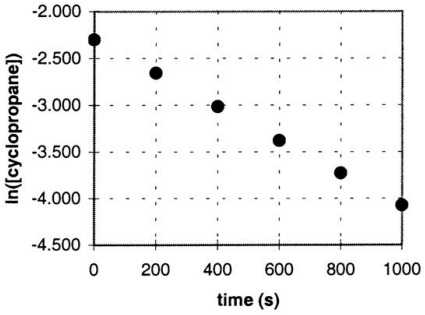
Name _____ AP Chemistry

HW 12_2: Due 3/3/2020 Complete all free response and multiple choice questions. All questions will be graded. Show all work. Box and clearly label all final free response answers.

1. In the gas phase at 500.°C, cyclopropane reacts to form propene in a first-order reaction. The figure shows the natural logarithm of the concentration of cyclopropane (in mol/L) plotted versus time.



a. Calculate the first-order rate constant, *k*.
b. Determine the half -life of cyclopropane.
c. Determine the initial concentration of cyclopropane in this experiment.
d. Determine the concentration of cyclopropane after 1200. seconds.

Circle and write the choice answer on the line in front of the question.

1._____ A homogeneous liquid reaction mixture is often heated to increase the rate of reaction. This is best explained by the fact that raising the temperature
(A) increases the heat of reaction. (B) decreases the energy of activation.
(C) increases the vapor pressure of the liquid (D) increases the average kinetic energy of the reactants.

2. _____ For the reaction, $2A + B \rightarrow C$, which relationship is correct?
(A) $\Delta[A] = \Delta[C]$ (B) $-\Delta[A] = \Delta[C]$ (C) $-2\Delta[A] = \Delta[C]$ (D) $-\Delta[A] = 2\Delta[C]$

3. _____ Which is constant for different reactant concentrations in a first-order reaction?
(A) The time required for the concentration of reactants to drop below 0.001 M.
(B) The time required for one-half of reactants to disappear.
(C) The rate of disappearance of reactants in $mol.L^{-1}.time^{-1}$.
(D) The rate of formation of products in $mol.L^{-1}\ time^{-1}$.

4. _____ The activation energy for a reaction can be determined by measuring the reaction rate at different
(A) temperatures. (B) catalyst concentrations. (C) reactant concentrations. (D) times on the reaction curve.

5. _____ For a rate law of the form; Rate = $k[A]^m[B]^n$, the exponents m and n are obtained from
(A) changes in rate with changing temperature. (B) the coefficients of A and B in the balanced equation.
(C) the concentrations of A and B in a single experiment. (D) changes in the reaction rate for different concentrations of A and B.

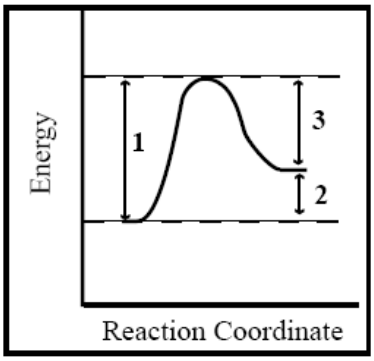
6. _____ What is the order of a reaction for which the units of k are $L\ mol^{-1}\ s^{-1}$ and the units of the rate are $mol\ L^{-1}\ s^{-1}$?
(A) zero order (B) first order (C) second order (D) some other order

7. _____ For the reaction $A + B \rightarrow C$, the rate law is: Rate = $k[A]^2$. Which change(s) will increase the rate of the reaction?
I. Increasing the concentration of A II. Increasing the concentration of B
(A) I only (B) II only (C) Both I and II (D) Neither I nor II

8. _____ Which does NOT change with time for a first-order reaction?
(A) the amount of reactant that disappears in each half life (B) the concentration of the reactant
(C) the length of each half-life (D) the rate of the reaction

9. _____ The rates of which reactions are increased when the temperature is raised?
I. endothermic reactions II. exothermic reactions
(A) I only (B) II only (C) Both I and II (D) Neither I nor II

10. _____ When a catalyst is added to the system represented by this energy-reaction coordinate diagram, which dimensions in the diagram are changed?
(A) 1 and 2 only (B) 1 and 3 only
(C) 2 and 3 only (D) 1, 2, 3



11. _____ All of the following are expected to affect the rate of an irreversible chemical reaction EXCEPT
(A) adding a catalyst. (B) removing some products.
(C) increasing the temperature. (D) decreasing the reactant concentration.

12. _____ The oxidation of ammonia produces nitrogen and water according to the equation: $4NH_3(g) + 3O_2(g) \rightarrow 2N_2(g) + 6H_2O(g)$
If the rate of formation of N_2 at a certain temperature is 3.0 $mol\ L^{-1}\ s^{-1}$, what is the rate of disappearance of O_2?
(A) 2.0 $mol\ L^{-1}\ s^{-1}$ (B) 3.0 $mol\ L^{-1}\ s^{-1}$ (C) 4.5 $mol\ L^{-1}\ s^{-1}$ (D) 9.0 $mol\ L^{-1}\ s^{-1}$

13. _____ At a given temperature a first-order reaction has a rate constant of $3.33 \times 10^{-3}\ s^{-1}$. How much time is required for the reaction to be 75% complete?
(A) 100 s (B) 210 s (C) 420 s (D) 630 s