Chemistry 141 Name

Dr. Cary Willard

Exam 3 in-class portion November 8, 2007

Multiple Choice (20 points)

Page 1 (27 points)

Page 2 (27 points)

Page 3 (26 points)

Total (100 points)

All work must be shown to receive credit.

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) |  | |  |  |  |  |  |  |  |

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| 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

Multiple Choice (20 points)

1. Which ion does **not** have a noble gas configuration in its ground state?
   1. Al3+
   2. Ga3+
   3. P3-
   4. Sc3+
   5. As3-
2. Arrange the ions N3-, O2-, Mg2+, Na+, and F- in order of increasing ionic radius, starting with the smallest first.
   1. N3-, Mg2+, O2-, Na+, F-
   2. N3-, O2-, Mg2+, F-, Na+
   3. Mg2+, F-, O2-, N3-, Na+
   4. N3-, O2-, F-, Na+, Mg2+
   5. Mg2+, Na+, F-, O2-, N3-
3. Of the following, which element has the largest radius?
   1. magnesium
   2. silicon
   3. sodium
   4. aluminum
   5. boron
4. Of the following, which element has the highest first ionization energy?
   1. Ca
   2. K
   3. Li
   4. Be
   5. Na
5. Which of the following ionic compounds would be expected to have the highest lattice energy?
   1. NaI
   2. NaBr
   3. NaF
   4. NaCl
   5. CsI
6. Which ionic compound would be expected to have the highest lattice energy?
   1. Al2O3
   2. MgO
   3. NaCl
   4. AlF3
   5. Ag3N
7. Covalent bonding is a
   1. loss of electrons.
   2. gain of electrons.
   3. sharing of electrons.
   4. transfer of electrons.
8. Which bond should have the longest length?
   1. N-N
   2. N=N
   3. N≡N
   4. All three bond lengths should be about the same.
9. Of the following elements, which has the highest electronegativity?
   1. S
   2. P
   3. As
   4. Sc
10. A**::**A represents
    1. a quadruple bond.
    2. a double bond.
    3. two lone pairs of electrons.
    4. one lone pair of electrons.

Problems

1. (9 points) Write the electron configurations for the following atoms or ions as predicted by the periodic table
   1. S (complete configuration)
   2. Os (shorthand configuration)
   3. V +2 (shorthand configuration)
2. (6 points) In general, ionization energy increases as you move across the periodic table from left to right. Why is there a decrease in ionization energy as you go from magnesium to aluminum?
3. (6 points) Write the Lewis electron dot structures for the following species
   1. S
   2. N-3
4. (6 points) Explain how sigma and pi bonds differ.
5. (9 points) This is the structure of an organic compound.



1. Which is the shortest C-N bond?
2. How many pi bonds are there?
3. How many sigma bonds are there?
4. (18 points) Write reasonable Lewis Electron Dot Structures for the following molecules or ions (Central atom is listed first). Tell the orbital and molecular geometry for each molecule/ion. Show formal charges for all non-zero charges. If resonance structures exist, show them.

|  |  |  |
| --- | --- | --- |
| COCl2  C is central atom |  | orbital geometry  molecular geometry |
| KrF4 |  | orbital geometry  molecular geometry |
| BrO4-1 |  | orbital geometry  molecular geometry |

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1. (6 points) Draw the resonance structures for CH3NO2.



1. (20 points) Answer the following questions for the structure below:
2. What is the molecular geometry of Xe?



1. What is the orbital geometry on Br?
2. What is the formal charge of N?
3. What is the hybridization of O?
4. What is the charge on Kr?
5. What is the molecular geometry of O?
6. What is the formal charge of P?
7. What is the hybridization of C?
8. What is the molecular geometry of I?

1. What is the molecular geometry of N?