Chemistry 115 Name blue

Dr. Cary Willard

Exam 1a February 14, 2011

Multiple Choice (30 points)

Page 5 (14 points)

Page 6 (19 points)

Page 7 (20 points)

Page 8 (18 points)

Total (101 points)

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

454 g = 1 lb

2.54 cm = 1 in

946 mL = 1 qt

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. Which of the following is the largest unit?
   1. millimeter
   2. kilometer
   3. micrometer
   4. meter
   5. decimeter
2. One way to enhance your learning in chemistry is to \_\_\_\_\_\_\_\_.
   1. study a little every day
   2. form a study group
   3. go to office hours
   4. be an active learner
   5. all the above
3. In this list, which substance can be classified as a chemical?
   1. salt
   2. sleep
   3. cold
   4. heat
   5. temperature
4. Which of the following examples illustrates a number that is correctly rounded to three significant figures?
   1. 4.05438 grams to 4.054 grams
   2. 0.03954 grams to 0.040 grams
   3. 103.692 grams to 103.7 grams
   4. 109 526 grams to 109 500 grams
   5. 20.0332 grams to 20.0 grams
5. The measurement 0.000 043 m, expressed correctly using scientific notation, is \_\_\_\_\_\_\_\_.
   1. 4.3 × 10-7 m
   2. 4.3 × 10-6 m
   3. 4.3 × 106 m
   4. 4.3 × 10-5 m
   5. 4.3 m
6. Which of the following conversion factors involves a measured number?
   1. 10 cm/dm
   2. 25 miles/gallon
   3. 12 in/ft
   4. 16 oz/lb
   5. 12 eggs/dozen
7. In which of the following is the metric unit paired with its correct abbreviation?
   1. microgram / mg
   2. milliliter / mL
   3. centimeter / km
   4. kilogram / cg
   5. gram / gm
8. When you observe the formation of fog on a cool, humid day, what type of event are you observing?
   1. a chemical change in oxygen
   2. a physical change in air
   3. a physical change in water
   4. a chemical change in water
   5. a combination of nitrogen and oxygen
9. Identify the noble gas in the following list.
   1. helium
   2. nitrogen
   3. oxygen
   4. gold
   5. chlorine
10. Which of the following is a property of a solid?
    1. It takes the shape of the container.
    2. It fills the volume of the container.
    3. The particles move at a rapid rate.
    4. The interactions between its particles are very weak.
    5. The particles have fixed positions and are very close together.
11. Which of the following descriptions of a subatomic particle is correct?
    1. An electron has a negative charge and a mass of approximately 1 amu.
    2. A neutron has no charge and its mass is negligible.
    3. A proton has a positive charge and a negligible mass.
    4. A neutron has a positive charge and a mass of approximately 1 amu.
    5. A proton has a positive charge and a mass of approximately 1 amu.
12. Valence electrons are electrons located
    1. in the nucleus of an atom.
    2. in the first energy level of an atom.
    3. throughout the atom.
    4. in the outermost energy level of an atom.
    5. in the first three energy levels of an atom.
13. One element that has 7 valence electrons is \_\_\_\_\_\_\_\_.
    1. bromine
    2. nitrogen
    3. oxygen
    4. phosphorus
    5. sodium
14. Isotopes are atoms of the same element that have \_\_\_\_\_\_\_\_.
    1. different atomic numbers
    2. the same atomic number but different numbers of neutrons
    3. the same atomic numbers but different numbers of protons
    4. the same atomic numbers but different numbers of electrons
    5. the same atomic mass but different numbers of protons
15. The atomic number of iron is \_\_\_\_\_\_\_\_.
    1. 26
    2. 55.85
    3. 29.85
    4. 56
    5. 27.78

Part 2 – 70 points (68)

1. (3 points) Write the correct formula for the following ions.
   1. Manganese(III) ion
   2. Calcium ion
   3. Phosphide ion
2. (3 points) Write the correct name for the following ions.
   1. O2−
   2. Ag+
   3. V5+
3. (4 points) What did Rutherford determine about the structure of the atom from his gold-foil experiment?

Rutherford determined that atoms were composed of very small dense centers known as the nucleus surrounded by large regions of nearly empty space inhabited by the electrons.

1. (4 points) Perform the following actions on each of the following

|  |  |
| --- | --- |
| Round 0.0000000834834 mL to 3 significant figures and write it in scientific notation. | 8.35 x 10−8 mL |
| How many significant figures are in 7.052700g? | 7 |
| Circle the exact number | **5 pizzas** or **50.0 g cheese** |
| Add the following masses and report the sum to the proper number of significant figures.  4.33265 g, 65.43 g and 687.99g | 757.75 g |

1. (4 points) A tank of gasoline contains 8.34 x 107 mL of gas. What is the volume of gas in L?
2. (4 points) You run 5.32 km on the weekend. How many cm have you run?
3. (6 points) The lowest recorded temperature in the world was −89 oC in Vostok, Antarctica, on July 23, 1983. Calculate this temperature in oF.

Calculate the temperature in K.

1. (5 points) During a workout at the gym, you set the treadmill at a pace f 65.0 m/min. How many minutes will you walk if you cover a distance of 8564 ft?
2. (5 points) In a candy factory, the nutty chocolate bars contain 22.0% by mass pecans. If 7.0 kg of pecans were used for candy last Thursday, how many pounds of nutty chocolate bars were made?
3. (5 points) A gem has a mass of 6.37g. When the gem is placed in a graduated cylinder containing 2.00 mL of water, the water level rises to 4.17 mL. What is the density of the gem in g/mL?
4. (6 points) A particular isotope of cobalt has 35 neutrons.
   1. How many protons does this isotope contain? 27 protons
   2. What is the mass number of this isotope? 62
   3. Write the correct atomic symbol for this atom including information regarding the mass number and the atomic number.
5. (4 points) How can we explain the distinct lines that appear in an atomic spectrum?

Each of the lines of the atomic spectra are due to individual transitions of electrons from higher energy levels to lower energy levels.

1. (6 points) Answer the following questions regarding the energy levels and sublevels in atoms
   1. How many electrons will occupy a filled orbital? 2 electrons
   2. How many electrons will occupy a filled d sublevel? 10 electrons
   3. How many orbitals are found in a p sublevel? 3 orbitals
2. (3 points) Write the complete electron configuration of an atom of silicon.

1s2 2s2 2p6 3s2 3p2

1. (3 points) Write the shorthand electronic configuration of an atom of rhodium (Rh).

[Kr] 5s2 4d7

1. (6 points) Circle the correct element from each of the following pairs.
   1. Element with the larger atomic radii Mg or P
   2. Particle with the larger radius Be or Be+2
   3. Element with the higher ionization energy Na or P