- No one knows exactly where an electron is around the nucleus, and where it is going to be next
- Heisenberg Uncertainty Principle
  - This is a principle that says – you cannot know with certainty where an electron is and where it is going next
- Pauli exclusion principle
  - suggests that only two electrons with opposite spin can occupy an atomic orbital

- Any electron can be described using 4 quantum numbers
  - Main energy level
  - Sub-level
  - Orbital
  - spin

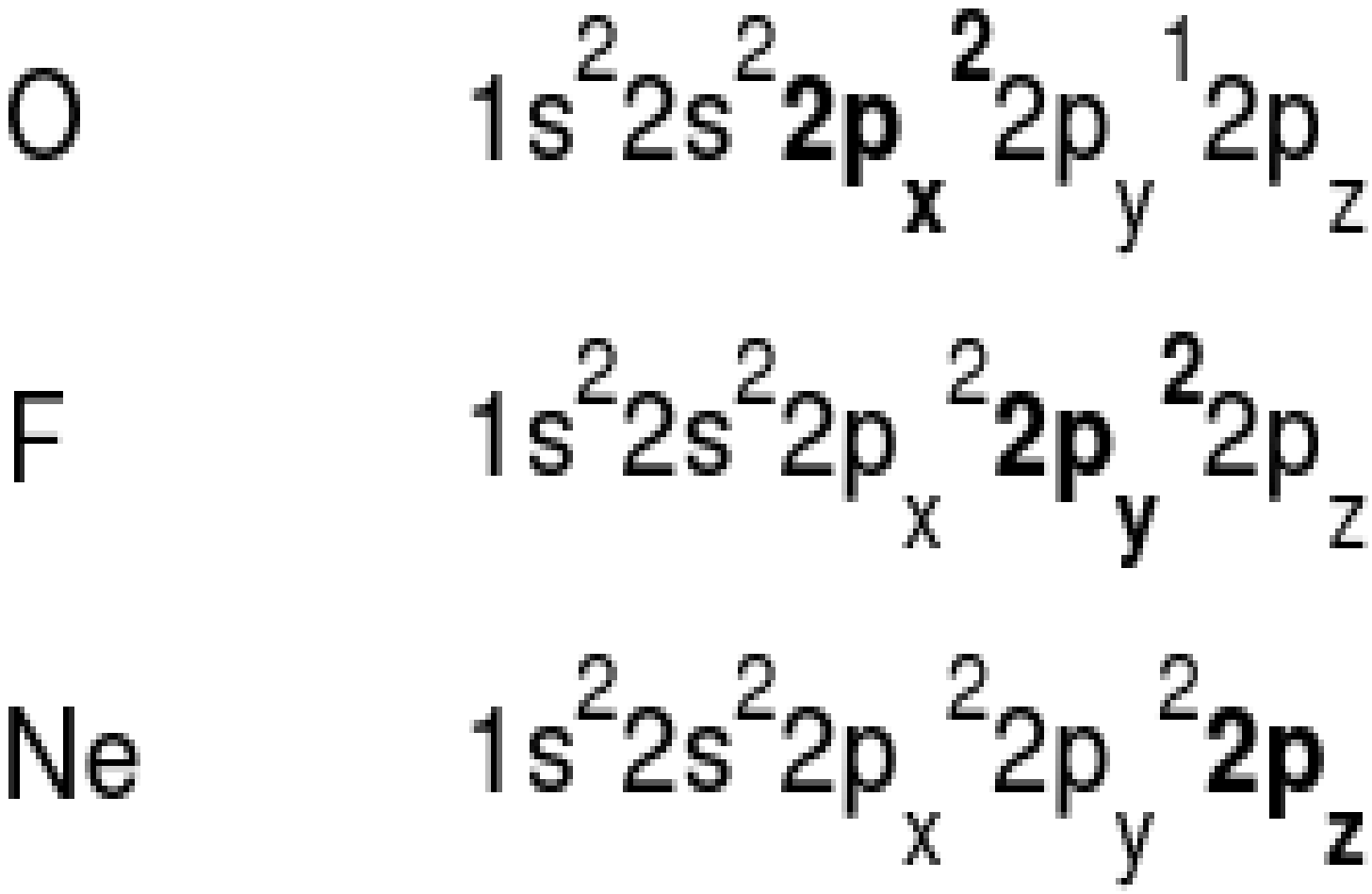
The order of filling electrons

- Electrons fill low energy orbitals before they fill higher energy level ones
- Where orbitals have exactly the same energies, the orbitals fill singly as far as possible
  - this is known as Hund's Rule
- Electrons fill each and all orbitals in the subshell before they pair up with opposite spins
- s orbitals always have a slightly lower energy than p orbitals
- Note that 3d orbitals are a slightly higher energy level than 4s orbitals
- 4s will always fill before 3d orbitals

B $1s^2 2s^2 \mathbf{2p_x^1}$

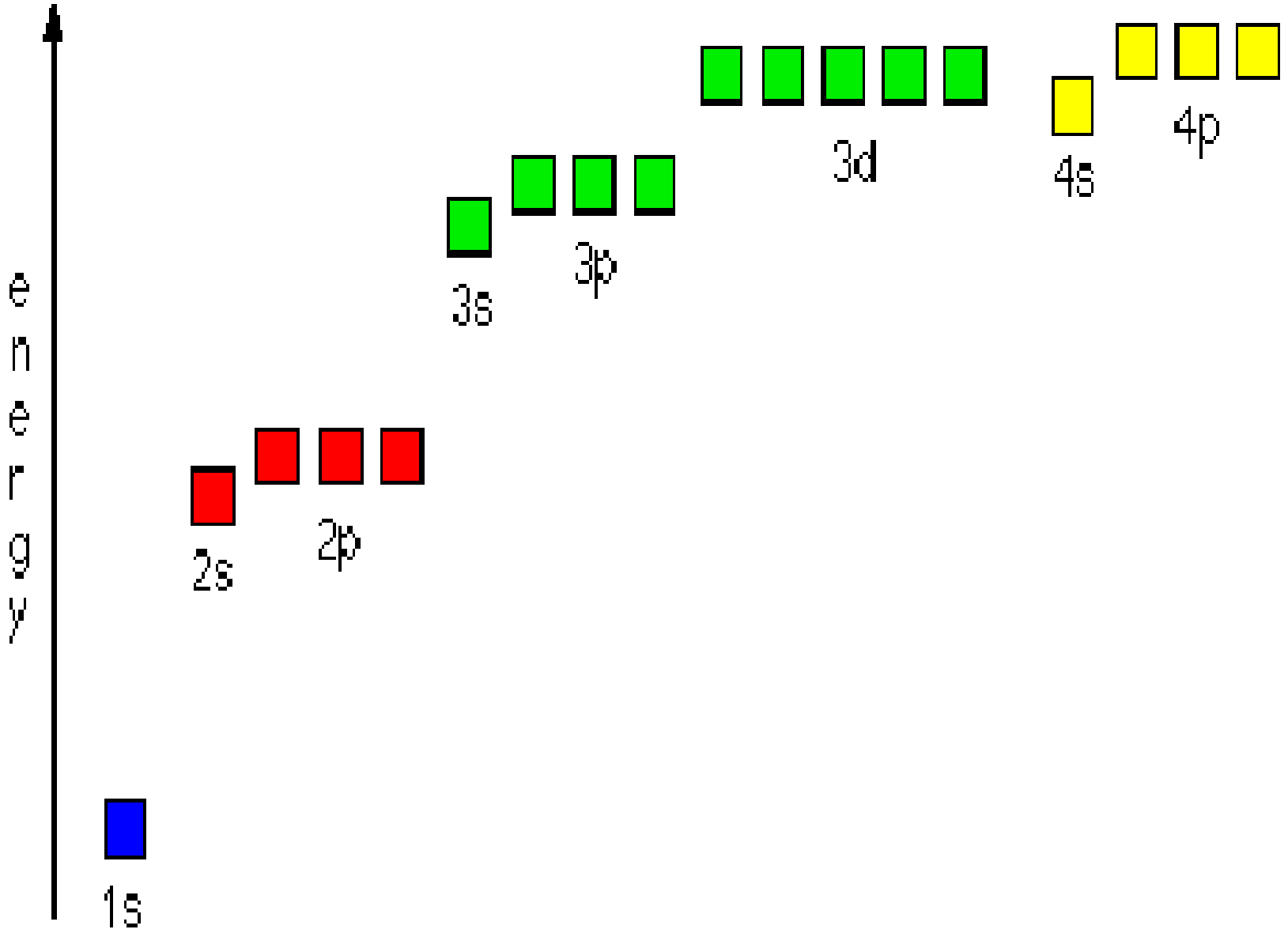
C $1s^2 2s^2 2p_x^1 \mathbf{2p_y^1}$

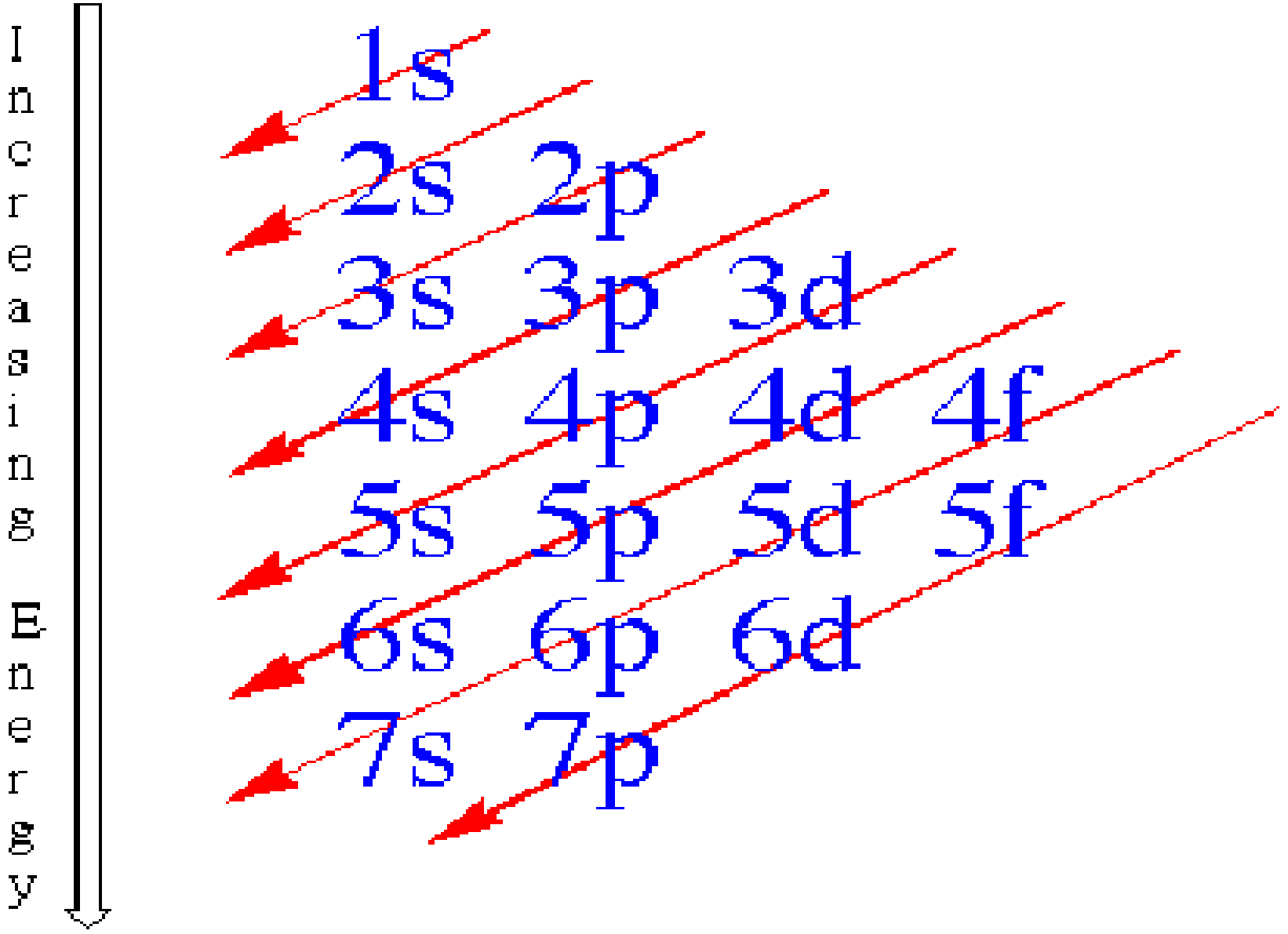
N $1s^2 2s^2 2p_x^1 2p_y^1 \mathbf{2p_z^1}$


O
$1s^2 2s^2 \mathbf{2p_x^2} 2p_y^1 2p_z^1$
F
$1s^2 2s^2 2p_x^2 \mathbf{2p_y^2} 2p_z^1$
Ne
$1s^2 2s^2 2p_x^2 2p_y^2 \mathbf{2p_z^2}$

- Common shorthand notation is to refer to the noble gas core, rather than write out the entire configuration

		short version
Mg	$1s^2 2s^2 2p^6 3s^2$	$[Ne]3s^2$
S	$1s^2 2s^2 2p^6 3s^2 3p_x^2 3p_y^1 3p_z^1$	$[Ne]3s^2 3p_x^2 3p_y^1 3p_z^1$
Ar	$1s^2 2s^2 2p^6 3s^2 3p_x^2 3p_y^2 3p_z^2$	$[Ne]3s^2 3p_x^2 3p_y^2 3p_z^2$


energy
1s
2s
2p
3s
3p
3d
4s
4p


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