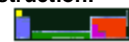


**Revised August 2008**



## AP WORKED ANSWERS

**1983, 2**

**Points 2, 2, 2, 3**

$$(a) \Delta G = \sum \Delta G_f^\circ (\text{products}) - \sum \Delta G_f^\circ (\text{reactants})$$

$$\Delta G = -166.2 - (-137.3 + 2(0))$$

$$\Delta G = \mathbf{-28.9 \text{ kJ mol}^{-1}}$$

$$(b) \Delta G = -RT \ln K$$

$$-28.9 = - (8.31 \times 10^{-3}) (298) \ln K$$

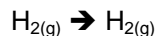
$$\mathbf{K = 1.17 \times 10^5}$$

$$(c) \Delta G = \Delta H - T\Delta S$$

$$-28900 \text{ Jmol}^{-1} = -128100 \text{ Jmol}^{-1} - 298(\Delta S^\circ)$$

$$\Delta S^\circ = \frac{-99200 \text{ Jmol}^{-1}}{298 \text{ K}} = \mathbf{-333 \text{ Jmol}^{-1}\text{K}^{-1}}$$

(d)  $\Delta H_f^\circ (\text{H}_2) = 0$  and  $\Delta G_f^\circ (\text{H}_2) = 0$ , since in the formation reaction of  $\text{H}_2$  from its elements (i.e.  $\text{H}_2$ ), there is no CHANGE ( $\Delta$ );



$$\Delta S^\circ = \sum S^\circ (\text{products}) - \sum S^\circ (\text{reactants})$$

$$-333 \text{ Jmol}^{-1}\text{K}^{-1} =$$

$$126.8 \text{ Jmol}^{-1}\text{K}^{-1} - (197.9 \text{ Jmol}^{-1}\text{K}^{-1} - 2S^\circ(\text{H}_2))$$

$$S^\circ(\text{H}_2) = \mathbf{131 \text{ Jmol}^{-1}\text{K}^{-1}}$$