

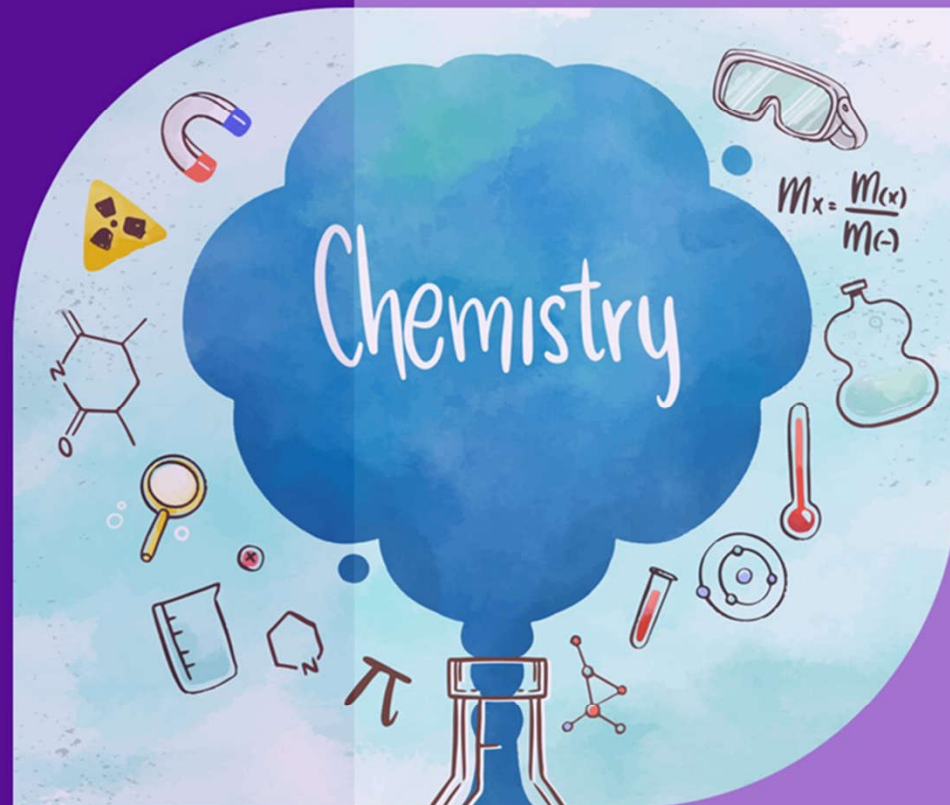


CLASS IX ACADEMIC PROGRAM 2020

# CHEMISTRY

LECTURE : C-08

CHAPTER 4 : PERIODIC TABLE



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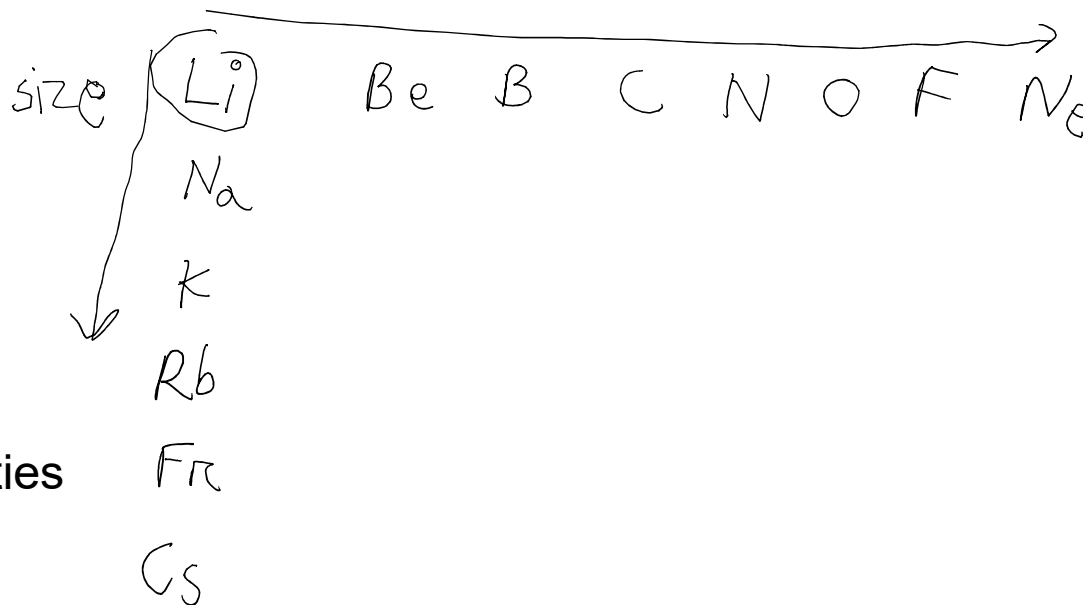
একাডেমিক এন্ড এডমিশন কেয়ার

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# Periodic Properties of Elements

- Size of Atom
- ✓ Ionization Energy
- ✓ Electron Affinity
- ✓ Metallic and Non-metallic properties
- ✓ Electronegativity



# Size of Atom

- In a same group, the lower we move from upper part, a new shell is added to the outer layer.

orbit  $\rightarrow$  2<sup>nd</sup>

orbit number increase (+1) size increase

Li

Na

K

Fr

increase

Group I The Alkali Metals

|    | Electronic configuration                                      |
|----|---|
| Li | Lithium 2, 1 $\rightarrow$ 2 <sup>nd</sup>                    |
| Na | Sodium 2, 8, 1 $\rightarrow$ 3 <sup>rd</sup>                  |
| K  | Potassium 2, 8, 8, 1 $\rightarrow$ 4 <sup>th</sup>            |
| Rb | Rubidium 2, 8, 8, 18, 1                                       |
| Cs | Cesium 2, 8, 8, 18, 18, 1                                     |
| Fr | Francium 2, 8, 8, 18, 18, 32, 1 $\rightarrow$ 7 <sup>th</sup> |

Na

K

4<sup>th</sup>

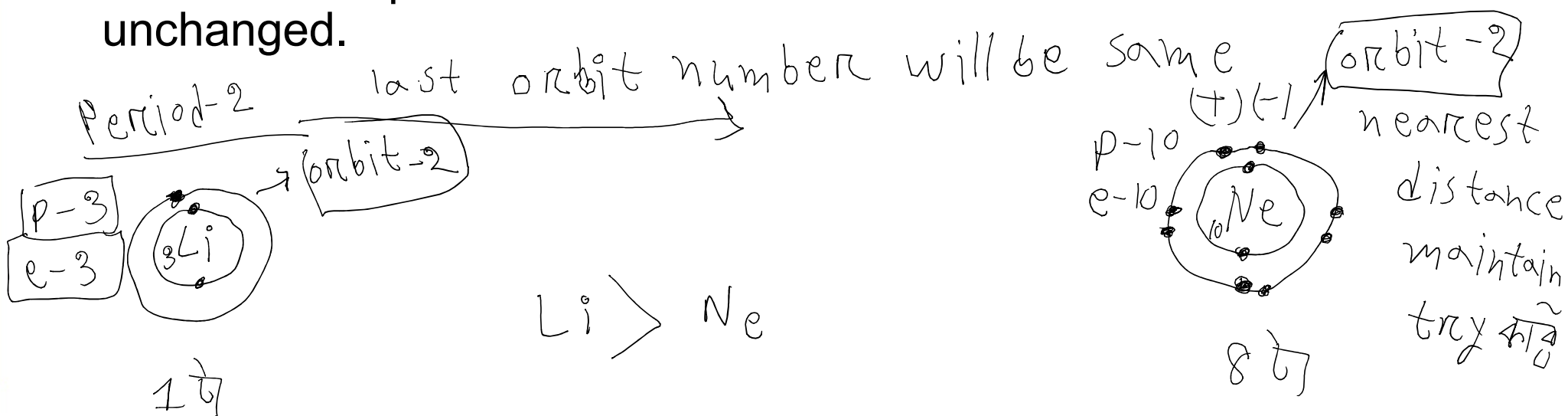


# Atom's Size in a period

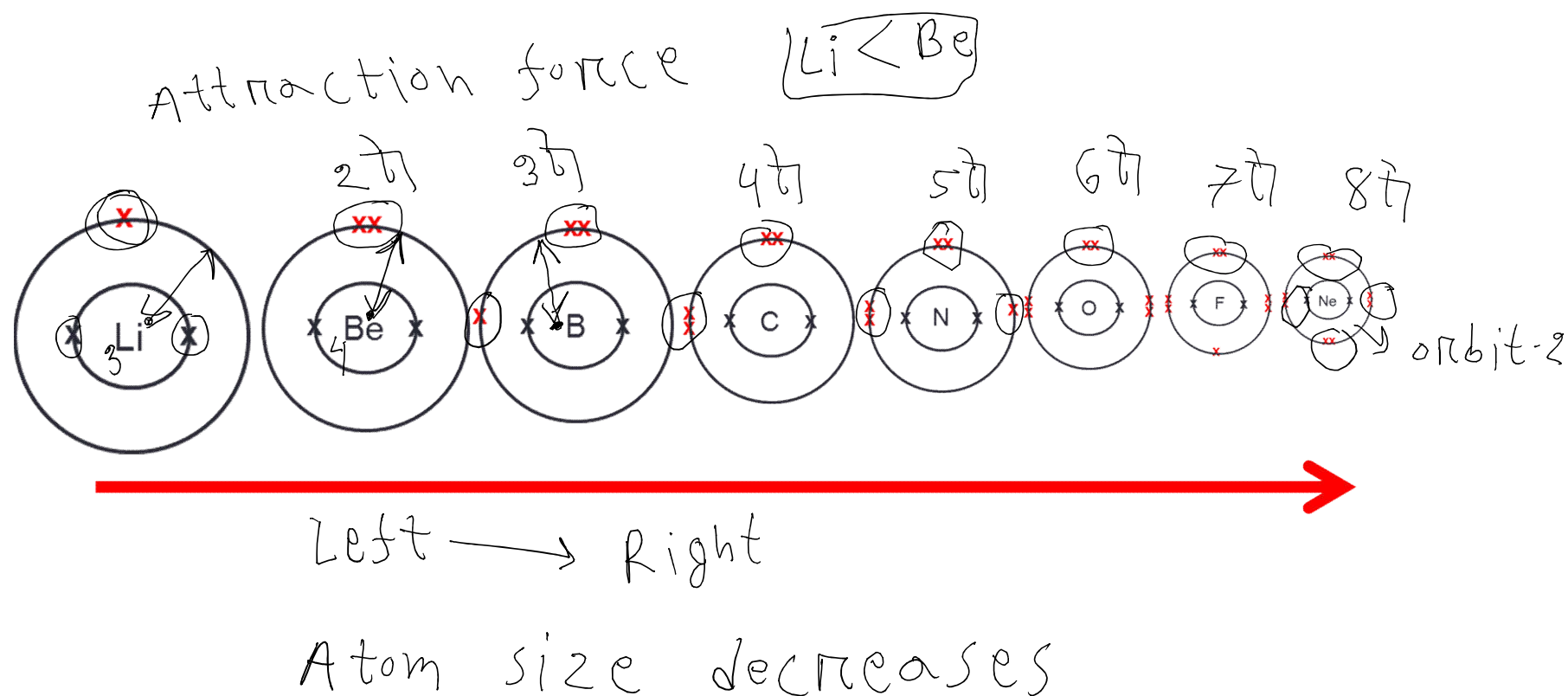
charge number ↑  
(+) (-)

Attraction ↑

- In a period, the more we move from left to right, the number of electron and proton increases but the shell number remains unchanged.

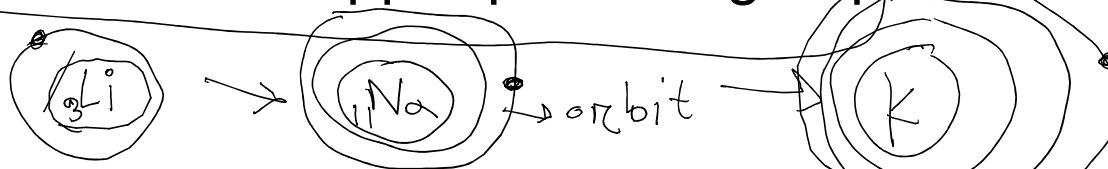


## Size of Atom in a period

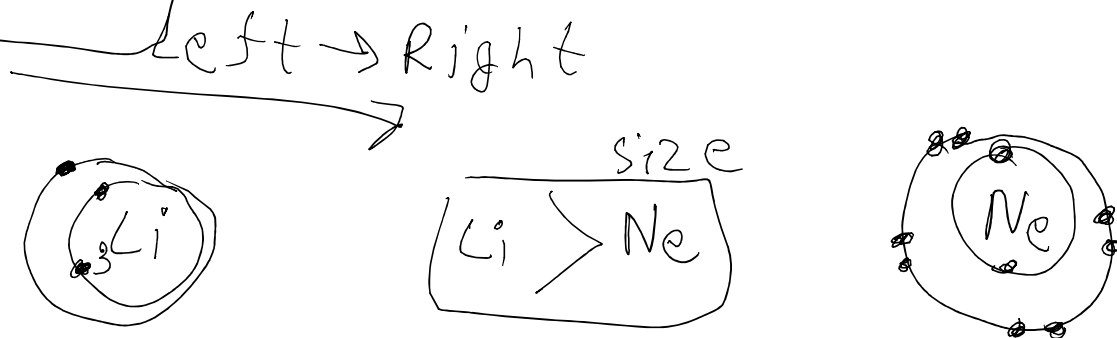


## Summary

- The lower we move from upper part in a group, the size of atom increases.



- The more a period progresses from left to right, the size of atom decreases.



## Poll Question -1

The picture of elements of group 17 is given beside:

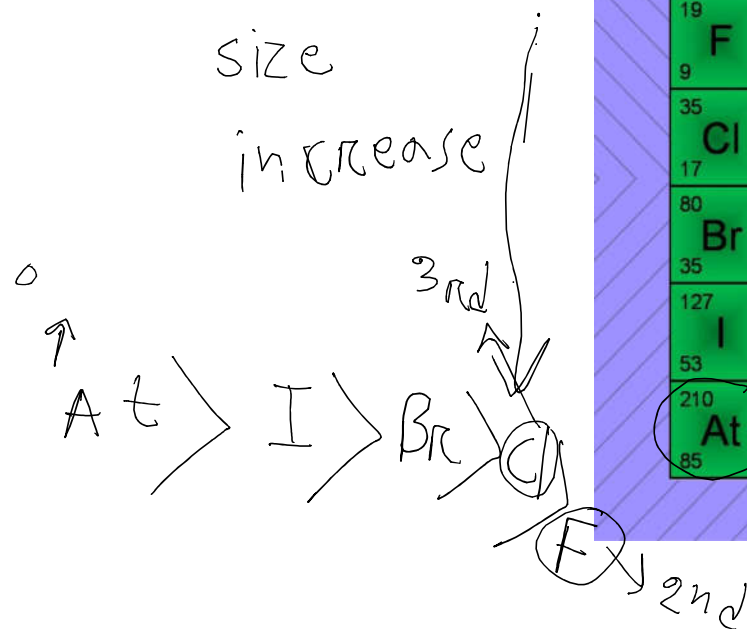
Which is the smallest of the following Elements?

☒ (a) F

(b) Cl

(c) Br

(d) I

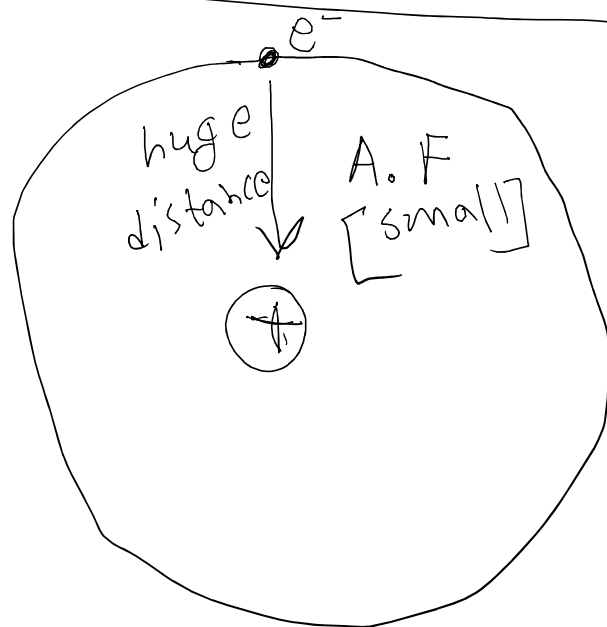


| THE HALOGEN FAMILY |    |          |
|--------------------|----|----------|
| 19<br>9            | F  | Fluorine |
| 35<br>17           | Cl | Chlorine |
| 80<br>35           | Br | Bromine  |
| 127<br>53          | I  | Iodine   |
| 210<br>85          | At | Astatine |

## Attraction of last orbit's electron by nucleus

- If distance is increased then attraction will decrease.

$$F \propto \frac{1}{d^2}$$



Distance  $\uparrow$

A, F  $\downarrow$





# Metallic and Non-metallic Properties

- If the atom of an element donates electron, it is called **Metal** and if the atom of an element accept electron, it is called **Non-metal**.

easily electron donate Metal.

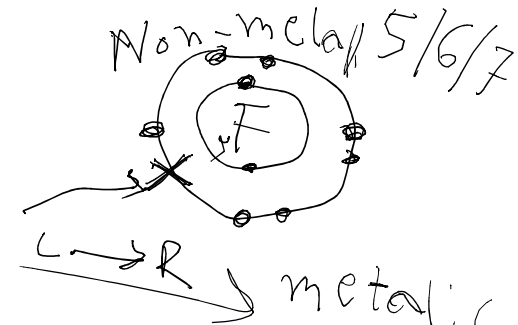
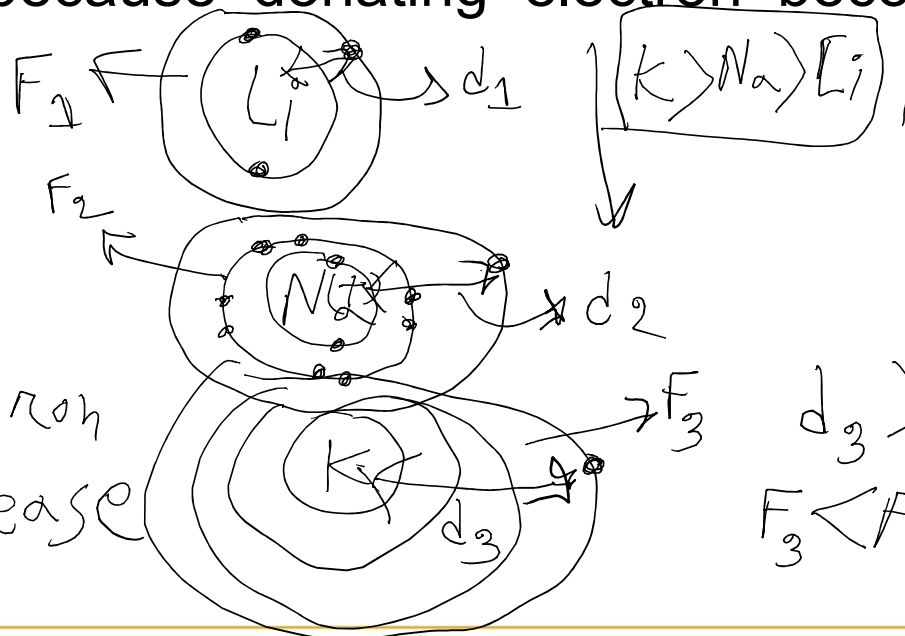
- In a period, as the size of atom increases the metallic property increases too because donating electron becomes much easier then.

Generally

last orbit

1/2/3 electron

যা কে Release



$d_3 > d_2 > d_1$

$F_3 < F_2 < F_1$

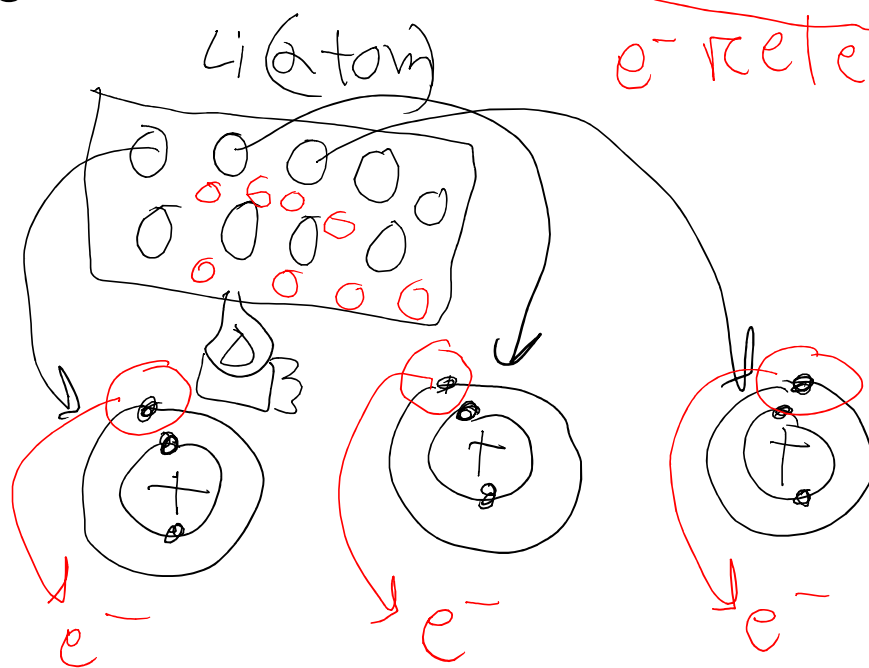
decrease

Chemistry

Chapter 4 : periodic table

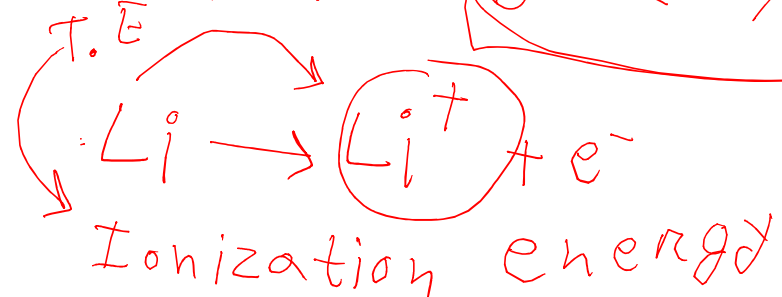
# Ionization Energy

- The energy that is required to transform an element into 1 mole positive ion removing 1 mole electron from its 1 mole atom in its gaseous state is called ionization energy of that element.



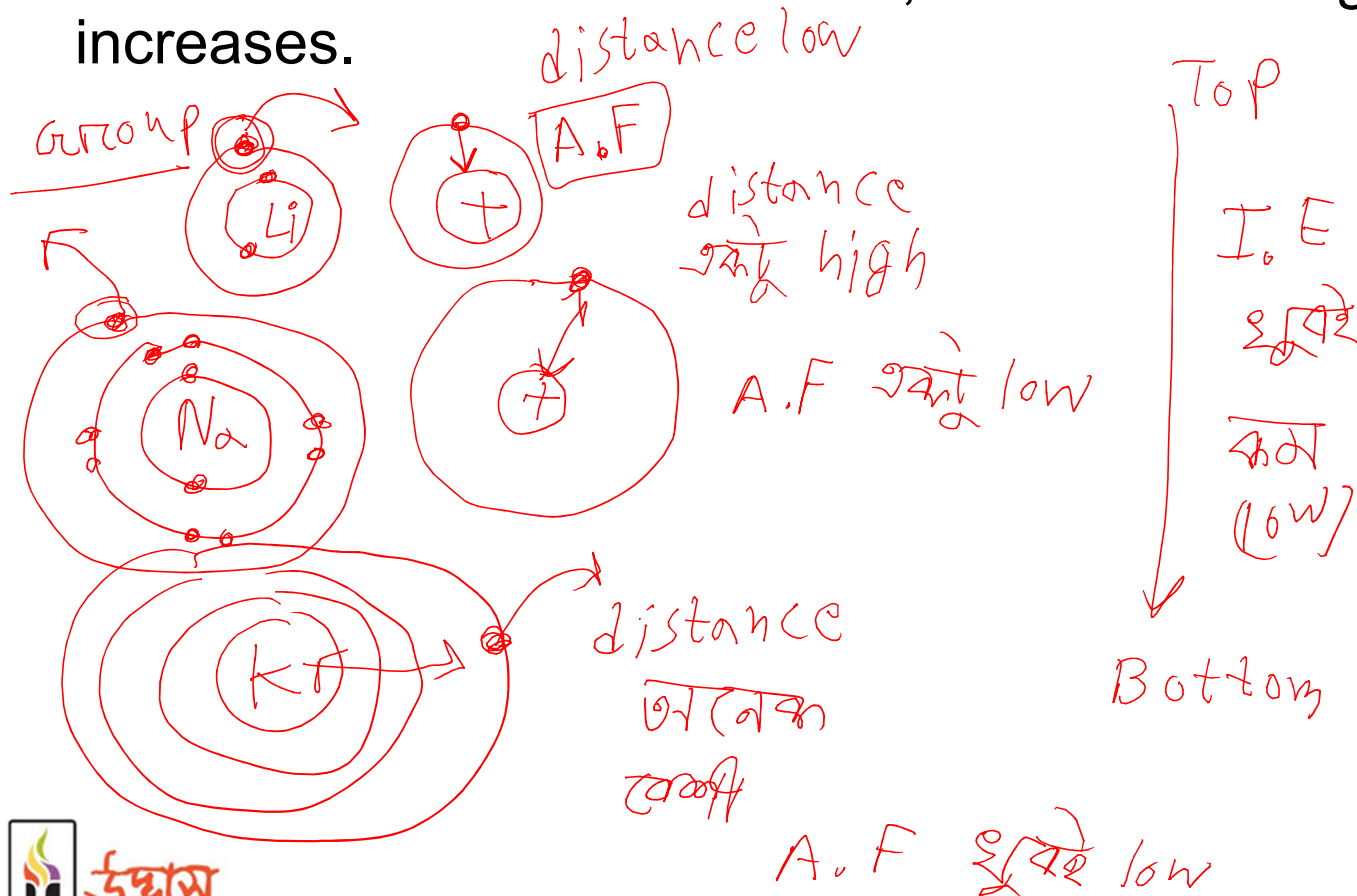
$e^-$  release করতে Total Energy.  
 element  
 (i) Gaseous state

(ii)  $e^-$  release করতে  
 1 mole  $e^- = 6.023 \times 10^{23}$



# Ionization Energy

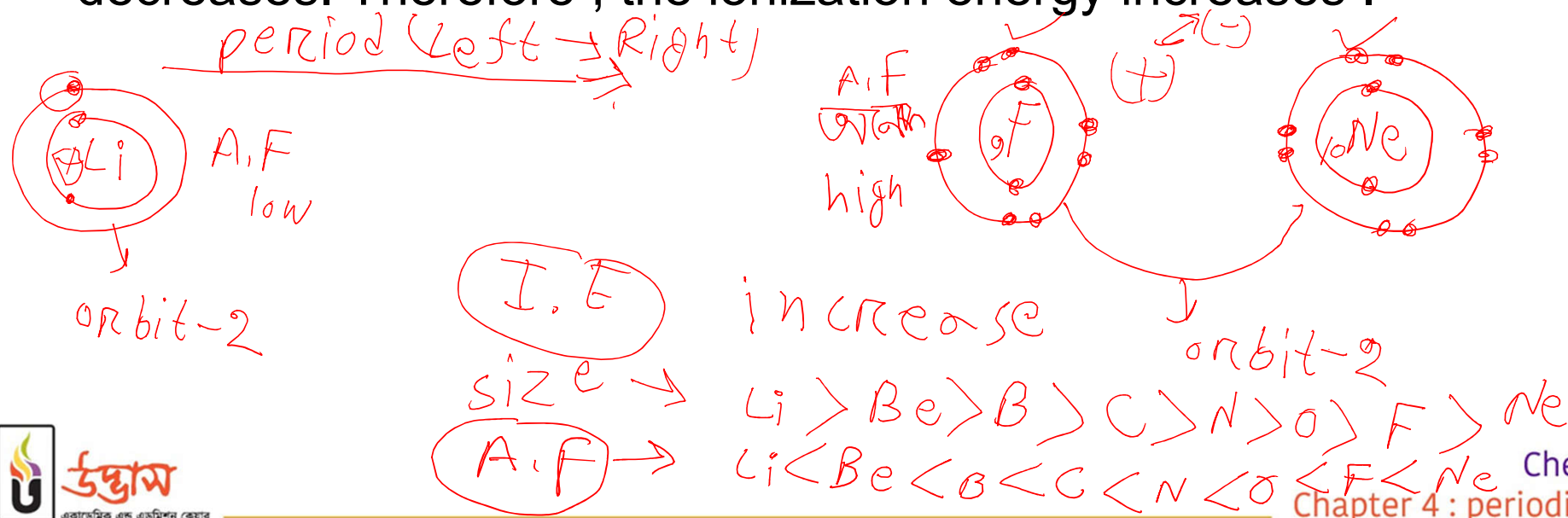
- As the size of atom decreases, ionization energy of the atom increases.



# Ionization Energy

$$\text{size} \propto \frac{1}{I, E}$$

- The lower we move from upper part in a group, the size of atom increases. Therefore, the ionization energy decreases.
- In a period, the more we move from left to right, the size of atom decreases. Therefore, the ionization energy increases.



## Poll Question -2

The picture of elements of group 1 is given beside:

Which of the following element has the most ionization energy ?

- (a) Li
- (b) Na
- (c) K
- (d) Rb

$\uparrow \text{size} \propto \frac{1}{\text{I.E.}} \downarrow$

size

$\text{Li} < \text{Na} < \text{K} < \text{Rb} < \text{Cs} < \text{Fr}$

I.E

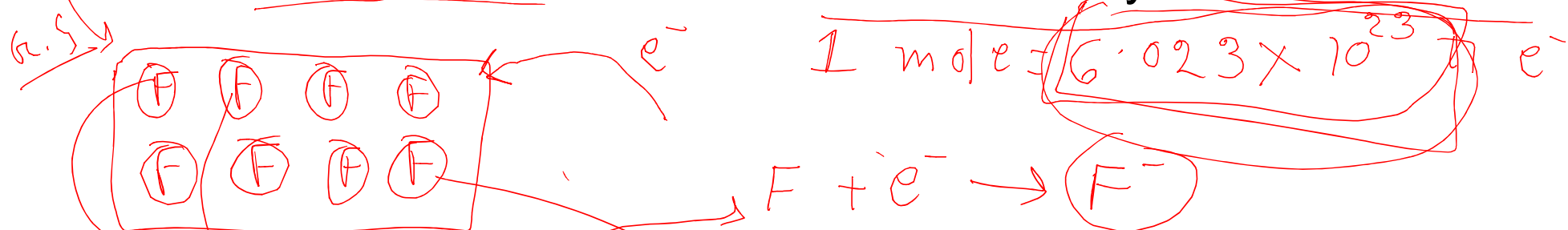
$\text{Li} > \text{Na} > \text{K} > \text{Rb} > \text{Cs} > \text{Fr}$

|    |           |
|----|-----------|
| H  |           |
| Li | Lithium   |
| Na | Sodium    |
| K  | Potassium |
| Rb | Rubidium  |
| Cs | Cesium    |
| Fr | Francium  |

# Electron Affinity

Definition opposite (I.E)

- The energy emitted when we try to transform an element in its gaseous state into 1 mole negative ion by injecting 1 mole electron into its 1 mole atom is called the electron affinity of that element.



electron accept  
energy release →

(T.E)

Electron  
Affinity

Chemistry

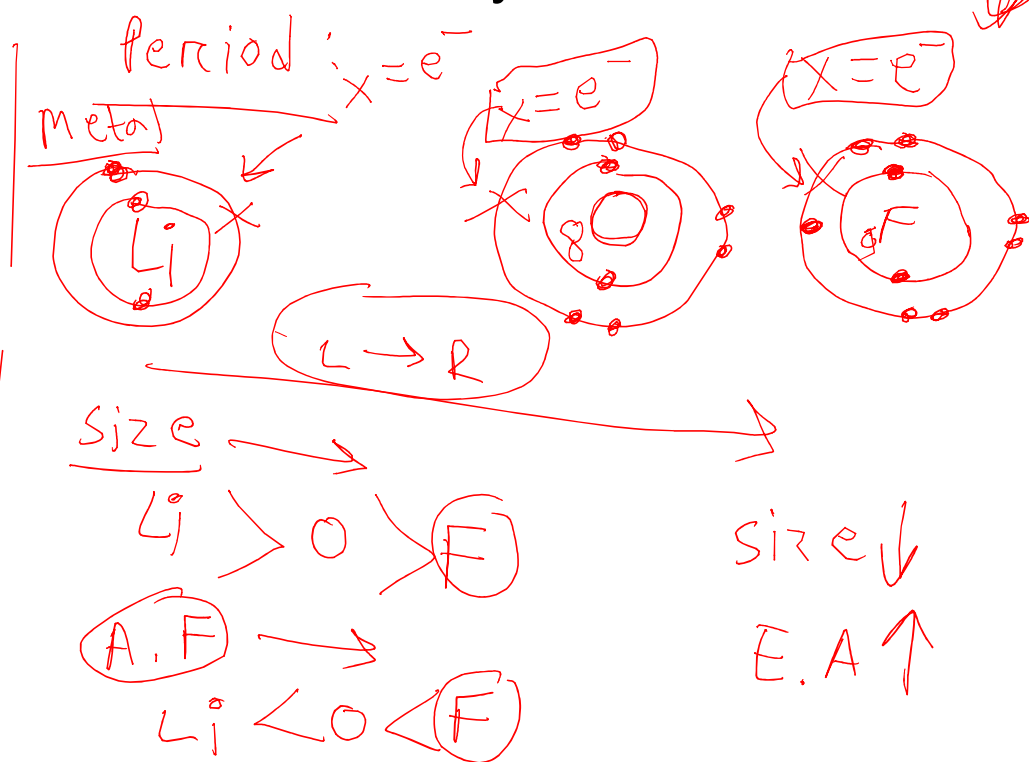
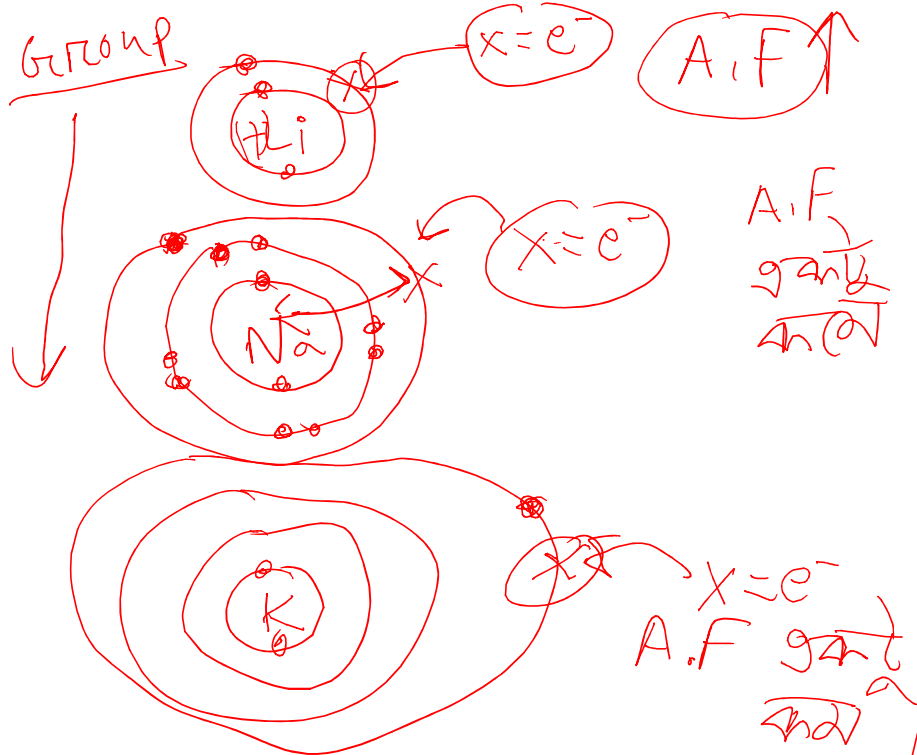
Chapter 4 : periodic table

~~charge~~  $\propto$   $A.F \uparrow$   
(+) (-)

## Electron Affinity

$\uparrow$  size  $\propto \frac{1}{\text{electron Affinity}}$   
 $\downarrow$

- As the size of an atom decreases, electron affinity increases.



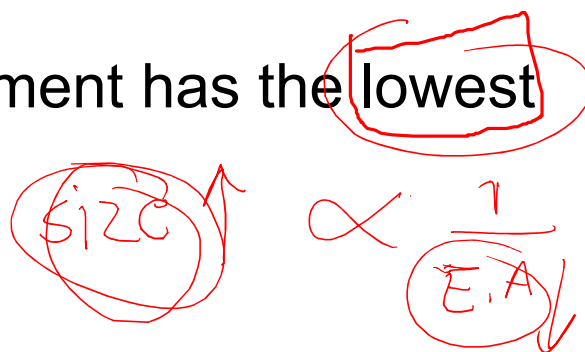
## Poll Question -3

The picture of elements of group 17 is given beside:

Which of the following element has the lowest electron affinity?

- (a) F
- (b) Cl
- (c) Br

~~(d) I~~ lowest



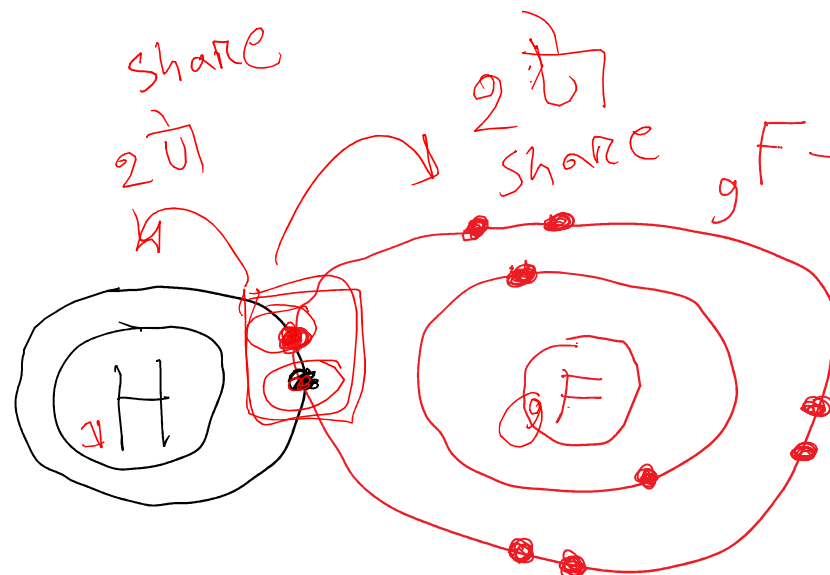
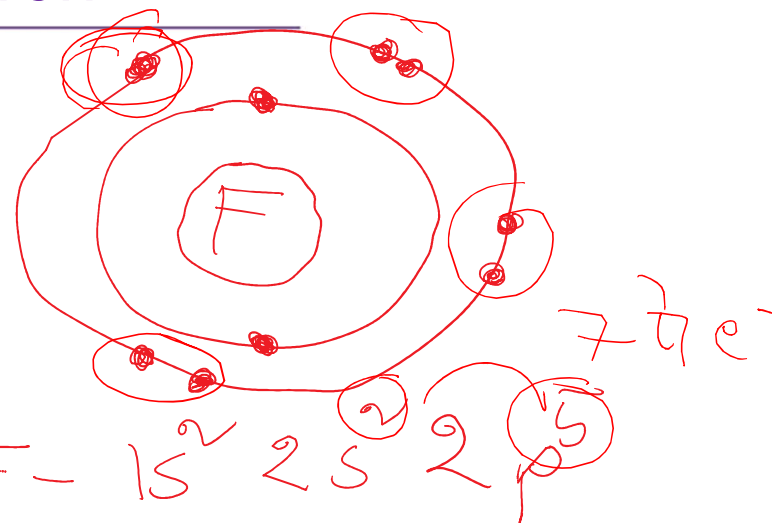
size

At > I > Br > Cl > F

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|--------------------|----|----------|
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| 80<br>35           | Br | Bromine  |
| 127<br>53          | I  | Iodine   |
| 210<br>85          | At | Astatine |

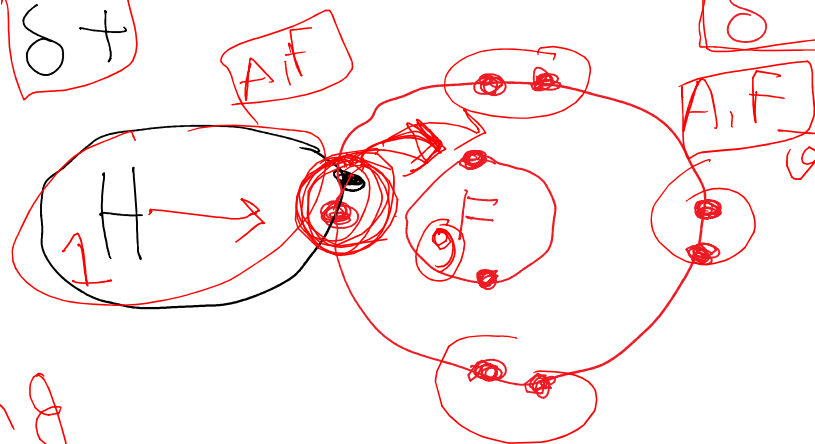


# Sharing of Electron



# Electronegativity

partially =  $\delta +$



$\delta = \text{delta} = \text{partially}$

অনেক বেশি

$\uparrow \text{size} \propto \frac{1}{\text{electronegativity}}$

Sharing  
electron কে

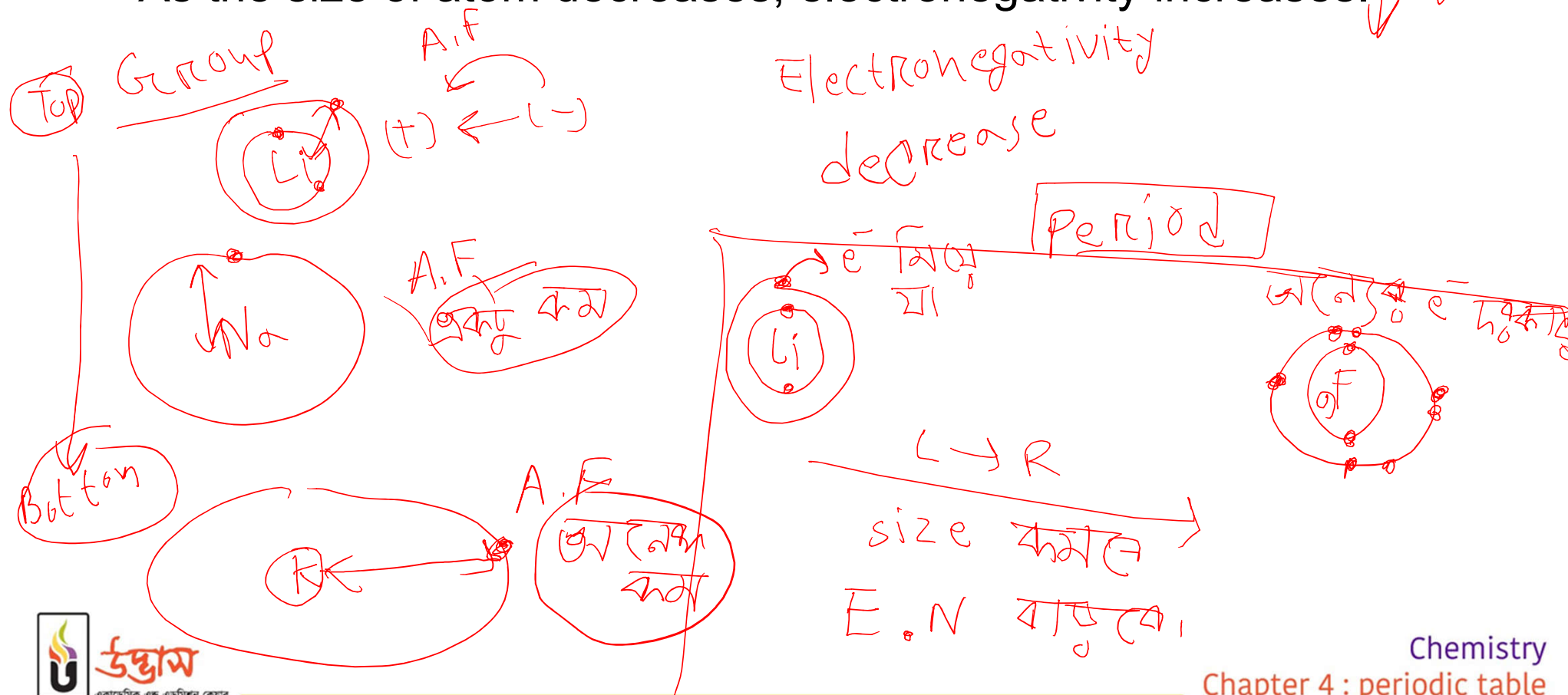
নিজের কাছে টানবে  
এ property

electronegativity

# Electronegativity

$\uparrow \text{size} \propto \frac{1}{\text{electronegativity}}$

- As the size of atom decreases, electronegativity increases.



## Poll Question -4

The picture of elements of group 17 is given beside:

Which of the following element has the highest electronegativity?

(a) F

(b) Cl

(c) Br

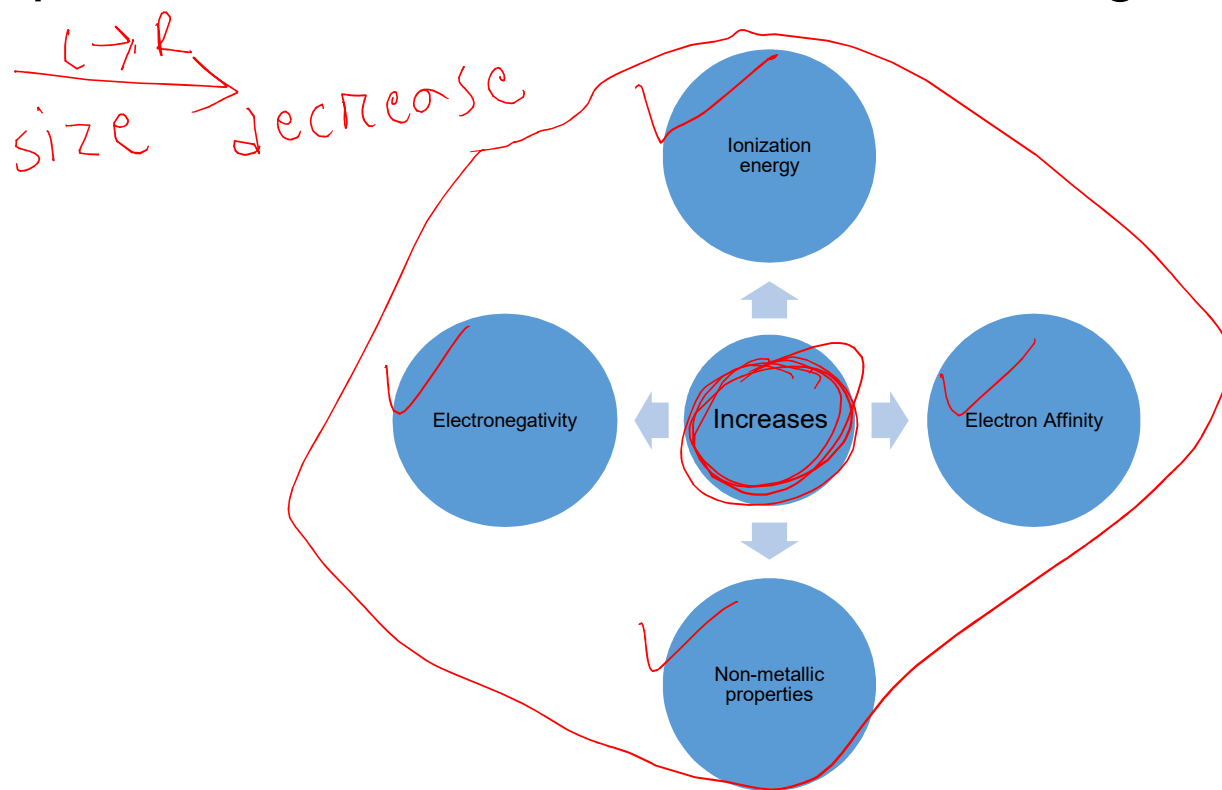
(d) I

| THE HALOGEN FAMILY |    |          |
|--------------------|----|----------|
| 19<br>9            | F  | Fluorine |
| 35<br>17           | Cl | Chlorine |
| 80<br>35           | Br | Bromine  |
| 127<br>53          | I  | Iodine   |
| 210<br>85          | At | Astatine |

↑ size  $\propto \frac{1}{\text{electronegativity}}$   
↓ electronegativity  
size increases  
F is the smallest  
↓

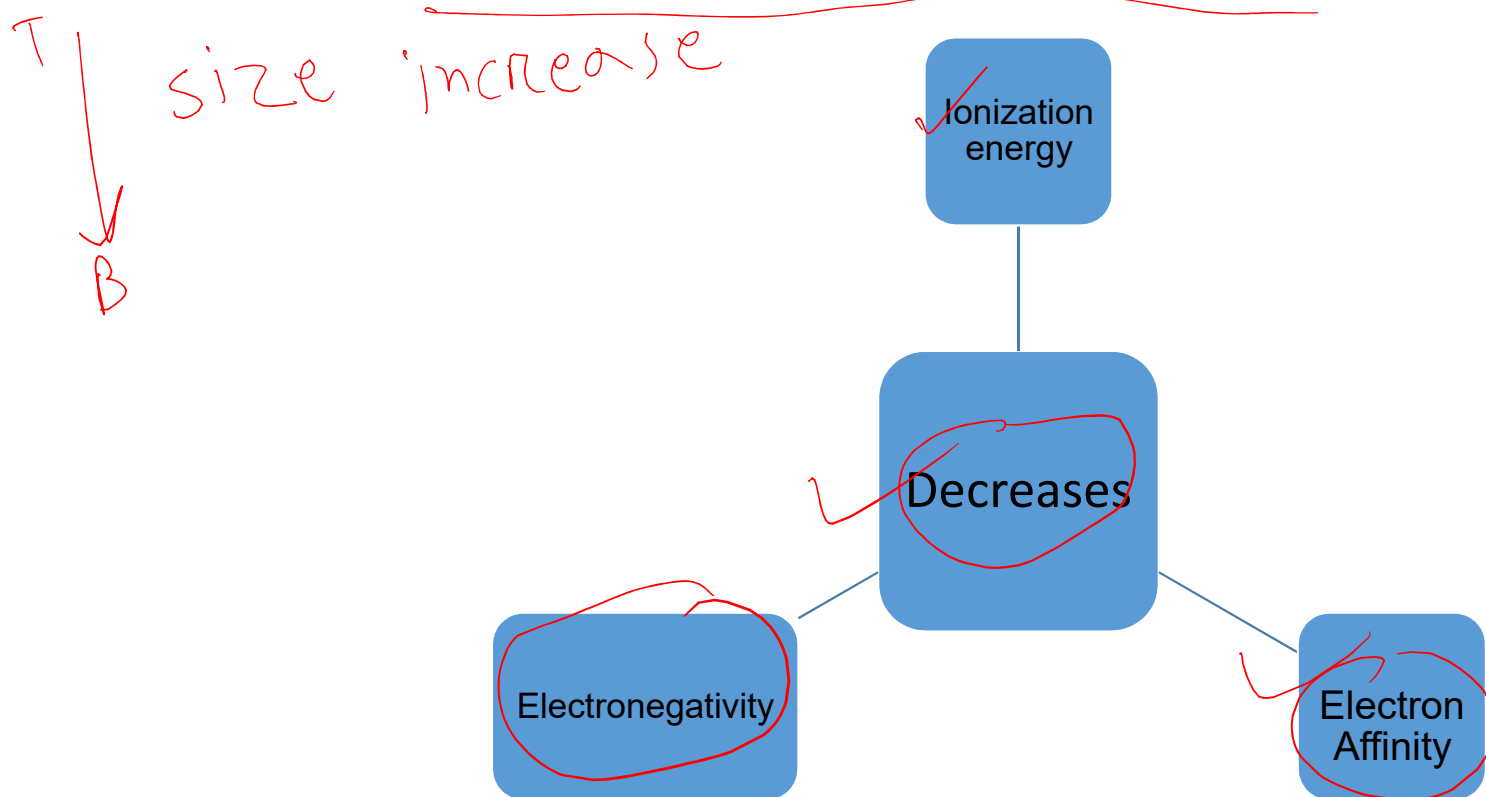
## Summary

- In a period, the more we move from left to right:



## Summary

- The lower we move from upper part in a group:



# Halogen Group

- The elements of group 17 are called halogen.

| THE HALOGEN FAMILY |    |          |
|--------------------|----|----------|
| 19<br>9            | F  | Fluorine |
| 35<br>17           | Cl | Chlorine |
| 80<br>35           | Br | Bromine  |
| 127<br>53          | I  | Iodine   |
| 210<br>85          | At | Astatine |

salt produce



# Inert Gas

- The elements of group 18 are called inert gas.

No compound

~~e<sup>-</sup> donate~~

~~e<sup>-</sup> accept~~

Exception

| Element | Atomic Number | Electronic Configuration  | Group Number | Period Number |
|---------|---------------|---|--------------|---------------|
| Helium  | 2             | 1s <sup>2</sup>   | 18           | 1             |
| Neon    | 10            | 1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup>   | 18           | 2             |
| Argon   | 18            | 1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>2</sup> 3p <sup>6</sup>   | 18           | 3             |
| Krypton | 36            | 1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>2</sup> 3p <sup>6</sup> 3d <sup>10</sup> 4s <sup>2</sup> 4p <sup>6</sup>  | 18           | 4             |
| Xenon   | 54            | 1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>2</sup> 3p <sup>6</sup> 3d <sup>10</sup> 4s <sup>2</sup> 4p <sup>6</sup> 4d <sup>10</sup> 5s <sup>2</sup> 5p <sup>6</sup>   | 18           | 5             |
| Radon   | 86            | 1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>2</sup> 3p <sup>6</sup> 3d <sup>10</sup> 4s <sup>2</sup> 4p <sup>6</sup> 4d <sup>10</sup> 4f <sup>14</sup> 5s <sup>2</sup> 5p <sup>6</sup> 5d <sup>10</sup> 6s <sup>2</sup> 6p <sup>6</sup> | 18           | 6             |



# Transition Elements

Elements of Group- 3 to Group-12 are known as transition elements.

Coloured compound

Catalyst

|          |          |          |           |           |           |           |           |           |           |           |           |            |           |
|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|-----------|
| → 1      | 2        | 3        | 4         | 5         | 6         | 7         | 8         | 9         | 10        | 11        | 12        | 13         | 14        |
| 1<br>H   |          |          |           |           |           |           |           |           |           |           |           |            |           |
| 3<br>Li  | 4<br>Be  |          |           |           |           |           |           |           |           |           |           | 5<br>B     | 6<br>C    |
| 11<br>Na | 12<br>Mg |          |           |           |           |           |           |           |           |           |           | 13<br>Al   | 14<br>Si  |
| 19<br>K  | 20<br>Ca | 21<br>Sc | 22<br>Ti  | 23<br>V   | 24<br>Cr  | 25<br>Mn  | 26<br>Fe  | 27<br>Co  | 28<br>Ni  | 29<br>Cu  | 30<br>Zn  | 31<br>Ga   | 32<br>Ge  |
| 37<br>Rb | 38<br>Sr | 39<br>Y  | 40<br>Zr  | 41<br>Nb  | 42<br>Mo  | 43<br>Tc  | 44<br>Ru  | 45<br>Rh  | 46<br>Pd  | 47<br>Ag  | 48<br>Cd  | 49<br>In   | 50<br>Sn  |
| 55<br>Cs | 56<br>Ba |          | 72<br>Hf  | 73<br>Ta  | 74<br>W   | 75<br>Re  | 76<br>Os  | 77<br>Ir  | 78<br>Pt  | 79<br>Au  | 80<br>Hg  | 81<br>Tl   | 82<br>Pb  |
| 87<br>Fr | 88<br>Ra |          | 104<br>Rf | 105<br>Db | 106<br>Sg | 107<br>Bh | 108<br>Hs | 109<br>Mt | 110<br>Ds | 111<br>Rg | 112<br>Cn | 113<br>Uut | 114<br>Fl |

**Transition Metals**

লেগে থাকো সৎ ভাবে,  
স্বপ্ন জয় তোমারই হবে।