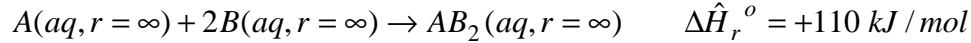


**CM205 Exam 4**  
**Open Books/Open Notes**

Name: \_\_\_\_\_

- (20 pts) What is the specific heat of formation for nitrogen dioxide at  $T=100^\circ\text{C}$  and 1 atm?
- (20 pts) Obtain the standard heat of mixing for  $AB_2(aq, r=\infty)$  given the following data:



$$\Delta\hat{H}_f^\circ(A) = -100 \text{ kJ/mol}$$

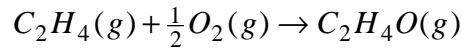
$$\Delta\hat{H}_f^\circ(B) = -50 \text{ kJ/mol}$$

$$\Delta\hat{H}_f^\circ(AB_2) = -120 \text{ kJ/mol}$$

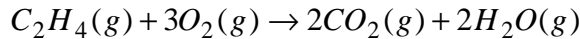
$$\Delta\hat{H}_m^\circ A(aq, r=\infty) = -20 \text{ kJ/mol}$$

$$\Delta\hat{H}_m^\circ B(aq, r=\infty) = -35 \text{ kJ/mol}$$

- (5 pts) What is the formation reaction for magnesium hydroxide ?
- (5 pts) What is the combustion reaction for liquid benzyl alcohol ?
- Ethylene is mixed with air and fed at  $200^\circ\text{C}$  to a reactor to form ethylene oxide:



with a side reaction:



The product gas is 6.90 mol%  $C_2H_4O$ , 9.20 mol%  $CO_2$ , 9.20 mol%  $H_2O$ , 0.00 mol %  $C_2H_4$ , and the balance is a mixture of  $O_2$  and  $N_2$ . The product gas exits the reactor at  $600^\circ\text{C}$ .

- (25 pts) Using the basis of 100 mols/hr of ethylene oxide, calculate the molar flow rates of the components in the feed and in the product gas.
- (25 pts) Using the same basis of a), calculate the rate of heat supplied (or removed) in kJ per hour.

Additional data for ethylene-oxide:

$$\Delta H_f^\circ = -51 \text{ kJ/mol}$$

$$C_p(\text{ kJ/(mol K)}) = 0.441 \times 10^{-3} + 0.151 \times 10^{-5} T - 0.995 \times 10^{-8} T^2 \quad (T \text{ in } ^\circ\text{C})$$

- (Bonus 10 pts) What is the standard specific enthalpy of reaction for the partial combustion reaction of one mole of liquid heptane to form  $CO(g)$  and  $H_2O(g)$  ?