Chemistry 115 Name

Dr. Cary Willard

Exam 2C March 18, 2009

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|  | Points Earned | Points Possible |
| Page 1  multiple choice |  | 20 |
| Page 2 |  | 24 |
| Page 3 |  | 26 |
| Page 4 |  | 24 |
| Page 5 |  | 12 |
|  |  |  |
| Total |  | 106 |

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  **??**  (???) |  |  |  |  |  |  |  |  |

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| 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 (20 points)

1. Each atom of a specific element has the same
   1. Atomic mass
   2. Mass number
   3. Number of protons
   4. Number of neutrons
   5. None of the above
2. What charge does an anion possess?
   1. Positive
   2. Negative
   3. Neutral
   4. Unable to determine
3. Which pair of symbols represents isotopes?
   1. and
   2. and
   3. and
   4. and
4. The mass of an atom is primarily determined by the mass of its
   1. Protons
   2. Neutrons
   3. Electrons
   4. Both protons and neutrons
   5. Both neutrons and electrons
5. An atom of atomic number 53 and mass number 127 contains how many neutrons
   1. 74
   2. 180
   3. 53
   4. 127
6. Which of the following contains the largest number of moles?
   1. 1.0 go Na
   2. 1.0 g Li
   3. 1.0 g Al
   4. 1.0 g Ag
7. The reaction

BaCl2 + (NH4)2CO3 🡪 BaCO3 + 2 NH4Cl

is an example of

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

1. The reaction

2 PbO2 🡪 2 PbO + O2

is an example of

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

Given the activity series Mg>Zn>Cu>Ag, predict the products of the following reactions.

1. Mg + Cu(NO3)2 🡪
   1. Mg(NO3)2 + Cu
   2. MgNO3 + Cu
   3. MgCu + 2 NO3
   4. No reaction
   5. Unable to determine based on information provided
2. Ag + Zn(NO3)2 🡪
   1. AgNO3 + Zn
   2. Ag(NO3)2 + Zn
   3. Ag2Zn + NO3
   4. No reaction
   5. Unable to determine based on information provided

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

|  |  |
| --- | --- |
| IUPAC Name | Chemical Formula |
| Aluminum periodate | Al(IO4)3 |
| Manganese(II) chloride | MnCl2 |
| Ammonium iodate | NH4IO3 |
| Sodium borate | Na3BO3 |
| Magnesium nitrate | Mg(NO3)2 |
| Potassium phosphide | K3P |
| Zinc hydroxide | Zn(OH)2 |
| Carbon disulfide | CS2 |

Part 3 – Problems (68 points)

1. (4 points) What particles in an atom contain practically all of its mass?

The protons and neutrons comprise all of the mass of an atom. These particles may be found in the nucleus of the atom.

1. (4 points) How is it possible for there to be more than one kind of atom of the same element?

In order to have more than one kind of atom of the same element you must have a particle with the same number of protons but different number of neutrons.

1. (4 points) Explain why the name for MgCl2 is magnesium chloride but the name for CuCl2 is copper(II) chloride.

Magnesium has only one possible charge or oxidation state and therefore the charge of the atom magnesium ion does not need to be included in the name. Copper has 2 possible charges or oxidation states and therefore the charge on the ion must be specified in the name.

1. (4 points) What is meant by the physical state of a substance? What symbols are used to represent these physical states and what does each symbol mean?

The physical state of the substance refers to whether the substance is a gas, liquid, or solid (or aqueous solution). The symbols for each of these states are:

Solid (s)

Liquid (l)

Gas (g)

1. (6 points) Balance the equations below
   1. P4 + 10 Cl2 → 4 PCl5
   2. 3 H2TeO4 + 2 V(OH)3 → 6 H2O + V2(TeO4)3
2. (20 points) Given a 8.55 g sample of the acetylsalicylic acid (C9H8O4) or aspirin, calculate the following:
   1. molar mass of aspirin
   2. moles of aspirin
   3. moles of carbon atoms
   4. molecules of aspirin
   5. number of oxygen atoms
3. (24 points) Trinitrotoluene, C7H5N3O6, is an explosive otherwise known as TNT. The equation for its combustion is

4 C7H5N3O6 + 33 O2 ⎯⎯→ 28 CO2 + 10 H2O + 6 N2

* 1. How many moles of oxygen are required to react with 8.27 mol C7H5N3O6?
  2. How many grams of carbon dioxide will be produced when 4.04 mol of C7H5N3O6 are burned?
  3. If 1090 grams of CO2 are produced in part b, what is the percent yield of the reaction?
  4. How many molecules of TNT will react with 165 molecules of oxygen gas?
  5. How many molecules of water will be produced by the combustion of 4.00 g of TNT?
  6. How many moles of CO2 will be produced by the reaction of 5.00 moles of TNT with 42.0 moles of oxygen gas?

1. (7 points) Calculate the empirical formula of eugenol or oil of clove which is composed of 73.19% C, 7.37% H, and 19.49% O.
2. (5 points) A compound with empirical formula C2H4O has a molar mass of 176 g/mol. Determine the molecular formula for the compound.