

TENDER HEART HIGH SCHOOL, SEC-33B, CHD

CLASS - IX
CHAPTER - I

SUBJECT - CHEMISTRY
TEACHER - ANAMIKA

Good morning to all the students!

Students this lesson is of class - IX for the subject of chemistry Topic - 'Periodic Properties' which is covered in chapter - I, 'Periodic Table, Periodic Properties and variations of Properties' starting on page 6 of your ^{text} book titled - consize chemistry by Selina Publication and is being submitted to you on 14 October 2024

All students may now please open page number 6 of your notebook in front of you.

If all students are ready then let us start with first chapter which is 'Periodic Table, Periodic Properties and variations of Properties'. All students may now please listen carefully.

Periodic Properties :-

The properties of elements which are directly or indirectly related to their electronic configuration - s and p show a regular gradation as we move across a period, from left to right or down the group from top to bottom, are called Periodic Properties.

(P.T.O.)

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Important periodic properties are:-

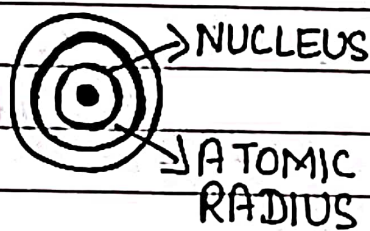
- (i) Atomic size (atomic radius),
- (ii) Metallic character.
- (iii) Non-metallic character,
- (iv) Ionisation potential (ionisation energy).
- (v) Electron affinity.
- (vi) Electronegativity.

Let us discuss these all periodic properties one by one.

(i) Atomic size (atomic radius)

The distance between the centre of the nucleus of an atom is known as atomic size or atomic radius.

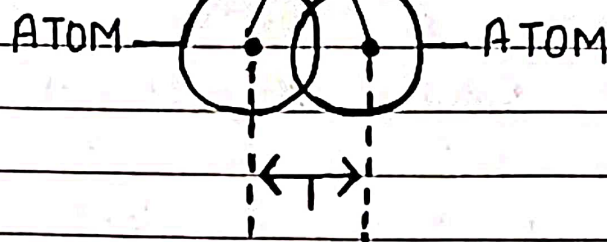
FIGURE-1



You may observe the atomic size of nucleus by Figure-1 on page no-2 of the notes

It can also be defined as half the inter-nuclear distance between the combined atoms in a molecule. You may also observe this also by Figure-2 on page no-3 of the notes

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FIGURE - 2

INTER - NUCLEAR DISTANCE

Its Unit : Angstrom : $1 \text{ \AA} = 10^{-10} \text{ m}$ Picometre : $1 \text{ pm} = 10^{-12} \text{ m}$

Atomic size depends upon:-

(i) number of shells and (ii) nuclear charge.

(i) Number of shells.

An increase in the number of shells increases the size of an atom because the distance between the outermost shell and the nucleus increases.

(ii) Nuclear charge.

It is the positive charge present in the nucleus of an atom, which is equal to the number of protons in the nucleus, i.e., the atomic number.

An increase in nuclear charge decreases the size of the atom because the electrons are then attracted towards the nucleus with a greater force, thereby bringing the outermost shell closer to the nucleus.

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Now, we will do

Trends in atomic size (atomic radius)(a) Down a group :-

As we move down in a group from top to bottom, the atomic size i.e., the charge on the nucleus progressively increases, therefore, due to greater pull, the atomic size should decrease.

Also, as we move down the group, the number of occupied electronic shells increases and therefore, atomic size should increase. But, due to Interpenetrating electronic shells which act as a screen, the outermost electron does not experience the full attractive force of the nucleus. Therefore, the effective nuclear charge is less than the actual nuclear charge. Hence atomic radius increases in moving from top to bottom in a group.

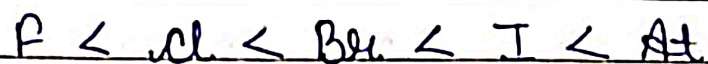
This is illustrated by the variation of atomic radii of the elements of group 1 as shown below:

ATOM	No. of Occupied Shells	Atomic Radius (pm)
Li (Z=3)	2, 1 (2 shells)	152
Na (Z=11)	2, 8, 1 (3 shells)	186
K (Z=19)	2, 8, 8, 1 (4 shells)	231
Rb (Z=37)	2, 8, 18, 8, 1 (5 shells)	244
Cs (Z=55)	2, 8, 18, 18, 8, 1 (6 shells)	262

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In group 17 the size of fluorine is the smallest.



64 99 114 133 140

pm pm pm pm pm

(b) Across a period:-

In general, the atomic size decreases from left to right in a period. This is illustrated when we consider the atomic size of the elements of 2nd period; the atomic radii decrease from Li to F as shown in Table-1 on page no. 5 of the notes

Table-1

Element	Li	Be	B	C	N	O	F
Atomic Size (pm)	152	111	88	77	74	66	64

The decrease in atomic radius across a period from left to right is because of the fact that number of occupied electronic shells is same but the charge on the nucleus is progressively increasing from left to right. Therefore electrons are attracted with a greater force towards the nucleus resulting in more compact atom. This results in decrease in atomic radius.

The atomic radii of noble gases are not considered here because their atomic radii are considerably large because of stable electronic configuration. For example, atomic radius of He is 140 pm.

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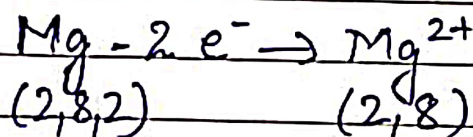
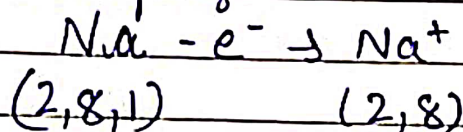
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2 Metallic character:-

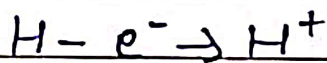
Those elements, which have a tendency to lose their valence electrons or electrons of the outermost orbit and form a positive ion, are considered metals.

for example:-



Note it

Hydrogen is an element (non metal) which does not have a neutron, it has only one electron and one proton. On losing this electron it forms its cation which has only one proton, therefore its cation can also be called a proton.



The metallic character of elements depends on (i) atomic size and (ii) nuclear charge.

- (i) Atomic size:- Greater the atomic size, farther is the outermost orbit, and thus, lesser is the nuclear pull exerted on it. As a result, electron (s) can be removed more easily from the valence shell, thus making the elements more metallic.
- (P.T.O)

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- (ii) Nuclear charge° - Greater the nuclear charge, greater is the force exerted by the nucleus on the electron(s) of the outermost orbit. This makes it difficult to remove the electron(s) from the outermost orbit. Thus metallic nature decreases - es.

Trends in metallic character.Down a group° -

Due to increase in the no. of shells, the distance of the outermost electron from the nucleus increases and therefore, removal of electron to form positive ion becomes easier. Therefore, metallic character increases down the group from top to bottom. Thus, among the elements of group 1, cesium (Cs) is the most metallic element (Francium is not considered as it is radioactive).

Across a period° -

Metallic character or electropositive character decreases from left to right in a period. It is because of the fact that as we move across in a period from left to right, the atomic radius decreases and effective nuclear charge increases. This makes the loss of electron more and more difficult. In a particular period, the first element, i.e., alkali metal is the most metallic element of the period.

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Now, students I will give you three short Questions. You will get a three minutes break to write the answers.

The Questions are:-

- Q1 What is the value of $1 \text{ \AA}$?
- Q2 Out of Li and Cs which would have large atomic radius down a group (from top to bottom)?
- Q3 Thus, among the elements of group 1, (Cs)^(Cesium) is the most metallic element but why, not Francium (Fr)?

I hope you all have written the answer by now. Let us check the answers now.

Ans1 $1 \text{ \AA} = 10^{-10} \text{ m}$

Ans2 ${}^{\text{6}}\text{Cs}$ would have large atomic radius down a group (from top to bottom).

Ans3 It is because, as it is radioactive element.

Students, Now I am ending the chapter by giving instructions and homework.

INSTRUCTIONS:

You all are required to read the lesson again and then read this chapter by given notes.

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DOMS

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HOMEWORK:-

Do Question no. 1, 2, 3, 4, 8, 10, 11, 12 from
Intext Questions given on pg. no- 10 of your
note book.

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