Name _____ Slayter Box _____

Examination I February 11, 2013

Organic Structure and Reactivity (CHEM 132-01)

Dr. Fantini

You may CAREFULLY detach the last page of the exam
(solubility rules and periodic table)

Please do not open until instructed

ALLOWED at exam:
Pens, pencils, erasers.
Calculator

NOT ALLOWED at exam:
Cellular telephones and PDA's

Organic Structure and Reactivity (CHEM 132-01)

Dr. Fantini

Examination I February 11, 2013

Instructions:

1) This exam consists of **7** problems.

2) Work that is not clear and legible will not be graded

3) Method and/or reasoning must be shown. No credit will be given for an answer alone.

4) Give units for all answers and use significant figures.

5) No books or notes are to be used.

6) Do not share calculators

Question	Possible	Score
1	10	
2	6	
3	7	
4	22	
5	25	
6	17	
7	13	
TOTAL	100	

*10*1. Write the equilibrium constant expressions for each of these reactions:

(a) $Ba_3(PO_4)_2(s) \rightleftharpoons 3\ Ba^{2+}(aq) + 2\ PO_4^{3-}(aq)$ $K_{eq} =$

(b) $Ni(s) + 4\ CO(g) \rightleftharpoons Ni(CO)_4(l)$ $K_{eq} =$

*6*2. Give the name or formula to go with the formula or name shown.

(a) ClO_4^- (b) hydroxide (c) sulfate

*7*3. Balance these equations with the smallest integers possible.

(a) _____ $NH_3(g)$ + _____ $O_2(g) \rightleftharpoons$ _____ $N_2O(g)$ + _____ $H_2O(l)$

(b) _____ $N_2O_5(g) \rightleftharpoons$ _____ $NO_2(g)$ + _____ $O_2(g)$

224. For the following reaction, a person used 35 g Al*(s)* and 122 g Fe_2O_3*(s)*.

$$\underset{27.0\ g/mol}{2\ Al(s)} + \underset{160\ g/mol}{Fe_2O_3(s)} \rightarrow \underset{55.8\ g/mol}{2\ Fe(l)} + \underset{102\ g/mol}{Al_2O_3(s)}$$

(a) Which is the limiting reagent, Al*(s)* or Fe_2O_3*(s)*?

(b) What is the theoretical yield of Fe*(l)*?

**** Remember, show work for maximum partial credit potential ****

25 5. A student mixed 0.50 L of 0.080 M $Pb(NO_3)_2$ solution with just enough solid to make all the Pb^{2+} precipitate as $PbSO_4(s)$. How many grams of Na_2SO_4 did she use?

$$\underset{331\ g/mol}{Pb(NO_3)_2(aq)} + \underset{142\ g/mol}{Na_2SO_4(aq)} \rightarrow 2\ \underset{85.0\ g/mol}{NaNO_3(aq)} + \underset{303\ g/mol}{PbSO_4(s)}$$

17 6. Write the oxidation number for each element on the reactant and product side of this chemical equation. (Phase labels are omitted for clarity.)

$$2\ NH_3 + 2\ KMnO_4 \rightarrow 2\ KOH + 2\ MnO_2 + 2\ H_2O + N_2$$

reactant side

N	
H	
K	
Mn	
O	

product side

K	
O in KOH	
H in KOH	
Mn	
O in MnO_2	
H in H_2O	
H in H_2O	
N	

What ***element*** was oxidized? _____

What ***element*** was reduced? _____

What ***compound*** was the oxidizing agent? _____

What ***compound*** was the reducing agent? _____

13 7. Determine what precipitate is formed when solutions of cobalt(II) nitrate, $Co(NO_3)_2$, and potassium phosphate (K_3PO_4) are mixed, and then write the balanced net ionic reaction, being sure to include phase labels.

McQuarrie's Solubility Rules

apply in this order

1. Most alkali metal salts and ammonium salts are soluble.
2. Most nitrates, acetates, and perchlorates are soluble.
3. Most silver, lead, and mercury(I) salts are insoluble.
4. Most chlorides, bromides, and iodides are soluble.
5. Most carbonates, chromates, sulfides, oxides, phosphates, and hydroxides are insoluble, except for hydroxides of Ba^{2+}, Ca^{2+}, and Sr^{2+}, which are slightly soluble.
6. Most sulfates are soluble, except for calcium sulfate and barium sulfate, which are insoluble.

Periodic Table of the Elements

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 **H** 1.008																	2 **He** 4.003
3 **Li** 6.941	4 **Be** 9.012											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											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** 44.96	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** 183.9	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 **Rf** (261)	105 **Db** (262)	106 **Sg** (263)	107 **Bh** (262)	108 **Hs** (265)	109 **Mt** (266)	110 **Uun** (269)	111 **Uuu** (272)	112 **Uub** (277)						

Lanthanides	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** 157.3	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
Actinides	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)