

## CONCEPT: THE 18 AND 16 ELECTRON RULE

- Remember main-group elements want to follow the octet rule.

	1A (1)	2A (2)															8A (8)
			3A (3)	4A (4)	5A (5)	6A (6)	7A (7)										
1																	
2																	
3																	
4																	
5																	
6																	
7																	

  

	1A (1)	2A (2)	3A (3)	4A (4)	5A (5)	6A (6)	7A (7)	8A (8)
2	3 Li 6.941	4 Be 9.012	5 B 10.81	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180
3	11 Na 22.99	12 Mg 24.31	13 Al 26.982	14 Si 28.085	15 P 30.974	16 S 32.06	17 Cl 35.45	18 Ar 39.948

- In transition-metal chemistry, we use the 18 and 16-electron rule as an indicator for the reactivity of the transition metal.
  - The most stable transition-metal complexes in several cases have electron counts of \_\_\_\_ electrons.
  - This trend is called the \_\_\_\_ - electron rule.
  - This most stable number of electrons represents the number of total \_\_\_\_, \_\_\_\_, & \_\_\_\_ electrons.

	1A	2A	3B	4B	5B	6B	7B	8B			1B	2B	3A	4A	5A	6A	7A	8A
	(1)												(3)	(4)	(5)	(6)	(7)	(8)
4	19 K 39.10	20 Ca 40.08	21 Sc 44.956	22 Ti 47.867	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.38	31 Ga 69.723	32 Ge 72.630	33 As 74.922	34 Se 78.971	35 Br 79.904	36 Kr 83.798

### 18-Electron Rule Exceptions

- Exceptions happen most often with transition metals from the \_\_\_\_ to \_\_\_\_ valence electron groups.
  - The tendency of these metals to be happy with 16 electrons is called the \_\_\_\_ - electron rule.
  - \_\_\_\_ and \_\_\_\_ are the most common examples of transition metals following this rule.

**EXAMPLE:** What is the electron count of the neutral transition metal complex of  $\text{Br}_2\text{Pd}(\text{CO})_2$ ?

**EXAMPLE:** What is the electron count of the neutral transition metal complex of  $\text{Pd}(\text{en})_2$ ?

**CONCEPT: THE 18 AND 16 ELECTRON RULE**

**PRACTICE:** How many  $\text{NH}_3$  ligands would need to be placed onto a nickel atom if we assume the resulting complex follows the 18-electron rule?

**PRACTICE:** Using the 18-electron rule, explain why  $\text{V}(\text{CO})_6$  can be easily reduced to  $[\text{V}(\text{CO})_6]^-$ .