Name _____ Test 3 (12/6)
CHEM 0211 (Adv. Inorganic) Fall 2023

1. (10 pts.) Explain how alcohols like ethanol can act as both a Brønsted-Lowry base and a Brønsted-Lowry acid. In the explanation provide examples of ethanol acting in both ways.

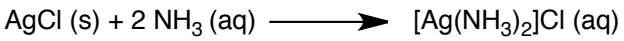
1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

2. (10 pts.) Explain why $HClO_3$ is a stronger acid than $HBrO_3$.

7. _____
8. _____
9. _____

3. (10 pts.) Ammonia, NH_3, and diisopropylamine, $NH(CH(CH_3)_2)_2$ are both bases. Ignoring any possible solvent effects, determine which is the stronger base and briefly explain your choice.

4. Sliver chloride can be made to dissolve in water if ammonia is added to the water. A balanced chemical equation describing the reaction is drawn below.



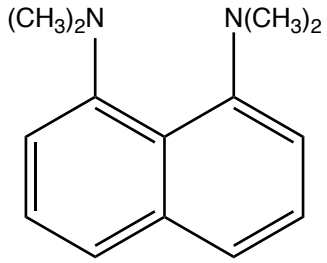
a. (5 pts.) Is the ammonia acting as a Lewis acid or a Lewis base? Briefly explain your response.

b. (5 pts.) Is the metal acting as a Lewis acid or a Lewis base? Briefly explain your response.

5. (10 pts.) What is the strongest base that can exist in water? Explain.

6. (8 pts.) Using the hard-soft acid-base concept, explain why AgF is more soluble in water than AgI.

7. (8 pts.) The structure of 1,8-bis(dimethylamino)naphthalene is drawn below. It is a very effective base when used in organic solvents. Explain why it is such a good base.



8. (8 pts.) Determine the oxidation numbers(charges) for the transition metals in the following coordination complexes

$K[ReO_4]$ *trans*-$[Co(H_2O)_2(NH_3)_4]Cl_3$

$Fe(CO)_5$ *fac*-$[Mn(CO)_3(H_2O)_3]Br$

9. (12 pts.) The compound pentamminebromocobalt(III) chloride contains both bromide and chloride ions. (Remember the ammine ligands are ammonia molecules.)
Which of the halogen ions is in the first (sometimes called inner) coordination sphere of the complex?

What does it mean, bonding-wise, for a ligand to be part of the inner coordination sphere.

What is the charge on the transition metal complex ion?

How many chloride ions are present to balance the charge on the complex ion?

Draw the structure of the octahedral pentaminebromocobalt(III) chloride. Remember, to use brackets, [ ], where appropriate and to indicate the net charges on the ions

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89 Ac	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og

58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr