Answer on Question #55507 - Chemistry - General chemistry
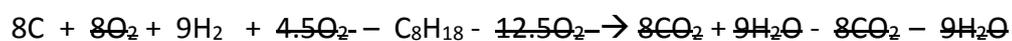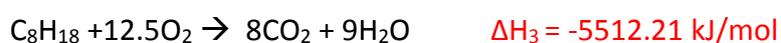
Question:

What is the standard enthalpy of formation of this isomer of C_8H_{18} (g)?

Answer:

$$8C + 9H_2 \rightarrow C_8H_{18} \quad \Delta H_{f,C8H18}$$

$$8C + 8O_2 \rightarrow 8CO_2 \quad \Delta H_1 = -393 \text{ kJ/mol}$$

$$9H_2 + 4.5O_2 \rightarrow 9H_2O \quad \Delta H_2 = -285.8 \text{ kJ/mol}$$

$$C_8H_{18} + 12.5O_2 \rightarrow 8CO_2 + 9H_2O \quad \Delta H_3 = -5512.21 \text{ kJ/mol}$$

$$8C + \cancel{8O_2} + 9H_2 + \cancel{4.5O_2} - C_8H_{18} - \cancel{12.5O_2} \rightarrow \cancel{8CO_2} + \cancel{9H_2O} - \cancel{8CO_2} - \cancel{9H_2O}$$

$$\Delta H_{f,C8H18} = 8\Delta H_1 + 9\Delta H_2 - \Delta H_3$$

$$\mathbf{\Delta H_{f,C8H18}} = 8 \times (-393.5) + 9 \times (-285.8) - (-5512.21) = \mathbf{-207.99 \text{ kJ/mol}}$$