Name: _____ Per: ____ Date: _____

Electron Configuration & the Periodic Table Activity

Purpose: To find the relationship between electron configuration and organization of the periodic table.

Part 1:

a) For each electron configuration, circle (or highlight) the energy level with the highest number. This represents the **OUTERMOST ENERGY LEVEL (OR VALENCE ELECTRONS FOR MAIN GROUP ELEMENTS)** and *may* involve either one or two sub levels (*s* & *p*).

b) For the main groups elements, write the number of valence electrons in the empty column.

*Remember, most of the transition metals can have different charges.

Part 2:

a) For each element, where the configuration ends in **s or p** only, place the element symbol in the appropriate column according to its number of valence electrons, as determined in part 1.

1 Valence e^-	**2** Valence e^-	**3** Valence e^-	**4** Valence e^-	**5** Valence e^-	**6** Valence e^-	**7** Valence e^-	**8** Valence e^-

b) For each element that you have placed in ***columns 1 & 2;*** color their boxes on the PERIODIC TABLE **blue**.

c) For each element that you placed in ***columns 3-8;*** color their boxes on the PERIODIC TABLE **pink**.

Part 3:

1. Fill in the table below. In the 3d row, write the symbol of all elements whose electron configurations end with 3d. In the 4d row, write the symbol of all elements whose electron configuration ends with 4d.

3d										
4d										

2. For each element that you have placed in 3d and 4d, color their boxes on the periodic table **orange**.

Part 4:

a) For each of the sections that you have already colored (columns 1 & 2, columns 3 -12, columns 13 -18) extend the shading to the bottom of each column. Ex: Color elements 55, 56, 87, & 88 the same color as the ones above them.

b) There should only be one section of the periodic table that is uncolored, at this point, at the very bottom of the table. Please, color these two rows of boxes on the PERIODIC TABLE **green**.

c) Make a legend under the periodic table. Label the blue section as s-block, the pink as p-block, the orange as d-block, and the green as f-block.

d) Label each column. The blue columns are s^1 and s^2, the orange columns are d^1-d^{10}, the pink columns are p^1-p^6, and the green columns are f^1-f^{14}.

Questions:

1. How many horizontal rows are there on the periodic table? _____
   This matches the number of energy levels in the electron cloud.

2. How many columns are on your first chart of valence electrons (part 2a)? _____
   Notice that this is the same as the "A" columns on the periodic table.

3. How many elements are in any horizontal row on your second chart (part 3a)? _____
   Notice that the “d” section of your periodic table also has this many elements across each row.

4. How many columns are there in the "*s*" section on the periodic table? _____

5. How many columns are there in the "*p*" section on the periodic table? _____

6. Add the answers from questions 3 - 5 together. _____
   What is the significance of this number? _____

7. Which column from your first chart (table 1) would you place Cesium in? _____

8. Write the electron configuration for Cesium (Cs).
   _____

9. Look at the blocks at the bottom of the table – the Lanthanide and Actinide Series’. How many elements are there in each of the rows?
   _____

CHALLENGE!

10. Write the electron configuration for Lanthanum (La).

11. Write the electron configuration for Cerium (Ce).

12. Write the electron configuration for Praseodymium (Pr).

13. Write the electron configuration for Lutetium (Lu).

14. Write the electron configuration for Lead (Pb).

15. Predict the electron configuration for element #118.

Part 1:

	Symbol	Electron Configuration	# of Valence Electrons
1.	H	$1s^1$	
2.	He	$1s^2$	
3.	Li	$1s^2 2s^1$	
4.	Be	$1s^2 2s^2$	
5.	B	$1s^2 2s^2 2p^1$	
6.	C	$1s^2 2s^2 2p^2$	
7.	N	$1s^2 2s^2 2p^3$	
8.	O	$1s^2 2s^2 2p^4$	
9.	F	$1s^2 2s^2 2p^5$	
10.	Ne	$1s^2 2s^2 2p^6$	
11.	Na	$1s^2 2s^2 2p^6 3s^1$	
12.	Mg	$1s^2 2s^2 2p^6 3s^2$	
13.	Al	$1s^2 2s^2 2p^6 3s^2 3p^1$	
14.	Si	$1s^2 2s^2 2p^6 3s^2 3p^2$	
15.	P	$1s^2 2s^2 2p^6 3s^2 3p^3$	
16.	S	$1s^2 2s^2 2p^6 3s^2 3p^4$	
17.	Cl	$1s^2 2s^2 2p^6 3s^2 3p^5$	
18.	Ar	$1s^2 2s^2 2p^6 3s^2 3p^6$	
19.	K	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$	
20.	Ca	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$	
21.	Sc	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^1$	X
22.	Ti	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^2$	X
23.	V	$ls^i 2s^2 2p^6 3s^2 3p^6 4s^2 3d^3$	X
24.	Cr	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^4$	X
25.	Mn	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^5$	X
26.	Fe	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$	X
27.	Co	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^7$	X
28.	Ni	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^8$	X
29.	Cu	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^9$	X
30.	Zn	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}$	X
31.	Ga	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^1$	

	Symbol	Electron Configuration	# of Valence Electrons
32.	Ge	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^2$	
33.	As	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^3$	
34.	Se	$1s^2 2s^2 2p^6 3s^2 3p^6 4_S{}^2 3d^{l0} 4p^4$	
35.	Br	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{l0} 4p^5$	
36.	Kr	$1s^2\ 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{l0} 4p^6$	
37.	Rb	$1s^2\ 2s^2 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s^1$	
38.	Sr	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2$	
39.	Y	$1s^2\ 2s^2 2p^6\ 3s^2\ 3p^6 4s^2\ 3d^{10} 4p^6\ 5s^2\ 4d^1$	X
40.	Zr	$1s^2 2s^2 2p^6\ 3s^2\ 3p^6 4s^2\ 3d^{10} 4p^6\ 5s^2\ 4d^2$	X
41.	Nb	$1s^2\ 2s^2 2p^6\ 3s^2\ 3p^6 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^3$	X
42.	Mo	$1s^2\ 2s^2 2p^6\ 3s^2\ 3p^6 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^4$	X
43.	Tc	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^5$	X
44.	Ru	$1s^2 2s^2 2p^6\ 3s^2\ 3p^6 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^6$	X
45.	Rh	$1s^2 2s^2 2p^6\ 3s^2\ 3p^6 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^7$	X
46.	Pd	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^8$	X
47.	Ag	$1s^2\ 2s^2 2p^6\ 3s^2\ 3p^6 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^9$	X
48.	Cd	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10}$	X
49.	In	$1s^2 2s^2 2p^6\ 3s^2\ 3p^6 4s^2\ 3d^{10} 4p^6\ 5s^2\ 4d^{10}\ 5p^1$	
50.	Sn	$1s^2\ 2s^2 2p^6\ 3s^2\ 3p^6 4s^2\ 3d^{10} 4p^6\ 5s^2\ 4d^{10}\ 5p^2$	
51.	Sb	$1s^2\ 2s^2 2p^6\ 3s^2\ 3p^6 4s^2\ 3d^{10} 4p^6\ 5s^2\ 4d^{10}\ 5p^3$	
52.	Te	$1s^2\ 2s^2 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10} 4p^6\ 5s^2\ 4d^{10}\ 5p^4$	
53.	I	$1s^2\ 2s^2 2p^6\ 3s^2\ 3p^6 4s^2\ 3d^{10} 4p^6\ 5s^2\ 4d^{10}\ 5p^5$	
54.	Xe	$1s^2\ 2s^2 2p^6\ 3s^2\ 3p^6 4s^2\ 3d^{10} 4p^6\ 5s^2\ 4d^{10}\ 5p^6$	

Periodic Table of the Elements

Period	1 IA	2 IIA		3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8 VIIIB	9 VIIIB	10 VIIIB	11 IB	12 IIB	13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
1	1 H 1.008																		2 He 4.003
2	3 Li 6.939	4 Be 9.012												5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
3	11 Na 22.99	12 Mg 24.31												13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
4	19 K 39.10	20 Ca 40.08		21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.71	29 Cu 63.54	30 Zn 65.37	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.91	36 Kr 83.80
5	37 Rb 85.47	38 Sr 87.62		39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 *Tc* (99)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.4	47 Ag 107.87	48 Cd 112.40	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.90	54 Xe 131.30
6	55 Cs 132.90	56 Ba 137.34	*	57 La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.21	76 Os 190.2	77 Ir 192.2	78 Pt 195.09	79 Au 196.97	80 Hg 200.59	81 Tl 204.37	82 Pb 207.19	83 Bi 208.98	84 Po (210)	85 At (210)	86 Rn (222)
7	87 Fr (223)	88 Ra (226)	**	89 Ac (227)	104 *Rf* (261)	105 *Db* (262)	106 *Sg* (266)	107 *Bh* (264)	108 *Hs* (269)	109 *Mt* (268)	110 *Ds* (271)	111 *Rg* (272)	112 *Uub* (285)	113 *Uut* (284)	114 *Uuq* (289)	115 *Uup* (288)	116 *Uuh* (292)	117	118

*	58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 *Pm* (147)	62 Sm 150.35	63 Eu 151.96	64 Gd 157.25	65 Tb 158.92	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
**	90 Th 232.04	91 Pa (231)	92 U 238.03	93 *Np* (237)	94 *Pu* (242)	95 *Am* (243)	96 *Cm* (247)	97 *Bk* (248)	98 *Cf* (251)	99 *Es* (252)	100 *Fm* (257)	101 *Md* (258)	102 *No* (255)	103 *Lr* (257)

Reference for elements 106-116: http://www.webelements.co