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Classification of Elements and Periodicity in Properties

TOPIC 1

Periodic Table and Classification of Elements

01 From the following pairs of ion which one is not an iso-electronic pair? **[NEET 2021]**

(a) O^{2-}, F^- (b) Na^+, Mg^{2+}

(c) Mn^{2+}, Fe^{3+} (d) Fe^{2+}, Mn^{2+}

Ans. *(d)*

Ion	Number of electrons
O^{2-}	10
F^-	10
Na^+	10
Mg^{2+}	10
Mn^{2+}	23
Fe^{3+}	23
Fe^{2+}	24
Mn^{2+}	23

O^{2-} and F^- are iso-electronic pair.

Na^+ and Mg^{2+} are iso-electronic pair.

Mn^{2+} and Fe^{3+} are iso-electronic pair.

Fe^{2+} and Mn^{2+} are not iso-electronic pair.

02 Identify the incorrect match.

	Name		IUPAC official name
(A)	Unnilunium	(i)	Mendelevium
(B)	Unniltrium	(ii)	Lawrencium
(C)	Unnihexium	(iii)	Seaborgium
(D)	Unununnium	(iv)	Darmstadtium

[NEET (Sep.) 2020]

(a) (B), (ii) (b) (C), (iii)

(c) (D), (iv) (d) (A), (i)

Ans. *(c)*

	Name	Atomic number (Z)		IUPAC official name
(A)	Unnilunium	101	(i)	Mendelevium (Md)
(B)	Unniltrium	103	(ii)	Lawrencium (Lr)
(C)	Unnilhexium	106	(iii)	Seaborgium (Sg)
(D)	Unununnium	111	(iv)	Roentgenium (Rg) [but (iv) Darmstadtium (Ds), Given] [$Z = 110$]

So, D-(iv) is the incorrect match.

03 The element $Z = 114$ has been discovered recently. It will belong to which of the following family/group and electronic configuration? **[NEET 2017]**

(a) Halogen family, $[Rn]\,5f^{14}\,6d^{10}\,7s^2\,7p^5$

(b) Carbon family, $[Rn]\,5f^{14}\,6d^{10}\,7s^2\,7p^2$

(c) Oxygen family, $[Rn]\,5f^{14}\,6d^{10}\,7s^2\,7p^4$

(d) Nitrogen family, $[Rn]\,5f^{14}\,6d^{10}\,7s^2\,7p^6$

Ans. *(b)*

The element with atomic number, $Z = 114$ is flerovium (F1). It is a super heavy artificial chemical element. In the periodic table of the elements, it is a transactinide element in the *p*-block. It is a member of the 7th period and is the heaviest known member of the carbon family.

Electronic configuration for $Z = 114$ is

$$[Rn]_{86}\ 5f^{14}, 6d^{10}, 7s^2, 7p^2$$

04 Which one of the elements with the following outer orbital configurations may exhibit the largest number of oxidation states? **[CBSE AIPMT 2009]**

(a) $3d^3, 4s^2$ (b) $3d^5, 4s^1$

(c) $3d^5, 4s^2$ (d) $3d^2, 4s^2$

Ans. *(c)*

The sum of number of electrons (unpaired) in *d*-orbitals and number of electrons in *s*-orbital gives the number of oxidation states (os) exhibited by a *d*-block element. Therefore,

(a) $3d^3, 4s^2 \Rightarrow OS = 3 + 2 = 5$

(b) $3d^5, 4s^1 \Rightarrow OS = 5 + 1 = 6$

(c) $3d^5, 4s^2 \Rightarrow OS = 5 + 2 = 7$

(d) $3d^2, 4s^2 \Rightarrow OS = 2 + 2 = 4$

Hence, element with $3d^5, 4s^2$ configuration exhibits largest number of oxidation states.

05 An atom has electronic configuration $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^3, 4s^2$, you will place it in **[CBSE AIPMT 2002]**

(a) fifth group (b) fifteenth group

(c) second group (d) third group

Ans. *(a)*

The amount of energy required to remove an electron from the outermost orbit of a gaseous atom is known as **ionisation potential**. Elements having half-filled or completely filled orbitals are more stable than partially filled orbitals.

In a period from left to right ionisation potential decreases as the atomic number increases. The given elements (Be, B, C, N, O) are present in II period as

Be B C N O

Ionisation potential increases →

But in case of Be and B, Be has higher ionisation potential due to stable configuration.

$_4Be = 1s^2, 2s^2$

$2s^2$ ⇅ Stable configuration

$_5B = 1s^2, 2s^2 2p^1$

$2p^1$ ↑ | | Unstable configuration

In the same way in case of N and O, N has higher ionisation potential than O due to stable configuration

$_7N = 1s^2, 2s^2 2p^3$

$2p^3$ ↑ | ↑ | ↑ Stable configuration (half-filled)

$_8O = 1s^2, 2s^2 2p^4$

$2p^4$ ⇅ | ↑ | ↑ Unstable configuration

So, the correct order of increasing ionisation potential will be

B < Be < C < O < N

06 The element with the atomic number 118, will be

(a) alkali **[CBSE AIPMT 1996]**
(b) noble gas
(c) lanthanide
(d) transition element

Ans. *(b)*

The outermost electronic configuration of element with atomic number 118 is $7s^2 7p^6$, so it will be a noble gas.

07 The electronic configuration of an element is $1s^2, 2s^2 2p^6, 3s^2 3p^3$. What is the atomic number of the element, which is present just below the above element in the periodic table? **[CBSE AIPMT 1995]**

(a) 33 (b) 34 (c) 36 (d) 49

Ans. *(a)*

The element which present just below the given element will have outermost electronic configuration as $4s^2 4p^3$, so its full electronic configuration is $1s^2, 2s^2 2p^6, 3s^2 3p^6, 4s^2, 3d^{10}, 4p^3$ and hence, its atomic number is 33.

08 If the atomic number of an element is 33, it will be placed in the periodic table in the **[CBSE AIPMT 1993]**

(a) first group (b) third group
(c) fifth group (d) seventh group

Ans. *(c)*

The electronic configuration of element with atomic number 33 is $1s^2, 2s^2 2p^6, 3s^2 3p^6, 4s^2, 3d^{10}, 4p^3$. As, its last shell have five electrons and hence, its group is 10 + 5 = 15th or V A.

09 The electronic configuration of four elements are given below. Which element does not belong to the same family as others? **[CBSE AIPMT 1989]**

(a) $[Xe]4f^{14}, 5d^{10}, 6s^2$
(b) $[Kr]4d^{10}, 5s^2$
(c) $[Ne]3s^2, 3p^5$
(d) $[Ar]3d^{10}, 4s^2$

Ans. *(c)*

In a family, all elements have same outermost electronic configuration. Since $[Ne]3s^2 3p^5$, chlorine belongs to halogen family while the remaining three are in same group i.e. group 12.

$_{80}Hg = [Xe]4f^{14} 5d^{10} 6s^2$

$_{48}Cd = [Kr]4d^{10} 5s^2$

$_{30}Zn = [Ar]3d^{10} 4s^2$

TOPIC 2
Periodic Properties

10 The correct order of atomic radii in group 13 elements is **[NEET 2018]**

(a) B < Ga < Al < Tl < In
(b) B < Al < Ga < In < Tl
(c) B < Al < In < Ga < Tl
(d) B < Ga < Al < In < Tl

Ans. *(d)*

The atomic radii as well as ionic radii increases on moving down the group 13 elements because of the successive addition of one extra shell of electrons.

However, there is an anomaly at gallium in case of atomic radii. Atomic radii of Ga is lesser as compared to Al.

Gallium (Ga) with electronic configuration, $[Ar]_{18}3d^{10}4s^2 4p^1$ has an extra *d*-electrons which do not screen the nucleus effectively. Consequently, electrons of Ga are more attracted by nucleus.

Thus, the increasing order of atomic radii of the group 13 elements is B (85 pm) < Ga (135 pm) < Al (143 pm) < In (167 pm) < Tl (170 pm).

11 In which of the following options the order of arrangement does not agree with the variation of property indicated against it? **[NEET 2016, Phase I]**

(a) B < C < N < O (increasing first ionisation enthalpy)
(b) I < Br < Cl < F (increasing electron gain enthalpy)
(c) Li < Na < K < Rb (increasing metallic radius)
(d) $Al^{3+} < Mg^{2+} < Na^+ < F^-$ (increasing ionic size)

Ans. *(a,b)*

For option (a)

First ionisation energy is the energy required to remove an electron from outermost shell.

Hence, correct order is B < C < O < N.

For option (b)

Electron gain enthalpy is the energy required to gain an electron in the outermost shell.

Hence, the correct order is I < Br < F < Cl.

For option (c)

As we move down the group in alkali metal, metallic radius increases Li < Na < K < Rb.

For option (d)

In case of isoelectronic species, as positive charge decreases or negative charge increases the ionic size of the species increases and *vice-versa*

$Al^{3+} < Mg^{2+} < Na^+ < F^-$.

12 The species Ar, K^+ and Ca^{2+} contain the same number of electrons. In which order do their radii increase? **[CBSE AIPMT 2015]**

(a) $Ar < K^+ < Ca^{2+}$ (b) $Ca^{2+} < Ar < K^+$
(c) $Ca^{2+} < K^+ < Ar$ (d) $K^+ < Ar < Ca^{2+}$

Ans. *(c)*

$Ca^{2+} < K^+ < Ar$

Ar, K^+ and Ca^{2+} are isoelectronic i.e. with same number of electrons, 18. For isoelectronic species ionic radii decreases with increase in effective (relative) positive charge. Also Ar, K and Ca belong to the same period (3rd period).

13 Which of the following orders of ionic radii is correctly represented? **[CBSE AIPMT 2014]**

(a) $H^- > H^+ > H$
(b) $Na^+ > F^- > O^{2-}$
(c) $F^- > O^{2-} > Na^+$
(d) $Al^{3+} > Mg^{2+} > N^{3-}$

Ans. *(*)*

(No option is correct.)

(a) $H^- > H^+ > H$

It is known that radius of a cation is always smaller than that of a neutral atom due to decrease in the number of orbits. Whereas, the radius of anion is always greater than a cation due to decrease in effective nuclear charge. Hence, the correct order is

$H^- > H > H^+$

(b) $Na^+ > F^- > O^{2-}$

The given species are isoelectronic as they contain same number of electrons. For isoelectronic species,

$$\text{Ionic radii} \propto \frac{1}{\text{atomic number}}$$

Ion: Na^+ F^- O^{2-}

Atomic number : 11 9 8

Hence, the correct order of ionic radii is

$O^{2-} > F^- > Na^+$

(c) Similarly, the correct option is

$O^{2-} > F^- > Na^+$

(d) Ions : Al^{3+} Mg^{2+} N^{3-}

Atomic number : 13 12 7

Hence, the correct order is,

$N^{3-} > Mg^{2+} > Al^{3+}$

14 Identify the wrong statement in the following. **[CBSE AIPMT 2012]**

(a) Amongst isoelectronic species, smaller the positive charge on the cation, smaller is the ionic radius

(b) Amongst isoelectronic species, greater the negative charge on the anion, larger is the ionic radius

(c) Atomic radius of the elements increases as one moves down the first group of the periodic table

(d) Atomic radius of the elements decreases as one moves across from left to right in the 2nd period of the periodic table

Ans. *(a)*

Atomic radius of the elements decreases across a period from left to right due to increase in effective nuclear charge. On moving down a group, since, number of shells increases, so atomic radius increases.

Amongst isoelectronic species, ionic radius increases with increase in negative charge or decrease in positive charge.

15 The correct order of the decreasing ionic radii among the following isoelectronic species is **[CBSE AIPMT 2010]**

(a) $Ca^{2+} > K^+ > S^{2-} > Cl^-$

(b) $Cl^- > S^{2-} > Ca^{2+} > K^+$

(c) $S^{2-} > Cl^- > K^+ > Ca^{2+}$

(d) $K^+ > Ca^{2+} > Cl^- > S^{2-}$

Ans. *(c)*

Key Idea *Ionic radii* $\propto$ *charge on anion*

$$\propto \frac{1}{\text{charge on cation}}$$

During the formation of a cation, the electrons are lost from the outer shell and the remaining electrons experience a great force of attraction by the nucleus, i.e. attracted more towards the nucleus. In other words, nucleus hold the remaining electrons more tightly and this results in decreased radii.

However, in case of anion formation, the addition of electron(s) takes place in the same outer shell, thus the hold of nucleus on the electrons of outer shell decreases and this results in increased ionic radii.

Thus, the correct order of ionic radii is

$S^{2-} > Cl^- > K^+ > Ca^{2+}$

16 Which of the following represents the correct order of increasing electron gain enthalpy with negative sign for the elements O, S, F and Cl? **[CBSE AIPMT 2010]**

(a) Cl < F < O < S

(b) O < S < F < Cl

(c) F < S < O < Cl

(d) S < O < Cl < F

Ans. *(b)*

Key Idea *Electron gain enthalpy, generally, increases in a period from left to right and decreases in a group on moving downwards. However, members of III period have somewhat higher electron gain enthalpy as compared to the corresponding members of second period, because of their small size.*

O and S belong to VI A (16) group and Cl and F belong to VII A (17) group. Thus, the electron gain enthalpy of Cl and F is higher as compared to O and S.

Cl and F > O and S

Between Cl and F, Cl has higher electron gain enthalpy then the F, since the incoming electron experiences a greater force of repulsion because of small size of F-atom. Similar is true in case of O and S, i.e. the electron gain enthalpy of S is higher as compared to O due to its small size. Thus, the correct order of electron gain enthalpy of given elements is

O < S < F < Cl

17 Amongst the elements with following electronic configurations, which one may have the highest ionisation energy? **[CBSE AIPMT 2009]**

(a) $[Ne]\,3s^2 3p^3$

(b) $[Ne]\,3s^2\ 3p^2$

(c) $[Ar]\,3d^{10}, 4s^2\ 4p^3$

(d) $[Ne]\,3s^2\ 3p^1$

Ans. *(a)*

Key Idea *Across a period, increasing nuclear charge outweighs the shielding, hence the outermost electrons are held more and more tightly and ionisation energy. increases across a period while as we move down a group increase in shielding outweighs the increasing nuclear charge and the removal of the outermost electron required less energy down a group.*

Electronic configuration	Group
$[Ne]3s^2 3p^3$	V
$[Ne]3s^2\ 3p^2$	IV
$[Ar]3d^{10}, 4s^2\ 4p^3$	V
$[Ne]3s^2 3p^1$	III

Since, ionisation energy increases in a period and decreases in a group, $[Ne]3s^2\ 3p^3$ configuration has the highest ionisation energy among the given elements.

18 Which of the following oxides is not expected to react with sodium hydroxide? **[CBSE AIPMT 2009]**

(a) B_2O_3 (b) CaO (c) SiO_2 (d) BaO

Ans. *(b)*

Sodium hydroxide, NaOH, being a strong alkali never react with a basic oxide (compound). Among the given options, B_2O_3 and BeO are amphoteric oxides, SiO_2 is an acidic oxide and CaO is a basic oxide. Therefore, NaOH does not react with CaO.

19 The correct order of decreasing second ionisation enthalpy of Ti(22), V(23), Cr(24) and Mn(25) is **[CBSE AIPMT 2008]**

(a) Cr > Mn > V > Ti

(b) V > Mn > Cr > Ti

(c) Mn > Cr > Ti > V

(d) Ti > V > Cr > Mn

Ans. *(a)*

The amount of energy required to remove an electron from unipositive ion is referred as **second ionisation potential**.

In Ti, V, Cr and Mn, generally second ionisation energy increases with increase in atomic number but second ionisation potential of Cr is greater than that of Mn due to the presence of exactly half-filled *d*-subshell in Cr.

Thus, the order of second ionisation enthalpy is

$$Cr > Mn > V > Ti$$

20 Which of the following electronic configuration of an atom has the lowest ionisation enthalpy? **[CBSE AIPMT 2007]**

(a) $1s^2, 2s^2 2p^5$ (b) $1s^2, 2s^2 2p^3$

(c) $1s^2, 2s^2 2p^5, 3s^1$ (d) $1s^2, 2s^2 2p^6$

Ans. ***(c)***

The electronic configuration $1s^2, 2s^2 2p^5, 3s^1$ shows lowest ionisation energy because this configuration is unstable due to the presence of one electron in *s*-orbital. Hence, less energy is required to remove the electron.

21 Identify the correct order of the size of the following. **[CBSE AIPMT 2007]**

(a) $Ca^{2+} < K^+ < Ar < S^{2-} < Cl^-$

(b) $Ca^{2+} < K^+ < Ar < Cl^- < S^{2-}$

(c) $Ar < Ca^{2+} < K^+ < Cl^- < S^{2-}$

(d) $Ca^{2+} < Ar < K^+ < Cl^- < S^{2-}$

Ans. ***(b)***

A cation has always the lesser ionic size than a metal atom due to loss of electrons and an anion has always the greater size than metal atom due to gain of electrons. The given species are isoelectronic species as they contain same number of electrons. For isoelectronic species ionic radii $\propto \frac{1}{\text{atomic number}}$.

Ion	:	Ca^{2+}	K^+	Ar	S^2	Cl
Atomic number	:	20	19	18	16	17

So, the correct order of size is as

$$Ca^{2+} < K^+ < Ar < Cl^- < S^{2-}$$

22 Ionic radii are **[CBSE AIPMT 2004]**

(a) inversely proportional to effective nuclear charge

(b) inversely proportional to square of effective nuclear charge

(c) directly proportional to effective nuclear charge

(d) directly proportional to square of effective nuclear charge

Ans. ***(a)***

$$\text{Ionic radii} \propto \frac{1}{Z_{\text{eff}}}$$

$Z_{\text{eff}} \rightarrow$ effective nuclear charge

This Z_{eff} is calculated as follows :

$Z_{\text{eff}} = Z -$ screening constant (σ)

This value of screening constant is based upon the number of electrons in valence shell as well as in penultimate shells.

23 The ions $O^{2-}, F^-, Na^+, Mg^{2+}$ and Al^{3+} are isoelectronic. Their ionic radii show **[CBSE AIPMT 2003]**

(a) an increase from O^{2-} to F^- and then decrease from Na^+ to Al^{3+}

(b) a decrease from O^{2-} to F^- and then increase from Na^+ to Al^{3+}

(c) a significant increase from O^{2-} to Al^{3+}

(d) a significant decrease from O^{2-} to Al^{3+}

Ans. ***(d)***

On increasing atomic number of isoelectronic species ionic radii decreases due to increasing effective nuclear charge (Z_{eff}).

$$\text{Radius} \propto \frac{1}{\text{Atomic number}} \propto \frac{1}{Z_{\text{eff}}}$$

So, as the negative charge increases ionic radii increases while on increasing positive charge ionic radii decreases. Anions having higher ionic radii than the cation.

Hence, order of radii

$$O^{2-} > F^- > Na^+ > Mg^{2+} > Al^{3+}$$

24 Which of the following order is wrong? **[CBSE AIPMT 2002]**

(a) $NH_3 < PH_3 < AsH_3$ – Acidic

(b) Li < Be < B < C – 1st Ionisation potential

(c) $Al_2O_3 < MgO < Na_2O < K_2O$ – Basic

(d) $Li^+ < Na^+ < K^+ < Cs^+$ – Ionic radius

Ans. ***(b)***

Li, Be, B and C are present in IInd period. In a period from left to right ionisation potential increases.

$$\xrightarrow{\text{Ionisation potention increases}}$$

Li Be B C

* But in case of Be and B, Be has higher ionisation potential than B due to stable configuration of Be.

$$_4Be = 1s^2, 2s^2$$

$\boxed{\uparrow\downarrow}$ Stable configuration (due to fully-filled orbital)

$2s^2$

$$_5B = 1s^2, 2s^2 2p^1$$

$\boxed{1}\ \boxed{\ }\ \boxed{\ }$ Unstable configuration

$2p^1$

So, the correct order of ionisation potential of given elements is

$$Li < B < Be < C$$

25 Correct order of Ist ionisation potential (IP) among following elements Be, B, C, N, O is **[CBSE AIPMT 2001]**

(a) B < Be < C < O < N

(b) B < Be < C < N < O

(c) Be < B < C < N < O

(d) Be < B < C < O < N

Ans. ***(a)***

An atom has electronic configuration

$$1s^2, 2s^2, 2p^6, 3s^2 3p^6 3d^3, 4s^2$$

It is a member of *d*- block element because the last electron is filled in *d*- subshell as $3d^3$ and the following electronic configuration is possible for *d*- subshell as $(n-1)d^{(1 \text{ to } 10)}$

Group number	IIIB	IVB	VB	VIB	VIIB
	3	4	5	6	7
$ns^2(n-1)s^2p^6$	d^1	d^2	d^3	d^4	d^5
	VIII	VIII	VIII	IB	IIB
	8	9	10	11	12
	d^6	d^7	d^8	d^9	d^{10}

Hence, it is member of third group.

26 The first ionisation potential (in eV) of Be and B, respectively are **[CBSE AIPMT 1998]**

(a) 8.29, 9.32 (b) 9.32, 9.32

(c) 8.29, 8.29 (d) 9.32, 8.29

Ans. ***(d)***

First ionisation potential of beryllium (Be) is greater than boron (B) due to stable configuration

$$_4Be = 1s^2, 2s^2$$

$$_5B = 1s^2, 2s^2 2p^1$$

Order of attraction of electrons towards nucleus is $2s > 2p$, so more amount of energy is required to remove the electron from 2*s* orbital in comparison to 2*p* orbital. So, ionisation potential of Be is 9.32 eV and B is 8.29 eV.

27 In crystals of which of the following ionic compounds would you expect maximum distance between centres of cations and anions? **[CBSE AIPMT 1998]**

(a) LiF (b) CsF

(c) CsI (d) LiI

Ans. *(c)*

On moving from top to bottom in a group of periodic table distance between ions in ionic compounds increases. Hence, it is maximum in CsI.

28 Which one of the following ions will be smallest in size? **[CBSE AIPMT 1996]**

(a) Na^+ (b) Mg^{2+} (c) F^- (d) O_2^-

Ans. *(b)*

Na^+, Mg^{2+}, O^{2-} and F^- all are isoelectronic but Mg^{2+} have 12 protons in his nucleus, so the attraction force on last shell is maximum and hence, it have smallest size.

29 Among the following, the one which is most basic is **[CBSE AIPMT 1994]**

(a) ZnO (b) MgO
(c) Al_2O_3 (d) N_2O_5

Ans. *(b)*

ZnO and Al_2O_3 are amphoteric oxide, N_2O_5 is oxide of non-metal, so it is acidic and hence, MgO is most basic among Al_2O_3, ZnO, N_2O_5 and MgO.

30 Which electronic configuration of an element has abnormally high difference between second and third ionisation energy? **[CBSE AIPMT 1993]**

(a) $1s^2, 2s^2\,2p^6, 3s^1$
(b) $1s^2, 2s^2\,2p^6, 3s^2\,3p^1$
(c) $1s^2, 2s^2\,2p^6, 3s^2\,3p^2$
(d) $1s^2, 2s^2\,2p^6, 3s^2$

Ans. *(d)*

When the element having $1s^2, 2s^2\,2p^6, 3s^2$ configuration, loss two electrons, then it acquire the electronic configuration of noble gas (Ne), so to remove third electron a large amount of energy is required and hence, its second and third ionisation energy have large difference.

31 In the periodic table from left to right in a period, the atomic volume **[CBSE AIPMT 1993]**

(a) decreases
(b) increases
(c) remains same
(d) first decrease then increases

Ans. *(d)*

In the periodic table the atomic size first decreases from left to right in period, so the atomic volume first decreases and then increases because atomic size in last of any period increases.

32 One of the characteristic properties of non-metals is that they **[CBSE AIPMT 1993]**

(a) are reducing agents
(b) form basic oxides
(c) form cations by electron gain
(d) are electronegative

Ans. *(d)*

Non-metals easily gain electrons and hence, they form negative ions, so they are electronegative in nature.

33 Na^+, Mg^{2+}, Al^{3+} and Si^{4+} are isoelectronic. The order of their ionic size is **[CBSE AIPMT 1993]**

(a) $Na^+ > Mg^{2+} < Al^{3+} < Si^{4+}$
(b) $Na^+ < Mg^{2+} > Al^{3+} > Si^{4+}$
(c) $Na^+ > Mg^{2+} > Al^{3+} > Si^{4+}$
(d) $Na^+ < Mg^{2+} > Al^{3+} < Si^{4+}$

Ans. *(c)*

In isoelectronic species the number of electrons are same but nuclear charge is different. As the nuclear charge increase, the attraction force on last electron increases, so the size decreases or in other words

$$\text{Ionic size} \propto \frac{1}{\text{Charge on cation}}$$ and

hence, order is

$$Na^+ > Mg^{2+} > Al^{3+} > Si^{4+}$$

$$\xrightarrow[\text{Size decrease}]{\text{Nuclear charge increase}}$$

34 One would expect proton to have very large **[CBSE AIPMT 1993]**

(a) charge
(b) ionisation potential
(c) hydration energy
(d) radius

Ans. *(c)*

Proton have very small size, so have large hydration energy. The degree of hydration depends upon the size of the cation. Smaller the size of a cation greater the hydration energy.

35 Which of the following sets has strongest tendency to form anions? **[CBSE AIPMT 1993]**

(a) Ga, In, Tl (b) Na, Mg, Al
(c) N, O, F (d) V, Cr, Mn

Ans. *(c)*

N, O, F are more electronegative element, so they accept electrons more easily and form negative ions (anions).

36 The ionisation of hydrogen atom would give rise to **[CBSE AIPMT 1990]**

(a) hydride ion (b) hydronium ion
(c) proton (d) hydroxyl ion

Ans. *(c)*

Hydrogen have one proton and one electron, when it ionise, i.e. it lose one electron, then only proton is left in the nucleus, so H^+ ion is formed during ionisation which is also called **proton**.

$$\underset{\begin{pmatrix}e^-=1\\p=1\end{pmatrix}}{H} \longrightarrow \underset{\text{Proton}}{H^+} + e^-$$

37 In the periodic table, with the increase in atomic number, the metallic character of an element **[CBSE AIPMT 1989]**

(a) decrease in a period and increases in a group
(b) ncreases in a period and decreases in a group
(c) increases in a period as well as in the group
(d) decreases in a period and also in the group

Ans. *(a)*

In periodic table, the metallic character increases down the group because the ionisation enthalpy decreases down the group and metallic character decreases from left to right because the ionisation enthalpy increases from left to right.

38 Pauling's electronegativity values for elements are useful in predicting **[CBSE AIPMT 1989]**

(a) polarity of the molecules
(b) position in the emf series
(c) coordination numbers
(d) dipole moments

Ans. *(a)*

Pauling's electronegativity values are useful in determination of polarity of the bond in molecules. If electronegativity difference is zero, then the molecule is non-polar otherwise it is polar.

$$x_A - x_B = 0.028\sqrt{\Delta E}$$

x_A and x_B are electronegativities of the atoms A and B respectively. While,

ΔE = actual bond energy

$$-\sqrt{E_{A-A} \times E_{B-B}}$$