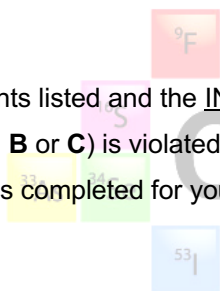


## AP WORKSHEET 01E: Orbital filling rules

The rules that you have been applying in order to determine the electronic configuration of an atom are summarized below.

- A. Lowest energy orbitals are filled first. **THE AUFBAU PRINCIPLE.**
  
- B. Orbitals can only contain a maximum of two electrons and when two electrons enter the same orbital they must have opposite spins ( $+ \frac{1}{2}$  or  $- \frac{1}{2}$ ) so that each electron has a unique set of quantum numbers. (In the electrons in boxes diagram they must be drawn  $\uparrow\downarrow$  **NOT**  $\uparrow\uparrow$  **OR**  $\downarrow\downarrow$ ). **THE PAULI EXCLUSION PRINCIPLE.**
  
- C. When orbitals of identical energy (degenerate) are available electrons enter these orbitals singly before any spin pairing takes place. **HUNDS RULE.**

Consider each of the elements listed and the INCORRECT electronic configuration associated with each one. In each case identify which of the above rules or principles (**A**, **B** or **C**) is violated and insert the correct electronic configuration (*in a similar format to that of the incorrect configuration*). An example is completed for you. (34)



ELEMENT	INCORRECT CONFIGURATION	VIOLATION	CORRECT CONFIGURATION
N	$1s^2 2s^2 2px^2 2py^1$	C	$1s^2 2s^2 2px^1 2py^1 2pz^1$
Al	$1s^2 2s^2 2p^6 3p^3$		
B	$1s^2 2s^3$		
P	$1s^2 2s^2 2p^6 3p^5$		
Mg	[Ne] $\uparrow\uparrow$		
C	$1s^2 2s^1 2px^1 2py^1 2pz^1$		
C	$1s^2 2s^2 2px^2$		
Mn	[Ar] $4s^1 3d^6$		
Ni	[Ar] $4s^2 3d_{xy}^2 3d_{xz}^2 3d_{yz}^2 3d_{z^2}^2 3d_{x^2-y^2}^0$		
Cl	[Ne] $\downarrow\downarrow \uparrow\uparrow \downarrow\downarrow \uparrow$		
Sc	[Ar] $3d^3$		
B	$1s^2 2s^1 2px^1 2py^1$		
Na	$1s^1 2s^2 2p^6 3s^2$		
S	[Ne] $3s^2 3px^2 3py^2$		
V	[Ar] $3d^5$		
P	[Ne] $3s^2 3px^2 3py^1$		
Kr	[Ar] $4s^2 3d^{16}$		