Chem 111 **Summer 2006** **Key I** **Whelan**

Question 1
6 Points

1. Give the **number** of significant figures in: **160** **2**

2. **[23.56-2.3]/1.248x10^3**
   Report the answer in the **correct number of significant figures**: **1.70x10^{-2}**

Question 2
8 Points

Fill in the blanks in the following table:

Protons	Neutrons	Electrons	Complete Atomic Symbol
12	**12**	**10**	**$^{24}_{12}Mg^{+2}$**
35	45	36	**$^{80}_{35}Br^{-}$**

Question 3
18 Points

Use the Periodic Table accompanying this exam to answer the following questions:

1. **Name** the only **diatomic gas** in **Group VIA** **Oxygen**
2. **Symbol** for the **lightest Alkali Earth** element. **Be**
3. **Symbol** for **transition metal** in **Group IB**, **Period 5**. **Ag**
4. Group **IIA** Metals like to have this **charge**. **2+**
5. The **Lanthanides** belong to what **Period?** **6**
6. Group **VIIIA** are collectively **known** to as: **Noble Gases**

Question 4
5 Points

Eu has two naturally occurring isotopes:

Isotope	Exact Mass	Natural Abundance
^{151}Eu	**150.920**	**47.80%**
^{153}Eu	**152.921**	**52.20%**

What is the average atomic mass of Eu? (Give your answer to **3 decimal places**)

150.920(0.4780) + 152.921(0.5220) = **151.965**

Question 5
4 Points

A sample of citric acid, **$C_6H_8O_7$**, contains **0.632 mol** of the compound. What is the mass of this sample, in grams? **[Show All Work]**

Molar Mass = 6(12.01) + 8(1.01) + 7(16.00) = **192.14 g/mol**

$$\frac{0.632 \text{ mol } C_6H_8O_7 \mid 192.14 \text{ g}}{\qquad\qquad\quad \mid 1 \text{ mol}} = \mathbf{121g}$$

Question 6
7 Points

An unknown compound is composed of:

C **63.15%** H **5.30%** *O* **31.55%**

It has a molar mass of **456.5g**. Determine the formula of this compound.

[Show All Work]

C	H	O
63.15 *g*	5.30 *g*	31.55 *g*
5.258 mol	**5.248 mol**	**1.972 mol**
$\frac{5.258}{1.972}$	$\frac{5.248}{1.972}$	$\frac{1.972}{1.972}$
2.666	2.661	1
5.332	5.322	2
7.998	7.983	3
8	**8**	**3**

$C_8H_8O_3 = 8(12.01) + 8(1.01) + 3(16.00) = 152.16$ g/mol

$C_{24}H_{24}O_9$

Question 7
6 Points

Using the smallest whole number integers possible, balance the following chemical equations.

1. **2** $C_3H_6(g)$ + **9** $O_2(g)$ = **6** $H_2O(g)$ + **6** $CO_2(g)$
2. **2** $Fe_2O_3(s)$ + **3** $C(gr)$ = **4** $Fe(s)$ + **3** $CO_2(q)$

Question 8
12 Points

Give the correct name for each of the following ionic compounds.

1. CuS — **Copper(II) sulfide**
2. $Ca(CO_3)_2$ — **Calcium carbonate**
3. Na_3P — **Sodium phosphide**
4. $Fe_3(PO_4)_2$ — **Iron(II) phosphate**

Question 9
12 Points

Give the correct formula for each of the following ionic compounds.

1. Ammonium hydroxide — **NH_4OH**
2. Iron(II) sulfite — **$FeSO_3$**
3. Potassium chlorate — **$KClO_3$**
4. Aluminum chromate — **$Al_2(CrO_4)_3$**

Question 10
6 Points

In the visible region of the electromagnetic spectrum, **red** and **blue** light lie at the extremes. Which of these has:

1. The **longest** wavelength: **Red**
2. The **smallest** frequency: **Red**
3. The **least** energy: **Red**

Question 11
7 Points

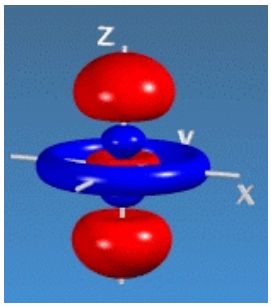
A chemical reaction can be initiated by light that carries energy of 4.56×10^5 J.mol^{-1}. Only light less than a certain wavelength will initiate the reaction.
What is the longest wavelength, in meters, that can deliver the required energy?
[Show All Work]

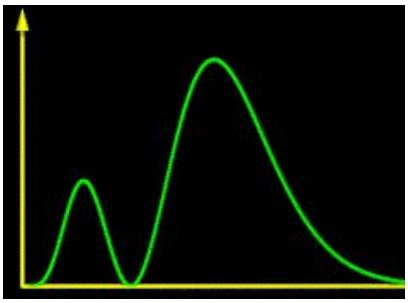
$$E = \frac{4.56 \times 10^5 \text{ J.mol}^{-1}}{6.023 \times 10^{23} \text{ mol}^{-1}} = 7.571 \times 10^{-19} \text{ J}$$

$$\nu = \frac{E}{h} = \frac{7.571 \times 10^{-19} \text{ J}}{6.626 \times 10^{-34} \text{ J.s}} = 1.143 \times 10^{15} \text{ s}^{-1}$$

$$\lambda = \frac{c}{\nu} = \frac{2.998 \times 10^8 \text{ m.s}^{-1}}{1.143 \times 10^{15} \text{ s}^{-1}} = 2.62 \times 10^{-7} \text{ m}$$

Question 12
9 Points





1. The orbital depicted above is of what type? **d**
2. The n value of this orbital is? **4**
3. Its complete designation is? **$4d_{z2}$**

   (xy, xz, yz, x^2-y^2, z^2)

Do Not Write Below This Line

Exam I Score