Unit 10 Review – Accelerated Chemistry Name KEY Pd:_____

1. What is a reaction rate and what units are used with reaction rates?
change in concentration over change in time (M/s)
2. What is the collision theory?
states reactants must collide w/ correct orientation & enough energy for a rxn to occur
3. List the factors that affect the rate of a reaction. Explain how each factor affects the rate.

A Nature of Reactants – some reactants are more reactive

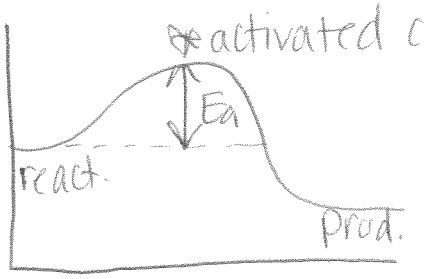
B Surface Area – more space for a collision w/ correct orient.

C Concentration – more reactants, more collisions

D Temperature – ↑temp, ↑KE, more energy & more collisions

E Catalyst – lowers the activation energy

4. Draw a reaction diagram for an exothermic reaction and label the following: reactants, products, activation energy, activated complex.



5. For the reaction $3\ ClO^-(aq) \rightarrow ClO_3^-(aq) + 2\ Cl^-(aq)$ doubling the concentration of ClO^- quadruples the initial rate of formation of ClO_3^-. What is the rate expression for the reaction?
$[ClO^-] \times 2$ rate $\times 4$ $2^x = 4$ $x = 2$ rate $= k[ClO^-]^2$
6. The reaction $C_6H_5N_2Cl\ (aq) + H_2O\ (l) \rightarrow C_6H_5OH\ (aq) + N_2\ (g) + HCl\ (aq)$ is first order in $[C_6H_5N_2Cl]$ and zero order in $[H_2O]$. What is the rate expression?
rate $= k[C_6H_5N_2Cl]$
7. For the reaction A + B → AB , the following data was obtained:
   a. Write the rate expression for the reaction.
[A] x2 rate x4 $2^x = 4$ $x = 2$
[B] x2 rate x1 $2^y = 1$ $y = 0$
rate $= k[A]^2$

Trial	Initial [A]	Initial [B]	Initial Rate mol/L*min
1	0.480 M	0.190 M	0.350
2	0.480 M	0.380 M	0.350
3	0.240 M	0.190 M	0.087

8. What 2 factors will drive a reaction to completion?
a) formation of precipitate
b) formation of a gas
9. Describe a reversible reaction. Give an example.
10. Describe dynamic equilibrium. Give an example.

11. At equilibrium how do the forward and reverse reaction rates compare? The forward rate equals the reverse rate.

12. State Le Chatelier's Principle.
when a stress is put on a system, the system will respond to alleviate the stress

13. What are the 3 possible stresses we can apply to a system at equilibrium?

a) concentration (3 mol) b) temperature (2 mol) c) volume

14. Use the reaction ($2SO_{2(g)} + O_{2(g)} \leftrightarrow 2SO_{3(g)}$ + heat) to determine what will happen (shift left/right, no change) if the following stresses are applied:

a. SO_2 is added shift right b. Volume is increased shift left c. Heat is added shift left

15. What is the general formula for the equilibrium constant, K_{eq}?
$K_{eq} = \frac{products}{reactants}$

16. What does the value of K_{eq} tell a chemist about a reaction if....
If the value of K_{eq} is greater than 1 .....
products are favored
If the value of K_{eq} is less than 1 ....
reactants are favored

17. Write the equilibrium constants for these reversible reactions – ALL CHEMICALS ARE GASES:

a. $2A + B \leftrightarrow C + 3D$ $K_{eq} = \frac{[C][D]^3}{[A]^2[B]}$

b. $NO + O_2 \leftrightarrow NO_3$ $K_{eq} = \frac{[NO_3]}{[NO][O_2]}$

c. $CO_2 + H_2 \leftrightarrow CO + H_2O$ $K_{eq} = \frac{[CO][H_2O]}{[CO_2][H_2]}$

18. Calculate K_{eq} for reaction **17a** if the equilibrium concentrations are: [A]=0.100M, [B]=0.230M, [C]=1.17M, & [D]=2.19M.
$K_{eq} = \frac{[1.17][2.19]^3}{[.100]^2[.230]} = 5343$

19. The equilibrium constant in **17b** is .025. If [NO] = .36 M and $[O_2]$ = .21 M, what is the equilibrium concentration of NO_3?
$K_{eq} = \frac{[NO_3]}{[.36][.21]} = 0.025$ $[NO_3] = .00189M$

20. If K_{eq} in **17c** is 6.37×10^{-3}, $[CO_2]$ = 0.037M, $[H_2]$ = 0.28M, and [CO] = 0.084M, calculate $[H_2O]$.
$K_{eq} = \frac{[.084][H_2O]}{[.037][.28]} = 6.37 \times 10^{-3}$ $[H_2O] = 7.86 \times 10^{-4}$

21. Describe K_{sp}.
solubility product constant for salts

22. What is the generic formula for K_{sp}? $K_{sp} = [B^+]^b[C^-]^c$

23. Write the expression for K_{sp} for the following sparingly soluble salts:

$PbBr_2$ $K_{sp} = [Pb^{2+}][Br^-]^2$ $Ca_3(PO_4)_2$ $K_{sp} = [Ca^{2+}]^3[PO_4^{-3}]^2$

24. Calculate the Ksp of $CaSO_4$ if a saturated solution has a concentration of 1.58×10^{-4}.
$K_{sp} = [Ca^{2+}][SO_4^{2-}]$ $K_{sp} = x^2$ $K_{sp} = (1.58 \times 10^{-4})^2$ $K_{sp} = 2.50 \times 10^{-8}$

25. The solubility product constant of $BaCO_3$ is 2.6×10^{-9}. Calculate the solubility (in mol/L) of $BaCO_3$.
$K_{sp} = [Ba^{2+}][CO_3^{2-}]$ $K_{sp} = x^2$ $\sqrt{2.6 \times 10^{-9}} = \sqrt{x^2}$ $x = 5.10 \times 10^{-5} M$

26. The solubility product constant of Ag_2CrO_4 is 1.1×10^{-12}. Calculate the [Ag+] in a solution of Ag_2CrO_4 at equilibrium.
$K_{sp} = [Ag^+]^2[CrO_4^{2-}]$ $K_{sp} = [2x]^2[x]$ $K_{sp} = 4x^3$ $1.1 \times 10^{-12} = 4x^3$ $x = 6.50 \times 10^{-5} \cdot 2$ $1.30 \times 10^{-4} M$