**Exam 1 General Chemistry 1114 Alfred State College Section 2 (Fong)**

Your name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1 pt)

1. **Introductions (3 pts)**
2. From what University did Doc Fong receive a Ph.D. in Physical Chemistry ? \_\_U. of Michigan\_\_\_\_\_
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. Given that a proton has a mass of 1, what is the relative mass of an electron ? \_0.0005\_\_\_\_\_\_\_\_
2. Given that a proton has a mass of 1, what is the relative mass of a neutron ? \_\_\_\_1\_\_\_\_\_\_\_\_\_\_\_\_
3. What is the ~ratio of an electron orbit diameter to an atomic nucleus diameter?\_\_100,000=105\_\_\_\_\_
4. 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
5. 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)
6. Distance across a football field (~ 10,000 cm)

**2 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)

**BE u Co Kr UuU Mge hE 2 pts**

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

Spelling matters

Au \_Gold\_\_\_\_ b) Mn \_\_Manganese\_\_\_ c) Arsenic\_As\_\_\_ d)Silver \_\_Ag\_\_

Potassium\_K\_\_\_ f) Mg\_\_Magnesium\_\_\_\_ g) Mercury\_Hg\_ h) Ga\_\_\_\_Gallium\_\_\_\_\_\_\_\_\_\_

**c)**  How many neutrons are present in neutral Boron-11 ? \_\_\_\_6\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

d) What is the electron count for neutral Phosphorus 32 ? \_\_\_\_\_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** | **25** | **Mg** | 12 | 13 | 12 | **0** |
| **17** | **35** | **Cl** | 17 | **18** | **17** | **0** |
| 15 | 40 | P | **15** | **25** | 15 | **0** |
| 18 | 38 | Ar | 18 | **20** | **18** | **0** |

* 1. **Let There be Light (6 pts)**

**a)Sort the equations and statements below (by #) into those connected to the classical or new theory of light:**

1)Energy of light is in amplitude 2) light requires an ether medium 3)E=hf

4) Amplitude ? What amplitude ? 5) light is a massless bullet called 6) light is a wave

a photon

OLD THEORY of LIGHT \_\_\_1,2,6\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**4 pts**

NEW THEORY of LIGHT \_\_\_\_3,4,5\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **The Michelson-Morley experiment demonstrated:**
2. that light interferes destructively and constructively to make light-dark patterns
3. E=hf
4. E-mc2
5. electrons undergo quantum jumps
6. the `ether’ medium proposed for light doesn’t exist

**c)The photoelectric effect experiment is most connected to:**

1) The Plum Pudding Model of J.J. Thomson

2) E=hf and the destruction of the old theory of light

3) Debroglie’s equation m=h/vλ connecting moving matter to a wavelength

4) Bohr’s prediction of the emission lines of the sun from pure theory

5) why electrons can diffract and produce a pattern of light-dark-light dark

**1.5 Calculations and Numbers ala’ Carte (9 pts total)**

**Given that λ\*f = c:**

1. Calculate c given λ=1\*10-5 and f = 3\*1013 : c= \_\_\_\_\_\_3\*108\_\_\_\_\_\_\_\_
2. Calculate λ given f= 6\*1014 and c= 3\*108 : λ=\_\_\_\_\_\_\_5\*10-7\_\_\_\_\_\_\_
3. Calculate f given λ=4.2857\*10-5 and c = 3\*108: f=\_\_\_\_\_\_\_7\*1012\_\_\_\_\_\_\_

**Calculate or provide indicated equivalent**

1. 1.0 + (2.0\*103)\*(6\*103) =\_\_\_\_\_2\_\_\_\_\_\_\_\_\_\_\_\_

[6\*106 + 6\*106]

1. Convert 0.000032 to its equivalent scientific notation: \_\_\_\_\_3.2\*10-5\_\_\_\_\_\_
2. Find **λ(nm)** from the equation below given ni=6 and nf=3

1 = 0.01097\* 1 - 1 **λ(nm)** = \_\_\_\_\_1093.8\_\_\_\_\_\_\_\_\_\_\_

**λ(nm)** nf2 ni2

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**1.5 Calculations and Numbers ala’ Carte (continued)**

d)A 1.00 gram sample of O is combined with various elements and the extra mass of that element combined with the O as well as the assumed formula are shown below. Compute the relative masses of Na,Mg and O assuming the relative mass of H is 1. (3 pts)

Element mass that combines with 1 gram O assumed formula element relative mass

H 0.126 g HO **1**

Na 2.875 NaO \_\_2.28\_\_\_(2.875/0.126)

Mg 1.500 MgO \_\_11.9\_\_(1.500/0.126)

O - - \_\_7.94\_\_\_(1/0.126)

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

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

**1)\_\_\_\_\_\_quantum jump/state idea\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**2)\_\_\_\_\_\_matter follows a wavelike pattern\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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

**1)\_\_\_\_\_\_emission spectrum of H predicted perfectly\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**2)\_\_\_\_\_\_radius of H atom computed accurately\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

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

**1)\_\_\_Unable to explain any other element\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**2)\_\_magnetic Zeeman lines in H not explained\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**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. **Mg \_\_\_\_1s22s22p63s2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
2. **Cl \_\_\_\_\_1s22s22p63s23p5\_\_\_\_\_\_\_\_\_\_\_\_\_**
3. **Ca \_\_\_\_\_1s22s22p63s23p64s2\_\_\_\_\_\_\_\_\_\_\_**
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]3d54s0\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
4. **V \_\_\_\_\_\_[Ar]3d54s0\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_/25**

**1.7. Electronic Configurations of the Atoms (continued)**

**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 [Ar]**

**c) Ag+1 [Kr]**

**1.8 Periodic Table Predictions and Vocabulary (14 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 ( 9 pts)**

Chlorine is in this group column \_\_halogens\_\_\_\_\_\_\_\_

Example of an alkali metal\_\_\_Li, Na, K, Rb,Cs, Fr\_\_\_\_\_

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

Example of a noble metal\_\_\_\_\_\_\_\_Cu,Ag,Au,Pt\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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\_\_\_\_\_\_\_\_\_\_\_\_\_

Another name for elements in the `p’ block\_\_\_\_Main group elements\_\_\_\_\_\_

Calcium is in this group’s column\_\_\_\_\_\_\_\_\_\_\_alkaline earths\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

These elements are the heaviest in the f block families\_\_\_\_actinides\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

1. Name of the Russian associated with the **Periodic Table**\_Mendeleev\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What experiment first established the dimensions of the atom ? \_\_Gold leaf experiment (Rutherford)\_\_\_\_\_\_
3. German who won the Nobel Prize with Einstein and got his name on the constant **h**\_\_\_Max Planck\_\_\_\_\_\_\_\_\_
4. What experiment destroyed the old theory of light ? \_\_\_Photoelectric effect experiment\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**True or False**

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

The use of s,p,d and f results from the way different atomic emission lines look. T F

Any day doing chemistry is a good day. T T

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