**Exam 1 General Chemistry 1114 Alfred State College A**

Your name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1 pt) \_\_\_\_/100 pts

1. **Introductions (3 pts)**
2. From what California university did Doc Fong receive a B.Sc. in Chemistry ? \_\_\_\_\_UC Berkeley\_
3. How many cats at home does Doc Fong act as servant to? \_\_\_\_2\_\_\_\_
4. What corporation did Doc Fong work at before becoming an impoverished chemistry professor?

\_\_\_\_\_Corning Inc.\_\_\_\_\_\_\_\_\_\_\_\_

* 1. **Atomic dimensions and scaling (6 pts)**
1. What is the approximate ratio of the mass of the proton/mass of electron? \_\_\_2000\_\_\_\_\_\_\_\_\_
2. What is the ~ratio of an electron orbit diameter to an atomic nucleus diameter?\_\_\_100,000:1\_\_\_\_\_\_\_\_
3. If you wanted to make an accurate scale model of the hydrogen atom and decided the nucleus would have a diameter of 1 mm, what would be the diameter of the entire model ? \_100,000\_\_\_\_\_\_ mm
4. A softball is about 10 cm in diameter. If we assume the softball is a nucleus, which distance below is closest to representing the diameter of the nearest electronic orbit ? (circle your choice)
5. Distance across a football field (~ 10,000 cm)

**3 pts**

1. Distance across a pizza (~100 cm)
2. Diameter of the Earth (~1,000,000,000 cm)
3. Distance from Alfred Bell Tower to Alfred Pizza and Sub (~100,000 cm)
4. Distance from Almond to Hornell ( 1,000,000 cm)
5. Distance to the Sun (~10,000,000,000,000 cm)
	1. **Element Symbols and Names 18 pts total**
6. Circle all the symbolic representations of atomic elements below that are **incorrect:**

 (must circle all for credit)

**KR U Co Kr UuU bE h 2 pts**

 b) Write the correct name or symbol for the elements listed below: (1 pt for each correct answer)

 Ag \_silver\_\_\_\_ Mg \_\_magnesium\_\_\_\_\_ Arsenic\_As\_\_ d)Gold \_Au\_\_\_

Manganese\_\_Mn\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ Mercury\_Hg\_ h) Pb\_\_\_lead\_\_\_\_\_\_\_\_\_\_\_\_\_

 **c)**  How many neutrons are present in neutral Fe-57 ? \_\_\_31\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 d) What is the electron count for neutral Phosphorus-31 ? \_\_15\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 e)How many protons(**p**), neutrons(**n**) and electrons(**e**) are in the neutral atoms of the two elements below ?

 **199Au 34S**

**6 pts** total

 **p=\_\_79\_ n=\_\_120\_\_\_\_ e=\_79\_\_ p=\_\_16\_\_\_ n=\_\_18\_\_\_\_ e=\_\_16\_\_**

**\_\_\_/28 (includes name pt)**

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**1.3 Atomic Body Part Count ( 8 pts/ 2 pts per line)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Atomic # | mass # | element symbol  | #p | #n | #e | atom charge |
| **12** | **23** | **Mg** | 12 | 11 | 12 | **0** |
| **31** | **69** | **Ga** | 31 | **38** | **31** | **0** |
| 16 | 32 | S | **16** | **16** | 16 | **0** |
| 18 | 38 | Ar | 18 | **20** | **18** | **0** |

**1.4 Evolution of the Atomic Model ( 10 pts)**

 **2p \_\_\_ \_\_\_ \_\_\_**

 **2s \_\_\_**

 **1s \_\_\_ Carbon 1s22s22p2**

**A B C D E**

**a)Which pictorial representation above goes with which atomic model listed below ? (use letter designations)**

**Bohr atom Thomson atom Rutherford atom Schrodinger’s atom spectroscopist’s atom**

**\_\_\_C A B E D**

1. Which model(s) above rely mostly on mathematics ? \_\_\_\_\_C,E\_\_\_\_\_\_\_\_\_
2. Which model had problems explaining why the Earth wasn’t the size of a golf ball \_\_\_B\_\_\_\_\_\_
3. Which model was crushed by the gold foil experiment? \_\_\_A\_\_\_\_

**e**) Which model doesn’t rely on theory at all ? D

f) Which of the models above is connected to hypothetical murders of innocent cats ? \_\_\_E\_\_\_

**1.5. Wave and Planck’s Laws Calculations ( 9 pts)**

**Given that λ\*f = c:**

1. Calculate c given λ=1\*10-5 and f = 3\*1013 : c= \_\_\_\_\_3EE8\_\_\_\_\_\_\_\_ m/s
2. Calculate λ given f= 6\*1014 and c= 3\*108 : λ=\_\_\_\_\_\_5EE-7\_\_\_\_\_\_\_\_ m
3. Calculate f given λ=4.2857\*10-5 and c = 3\*108: f=\_\_\_\_\_\_ 7EE12\_\_\_\_\_\_\_\_\_\_\_ s-1

**Given E = hf = hc/λ in Joules (J) : (h=6.63\*10-34 Joule sec ; c= 3\*108 m/s) [2 pts each]**

1. **Calculate E given f= 4.522\*108 s-1 E = \_\_\_\_3EE-25\_\_\_\_\_\_ J**
2. **Calculate E given λ = 1.326\*10-5 m E = \_\_\_1.5EE-20\_\_\_\_\_ J**
3. **Calculate f given E= 1.989\*10‑19 J f= \_\_\_\_3EE14\_\_\_\_\_\_ s-1**

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**1.6. Bohr’s Theory of the atom ( 6 pts)**

**Name two new ideas Bohr introduced to describe the H atom**

**1)\_\_\_\_\_\_\_applying wave notion to atoms\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**2)\_\_\_\_\_\_\_\_quantum leap (jump) idea\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Name two successes of the Bohr theory of the atom**

**1)\_\_\_\_\_\_\_explained why electron and nucleus don’t collapse into each other\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**2)\_\_\_\_\_\_\_\_\_\_\_H atom (sun emission) spectrum perfectly predicted\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Name two failures of the Bohr theory of the atom**

**1)\_\_\_\_\_\_\_Unable to explain spectrum of atoms othe than H\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**2)\_\_\_\_\_\_\_Failed to predict Zeeman splitting due to magnetic field when applied to H\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**1.7. Electronic Configurations of the Atoms (using the Periodic Table provided during exam) 22 pts**

**Write the complete electronic configurations for the elements below (2 pts each)**

1. **Na 1s22s22p63s1**
2. **Cl \_\_1s22s22p63s23p5\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
3. **Mg \_\_\_1s22s22p63s2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
4. **Si \_\_\_\_1s22s22p63s23p2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Write the correct abbreviated electronic configurations for the elements below, making sure to pay attention to all the rules associated with d electrons if they are present. (2 pts each)**

1. **P \_\_\_\_[Ne]3s23p3\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
2. **Mn \_\_\_\_[Ar] 3d54s2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
3. **Cr+1 \_\_\_\_\_[Ar]3d54so \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
4. **V \_\_\_\_\_[Ar] 3d54so or 3d34s2  both accepted\_\_\_\_**

**Write the correct pigeonhole (orbital) diagrams for the elements below, making sure to pay attention to all the rules associated with d electrons if they are present, and including the correct inert gas core. (2 pts each)**

**a) Cr [ Ar] ]**

**b) Ni [ ]**

**c) Ag+1 [ ]**

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**1.8 Periodic Table Predictions and Vocabulary (13 pts total)**

**a) fill** in the blank spaces below assuming that X and Z are in the same column and the unknown element (???) lies between them : (5 pts)

***element # p atomic mass #n/#p density (g/cm3****) mp (oC)*

**X 130 299 1.3 1.9 1200**

**?? 150 345 1.3 2.2 1300**

**Z 170 391 1.3 2.5 1400**

**b) fill-in the required term or region name ( 8 pts)**

Sodium is in this group column \_\_\_alkali metal\_\_\_\_\_\_\_\_\_\_

Example of an alkaline earth metal\_\_\_Be,Mg, Ca,Sr, Ba\_\_\_\_\_\_\_\_\_

The Periodic Table is composed of metals, non-metals and \_\_\_metalloids\_\_(semi-metals)\_\_\_\_\_\_\_\_\_\_

Example of a noble metal\_\_\_Au,Ag,Pt (Cu)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

These gases are completely un-reactive and all reside on the far right of the Periodic Table\_\_\_Noble gases

Another name for elements in the `d’ block \_\_\_\_\_transition metals\_\_\_\_\_\_\_\_\_\_\_\_\_

Fluorine is in this group’s column\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_halogens\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**1.9 This, that and the other things (7 pts)**

1. Who was behind the gold leaf experiment? \_\_\_\_\_\_Rutherford\_\_\_\_\_\_\_\_\_\_\_\_
2. German who won the Nobel Prize with Einstein and got his name on the constant **h**\_Max Planck\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Besides 1/sec or cycles per second, another name for the units of frequency is\_\_\_\_\_\_\_\_\_

**True or False**

Bohr’s theory of the atom is good for all the elements. T F

Elements are distinguished by proton count T F

The specific mixture of s, p,d for an element’s valence electrons decides its chemical character T F

Any day doing chemistry is a good day. T T

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