Chemistry 115 Name

Dr. Cary Willard

Exam 4a May 16, 2011

Multiple Choice (30 points)

Page 5 (16 points)

Page 6 (16 points)

Page 7 (14 points)

Page 8 (24 points)

Total (100 points)

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 molarity (M) of a solution refers to
   1. moles of solute/L of solvent.
   2. moles of solute/100 mL of solution.
   3. grams of solute/100 mL of solution.
   4. grams of solute/L of solution.
   5. moles of solute/L of solution.
2. During the process of diluting a solution to a lower concentration,
   1. the amount of solute does not change.
   2. the amount of solvent does not change.
   3. there is more solute in the concentrated solution.
   4. the volume of the solution does not change.
   5. water is removed from the concentrated solution.
3. According to Henry's law, the solubility of a gas in a liquid
   1. decreases as the gas pressure above the liquid increases.
   2. increases as the gas pressure above the liquid increases.
   3. remains the same as the temperature increases.
   4. depends on the liquid polarity.
   5. depends on the liquid density.
4. The name given to an aqueous solution of HBr is \_\_\_\_\_\_\_\_.
   1. hydrogen bromide
   2. bromous acid
   3. hypobromous acid
   4. hydrobromic acid
   5. bromic acid
5. According to the Bronsted-Lowry definition,
   1. an acid is a proton acceptor.
   2. a base produces H+ ions in aqueous solutions.
   3. a base is a proton donor.
   4. a base is a proton acceptor.
   5. an acid acts as the solvent.
6. What is the nuclear symbol for a radioactive isotope of copper with a mass number of 60?
   1. 
   2. Cu-29
   3. 
   4. 
   5. 
7. The symbol  is a symbol used for a(n) \_\_\_\_\_\_\_\_.
   1. beta particle
   2. alpha particle
   3. gamma ray
   4. proton
   5. neutron
8. The process in which a nucleus spontaneously breaks down by emitting radiation is known as \_\_\_\_\_\_\_\_.
   1. transmutation
   2. transformation
   3. radioactive decay
   4. fusion
   5. a chain reaction
9. The process of changing one element into another is called \_\_\_\_\_\_\_\_.
   1. transmutation
   2. fission
   3. fusion
   4. precipitation
   5. neutralization
10. Why is it important that radioisotopes used in diagnostic tests have short half-lives?
    1. These radioisotopes have a greater activity so they are easier to monitor.
    2. This minimizes the harmful side effects of the radiation.
    3. This is necessary so the radioisotopes will have high energy.
    4. These radioisotopes are less expensive.
    5. These radioisotopes are more abundant in nature.
11. When an atom of uranium-235 is bombarded with neutrons, it splits into smaller nuclei and produces a great amount of energy. This nuclear process is called \_\_\_\_\_\_\_\_.
    1. decomposition
    2. chain reaction
    3. ionization
    4. fusion
    5. fission
12. Long-chain molecules that consist of many repeating units are called \_\_\_\_\_\_\_\_.
    1. alkenes
    2. alkanes
    3. polymers
    4. monomers
    5. organic compounds
13. When starch is broken into monosaccharides, the carbohydrate formed is \_\_\_\_\_\_\_\_.
    1. fructose
    2. glucose
    3. xylose
    4. maltose
    5. galactose
14. Lipids are compounds that are soluble in \_\_\_\_\_\_\_\_.
    1. distilled water
    2. normal saline solution
    3. glucose solution
    4. organic solvents
    5. oxygen
15. The two strands of the double helix of DNA are held together by \_\_\_\_\_\_\_\_.
    1. hydrogen bonds
    2. covalent bonds
    3. dipole-dipole interactions
    4. ionic bonds
    5. sugar-to-phosphate bonds

Problems (70 points)

1. (4 points) Sodium phosphate commonly referred to as TSP or trisodium phosphate is a commonly used cleaner when dissolved in water. Calculate the mass percent of sodium phosphate (163.94 g/mol) in a solution prepared by dissolving 5.973 g of Na3PO4 in 75.00 g of H2O.
2. (4 points) Calculate the molarity of a solution prepared by dissolving 6.972 grams of citric acid H3C6H5O7(192.12 g/mol) in enough water to make 50.00 mL of solution.
3. (4 points) Calculate the number of molecules of glucose in 37.54 mL of a 1.344 M solution of glucose, C6H12O6 (180.16 g/mol).
4. (4 points) To what volume must a 15.00 mL sample of a 3.092 M solution of nitric acid,HNO3 (63.01 g/mol) be diluted to make a 0.2954 M solution of nitric acid?
5. (4 points) How does the solubility vary with temperature? Compare the effect of temperature change on gases, liquids, and solids.
6. (4 points) State whether each of the following refers to a saturated or unsaturated solution:
   1. A crystal added to a solution does not change in size
   2. A sugar cube completely dissolves when added to a cup of coffee.
7. (3 points) The formula for citric acid is generally written as H3C6H5O7 rather than C6H8O7. Explain why.
8. (5 points) Write an equation to illustrate the acid-base reactions that will take place between HNO3 and OH-1. Identify the acids, bases, and conjugate acid base pairs.
9. (4 points) Calculate the pH and pOH of a solution with . (Give answer to 3 places after decimal.)
10. (4 points) Calculate the concentration of H3O+ and OH-1 in a solution with a pH of 3.214. (to 3 sig figs)
11. (6 points) A 25.00 mL sample of a benzoic acid solution is reacted with 41.22 mL of a 0.3462 M solution of sodium hydroxide(40.00 g/mol). What is the concentration of benzoic acid(110.12 g/mol) in the solution?
12. (4 points) The half-life of Bohrium-264 (named after Neils Bohr) is 1.5 hr. How long will it take for a 128.0 g sample of this nuclide to decay to 4.0 g?
13. (6 points) Write balanced nuclear equations for
    1. The decay of by alpha particle emission
    2. The decay of by beta particle emission
14. (3 points) What is the purpose of irradiating meats, fruits, and vegetables?
15. (3 points) Why is it important that radionuclides used in nuclear medicine have short half lives?
16. (3 points) What is the difference between saturated and unsaturated fats?
17. (3 points) Differentiate between monosaccharides, disaccharides, and starches.
18. (2 points) What is the function of an enzyme?