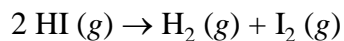


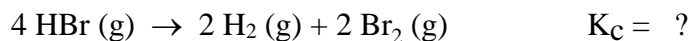
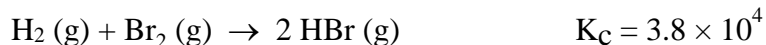
REVIEW QUESTIONS**Test 1**

1. Hydrogen iodide decomposes at 800 K via a second-order process to produce hydrogen and iodine according to the following chemical equation.

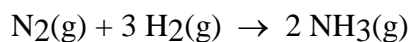


At 800 K it takes 142 seconds for the initial concentration of HI to decrease from 6.75×10^{-2} M to 3.50×10^{-2} M. What is the rate constant for the reaction at this temperature?

2. The equilibrium constant is given for one of the reactions below. Determine the value of the missing equilibrium constant.

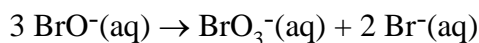


3. The reaction below has a K_p value of 41. What is the value of K_c for this reaction at 400 K?



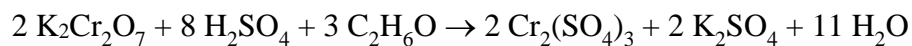
4. The first-order reaction, $\text{SO}_2\text{Cl}_2 \rightarrow \text{SO}_2 + \text{Cl}_2$, has a half-life of 8.75 hours at 593 K. How long will it take for the concentration of SO_2Cl_2 to fall to 16.5% of its initial value?

5. In aqueous solution, hypobromite ion, BrO^- , reacts to produce bromate ion, BrO_3^- , and bromide ion, Br^- , according to the following chemical equation:

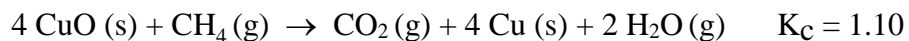


A plot of $1/[\text{BrO}^-]$ vs. time is linear and the slope is equal to $0.056 \text{ M}^{-1}\text{s}^{-1}$. If the initial concentration of BrO^- is 0.80 M, how long will it take one-half of the BrO^- ion to react?

6. The reaction that occurs in a Breathalyzer, a device used to determine the alcohol level in a person's bloodstream, is given below. If the rate of appearance of $\text{Cr}_2(\text{SO}_4)_3$ is 1.64 M/min at a particular moment, what is the rate of disappearance of $\text{C}_2\text{H}_6\text{O}$ at that moment?



7. Consider the following reaction and its equilibrium constant:



A reaction mixture contains 0.22 M CH₄, 0.67 M CO₂ and 1.3 M H₂O. Which direction will the reaction proceed to reach equilibrium?

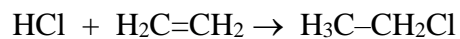
8. Consider the endothermic reaction shown below:



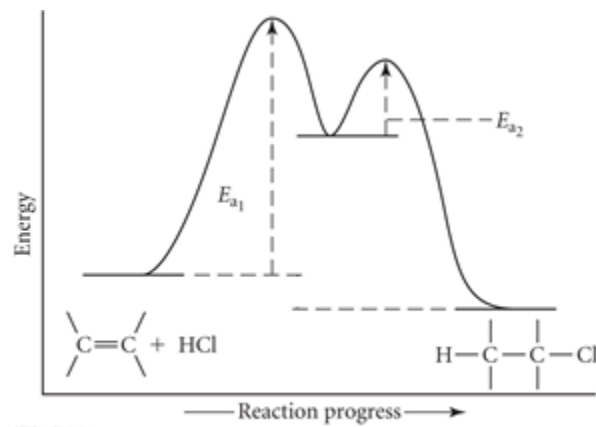
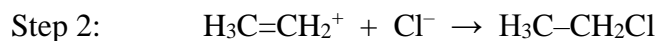
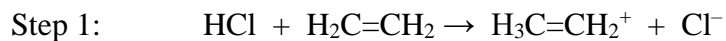
If you were a chemist trying to maximize the amount of C₂H₄Cl₂, describe 3 different tactics that you might try to achieve this.

9. A certain substance X decomposes. Fifty percent of X remains after 100 minutes. How much X remains after 200 minutes if the reaction order with respect to X is (a) first order, (b) second order.

10. Consider the reaction in which HCl adds across the double bond of ethene:



The following mechanism with the energy diagram shown below has been proposed for this reaction:



a) Based on the energy diagram, determine which step is the rate determining step.

b) What is the expected order of the reaction based on the proposed mechanism?

c) Is the overall reaction endothermic or exothermic?

ANSWERS

- 1) $9.69 \times 10^{-2} \text{ M}^{-1}\text{s}^{-1}$
- 2) 6.9×10^{-10}
- 3) 4.4×10^4
- 4) 22.7 hr
- 5) 22 s
- 6) 2.46 M/min
- 7) Reverse (to the left)
- 8) No answer provided
- 9) (a) 25% (b) 33%
- 10) (a) 1st step (b) 2nd order (c) exothermic