**Exam 1: Chem 1013 INTRODUCTORY CHEMISTRY ALFRED STATE 22 FEB 2013**

Your name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **Atomic Structure and General Atomic Properties (fill-in the blanks) 11 pts**
2. The proton count is the same as the \_\_\_atomic\_\_\_\_\_\_\_\_\_\_\_ number in an given element.
3. The electronic radius is about \_\_\_100,000\_\_\_\_\_\_\_\_\_\_\_\_\_times bigger than the nuclear radius

c) Where is most of the mass of the atom located ? \_\_\_nucleus\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

d) Which is heavier, a proton or an electron? \_\_\_\_proton\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

e) which sub atomic particle is responsible for the chemistry ? \_\_\_electron\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

f)Fill in the missing boxes assuming the elements are neutral (You can use your Periodic Tables)

(2 pt for each completely correct line)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Atomic # | Mass # Z | Element symbol | # protons  | # neutrons | # electrons |
| 10 | 20 | Ne | 10 | 10 | 10 |
| 12 | 24 | Mg | 12 | 12 | 12 |
| 13 | 28 | Al | 13 | 15 | 13 |

1. **Element ID 8 pts**

***Fill in the name or symbol for the elements below: (spelling counts)***

**F\_\_fluorine Aluminum\_Al\_\_\_ Si\_\_silicon\_\_\_\_\_\_ Argon\_\_\_Ar\_\_\_\_\_**

**Be\_\_beryllium\_ Magnesium\_Mg\_\_ P\_\_\_phosphorus\_\_\_ Sulfur\_\_\_S\_\_\_\_\_**

1. **Chemical Book keeping:-Reading and Balancing Chemical Reactions 13 pts**

***Given the reaction: 4 C3H5N3O9(l) 🡪 6N2(g) + 10H2O(g) +1 O2(g) + 12CO2(g) (7 pts)***

1. How many atoms of H are involved in the reaction ? \_\_20\_\_\_\_\_
2. How many atoms of O are involved in the reaction ? \_\_36\_\_\_\_\_
3. How many molecules of H2O are created in the reaction ? \_\_\_10\_\_\_\_
4. What physical state is CO2 in when formed ? \_\_gas\_\_\_\_\_
5. How many molecules of N2 are created in the reaction ? \_\_\_6\_\_\_\_
6. How many atoms of N are involved in the reaction ? \_\_\_12\_\_\_\_
7. How many atoms of C are involved in the reaction ? \_\_\_12\_\_\_\_

***Provide coefficients in front of the indicated molecules to create a balanced reaction: (9 pts)***

1. \_1\_\_H2  + \_\_1\_\_O2  🡪 \_1\_\_H2O2

1. \_2\_ Cu + \_3\_H2S 🡪 \_\_\_ Cu2S3 +3H2
2. \_\_5\_O2 + \_\_1\_\_C3H8 🡪 3 CO2 + \_4\_\_H2O

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Exam 1 (continued) Chem 1013 INTRO TO CHEM

1. **Stable Element Charges and Inorganic Compound Building (18 pts)**

***What are likely stable charges for the elements listed below ? (Make sure to include sign) (8 pts)***

1. H \_\_\_+1\_\_\_
2. P \_\_\_-3\_\_\_
3. Cl \_\_\_-1\_\_
4. Li \_\_\_+1\_\_\_
5. Ar \_\_\_\_0\_\_
6. Br \_\_\_-1\_\_\_
7. Mg \_\_\_+2\_\_\_
8. As \_\_\_\_-3\_\_\_

***Write the most likel yionic compound formula formed from combining the element pairs below:***

**(2 pts each/ 12 pts total)**

1. B and O \_\_\_\_B2O3\_\_\_\_\_\_\_\_\_
2. C and Cl \_\_\_CaCl2\_\_\_\_\_\_\_\_\_\_\_\_
3. H and P \_\_\_\_H3P \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Ca and P \_\_\_Ca3P2\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Na and As \_\_\_\_Na3As\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. Be and O \_\_\_\_BeO\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. **Minerals and Salts vs Organics (poo) 15 pts**

***Briefly characterize the listed properties for both minerals and organics as high or low (3 pts)***

*Property Minerals/salts Organics*

**Ex. Solubility in water\_\_\_\_\_high\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_low\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Melting points \_\_\_\_\_\_\_\_\_high\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_low\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Conductivity of solutions \_\_\_\_\_\_high\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_low\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Hardness/brittleness \_\_\_\_\_\_\_\_high\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_low\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Salt dissolving in water is a : physical chemical biological process (circle choice)**

**Milk is a: a)pure substance b)homogeneous mixture c) compound d)heterogeneous mixture**

***What kind of bond is typical of salts and minerals ? \_\_ionic\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

***What kind of bond is typical of organics ? \_\_\_\_\_\_\_\_\_covalent\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

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Exam 1 (continued) Chem 1013 INTRO TO CHEM ***Minerals and Salts vs Organics (poo) (continued)***

**How do you correctly write the formulas for compounds composed of the element counts below ?**

**1 Mg + 4 O + 1 S \_\_\_\_\_MgSO4\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**1 C + 2 H + 3 O \_\_\_\_H2CO3\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**2 N + 5 O \_\_\_\_\_N2O5\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Circle all the compounds below that are written correctly : (2 pts)**

**O2H CaCO3 Li2S S3Na2Al**



1. **Describing Organic Compounds 15 pts**

***a)How many bonds are in this compound ?* \_\_6\_\_\_\_ bonds**

**b)*How many electrons are in the bonds?*  \_\_12\_\_\_\_ # bond e-**

**c) How many total core + valence electrons are in this compound ? \_\_\_16\_\_\_\_ sum of e-**

***c) Draw to electron dot picture for the elements in their neutral states below:***

**\* \*\* \*\* \* ..**

**Na Mg B\* : C: : N: \*K :Br:**



 **\***

***d) In the molecule shown on the right, what two kinds of valence electrons are shown ?***

**\_\_\_\_\_lone pairs\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_bond pairs\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

***e) The bond length of the C=O bond is \_\_\_\_\_longer\_compared to that of the C≡O bond.***

1. **Last name of the American chemist connected with the `octet rule’\_\_\_\_\_\_Lewis\_\_\_\_\_\_\_\_\_\_\_\_**
2. **The compound shown below is: *saturated unsaturated polyunsaturated***

 **(circle your choice)**



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Exam 1 (continued) Chem 1013 INTRO TO CHEM

1. **Building and Describing Covalent Molecules (2 pts each/8 pts total)**

**Draw the correct bonding structures for the combinations of elements below, making sure to indicate all lone pairs.**



**O2**

**CO2 (assume O-C-O attachment order)**



**CO**



**N2**





**SO3 (all O attached to central S only with minimum**

**Formal charge)**

**What is the correct formula for the two compounds drawn in abbreviated bond line form below ?**





**\_C10H18\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_C5H12\_\_\_\_ 🡨 formula (2 pts each)**

**9) Formal charge (5 pts)**

A

 B



 **What are the formula charges of S, O and H in the structure drawn here ?**

S \_\_\_+1\_\_ OA\_-1\_\_\_\_ OB\_\_0\_\_\_\_\_

OC\_\_0\_\_\_ H\_\_0\_\_\_ (1 pt each)

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 C