Combining Capacity of Elements

Learning Goals

- I can use diagrams to show atoms and molecules.
- I can classify compounds as ionic or covalent.

Combining Capacity of Elements

Definition of Combining Capacity:

- An element's combining capacity is the number of **electrons** it needs to **gain or lose** in order to be a **stable ion**.
- It is also the subsequent **ionic charge** that the element possesses.

NOTE: Combining capacity will be used later on to predict chemical formulas so it is **essential** that you know how to figure them out.

Recall:

- Metals lose electrons.

  (positive ion → **CATION**)

- Non-metals gain electrons.

  (negative ion → **ANION**)

We will use examples to help you learn about combining capacities.

Element and its Lewis Diagrams

1. lithium

Combining Capacity/Ionic Charge

Element and its Lewis Diagrams

1. lithium

Li •

needs to lose 1 electron to be stable

Combining Capacity/Ionic Charge

Element and its Lewis Diagrams

1. lithium

Combining Capacity/Ionic Charge

+1

Element and its Lewis Diagrams

2. beryllium

Combining Capacity/Ionic Charge

Element and its Lewis Diagrams

2. beryllium

Combining Capacity/Ionic Charge

Element and its Lewis Diagrams

2. beryllium

Combining Capacity/Ionic Charge

$+2$

Element and its Lewis Diagrams

3. boron

Combining Capacity/Ionic Charge

Element and its Lewis Diagrams

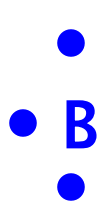
3. boron

needs to lose 3 electrons to be stable

Combining Capacity/Ionic Charge

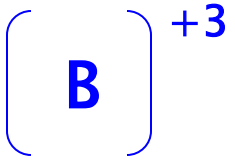
Element and its Lewis Diagrams

3. boron



needs to lose 3 electrons to be stable

becomes



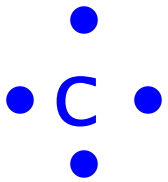
Combining Capacity/Ionic Charge

+3

NOTE: ALWAYS treat boron as a metal!

Element and its Lewis Diagrams

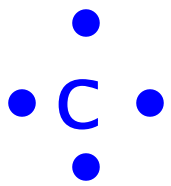
4. carbon



Combining Capacity/Ionic Charge

Element and its Lewis Diagrams

4. carbon

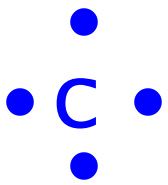


needs to gain
4 electrons to
be stable

Combining Capacity/Ionic Charge

Element and its Lewis Diagrams

4. carbon



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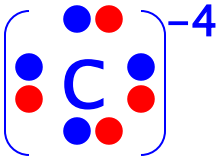
becomes

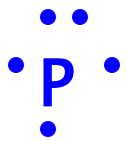


Combining Capacity/Ionic Charge

−4

Element and its Lewis Diagrams

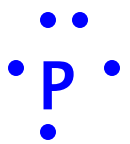
5. phosphorus



Combining Capacity/Ionic Charge

Element and its Lewis Diagrams

5. phosphorus



needs to gain
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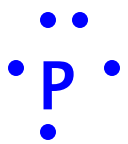
Combining Capacity/Ionic Charge

Element and its Lewis Diagrams

5. phosphorus



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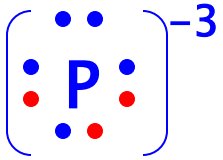
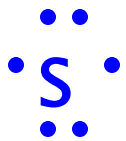


Combining Capacity/Ionic Charge

−3

Element and its Lewis Diagrams

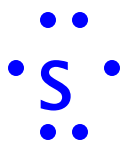
6. sulfur



Combining Capacity/Ionic Charge

Element and its Lewis Diagrams

6. sulfur

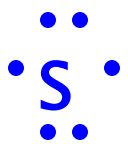


needs to gain
2 electrons to
be stable

Combining Capacity/Ionic Charge

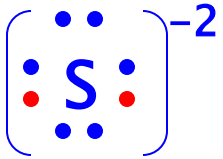
Element and its Lewis Diagrams

6. sulfur



needs to gain
2 electrons to
be stable

becomes

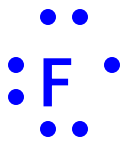


Combining Capacity/Ionic Charge

−2

Element and its Lewis Diagrams

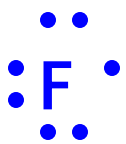
7. fluorine



Combining Capacity/Ionic Charge

Element and its Lewis Diagrams

7. fluorine

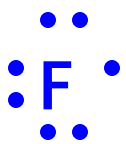


needs to gain
1 electron to
be stable

Combining Capacity/Ionic Charge

Element and its Lewis Diagrams

7. fluorine



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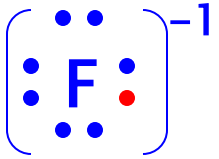


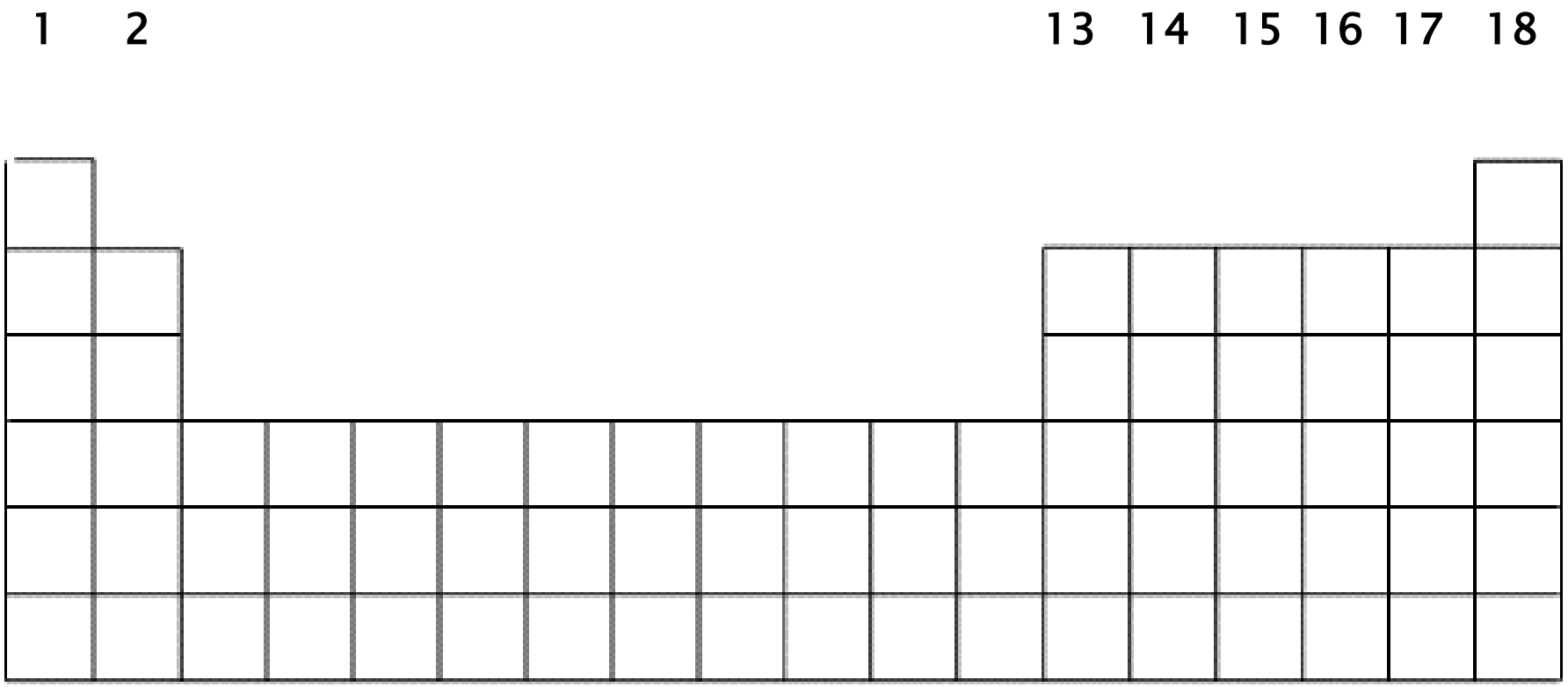
Combining Capacity/Ionic Charge

−1

Summary:

Combining Capacities of Elements (red)

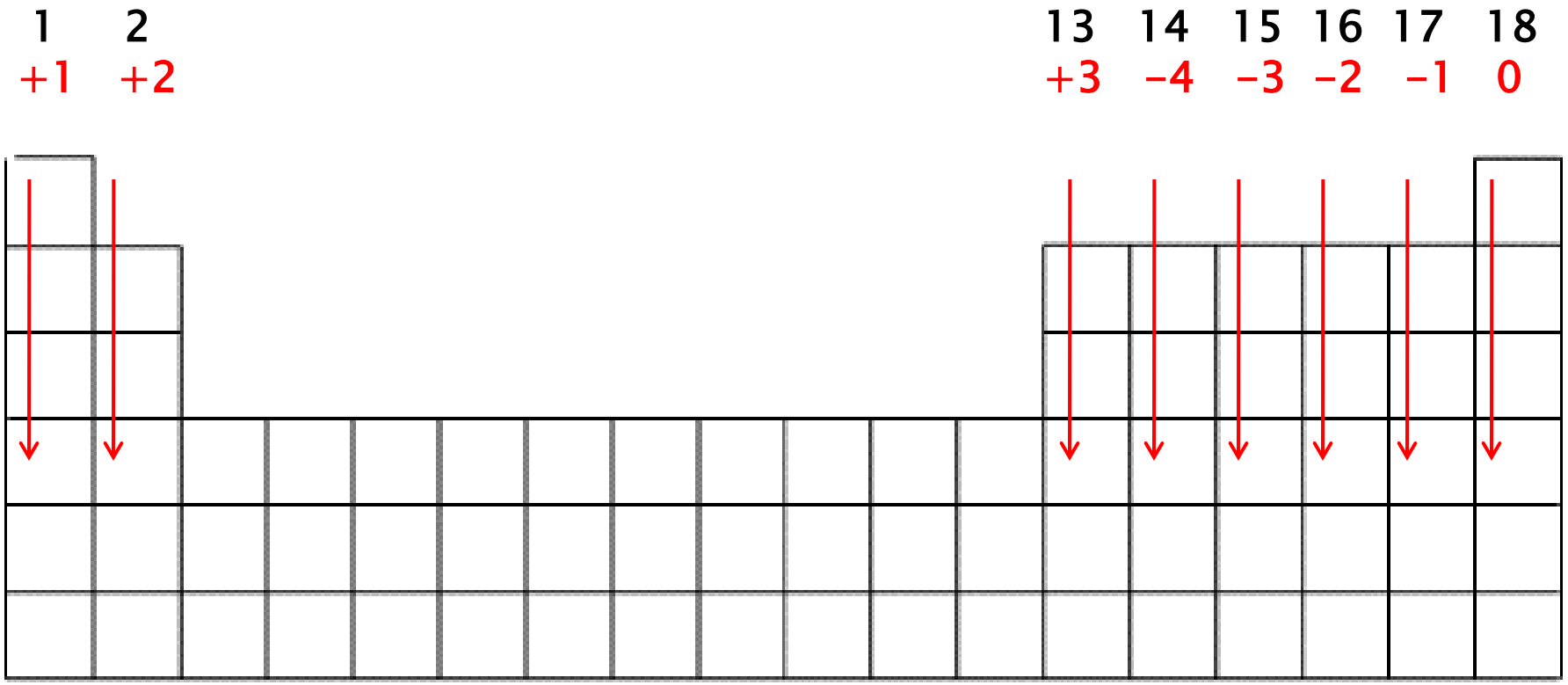
Number of Valence Electrons in Outermost Shell (blue)



Summary:

Combining Capacities of Elements (red)

Number of Valence Electrons in Outermost Shell (blue)



Summary:

Combining Capacities of Elements (red)

Number of Valence Electrons in Outermost Shell (blue)