Name: _____

Chemistry 150 Exam 1

Be sure to put your name on each page. This page can be removed from your exam so that you will have a Periodic Table handy throughout the exam, it does not need to be turned in. Show all your work for non-multiple choice problems which require any sort of calculation, no credit will be given for answers without work shown. If you have shown a significant amount of work or multiple drawings for a problem, draw a box around what you consider your final answer.

Avogadro's Number = 6.022×10^{23} units/mol
$32.00^{o}F = 0.000^{o}C = 273.15K$
1 foot = 12 inches
1 inch = 2.54cm (exactly)
1 pound = 453.6 g = 16 ounces
1 amu = 1.6605×10^{-24} g
Masses of subatomic particles:

Proton	1.00728amu =	1.6726×10^{-24} g
Neutron	1.00866amu =	1.6749×10^{-24} g
Electron	0.000549amu =	9.1094×10^{-28} g

Density of Water = 1.000 g/mL
R = 0.08206 L•atm/mol•K
PV=nRT
1 calorie = 4.184 J = 0.001Calorie

$h = 6.626 \times 10^{-34}$ Jsec
$\lambda = h/mv$
$1\ J = 1\ kg\ (m/sec)^2$
$c = \lambda\nu = 3.00 \times 10^{8}$ m/sec
$E_{photon} = h\nu$

1 **H** 1.0079																	2 **He** 4.0026
3 **Li** 6.941	4 **Be** 9.0122											5 **B** 10.811	6 **C** 12.011	7 **N** 14.007	8 **O** 15.999	9 **F** 18.998	10 **Ne** 20.180
11 **Na** 22.990	12 **Mg** 24.305											13 **Al** 26.982	14 **Si** 28.086	15 **P** 30.974	16 **S** 32.066	17 **Cl** 35.453	18 **Ar** 39.948
19 **K** 39.098	20 **Ca** 40.078	21 **Sc** 44.956	22 **Ti** 47.88	23 **V** 50.942	24 **Cr** 51.996	25 **Mn** 54.938	26 **Fe** 55.847	27 **Co** 58.933	28 **Ni** 58.69	29 **Cu** 63.546	30 **Zn** 65.39	31 **Ga** 69.723	32 **Ge** 72.61	33 **As** 74.922	34 **Se** 78.96	35 **Br** 79.904	36 **Kr** 83.80
37 **Rb** 85.468	38 **Sr** 87.62	39 **Y** 88.906	40 **Zr** 91.224	41 **Nb** 92.906	42 **Mo** 95.94	43 **Tc** (98)	44 **Ru** 101.07	45 **Rh** 102.91	46 **Pd** 106.42	47 **Ag** 107.87	48 **Cd** 112.41	49 **In** 114.82	50 **Sn** 118.71	51 **Sb** 121.76	52 **Te** 127.60	53 **I** 126.90	54 **Xe** 131.29
55 **Cs** 132.91	56 **Ba** 137.33	71 **Lu** 174.97	72 **Hf** 178.49	73 **Ta** 180.95	74 **W** 183.84	75 **Re** 186.21	76 **Os** 190.23	77 **Ir** 192.22	78 **Pt** 195.08	79 **Au** 196.97	80 **Hg** 200.59	81 **Tl** 204.38	82 **Pb** 207.2	83 **Bi** 208.98	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** 226.03	103 **Lr** (260)	104 **Rf** (261)	105 **Db** (262)	106 **Sg** (263)	107 **Bh** (262)	108 **Hs** (265)	109 **Mt** (266)	110 **Ds** (269)	111 **Rg** (272)	112 **Cn** (277)	113	114	115	116	117	118

57 **La** 138.91	58 **Ce** 140.12	59 **Pr** 140.91	60 **Nd** 144.24	61 **Pm** (145)	62 **Sm** 150.36	63 **Eu** 151.97	64 **Gd** 157.25	65 **Tb** 158.93	66 **Dy** 162.50	67 **Ho** 164.93	68 **Er** 167.26	69 **Tm** 168.94	70 **Yb** 173.04
89 **Ac** 227.03	90 **Th** 232.04	91 **Pa** 231.04	92 **U** 238.03	93 **Np** 237.05	94 **Pu** (244)	95 **Am** (243)	96 **Cm** (247)	97 **Bk** (247)	98 **Cf** (251)	99 **Es** (252)	100 **Fm** (258)	101 **Md** (258)	102 **No** (259)

Score

Multiple Choice: Circle the letter of the most correct response. (4pts. per question)

1. Consider the following reaction:

$$a\ K_3PO_3(aq) + b\ Co(NO_3)_3(aq) \rightarrow c\ CoPO_3(s) + d\ KNO_3(aq)$$

For every mol of $CoPO_3(s)$ that forms, how many mols of $K_3PO_3(aq)$ have reacted?
   a. 0.33 mols
   b. 0.5 mols
   c. 1 mol
   d. 2 mols
   e. 3 mols

2. Which of the following reactions would form only water and a salt?
   a. $HNO_3(aq) + Na_2SO_3(aq)$
   b. $HClO_4(aq) + Mg(OH)_2(aq)$
   c. $Ni(C_2H_3O_2)_2(aq) + Zn(s)$
   d. $HCl(aq) + Pb(NO_3)_2(aq)$
   e. $Fe(NO_3)_3(aq) + Mg(OH)_2(aq)$

3. Which of the following statements is ***true***?
   a. Oxidation can happen without reduction
   b. Reduction is losing electrons
   c. Increasing positive charge is a reduction
   d. Loss of electrons is reduction
   e. Oxidizing agents are reduced in a reaction

4. In which of the following formulas does phosphorus (P) have the ***lowest*** oxidation number?
   a. $H_3P(g)$
   b. $P(s)$
   c. $PO_4^{3-}(aq)$
   d. $Na_3PO_3(s)$
   e. $PF_5(l)$

5. Which of the following would you expect to be ***soluble*** in water?
   a. $AgC_2H_3O_2$
   b. $BaSO_4$
   c. $Mg_3(PO_4)_2$
   d. $Pb(OH)_2$
   e. $CrCO_3$

6. Consider the following reaction:

$$Mn(NO_3)_2(aq) + Ni(s) \rightarrow Ni(NO_3)_2(aq) + Mn(s)$$

What is being ***oxidized*** in this reaction?
   a. $Mn(NO_3)_2(aq)$
   b. $Ni(s)$
   c. $Ni(NO_3)_2(aq)$
   d. $Mn(s)$
   e. This is not a redox reaction

Score

Chemical Equations: For each of the following, write a correctly balanced chemical equation, identify the reaction type, and write the net ionic equation. Be sure to include state labels. (12pts each)

Potassium sulfide (aq) + Cobalt(III) acetate(aq) → Cobalt(III) sulfide + Potassium acetate
{Cobalt atomic # = 27}

Titanium(IV) nitrate(aq) + Gallium(s) → Titanium(s) + Gallium(III) nitrate
{Titanium atomic # = 22; Gallium atomic # = 31}

Sulfuric acid(aq) + Ammonium hydroxide(aq) → Ammonium sulfate + Water

Problems:

10. You have diluted 25.0mL of a 0.884M solution of copper(II) acetate with enough water to make 125.0mL of solution. What is the new concentration of *acetate ions* in this solution? (8pts)

Answer 10:

11. You have dissolved 20.00g of calcium nitrate in enough water to make 150.00mL of solution. What is the concentration of the resulting solution? (8pts)

Answer 11:

12. You have titrated 25.00mL of an unknown stock potassium hydroxide solution to the equivalence point with 47.93mL of 1.159M nitric acid. What is the concentration of the stock potassium hydroxide solution? (15pts)

Answer 12:

13. How many grams of sodium carbonate solid are required to react with 32.65g of nitric acid? (12pts)

Answer 13:

Score

14. You would like to prepare 25.00g of lead(II) bromide solid. How many grams of potassium bromide are required if you have unlimited lead(II) nitrate solution? (12pts)

Answer 14:

15. You would like to produce 50.00L of hydrogen gas at 17.54°C and 1.773atm by the following reaction:

$$a\ Ru(s) + b\ HClO_4(aq) \rightarrow c\ H_2(g) + d\ Ru(ClO_4)_3(aq)$$

How many milliliters of 1.192M perchloric acid solution are required to produce 50.00L of $H_2(g)$? How many grams of Ru(s) are required to produce 50.00L of $H_2(g)$? (20pts)

16. 75.0mL of 1.662M barium(II) acetate solution is combined with 75.0mL of 1.456M sodium phosphate solution. Write a correctly balanced equation and net ionic equation for the reaction that takes place. How many grams of precipitate can this reaction form? You recover 14.938g of precipitate. What is the percent yield? (20pts)

Score