Reaction Kinetics – Practice Problems for Assignment 2

1. The rate of a chemical reaction can be expressed in
    a. energy released per mole of reactant
    b. grams per mole of reactant
    c. moles per liter of solution
    d. volume of gas per minute

2. Rate constant
    a. is the proportionality constant in the rate law
    b. is the ratio of disappearance of a reactant per unit time
    c. is the y-interept when you graph “ln k versus 1/T”
    d. is the same number at any temperature

3. Arrhenius equation
    a. relates reaction rate to the concentration of the reactants
    b. relates reaction rate to the concentration of the products
    c. relates the rate constant with temperature
    d. relates the rate constant with concentration of the reactants

4. Consider the following reaction

    $CaO\ (s) + 2\ HCl\ (aq) \rightarrow CaCl_2\ (aq) + H_2O\ (l)$

    Which of the following could be used to measure the rate of the reaction?

    a. measure Δ pressure / Δ time
    b. measure Δ total mass / Δ time
    c. measure Δ pH / Δ time
    d. measure Δ volume / Δ time

5. Consider the following reaction

    $N_2H_4\ (l) + 2\ H_2O_2\ (l) \rightarrow N_2\ (g) + 4\ H_2O\ (l)$

    Which of the following could be used to determine the reaction rate in a closed system.

    a. measure the increase in gas pressure
    b. measure the decrease in gas pressure
    c. measure the increase in mass of the system
    d. measure the decrease in mass of the system

6. Consider the following reaction

N_2H_4 (l) + 2 H_2O_2 (l) $\rightarrow$ N_2 (g) + 4 H_2O (l)

In 55.0 sec, 0.165 mole of H_2O_2 is consumed. The rate of production of N_2 is

a. 1.5×10^{-3} mole in 55 s
b. 0.33 mole per second
c. 1.5×10^{-3} mole per second
d. 0.006 mole per second

7. Which factor explains why lithium metal generally reacts faster than gold metal.
   a. concentration
   b. nature of the substance
   c. surface area
   d. temperature

8. Consider the following reaction

N_2 (g) + 2 H_2 (g) $\rightarrow$ 2NH_3 (g)

The rate of formation of NH_3 is 0.0153 g/s, the rate of consumption of N_2 is

a. 0.0765 g/s
b. 0.0306 g/s
c. 0.000449 mole/s
d. 0.00180 mole/s

9. Nitrogen monoxide and hydrogen react according to the following reaction.

2 NO (g) + 2 H_2 (g) $\rightarrow$ N_2 (g) + 2 H_2O (g)

If the rate of hydrogen consumption is 0.87 g in 10 minutes, what is the rate of nitrogen production?

a. 0.044 g/min
b. 0.61 g in 10 minutes
c. 1.2 g/min
d. 0.61 g/min

10. The rate law of the reaction

$$2\ NO\ (g) + H_2\ (g) \rightarrow N_2O\ (g) + H_2O\ (g)$$

is Rate = $k[NO]^2\ [H_2]$. The overall reaction order is

a. 1
b. 2
c. 3
d. Don't know, not enough information provided

11. The rate constant of a 1st order reaction has units of

a. It has no unit.
b. moles/s
c. moles/L·s
d. 1/s

12. The iodate ion reacts with sulfite ions in the following reaction

$$IO_3^-\ (aq) + 3\ SO_3^{2-}\ (aq) \rightarrow I^-\ (aq) + 3\ SO_4^{2-}\ (aq)$$

Which of the following statements is true?

a. The disappearance of iodate is three times the disappearance of sulfite.
b. The disappearance of iodide is the same as the appearance of iodate.
c. The rate of formation of all the products are the same.
d. The rate of disappearance of sulfite is three times the disappearance of iodate.

13. For the reaction in question 12, what are the rates of iodide and sulfate ions being produced if the sulfite ion is disappearing at a rate of 2.4×10^{-4} mole/ L·s.

    a. I^- : 8.0×10^{-5} moles/L; SO_4^{2-}: 2.7×10^{-5} moles/L
    b. I^- : 8.0×10^{-5} moles/L; SO_4^{2-}: 2.4×10^{-4} moles/L
    c. I^- : 8.0×10^{-5} moles/s; SO_4^{2-}: 2.4×10^{-4} moles/s
    d. I^- : 8.0×10^{-5} M/s; SO_4^{2-}: 2.4×10^{-4} M/s

14. The rate law for the decomposition of HI to I_2 and H_2 is second order with respect to HI. At 508°C, the rate of the reaction was found to be 2.5×10^{-4} M/s when the HI concentration was 0.0558 M. What is k?

    a. 0.08 $L \cdot mole^{-1} \cdot s^{-1}$
    b. 0.08 s^{-1}
    c. 0.004 $L \cdot mole^{-1} \cdot s^{-1}$
    d. 0.004 s^{-1}

15. The rate law for the reaction of nitric oxide with hydrogen is

    $$Rate = k[NO]^2 [H_2]$$

    What will happen to the reaction rate if the concentration of NO is doubled and the concentration of H_2 doubled.

    a. Don't know. Can only be determined experimentally.
    b. Rate is 4x.
    c. Rate is 6x.
    d. Rate is 8x.

Answers:

1. d
2. a
3. c
4. c
5. a
6. c
7. b
8. c
9. d
10. c
11. d
12. d
13. d
14. a
15. d