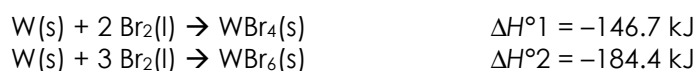


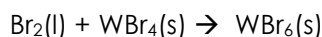
Energy Enthalpy Calorimetry Questions

1. Calculate the enthalpy change for the melting of a 30 g ice cube. [$\Delta H_{\text{fusion}} = -6.03 \text{ kJ/mol}$]
2. A calorimeter has a heat capacity of $40.00 \text{ kJ/}^\circ\text{C}$. Complete combustion of 1.00 g of hydrogen in this calorimeter causes a temperature increase of 3.54°C . Calculate the molar enthalpy of combustion for hydrogen from this evidence. [$q = C\Delta T$]
3. The molar enthalpy of combustion for octane, $\text{C}_8\text{H}_{18(\text{l})}$, is reported to be -5.45 MJ/mol .
 - (a) Write the balanced chemical equation using whole number coefficients and include the energy change as a ΔH_r value.
 - (b) Write the balanced chemical equation using whole number coefficients and include the energy change as a term in the balanced equation.

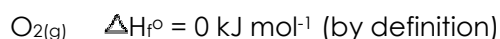
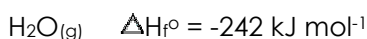
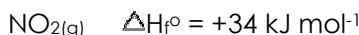
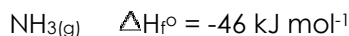
4. The enthalpy changes for the formation of two wolfram bromides are shown below.



Calculate the standard enthalpy change for the following reaction.



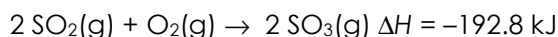
5. Calculate the molar enthalpy of the oxidation of ammonia gas to produce nitrogen dioxide gas and water vapour given the following standard enthalpies (heats) of formation:



6. For the following combustion, what mass of carbon dioxide is produced when 1500 kJ of energy is released?



7. How much energy is released when 1.00 t of sulfur trioxide is produced by the following reaction? [1 t = 1000 kg]



8. In respiration, glucose is oxidized by oxygen gas to produce carbon dioxide gas, liquid water, and energy. What is the energy released when 18.0 g of glucose is consumed?
9. Methanol is burned in a bomb calorimeter. Liquid water is formed as a product. If 3.40 g of methanol reacts, what is the expected temperature change in a calorimeter with a heat capacity of $6.75 \text{ kJ/}^\circ\text{C}$?
10. A waste heat exchanger is used to absorb the energy from the complete combustion of hydrogen sulfide gas. What volume of water undergoing a temperature change of 64°C is required to absorb all of the energy from the burning of 15 kg of hydrogen sulfide?

Solutions

1.	$\Delta H = 10 \text{ kJ}$
2.	$\Delta H_c = -286 \text{ kJ/mol}$
3.	$2 \text{ C}_8\text{H}_{18(l)} + 25 \text{ O}_{2(g)} \rightarrow 16 \text{ CO}_{2(g)} + 18 \text{ H}_2\text{O}_{(g)} \quad \Delta H_{\text{comb}} = -10.9 \text{ MJ}$ $2 \text{ C}_8\text{H}_{18(l)} + 25 \text{ O}_{2(g)} \rightarrow 16 \text{ CO}_{2(g)} + 18 \text{ H}_2\text{O}_{(g)} + 10.9 \text{ MJ}$
4.	<p>(1) $\text{W(s)} + 2 \text{ Br}_{2(l)} \rightarrow \square \text{ WBr}_4(\text{s}) \quad \Delta H^\circ_1 = -146.7 \text{ kJ}$ (2) $\text{W(s)} + 3 \text{ Br}_{2(l)} \rightarrow \square \text{ WBr}_6(\text{s}) \quad \Delta H^\circ_2 = -184.4 \text{ kJ}$ Calculate the standard enthalpy change for the following reaction. $\text{Br}_{2(l)} + \text{WBr}_4(\text{s}) \rightarrow \square \text{ WBr}_6(\text{s})$</p> <p>$\text{WBr}_4(\text{s}) \rightarrow \square \text{ W(s)} + 2 \text{ Br}_{2(l)} \quad \Delta H^\circ = 146.7 \text{ kJ}$ $\text{W(s)} + 3 \text{ Br}_{2(l)} \rightarrow \square \text{ WBr}_6(\text{s}) \quad \Delta H^\circ = -184.4 \text{ kJ}$ $\text{Br}_{2(l)} + \text{WBr}_4(\text{s}) \rightarrow \square \text{ WBr}_6(\text{s}) \quad \Delta H_{\text{total}} = -37.7 \text{ kJ}$</p>
5.	$= -283 \text{ kJ/mol}$
6.	$2 \text{ C}_2\text{H}_6(\text{g}) + 7 \text{ O}_{2(g)} \rightarrow 4 \text{ CO}_{2(g)} + 6 \text{ H}_2\text{O}_{(g)} + 2502 \text{ kJ}$ -626 kJ/mol CO_2 $m = 106 \text{ g}$
7.	$2 \text{ SO}_{2(g)} + \text{O}_{2(g)} \rightarrow 2 \text{ SO}_{3(g)} \quad \Delta H = -192.8 \text{ kJ}$ $-96.4 \text{ kJ/mol SO}_3$ 1.20 GJ
8.	$\text{C}_6\text{H}_{12}\text{O}_6(\text{s}) + 6 \text{ O}_{2(g)} \rightarrow 6 \text{ CO}_{2(g)} + 6 \text{ H}_2\text{O}_{(l)}$ -2802.7 kJ 280 kJ
9.	$\text{CH}_3\text{OH}_{(l)} + 3/2 \text{ O}_{2(g)} \rightarrow \text{CO}_{2(g)} + 2 \text{ H}_2\text{O}_{(l)}$ -726.0 kJ $-726.0 \text{ kJ/mol CH}_3\text{OH}$ 11.4°C
10.	$\text{H}_2\text{S}_{(g)} + 3/2 \text{ O}_{2(g)} \rightarrow \text{SO}_{2(g)} + \text{H}_2\text{O}_{(g)}$ -518.0 kJ $m = 850 \text{ g}$ $v = 0.85 \text{ L}$