The Periodic Table

IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIIIB	VIIIB	VIIIB	IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIIIA
H 1 1.01																	He 2 4.00
Li 3 6.94	Be 4 9.01											B 5 10.81	C 6 12.01	N 7 14.01	O 8 16.00	F 9 19.00	Ne 10 20.18
Na 11 22.99	Mg 12 24.31											Al 13 26.98	Si 14 28.09	P 15 30.97	S 16 32.07	Cl 17 35.45	Ar 18 39.95
K 19 39.10	Ca 20 40.08	Sc 21 44.96	Ti 22 47.88	V 23 50.94	Cr 24 52.00	Mn 25 54.94	Fe 26 55.85	Co 27 58.93	Ni 28 58.69	Cu 29 63.55	Zn 30 65.39	Ga 31 69.72	Ge 32 72.61	As 33 74.92	Se 34 78.96	Br 35 79.90	Kr 36 83.80
Rb 37 85.47	Sr 38 87.62	Y 39 88.91	Zr 40 91.22	Nb 41 92.91	Mo 42 95.94	Tc 43 (97.9)	Ru 44 101.07	Rh 45 102.91	Pd 46 106.42	Ag 47 107.87	Cd 48 112.41	In 49 114.82	Sn 50 118.71	Sb 51 121.76	Te 52 127.60	I 53 126.90	Xe 54 131.29
Cs 55 132.91	Ba 56 137.33	La 57 138.91	Hf 72 178.49	Ta 73 180.95	W 74 183.85	Re 75 186.21	Os 76 190.2	Ir 77 192.22	Pt 78 195.08	Au 79 197.97	Hg 80 200.59	Tl 81 204.38	Pb 82 207.2	Bi 83 208.98	Po 84 (209)	At 85 (210)	Rn 86 (222)
Fr 87 223.02	Ra 88 226.03	Ac 89 227.03	Rf 104 (261)	Db 105 (262)	Sg 106 263)	Bh 107 (262)	Hs 108 (265)	Mt 109 (266)	Ds 110 (271)	Rg 111 (272)	Uub 112 (285)	Uut 113 (284)	Uuq 114 (289)	Uup 115 (288)			

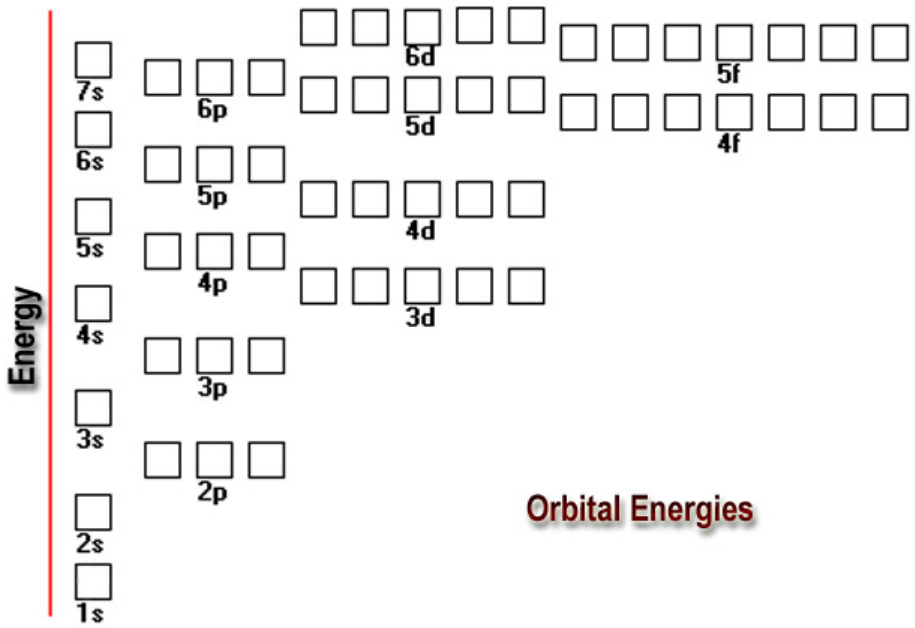
Ce 58 140.12	Pr 59 140.91	Nd 60 144.24	Pm 61 (145)	Sm 62 150.36	Eu 63 152.97	Gd 64 157.25	Tb 65 158.93	Dy 66 162.50	Ho 67 164.93	Er 68 167.26	Tm 69 168.93	Yb 70 173.04	Lu 71 174.97
Th 90 232.04	Pa 91 231.04	U 92 238.03	Np 93 237.05	Pu 94 (240)	Am 95 243.06	Cm 96 (247)	Bk 97 (248)	Cf 98 (251)	Es 99 252.08	Fm 100 257.10	Md 101 (257)	No 102 259.10	Lr 103 262.11

Some Useful And Not So Useful Information:

$\lambda\nu = c$ $E = h\nu$ $E = mc^2$ $d = m/V$

1 kJ = 1000 J
1 cm = 10 mm

$N = 6.023 \times 10^{23}\ mol^{-1}$
$c = 2.998 \times 10^{8}\ m.s^{-1}$
$h = 6.626 \times 10^{-34}\ J.s.$

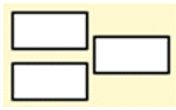

Energy
7s
6s
5s
4s
3s
2s
1s
6p
5p
4p
3p
2p
6d
5d
4d
3d
5f
4f
Orbital Energies

SID _____ Last _____ First _____

Question 1
4 Points

A spherical metal ball has a mass of **6.581g** and a diameter of **9.06mm**. What is the density of the metal in **g/cm^3** [Volume of a sphere is **(4/3)πr^3**]

Question 2
7 Points

1. A neutral atom has 60 protons and 83 neutrons. Fill in the three blanks to complete the atomic symbol 
2. Which if any of the following species has the same number of **neutrons** as it does **electrons**? Circle the correct answer(s).

$^{47}_{24}Cr^{+}$ $^{24}Mg^{2+}$ $^{59}Co^{2+}$ $^{35}Cl^{-}$ $^{125}_{50}Sn$ ^{90}Sr

Question 3
10 Points

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

1. Name the only **diatomic gas** in **Group VA** _____
2. Symbol for the **heaviest Alkali Earth** element. _____
3. Symbol for **transition metal** in **Group VIB**, **Period 5**. _____
4. The **Lanthanides** belong to what Period? _____
5. Group **VIIA** are collectively referred to as: _____

Question 4
8 Points

Give the **sign** and **magnitude** of the charge associated with the following:

1. Phosphate ion _____
2. Phosphide ion _____
3. Ammonium ion _____
4. Group IIIA elements _____

Question 5
4 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**)

Question 6 (4 Points) A sample of citric acid, $C_6H_8O_7$, contains **0.0645 mol** of the compound. What is the mass of this sample, in grams? **[Show All Work]**

Question 7 (4 Points) Calculate the mass percent of **boron** in B_2O_3.

Question 8 (6 Points) An organic acid is composed of 58.80% carbon, 9.87% hydrogen, and 31.33% oxygen. Its molar mass is 204.26 g/mol. Determine the molecular formula of the compound. **[Show All Work]**

Question 9 (4 Points) Using the **smallest whole number integers** possible, balance the following chemical equations.

1. ___ $AgNO_3(aq)$ + ___ $K_2CrO_4(aq)$ = ___$Ag_2CrO_4(s)$ + __$KNO_3(aq)$
2. ___ $C_2H_6(g)$ + ___ $O_2(g)$ = ___ $H_2O(g)$ + ___ $CO_2(g)$

Question 10 (6 Points) Give the **correct name** for each of the following ionic compounds.

1. $Ca(HCO_3)_2$ _____
2. Na_3P _____
3. $Fe_2(SO_3)_3$ _____

Question 11 (6 Points) Give the **correct formula** for each of the following ionic compounds.

1. Ammonium hydroxide _____
2. Potassium chlorite _____
3. Aluminum chromate _____

Question 12 (4 Points) With respect to **infrared**, **visible** and **ultraviolet** electromagnetic radiation. Which of these has:

1. The **shortest** wavelength: _____
2. The **greatest** frequency: _____

Question 13 (6 Points) A chemical reaction can be initiated by light that carries energy of 4.87×10^5 $J.mol^{-1}$. 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]

Question 14 (5 Points) A general trend in atomic size is that as one progresses down a group the size increases. Which one of the following salts might you expect to be **insoluble** in water?

MgS CaS BaS

Briefly justify your choice.

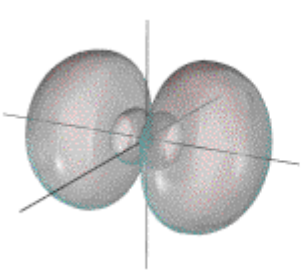
Question 15
10 points

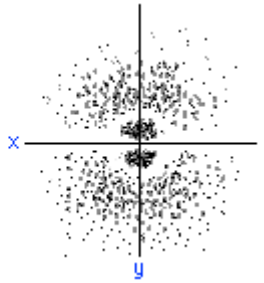
1. How many orbitals are there with an **n** value equal to 4? _____
2. How many **nodal** surfaces are associated with a **4p** orbital? _____
3. The orbital depicted on the left is:

   What type of orbital? _____

   Its n value is? _____

   Its specific designation? _____





Question 16
12 Points

1. Give the **complete electronic configuration** for:

   S: _____

   Br: _____

2. Give the **Noble Gas** (Valence) configuration for

   I: _____

   K: _____

3. Give the **symbol(s)** of the **Period 3** element(s) that is/are **diamagnetic**:

   _____

Do Not Write Below This Line

Exam I Score	