CHEM 1105 TEST#2

NAME: **Date: July 6, 2016**
Student Number:

Useful Data!

$\Delta G° = \Delta H° - T\Delta S°$ **$\Delta G = \Delta H - T\Delta S$**
$T(K) = T(°C) + 273.15$ **1000 J = 1kJ**

1. Consider the following process.

$$Br_2(l) \rightarrow Br_2(g)$$
$$\Delta H° = 31.0\ kJ, \quad \Delta S° = 93.0\ J/K$$

Assuming $\Delta H°$ and $\Delta S°$ do not change in this temperature range.
a) Is this process spontaneous at 30. °C.
b) What is the normal boiling point of liquid Br_2 when the reaction starts to becomes spontaneous?

2. Consider the reaction

$$2SO_2(g) + O_2(g) \rightarrow 2SO_3(g)$$

carried out at 25 °C.

Substance	$\Delta H_f°$(kJ/mole)	$\Delta S°$(J/K·mole)
$SO_2(g)$	-297	248
$SO_3(g)$	-396	257
$O_2(g)$	0	205

a) Calculate $\Delta H°$, $\Delta S°$, and $\Delta G°$.
b) Discuss the significance of each.
c) Determine if this reaction is spontaneous at high temperatures, low temperatures, all temperatures, or no temperatures. Justify.

Answer Set for CHEM 1105 TEST#2

1.a) ΔG° = + 2.8 kJ thus the process is not spontaneous. b) Normal boiling point = 333 K

2.a) b) ΔH° = -198 kJ, exothermic; ΔS° = -187 J/K, disorder decreased;
ΔG° = -142 kJ, spontaneous
c) Spontaneous at low temperatures. Since ΔH° is negative and ΔS° is negative, ΔG° will only be negative when ΔH° is dominate or $-T\Delta S^\circ$ is small. Thus spontaneous at low temperatures.