

CHEM 1105 TEST#2

NAME:

Date: July 6, 2016

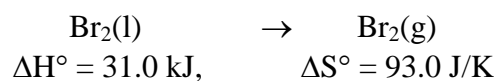
Student Number:

Useful Data!

$$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$$
$$T(\text{K}) = T(^{\circ}\text{C}) + 273.15$$

$$\Delta G = \Delta H - T\Delta S$$
$$1000 \text{ J} = 1\text{kJ}$$

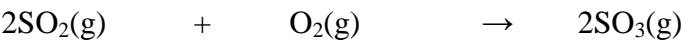
1. Consider the following process.



Assuming ΔH° and ΔS° do not change in this temperature range.

- Is this process spontaneous at 30. °C.
- What is the normal boiling point of liquid Br_2 when the reaction starts to becomes spontaneous?

2. Consider the reaction



carried out at 25 °C.

Substance	$\Delta H_f^\circ(\text{kJ/mole})$	$\Delta S^\circ(\text{J/K}\cdot\text{mole})$
$\text{SO}_2(\text{g})$	-297	248
$\text{SO}_3(\text{g})$	-396	257
$\text{O}_2(\text{g})$	0	205

- a) Calculate ΔH° , ΔS° , and ΔG° .
- 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) $\Delta G^\circ = + 2.8 \text{ kJ}$ thus the process is not spontaneous. b) Normal boiling point = 333 K

2.a) b) $\Delta H^\circ = -198 \text{ kJ}$, exothermic; $\Delta S^\circ = -187 \text{ J/K}$, disorder decreased;
 $\Delta G^\circ = -142 \text{ kJ}$, 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.