# STUDYDADDY

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you have a question please ask for clarification.

9 pts) The decomposition of the iron thiocyanate complex [FeSCN with time. The data for the experiment and the resultant plot is shown. You wish to determine the order for the reaction kn reaction order for [FeSCN^{2+}] is **zero, first, or second order.**

$$FeSCN^{2+}_{(aq)} \rightarrow Fe^{3+}_{(aq)} + SCN^-_{(aq)}$$
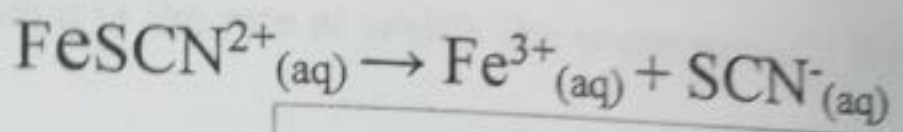
Time (min)	[FeSCN^{2+}]
0	0.0200
2	0.0071
4	0.0043
6	0.0031
8	0.0024
10	0.0020
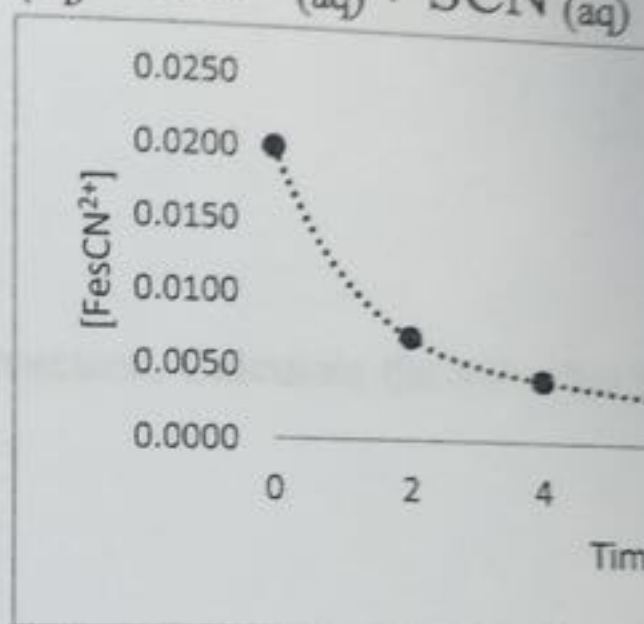
a. Write a generic rate law for the reaction

b. From the information given can any of the three reaction orders (ze eliminated as a possibility? Explain.

c. You cannot solve this problem with the information given, but if g

reaction order given the information above?

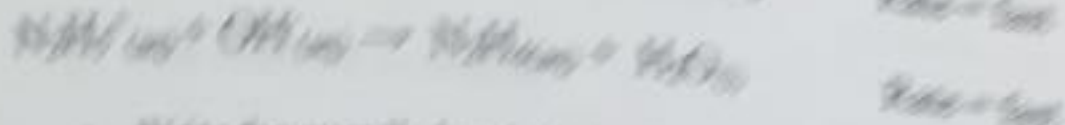pts) For the following reaction the rate at which H_2 was consumed was monitored with time.

$$H_{2(g)} + Br_{(g)} \rightarrow 2HBr_{(g)}$$
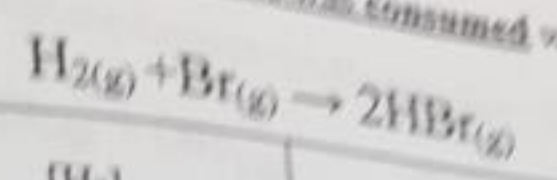
Experiment	$[H_2]$	$[Br_2]$	$-\left(\frac{\Delta[H_2]}{\Delta t}\right)$
1	0.200	0.450	0.015
2	0.200	0.900	0.030
3	0.600	0.450	0.135

a. For experiment 1 what is the rate at which Br_2 is consumed? What is the rate at w HBr is produced?

b. Determine the rate law for the reaction. Calculate the value for the rate constan include proper units!

3.(4 pts) You perform a series of experiments for the reaction $A \rightarrow B + C$ and find the form $R = [A]^x$. Determine the value of x (order) in each case.

4. (10pts) Consider the following two step mechanisms for the reaction. [...]

$$NH_{3(aq)} + OCl^-_{(aq)} \rightarrow NH_2Cl_{(aq)} + OH^-_{(aq)}$$
Rate = fast

$$NH_2Cl_{(aq)} + NH_{3(aq)} \rightarrow N_2H_5^+_{(aq)} + Cl^-_{(aq)}$$
Rate = slow

$$N_2H_5^+_{(aq)} + OH^-_{(aq)} \rightarrow N_2H_{4(aq)} + H_2O_{(l)}$$
Rate = fast

a. Write the overall chemical reaction.

b. Identify any intermediates in the mechanism. [...]

c. What is the predicted rate law?

d. Explain the term activation energy (E_a). [...]

5. (6pts) Write the equilibrium constant expression (K_c) for the following balanced reactions. Indicate [...] equilibrium constant (K_c, K_a, K_b, K_{sp}, K_f etc.)

a. $2C_6H_{12}O_{6(aq)} + 2H_2O_{(l)} = 2C_6H_{12}O_{6(aq)} + O_{2(g)}$

6. (10 points) How will each of the following changes affect the equilibrium amount?

$$NH_4HS_{(s)} \rightleftharpoons NH_{3(g)} + H_2S_{(g)} \quad \text{rxn is endother...}$$
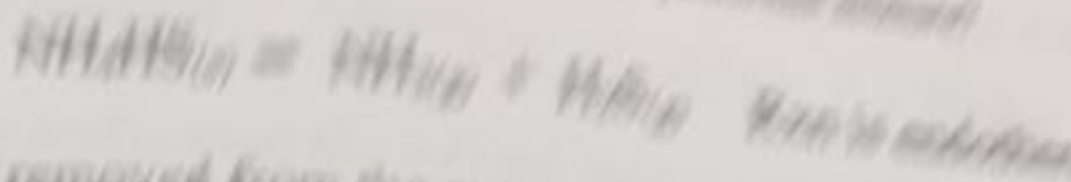
a. $H_2S_{(g)}$ is removed from the system

_____

b. The reaction is heated

_____

c. The volume of reaction is reduced

_____

d. A catalyst is added

_____

e. $NH_4HS_{(s)}$ is added

_____

f. $NH_{3(g)}$ is added

_____

7. (4pts) For the reaction $3A_{(g)} \rightleftharpoons B_{(g)}$ the equilibrium constant value is

a. What is the value of K_c for the reverse reaction?

b. What is the value of K_c if the reaction is multiplied by 3?

8. (6 pts) Concerning equilibrium reactions match the following

1. $K \ll 1$	1) ___	a. Reaction favors formation of more
2. $K \approx 1$	2) ___	b. Reaction is at equilibrium
3. $Q < K_c$	3) ___	c. Reaction has more products than ...
4. $Q > K$	4)	d. Reaction does not favor reactants

9. (10 pts) Solid NH_4NO_3 is introduced into a flask that has a pressure of 0 atm at 295K. The following reaction takes place: $NH_4NO_{3(s)} \rightleftharpoons N_2O_{(g)} + 2 H_2O_{(g)}$.

At equilibrium the total pressure (for N_2O and H_2O) is 1.25 atm. What is Kc?

10. (10pts) Consider the reaction: $2H_2S_{(g)} + SO_{2(g)} \rightleftharpoons 3 S_{(s)} + 2 H_2O_{(g)}$

A reaction mixture initially contains 0.500 M H_2S and 0.500 M SO_2. When reached 0.011 M H_2O is present.

A second reaction mixture at the same temperature initially contains [H_2S $[SO_{2(g)}] = 0.325$ M. What is the concentration of H_2O at equilibrium of th

11. (4pts) Give the conjugate acid or base for the following

    a. Conjugate acid of NH_3 _____

    b. Conjugate base of H

12. (6pts) a) Write the equilibrium reaction of H_2CO_3 in water.

b) Write the equilibrium of the weak base $NaHSO_3$ dissolved in wa

13. (10pts) What is the pH of a buffer solution made by dissolving 5.6 g
    1.00 L of water. Note Kb of $[NH_3] = 1.7 \times 10^{-5}$.

    a. What is the pH of the solution of 25 mL of 0.2 M H

14.(12pts) Calculate the molar solubility of $Ca(OH)_2$ when it is dissolved in solution. $K_{sp} = 4.7 \times 1$

a. What is the pH of the previous solution?

b. If we add Ca^{2+} to a solution with a pH = 9.3. The concentration of Ca^{2+} a precipitate form?

15. (10pts) Malonic acid ($H_2C_3H_2O_4$ or H_2Mal for short) is a weak diprotic acid wi $Ka2 = 2.0 \times 10^{-7}$. It is a naturally occurring acid found in many fruits.

a. Malonic acid has two protons which can contribute to the pH of a s assumption be made to simplify the determination of the pH? Exp why it is valid?

b. What is the pH of a 1.75 M solution of Malonic Acid?

c. If disodium malate (Na_2Mal) is added to the solution above w decrease, or stay the same? Explain.

16.(12 pts) Fill in the blanks in the table below. ΔH and ΔS refer to the system. If the process is dependent on temperature write BOTH (+ and -). In the temperature column is spontaneous or nonspontaneous.

ΔH	ΔS	ΔG	Low Temp
Negative	Positive		
			Spontaneous
Positive	positive		
			Nonspontaneo

17. (12pts) Copper dissolves in nitric acid, does platinum?

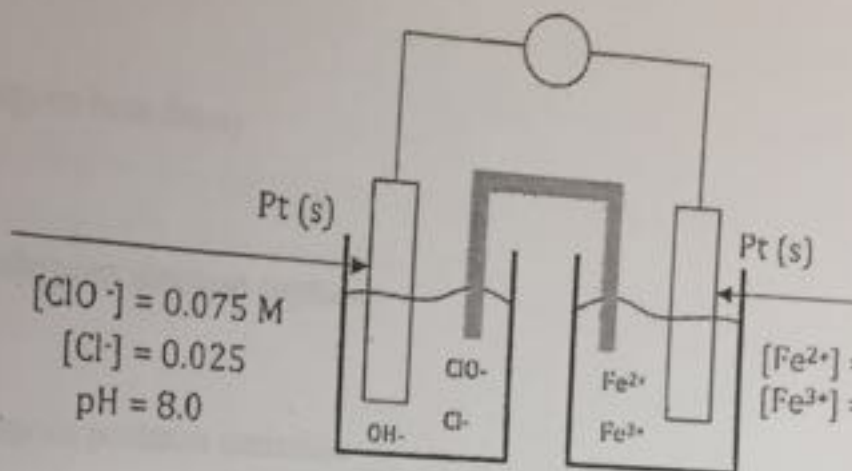$$NO_3^-{}_{(aq)} + Pt_{(s)} + Cl^-{}_{(aq)} \rightarrow PtCl_4{}^{2-}{}_{(aq)} + NO_{2(g)}$$
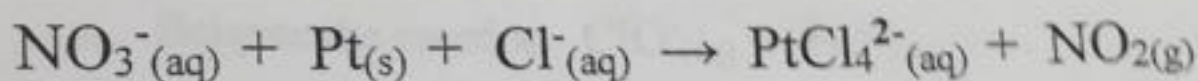
a. Balance the above redox reaction:

b. Calculate the standard reduction potential for this reactio

18.(18 points) Using the following voltaic cell

$E°_{ClO-} = 1.05$ V
$E°_{Fe} = 0.77$ V

Pt (s)

$[ClO^-] = 0.075$ M
$[Cl^-] = 0.025$
$pH = 8.0$

Pt (s)

ClO-
OH-   Cl-

Fe^{2+}
Fe^{3+}

$[Fe^{2+}]$
$[Fe^{3+}]$

a. Balance the reaction: $ClO^-_{(aq)} + Fe^{2+}_{(aq)} \rightarrow Fe^{3+}_{(aq)} + Cl^-_{(aq)}$ (E

b. On the diagram above label the anode, cathode, sign for each electrod electron flow.

c. What is $E°cell$ for this reaction?

d. Calculate Ecell for this reaction.

19. (8 pts) Write the balanced nuclear equations:

a. Pb-215 undergoes alpha decay

b. N-13 undergoes beta decay

c. Am-246 undergoes electron capture

d. Cr-51 undergoes positron emission

20. (5pts) Pu-239 is used to make atomic weapons and when it is bombarded with a sing 239 produces 2 neutrons, Ce-144 and a second daughter atom. Write the balance this process.

21. (28 ppts) 450 mL of unknown solution are found. pH paper shows it to basic. A following questions regarding this original solution.

a. To find the concentration of the solution should it be titrated with 0.50 H_2CO_3? Explain your choice.

b. The equivalence point is found after adding 152 mL of Acid. What concentration of base?

c. If the pH at equivalence point is 9.78 what would be a good indicator? Wh

Thymol blue   pKa = 1.4

Bromothymol blue   pKa = 5.1

Thymolphthalein   pKa = 9.6

d. Since the pH was 9.78 at equivalence point and knowing the concentration part B, what is the Kb of the unknown base?

e. If instead of adding 152 mL of acid you added only 80 mL of Acid, what be?

f. Draw a titration curve illustrating pH vs a point.