NOTE

Another teacher made this – I have no idea if it is duplicate questions from the one I already gave you, I did not have time to check it! I thought I would give it to you anyway, just in case. I also have not checked to see if the answer key is correct. Let me know if you notice duplicates or any typos and I can try and update them if possible.

Dougherty Valley HS
Chemistry – Sol-Kin-Equal Review

1. A sample of a substance burns more rapidly in pure oxygen than in air. Which factor is most responsible for this high rate of reaction?
   A) temperature
   B) Surface area exposed to air
   C) Catalyst
   D) concentration of the substance
   E) the properties of the reactants

2. For the reaction A + B ←→ 2C. if we start with 3.2E-2M of A and B. What is the concentrations of C at equilibrium given that K_{eq} = 5.2E-9?
   A) 6.92E-21M
   B) 7.39E-11M
   C) 2.08E-11M
   D) 4.16E-11M
   E) 8.32E-11M

3. What volume of 16.3 *M* H_2SO_4 is required to prepare 12.0 L of 0.156 *M* sulfuric acid?
   A) 1.25 L
   B) 115 mL
   C) 2.54 L
   D) 212 mL
   E) 104 mL

4. At a certain temperature *K* for the reaction $2NO_2$ <--> N_2O_4 is 7.5 liters/mole. If 2.0 moles of NO_2 are placed in a 2.0-liter container and permitted to react at this temperature, calculate the concentration of N_2O_4 at equilibrium.
   A) 7.5 moles/liter
   B) 0.82 moles/liter
   C) 0.39 moles/liter
   D) 0.65 moles/liter
   E) none of these

5. Write the equilibrium expression for the following reaction: $S(s) + O_2(g) \rightleftharpoons SO_2(g)$
   A) $K = \dfrac{[SO_2]}{[O_2]^2}$
   B) $K = \dfrac{[SO_2]^2}{[O_2]}$
   C) $K = \dfrac{[O_2]}{[SO_2]^2}$
   D) $K = \dfrac{[SO_2]}{[O_2]}$
   E) none of these

Use the following to answer questions 6-7:
The following questions refer to the equilibrium shown here:
$CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$

6. What would happen to the system if the total pressure were increased by adding $CO_2(g)$?
   A) The amount of CaO would increase.
   B) Nothing would happen.
   C) Equilibrium would shift to the right.
   D) More $CO_2(g)$ would be produced.
   E) The amount of $CaCO_3$ would increase.

7. What would happen to the system if the total pressure were increased by adding Ar(*g*)?
   A) The amount of $CaCO_3$ would increase.
   B) Nothing would happen.
   C) Equilibrium would shift to the right.
   D) The amount of CaO would increase.
   E) More $CO_2(g)$ would be produced.

8. Determine the equilibrium constant for the system N_2O_4 <--> $2NO_2$ at 25°C. The concentrations are shown here: $[N_2O_4] = 3.63 \times 10^{-2}$ M, $[NO_2] = 1.41 \times 10^{-2}$ M.
   A) 5.48×10^{-3}
   B) 0.151
   C) 0.388
   D) 1.83×10^{2}
   E) 2.57

9. An oven-cleaning solution is 40.0% (by mass) NaOH. If one jar of this product contains 468 g of solution, how much NaOH does it contain?
   A) 187 g
   B) 1.17×10^3 g
   C) 18.7 g
   D) 11.7 g
   E) none of these

10. Consider the reaction $X \rightarrow Y + Z$
    Which of the following is a possible rate law?
    A) Rate = k[X][Y]
    B) Rate = k[Z]
    C) Rate = k[Y]
    D) Rate = k[Y][Z]
    E) Rate = k[X]

11. The correct equilibrium expression for the rxn of sulfur dioxide gas with oxygen gas to produce sulfur trioxide gas is
    A) $\dfrac{[SO_3]}{[SO_2]^2[O_2]}$
    B) $\dfrac{[O_2][SO_2]^2}{[SO_3]^2}$
    C) $\dfrac{[SO_3]^2}{[SO_2]^2[O_2]}$
    D) $\dfrac{[SO_3]}{[SO_2][O_2]}$
    E) none of these

12. Equilibrium is reached in chemical reactions when:
    A) all chemical reactions stop.
    B) the temperature shows a sharp rise.
    C) the rates of the forward and reverse rxns become equal.
    D) the forward reaction stops.
    E) the [ ]s of reactants and products become equal.

13. Catalysts generally affect chemical reactions by
    A) lowering the reaction rate
    B) providing an alternate pathway with a higher activation energy
    C) increasing the surface area of teh reactants
    D) increasing the temperature of the system
    E) providing an alternate pathway with a lower activation energy

14. A 34.9-g sample of $SrCl_2$ is dissolved in 112.5 mL of solution. Calculate the molarity of this solution.
    A) 0.0248 *M*
    B) 3.28 *M*
    C) 1.96 *M*
    D) 0.220 *M*
    E) none of these

15. The rate law for a particular reaction is rate = k[A][B]^2. If the initial concentration of B is increased from 0.1 M to 0.3 M, the initial rate will increase by which of the following factors?
    A) 9
    B) 3
    C) 2
    D) 12
    E) 6

16. Calculate the molarity of the following aqueous solution 54g $MgCl_2$ in 250ml of solution
    A) 3.21M
    B) 1.25M
    C) 2.27M
    D) 0.216M
    E) 216M

17. Consider the reaction: $4NH_3 + 7O_2 \rightarrow 4NO_2 + 6H_2O$
    At a certain instant the initial rate of disappearance of the oxygen gas is X. What is the value of the appearance of water at the same instant?
    A) 1.1 X
    B) 0.58 X
    C) 1.2 X
    D) cannot be determined from the data
    E) 0.86 X

Use the following to answer question 18:

Consider the following equilibrium: $H_2(g) + I_2(s) <--> 2HI(g)$

18. The proper K_{eq} expression is:
    A) $\dfrac{[HI]}{\sqrt{([H_2])}}$
    B) $\dfrac{[H_2][I_2]}{[HI]}$
    C) $\dfrac{[HI]^2}{[H_2]}$
    D) $\dfrac{\sqrt{([H_2][I_2])}}{[HI]^2}$
    E) $\dfrac{[HI]^2}{[H_2][I_2]}$

19. Tabulated below are initial rate data for the reaction

$$2Fe(CN)_6^{3-} + 2I^- \rightarrow 2Fe(CN)_6^{4-} + I_2$$

Run	$[Fe(CN)_6^{3-}]_0$	$[I^-]_0$	$[Fe(CN)_6^{4-}]_0$	$[I_2]_0$	Initial Rate (M/s)
1	0.01	0.01	0.01	0.01	1×10^{-5}
2	0.01	0.02	0.01	0.01	2×10^{-5}
3	0.02	0.02	0.01	0.01	8×10^{-5}
4	0.02	0.02	0.02	0.01	8×10^{-5}
5	0.02	0.02	0.02	0.02	8×10^{-5}

The experimental rate law is:

A) $\frac{\Delta[I_2]}{\Delta t} = k[Fe(CN)_6^{3-})]^2[I^-]$

B) $\frac{\Delta[I_2]}{\Delta t} = k[Fe(CN)_6^{3-}]^2[I^-]^2[Fe(CN)_6^{4-}]^2[I_2]$

C) $\frac{\Delta[I_2]}{\Delta t} = k[Fe(CN)_6^{3-}][I^-]^2$

D) $\frac{\Delta[I_2]}{\Delta t} = k[Fe(CN)_6^{3-}][I^-]\,[Fe(CN)_6^{4-}]$

E) $\frac{\Delta[I_2]}{\Delta t} = k[Fe(CN)_6^{3-}]^2[I^-][Fe(CN)_6^{4-}][I_2]$

20. What volume of 12.0 *M* nitric acid is required to prepare 4.82 L of 0.100 *M* nitric acid?
A) 24.9 L
B) 0.482 L
C) 2.49 L
D) 0.249 L
E) 0.0402 L

21. $CaCl_2(s) + 2H_2O(g) <--> CaCl_2 \cdot 2H_2O(s)$ The equilibrium constant for the reaction as written is
A) $K = \frac{1}{2[H_2O]}$
B) $K = [H_2O]^2$
C) $K = \frac{1}{[H_2O]^2}$
D) $K = \frac{[CaCl_2 \cdot 2H_2O]}{[H_2O]^2}$
E) $K = \frac{[CaCl_2 \cdot 2H_2O]}{[CaCl_2][H_2O]^2}$

22. As ice melts the energy in the reaction is
A) released
B) Absorbed
C) does not change
D) neither
E) Both a and b

23. Consider a system of four gases. The equilibrium concentration of each product is 1.8 *M*. The equilibrium concentrations of the reactants are equal. The equilibrium is shown here:
A + B <--> C + D $K = 2.6$
What is the equilibrium concentration of gas A?
A) 1.1 *M*
B) 1.2 *M*
C) 8.4 *M*
D) 0.90 *M*
E) 4.7 *M*

24. The average rate of disappearance of ozone in the reaction $2O_3(g) \rightarrow 3O_2(g)$ is found to be 8.12×10^{-3} atm over a certain interval of time. What is the rate of appearance of O_2 during this interval?
A) 268×10^{-3}atm/s
B) 5.41×10^{-3}atm/s
C) 22.0×10^{-3}atm/s
D) 8.12×10^{-3}atm/s
E) 12.2×10^{-3} atm/s

Use the following to answer questions 25-26:
Consider the following data concerning the equation:

$$H_2O_2 + 3I^- + 2H^+ \rightarrow I_3^- + 2H_2O$$

	$[H_2O_2]$	$[I^-]$	$[H^+]$	rate
I	0.100 M	5.00×10^{-4} M	1.00×10^{-2} M	0.137 M/sec
II.	0.100 M	1.00×10^{-3} M	1.00×10^{-2} M	0.268 M/sec
III.	0.200 M	1.00×10^{-3} M	1.00×10^{-2} M	0.542 M/sec
IV.	0.400 M	1.00×10^{-3} M	2.00×10^{-2} M	1.084 M/sec

25. The average value for the rate constant k (without units) is
A) 2.74×10^4
B) 137
C) 108
D) 2710
E) none of these

26. The rate law for this reaction is
A) rate = $k[I^-][H^+]$
B) rate = $k[H_2O_2][H^+]$
C) rate = $k[H_2O_2][I^-]$
D) rate = $k[H_2O_2][I^-][H^+]$
E) rate = $k[H_2O_2]^2[I^-]^2[H^+]^2$

27. Which of the following processes is exothermic?
A) reacting hydrogen and oxygen gases to make water
B) allowing meat to thaw after taking it out of the freezer
C) rolling a ball up a hill
D) a popsicle melting on a warm summer day
E) boiling water in a beaker to make steam

28. A 108.7-g sample of nitric acid solution that is 70.0% HNO_3 (by mass) contains
A) 4.80×10^3 mol HNO_3
B) 1.72 mol HNO_3
C) 76.1 mol HNO_3
D) 1.21 mol HNO_3
E) none of these

29. In a KCl Solution, water is the _____, and Potassium Chloride is the _____.
    A) Solution, Solute
    B) Solute, Solution
    C) Solute, Solvent
    D) Solvent, Solute
    E) Solvent, Solution

30. For a reaction in which A and B react to form C, the following initial rate data were obtained:

[A] (mol/L)	[B] (mol/L)	Initial Rate of Formation of C (mol/L·s)
0.10	0.10	1.00
0.10	0.20	4.00
0.20	0.20	8.00

What is the rate law?
    A) Rate = $k[A]^3$
    B) Rate = $k[A][B]$
    C) Rate = $k[A]^2[B]$
    D) Rate = $k[A][B]^2$
    E) Rate = $k[A]^2[B]^2$

Use the following to answer questions 31-32:
Given the equation $A(g) \rightleftharpoons B(g) + 2C(g)$. At a particular temperature, $K = 1.4 \times 10^5$.

31. Raising the P by decreasing the V of the container
    A) will have no effect
    B) cannot be determined
    C) will cause [B] to increase
    D) will cause [A] to increase
    E) none of the above

32. If you mixed 1.2 mol B, 0.050 mol C, and 0.003 mol A in a 1-L container, in which direction would the reaction initially proceed?
    A) to the right
    B) The mixture is in the equilibrium state.
    C) to the left
    D) cannot tell from the information given

33. You have two solutions of sodium chloride. One is a 2.00 *M* solution, the other is a 4.00 *M* solution. You have much more of the 4.00 *M* solution, and you add the solutions together. Which of the following could be the concentration of the final solution?
    A) 7.20 *M*
    B) 2.60 *M*
    C) 6.00 *M*
    D) 3.00 *M*
    E) 3.80 *M*

34. Which factor below will allow you to dissolve a great amount of solute and fast?
    A) agitate
    B) surface area
    C) stir
    D) heat
    E) cool

35. Which solute below will conduct electricity?
    A) Sugar
    B) oil
    C) water
    D) electrolyte
    E) non-electrolyte

Answer Key

1. D
2. E
3. B
4. C
5. D
6. E
7. B
8. A
9. A
10. E
11. C
12. C
13. E
14. C
15. A
16. C
17. E
18. C
19. A
20. E
21. C
22. B
23. A
24. E
25. D
26. C
27. A
28. D
29. D
30. D
31. D
32. A
33. E
34. D
35. D