Chemistry 115 Name

Dr. Cary Willard

Exam 4b December 8, 2010

Multiple Choice (30 points)

Page 5 (16 points)

Page 6 (18 points)

Page 7 (16 points)

Page 8 (20 points)

Total ( points)

Percent (100 %)

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

Avogadros number = 6.022 x 1023 /mol

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 I – Multiple Choice (30 points)

1. The O-H bond in water is polar because
   1. oxygen occupies more space than hydrogen.
   2. hydrogen is much more electronegative than oxygen.
   3. it is a hydrogen bond.
   4. it is an ionic bond.
   5. oxygen is much more electronegative than hydrogen.
2. Which of the following molecules can form hydrogen bonds?
   1. CH4
   2. H2O
   3. NaH
   4. BH3
   5. HI
3. A solution is prepared by dissolving 2 g of KCl in 100 g of H2O. In this solution, H2O is the \_\_\_\_\_\_\_\_.
   1. solution
   2. solute
   3. solvent
   4. solid
   5. ionic compound
4. When some of the sugar added to iced tea remains undissolved at the bottom of the glass, the solution is \_\_\_\_\_\_\_\_.
   1. dilute
   2. saturated
   3. unsaturated
   4. polar
   5. nonpolar
5. The molarity (M) of a solution refers to
   1. moles of solute/L of solvent.
   2. moles of solute/100 mL of solution.
   3. moles of solute/L of solution.
   4. grams of solute/100 mL of solution.
   5. grams of solute/L of solution.
6. During the process of diluting a solution to a lower concentration,
   1. the amount of solvent does not change.
   2. the volume of the solution does not change.
   3. water is removed from the concentrated solution.
   4. there is more solute in the concentrated solution.
   5. the amount of solute does not change.
7. According to Henry's law, the solubility of a gas in a liquid
   1. decreases as the gas pressure above the liquid increases.
   2. remains the same as the temperature increases.
   3. depends on the liquid polarity.
   4. increases as the gas pressure above the liquid increases.
   5. depends on the liquid density.
8. The solubility of carbon dioxide in soda water
   1. is lower as the temperature increases.
   2. is always a fixed concentration.
   3. is not affected by the temperature of the atmosphere.
   4. is not affected by the pressure of the atmosphere.
   5. depends significantly on whether the soda is flavored or not.
9. According to the Bronsted-Lowry definition,
   1. an acid is a proton acceptor.
   2. a base is a proton acceptor.
   3. a base produces H+ ions in aqueous solutions.
   4. a base is a proton donor.
   5. an acid acts as the solvent.
10. The conjugate base of H2S is \_\_\_\_\_\_\_\_.
    1. HS-
    2. HS2
    3. OH-
    4. H2O
    5. HOS
11. The conjugate acid of NH3 is \_\_\_\_\_\_\_\_.
    1. OH-
    2. H3O+
    3. H2O
    4. NH2-
    5. NH4+
12. The correct formula for sulfuric acid is \_\_\_\_\_\_\_\_.
    1. H2SO3
    2. H2SO4-
    3. H2SO3-
    4. H2SO4
    5. SO42-
13. The nuclear symbol of helium, , is also the symbol for designating a(n) \_\_\_\_\_\_\_\_.
    1. alpha particle
    2. beta particle
    3. proton
    4. neutron
    5. gamma ray
14. The process of changing one element into another is called \_\_\_\_\_\_\_\_.
    1. fission
    2. fusion
    3. transmutation
    4. precipitation
    5. neutralization
15. The half-life of a radioisotope is
    1. one-half of the time it takes for the radioisotope to completely decay to a nonradioactive isotope.
    2. the time it takes for one-half of the sample to decay to a new isotope.
    3. the time it takes for the radioisotope to become an isotope with one-half of the atomic weight of the original radioisotope.
    4. the time it takes for the radioisotope to become an isotope with one-half the atomic number of the original radioisotope.
    5. the time it takes for the radioisotope to lose one-half of its neutrons.

Problems (70 points)

1. (4 points) Calculate the mass percent of potassium oxalate(166.22 g/mol) in a solution prepared by dissolving 4.58 g of K2C2O4 in 50.00 g of H2O.
2. (4 points) Calculate the molarity of a solution prepared by dissolving 38.6 grams of Li2SO4(109.94 g/mol) in enough water to make 450.0 mL of solution.
3. (4 points) Calculate the mass(g) of silver acetate(166.91 g/mol) in 639.6 mL of a 0.5239 M solution of AgC2H3O2.
4. (4 points) What volume of 6.275 M CaCl2(110.98 g/mol) is required to prepare 850.0 mL of 0.4930 M CaCl2?
5. (5 points) Calculate the molarity of a 36.4% solution of sodium acetate (NaC2H3O2, 82.03 g/mol) with a density of 1.52 g/mL.
6. (5 points) Tripping Trina dropped 70.31 g of mercury(II) nitrate(324.6 g/mol) into a puddle of water in the laboratory. What volume (mL) of 0.8036 M sodium phosphate(163.94 g/mol) will be required to precipitate all of the mercury so that she can dispose of it properly? The balanced equation for the precipitation reaction follows

3 Hg(NO3)2 + 2 Na3PO4 🡪 Hg3(PO4)2 + 6 NaNO3

1. (3 points) The formula for lactic acid is preferable written as H2C3H4O3 rather than C3H6O3. Explain why.
2. (5 points) Write an equation to illustrate the acid-base reactions that will take place between HClO4 and NH3. Identify the acids, bases, and conjugate acid base pairs.
3. (6 points) A 25.00 mL sample of a vinegar solution is reacted with 27.37 mL of a 0.4275 M solution of sodium hydroxide(40.00 g/mol). What is the concentration of acetic acid(60.05 g/mol) in the vinegar solution?
4. (5 points) Calculate the pH and pOH of a solution with [H3O+] = 6.48 x 10-5M. (Give answer to 3 places after decimal.)
5. (5 points) Calculate the concentration of H3O+ and OH-1 in a solution with a pH of 8.524. (to 3 sig figs)
6. (6 points) Write balanced nuclear equations for
   1. The decay of by alpha particle emission
   2. The decay of by beta particle emission
7. (4 points) The half-life of Bohrium-264 (named after Neils Bohr) is 1.5 hr. How many grams of this nuclide in a 128.0 g sample will remain after 9 hr?
8. (3 points) What is the purpose of irradiating meats, fruits, and vegetables?
9. (3 points) What is the difference between saturated and unsaturated fats?
10. (4 points) Life is dependent on four major classes of biomolecules. What are they?