Thermochemistry and Thermodynamics Worksheet 3

1. Calculate ΔH_f of propane, C_3H_8, given the following information:

$2\ C_3H_{8(g)} + 10\ O_{2(g)}$ -----> $6\ CO_{2(g)} + 8\ H_2O_{(l)}$	$\Delta H = -4439.4$ kJ
$C_{(s)} + O_{2(g)}$ -----> $CO_{2(g)}$	$\Delta H = -393.5$ kJ
$2\ H_{2(g)} + O_{2(g)}$ -----> $2\ H_2O_{(l)}$	$\Delta H = -571.6$ kJ

2. When nitromethane, CH_3NO_2 (molecular mass = 61.05) is burned the reaction occurs:

$2\ CH_3NO_{2(l)} + O_{2(g)}$ -----> $2\ CO_{2(g)} + N_{2(g)} + 3\ H_2O_{(g)}$

Given the following information:

$\Delta H_f\ CO_{2(g)} =$	-393.5 kJ/mol
$\Delta H_f\ 3\ H_2O_{(g)} =$	-241.8 kJ/mol
$\Delta H_f\ CH_3NO_{2(l)} =$	112.0 kJ/mol

(A) Calculate ΔH for the burning of 1 mole of nitromethane.

(B) Is the reaction exothermic or endothermic?

(C) What is ΔH when 18.02 g $H_2O_{(g)}$ is formed in the above reaction?

3.Given the following information:

$\Delta H_f\ MgCl_{2(S)} =$	-641.8 kJ/mol
$\Delta H_f\ Mg^{2+}_{(aq)} =$	-462.0 kJ/mol
$\Delta H_f\ Cl^-_{(aq)} =$	-167.4 kJ/mol

(A) Calculate ΔH for the following reaction: $MgCl_{2(s)}$ -----> $Mg^{2+}_{(aq)} + 2\ Cl^-_{(aq)}$

(B) If 3.17 g $MgCl_{2(s)}$ (formula mass = 95.21) is dissolved in 250.0 g of water (S.H. = 4.184J/g°C) in a coffee-cup calorimeter, what would the final temperature of the water be if the water were initially at 19.00°C?