Orbit Filling Diagrams

- Chemistry of atoms is caused by their outer (valence) electrons.
- We want to identify outer (valence) electrons.

Example: Nitrogen

1. Write out the electron configuration
   a. Look up "Z"(atomic #)
   b. Use the diagonal rule.

$$Nitrogen = 1s^2\,2s^2\,2p^3$$

2. Select <u>only</u> electrons with the <u>highest principle quantum number</u>.

Nitrogen = $\underline{2s^2}\,\underline{2p^3}$

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Example: Nitrogen

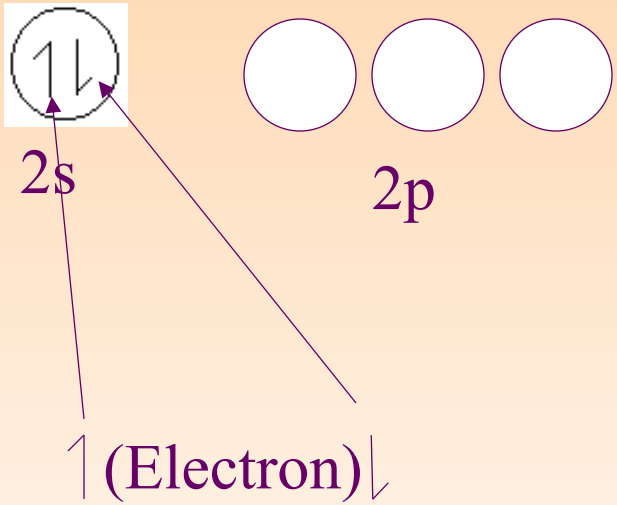
- The Chemistry of Nitrogen is determined by the $2s^2 2p^3$ electrons
  - Chemists represent active (valence) electrons in two ways.

1. Orbital filling diagrams
2. Electron (Lewis) dot diagrams

I. Orbit Filling Diagrams:

- Show the positions of electrons in a chart with circles (sometimes squares) and arrows.

Nitrogen



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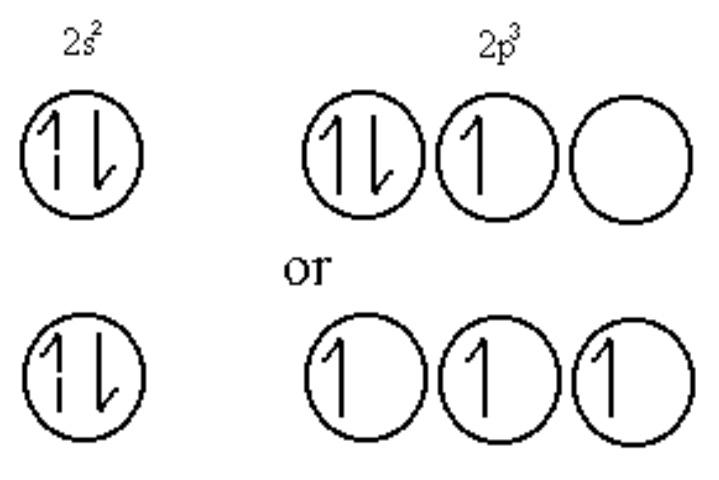
Nitrogen

- Hund's rule: Electrons prefer <u>not</u> to pair up if possible.
- Which diagram is correct (top or Bottom)?



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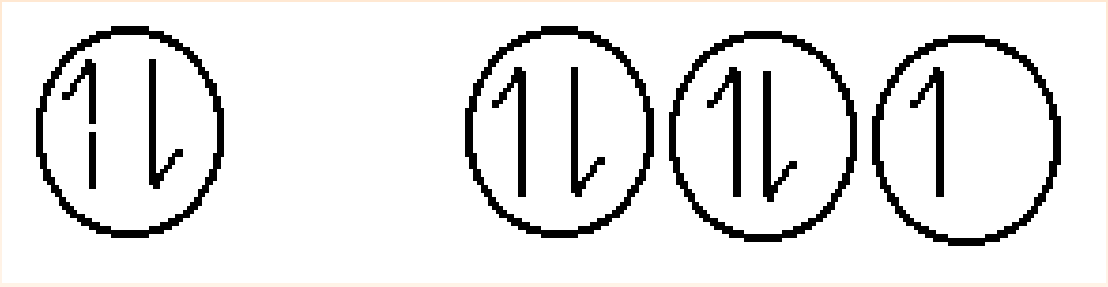
Try Fluorine (Z = 9)

$$1s^2\,\underline{2}s^2\,\underline{2}p^5$$



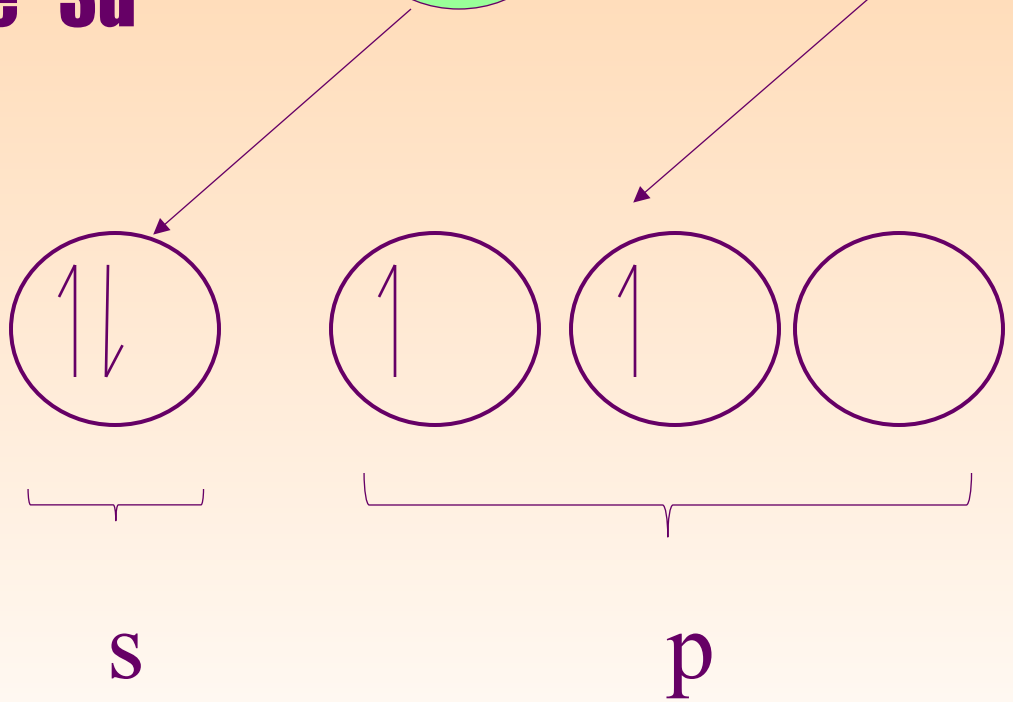
Now Germanium (Z = 32)

$$1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,4s^2\,3d^{10}\,4p^2$$

or

$$[Ar]\,4s^2\,3d^{10}\,4p^2$$

- **DO NOT WRITE the "3d" electrons!!!!!!!**
- **Why?**



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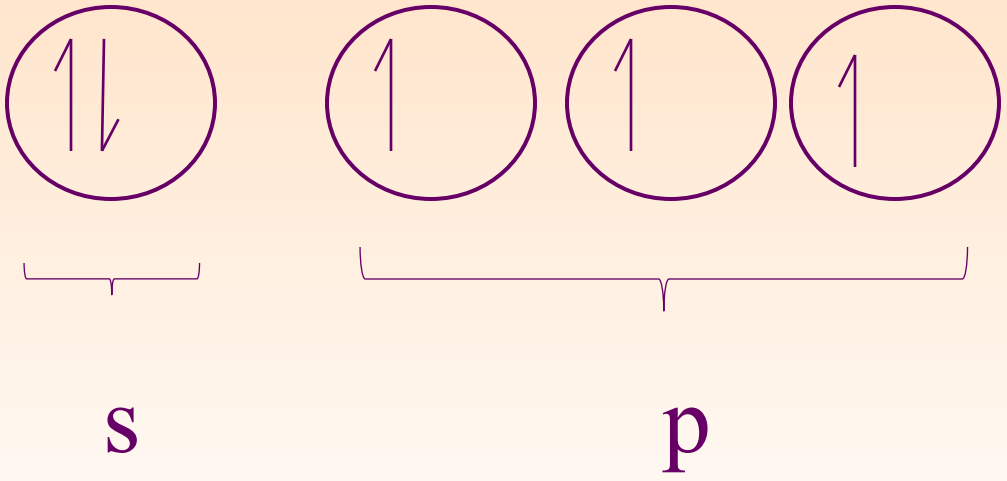
Now Phosphorus (Z = 15)

[Ne]$3s^2$ $3p^3$



II. Electron Dot Diagrams (Nitrogen)

- Write out configuration.
- Underline electrons with the highest principle quantum #.
- Make an orbital filling diagram.
- Write the symbol for the element (example: Nitrogen = N)
- Count up the # of electrons with the highest quantum # (for Nitrogen, that's five.)

$$2s^2\,2p^3$$

II. Electron Dot Diagrams (Nitrogen)

- Use dots for electrons.
- Pair up the"s" electrons.
- Don't pair others unless you have to.

$$2s^2 2p^3 = 5$$

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II. Electron Dot Diagrams (Nitrogen)

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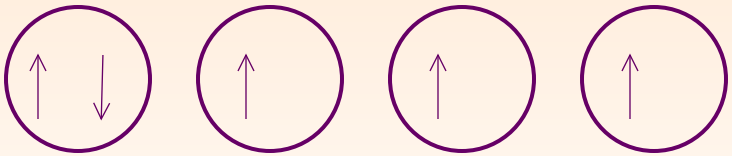
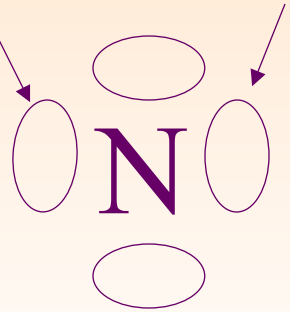
Four regions around each symbol

Each region can have at most two electrons

$2s^2 2p^3$





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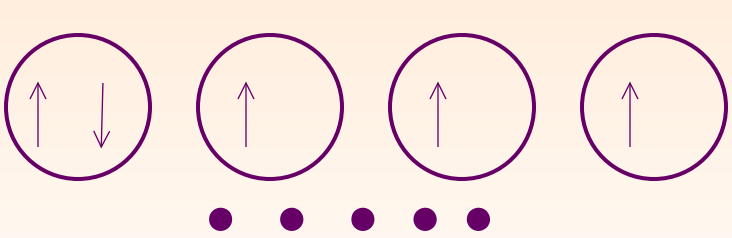
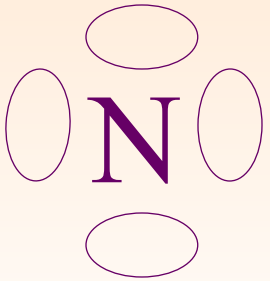
$2s^2 2p^3$





electrons

II. Electron Dot Diagrams (Nitrogen)

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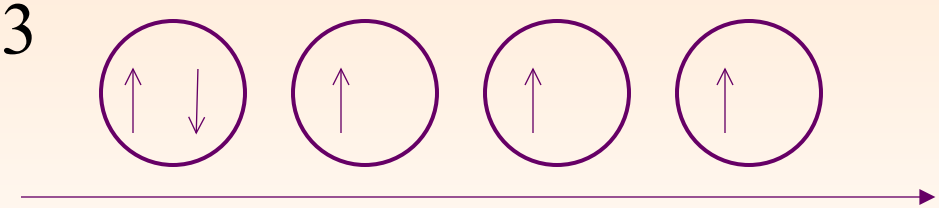
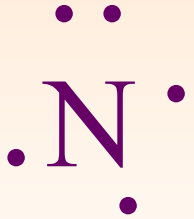
$2s^2 2p^3$





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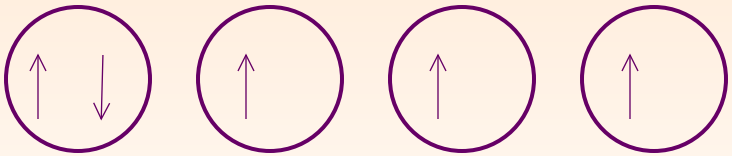
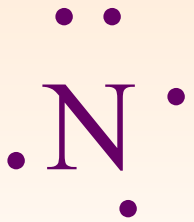
To a maximum of eight

$2s^2 2p^3$





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