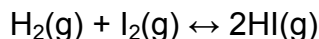


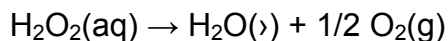
Solutions for Practice Exam 1

- The mol fraction of NH_4Cl in a solution is 0.0311. What is its molality? (The molar mass of water is 18.016 g/mol.)
 - 1.78 m
- What is the molarity of a 25.0% HCl solution if the density is 1.08 g/cm³?
 - 7.41 M
- Which of the following gases do you expect to have the highest Henry's Law gas constant for water at 25 °C?
 - HCN
- Which of the following solvents should Na^+ ion have the highest solvation energy in?
 - $\text{H}_2\text{O}(\text{l})$
- Which of the following changes in the property of a salt would increase its heat of hydration?
 - a decrease (weakening) in lattice energy
- What is the molar mass of a compound if 5.96 grams is dissolved in 25.0 grams of chloroform solvent to form a solution which has a boiling point elevation of 4.80 °C? The boiling point constant of chloroform is +3.63 °C/m.
 - 180 g/mol
- What is the osmotic pressure of a 0.100 M aqueous solution of urea at 25 °C?
 - 2.44 atm
- Consider the reaction
$$\text{S}_2\text{O}_8^{2-} + 3 \text{I}^- \rightarrow 2\text{SO}_4^{2-} + \text{I}_3^-$$
which one of the following rate expressions would give the same value as the rate of disappearance of $\text{S}_2\text{O}_8^{2-}$?
 - rate = $-1/3(\Delta[\text{I}^-])/\Delta t$

9. The exponents in a rate law are determined by
1. the coefficients in the balance equation.
 2. experiment.
 3. the physical states of the reactants and products.
- b. 2 only
10. After five half-life periods for a first-order reaction, what is the molarity of a reagent initially at 0.366 M?
- a. 1.14×10^{-2}
11. If the half-life of a first-order process is 3.00 minutes, the rate constant for the process is
- e. 0.231/min.
12. Under which of the following conditions does the equilibrium constant K change for the reaction

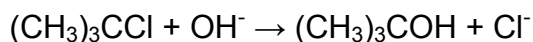


- b. Introducing more I_2 into the container
13. Hydrogen peroxide decays into water and oxygen in a first-order process.

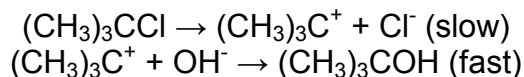


where the rate expression is $-\Delta[\text{H}_2\text{O}_2]/\Delta t = k[\text{H}_2\text{O}_2]$. If we begin with 0.100 M H_2O_2 and find that after 3200 seconds, the peroxide concentration falls to 0.0825 M, what is the rate constant, k , at the temperature at which the experiment is performed?

- b. $6.01 \times 10^{-5} \text{ s}^{-1}$
14. In basic solution, $(\text{CH}_3)_3\text{CCl}$ reacts according to the equation



The accepted mechanism for the reaction is



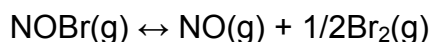
What is the rate law expression for the reaction?

- d. $\text{rate} = k[(\text{CH}_3)_3\text{CCl}]$

15. The activation energy for $2\text{N}_2\text{O}(\text{g}) \rightarrow 2\text{N}_2(\text{g}) + \text{O}_2(\text{g})$ is 250. kJ. If k for this reaction is $0.380 \text{ M}^{-1}\text{s}^{-1}$ at 1001 K, what will k be at room temperature, 298 K?

a. 6.36×10^{-32}

16. If $K_{\text{C}} = 0.44$ for the reaction $2\text{NOBr}(\text{g}) \leftrightarrow 2\text{NO}(\text{g}) + \text{Br}_2(\text{g})$ at a particular temperature, what is K_{C} for the following reaction?



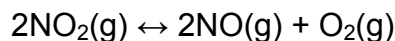
d. 0.66

17. A chemist prepared a sealed tube with 0.85 atm of PCl_5 at 500 K. The pressure increased as the following reaction occurred. When equilibrium was achieved, the pressure in the tube had increased to 1.25 atm. Calculate K_{P} .



a. 0.36

18. A 1.00 liter flask contained 0.24 mol NO_2 at 700 K which decomposed according to the following equation. When equilibrium was achieved, 0.14 mol NO was present. Calculate K_{C} .



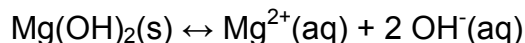
d. 1.4×10^{-1}

19. A mixture of 0.30 mol NO and 0.30 mole CO_2 is placed in a 2.00 L flask and allowed to reach equilibrium at a given temperature. Analysis of the equilibrium mixture indicated that 0.10 mol of CO was present. Calculate K_{C} for the reaction.



c. 0.25

20. A flask contains the following system at equilibrium:



Which of the following reagents could be added to increase the solubility of $\text{Mg}(\text{OH})_2$?

c. HCl