7) Calculate the reaction enthalpy of formation of anhydrous aluminum chloride,

$2\ Al(s) + 3\ Cl_2(g) \rightarrow 2\ AlCl_3(s)$ from the following data:

$2\ Al(s) + 6HCl(aq) \rightarrow 2\ AlCl_3(aq) + 3\ H_2(g)$ $\Delta H^o_{rx} = -1049$ kJ

$HCl(g) \rightarrow HCl(aq)$ $\Delta H^o_{rx} = -74.8$ kJ

$H_2(g) + Cl_2(g) \rightarrow 2\ HCl(g)$ $\Delta H^o_{rx} = -185$ kJ

$AlCl_3(s) \rightarrow AlCl_3(aq)$ $\Delta H^o_{rx} = -323$ kJ

Would you expect the equilibrium constant to rise or fall with increasing temperature for this reaction?

8) **Draw valid Lewis structures** for each of the following compounds: $CH_3CH_2CH_2OH$ (propanol), $CH_3CH_2CH_2CH_3$ (butane), and $CH_3CH_2OCH_3$ (methyl-ethyl-ether) indicating for each molecule which Van der Waals forces are important.

a) Rank the molecules in order of increasing vapor pressure at fixed temperature.

b) Rank the molecules in order of increasing normal boiling point.

c) Which molecule has the highest vapor pressure? Which has the lowest vapor pressure?

d) Which molecule has the highest boiling point? Which has the lowest boiling point?

9) What is a “state” in chemistry? What is a “state property” or “state function”?

10) Give as many examples as you can of Chem 1A systems which are in a “state”.

11) State the 1st Law of Thermodynamics in at least 3 ways.

12) Write balanced **“molecular”, complete ionic, and net ionic chemical equations** for the following reactions:

a) The neutralization of HCl by calcium carbonate to give calcium chloride, water, and carbon dioxide (TUMS reaction).

b) The precipitation of lead iodide when a KI solution is added to a solution of $Pb(NO_3)_2$.