ of water = 1009 -> 150mL -> 150g ()	
DT = 94-14 = 80°C (1)	
AT - 150 × 4:18 × 80 = 50 160 J = 5.02	KOT
$\Delta T = 94 - 14 = 80^{\circ}C$ (1) $\Delta H = MC\Delta T = 150 \times 4.18 \times 80 = 50160 J = 5.02$	D .
DH = 50.16 KJ	
	[4 marks]
(b) Calculate the change of enthalpy per mole of Hexane (C ₆ H ₁₄).	
m (C6 H14) = 37.77 - 36.62 = 1.159 1)	[3 marks]
M (C6 H14) = (12.01×6) + (1.008×14) = 86.172 (1)	
$n_{c_6 i + 4} = \frac{m}{M} = \frac{1.15}{86.172} = 0.013345 \text{ mel}$	
$\Delta H/mol = \frac{50.16}{0.013345} = \frac{3759 \text{ kJ/mol}}{3.76 \times 10^6 \text{ J mol}^{-1}}$	
(er) = 3.76 × 106 J mol-1.	
$5(a)$ Calculate the change in enthalpy (ΔH) for the combustion for Methanol (CH ₃ OH).	
[Assume that 1.00g of water = 1mL of water]	
$M_{110} = 1509$	[3 marks]
△T = 74 - 15 = 59°C ①	
$= 150 \times 4.18 \times 59 0$	
= 36993J	
= 3.70×104JD	
er = 37.0 kJ	

3. State clearly two variables that should be controlled in this investigation.

Variable 1

Variable 2

Volume of water (150mL)

Burning time Material for flask (glass?)

Distance of burner to bottom of flask.

4(a) Calculate the change in enthalpy (ΔH) for the combustion for Hexane (C_6H_{14}).

Water type (distilled) Change in Hurpera

[2 marks]

M chzot = 37.25 - 35.50 = 1.75 g [3 marks] M chzot = 12.01 + (4 × 1.008) + 16.0 = 32.042 [] N = M = 1.75 32.042 = 5.462 × 10 - 2 mol. 6. The theoretical values for the change in enthalpy of combustion of substances are often significantly different than the values obtained in investigations carried out in the school laboratory. (a) Discuss in terms of validity, two reasons why these values differ from the theoretical values. The Variables other than the independent and dependent Variables have not been convector in any conductive of glass, incomplete convector in any conductive of glass, incomplete convector in any conductive of glass, incomplete convector in any conductive of glass, evaporation of waster. (b) Outline a possible step that could be taken to reduce each error. 3) control witch flame size 4) Hence AT to limit evaporation to the reliability of this experiment. **Yeliability** Is increased by completing the proof of the proof o	(b) Calculate the change of enthalpy per mole of Methanol (CH₃OH).
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exothermic - heat livergy was released	[2 marks]
(1)	exothermic - heat energy was released

8. The heat of combustion per mole of hexane is more than twice than that of methanol. Explain why this is the case. [1 mark] H-C-0-11 Her ame has many more atoms than neethand and can therefore form many more bonds. the hexane system will release more enthalpy than methanol. 264/4+1902 -> 12Co2 + 14H20 more bonds formed. 2 CH30H +302 > 2 CO2 + 41/20 Less bands formed. > I mark for descrision the number of bourds. released.