

Vasquez High School -- AP Chem -- Chapter 13 -- 100 points

Write TRUE if the statement is true OR write the word(s) that substitute(s) for the underlined word(s) that would make it true. Writing false earns partial credit. Three points apiece.

- _____ 1) The rate constant for a first-order reaction would have units of $\frac{1}{s \cdot M}$.
- _____ 2) A biological catalyst is called an enzyme.
- _____ 3) The logarithm of 100 to the base ten is $\frac{1}{10}$.
- _____ 4) The rate constant k changes only with time.
- _____ 5) The platinum catalyst in a car's exhaust system is an example of a heterogeneous one.

6) Expand this logarithm:

$$\log_5 7t^4 \sqrt[4]{n}$$

7) Combine this expression into one log:

$$2 \ln y + 1/3 \ln t - 6 \ln a$$

8) If $\log 2 = 0.3$, $\log 3 = 0.48$, and $\log 5 = .7$, show how we arrive at $\log 1500$.

Fill-in/Short Answer - Be neat (Sam and Danny) and complete. Read what you write before turning it in.

9) An Arrhenius plot is a graph of _____ vs. _____.

10) A first-order reaction has a half-life of 40 seconds. What fraction of the reactant is left after 160 seconds? _____

Problems and Calculations - Be clear here - write formulas first where required - five points on these.

- 11) If the temperature of a reaction is raised from 40 degrees C to 80 degrees C, the reaction rate will increase by what factor? Assume the activation energy is 100 kJ/mol.
- 12) A first-order reaction has a half-life of 28 minutes. What is the value of the rate constant?

13) Fifteen points on this one. Look at the data for the reaction: $A + 2B + C \rightleftharpoons D + 3E$ and answer the following questions:

Exper.	Rate	[A] (M)	[B] (M)	[C] (M)
1	1.2×10^{-4}	0.236	0.109	0.157
2	2.4×10^{-4}	0.237	0.217	0.158
3	3.6×10^{-4}	0.709	0.108	0.156
4	4.8×10^{-4}	0.236	0.109	0.313

a) What is the rate law for this reaction: _____

b) How much is the rate constant (with the correct units)?

c) What rate would you expect when $[A] = .338 \text{ M}$, $[B] = .165 \text{ M}$, and $[C] = .224 \text{ M}$?

14) For an easy ten points, draw a potential energy diagram for an endothermic chemical reaction with labels for energy, time, activated complex, activation energy, heat of reaction, and annotate how a catalyzed reaction would change the curve.

15) The thermal decomposition of potassium chlorate into potassium chloride and oxygen is given by



16.2 s at 445 °C. Calculate the time required for 90% of this reaction to be completed. Ten points.

16) Given the same reactant concentrations, the reaction $2\text{NO}(\text{g}) + \text{Cl}_2(\text{g}) \implies 2\text{NOCl}(\text{g})$ at 500 K takes place at a rate 850 times that of the same reaction at 350 K. Assuming the frequency factor is constant here, find the activation energy for this reaction.

17) The overall reaction mechanism for the production of nitrogen gas from nitric oxide is given by



step must be: $2\text{NO} \implies \text{N}_2\text{O}_2$ and $\text{N}_2\text{O}_2 + \text{H}_2 \implies \text{N}_2\text{O} + \text{H}_2\text{O}$

18) Five points: Give one reason why we measure reaction rates at the very beginning of a reaction:
