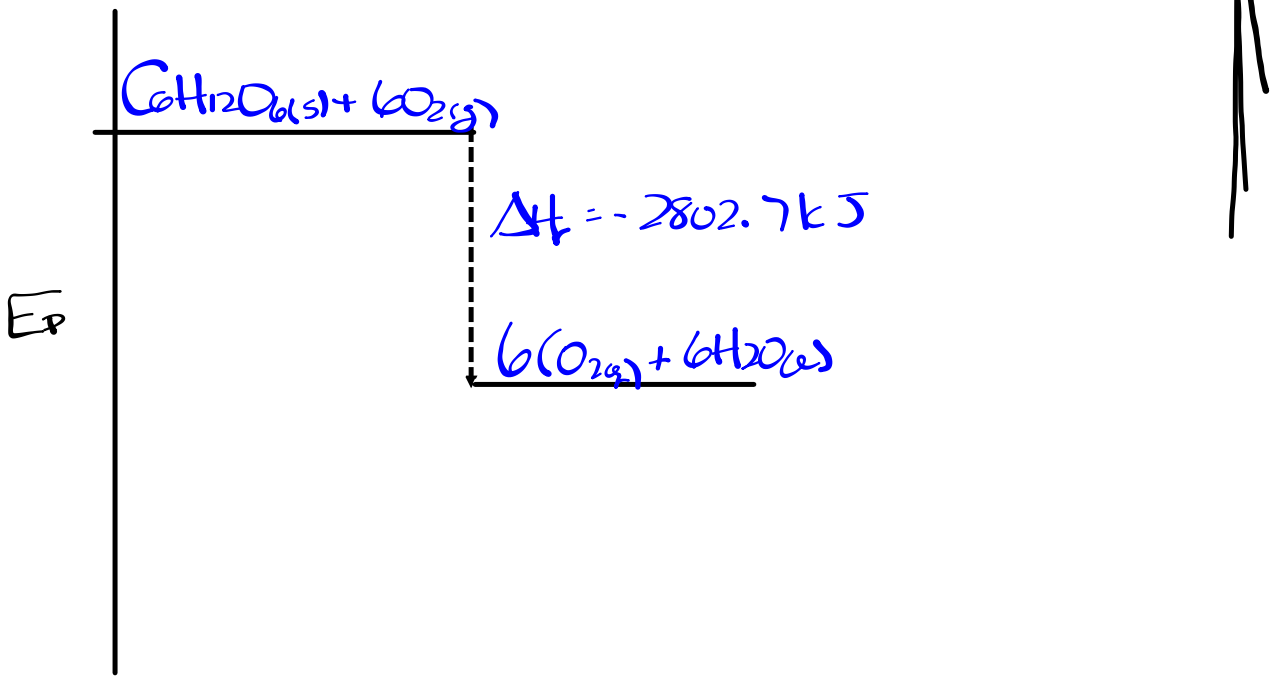
For each of the following reactions:
(a) rewrite the equation including the enthalpy change as a term
(b) draw a potential energy diagram

(i) $C_6H_{12}O_{6(s)} + 6O_{2(g)} \longrightarrow 6CO_{2(g)} + 6H_2O_{(l)}$ $\Delta H^o = -2802.7kJ$

$C_6H_{12}O_{6(s)} + 6O_{2(g)} \rightarrow 6CO_{2(g)} + 6H_2O_{(l)} + 2802.7kJ$



For the following reactions:
(a) rewrite the equation including the enthalpy change as a term
(b) draw a potential energy diagram

(ii) $H_2O_{(g)} \longrightarrow H_{2(g)} + \frac{1}{2}O_{2(g)}$ $\Delta H^o = 241.8$ kJ

Predicting Energy Changes using Hess's Law

Hess' Law - (Heat of Summation)
- allows for the determination of the enthalpy change of a reaction with direct use of calorimetry.

Rules:
- if a chemical equation is reversed, then the sign of the ΔH_r changes
- if the coefficients of a chemical equation are altered by multiplying or dividing by a constant factor, then the ΔH_r is altered in the same way

Ex. $C_{(s)} + O_{2(g)} \Rightarrow CO_{2(g)}$ $\Delta H = -393.5$ kJ

(x2) $2C_{(s)} + 2O_{2(g)} \rightarrow 2CO_{2(g)}$ $\Delta Hr = -787$ kJ

Rev $CO_{2(g)} \rightarrow C_{(s)} + O_{2(g)}$ $\Delta Hr = 393.5$ kJ

Example

$H_2O\,(g) + C\,(s) \rightarrow CO\,(g) + H_2\,(g)$

$\Delta H = ?$

Steps (found using calorimetry):

① $H_2\,(g) + 1/2\,O_2\,(g) \rightarrow H_2O\,(g)$ $\Delta H_r = -242.0$ kJ

② $2CO\,(g) \rightarrow 2\,C\,(s) + O_2\,(g)$ $\Delta H_r = +221.0$ kJ

Rev①

③ $H_2O_{(g)} \longrightarrow H_{2(g)} + \frac{1}{2}O_{2(g)}$ $\Delta H_r = 242.0$ kJ

Rev② ÷ 2

④ $C_{(s)} + \frac{1}{2}O_{2(g)} \longrightarrow CO_{(g)}$ $\Delta H_r = -110.5$ kJ

③ + ④

$H_2O_{(g)} + C_{(s)} \longrightarrow H_{2(g)} + CO_{(g)}$ $\Delta H_r = 131.5$ kJ

Calculate the heat released by the burning of sulfur in oxygen given the following steps:

$2S(s) + 3O_2(g) \rightarrow 2SO_3(g) \quad \Delta H = ?$

Evidence:

Step 1 ①	$S(s)$	+	$O_2(g)$	→	$SO_2(g)$ ΔH= -297 kJ
Step 2 ②	~~$2SO_2(g)$~~	+	$O_2(g)$	→	$2SO_3(g)$ ΔH= - 198 kJ

① x 2

③ $2S_{(s)} + 2O_{2(g)} \rightarrow 2SO_{2(g)}$ $\Delta H = -594\ kJ$

② + ③

$2S_{(s)} + 3O_{2(g)} \rightarrow 2SO_{3(g)}$ $\Delta H = -792\ kJ$

Worksheet