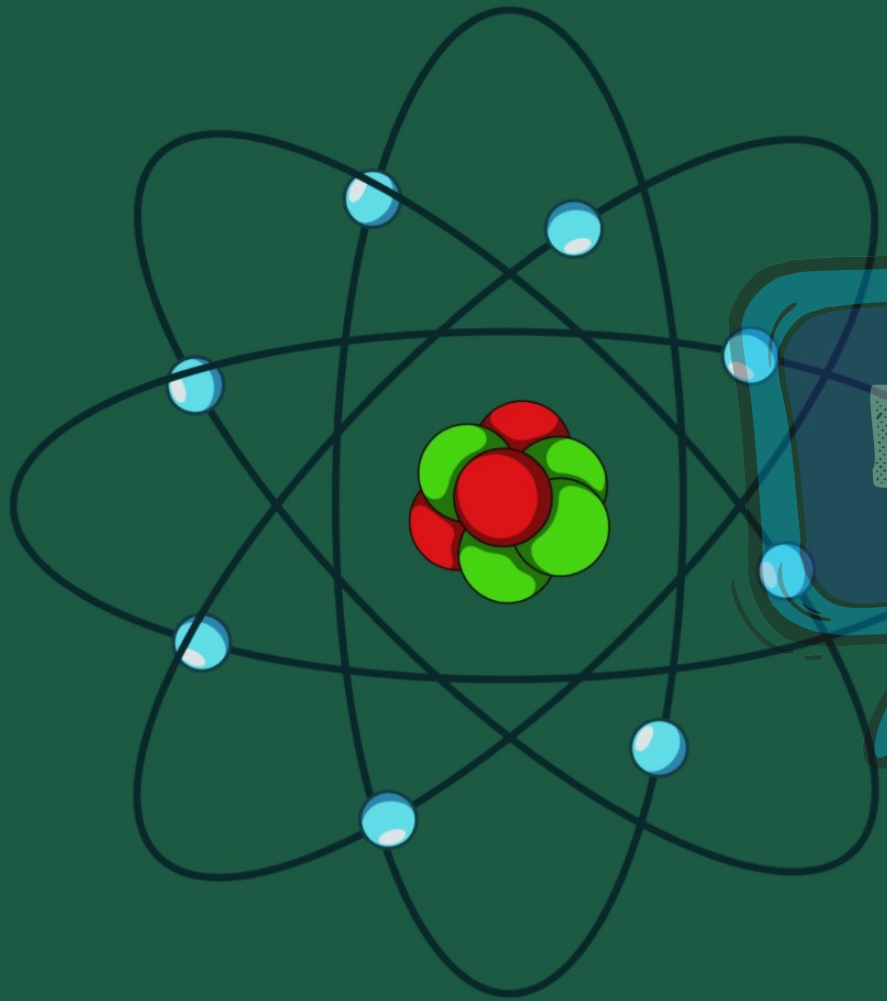
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Class–9

SCIENCE

Chapter – 4

Structure of the Atom

Part – 2

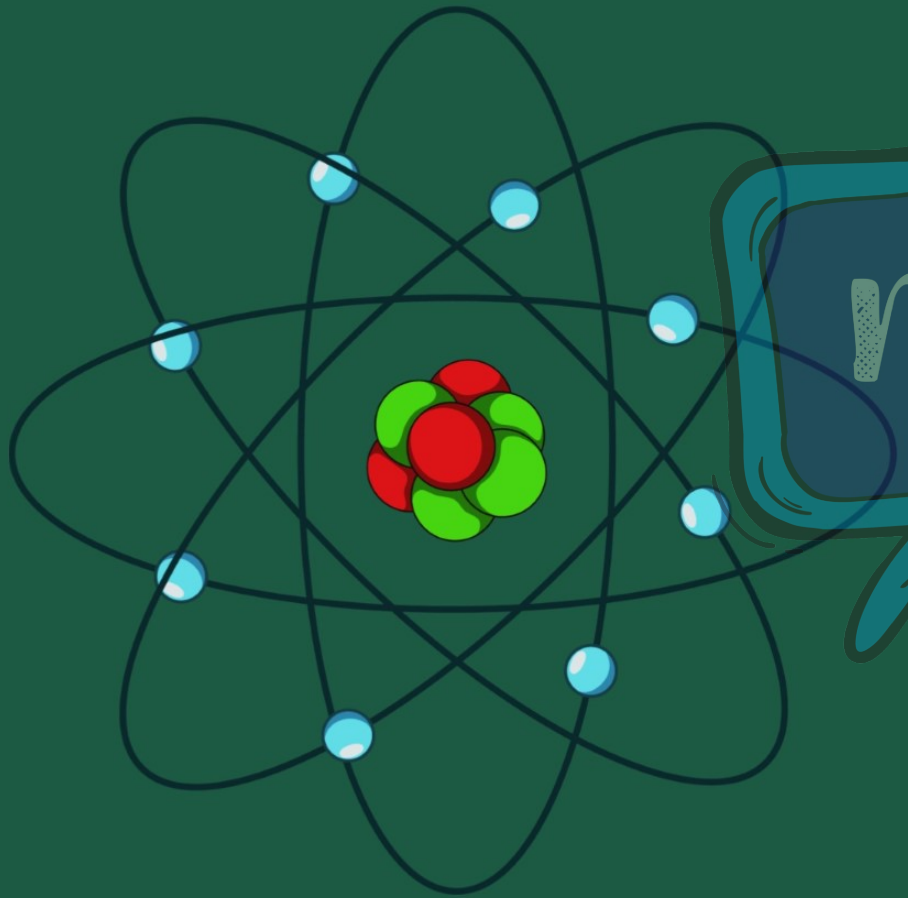
Electron Distribution & Valency

Deeksha Pahilajani

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OVERVIEW

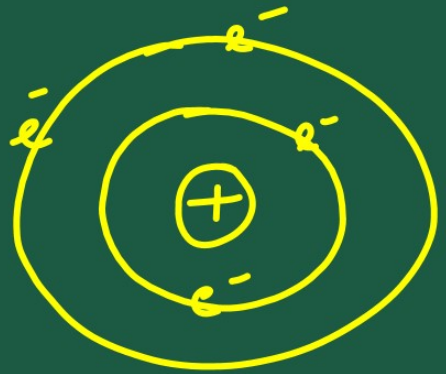
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1. Models of an atom
2. Electron Distribution & Valency
3. Atomic Number & Mass Number

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BOHR'S MODEL OF ATOM

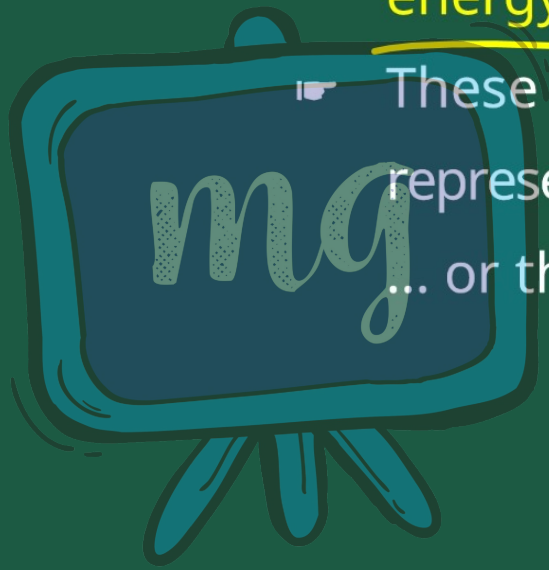
- Proposed by Neils Bohr in 1913
- Postulates
- Electrons revolve only in certain fixed orbits around the nucleus.
- While revolving in discrete orbits, the electrons do not radiate energy.



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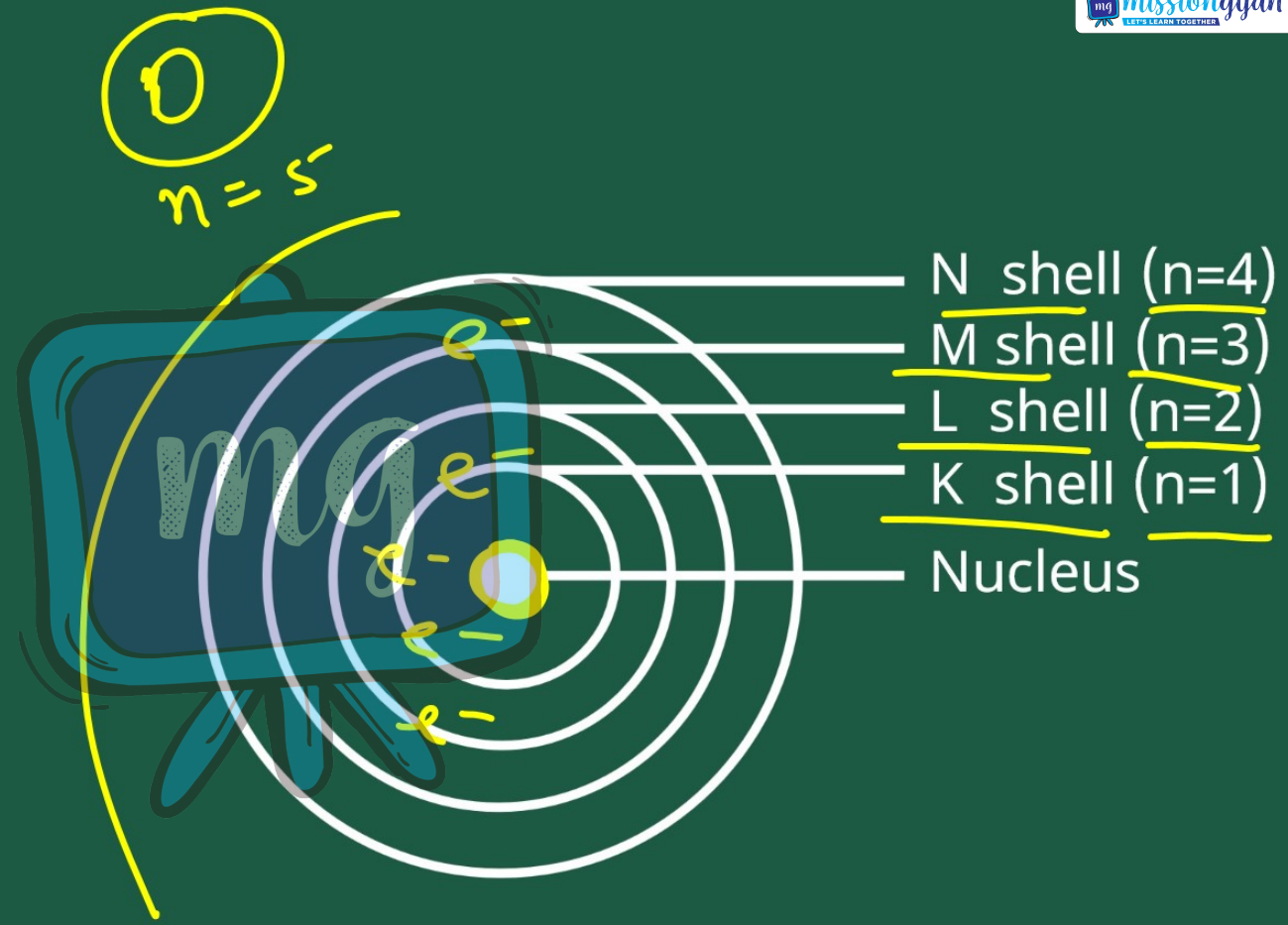
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- These orbits or shells are called energy levels.
- These orbits or shells are represented by the letters K, L, M, N, ... or the numbers, n = 1, 2, 3, 4, ...



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DISTRIBUTION OF ELECTRONS

- The distribution was suggested by Bohr and Bury.

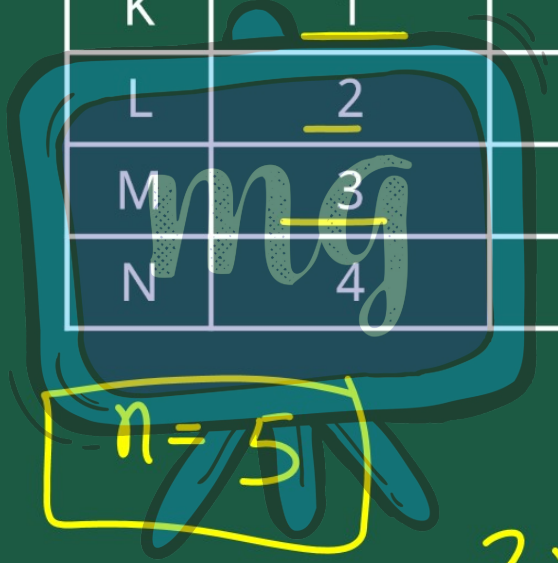
Rules :

- The maximum number of electrons present in a shell is given by the formula $2n^2$, where 'n' is the orbit number or energy level index, 1, 2, 3, ...

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Shell	Value of (n)	Maximum number of electrons ($2n^2$)
K	1	$2 \times 1^2 = 2$
L	2	$2 \times 2^2 = 8$
M	3	$2 \times 3^2 = 18$
N	4	$2 \times 4^2 = 32$



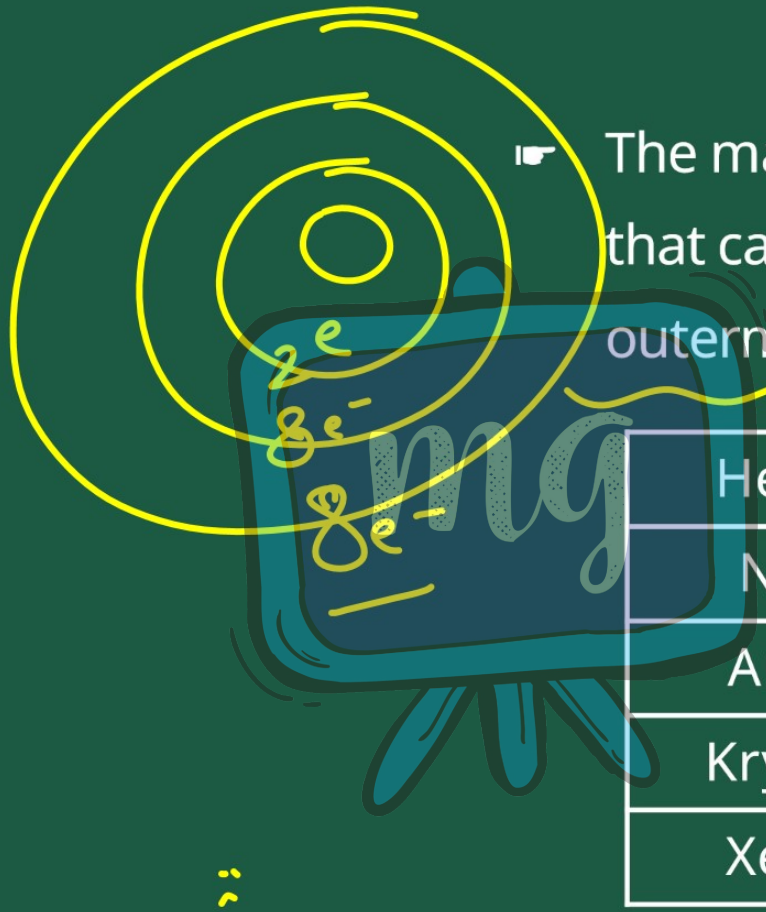
$n = 5$

$2n^2$

$2 \times 5^2 = 50$

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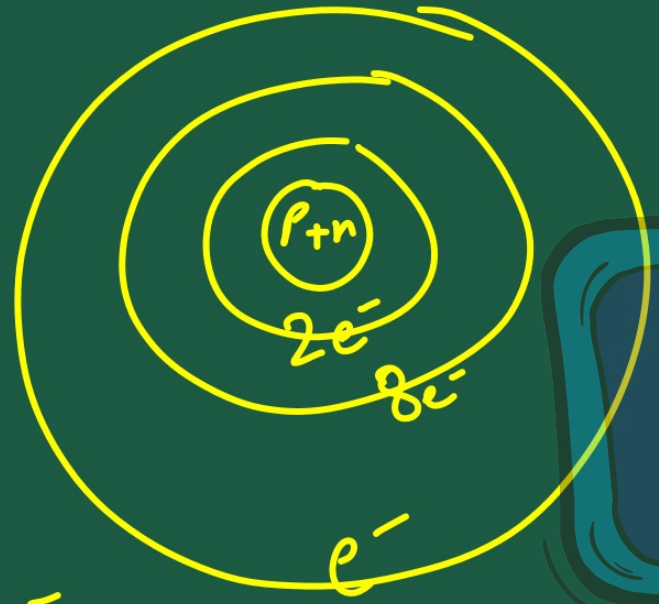


The maximum number of electrons that can be accommodated in the outermost orbit is 8.

Helium	2
Neon	2, 8
Argon	2, 8, 8
Krypton	2, 8, 18, 8
Xenon	2, 8, 18, 18, 8

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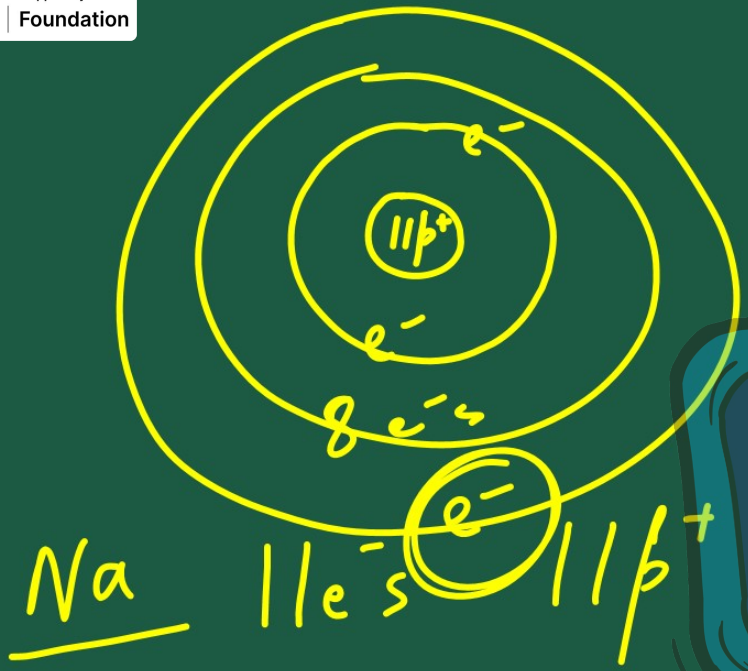
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- The shells are always filled in a step-wise manner from the lower to higher energy levels.
- Electrons are not filled in the next shell unless previous shells are filled.

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VALENCY

- The electrons present in the outermost shell of an atom are known as the valence electrons.
- The combining capacity of the atoms i.e. their tendency to react and form molecules with atoms of the same or different elements is known as valency of the atom.

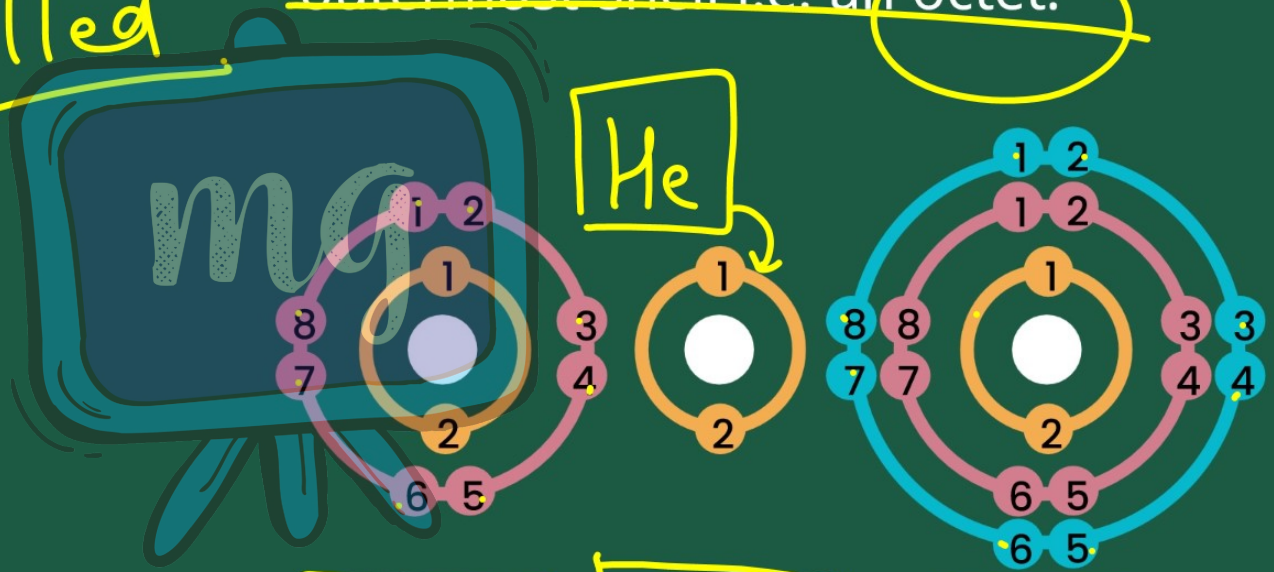
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fully filled

Imp.

☛ Atoms attempt to attain a fully-filled outermost shell i.e. an octet.



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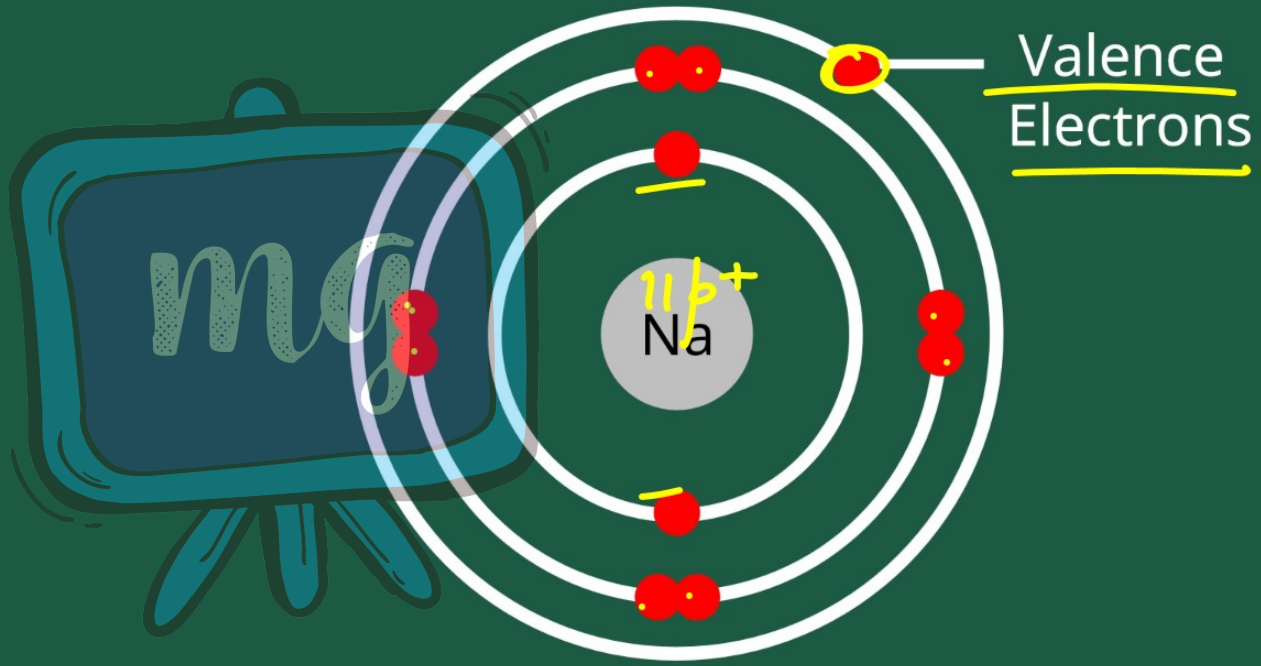
- Atoms of elements, having a completely filled outermost shell show little chemical activity.
- Their combining capacity or valency is zero.

Example: He, Ne.

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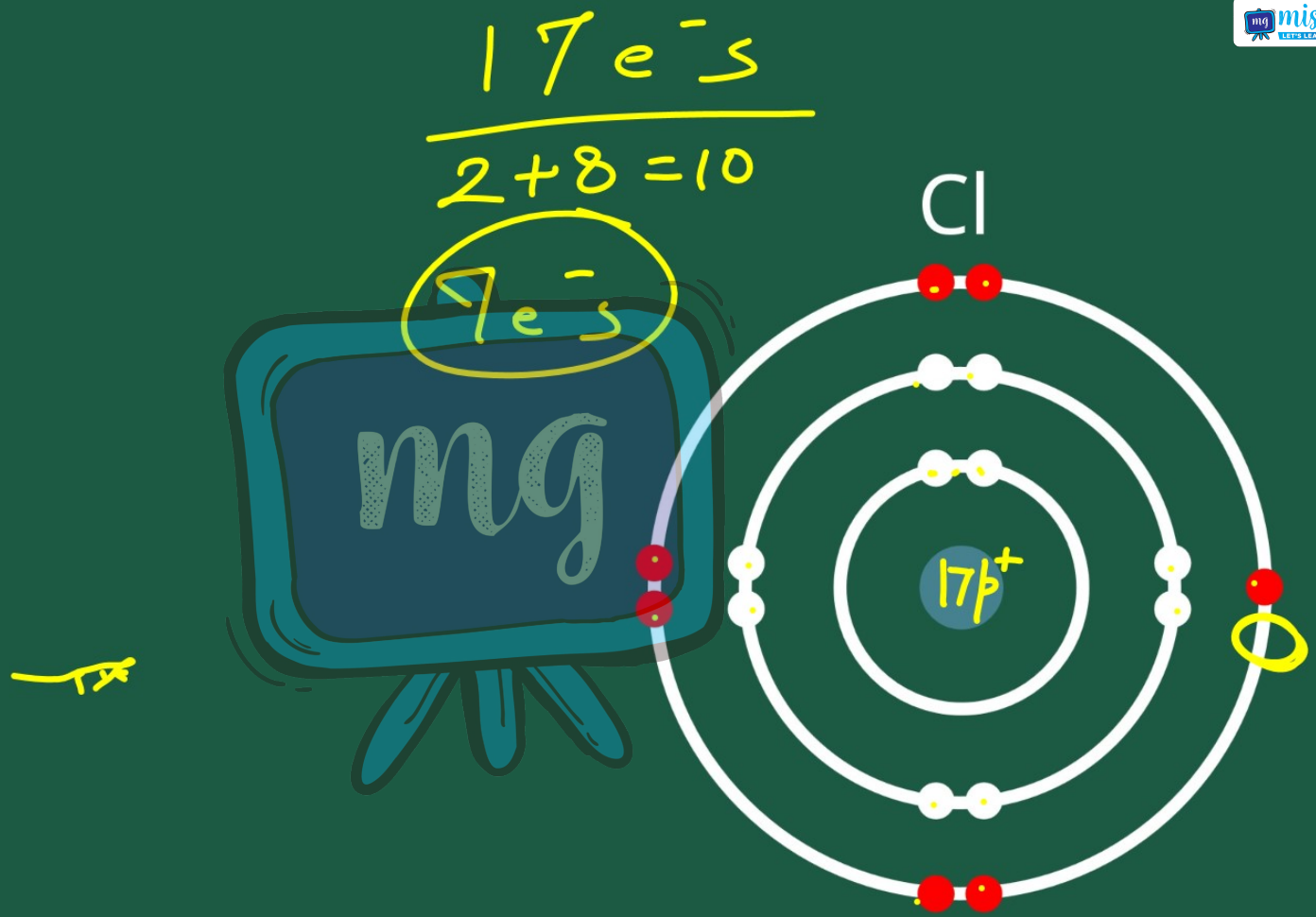
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11 e^-s



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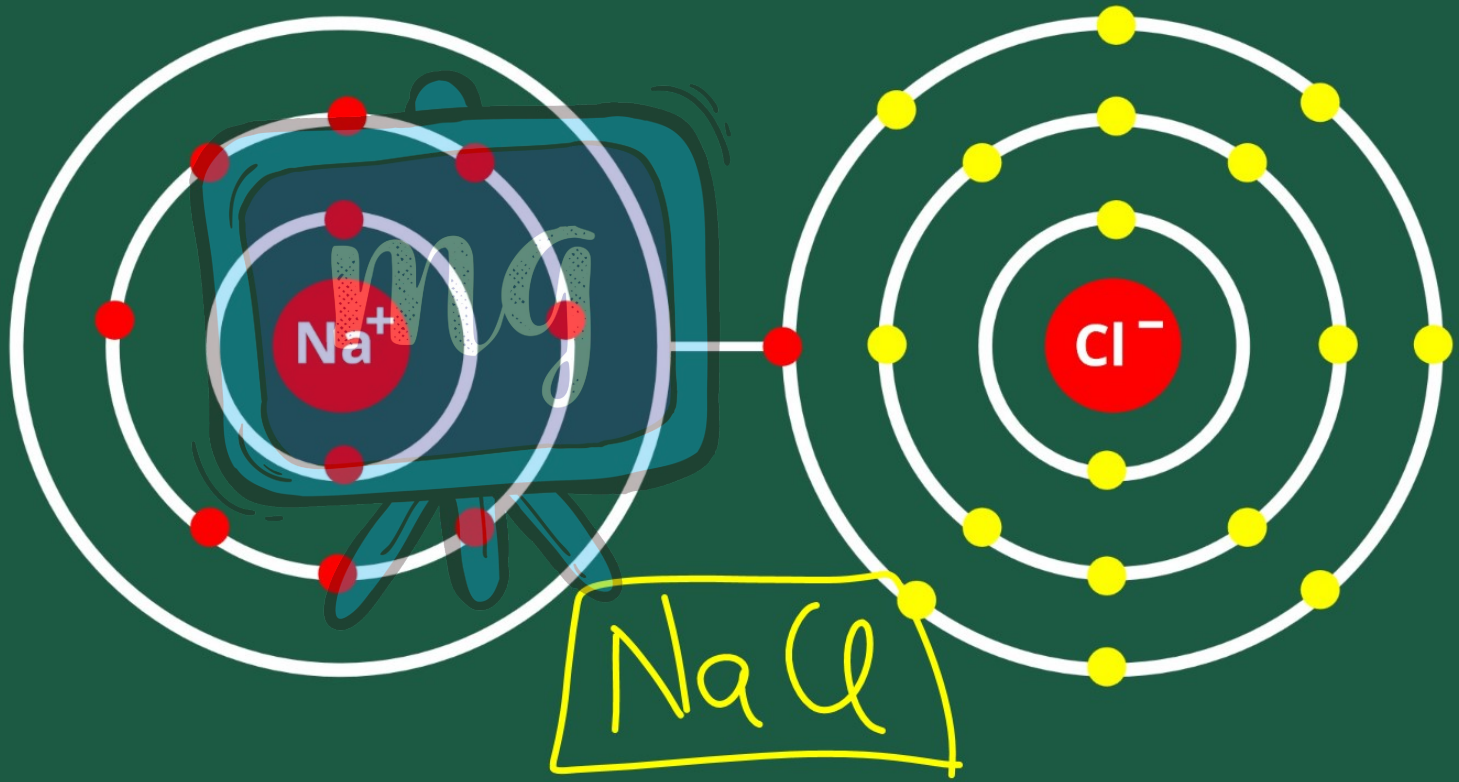
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$11p^+$ $10e^-$ $17p^+$ $18e^-$



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8 e⁻s O^{-2} CH_4 methane

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More than 4 e⁻s

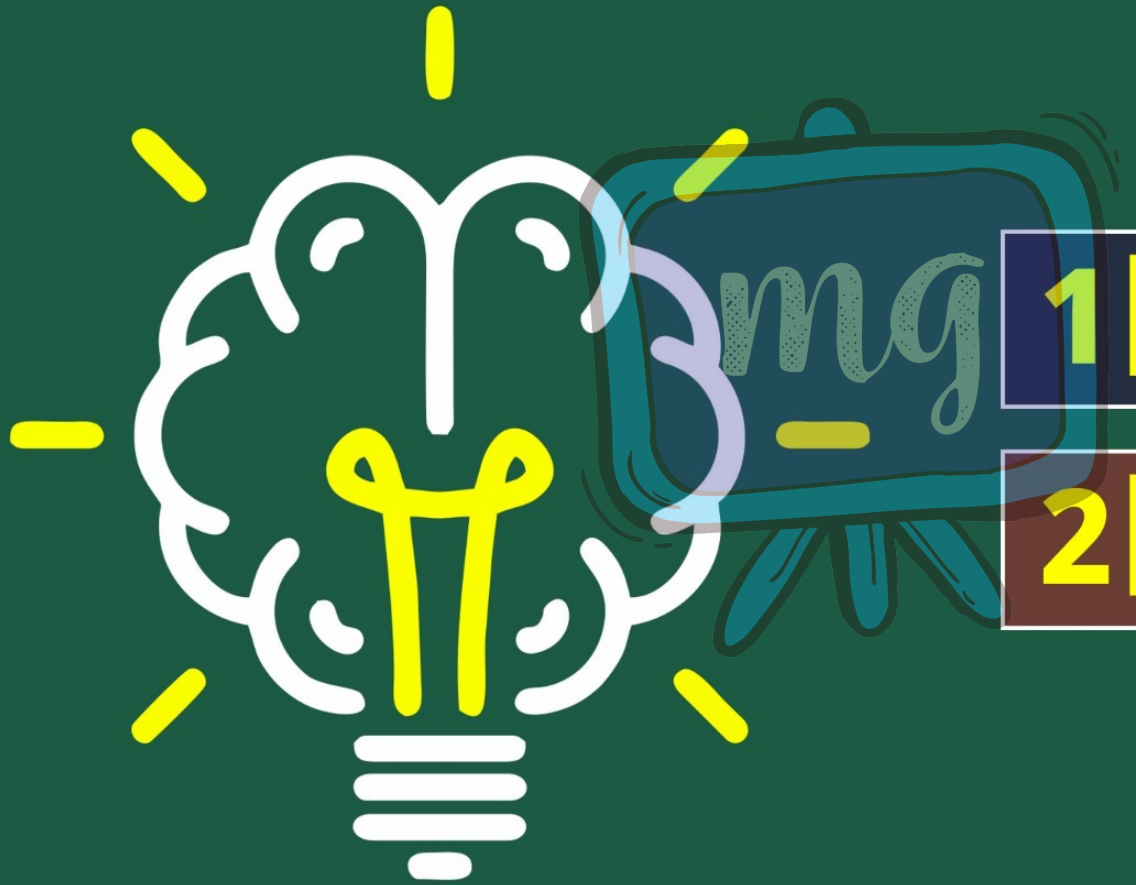
5 + 3 = 8

Elements	Atomic Number	Electronic Configuration K L M N	Valency
Hydrogen	1	1	1
Helium	2	2	0
Lithium	3	2 1	1
Beryllium	4	2 2	2
Boron	5	2 3	3
Carbon	6	2 4	4
Nitrogen	7	2 5	3
Oxygen	8	2 6	2
Fluorine	9	2 7	1
Neon	10	2 8	0

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LEARNING OUTCOMES

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1. Bohr's Model of Atom
2. Distribution of Electrons in an Atom

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ASSESSMENT

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1 The maximum number of electrons that can be accommodated in the third shell/orbit of an atom is:

A 2

B 8

C 18

D 32

$2n^2$

$2 \times 3^2 = 18$ e⁻

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ASSESSMENT

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2 The electronic configuration of the element with atomic number 15 is-

- A 2, 8, 4, 1
- B 2, 5, 8
- C 2, 8, 5
- D 2, 8, 1, 4

K L M

2 8 5

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ASSESSMENT

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3 Number of valence electrons in Cl^- ion are:

A 16

B 8

C 17

D 18

Cl^- ion

$17e^- s + 1$

$2, 8, 7 = 18e^- s$