REVIEW FOR TEST

1. What is the concentration of beryllium ions in a saturated solution of beryllium hydroxide? Ksp = 1.58×10^{-22}

$Be(OH)_{2(s)} \rightleftharpoons Be^{+2}_{(aq)} + 2OH^-_{(aq)}$

$K_{sp} = [Be^{+2}][OH^-]^2$

$1.58 \times 10^{-22} = (x)(2x)^2$

$1.58 \times 10^{-22} = 4x^3$

$x = 3.41 \times 10^{-8} M = [Be^{+2}]$

2. If the solubility of Ag_2CrO_4 is 7.2×10^{-5}M, what is the Ksp?

$Ag_2CrO_{4(s)} \rightleftharpoons 2Ag^+_{(aq)} + CrO_4^{-2}{}_{(aq)}$

$K_{sp} = [Ag^+]^2[CrO_4^{-2}]$

$= (2 \cdot 7.2 \times 10^{-5})^2 (7.2 \times 10^{-5})$

$= 7.46 \times 10^{-13}$

3. Find the Ksp of $BaCl_2$ if 0.095 grams can be recovered from 1.0 liter of a saturated solution.

$0.095g\ BaCl_2 \frac{1 mole}{208.23g} = \frac{4.56 \times 10^{-4} mole}{1.0L} = 4.56 \times 10^{-4} M$

$BaCl_{2(s)} \rightleftharpoons Ba^{+2}_{(aq)} + 2Cl^-_{(aq)}$

$K_{sp} = [Ba^{+2}][Cl^-]^2$

$= (4.56 \times 10^{-4} M)(2 \cdot 4.56 \times 10^{-4} M)^2 = 3.79 \times 10^{-10}$

4. If the Ksp of $CuCO_3$ is 1.7×10^{-7}, how many grams could be recovered from 2.0 liters of a saturated solution?

$CuCO_{3(s)} \rightleftharpoons Cu^{+2}_{(aq)} + CO_3^{-2}{}_{(aq)}$

$K_{sp} = [Cu^{+2}][CO_3^{-2}]$

$1.7 \times 10^{-7} = x^2$

$x = 4.12 \times 10^{-4} M$

$mole = (4.12 \times 10^{-4} M)(2.0L) = 8.24 \times 10^{-4} mole$

$8.24 \times 10^{-4} mole \frac{23.56g}{1 mole} = 0.10g\ CuCO_3$

5. If 1.00 liter of 0.0200M NaCl is added to 1.00 liter of 0.0100M $AgNO_3$. Will a precipitate of AgCl form? Show all work to prove your answer!

$NaCl \rightarrow Na^+ + Cl^-$

$M_1V_1 = M_2V_2$

$(0.0200 M)(1.00L) = x(2.00L)$

$0.0100 M\ Cl^-$

$AgNO_3 \rightarrow Ag^+ + NO_3^-$

$M_1V_1 = M_2V_2$

$(0.0100 M)(1.00L) = x(2.00L)$

$0.00500 M\ Ag^+$

$AgCl_{(s)} \rightleftharpoons Ag^+_{(aq)} + Cl^-_{(aq)}$

$K_{sp} = [Ag^+][Cl^-] = (0.00500)(0.0100)$

$Q = 5 \times 10^{-5}$

$K_{sp} < Q$ yes

6. What is the half-life of a radioactive isotope if a 500.0g sample decays to 62.5g in 24.3 hours?

500 ① 250 ② 125 ③ 62.5

3 half lives

$\frac{24.3 \text{ hrs}}{3} = 8.1 \text{ hrs}$

7. 6. How old is a bone if it presently contains 0.3125g of C-14, but it was estimated to have originally contained 80.000g of C-14 (half life = 5730 yr)?

80 ① 40 ② 20 ③ 10 ④ 5 ⑤ 2.5 ⑥ 1.25 ⑦ 0.625 ⑧ 0.3125

8 half lives

8 × 5730 = 45,840 hrs

8. How long does it take a 100.00g sample of Au-l 98 to decay to 6.25g (half life = 2.69 days)?

100 ① 50 ② 25 ③ 12.5 ④ 6.25

4 half lives

4 × 2.69 = 10.76 days

9. The remnants of an ancient artifact in a cave in Africa showed a $^{14}_{6}C$ decay rate of 1.2 counts per minute per gram of carbon. Assuming that the decay rate of $^{14}_{6}C$ in a freshly cut wood is 13.6 counts per minute per gram of carbon, calculate the age of the artifact. The half life of $^{14}_{6}C$ is 5730 years:
   a. Calculate the rate constant
   b. Calculate the time using the integrated rate law equation

$t_{\frac{1}{2}} = \frac{0.693}{k}$

$k = \frac{0.693}{t_{\frac{1}{2}}}$

$= \frac{0.693}{5730}$

$= 1.21 \times 10^{-4}$

$\ln \frac{[A]}{[A_0]} = -kt$

$\ln \frac{(1.2)}{(13.6)} = (-1.21 \times 10^{-4})(t)$

$\frac{-2.43}{-1.21 \times 10^{-4}} = \frac{(-1.21 \times 10^{-4})(t)}{-1.21 \times 10^{-4}}$

$t = 20,083$ years old

10. Which of the following involve an increase in the entropy of the system:
    a. Melting of a solid
    b. Sublimation
    c. Freezing
    d. Mixing
    e. Separation
    f. Boiling

11. Predict the sign on ΔS_{surr} for the following processes:
    a. $C_3H_{8(g)} + 5O_{2(g)} \rightarrow 3CO_{2(g)} + 4H_2O_{(g)}$ $\Delta H = -2221$ kJ
    b. $2NO_{2)g)} \rightarrow 2NO_{(g)} + O_{2(g)}$ $\Delta H = 112$ kJ

12. Given the following ΔH and ΔS, which of the following changes will be spontaneous at constant T and P?
    a. $\Delta H = +25$ kJ, $\Delta S = +5.0$ J/K, T = 300K
    b. $\Delta H = -10$ kJ, $\Delta S = -40$ J/K, T = 200K

13. For the reaction

    $CS_{2(g)} + 3O_{2(g)} \rightarrow CO_{2(g)} + 2SO_{2(g)}$

    ΔS^0 is equal to -143 J/K. Use the values on the table to calculate the value of S^0 fo CS_2

14. Consider the reaction

    $2O_{(g)} \rightarrow O_{2(g)}$

    a) Predict the signs on ΔH and ΔS
    b) Would the reaction be more spontaneous at high or low temperatures? Explain.

15. Balance the following REDOX reactions

    $Cu_{(s)} + NO_3^-{}_{(aq)} \rightarrow Cu^{+2}{}_{(aq)} + NO_{(g)}$ in an acidic solution

    $NO_2^-{}_{(aq)} + Al_{(s)} \rightarrow NH_{3(g)} + AlO_2^-{}_{(aq)}$ in a basic solution

16. Sketch and label all the parts of the following galvanic cell, calculate the voltage across the cell and give the standard line notation

$Zn_{(s)} + Ag^{+}_{(aq)} \rightarrow Zn^{+2}_{(aq)} + Ag_{(s)}$

17. Use the reduction potential table to determine the order of increasing strength as reducing agents

    Cu+ , F^- , H^- , H_2O , I_2 , K

18. Consider the cell described below:

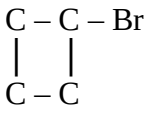
    $Zn|Zn^{+}$ (1.00M)||Cu^{+2} (1.00M)|Cu

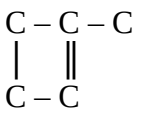
    Draw and label the cell. Write the balanced redox reaction. Calculate the initial cell potential

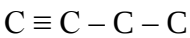
19. How long will it take to plate out 1.0 g Ni from a Ni^{+2} solution with a current of 100.0 A?

20. What mass of Co will plate out from a Co^{+2} solution in 1.0 hour with a current of 15 A?

Classification Name

_____ 1.  _____

_____ 2.  _____

_____ 3.  _____

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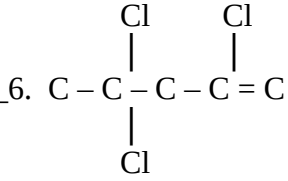
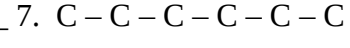
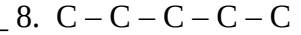
_____6.  _____

_____ 7.  _____

_____ 8.  _____

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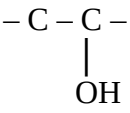
10. 

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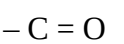
11. 

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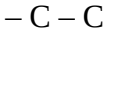
12. 

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Draw the condensed structural formula and the skeletal formula for the following

pentanioc acid	Ethyl propanoate	trichloromethane
tetramethylbutane	hexane	2-propanol
3-hexyne	3-methyl-2-pentene	2,3-pentadiene
2,3-dimethylpentane	1-methyl-3-propylcylcopentane	3-ethyl-1-heptene

1,2,3,4-tetrachlorobenzene	2-heptanone	Methanal