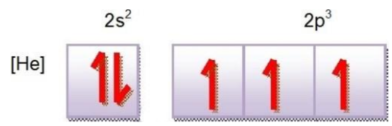
LEWIS DOT STRUCTURES/DIAGRAMS

Lewis Dot Structure/Diagram for an ATOM:

The Electron Configuration for a Nitrogen atom is [He] $2s^2$ $2p^3$

The Orbital Diagram for N is



Thus, the Valence Shell of N is $2s^2$ $2p^3$ with a total of 5 Valence Electrons (= sum of exponents in the Valence Shell).

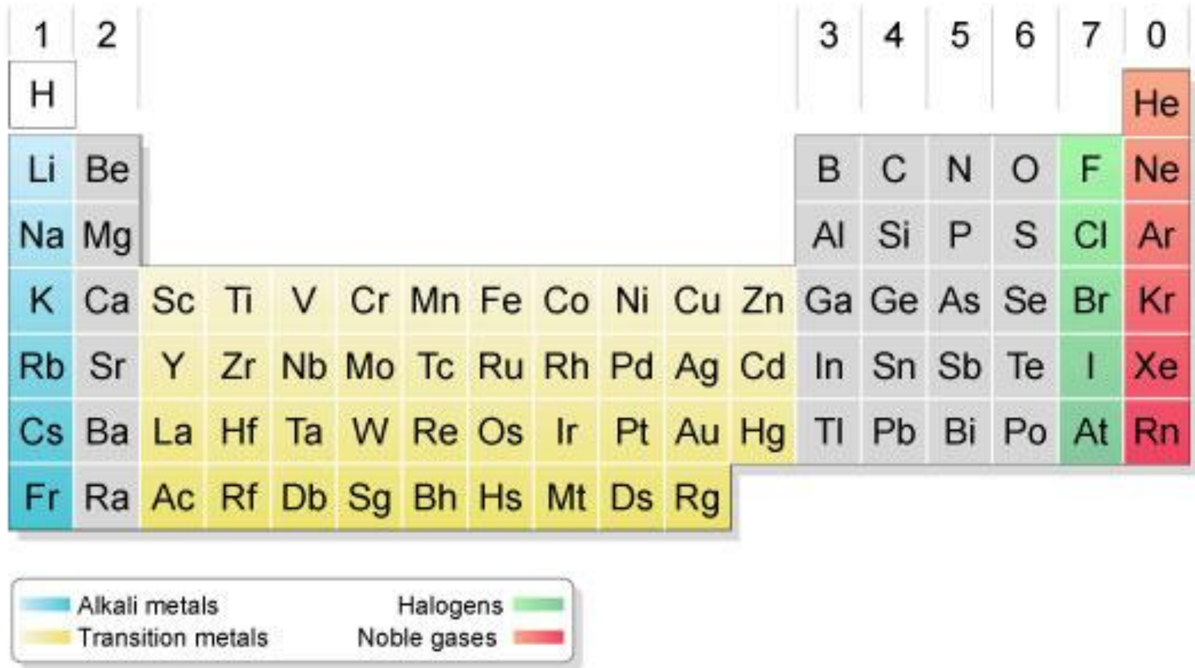
As easier way to determine the number of Valence Electrons is to look at the Group Number in the Periodic Table. N is in Group 5, which means it has 5 Valence Electrons.

So the Lewis Dot Structure/Diagram for N has 5 dots around the N atom. 2 dots are in a pair for $2s^2$ and 3 dots are unpaired for $2p^3$

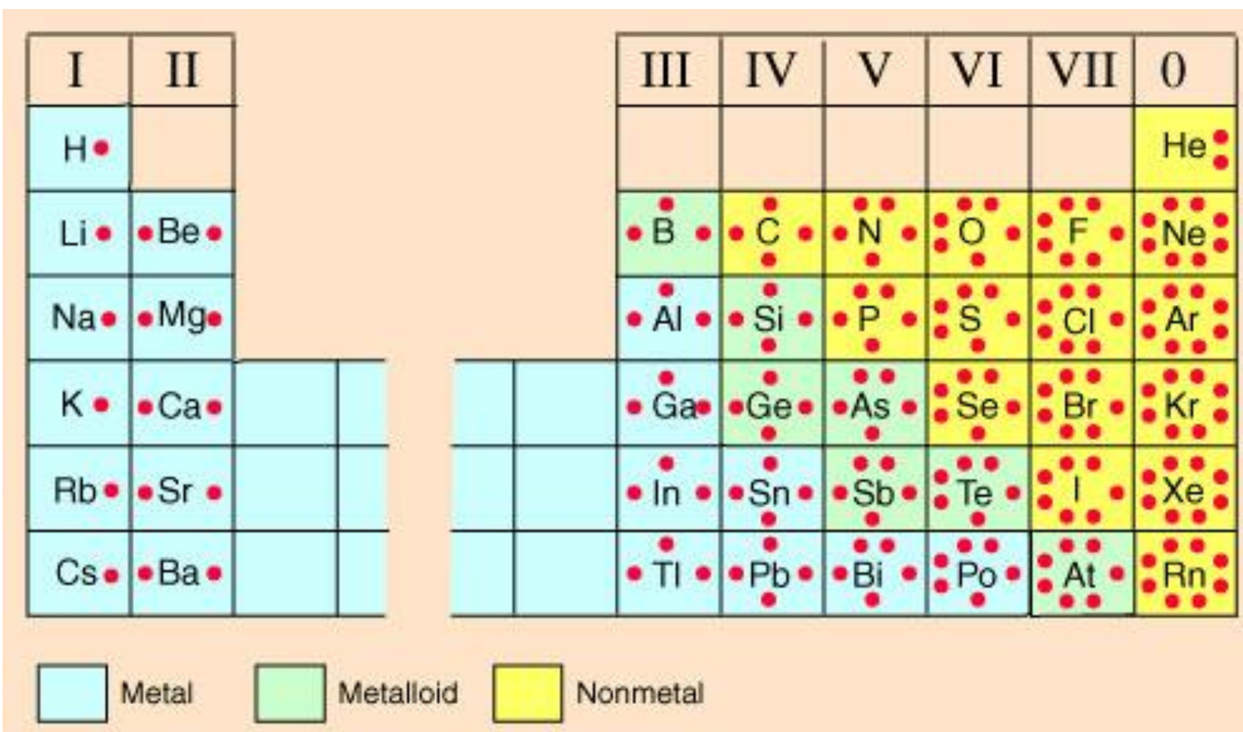
Try These!

P	H
O	S
F	Cl

Periodic Table with Group Numbers:



Periodic Table with Group Numbers and Valence Electrons:



Lewis Dot Structure/Diagram for a MOLECULE:

1) Count the number of Valence Electrons (= Group Number) for each element.
2) Add these together for the total Valence Electrons for the molecule (even!)
   a. If the molecule is a polyatomic ion:
      i. Anions: for negative charges, add electrons to this total
      ii. Cations: for positive charges, subtract electrons from this total
3) Make the least electro-negative atom the central atom.
   a. Electronegativity decreases down a group and from right to left across a period; *Fr is the least electro-negative.*
   b. *H and F can never be the central atom because they each need only one electron to complete their respective duplet and octet*.
   c. *Halogens are rarely the central atom*.
4) Draw a skeletal structure. Write the rest of the atoms around the central atom, connecting each of them to the central atom with a line.
   a. Each line indicates a single bond, which involves 2 Valence Electrons.
5) Complete the Octets of each of the outer atoms, by drawing 6 dots in 3 pairs around the element symbol (to be added to the 2 electrons accounted for by the single bond with the central atom).
   a. 1^{st} period element (H): Maximum 2 electrons (Duplet Rule).
6) Complete the Octet of the central atom by drawing dots (to be added to the 2 electrons for each single bond already drawn).
   a. 2^{nd} period elements: Maximum 8 electrons in outermost shell (Octet Rule).
      i. Exceptions: *Be can have 4 electrons and B can have 6 electrons.*
   b. 3^{rd} period (and beyond) elements: Can have more than 8 electrons because of the empty 3d orbitals (Expanded Octet Rule).
      i. *Al can have 6 or 8 electrons*.
      ii. *P, Cl, Se, and Sb and can have 8 or 10 electrons*.
      iii. *S, Br, I, and Xe can have 8, 10, or 12 electrons*.
7) Count the sum of the electrons in the structure
   a. each dot = 1 electron; each line = 2 electrons
8) Compare this sum from the structure to the total Valence Electrons for the molecule (from Step 2). If these are equal, the structure is complete!
   a. If the sum of the electrons in the structure is more that the total Valence Electrons of the molecule:
      i. Erase one pair of electrons from both an outer atom and the central atom; make the bond between those a double bond. Then re-count the sum of the electrons in the structure.
      ii. Repeat with another outer atom as necessary.
      iii. If all possible double bonds have been formed and there are still more electrons in the structure than there should be, erase another pair of electrons from both an outer atom and the central atom; make the bond between these a triple bond. Then re-count.
      iv. Repeat with another outer atom as necessary.

Try these!

PH_3	BrO_3^-
P: 1 x 5 = 5 H: 3 x 1 = 3	Br: 1 x 7 = 7 O: 3 x 6 = 18 1-: 1 x 1 = 1
SO_3	CO
S: 1 x 6 = 6 O: 3 x 6 = 18	C: 1 x 4 = 4 O: 1 x 6 = 6
CH_2O	BrF_5
C: 1 x 4 = 4 H: 2 x 1 = 2 O: 1 x 6 = 6	Br: 1 x 7 = 7 F: 5 x 7 = 35