Structure of Atom

Module 2

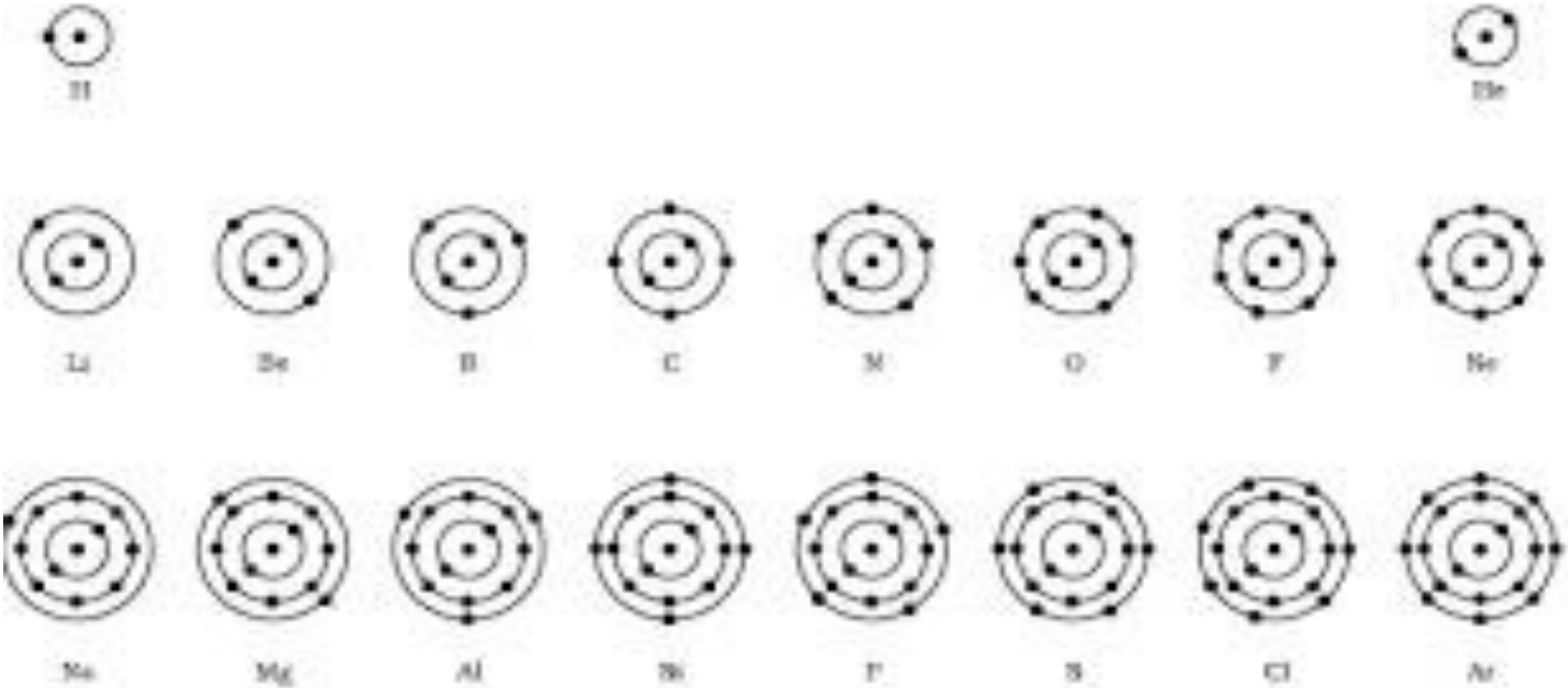
Distribution of Electrons

Valency

Atomic number and Mass Number

Isotopes And Isobars

Distribution of electrons in first 18 elements



Valency :

The number of electrons gained, lost or shared by the atom of an element so as to complete its octet in its valence shell or outermost shell (or duplet in case of elements having only K shell) is called the ***valency*** of the element.

Name of Element	Symbol	Atomic Number	Number of Protons	Number of Neutrons	Number of Electrons	Distribution of Electrons				Valency
						K	L	M	N	
Hydrogen	H	1	1	-	1	1	-	-	-	1
Helium	He	2	2	2	2	2	-	-	-	0
Lithium	Li	3	3	4	3	2	1	-	-	1
Beryllium	Be	4	4	5	4	2	2	-	-	2
Boron	B	5	5	6	5	2	3	-	-	3
Carbon	C	6	6	6	6	2	4	-	-	4
Nitrogen	N	7	7	7	7	2	5	-	-	3
Oxygen	O	8	8	8	8	2	6	-	-	2
Fluorine	F	9	9	10	9	2	7	-	-	1
Neon	Ne	10	10	10	10	2	8	-	-	0
Sodium	Na	11	11	12	11	2	8	1	-	1
Magnesium	Mg	12	12	12	12	2	8	2	-	2
Aluminium	Al	13	13	14	13	2	8	3	-	3
Silicon	Si	14	14	14	14	2	8	4	-	4
Phosphorus	P	15	15	16	15	2	8	5	-	3,5
Sulphur	S	16	16	16	16	2	8	6	-	2
Chlorine	Cl	17	17	18	17	2	8	7	-	1
Argon	Ar	18	18	22	18	2	8	8		0

Atomic Number and Mass Number

- What element an atom is depends on the number of protons in the atom's nucleus, called its **atomic number** (**Z**).

$$Z = \text{number of protons}$$

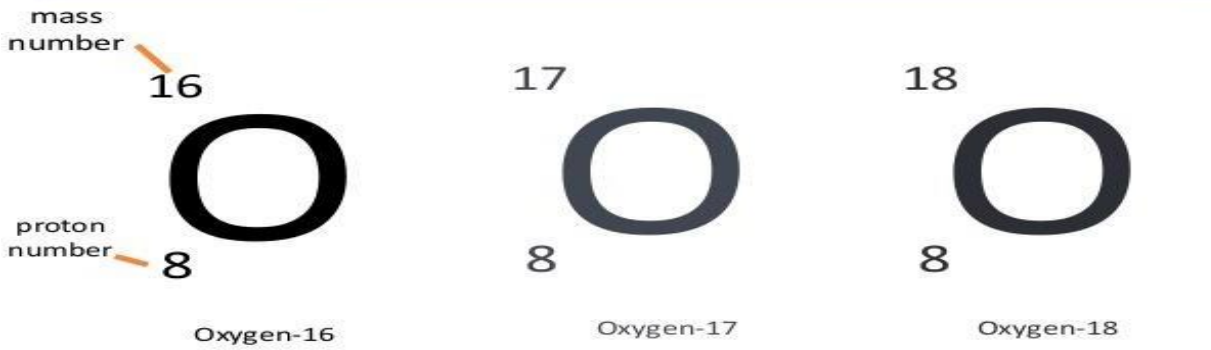
- The **mass number** (**A**) of an atom is the number of protons and neutrons in its nucleus.

$$A = \text{number of protons} + \text{number of neutrons}$$

ATOMIC NUMBER VERSUS MASS NUMBER

ATOMIC NUMBER	MASS NUMBER
Atomic number is the number of protons present in an atom	Mass number is the sum of the number of protons and the neutrons of an atom
Not affected by number of neutrons	Affected by the number of neutrons
Isotopes have the same atomic number	Isotopes have different mass numbers
Isobars cannot have the same atomic number	Isobars have the same mass number
Always a smaller value than the mass number	Always a larger value than the atomic number

Isotopes



Isobar

- Same atomic mass
- Different elements

$^{22}_{10}Ne$ $^{22}_{11}Na$

$^{40}_{18}Ar$ $^{40}_{19}K$

ISOTOPES VERSUS ISOBARS

ISOTOPES	ISOBARS
Isotopes are different atomic structures of the same element	Isobars are chemical elements having the sam atomic mass
Atomic numbers are equal to each other	Atomic numbers are different from each othe
Atomic masses are different from each other	Atomic masses are equal to each other
The same chemical element in different forms	Different chemical elements
Physical properties are different from each other	Physical properties are often similar

Applications of Isotopes

Radioactive Isotope	Industrial Applications
Americium-241	For uniform thickness when rolling steel and paper, determine location of oil wells
Sodium-24	Oil well studies and to locate leaks in pipe lines
Iridium-192	Test integrity of boilers and aircraft parts
Uranium-235	Nuclear power plant and naval propulsion systems fuel, production of fluorescent glassware and colored wall tiles
Californium-252	Determine moisture content of soil – important for road construction and building industries

Radioactive Isotope	Applications in Medicine
Cobalt-60	Radiation therapy to prevent cancer
Iodine-131	Locate brain tumors, monitor cardiac, liver and thyroid activity
Carbon-14	Study metabolism changes for patients with diabetes, gout and anemia
Carbon-11	Tagged onto glucose to monitor organs during a PET scan
Sodium-24	Study blood circulation
Thallium-201	Determine damage in heart tissue, detection of tumors
Technetium-99m	Locate brain tumors and damaged heart cells, radiotracer in medical diagnostics (imaging of organs and blood flow studies)

End of Module 2