CHAPTER 3

# Classification of Elements and Periodicity in Properties

## 3.4 Nomenclature of Elements with Atomic Numbers > 100

**1.** Identify the incorrect match.

| Name | IUPAC Official Name |
|---|---|
| (A) Unnilunium | (i) Mendelevium |
| (B) Unniltrium | (ii) Lawrencium |
| (C) Unnilhexium | (iii) Seaborgium |
| (D) Ununnnium | (iv) Darmstadtium |

(a) (A), (i) (b) (B), (ii)
(c) (C), (iii) (d) (D), (iv)
*(NEET 2020)*

## 3.5 Electronic Configurations of Elements and The Periodic Table

**2.** The element $Z = 114$ has been discovered recently. It will belong to which of the following family/group and electronic configuration?
(a) Carbon family, [Rn] $5f^{14}\,6d^{10}\,7s^2\,7p^2$
(b) Oxygen family, [Rn] $5f^{14}\,6d^{10}\,7s^2\,7p^4$
(c) Nitrogen family, [Rn] $5f^{14}\,6d^{10}\,7s^2\,7p^6$
(d) Halogen family, [Rn] $5f^{14}\,6d^{10}\,7s^2\,7p^5$
*(NEET 2017)*

**3.** An atom has electronic configuration $1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^3\,4s^2$, you will place it in
(a) fifth group (b) fifteenth group
(c) second group (d) third group. *(2002)*

**4.** 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 just below the above element in the periodic table?
(a) 36 (b) 49
(c) 33 (d) 34 *(1995)*

**5.** If the atomic number of an element is 33, it will be placed in the periodic table in the
(a) first group (b) third group
(c) fifth group (d) seventh group. *(1993)*

**6.** The electronic configuration of four elements are given below. Which elements does not belong to the same family as others?
(a) $[Xe]4f^{14}5d^{10}4s^2$ (b) $[Kr]4d^{10}5s^2$
(c) $[Ne]3s^23p^5$ (d) $[Ar]3d^{10}4s^2$ *(1989)*

## 3.7 Periodic Trends in Properties of Elements

**7.** For the second period elements the correct increasing order of first ionization enthalpy is
(a) Li < Be < B < C < O < N < F < Ne
(b) Li < Be < B < C < N < O < F < Ne
(c) Li < B < Be < C < O < N < F < Ne
*(d)* Li < B < Be < C < N < O < F < Ne *(NEET 2019)*

**8.** Match the oxide given in column I with its property given in column II.

| Column I | Column II |
|---|---|
| (i) $Na_2O$ | A. Neutral |
| (ii) $Al_2O_3$ | B. Basic |
| (iii) $N_2O$ | C. Acidic |
| (iv) $Cl_2O_7$ | D. Amphoteric |

Which of the following options has all correct pairs?
(a) (i)-B, (ii)-A, (iii)-D, (iv)-C
(b) (i)-C, (ii)-B, (iii)-A, (iv)-D
(c) (i)-A, (ii)-D, (iii)-B, (iv)-C
(d) (i)-B, (ii)-D, (iii)-A, (iv)-C *(Odisha NEET 2019)*

**9.** Which of the following oxides is most acidic in nature?
(a) MgO (b) BeO
(c) BaO (d) CaO *(NEET 2018)*

**10.** In which of the following options the order of arrangement does not agree with the variation of property indicated against it?
(a) I < Br < Cl < F (increasing electron gain enthalpy)
(b) Li < Na < K < Rb (increasing metallic radius)
(c) $Al^{3+} < Mg^{2+} < Na^+ < F^-$ (increasing ionic size)
*(d)* B < C < N < O (increasing first ionisation enthalpy) *(NEET-I 2016)*

**11.** The formation of the oxide ion, $O^{2-}_{(g)}$ from oxygen atom requires first an exothermic and then an endothermic step as shown below :

$O_{(g)} + e^- \rightarrow O^-_{(g)}$; $\Delta_f H° = -141$ kJ mol$^{-1}$

$O^-_{(g)} + e^- \rightarrow O^{2-}_{(g)}$; $\Delta_f H° = +780$ kJ mol$^{-1}$

Thus, process of formation of $O^{2-}$ in gas phase is unfavourable even though $O^{2-}$ is isoelectronic with neon. It is due to the fact that,

(a) $O^-$ ion has comparatively smaller size than oxygen atom

(b) oxygen is more electronegative

(c) addition of electron in oxygen results in larger size of the ion

*(d)* electron repulsion outweighs the stability gained by achieving noble gas configuration. *(2015)*

**12.** Which of the following orders of ionic radii is correctly represented?

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

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

*(2014)*

**13.** Which one of the following arrangements represents the correct order of least negative to most negative electron gain enthalpy for C, Ca, Al, F and O?

(a) Al < Ca < O < C < F

(b) Al < O < C < Ca < F

(c) C < F < O < Al < Ca

*(d)* Ca < Al < C < O < F *(Karnataka NEET 2013)*

**14.** In which of the following arrangements the given sequence is not strictly according to the property indicated against it?

(a) HF < HCl < HBr < HI : increasing acidic strength

(b) $H_2O < H_2S < H_2Se < H_2Te$ : increasing $pK_a$ values

(c) $NH_3 < PH_3 < AsH_3 < SbH_3$ : increasing acidic character

*(d)* $CO_2 < SiO_2 < SnO_2 < PbO_2$ : increasing oxidising power *(Mains 2012)*

**15.** Identify the wrong statement in the following.

(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 2$^{nd}$ period of the periodic table. *(2012)*

**16.** What is the value of electron gain enthalpy of $Na^+$ if $IE_1$ of Na = 5.1 eV?

(a) –5.1 eV (b) –10.2 eV

(c) +2.55 eV (d) +10.2 eV *(Mains 2011)*

**17.** Which of the following oxides is amphoteric?

(a) $SnO_2$ (b) CaO

(c) $SiO_2$ (d) $CO_2$ *(Mains 2011)*

**18.** The correct order of the decreasing ionic radii among the following isoelectronic species is

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

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

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

(d) $K^+ > Ca^{2+} > Cl^- > S^{2-}$ *(2010)*

**19.** Which of the following represents the correct order of increasing electron gain enthalpy with negative sign for the elements O, S, F and Cl?

(a) Cl < F < O < S (b) O < S < F < Cl

(c) F < S < O < Cl (d) S < O < Cl < F

*(2010, 2005)*

**20.** Among the elements Ca, Mg, P and Cl, the order of increasing atomic radii is

(a) Mg < Ca < Cl < P (b) Cl < P < Mg < Ca

(c) P < Cl < Ca < Mg (d) Ca < Mg < P < Cl

*(Mains 2010)*

**21.** Among the following which one has the highest cation to anion size ratio?

(a) CsI (b) CsF

(c) LiF (d) NaF *(Mains 2010)*

**22.** Amongst the elements with following electronic configurations, which one of them may have the highest ionisation energy?

(a) Ne $[3s^2\ 3p^2]$ (b) Ar $[3d^{10}\ 4s^2\ 4p^3]$

(c) Ne $[3s^2\ 3p^1]$ (d) Ne $[3s^2\ 3p^3]$ *(2009)*

**23.** Identify the correct order of the size of the following.

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

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

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

(d) $Ca^{2+} < K^+ < Ar < S^{2-} < Cl^-$ *(2007)*

**24.** With which of the following electronic configuration an atom has the lowest ionisation enthalpy?

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

(c) $1s^2\ 2s^2\ 2p^6$ (d) $1s^2\ 2s^2\ 2p^5$ *(2007)*

**25.** Which one of the following ionic species has the greatest proton affinity to form stable compound?

(a) $NH_2^-$ (b) $F^-$

(c) $I^-$ (d) $HS^-$ *(2007)*

**26.** Which of the following is the most basic oxide?
(a) $SeO_2$ (b) $Al_2O_3$
(c) $Sb_2O_3$ (d) $Bi_2O_3$ *(2006)*

**27.** What is the correct relationship between the pH of isomolar solutions of sodium oxide, $Na_2O$ ($pH_1$), sodium sulphide, $Na_2S$ ($pH_2$), sodium selenide, $Na_2Se$ ($pH_3$) and sodium telluride $Na_2Te$ ($pH_4$)?
(a) $pH_1 > pH_2 > pH_3 > pH_4$
(b) $pH_1 > pH_2 \approx pH_3 > pH_4$
(c) $pH_1 < pH_2 < pH_3 < pH_4$
(d) $pH_1 < pH_2 < pH_3 \approx pH_4$ *(2005)*

**28.** Ionic radii are
(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. *(2004)*

**29.** The ions $O^{2-}$, $F^-$, $Na^+$, $Mg^{2+}$ and $Al^{3+}$ are isoelectronic. Their ionic radii show
(a) a significant increase from $O^{2-}$ to $Al^{3+}$
(b) a significant decrease from $O^{2-}$ to $Al^{3+}$
(c) an increase from $O^{2-}$ to $F^-$ and then decrease from $Na^+$ to $Al^{3+}$
*(d)* a decrease from $O^{2-}$ to $F^-$ and then increase from $Na^+$ to $Al^{3+}$. *(2003)*

**30.** Which of the following order is wrong?
(a) $NH_3 < PH_3 < AsH_3$ – acidic
(b) Li < Be < B < C – 1st IP
(c) $Al_2O_3 < MgO < Na_2O < K_2O$ – basic
*(d)* $Li^+ < Na^+ < K^+ < Cs^+$ – ionic radius. *(2002)*

**31.** Correct order of 1st ionisation potential among following elements Be, B, C, N, O is
(a) B < Be < C < O < N
(b) B < Be < C < N < O
(c) Be < B < C < N < O
(d) Be < B < C < O < N *(2001)*

**32.** Which of the following elements has the maximum electron affinity?
(a) I (b) Br
(c) Cl (d) F *(1999)*

**33.** The first ionization potentials (eV) of Be and B respectively are
(a) 8.29, 8.29 (b) 9.32, 9.32
(c) 8.29, 9.32 (d) 9.32, 8.29 *(1998)*

**34.** Which one of the following is correct order of the size of iodine species?
(a) $I^+ > I^- > I$ (b) $I^- > I > I^+$
(c) $I > I^- > I^+$ (d) $I > I^+ > I^-$ *(1997)*

**35.** Which of the following ions is the largest in size?
(a) $K^+$ (b) $Ca^{2+}$
(c) $Cl^-$ (d) $S^{2-}$ *(1996)*

**36.** Which of the following has the smallest size?
(a) $Al^{3+}$ (b) $F^-$
(c) $Na^+$ (d) $Mg^{2+}$ *(1996)*

**37.** Among the following oxides, the one which is most basic is
(a) ZnO (b) MgO
(c) $Al_2O_3$ (d) $N_2O_5$ *(1994)*

**38.** Which of the following has largest size?
(a) Na (b) $Na^+$
(c) $Na^-$ (d) Can't be predicted. *(1993)*

**39.** $Na^+$, $Mg^{2+}$, $Al^{3+}$ and $Si^{4+}$ are isoelectronic. The order of their ionic size is
(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) $Na^+ < Mg^{2+} > Al^{3+} < Si^{4+}$ *(1993)*

**40.** In the periodic table from left to right in a period, the atomic volume
(a) decreases
(b) increases
(c) remains same
*(d)* first decreases then increases. *(1993)*

**41.** Which electronic configuration of an element has abnormally high difference between second and third ionization energy?
(a) $1s^2, 2s^2, 2p^6, 3s^1$
(b) $1s^2, 2s^2, 2p^6, 3s^1, 3p^1$
(c) $1s^2, 2s^2, 2p^6, 3s^2, 3p^2$
(d) $1s^2, 2s^2, 2p^6, 3s^2$ *(1993)*

**42.** One of the characteristic properties of non-metals is that they
(a) are reducing agents
(b) form basic oxides
(c) form cations by electron gain
*(d)* are electronegative. *(1993)*

**43.** Which one of the following has minimum value of cation/anion ratio?
(a) NaCl (b) KCl
(c) $MgCl_2$ (d) $CaF_2$ *(1993)*

**44.** Which of the following sets has strongest tendency to form anions?
(a) Ga, Ni, Tl
(b) Na, Mg, Al
(c) N, O, F
(d) V, Cr, Mn *(1993)*

**45.** Elements of which of the following groups will form anions most readily?
(a) Oxygen family (b) Nitrogen family
(c) Halogens (d) Alkali metals *(1992)*

**46.** In the periodic table, with the increase in atomic number, the metallic character of an element
(a) decreases in a period and increases in a group
(b) increases in a period and decreases in a group
(c) increases both in a period and the group
*(d)* decreases in a period and the group. *(1989)*

**47.** Which of the following atoms will have the smallest size?
(a) Mg (b) Na
(c) Be (d) Li *(1989)*

**ANSWER KEY**

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.** | (d) | **2.** | (a) | **3.** | (a) | **4.** | (c) | **5.** | (c) | **6.** | (c) | **7.** | (c) | **8.** | (d) | **9.** | (b) | **10.** | (a,d) |
| **11.** | (d) | **12.** | (None) | | | **13.** | (d) | **14.** | (b) | **15.** | (a) | **16.** | (a) | **17.** | (a) | **18.** | (c) | **19.** | (b) |
| **20.** | (b) | **21.** | (b) | **22.** | (d) | **23.** | (a) | **24.** | (b) | **25.** | (a) | **26.** | (d) | **27.** | (a) | **28.** | (a) | **29.** | (b) |
| **30.** | (b) | **31.** | (a) | **32.** | (c) | **33.** | (d) | **34.** | (b) | **35.** | (d) | **36.** | (a) | **37.** | (b) | **38.** | (c) | **39.** | (c) |
| **40.** | (d) | **41.** | (d) | **42.** | (d) | **43.** | (c) | **44.** | (c) | **45.** | (c) | **46.** | (a) | **47.** | (c) | | | | |

## Hints & Explanations

**1. (d) :** Unnilunium – Mendelevium ⇒ (a)-(i)
Unniltrium – Lawrencium ⇒ (b)-(ii)
Unnilhexium – Seaborgium ⇒ (c)-(iii)
Ununnium – Roentgenium ⇒ (d) (~~iv~~)

**2. (a) :** The electronic configuration of the element with $Z = 114$ (Flerovium) is $[Rn]5f^{14}\,6d^{10}7s^2 7p^2$.
Hence, it belongs to carbon family which has the same outer electronic configuration.

**3. (a) :** The electronic configuration of an atom: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^3\ 4s^2$
In the configuration, the last electron of the atom is filled in *d*-subshell as $3d^3$. Thus, this element belongs to *d*-block of the periodic table with group no. VB or 5.

**4. (c) :** Atomic number of the given element is 15 and it belongs to group 15. Therefore atomic number of the element below the above element = 15 + 18 = 33.

**5. (c) :** Electronic configuration of an element with $Z = 33$ is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^3$.
Hence, it lies in VA or $15^{th}$ group.

**6. (c) :** Elements (a), (b) and (d) belong to the same group since each one of them has two electrons in valence shell. In contrast, element (c) has seven electrons in the valence shell, and hence it lies in other group.

**7. (c) :** As we move across a period, ionisation enthalpy increases, because of increased nuclear charge and decrease in atomic radii. However, abnormal values are observed for Be, N and Ne due to extra stability of half filled and fully filled orbitals. Thus, the actual order is, Li < B < Be < C < O < N < F < Ne.

**8. (d) :** $Na_2O$ - Basic oxide, $Al_2O_3$ - Amphoteric oxide, $N_2O$ - Neutral oxide, $Cl_2O_7$ - Acidic oxide.

**9. (b) :** In metals, on moving down the group, metallic character increases, so basic nature increases hence most acidic will be BeO.

**10. (a, d) :** The correct order of increasing negative electron gain enthalpy is : I < Br < F < Cl due to electron-electron repulsion in small sized F atom and the correct order of increasing first ionisation enthalpy is B < C < O < N due to extra stability of half-filled orbitals in N-atom.

**11. (d)**

**12. (None) :** Cations lose electrons and are smaller in size than the parent atom, whereas anions add electrons and are larger in size than the parent atom. Hence, the order is $H^- > H > H^+$.
For isoelectronic species, the ionic radii decreases with increase in atomic number *i.e.*, nuclear charge. Hence, the correct orders are
$O^{2-} > F^- > Na^+$ and $N^{3-} > Mg^{2+} > Al^{3+}$.

**13. (d)** Electron gain enthalpy becomes less negative from top to bottom in a group while it becomes more negative from left to right within a period.

**14. (b) :** Acidic strength of hydrides increase with increase in molecular mass.

Thus, order of acidic strength is

$HF < HCl < HBr < HI$

$H_2O < H_2S < H_2Se < H_2Te$

$NH_3 < PH_3 < AsH_3 < SbH_3$

and as acidic strength increases, $pK_a$ decreases. Thus order of $pK_a$

$H_2O > H_2S > H_2Se > H_2Te$

**15. (a) :** As positive charge on the cation increases, effective nuclear charge increases. Thus, atomic size decreases.

**16. (a) :** $Na \rightarrow Na^+ + e^-$; $\Delta H = 5.1$ eV

$Na^+ + e^- \rightarrow Na$ ; $\Delta H = -5.1$ eV

**17. (a) :** $SnO_2$ reacts with acid as well as base. So, $SnO_2$ is an amphoteric oxide.

$SnO_2 + 4HCl \longrightarrow SnCl_2 + 2H_2O$

$SnO_2 + 2NaOH \longrightarrow Na_2SnO_3 + H_2O$

CaO is basic in nature while $SiO_2$ and $CO_2$ are acidic in nature.

**18. (c) :** $S^{2-} > Cl^- > K^+ > Ca^{2+}$

Among isoelectronic species, ionic radii increases with increase in negative charge. This happens because effective nuclear charge ($Z_{eff}$) decreases.

Similarly, ionic radii decreases with increase in positive charge as $Z_{eff}$ increases.

**19. (b) :** Cl atom has the highest electron affinity in the periodic table. F being a member of group 17 has higher electron gain enthalpy than S which belongs to group 16. This in turn is higher than the electron affinity of O atom.

Thus, Cl > F > S > O

It is worth noting that the electron gain enthalpy of oxygen and fluorine, the members of the second period, have less negative values of electron gain enthalpy than the corresponding elements sulphur and chlorine of the third period.

This is due to small size of the atoms of oxygen and fluorine. As a result, there is a strong inter-electronic repulsion when extra electron is added to these atoms, *i.e.*, electron density is high and the addition of an extra electron is not easy.

**20. (b) :** The atomic radii decrease on moving from left to right in a period, thus order of sizes for Cl, P and Mg is Cl < P < Mg. Down the group size increases. Thus, overall order is Cl < P < Mg < Ca.

**21. (b) :** The cation to anion size ratio will be maximum when the cation is of largest size and the anion is of smallest size. Among the given species, $Cs^+$ has maximum size among given cations and $F^-$ has smallest size among given anions, thus CsF has highest $r_c/r_a$ ratio.

**22. (d) :** Among options (a), (c) and (d), option (d) has the highest ionisation energy because of extra stability associated with half-filled 3*p*-orbital. In option (b), the presence of $3d^{10}$ electrons offers shielding effect, as a result the $4p^3$ electrons do not experience much nuclear charge and hence, the electrons can be removed easily.

**23. (a) :** Among isoelectronic ions, ionic radii of anions is more than that of cations. Further size of the anion increases with increase in negative charge and size of the cation decreases with increase in positive charge.

**24. (b) :** The larger the atomic size, smaller is the value of the ionisation enthalpy. Again higher the screening effect, lesser is the value of ionisation potential. Hence, option (b) has lowest ionisation enthalpy.

**25. (a) :** In going from left to right across a period in the periodic table, the basicity (*i.e.*, proton affinity) decreases as the electronegativity of the atom possessing the lone pair of electrons increases. Hence, basicity of $NH^2$ is higher than F . On moving down a group, as the atomic size increases, basicity decreases. Hence, $F^-$ is more basic than $I^-$ and $HO^-$ is more basic than $HS^-$. Hence, among the given ionic species, $NH_2^-$ has maximum proton affinity.

**26. (d) :** $SeO_2 \longrightarrow$ acidic oxide,

$Al_2O_3$, $Sb_2O_3 \longrightarrow$ amphoteric,

$Bi_2O_3 \longrightarrow$ basic oxide.

**27. (a) :** $Na_2O$, $Na_2S$, $Na_2Se$, $Na_2Te$ — Basic character decreases down the group

pH ∝ basic character

Hence, $pH_1 > pH_2 > pH_3 > pH_4$

**28. (a)**

**29. (b) :** Amongst isoelectronic ions, ionic radii of anions is more than that of cations. Further size of the anion increases with increase in –ve charge and size of cation decreases with increase in +ve charge. Hence, correct order is $O^{2-} > F^- > Na^+ > Mg^{2+} > Al^{3+}$.

**30. (b) :** Li, Be, B, C - these elements belong to the same period. Generally the value of 1st ionisation potential increases on moving from left to right in a period, since the nuclear charge of the elements also increase in the same direction. But the ionisation potential of boron ($B \rightarrow 2s^2\,2p^1$) is lower than that of beryllium ($Be \rightarrow 2s^2$), since in case of boron, $2p^1$ electron has to be removed to get $B^+$ while in case of Be ($2s^2$), *s*-electron has to be removed to get $Be^+$ ($2s^1$). *p*-electron can be removed

more easily than *s*-electron so the energy required to remove electron will be less in case of boron. The order will be

$$Li < B < Be < C.$$

**31. (a) :** The energy required to remove the most loosely bound electron from an isolated gaseous atom is called the ionisation energy.
The ionisation potential increases as the size of the atom decreases. Atoms with fully or partly filled orbitals have high ionisation potential.

**32. (c) :** Among the halogens the electron affinity value of 'F' should be maximum. But due to small size there is inter-electronic repulsion thus, there is difficulty in entry of new electrons. Thus, the *E.A.* value is slightly lower than chlorine and the order is I < Br < F < Cl.

**33. (d) :** $_4Be \rightarrow 1s^2\,2s^2$, $_5B \rightarrow 1s^2\,2s^2\,2p^1$
Due to stable fully-filled '*s*'-orbital arrangement of electrons in 'Be' atom, more energy is required to remove an electron from the valence shell than 'B'-atom. Therefore 'Be' has higher ionisation potential than 'B'.

**34. (b) :** Positive ion is always smaller and negative ion is always larger than the parent atom.

**35. (d) :** Since all of these ions contain 18 electrons each, so these are isoelectronic. For isoelectronic ions, the anion having large negative charge is the largest in size *i.e.*, $S^{2-}$.

**36. (a) :** These are isoelectronic ions (ions with same number of electrons) and for isoelectronic ions, greater the positive charge, greater is the force of attraction on the electrons by the nucleus and the smaller is the size of the ion. Thus, $Al^{3+}$ has the smallest size.

**37. (b) :** $Al_2O_3$ and ZnO are amphoteric. $N_2O_5$ is strongly acidic. MgO is the most basic.

**38. (c) :** The cations are always smaller than the neutral atom and anions are always larger in size, $Na^- > Na > Na^+$.

**39. (c) :** In isoelectronic ions, the size of the cation decreases as the magnitude of the positive charge increases.

**40. (d) :** Within a period from left to right, atomic volume first decreases and then increases.

**41. (d) :** Abnormally high difference between $2^{nd}$ and $3^{rd}$ ionisation energy means that the element has two valence electrons, which is a case in configuration (d).

**42. (d)**

**43. (c) :** The order of ionic size for given ions will be $K^+ > Ca^{2+} > Mg^{2+}$ and that of $Cl^- > F^-$. Therefore, $MgCl_2$ has minimum value of cation/anion ($Mg^{2+}/Cl^-$) ratio.

**44. (c) :** N, O and F are highly electronegative non-metals and will have the strongest tendency to form anions by gaining electrons from metal atoms.

**45. (c) :** As halogens have seven electrons ($ns^2np^5$) in the valence shell, they have a strong tendency to acquire the nearest inert gas configuration by gaining an electron from the metallic atom and form halide ions easily.

**46. (a) :** Metallic character decreases in a period and increases in a group.

**47. (c) :** The atomic size decreases within a period from left to right, therefore Li > Be and Na > Mg. The size increases in a group from top to bottom. Hence, the size of Na is greater than Li. Overall order Na > Mg > Li > Be. Thus, Be has smallest size.