

## **Enthalpy Questions**

1. Given that:

 $CH_4(g) \longrightarrow C(s) + 2 H_2(g) \quad \Delta H_r = 74.8 \text{ kJ mol}^{-1}$ 

What is the  $\Delta H_f$  of CH<sub>4</sub> (g)?

- 2. Calculate the  $\Delta H_f$  of methane (CH<sub>4</sub> (g)), using the following  $\Delta H_C$  data: CH<sub>4</sub> (g) = -882 kJ mol<sup>-1</sup>; C (s) = -394 kJ mol<sup>-1</sup>; H<sub>2</sub> (g) = -286 kJ mol<sup>-1</sup>
- 3. Calculate the  $\Delta H_{\rm C}$  of propane (C<sub>3</sub>H<sub>8</sub> (g)), given the following:

 $C_3H_8$  (g) = -104 kJ mol<sup>-1</sup>;  $CO_2$  (g) = -394 kJ mol<sup>-1</sup>; H<sub>2</sub>O (I)  $\Delta H_f$  = -286 kJ mol<sup>-1</sup>

4. Calculate the  $\Delta H_f$  of ethanol (C<sub>2</sub>H<sub>5</sub>OH (I)), given the following:

 $\Delta H_c$  of C<sub>2</sub>H<sub>5</sub>OH (I) = -1371 kJ mol<sup>-1</sup> C (s) = -394 kJ mol<sup>-1</sup> H<sub>2</sub>(g) = -286 kJ mol<sup>-1</sup>

5. Given the bond enthalpies:

 $C-C = 348 \text{ kJ mol}^{-1}$ ;  $C-H = 412 \text{ kJ mol}^{-1}$ ;  $O=O = 496 \text{ kJ mol}^{-1}$ ;  $C-O = 336 \text{ kJ mol}^{-1}$ ;  $C=O = 743 \text{ kJ mol}^{-1}$ ;  $O-H = 463 \text{ kJ mol}^{-1}$ 

Find the  $\Delta H_r$  of the following reaction:

 $CH_{3}COOH (I) + 3O_{2} (g) \longrightarrow 2 CO_{2} (g) + 2 H_{2}O (I)$ 

6. Given the following:

 $\Delta H_{C}$  of maltose (C<sub>12</sub>H<sub>22</sub>O<sub>11</sub> (s)) = -5670 kJ mol<sup>-1</sup>

Calculate the  $\Delta H_C$  of glucose (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub> (s)):

 $2 C_6 H_{12}O_6 (s) \longrightarrow C_{12}H_{22}O_{11} (s) + H_2O (l) \Delta H_r = +54 \text{ kJ mol}^{-1}$ 

