Homework Answers

Pages 567-568

1. Time and concentration (or property that can be related to concentration).
   Concentration, surface area available for reaction, temperature, and catalysis.

2. Only one N_2 molecule is formed for every two NO molecules that react. The rate of formations of N_2 is ½ the rate of disappearance of NO.

23. 0.222M

24. 2.4×10^{-2} M/s

25. a) 3.1×10^{-4}M/s
    b) 9.3×10^{-4}M/s
    c) general rate of reaction = - rate if disappearance of A = 3.1×10^{-4}M/s

26. a) 2.2×10^{-4}M/s
    b) 1.1×10^{-4}M/s
    c) 1.1×10^{-4}M/s

30. a)Statement is true. The rate law is determined by the values of k and the exponents, m & n, not by concentrations.
    b) Statement is false, The unit for the rate is M/s or M/min. That means the unit for k must be $M^{-1}S^{-1}$ or $M^{-1}min^{-1}$.

31. a) Rate for $S_2O_8^{2-}$ is determined using experiments 1 & 2 and is 1st order.
    Rate for I^- is determined using experiment 2 & 3 and is 2nd order.
    The reaction is second order overall.
    b) $k = 6.1 \times 10^{-3}$ L/mol ·s
    c) rate=5.8×10^{-5} M/s

32. a) Rate for $HgCl_2$ is determined using experiments 2 & 3 and is 1st order.
    Rate for $C_2O_4^{2-}$ is determined using experiments 1 & 2 and is 2nd order.
    The reaction is 3rd order overall.
    b) $k=7.6 \times 10^{-3}$ $L^2/mol^2 \cdot min$
    c) rate=2.6×10^{-5}M/min
    d) Only three experiments are necessary. For each order determination, two experiments are necessary but if one experiment is used for both determinations, then only three are needed.

33. Zero-order for this reaction. For zero-order, rate is independent of concentration.

34. zero order

35. Rate = 7.50×10^{-3} M/s

36. rate=3×10^{-3} M/s

37. a) 0.325M
    b) Omit

6. (c) zero-order produces a straight line for a concentration versus time plot.

7. (d) is the answer. Rate = k[A][B] and ½ $rate_A$=$rate_B$

9. (b) fraction of molecules with energies in excess of the activation energy. Collision frequency increases but slowly.

10. Some reactions occur when an atom of one molecule collides with a particular atom of another molecule. Those reactions depend on orientation of the reactant molecules at the time of collision.

17. A catalyst must speed up the reaction, and it must not be consumed in the reaction. (The catalyst may be consumed in one elementary step and regenerated in another.)