Chemistry 115 Name

Dr. Cary Willard

Exam 4B December 9, 2009

|  |  |  |
| --- | --- | --- |
|  | Points Earned | Points Possible |
| Part 1  multiple choice |  | 30 |
| Page 2 |  | 10 |
| Page 3 |  | 25 |
| Page 4 |  | 14 |
| Page 4 |  | 21 |
|  |  |  |
| Total |  | 100 |

All work must be shown to receive credit. Show all answers to the proper number of significant figures.

NA = 6.022 x 1023/mol

K = oC+273.16

0oC=273.16 K

Grossmont College

Periodic Table

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 |  |  |  |  |  |  |  |  |  | |  | 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 | VIII VIII VIII | | | | 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**  (266) | 110  **??**  (269) |  | |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 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 (30 points)

1. The solubility of ammonium chloride at 70. °C is 60.g of solute per 100.g of water. Which solution would be saturated at 70. ° C?
   1. 30.g of solute in 50.g of water
   2. 60.g of solute in 200.g of water
   3. 90.g of solute in 200.g of water
   4. 35g of solute in 50.g of water
2. At which temperature would NH3 gas be most soluble?
   1. 303 K
   2. 313 K
   3. 283 K
   4. 293 K
3. Which phase of matter can act as a solute?
   1. Solid
   2. Liquid
   3. Gas
   4. All the above
4. Liquids which are capable of mixing and forming a solution are
   1. Immiscible
   2. Miscible
   3. Unsaturated
   4. Dilute
5. The hydronium ion is responsible for the properties of
   1. Salts
   2. Acids
   3. Bases
   4. hydrocarbons
6. Bronsted and Lowry defined an acid as a(n)
   1. Proton donor
   2. Proton acceptor
   3. Electron donor
   4. Electron acceptor
7. Which pH is most alkaline?
   1. 1
   2. 5
   3. 7
   4. 12
8. What is the conjugate acid of NH3?
   1. N-3
   2. NH2 -1
   3. NH4 +1
   4. NH -2
9. What type of compound is composed of only carbon and hydrogen atoms?
   1. Carbohydrate
   2. Ester
   3. Carboxylic acid
   4. Hydrocarbon
10. The four major classes of molecules upon which all life depends are
    1. Carbohydrates, ethers, proteins, and nucleic acids
    2. Carbohydrates, alcohols, proteins, and nucleic acids
    3. Carbohydrates, lipids, proteins, and nucleic acids
    4. Alcohols, lipids, proteins, and nucleic acids
11. Which hydrocarbon series is saturated?
    1. Alkenes
    2. Alkanes
    3. Alkynes
    4. Aromatics
12. Two or more different compounds with the same molecular formula are
    1. Isotopes
    2. Hypermeres
    3. Hypertopes
    4. Isomers
13. The simplest carbohydrates are
    1. Peptides
    2. Monosaccharides
    3. Dipeptides
    4. Disaccharides
14. Fats and oils are
    1. Carbohydrates
    2. Proteins
    3. Lipids
    4. Hydrocarbons
15. Proteins are polymers of
    1. Glucose
    2. Glycerol
    3. Amino acids
    4. Amylose

**Part 2 – Problems and Questions (70 points)**

1. (6 points) Predict whether each of the following is soluble in water, hexane, or both. Justify your answer.

|  |  |  |  |
| --- | --- | --- | --- |
| Substance | Soluble in water | Soluble in hexane | Explanation |
|  |  |  |  |
|  |  |  |  |
| Na3PO4 |  |  |  |

1. (4 points) Write the correct chemical formula for the following acids
   1. Hydrobromic acid
   2. Nitric acid
2. (5 points) A solution is prepared by dissolving 81.4 grams of Li2SO4 in 388.0 grams of water Calculate the mass percent lithium sulfate in the solution.
3. (6 points) Calculate the number of grams of magnesium chloride required to prepare 150.0 mL of a 0.3177 M solution MgCl2.
4. (6 points) 46.5 ml of 0.391 M H2C2O4 is diluted to 250.0 ml. What is the molarity of the resulting solution?
5. (8 points) A 2.87 M solution of potassium phosphate (K3PO4) has a density of 1.37 g/mL. Calculate the % K3PO4 in the solution.
6. (6 points) Given that 24.0 mL of 0.218 M sodium iodide reacts with 0.311 M mercury(II) nitrate solution according to the following balanced equation, what volume of Hg(NO3)2 is required for complete precipitation?

Hg(NO3)2(aq) + 2 NaI(aq) 🡪 HgI2(s) + 2 NaNO3(aq)

1. (8 points) A 25.00 ml sample of citric acid was titrated with 44.64 ml of 0.3155 M NaOH. Calculate the molarity of citric acid in the sample. (Hint: the table below may help to organize your thoughts to solve this problem.

H3C6H5O7 + 3 NaOH ⎯→ Na3C6H5O7 + 3 H2O

|  |  |
| --- | --- |
| Moles NaOH used to titrate sample |  |
| Moles citric acid in the sample |  |
| Molarity citric acid |  |

1. (6 points) A solution has an H3O+ concentration of 3.54 x 10-4 M.
   1. Determine the pH of the solution.
   2. Determine the pOH of the solution.
2. (3 points) A solution has a pH of 6.145. Calculate the hydronium ion concentration in the solution.
3. (3 points) Give the IUPAC name of



1. (3 points) Draw a condensed structural formula for 3-octyne.
2. (6 points) Identify and draw one or more functional groups that characterize each of the following biological compounds

|  |  |
| --- | --- |
| Protein |  |
| Carbohydrate |  |
| Lipid |  |