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What Is Valency?

Define Valency

The combining capacity of an atom is known as its valency. The number of bonds that an atom can form as part of a compound is expressed by the valency of the element.

We all know how electrons in an atom are arranged in shells/orbitals. **Valence electrons are those electrons which are present in the outermost orbit of the atom.** From the Bohr-bury scheme, we can say that the outermost shell can contain a maximum of 8 electrons. Only a little chemical activity is observed when the outermost shell is completely filled. We can also say that it's combining capacity becomes zero.

For example, nitrogen forms a number of compounds with hydrogen such as NH_3 , N_2H_4 , N_3H in which **nitrogen atoms** have valencies of 3, 2 and 1/3 respectively. Thus, this concept of valency as a mere number was not clear. Therefore, later on valency was defined as the number of chemical bonds formed by an atom in a molecule.

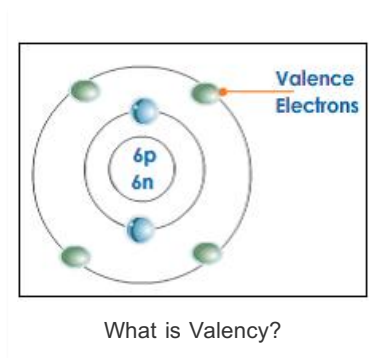
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Concept of Valency

Noble gases have a completely filled outermost shell and that's why they are least reactive. Other element's reactivity depends upon their ability to attain the noble gas configuration. In this section, we shall learn more about the valency of an atom.



If the *outermost shell has 8 electrons then the element is said to have a complete octet*. By gaining, sharing and losing the electrons the atoms complete their outermost orbital and make an octet.

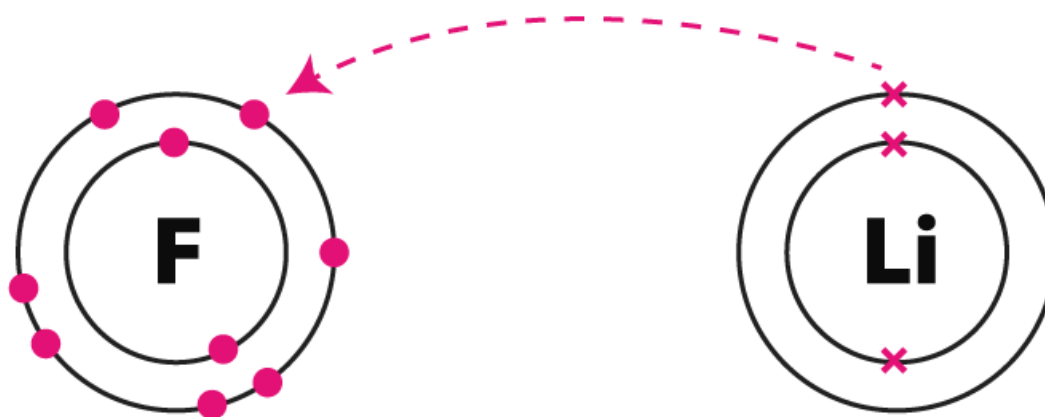
The capacity of an atom is described by the total number of electrons lost, gained or shared to complete its octet and it also determines the valency of the atom.

How to Find Valency of Elements?

As we know, the number of electrons in the outermost shell of hydrogen is 1, and in **magnesium**, it is 2. Therefore the valency of hydrogen is 1 as it can easily lose 1 electron and become stable. On the other hand, that of magnesium is 2 as it can lose 2 electrons easily and also attain stability.

Furthermore, it is not only determined when an atom loses an electron. For example, fluorine has 7 electrons in its outermost orbital. It is hard to lose 7 electrons and so it completes its octet by gaining 1 electron. Since it gains 1 electron, its valency is 1. In the **periodic table**, the elements in the same group have the same valency.

For example, all the elements in group 8 have 8 electrons and completely filled orbitals, that is why the valency of all the elements in this group is zero.



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Sharing of electron between Li & F

Difference between Valency and Oxidation Number

Valency is different from the oxidation number, and it has **NO SIGN**. Thus, the valency of nitrogen is 3, whereas it can have oxidation numbers from -3 to +5. The **oxidation number** is the hypothetical charge of an atom in a molecule or ion, and it is a measure of its apparent capacity to gain or lose electrons within that species.

Valency of First 30 Elements

Let us look at the valency of the first 30 elements of the periodic table.

Element	Atomic Number	Valency
Valency of Hydrogen	1	1
Valency of Helium	2	0
Valency of Lithium	3	1
Valency of Beryllium	4	2
Valency of Boron	5	3
Valency of Carbon	6	4
Valency of Nitrogen	7	3
Valency of Oxygen	8	2
Valency of Fluorine	9	1
Valency of Neon	10	0
Valency of Sodium (Na)	11	1
Valency of Magnesium (Mg)	12	2
Valency of Aluminium	13	3
Valency of Silicon	14	4
Valency of Phosphorus	15	3
Valency of Sulphur	16	2
Valency of Chlorine	17	1
Valency of Argon	18	0
Valency of Potassium (K)	19	1
Valency of Calcium	20	2
Valency of Scandium	21	3
Valency of Titanium	22	4
Valency of Vanadium	23	5,4
Valency of Chromium	24	2
Valency of Manganese	25	7, 4, 2
Valency of Iron (Fe)	26	2, 3
Valency of Nickel	27	3, 2
Valency of Cobalt	28	2
Valency of Copper (Cu)	29	2, 1
Valency of Zinc	30	2

Solved Example

Question:

Calculate the valency of phosphorus in phosphorus pentoxide.

Solution:

In Phosphorus pentoxide, two atoms of phosphorus have combined with five atoms of oxygen.

$5 \times 2 = 10$ valency units

Therefore, one atom of phosphorus will have $10/2 = 5$ valency units

So the valency of phosphorus in P_2O_5 is 5.

Frequently Asked Questions – FAQs

What is Valency and example?

An element's valence is the number of hydrogen atoms which can combine with or replace (directly or indirectly) one of the element's atoms. Oxygen, for instance, has six valence electrons but its valence is 2. Some elements may have more than one power combination (or valence), while others may have only one.

Can Valency be negative?

Loss of electron or electron gain called atom charge, Positive charge will be attained by donating an electron and negative charge vice versa. So valence has no sign, Charge has both positive and negative signs.

What is the importance of Valency?

The importance of valence: when two atoms react, their outer shell first comes into contact and it is, therefore, the outer shell electron that is normally involved in a chemical reaction. The atoms exchange valence electrons in a chemical reaction to stabilize their valence shell.

Why is the Valency of nitrogen is 5?

Nitrogen has either 3 or 5 valence electrons and is on the periodic table at the top of Group 15. It can have either 3 or 5 valence electrons, as it can bond in the 2p and 2s orbitals outside. Nitrogen makes up DNA both in the form of nitrogen bases and in neurotransmitters.

How can we calculate Valency?

An atom's valence is equal to the number of electrons in the outer shell when that number is four or fewer. Then the valence in the outer shell is equal to eight minus the number of electrons. Once you are aware of the number of electrons you can calculate the valence easily.

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**Sumanpreet Kaur**

APRIL 28, 2020 AT 8:02 AM

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