Chemistry 116 Name KEY

Martin Larter

Exam1 Fall 2013

Page 1 (20 points)

Page 2 (24 points)

Page 3 (23 points)

Page 4 (21 points)

Page 5 (12 points)

Total (100 points)

Percent (100 %)

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

1. (4 points) Draw an accurate **Lewis structure** for H2CNOH (condensed formula) below including number of **valence electrons** used. Please use lines to represent bonding electron pairs. Indicate all unshared electrons and make sure this structure has **no** **formal charges**.

Valence electrons\_\_\_\_18\_\_\_\_\_\_\_



1. Draw two other important resonance forms for the following structure. Determine formal charges on original structure and it resonance forms. (6 points)



1. Oxybutynin is used to treat symptoms of overactive bladder, such as frequent or urgent urination, incontinence (urine leakage), and increased night-time urination. The structure of oxybutynin is shown below



Determine the following: (10 points)

|  |  |  |  |
| --- | --- | --- | --- |
| Central atoms | Molecular Shape | Bond Angles | Hybridization |
| A | Trigonal planar | 120 | sp2 |
| B | Tetrahedral | 109 | sp3 |
| C | Bent | <109 | sp3 |
| D | Linear | 180 | sp |
| E | Trigonal pyrimidal | <109 | sp3 |

1. (4 points) Determine how many primary, secondary, tertiary and quaternary carbons are present by writing the correct number next to the designation below.



How many: 1o \_­­\_4\_ 2o \_4\_\_ 3o \_6\_\_ 4o \_\_0\_\_

1. (6 points) The structure for nicotine is shown to the right. Determine the correct molecular formula for this molecule.



* 1. Determine the number of sigma and pi bonds in the structure above

Sigma\_\_\_27\_\_\_\_ Pi\_\_\_\_\_3\_\_\_\_\_

* 1. molecular formula for this molecule \_\_ C10H14N2\_\_\_

1. (6 points) Identify the functional group(s) that appear in acebutolol. This compound is in a class of drugs called beta-blockers, which are used to lower blood pressure, lower heart rate, reduce angina (chest pain), and reduce the risk of recurrent heart attacks.



A\_\_\_\_\_\_ether\_\_\_\_

B\_\_\_\_\_ketone\_\_\_\_\_\_\_\_\_

C.\_\_\_\_\_amide\_\_\_\_\_\_\_\_

1. (8 points) Draw structures that correspond with the following names.

trans-1-bromo-3-isopropylcyclopentane cis-6-isopropyl-3-phenyl-4-nonene





1. (8 points) Below each structure, write the name of the following:

 

Name\_\_cis-2,3,6-triethyl-4-octene\_\_\_ Name\_\_\_\_m-tert-butylphenol\_\_\_\_\_

1. (10 points) Give the major product(s) for each of the following reactions:



1. (5 points) Draw the missing substituents on the chair structure below so that it represents the same *cis* or *trans* isomer, draw the most stable form, as the structure on the left. *Do not* draw wedged bonds on the chair structure. (methyl is larger than hydroxyl) (4 pts)

 

1. (10 points)Write out the reaction mechanism (curved arrows, intermediates, etc.) for the following reaction.





1. (5 points) Rank the following sets in order from highest (1) to lowest (3) value in boiling point. Explain what is responsible for the ranking.



\_\_\_\_\_\_\_\_\_2\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_3\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_1\_\_\_\_\_\_\_\_

Explain:

All the molecules have the same Intermolecular forces of hydrogen bonding, dipole-dipole, and London dispersion and the same molecular weight. So the boiling point determination was based off of surface area. The molecule labeled 1 has the least amount of branching, thus more effective London dispersion to attract molecules around it. The molecule labeled 3, is the most branched, has the least surface area making it less likely to have very many temporary attraction to the molecules around it.

1. (6 points) Draw structures for all of the possible products that result from the following reaction.





1. (6 points) Why are alkenes and alkynes more reactive than alkanes? Use drawings to illustrate your answer.

Both alkenes and alkynes have pi bonds, while alkanes have only sigma bonds. Because the pi bond electrons are farther from the positively charged nucleus (they result from sideways overlap of p orbitals) than sigma bond electrons, pi bonds are weaker than sigma bonds and can be more easily broken. That makes alkenes and alkynes more chemically reactive than alkanes. Also, reactions that cause an increase in sigma bonds compared to pi bonds are energetically favorable.



1. (6 points) Indicate whether the compounds in each set are **constitutional isomers,** the **same molecule** or **unrelated**.

 \_\_\_ **constitutional isomers** \_\_\_

 \_\_\_\_ **unrelated** \_\_\_\_

 \_\_\_\_\_ **same molecule** \_\_\_\_\_\_\_