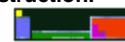


**Revised August 2011**



## HONORS WORKSHEET 10s: Thermochemistry Summary



1. Sketch fully labeled, enthalpy level diagrams (reaction profiles) for;
  - (a) A single step reaction that is exothermic. (2)
  
  
  
  
  
  
  
  
  
  - (b) A two step reaction in which an intermediate is formed in an exothermic reaction but the overall reaction is endothermic. (4)

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2. Butane,  $C_4H_{10}$  has a standard enthalpy of combustion =  $-2881 \text{ kJ mol}^{-1}$
- (a) What is the significance of the negative sign associated with the enthalpy change? (1)
- (b) Calculate the enthalpy change when 400. g of butane is completely burned. (2)
- (c) Assuming the specific heat capacity of water to be  $4.200 \text{ J g}^{-1} \text{ K}^{-1}$ , and that in such a reaction only 63.15 % of the energy generated is actually transferred to the water, calculate the change in temperature of 2.000 kg of water that is heated by burning the butane in part (b) above. (4)



3. This question concerns the compound carbon disulfide.

Using the data below, calculate the enthalpy change for the reaction between carbon and sulfur to form carbon disulfide. (4)

$$\Delta H_f^\ominus \text{SO}_{2(g)} = -297.0 \text{ kJ mol}^{-1}$$

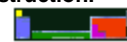
$$\Delta H_f^\ominus \text{CO}_{2(g)} = -393.0 \text{ kJ mol}^{-1}$$

$$\Delta H_c^\ominus \text{CS}_{2(l)} = -1073 \text{ kJ mol}^{-1}$$

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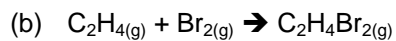
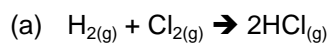


4. The standard enthalpy of formation of  $\text{BrCl}_{(g)}$  is  $14.7 \text{ kJmol}^{-1}$ . The standard enthalpies for the atomization of  $\text{Br}_{2(l)}$  and  $\text{Cl}_{2(g)}$  are  $+112$  and  $+121.0$  kJ per mol of atoms respectively, calculate the average enthalpy of the Br-Cl bond in  $\text{BrCl}_{(g)}$ . (4)



5. Use the table of bond enthalpies below to calculate  $\Delta H$  for the following reactions. (4)

Bond	Enthalpy in $\text{kJmol}^{-1}$
H-H	436
Cl-Cl	242
H-Cl	431
C=C	612
C-C	348
C-H	412
Br-Br	193
C-Br	276



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6. This question concerns the alcohol, propan-1-ol, ( $C_3H_7OH$ ).
- (a) Define standard enthalpy of formation. (2)
  
  - (b) Write an equation representing the standard enthalpy of formation of propan-1-ol. (2)
  
  - (c) Define standard enthalpy of combustion. (2)
  
  - (d) Write an equation representing the standard enthalpy of combustion of propan-1-ol. (2)
7. State Hess' law. (2)
8. This question concerns the organic compound propane, ( $C_3H_8$ ).
- The standard enthalpy of formation of propane is  $-103.9 \text{ kJ mol}^{-1}$ . Write the chemical equation that would represent an enthalpy change of  $-207.8 \text{ kJ mol}^{-1}$ . (2)