

**Test 2, Chemistry 121**  
**Spring 2006**

**Name:** \_\_\_\_\_

Instructions: You have 75 minutes to complete this 100-point exam. You may use a simple scientific calculator. No programmable calculators allowed.

**I. Solubility (10 pts):** Indicate whether the following compounds are soluble in water.

1. $\text{Na}_3\text{PO}_4$	Soluble	Insoluble	6. $\text{AgCl}$	Soluble	Insoluble
2. $\text{ZnCl}_2$	Soluble	Insoluble	7. $\text{TiNO}_3$	Soluble	Insoluble
3. $\text{FeCrO}_4$	Soluble	Insoluble	8. $(\text{NH}_4)_2\text{CO}_3$	Soluble	Insoluble
4. $\text{Ca}(\text{OH})_2$	Soluble	Insoluble	9. $\text{AlPO}_4$	Soluble	Insoluble
5. $\text{PbSO}_4$	Soluble	Insoluble	10. $\text{MgSO}_4$	Soluble	Insoluble

**II. Writing and Balancing Equations**

1. (15 pts) Write the balanced molecular, total ionic and net ionic equations for the reaction of lead (II) nitrate with potassium bromide. (make sure you identify the solid precipitate)

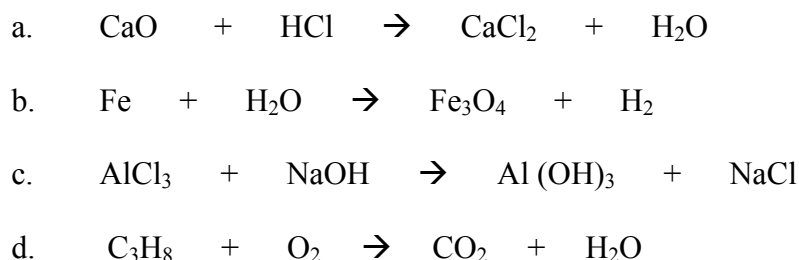
Molecular: \_\_\_\_\_

Total Ionic: \_\_\_\_\_

Net Ionic: \_\_\_\_\_

2. (5 pts) Write the balanced molecular equation for the reaction of sodium hydroxide with hydroiodic acid (HI).

3. (20 pts) Balance the following equations:



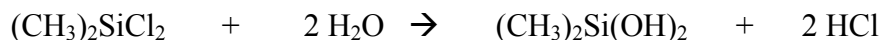
**III. Calculations** – show all work for partial credit

1. (15 pts) Sodium thiosulfate pentahydrate,  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$  is used in photography development.
- a. Calculate its molar mass. (show all work)

b. A solution of  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$  has a concentration 0.500 M. How many grams of  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$  are in 15.0 mL of the solution? (Use the MM from part a)

2. (10 pts) Propylene glycol ( $\text{CH}_3\text{CHOHCH}_2\text{OH}$ ) is used as a safe alternative to ethylene glycol, the main ingredient in antifreeze. How many molecules of propylene glycol are in 5.0 mg of  $\text{CH}_3\text{CHOHCH}_2\text{OH}$ ? (MM of  $\text{CH}_3\text{CHOHCH}_2\text{OH} = 76.09 \text{ g/mol}$ )

3. (15 pts) Silicone bracelets have become extremely popular in the last two years. The basic molecular unit of these bracelets is dimethylsiloxane  $(\text{CH}_3)_2\text{Si}(\text{OH})_2$ . This is made by reacting dimethyl dichlorosilane,  $(\text{CH}_3)_2\text{SiCl}_2$ , with water. How many grams of  $(\text{CH}_3)_2\text{Si}(\text{OH})_2$  are prepared by the reaction of 10.0g of  $(\text{CH}_3)_2\text{SiCl}_2$  with 5.00g of water? (MM of  $(\text{CH}_3)_2\text{SiCl}_2 = 129.06 \text{ g/mol}$ , MM of  $\text{H}_2\text{O} = 18.02 \text{ g/mol}$ , MM of  $(\text{CH}_3)_2\text{Si}(\text{OH})_2 = 92.17 \text{ g/mol}$ )



4. (10 pts) What volume (in mL) of 0.955 M HCl is required to exactly neutralize 15.0 mL of 0.596 M  $\text{Ca}(\text{OH})_2$ ?



5. (10 pts) Determine the empirical formula of a compound that contains 53.5 % Xe and 46.5 % F.

IA																										VIIIA																																																																											
1	H																									2																																																																											
	1.008																									He																																																																											
	IIA																																																																																																				
3	4											5	6	7	8	9	10																																																																																				
Li	Be											B	C	N	O	F	Ne																																																																																				
6.94	9.01											10.81	12.01	14.01	16.00	19.00	20.18																																																																																				
11	12											13	14	15	16	17	18																																																																																				
Na	Mg											Al	Si	P	S	Cl	Ar																																																																																				
22.99	24.31											26.98	28.09	30.97	32.06	35.45	39.95																																																																																				
		IIIB	IVB	VB	VIB	VIIIB	VIII B			IB	IIB																																																																																										
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36																																																																																				
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr																																																																																				
39.10	40.08	44.96	47.90	50.94	52.00	54.94	55.85	58.93	58.71	63.55	65.37	69.72	72.59	74.92	78.96	79.90	83.80																																																																																				
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54																																																																																				
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe																																																																																				
85.47	87.62	88.91	91.22	92.91	95.94	[98]	101.1	102.9	106.4	107.9	112.40	114.8	118.7	121.8	127.60	126.90	131.30																																																																																				
55	56	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86																																																																																				
Cs	Ba	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn																																																																																				
132.9	137.3	175	178.5	181	183.9	186.2	190.2	192.2	195.1	197	200.59	204.4	207.2	209	[209]	[210]	[222]																																																																																				
87	88	103	104	105	106																																																																																																
Fr	Ra	Lr																																																																																																			
[223]	[226]	[262]	[261]	[262]	[263]																																																																																																
<table border="1"> <tr> <td>57</td><td>58</td><td>59</td><td>60</td><td>61</td><td>62</td><td>63</td><td>64</td><td>65</td><td>66</td><td>67</td><td>68</td><td>69</td><td>70</td> </tr> <tr> <td>La</td><td>Ce</td><td>Pr</td><td>Nd</td><td>Pm</td><td>Sm</td><td>Eu</td><td>Gd</td><td>Tb</td><td>Dy</td><td>Ho</td><td>Er</td><td>Tm</td><td>Yb</td> </tr> <tr> <td>138.9</td><td>140.1</td><td>140.9</td><td>144.2</td><td>[145]</td><td>150.4</td><td>152</td><td>157.3</td><td>158.9</td><td>162.5</td><td>164.93</td><td>167.3</td><td>168.9</td><td>173</td> </tr> <tr> <td>89</td><td>90</td><td>91</td><td>92</td><td>93</td><td>94</td><td>95</td><td>96</td><td>97</td><td>98</td><td>99</td><td>100</td><td>101</td><td>102</td> </tr> <tr> <td>Ac</td><td>Th</td><td>Pa</td><td>U</td><td>Np</td><td>Pu</td><td>Am</td><td>Cm</td><td>Bk</td><td>Cf</td><td>Es</td><td>Fm</td><td>Md</td><td>No</td> </tr> <tr> <td>[227]</td><td>232</td><td>[231]</td><td>238</td><td>[237]</td><td>[244]</td><td>[243]</td><td>[247]</td><td>[247]</td><td>[251]</td><td>[252]</td><td>[257]</td><td>[258]</td><td>[259]</td> </tr> </table>																		57	58	59	60	61	62	63	64	65	66	67	68	69	70	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	138.9	140.1	140.9	144.2	[145]	150.4	152	157.3	158.9	162.5	164.93	167.3	168.9	173	89	90	91	92	93	94	95	96	97	98	99	100	101	102	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	[227]	232	[231]	238	[237]	[244]	[243]	[247]	[247]	[251]	[252]	[257]	[258]	[259]
57	58	59	60	61	62	63	64	65	66	67	68	69	70																																																																																								
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb																																																																																								
138.9	140.1	140.9	144.2	[145]	150.4	152	157.3	158.9	162.5	164.93	167.3	168.9	173																																																																																								
89	90	91	92	93	94	95	96	97	98	99	100	101	102																																																																																								
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No																																																																																								
[227]	232	[231]	238	[237]	[244]	[243]	[247]	[247]	[251]	[252]	[257]	[258]	[259]																																																																																								