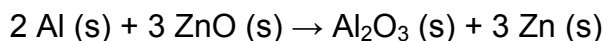


Name \_\_\_\_\_ KEY \_\_\_\_\_ Section \_\_\_\_\_ chm152 Quiz 2

1a) (6 pts) Calculate the change in entropy for the following reaction?

$$\Delta S^{\circ}_{\text{rxn}} = \Sigma S^{\circ}n(\text{products}) - \Sigma S^{\circ}m(\text{reactants})$$



	$S^{\circ}$ (J/K*mol)
Al (s)	28.3
ZnO (s)	43.9
Al <sub>2</sub> O <sub>3</sub> (s)	50.99
Zn (s)	41.6

$$\Delta S^{\circ}_{\text{rxn}} = [(1 \text{ mol})(50.99 \text{ J/K*mol}) + (3 \text{ mol})(41.6 \text{ J/K*mol})] - [(2 \text{ mol})(28.3 \text{ J/K*mol}) + (3 \text{ mol})(43.9 \text{ J/K*mol})]$$
$$= -12.51 \text{ J/K}$$

1b) (3 pts) Does this reaction lead to a more or less ordered (random) system?

**MORE ordered (LESS random)**, entropy is DECREASING.

2) (6 pts) Does the following reaction proceed spontaneously at 25 °C? **Explain your answer and use MATH to prove it, no guessing!**

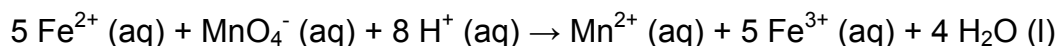
$$\Delta G = \Delta H - T\Delta S$$



$$\Delta G = (177.8 \text{ kJ/mol}) - (298 \text{ K})(0.1605 \text{ kJ/K*mol}) = 129.97 \text{ kJ/mol}$$

**At 25 °C, the reaction is NOT spontaneous.** The calculation of  $\Delta G$  at this temperature produces a positive value meaning the reaction is non-spontaneous.

3) (5 pts) You need to measure the rate of the following reaction by the change in pH ( $\text{H}^+$  concentration). What is the **rate expression for the change in  $\text{H}^+$**  as the reaction proceeds?



$$\text{rate} = -\frac{1}{8} \frac{\Delta[\text{H}^+]}{\Delta t}$$