Chemistry 102 Name KEY

Martin Larter

Exam 1a Fall 2015

Multiple Choice (30 points)

Page 5 (27 points)

Page 6 (25 points)

Page 7 (18 points)

Total (100 points)

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

|  |  |
| --- | --- |
| food type | Calories |
| carbohydrate | 4.0 |
| fat | 9.0 |
| protein | 4.0 |

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. If a sample of matter is uniform throughout and cannot be separated into other substances by physical processes, but can be decomposed into other substances by chemical processes, it is called a(n) \_\_\_\_\_\_\_\_\_\_\_\_.

|  |  |  |
| --- | --- | --- |
| a) heterogeneous mixture | b) element | c) compound |
| d) homogeneous mixture | e) Mixture of elements |  |

1. The amount of space occupied by a substance is its \_\_\_\_\_\_\_\_.

|  |  |  |
| --- | --- | --- |
| * 1. mass | * 1. length | * 1. density |
| * 1. weight | * 1. volume |  |

1. Which of the following is an example of a chemical change?

|  |  |  |
| --- | --- | --- |
| 1. Cooking a burger. | 1. Car tires appear flat in cold weather. | 1. Driving a nail into a block of wood. |
| 1. Mixing salt water. | 1. These are all physical changes |  |

1. The mass number is equal to
   1. The sum of the number of electrons and protons.
   2. The sum of the number of neutrons and electrons.
   3. The sum of the number of protons, neutrons, and electrons.
   4. The sum of the number of protons and neutrons
   5. The difference of the number of protons and electrons.
2. Isotopes of a given element have the same number of \_\_\_\_\_\_\_\_, but different numbers of \_\_\_\_\_\_\_\_ in their nucleus.

a) neutrons, electrons b) electrons, protons c) protons, electrons

d) neutrons, protons e) protons, neutrons

1. The atomic mass of an element is
2. The mass of the most abundant isotope of that element
3. The weighted average of the masses of the naturally occurring isotopes of that element
4. The arithmetic average of the masses of the isotopes of that element
5. The ratio of the mass of one atom of an isotope of that element to the mass of hydrogen
6. None of the above
7. Valence electrons are electrons located
   1. In the outermost energy level of an atom.
   2. In the nucleus of an atom.
   3. In the first energy level of an atom.
   4. Throughout the atom.
   5. In the first three energy levels of an atom.

|  |
| --- |
| 1. List the different types of nuclear radiation (alpha, beta, and gamma) in order of increasing penetrating power. |

|  |  |  |
| --- | --- | --- |
| 1. alpha < beta < gamma | 1. beta < alpha < gamma | 1. gamma < alpha < beta |
| 1. gamma < beta < alpha | 1. alpha < gamma < beta |  |

1. A nuclear equation is balanced when
   1. The same elements are found on both sides of the equation.
   2. The sum of the mass numbers and the sum of the atomic numbers of the particles and atoms are the same on both sides of the equation.
   3. The same particles and atoms are on both sides of the equation.
   4. Different particles and atoms are on both sides of the equation.
   5. The charges of the particles and atoms are the same on both sides of the equation.
2. The octet rule indicates that
3. All of the noble gases have eight total electrons.
4. The noble gases react with other compounds to get 8 valence electrons.
5. All of the Group (A) elements have 8 valence electrons.
6. All of the shells in an atom hold a maximum of 8 electrons.
7. Atoms lose, gain, or share valence electrons to have 8 valence electrons.
8. In ionic compounds, \_\_\_\_\_\_\_\_ lose their valence electrons to form positively charged \_\_\_\_\_\_\_\_.

|  |  |  |
| --- | --- | --- |
| 1. metals, anions | 1. nonmetals, cations | 1. metal, cations |
| 1. nonmetals, anions | 1. metals, polyatomic ions |  |

1. Which of the following exists in its natural state as a diatomic?

|  |  |  |
| --- | --- | --- |
| 1. Iron | 1. Bromine | 1. Boron |
| 1. Zirconium | 1. all of the above |  |

1. Which of the following is **isoelectronic** to argon?

|  |  |  |
| --- | --- | --- |
| 1. Br- | 1. Mg2+ | 1. Si4+ |
| 1. K+ | 1. These are all isoelectronic to Ar | |

1. The elements in column 1A of the periodic table are also known

|  |  |  |
| --- | --- | --- |
| 1. As halogens. | 1. As transition metals | 1. As noble gases. |
| 1. As alkali metals. | 1. As alkaline earth metals |  |

1. The ability of an atom to attract the shared electrons in a covalent bond is its \_\_\_\_\_\_\_\_.

|  |  |  |
| --- | --- | --- |
| 1. bonding ability | 1. polarity | 1. ionic character |
| 1. electronegativity | 1. nonpolarity |  |

Part 2 – Short Answer (70 points)

1. (4 points) Evaluate each of the following expressions. State the answer to the proper number of significant figures.
   1. 12.64 + 1.5 + 0.63= 14.77 14.8
   2. *=*
2. (6 points) Write the balanced convention, total ionic and net ions equations

Conventional: BiCl3 (aq) + 3 LiOH (aq) → Bi(OH)3 (s) + 3 LiCl (aq)

Total Ionic Bi3+ (aq) + 3 Cl- (aq) + 3 Li+ (aq) + 3 OH- (aq) 🡪 Bi(OH)3 (s) + 3 Li+ (aq) + 3 Cl- (aq)

Net Ionic Bi3+ (aq) + 3 OH- (aq) 🡪 Bi(OH)3 (s)

1. (4 points) Convert 9.53 km to μm.
2. (5 points) A car you are thinking of buying is 16.5 feet long. If your garage is about 6 meters long, will the new car fit in your garage (work must be shown)

or

Yes, the new car will fit in the garage.

1. (4 points) How are nuclear reactions different than conventional chemical reactions?

Nuclear reactions involve a change in an atom's nucleus, usually producing a different element.  Chemical reactions, on the other hand, involve only a rearrangement of electrons and do not involve changes in the nuclei.

1. (4 points) 18 carat white gold is an alloy of 75% gold with 25% other metals such as silver and palladium. Nickel was used as a component of white gold, however many people have reactions to it. If a necklace weighs 42 g, how many ounces of gold does it contain (8 points)? (16 oz = 1 lb)
2. (8 points) Given a 3.85 g sample of the cyanoacrylate (C5H5NO2) the principle component of superglue, calculate the following:
   1. molar mass of cyanoacrylate
   2. molecules of cyanoacrylate
3. (4 points) Gold-198 is a beta emitter used to assess kidney activity. Write the equation for the decay of gold-198

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. (8 points) Fill out table

|  |  |
| --- | --- |
| Valence Electrons:  \_\_\_\_\_\_\_\_\_18 electrons\_\_\_\_\_  Orbital geometry  \_\_\_\_trigonal planar\_\_\_\_\_  Molecular geometry  \_\_\_\_\_\_bent\_\_\_\_\_\_\_\_  Polarity  \_\_\_polar\_\_ | Lewis structure SeO2 |

1. (5 points) If the half-life for the radioactive decay of zirconium-84 is 26 minutes and I start with a 175 gram sample, how much will be left over after 104 minutes?
2. (6 points) A package of corn nuts contains 8 g of fat, 34 g of carbohydrate, and 4 g of protein.
   1. How many calories will you consume if you eat the entire bag? (8 points) (See front page for calorie data.)

Total Calories = 72 Cal +140 Cal +16 Cal = 230 Cal

* 1. What percentage of the calories in the package of corn nuts comes from fat?

1. (12 points) Complete the following table *not graded*

|  |  |  |  |
| --- | --- | --- | --- |
| Compound | name | formula for cation | formula for anion |
| MgCl2 | Magnesium chloride | Mg2+ | Cl- |
| PbCO3 | lead(II) carbonate | Pb2+ | CO32- |
| Co(OH)2 | Cobalt(II) hydroxide | Co2+ | OH- |
| N2O­4 | dinitrogen tetroxide | --------------------- | --------------------- |
| Al(NO3)3 | aluminum nitrate | Al3+ | NO3- |
| Na3PO3 | Sodium phosphite | Na+ | PO33- |