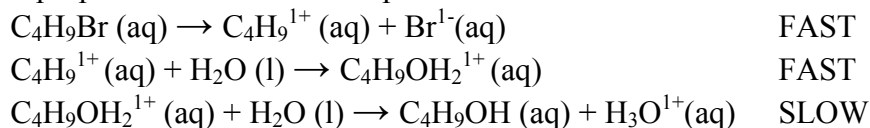


Show your work for all problems and be sure to box your final answer and include sensible units.
No work (i.e., reasonable justification) = no credit.

1. (24 pts) $2 \text{NO} (\text{g}) + \text{Br}_2 (\text{g}) \leftrightarrow 2 \text{NOBr} (\text{g})$; at 298 K, the equilibrium constant, K_p , is 109.
- a. (8 pts) If the equilibrium partial pressure of NO is 0.0259 atm and that of NOBr is 0.0568 atm, calculate the partial pressure of Br_2 at equilibrium.
- b. (8 pts) If the temperature in the container is lowered to 100 K and the overall pressure is observed to increase, what can be said about the enthalpy of this reaction? Briefly explain.
- c. (8 pts) If the volume of the container were increased, how would the equilibrium position shift? Briefly explain.

2. (8 pts) A proposed mechanism for a particular reaction is:



- a. (2 pts) Write the overall, balanced reaction for this reaction.
- b. (6 pts) Write the expected rate law if this proposed mechanism is correct.

3. (12 pts) A sample of a certain monoprotic weak base was dissolved in water and titrated with 0.125 M HCl in the presence of methyl red. After the addition of 3.00 mL of HCl, the resulting pH of the yellow solution was 7.008; after the addition of 15.00 mL of HCl, the solution took on a slight red color. Calculate the K_b of this weak base.

4. (16 pts) Given the following solubility-product constants measured at 25°C.

Ag_2SO_4	1.2×10^{-5}
CaSO_4	6.1×10^{-5}
$\text{Cu}_2(\text{SO}_4)_3$	5.7×10^{-8}

- a. (4 pts) Rank the solids in order from most to least soluble:

_____ > _____ > _____

- b. (12 pts) If saturated solutions are created of each of the above solids, which will have the greatest concentration of hydroxide ions?