

the same.

c) We can use the Gibbs free-energy equation,  $\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$ , to calculate the sign of the standard free-energy change. Since the enthalpy change is the driving force behind this reaction, the  $T\Delta S^\circ$  term in this reaction will have little significance. Since  $\Delta H$  is negative,  $\Delta G^\circ$  will also likely be negative.

d) The order of  $[O_3]$  is 1 because a doubling of its concentration while the other reactant's concentration remains constant results in a doubling of the rate of  $NO_2$  formation. This can be seen in experiments 1 & 3. Experiments 3 and 4 will show that  $[NO]$  is also 1st order for the same reason. The rate-law expression would be

$$\text{Rate} = k [O_3][NO].$$

e) Step 1 must be the slowest because these reactants ( $O_3$  and  $NO$ ) are both part of the rate-law expression. In the other steps only one reactant is a part of the rate-law.