**EXAM I**

**Spring 2020**

**CHEM 330**

**NAME\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**A frigate bird ca sleep while it flies. They are capable of flying nonstop for 10 days!**

1. (20 PTS) Calculate the solubility of AgCl in a solution of 0.05 M NaCL Ksp = 3.0 x 10-18

Kf1 = 9.6 x 101 Kf2 = 1.3 x 102 Kf3 = 9.5 x 103

2. (15 PTS) Generate a Mass and Charge balance equation for an aqueous solution of Fe3(PO4)2(s)

3. (15 PTS) Determine the ionic strength when 25 mL of 0.2 M AlCl3 is mixed with 15 mL of 0.2 M Ba(OH)2? (solid Aluminum hydroxide is formed)

4. (10 PTS) Calculate the activity coefficient for Aluminum in problem #3. αAl = 450

5. (15 PTS) A series of sulfate samples is to be analyzed by precipitation as BaSO4. If it is known that the sulfate content in these samples ranges between 20 and 55%, what minimum sample weight should be taken to ensure that a precipitate weight no smaller than 0.300 g is produced? What is the maximum precipitate weight to be expected if this quantity is taken?

6 (10 PTS) Sulfide is an excellent precipitant for many transition metals. It is easily generated in the lab by treating FeS with strong acid and bubbling the H2S so formed into the analyte solution. It can also be added directly to solution in the form of Na2S or (NH4)2S. It turns out though that when people want to do a gravimetric analysis for, say, copper, they typically add to the solution a small amount of thioacetamide, which slowly decomposes upon heating in aqueous solution to release sulfide ion. This process, in addition to being counterintuitive, takes longer than the other methods. They all stink wretchedly. Why, therefore, this predilection for thioacetamide rather than just doing the precipitation in a simple, fast and direct way?

7. (10 pts) Describe how you would prepare 3.00 L of 0.250 M perchloric acid from a concentrated solution that has a specific gravity of 1.66 and is 70% HClO4 (w/w). [State what volumes to use!]

8. (5 pts) Briefly define TGA and its utility.

IInert

I-A gases

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| 1  H  1.008 | II-A |  | **P** | **E** | **R** | **I** | **O** | **D** | **I** | **C** |  | III-A | IV-A | V-A | VI-A | VIII-A | 2  He  4.003 |
| 3  Li  6.941 | 4  Be  9.012 |  |  | **C** | **H** | **A** | **R** | **T** |  |  |  | 5  B  10.81 | 6  C  12.01 | 7  N  14.01 | 8  O  16.00 | 9  F  19.00 | 10  Ne  20.18 |
| 11  Na  22.99 | 12  Mg  24.31 | III-B | IV-B | V-B | VI-B | VII-B | VIII | VIII | VIII | I-B | II-B | 13  Al  26.98 | 14  Si  28.09 | 15  P  30.97 | 16  S  32.07 | 17  Cl  35.45 | 18  Ar  39.95 |
| 19  K  39.10 | 20  Ca  40.08 | 21  Sc  44.95 | 22  Ti  47.88 | 23  V  50.94 | 24  Cr  52.00 | 25  Mn  54.94 | 26  Fe  55.85 | 27  Co  58.93 | 28  Ni  58.69 | 29  Cu  63.55 | 30  Zn  65.38 | 31  Ga  69.72 | 32  Ge  72.59 | 33  As  74.92 | 34  Se  78.96 | 35  Br  79.90 | 36  Kr  83.80 |
| 37  Rb  85.47 | 38  Sr  87.62 | 39  Y  88.91 | 40  Zr  91.22 | 41  Nb  92.91 | 42  Mo  95.94 | 43  Tc  (98) | 44  Ru  101.1 | 45  Rh  102.9 | 46  Pd  106.4 | 47  Ag  107.9 | 48  Cd  112.4 | 49  In  114.8 | 50  Sn  118.7 | 51  Sb  121.8 | 52  Te  127.6 | 53  I  126.9 | 54  Xe  131.3 |
| 55  Cs  132.9 | 56  Ba  137.3 | 57  La  138.9 | 72  Hf  178.5 | 73  Ta  180.9 | 74  W  183.8 | 75  Re  186.2 | 76  Os  190.2 | 77  Ir  192.2 | 78  Pt  195.1 | 79  Au  197.0 | 80  Hg  200.6 | 81  Tl  204.4 | 82  Pb  207.2 | 83  Bi  209.0 | 84  Po  (209) | 85  At  (210) | 86  Rn  (222) |
| 87  Fr  (223) | 88  Ra  (226) | 89  Ac  (227) | 104  Unq  (261) | 105  Unp)  (262) | 106  Unh  (263) | 107  Uns  (262) | 108  Uno  (265) | 109  Une  (267) |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  | 58  Ce  140.1 | 59  Pr  140.9 | 60  Nd  144.2 | 61  Pm  (145) | 62  Sm  150.4 | 63  Eu  152.0 | 64  Gd  157.2 | 65  Tb  158.9 | 66  Dy  162.5 | 67  Ho  164.9 | 68  Er  167.3 | 69  Tm  168.9 | 70  Yb  173.0 | 71  Lu  175.0 |  |
|  |  |  | 90  Th  232.0 | 91  Pa  (231) | 92  U  238.0 | 93  Np  (237) | 94  Pu  (244) | 95  Am  (243) | 96  Cm  (247) | 97  Bk  (247) | 98  Cf  (251) | 99  Es  (252) | 100  Fm  (257) | 101  Md  (258) | 102  No  (259) | 103  Lr  (260) |  |