

Name: _____

chm112final2014

Short Answer

1. For a first-order reaction that has a rate constant of $1.9 \times 10^{-7} \text{ s}^{-1}$;
 - a) if the initial concentration of the only reactant is 1.25 M, what is the concentration after 30.0 min min?

 - b) How long will it take for the concentration to decrease to 0.75 M?

 - c) How long will it take for the reaction to be 90% complete?

2. Two reactants, A and B, are mixed, and the reaction is timed until a color change occurs. The data from three experiments are as follows:

[A]	[B]	time (sec)
0.100	0.140	25
0.050	0.140	50
0.100	0.070	100

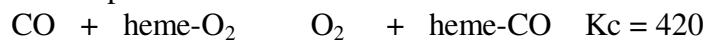
What is the order of the reaction with respect to A and B? What is the overall order of the reaction?

3. A coffee machine has become coated with 10.0 g CaCO_3 . If the machine is washed with 1.00 L of pure water until equilibrium is reached, what fraction of the precipitate is removed? K_{sp} for CaCO_3 is 5.05×10^{-9} .

4.

Inhalation of carbon monoxide, CO, is fatal if about 20 % of the lung's hemoglobin output is "tied up" as the complex heme-CO.

The reaction can be expressed as:



If a person is breathing air that is .0085 M O₂ (normal air), what concentration of CO will be fatal? (All species may be considered to be in the same phase)

5.

The rate constants for a reaction were determined at two temperatures.

At 100.0 degrees K the rate constant is $2.0 \times 10^3 \text{ s}^{-1}$, and at 500 degrees K the rate constant is $4.0 \times 10^7 \text{ s}^{-1}$. Calculate the activation energy for the reaction.

6. Consider the following gas phase reaction:



These are the relevant thermodynamic data.

	ΔH_f° , kJ/mol	ΔS° , J/mol °K
A	135	197
B	-45	205
C	25	214

Show by calculation;

Is this reaction spontaneous at 25 C and 1 atm pressure ?

Will the reaction become spontaneous or nonspontaneous as temperature increases ?

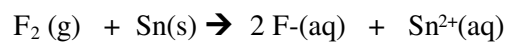
At what temperature will the system be in equilibrium at 1 atm ?

What is the value of K

7. 252.0 mL of a 0.980 M solution of a base with K_b 1.48×10^{-5} was titrated with 1.55 M HCl. What is the pH after 159.3 mL of acid is added?

8. What is the pH of a solution of weak acid after 25% titration with strong base?
 $K_a = 1.81 \times 10^{-6}$

9. Calculate the standard free energy change ΔG° for this reaction using standard reduction potentials E° .



10.

What is the voltage of the following cell?

