Chem 110 **Fall 2011** **Exam I** **Whelan**

SID | | | | | | | | | Last Key First Answer

Question 1 (6 Points) Report the follow operations to the **correct** number of **significant figures**?

a) 36.456 + 74.2 — 110.7

b) $18.4 \times (1.000 \times 10^{-3})$ — 1.84×10^{-2}

c) 2.01(23.56-2.3) — 42.7

Question 2 (4 Points) A piece of **copper** has a volume of **740L**. What is the mass of the same in **units of grams**.

$1\ cm^3\ Cu = 8.8\ g\ Cu$	1 kg = 1000 g	$1\ L = 1000\ cm^3$
9.5×10^{21} atoms Cu = 1 g Cu		$1\ cm^3 = 1\ mL$

No need to do the calculation – just set up the correct dimensional analysis conversions – **you may not need to fill in all the boxes**.

$$740\ L \times \frac{1000\ cm^3}{1L} \times \frac{8.8\ g\ Cu}{1\ cm^3\ Cu} \times \frac{\quad}{\quad}$$

Question 3 (10 Points) Give the correct **formula** for the following **polyatomic ions**:

a) **Phosphide** — P^{3-}

b) **Phosphate** — PO_4^{3-}

c) **Sulfite** — SO_3^{2-}

d) **Chromate** — CrO_4^{2-}

e) **Cyanide** — CN^-

Question 4 (4 Points) Which of the following apply to the **electron**?

- ☑ mass ~ 9.109×10^{-28} g
- ☐ charge = 0
- ☐ mass ~ 1.673×10^{-24} g
- ☑ charge = -1
- ☐ charge = +1

Question 5 (8 Points)

a) How many **protons** and **neutrons** are there in the nucleus of an atom that has an **atomic number of 83** and a **mass number of 214**?

Protons: 83

Neutrons: 131

b) What is the **symbol** for the **element**? **Symbol:** Bi

c) The atom bears a charge of **+3**, then number of **electrons** is: 80

Question 6 (8 Points) The following questions pertain to the **periodic table** given at the **front of this exam**:

a. The **atomic weight** of the element in **group 6A** and **period 3**? 32.07

b. What is the **name** of the **halogen** that is in **period 3**? Chlorine

c. The **symbol** for the **lightest alkali metal** is? Li

d. **Circle** any of the following that are **main group elements**? (Z = atomic number)

Sc (Z=21) **Te** (Z=52) **V** (Z=23) **Cs** (Z=55)

Question 7 (10 Points)

a. **Name** the compound with the formula $Ca(NO_2)_2$? Calcium nitrite

b. **Name** the compound with the formula $Cu(ClO_4)_2$? Copper(II) perchlorate

c. What is the **formula** for **sodium phosphide**? Na_3P

d. What is the **formula** for **iron(III) sulfate**? $Fe_2(SO_4)_3$

e. What is the **formula** for **ammonium hydroxide**? NH_4OH

Question 8 (4 Points) A certain element consists of two stable isotopes:

	Exact Mass (amu)	Abundance (%)
#1	106.9051	51.82
#2	108.9047	48.18

What is the atomic weight of this element? **Give answer to 4 decimal places.**

Show Work

$$0.5182(106.9051) + 0.4818(108.9047)$$

107.8685 **amu**

Question 9 (4 Points) How many **moles** of boron trifluoride, BF_3, are present in a sample that contains **7.95 moles** of **fluorine atoms**?

Show Work

$$7.95 \text{ mol F} \left| \frac{1 \ BF_3}{3 \ F} \right. =$$

2.65 **moles**

Question 10 (6 Points) How many **moles** of **copper(II) hydroxide** are present in **4.44 grams** of this compound? **Show Work**

$Cu(OH)_2$: $63.55 + 2(16.00 + 1.01) = 97.57\ g.mol^{-1}$

$$4.44g\ Cu(OH)_2 \left| \frac{1\ mol}{97.57g} \right. =$$

0.0455 **moles**

Question 11 (6 Points) Balance the following chemical equations using the **smallest possible integer coefficients**.

a. 4 HCl (aq) + ___O_2(g) → 2 H_2O (l) + 2 Cl_2 (g)

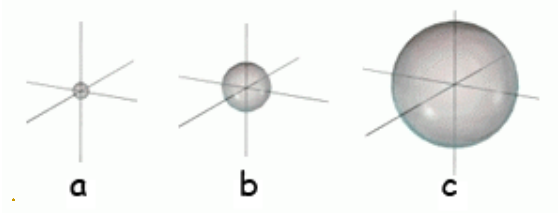
b. Write a **balanced equation** for the **complete oxidation** reaction that occurs when ethanol (**C_2H_5OH**) burns in air.

___ C_2H_5OH + 3 O_2 → 2 CO_2 + 3 H_2O

c. Write a **balanced equation** for the reaction of **nitrogen gas** with **hydrogen gas** to produce **ammonia** (**NH_3**)

___ N_2 (g) + 3 H_2 (g) → 2 NH_3(g)

Question 12 (6 Points)



a) The **orbitals** depicted above are **what type?** s

b) Which orbital would have the **highest ionization energy?** a

c) Which orbital would possess the **smallest force of attraction?** c

Question 13 (4 Points)

a) **How many 4d** orbitals are there in an atom? 5

b) What is the **maximum** number of electrons in a set of **3p** orbitals? 6

Question 14 (12 Points)

a) Write the electron configuration for the **magnesium** atom. $1s^2 2s^2 2p^6 3s^2$

b) Write the **noble gas** configuration for **iron**, (Fe)? $[Ar]\,4s^2 3d^6$

c) The **element** with an **electron configuration** of **$1s^2 2s^2 2p^6 3s^2 3p^6 4s^1 3d^{10}$** Cu

d) **Xe, $[Kr]5s^2 4d^{10} 5p^6$**, has how many **valence electrons?** 8

e) The **element** in **period 4** that has the **Lewis diagram**, Ge

f) **X** is a **Main Group** element in **period 3** with **4** valence electrons. X is: Si

Question 15
4 Points

Using only the periodic table **arrange** the following elements in order of **increasing atomic** radius: **Na, N, K, P**

N	P	Na	K
Smallest			**Largest**

Question 16
4 Points

Using only the periodic table **arrange** the following elements in order of **decreasing ionization energy**: **As, Cl, Ge, P**

Cl	P	As	Ge
Highest			**Lowest**

Exam I Score