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A Solution Manual for:  
COMBUSTION, 4th Ed.

by

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CHAPTER 1

**Problem 1**

Calculate the heat of reaction when methane and air in stoichiometric proportions are brought into a calorimeter at 500 K. The product composition is brought to the ambient temperature (298 K) by the cooling water. The pressure in the calorimeter is assumed to remain at 1 atm, but the water formed has condensed.

**Solution:** The heat of reaction can be calculated using Eqn. (10) in the text. However, as also suggested in the textbook, this equation can be simplified for the general case when  $H_{T_2}^o = H_{T_{amb}}^o$ . The modified equation becomes:

$$-Q = \Delta H = \sum_{i \in \text{prod}} n_i \left[ (H_{T_2}^o - H_{T_{amb}}^o) + (\Delta H_f^o)_{T_{amb}} \right] - \sum_{i \in \text{react}} n_i \left[ (H_{T_1}^o - H_{T_{amb}}^o) + (\Delta H_f^o)_{T_{amb}} \right] \quad (1)$$

In this Equation,  $T_2$  and  $T_1$  are the temperatures of the products and reactants respectively. The general equation for the complete combustion of one mole of methane in air is:



where  $a_{th}$  is a coefficient describing how much air is needed for stoichiometric combustion. Balancing the above reaction one has:



In order to apply Eqn. (1) to the above reaction, the following properties from Tables in the textbook are needed (note that for this problem  $T_2 = 298 \text{ K}$  and  $T_1 = 500 \text{ K}$ ):

gases	$\Delta H_f^o$ (kJ/mol)	$H_{T_1}^o - H_{T_{amb}}^o$ (kJ/mol)	$H_{T_2}^o - H_{T_{amb}}^o$ (kJ/mol)
CH <sub>4</sub>	-74.90	8.21	0.0
O <sub>2</sub>	0.0	6.09	0.0
N <sub>2</sub>	0.0	5.92	0.0
H <sub>2</sub> O <sub>(liq)</sub>	-286.04	0.0	0.0
CO <sub>2</sub>	-393.77	0.0	0.0

Equation (1) then becomes:

2

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# Glassman Combustion Solution Manual

**JS Bruner**



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Air Pollution Engineering Manual Air & Waste Management Association,2000-04-06 This manual characterizes air pollutant emission sources and the technology available to control them It provides industry and government with the guidelines to comply with air pollution standards and equipment used for gases and particulates *Recent Advances in the Aerospace Sciences* Corrado Casci,2012-12-06 This volume published in honor of Prof Luigi Crocco appears when Luigi Crocco celebrates his 75th birthday of a life devoted to study research and teaching The events in his life and World War II forced Luigi Crocco as well as other Italian scientists to look to foreign countries for the calm haven so vital to study This notwithstanding his scientific activity was never interrupted and this volume is an acknowledgment of scientists and researchers to his work and life Prefazione Questo volume in onore del prof ing Luigi Crocco vede la luce quando Luigi Crocco compie i 75 anni di una vita dedicata allo studio alia ricerca e all insegnamento a Le vicende della vita ed anche della 2 guerra mondiale hanno costretto Luigi Crocco come altri scienziati italiani a dover cercare in altri Paesi quella serenita necessaria per dedicarsi allo studio Ma la sua attivita scientifica non ha avuto interruzioni e questo volume essere la testimonianza di studiosi e di ricercatori alia sua opera e alia sua vita Previews of Heat and Mass Transfer ,1977-10

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