Chemistry 115 Name

Dr. Cary Willard

Exam 2B March 17, 2010

|  |  |  |
| --- | --- | --- |
|  | Points Earned | Points Possible |
| Page 1  multiple choice |  | 26 |
| Page 2 |  | 15 |
| Page 3 |  | 12 |
| Page 4 |  | 18 |
| Page 5 |  | 18 |
| Page 6 |  | 11 |
|  |  |  |
| Total |  | 100 |

Note: All work must be shown to receive credit. On calculation problems show answer with the correct number of significant figures using scientific notation if necessary.

Avogadro’s number 6.022 x 1023/mol

PERIODIC CHART

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| IA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | VIIA | NOBLE GASES |
| 1  **H**  1.008 | IIA |  |  |  |  |  |  |  |  |  |  | IIIA | IVA | VA | VIA | 1  **H**  1.008 | 2  **He**  4.002 |
| 3  **Li**  6.941 | 4  **Be**  9.012 | Transition Metals | | | | | | | | | | 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**  23.00 | 12  **Mg**  24.30 | IIIB | IVB | VB | VIB | VIIB | VIIIB | | | IB | IIB | 13  **Al**  27.00 | 14  **Si**  28.09 | 15  **P**  30.97 | 16  **S**  32.06 | 17  **Cl**  35.45 | 18  **Ar**  39.95 |
| 19  **K**  39.10 | 20  **Ca**  40.08 | 21  **Sc**  44.96 | 22  **Ti**  47.90 | 23  **V**  50.94 | 24  **Cr**  52.00 | 25  **Mn**  54.94 | 26  **Fe**  55.85 | 27  **Co**  58.93 | 28  **Ni**  58.70 | 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**  (99) | 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**  226.0 | 89  **Ac**  227.0 | 104  **Rf**  (261) | 105  **Db**  (262) | 106  **Sg**  (263) | 107  **Bh**  (262) | 108  **Hs**  (265) | 109  **Mt**  (268) | 110  **??**  (???) |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 58  **Ce**  140.1 | 59  **Pr**  140.9 | 60  **Nd**  144.2 | 61  **Pm**  (147) | 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 |
| 90  **Th**  232.0 | 91  **Pa**  231.0 | 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) |

Lanthanide series

Actinide series

Part 1 - Multiple Choice (26 points)

1. Neutral atoms of a specific element may have different
   1. Number of protons
   2. Number of neutrons
   3. Number of electrons
   4. Atomic number
   5. None of these may be different
2. Which pair of formulas illustrates the Law of Multiple Proportions?
   1. H2O and H2O2
   2. CH3Cl and CH3OH
   3. H2O and HOH
   4. CH3CH3 and CBr3CBr3
   5. CuCl2 and CuBr
3. What charge does a molecule possess?
   1. Positive
   2. Credit
   3. Negative
   4. Neutral
   5. Unable to determine
4. Which pair of symbols represents isotopes?
   1. and
   2. and
   3. and
   4. and
5. The mass of an atom is primarily determined by the mass of its
   1. Protons
   2. Neutrons
   3. Electrons
   4. Both neutrons and electrons
   5. Both protons and neutrons
6. How many moles of HF will be produced by the complete reaction of 1.42 moles of H2 in the following equation?

H2 + F2 → 2HF

* 1. 2.84
  2. 0.710
  3. 1.42
  4. 2.00
  5. 5.68

1. In which pair would both compounds have the same empirical formula?
   1. K2CrO4 and K2Cr2O7
   2. NaHCO3 and Na2CO3
   3. C2H4 and C3H6
   4. FeCl3 and FeCl2
   5. KClO2 and KClO4
2. Which is not part of Dalton’s atomic model?
   1. Atoms of the same element can be different in size.
   2. Elements are composed of minute, indivisible particles called atoms.
   3. Atoms of the same element are alike in mass.
   4. Chemical compounds are composed of two or more atoms of different elements.
   5. All of the above are part of Daltons atomic model.
3. An atom of atomic number 61 and mass number 142 contains how many neutrons
   1. 61
   2. 142
   3. 31
   4. 203
   5. 81
4. Which of the following contains the largest number of moles?
   1. 1.0 g Na
   2. 1.0g U
   3. 1.0 g Al
   4. 1.0 g Ag
   5. They all have the same number of moles.
5. Which statement is incorrect?
   1. One mole contains 6.02 X 1023 molecules.
   2. One molar mass equals one mole.
   3. One mole of water contains the same number of molecules as one mole of carbon dioxide.
   4. One mole equals 6.02 X 1023 g of a compound.
   5. One mole of copper has a mass of 63.55 g
6. The reaction

K + NaBr → KBr + Na

is an example of

* 1. A combination reaction
  2. A decomposition reaction
  3. A double displacement reaction
  4. A gas formation reaction
  5. A single displacement reaction

1. The reaction

CaCO3 → CaO + CO2

is an example of

* 1. A combination reaction
  2. A decomposition reaction
  3. A single displacement reaction
  4. A double displacement reaction
  5. Unable to determine

Part 2 – Nomenclature (8 points) Fill in the following table with the correct IUPAC name or formula

|  |  |
| --- | --- |
| IUPAC Name | Chemical Formula |
| Aluminum sulfate |  |
| Chromium(III) bromide |  |
| Lithium chromate |  |
| Zinc chlorite |  |
|  | K2CO3 |
|  | Ag2O |
|  | NaOH |
|  | S2O4 |

Part 3 – Problems (66 points)

1. (4 points) Explain why the name for MgCl2 is magnesium chloride but the name for CuCl2 is copper(II) chloride.
2. (3 points) Explain how endothermic reactions differ from exothermic reactions.
3. (6 points) Balance the equations below
   1. Be*(s)*+ O2*(g)* → BeO*(s)*
   2. CH3NH2*(g)* + O2*(g)* → H2O*(g)* + CO2*(g)* + N2*(g)*
4. (6 points) Given the following data determine the relative activities of the metals from each equation series for Ca, Cd, Mg, and Ni.

Mg + Cd(NO3)2 🡪 Cd + Mg(NO3)2 >

Ca + Mg(NO3)2 🡪 Ca(NO3)2 + Mg >

Ni+ Cd(NO3)2 🡪 no reaction >

* 1. Using the data from the first part of this problem, determine the activity series for Ca, Cd, Mg, and Ni.

> > >

* 1. Predict what would happen if a strip of nickel were dropped into a solution of Mg(NO3)2.

1. (18 points) Given a 6.05 g sample of the cyanoacrylate (C5H5NO2) the principle component of superglue, calculate the following:
   1. molar mass of cyanoacrylate
   2. moles of cyanoacrylate
   3. moles of carbon atoms
   4. molecules of cyanoacrylate
   5. number of oxygen atoms
   6. mass in grams of one molecule of cyanoacrylate (give 4 significant figures)
2. (18 points) Given the reaction

2 Al(s) + 3NH4NO3(s) ⎯⎯→ 3 N2 + 6 H2O + Al2O3

* 1. How many moles of NH4NO3 are required to react with 8.47 mol Al?
  2. How many grams of nitrogen gas(N2) will be produced when 3.15 mol of aluminum are reacted with excess NH4NO3?
  3. If 95.2 grams of N2 are produced in part b, what is the percent yield of the reaction?
  4. How many atoms of Al will react with 132 formula units of NH4NO3?
  5. How many molecules of water will be produced by the combustion of 5.00 g of Al?
  6. How many grams of Al2O3 will be produced by the reaction of 0.150 moles of Al with 0.150 moles of NH4NO3?

1. (7 points) Calculate the empirical formula of a compound which is composed of 35.00% N, 5.04% H and 59.96% O.
2. (4 points) A compound with empirical formula C3H4O2 has a molar mass of 144 g/mol. Determine the molecular formula for the compound.