

CHEM 1312

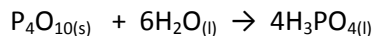
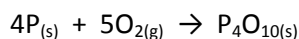
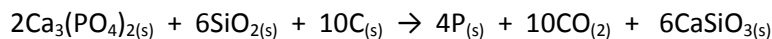
General Chemistry II

Amorde

Fall '09

Bonus # 1

As we discussed in class, the process to make phosphoric acid involves large amounts of energy!! The industrial process to manufacture H_3PO_4 is listed below;



- a. Calculate the $\Delta H^\circ_{\text{rxn}}$, $\Delta S^\circ_{\text{rxn}}$, and $\Delta G^\circ_{\text{rxn}}$ for the following reactions under standard conditions. The ΔH°_f for $\text{Ca}_3(\text{PO}_4)_2(\text{s})$ is -4132 KJ/mol and the ΔH°_f for $\text{CaSiO}_3(\text{s})$ is -78.3 KJ/mol.
 - b. Is each reaction exothermic or endothermic?
 - c. What amount of heat will be released or gained?
 - d. Is entropy increased or decreased for each reaction?
 - e. Which reactions are spontaneous?
-
1. Please calculate and compare the $\Delta H^\circ_{\text{rxn}}$, $\Delta S^\circ_{\text{rxn}}$, and $\Delta G^\circ_{\text{rxn}}$ for the formation of H_3PO_4 from elemental hydrogen, phosphorous, and oxygen to the values calculated for the industrial process to manufacture phosphoric acid described above.