

**EXERCISE-01****CHECK YOUR GRASP****SELECT THE CORRECT ALTERNATIVE (ONLY ONE CORRECT ANSWER)**

1. The atom having the valence shell electronic configuration  $4s^2 4p^2$  would be in:-  
(A) Group II A and period 3 (B) Group II B and period 4  
(C) Group IV A and period 4 (D) Group IV A and period 3
2. An element with atomic number 106 has been discovered recently. Which of the following electronic configuration will it possess :-  
(A)  $[Rn] 5f^{14} 6d^5 7s^1$  (B)  $[Rn] 5f^{14} 6d^5 7s^2$  (C)  $[Rn] 5f^{14} 6d^6 7s^0$  (D)  $[Rn] 5f^{14} 6d^1 7s^2 7p^3$
3. The electronic configuration of transition elements is exhibited by :-  
(A)  $ns^{1-2}(n-1)d^{1-10}$  (B)  $ns^2 (n-1) d^{10}$  (C)  $(n-1)d^{10}s^2$  (D)  $ns^2 np^5$
4. Which of the following electronic configurations in the outermost shell is characteristic of alkali metals :-  
(A)  $(n-1) s^2 p^6 ns^2 p^1$  (B)  $(n-1) s^2 p^6 d^{10} ns^1$  (C)  $(n-1) s^2 p^6 ns^1$  (D)  $ns^2 np^6 (n-1)d^{10}$
5. The chemistry of lithium is very similar to that of magnesium even though they are placed in different groups. Its reason is :-  
(A) Both are found together in nature (B) Both have nearly the same size  
(C) Both have similar electronic configurations (D) The ratio of their charge to size is nearly the same
6. Configuration of  $Br^-$  is :  $[Ar] 3d^{10} 4s^2 4p^6$ . The electronic configuration of  $Br^{+2}$  would be identical with the element :-  
(A) Se (B) As (C) Ga (D) Ge
7.  $4d^3 5s^2$  configuration belongs to which group :-  
(A) IIA (B) IIB (C) V B (D) III B
8. The ionic radii of  $N^{3-}$ ,  $O^{2-}$  and  $F^-$  are respectively given by :-  
(A) 1.36, 1.40, 1.71 (B) 1.36, 1.71, 1.40 (C) 1.71, 1.40, 1.36 (D) 1.71, 1.36, 1.40
9. From the given set of species, point out the species from each set having least atomic radius:-  
(a)  $O^{2-}$ ,  $F^-$ ,  $Na^+$  (b) Ni, Cu, Zn (c) Li, Be, Mg (d) He,  $Li^+$ ,  $H^-$   
correct answer is -  
(A)  $O^{2-}$ , Cu, Li,  $H^-$  (B)  $Na^+$ , Ni, Be,  $Li^+$  (C)  $F^-$ , Zn, Mg, He (D)  $Na^+$ , Cu, Be, He
10.  $K^+$ , Ar,  $Ca^{2+}$  and  $S^{2-}$  contains -  
(A) Same electronic configuration and atomic volume  
(B) Different electronic configuration but same IP.  
(C) Same electronic configuration but different atomic volume  
(D) None
11. Which of the following is not isoelectronic series :-  
(A)  $Cl^-$ ,  $P^{3-}$ , Ar (B)  $N^{3-}$ , Ne,  $Mg^{+2}$  (C)  $B^{+3}$ , He,  $Li^+$  (D)  $N^{3-}$ ,  $S^{2-}$ ,  $Cl^-$
12. Atomic radii of Fluorine and Neon in Angstrom units are given by :-  
(A) 0.72, 1.60 (B) 1.60, 1.60  
(C) 0.72, 0.72 (D) None of these
13. In the isoelectronic species the ionic radii (Å) of  $N^{3-}$ , Ne and  $Al^{+3}$  are respectively given by:-  
(A) 1.36, 1.40, 1.71 (B) 1.36, 1.71, 1.40  
(C) 1.71, 1.40, 1.36 (D) 1.71, 1.36, 1.40
14.  $S^{2-}$  is not isoelectronic with :-  
(A) Ar (B)  $Cl^-$  (C)  $HS^-$  (D)  $Ti^{+3}$
15. The  $IP_1$ ,  $IP_2$ ,  $IP_3$ ,  $IP_4$  and  $IP_5$  of an element are 7.1, 14.3, 34.5, 46.8, 162.2 eV respectively. The element is likely to be:-  
(A) Na (B) Si (C) F (D) Ca

16. In which case the energy released is minimum:-  
 (A)  $\text{Cl} \rightarrow \text{Cl}^-$  (B)  $\text{P} \rightarrow \text{P}^-$  (C)  $\text{N} \rightarrow \text{N}^-$  (D)  $\text{C} \rightarrow \text{C}^-$
17. The electron affinity values for the halogens shows the following trend :-  
 (A)  $\text{F} < \text{Cl} > \text{Br} > \text{I}$  (B)  $\text{F} < \text{Cl} < \text{Br} < \text{I}$   
 (C)  $\text{F} > \text{Cl} > \text{Br} > \text{I}$  (D)  $\text{F} < \text{Cl} > \text{Br} < \text{I}$
18. The process requiring the absorption of energy is.  
 (A)  $\text{F} \rightarrow \text{F}^-$  (B)  $\text{Cl} \rightarrow \text{Cl}^-$  (C)  $\text{O} \rightarrow \text{O}^{2-}$  (D)  $\text{H} \rightarrow \text{H}^-$
19. The X - X bond length is 1.00 Å and C - C bond length is 1.54 Å. If electronegativities of 'X' and 'C' are 3.0 and 2.0 respectively, the C - X bond length is likely to be :-  
 (A) 1.27 Å (B) 1.18 Å (C) 1.08 Å (D) 1.28 Å
20. Correct order of electronegativity of N, P, C and Si is :-  
 (A)  $\text{N} < \text{P} < \text{C} < \text{Si}$  (B)  $\text{N} > \text{C} > \text{Si} > \text{P}$   
 (C)  $\text{N} = \text{P} > \text{C} = \text{Si}$  (D)  $\text{N} > \text{C} > \text{P} > \text{Si}$
21. Mulliken scale of electronegativity uses the concept of :-  
 (A) E. A. and EN of pauling (B) E. A. and atomic size  
 (C) E.A. and I.P. (D) E.A. and bond energy
22. Which of the following general electronic configuration for transition elements is not correct :-  
 (A)  $(n + 1) s^{1-2} nd^{1-10}$  (B)  $ns^{1-2} (n - 1)d^{1-10}$  (Where  $n = 2, 3, 4, \dots$ )  
 (C)  $ns^{0,1,2} (n - 1)s^2 p^6 d^{1-10}$  (D)  $(n - 1)d^{1-10} ns^{0-2}$
23. Be and Mg have zero value of electron affinity, because :-  
 (A) Be and Mg have  $[\text{He}] 2s^2$  and  $[\text{Ne}] 3s^2$  configuration respectively.  
 (B) 2s and 3s orbitals are filled to their capacity  
 (C) Be and Mg are unable to accept electron.  
 (D) All the above are correct.
24. The pair with minimum difference in electronegativity is :-  
 (A) F, Cl (B) C, H (C) P, H (D) Na, Cs
25. In the following electronic configuration :  
 $ns^2 (n - 1) d^{0-1} (n - 2)f^{1-14}$   
 If value of  $(n - 1) = 6$  the configuration will be of :-  
 (A) Lanthanides (B) d - block (C) Actinides (D) s - block
26. Which of the following match is correct :-  
 (A) Base of mendeleef periodic table - Number of protons  
 (B) Dobernier's triad - Na, K, Rb  
 (C) Newland's octave rule is obeyed by H, F, Cl  
 (D) Lothar meyer curve plotted between - Atomic number V/S Atomic weight
27. True statement is :-  
 (A) All the transuranic elements are synthetic elements  
 (B) Elements of third group are called bridge elements  
 (C) Element of  $1s^2$  configuration is placed in IIA group  
 (D) Electronic configuration of elements of a group is same
28. The screening effect of s orbital electron is :-  
 (A) Greater than p but lesser than d and f electrons  
 (B) Less than p, d and f electrons  
 (C) Greater than p, d and f electrons  
 (D) Is equal to p, d and f electrons

29. In the first 100 elements, number of s-block elements are :-  
 (A) 88 (B) 12 (C) 14 (D) 22
30. The radius of isoelectronic series :-  
 (A) Decreases with decreasing nuclear charge  
 (B) Decreases with increasing effective nuclear charge  
 (C) Same for all  
 (D) First increases then decreases
31. In a period, the elements having least melting point are :-  
 (A) Noble gas (B) Alkali metals (C) Chalcogens (D) Pnictogens
32. Which set of elements has strong tendency to form cations :-  
 (A) N, O, P (B) F, Cl, Br (C) Be, He, Mg (D) Cs, Ba, K
33. A neutral atom (Ar) is converted to  $(Ar^{+3})$  by the following process  

$$Ar \xrightarrow[-e]{E_1} Ar^+ \xrightarrow[-e]{E_2} Ar^{+2} \xrightarrow[-e]{E_3} Ar^{+3}$$
 The correct order of  $E_1$ ,  $E_2$  and  $E_3$  energies is:-  
 (A)  $E_1 < E_2 < E_3$  (B)  $E_1 > E_2 > E_3$  (C)  $E_1 = E_2 = E_3$  (D)  $E_1 > E_2 < E_3$
34. The maximum energy will be released in the following process :-  
 (A)  $B + e^- \longrightarrow B^-$  (B)  $C + e^- \longrightarrow C^-$  (C)  $N + e^- \longrightarrow N^-$  (D)  $O + e^- \longrightarrow O^-$
35. Which of the following represents a correct sequence of electronegativity values :-  
 (A)  $F > N > O > C$  (B)  $F > N < O > C$   
 (C)  $F > N > C > O$  (D)  $F < N < O < C$
36. An element with the electronic configuration  $[Xe] 4f^7 5d^1 6s^2$  lies in the :-  
 (A) s-block II-A group (B) d-block III-B group  
 (C) f-block III-B group (D) d-block VIII group
37. In which of the following compounds cation and anion ratio is minimum :-  
 (A) CsF (B) LiI (C) LiF (D) CsI
38. In which of the following the energy change corresponds to first ionisation potential :-  
 (A)  $X_{(g)} \rightarrow X^+_{(g)} + e$  (B)  $2X_{(g)} \rightarrow 2X^+_{(g)} + 2e$   
 (C)  $X_{(s)} \rightarrow X^+_{(g)} + e$  (D)  $X_{(aq)} \rightarrow X^+_{(aq)} + e$
39. Set of elements having one electron in their valence shell are :-  
 (A) Cl, Br, I (B) Na, Mg, Al  
 (C) B, Al, Ga (D) K, Rb, Cs
40. The covalent and vander Waal's radii of hydrogen respectively are :-  
 (A) 0.37 Å, 0.8 Å (B) 0.37 Å, 0.37 Å (C) 0.8 Å, 0.8 Å (D) 0.8 Å, 0.37 Å
41. The electronic configuration of two neutral elements A and B are  
 $A = 1s^2 2s^2 2p^6 3s^1$  and  $B = 1s^2 2s^2 2p^5$   
 (A)  $A^+ B^-$  (B)  $A^- B^+$  (C)  $A - B$  (D)  $A^{2+} (B^-)_2$
42. If the ionic radii of  $K^{\oplus}$  and  $F^{\ominus}$  are nearly the same (i.e. 1.34 Å) then the atomic radii of K and F respectively are :-  
 (A) 1.34 Å, 1.34 Å (B) 0.72 Å, 1.96 Å (C) 1.96 Å, 0.72 Å (D) 1.96 Å, 1.34 Å
43. The electronegativities of the following elements H, O, F, S and Cl increase in the order:-  
 (A)  $H < O < F < S < Cl$  (B)  $S < H < Cl < O < F$   
 (C)  $H < S < O < Cl < F$  (D)  $H < S < Cl < O < F$
44. The correct order of size for iodine, species I,  $I^-$ ,  $I^+$  is :  
 (A)  $I > I^- > I^+$  (B)  $I > I^+ > I^-$  (C)  $I^+ > I^- > I$  (D)  $I^- > I > I^+$

45. In the periodic table, the metallic character of element :
- (A) Decreases from left to right across a period and on descending a group
  - (B) Decreases from left to right across a period and increases on descending a group
  - (C) Increases from left to right across a period and on descending a group
  - (D) Increases from left to right across a period and decreases on descending a group
46. Fluorine is the most reactive among all the halogens, because of it's :
- (A) small size
  - (B) low dissociation energy of F - F bond
  - (C) large size
  - (D) high dissociation energy of F - F bond

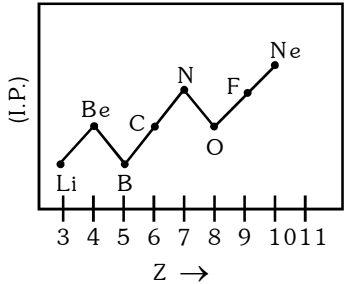
CHECK YOUR GRASP						ANSWER KEY				EXERCISE -1					
Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	C	A	A	C	D	B	C	C	B	C	D	A	C	D	B
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	C	A	C	B	D	C	B	D	C	C	C	A	C	C	B
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	A	D	A	D	B	C	B	A	D	A	A	C	D	D	B
Que.	46														
Ans.	B														

**EXERCISE-02****BRAIN TEASERS****SELECT THE CORRECT ALTERNATIVES (ONE OR MORE THEN ONE CORRECT ANSWERS)**

1. If the difference in atomic size of :  
Na - Li = x                      Rb - K = y                      Fr - Cs = z  
Then correct order will be:-  
(A) x = y = z                      (B) x > y > z                      (C) x < y < z                      (D) x < y << z
2. In the ions  $P^{3-}$ ,  $S^{2-}$  and  $Cl^{-}$  the increasing order of size is:-  
(A)  $Cl^{-}$ ,  $S^{2-}$ ,  $P^{3-}$                       (B)  $P^{3-}$ ,  $S^{2-}$ ,  $Cl^{-}$                       (C)  $S^{2-}$ ,  $Cl^{-}$ ,  $P^{3-}$                       (D)  $S^{2-}$ ,  $P^{3-}$ ,  $Cl^{-}$
3. Which of the following order of atomic/ionic radius is not correct :-  
(A)  $I^{-} > I > I^{+}$                       (B)  $Mg^{+2} > Na^{+} > F^{-}$                       (C)  $P^{+5} < P^{+3}$                       (D)  $Li > Be > B$
4. Ionic radii of :-  
(A)  $Ti^{4+} < Mn^{7+}$                       (B)  $^{37}Cl^{-} < ^{35}Cl^{-}$                       (C)  $K^{+} > Cl^{-}$                       (D)  $P^{3+} > P^{5+}$
5. The best reason to account for the general tendency of atomic diameters to decrease as the atomic numbers increase within a period of the periodic table is the fact that  
(A) Outer electrons repel inner electrons  
(B) Closer packing among the nuclear particles is achieved  
(C) The number of neutrons increases  
(D) The increasing nuclear charge exerts a greater attractive force on the electrons
6. Correct orders of 1<sup>st</sup> Ionisation Potential are :-  
(a)  $Li < B < Be < C$                       (b)  $O < N < F$                       (c)  $Be < N < Ne$   
(A) a, b                      (B) b, c                      (C) a, c                      (D) a, b, c
7. The second ionisation potentials in electron volts of oxygen and fluorine atoms are respectively given by :-  
(A) 35.1, 38.3                      (B) 38.3, 38.3                      (C) 38.3, 35.1                      (D) 35.1, 35.1
8. In which of the following pairs, the ionisation energy of the first species is less than that of the second :-  
(A)  $O^{-}$ ,  $O^{2-}$                       (B) S, P                      (C) N, P                      (D)  $Be^{+}$ , Be
9. The correct order of stability of  $Al^{+}$ ,  $Al^{+2}$ ,  $Al^{+3}$  is :-  
(A)  $Al^{+3} > Al^{+2} > Al^{+}$                       (B)  $Al^{+2} > Al^{+3} > Al^{+}$                       (C)  $Al^{+2} < Al^{+} > Al^{+3}$                       (D)  $Al^{+3} > Al^{+} > Al^{+2}$
10. Mg forms Mg(II) because of :-  
(A) The oxidation state of Mg is + 2  
(B) Difference between  $I.P_1$  and  $I.P_2$  is greater than 16.0 eV  
(C) There are only two electrons in the outermost energy level of Mg  
(D) Difference between  $I.P_1$  and  $I.P_2$  is less than 11 eV
11.  $IP_1$  and  $IP_2$  of Mg are 178 and 348 K. cal mol<sup>-1</sup>. The enthalpy required for the reaction  $Mg \rightarrow Mg^{2+} + 2e^{-}$  is :-  
(A) + 170 K.cal                      (B) + 526 K.cal                      (C) - 170 K.cal                      (D) - 526 K.cal
12. Which of the following decreases in going down the halogen group :-  
(A) Ionic radius                      (B) Atomic radius                      (C) Ionisation potential                      (D) Boiling point
13. Successive ionisation energies of an element 'X' are given below (in K. Cal)
- | $IP_1$ | $IP_2$ | $IP_3$ | $IP_4$ |
|--------|--------|--------|--------|
| 165    | 195    | 556    | 595    |
- Electronic configuration of the element 'X' is:-  
(A)  $1s^2, 2s^2 2p^6, 3s^2 3p^2$                       (B)  $1s^2, 2s^1$   
(C)  $1s^2, 2s^2 2p^2$                       (D)  $1s^2, 2s^2 2p^6, 3s^2$
14. The energy needed to remove one electron from unipositive ion is abbreviated as :-  
(A) 1<sup>st</sup> I.P.                      (B) 3<sup>rd</sup> I.P.                      (C) 2<sup>nd</sup> I.P.                      (D) 1<sup>st</sup> E.A.

15. Which of the following has  $2^{\text{nd}}$  IP  $<$   $1^{\text{st}}$  IP  
 (A) Mg (B) Ne (C) C (D) None
16. The correct order of decreasing first ionization energy is :-  
 (A) Si  $>$  Al  $>$  Mg  $>$  Na (B) Si  $>$  Mg  $>$  Al  $>$  Na  
 (C) Al  $>$  Si  $>$  Mg  $>$  Na (D) Mg  $>$  Li  $>$  Al  $>$  Si
17. Which of the following transitions involves maximum amount of energy.  
 (A)  $M_{(g)}^- \rightarrow M_{(g)}$  (B)  $M_{(g)} \rightarrow M_{(g)}^+$  (C)  $M_{(g)}^+ \rightarrow M_{(g)}^{2+}$  (D)  $M_{(g)}^{2+} \rightarrow M_{(g)}^{3+}$
18. Out of  $\text{Na}^+$ ,  $\text{Mg}^{+2}$ ,  $\text{O}^{-2}$  and  $\text{N}^{-3}$ , the pair of species showing minimum and maximum IP would be.  
 (A)  $\text{Na}^+$ ,  $\text{Mg}^{+2}$  (B)  $\text{Mg}^{+2}$ ,  $\text{N}^{-3}$  (C)  $\text{N}^{-3}$ ,  $\text{Mg}^{+2}$  (D)  $\text{O}^{-2}$ ,  $\text{N}^{-3}$
19. In the formation of a chloride ion, from an isolated gaseous chlorine atom, 3.8 eV energy is released, which would be equal to :-  
 (A) Electron affinity of  $\text{Cl}^-$  (B) Ionisation potential of Cl  
 (C) Electronegativity of Cl (D) Ionisation potential of  $\text{Cl}^-$
20. The correct order of electron affinity is :-  
 (A) Be  $<$  B  $<$  C  $<$  N (B) Be  $<$  N  $<$  B  $<$  C  
 (C) N  $<$  Be  $<$  C  $<$  B (D) N  $<$  C  $<$  B  $<$  Be
21. Electron addition would be easier in :-  
 (A) O (B)  $\text{O}^+$  (C)  $\text{O}^-$  (D)  $\text{O}^{+2}$
22. Process  $\text{Na}^+ \xrightarrow{\text{I}} \text{Na}_{(g)} \xrightarrow{\text{II}} \text{Na}_{(s)}$   
 (A) In (I) energy released, (II) energy absorbed (B) In both (I) and (II) energy is absorbed  
 (C) In both (I) and (II) energy is released (D) In (I) energy absorbed, (II) energy released
23. In the process  $\text{Cl}_{(g)} + e^- \xrightarrow{\Delta H} \text{Cl}_{(g)}^-$ ,  $\Delta H$  is  
 (A) Positive (B) Negative (C) Zero (D) None
24.  $\text{O}_{(g)} + 2e^- \rightarrow \text{O}_{(g)}^{2-}$   $\Delta H_{\text{eg}} = 744.7$  KJ/mole. The positive value of  $\Delta H_{\text{eg}}$  is due to :-  
 (A) Energy is released to add on 1  $e^-$  to  $\text{O}^{-1}$   
 (B) Energy is required to add on 1  $e^-$  to  $\text{O}^{-1}$   
 (C) Energy is needed to add on 1  $e^-$  to O  
 (D) None of the above is correct
25. Second electron affinity of an element is :-  
 (A) Always exothermic (B) Endothermic for few elements  
 (C) Exothermic for few elements (D) Always endothermic
26. The electron affinity  
 (A) Of carbon is greater than oxygen (B) Of fluorine is less than iodine  
 (C) Of  $\text{Cl}^-$  is less than Cl (D) Of S is less than oxygen
27. Which of the following statement is false :-  
 (A) Elements of  $ns^2np^6$  electronic configuration lies in  $1^{\text{st}}$  to  $6^{\text{th}}$  period  
 (B) Typical elements lies in  $3^{\text{rd}}$  period  
 (C) The seventh period will accommodate thirty two elements  
 (D) Boron and silicon are diagonally related
28. In boron atom screening is due to :-  
 (A) Electrons of K shell only (B) All the electrons of K and L shell  
 (C) Two electrons of 1s and 2s each (D) Only by electrons of L shell
29. Which will have the maximum value of electron affinity  $\text{O}^x$ ,  $\text{O}^y$  and  $\text{O}^z$  [x, y and z respectively are 0, - 1 and - 2] :-  
 (A)  $\text{O}^x$  (B)  $\text{O}^y$  (C)  $\text{O}^z$  (D) All have equal

30. The electron affinity of fluorine is less than that of chlorine because :-  
 (A) The incoming electron enters the 3p orbital in fluorine  
 (B) The incoming electron enters the 2p orbitals in fluorine and 3p orbital in chlorine  
 (C) The electron density in fluorine is higher  
 (D) Fluorine has lower ionisation potential than chlorine
31. If the atomic number of an element is 58, it will be placed in the periodic table in the -  
 (A) III B gp and 6<sup>th</sup> period (B) IV B gp and 6<sup>th</sup> period  
 (C) VB gp and 7<sup>th</sup> period (D) None of the above
32. Which of the following ion has largest size :-  
 (A) F<sup>-</sup> (B) Al<sup>+3</sup> (C) Cs<sup>+</sup> (D) O<sup>-2</sup>
33. Which ionisation potential (IP) in the following equations involves the greatest ammount of energy:-  
 (A)  $K^+ \rightarrow K^{+2} + e^-$  (B)  $Li^+ \rightarrow Li^{+2} + e^-$  (C)  $Fe \rightarrow Fe^+ + e^-$  (D)  $Ca^+ \rightarrow Ca^{+2} + e^-$
34. Which order is wrong :-  
 (A) Electronegativity - P < N < O < F  
 (B) 1<sup>st</sup> ionisation potential - B < Be < O < N  
 (C) Basic property - MgO > CaO > FeO > Fe<sub>2</sub>O<sub>3</sub>  
 (D) Reactivity - Be < Li < K < Cs
35. The correct electron affinity order of N, O, S, Cl is:-  
 (A) O < N < Cl < S (B) Cl > O > S > N  
 (C) N < O < S < Cl (D) N = Cl > O = S
36. 
$$\begin{array}{cccc} 1 & 2 & 3 & 4 \\ H_3C & -CH & =C & =CH_2 \end{array}$$
  
 In the given compound which carbon atom will show maximum electronegativity -  
 (A) Fourth (B) First  
 (C) Third (D) EN of all the carbon atoms is same
37. Decreasing order of size of ions is :-  
 (A) Br<sup>-</sup> > S<sup>-2</sup> > Cl<sup>-</sup> > N<sup>-3</sup> (B) N<sup>-3</sup> > S<sup>-2</sup> > Cl<sup>-</sup> > Br<sup>-</sup>  
 (C) Br<sup>-</sup> > Cl<sup>-</sup> > S<sup>-2</sup> > N<sup>-3</sup> (D) N<sup>-3</sup> > Cl<sup>-</sup> > S<sup>-2</sup> > Br<sup>-</sup>
38. In which case the maximum energy is needed in the formation of monpositive gaseous ion :  
 (A) 1 mole of Li atoms (B) 1 mole of Na atoms  
 (C) 1 mole of Cs atoms (D) 1 mole of Be atoms
39. (a)  $M_{(g)}^- \rightarrow M_{(g)}$  (b)  $M_{(g)} \rightarrow M_{(g)}^+$  (c)  $M_{(g)}^+ \rightarrow M_{(g)}^{+2}$  (d)  $M_{(g)}^{+2} \rightarrow M_{(g)}^{+3}$   
 Minimum and maximum I.P. would be of :-  
 (A) a, d (B) b, c (C) c, d (D) d, a
40. Correct order of ionic size of elements :-  
 (A) Mn<sup>+7</sup> > Mn<sup>+6</sup> > Mn<sup>+4</sup> (B) C<sup>+</sup> > C > C<sup>-</sup>  
 (C) Fe<sup>+3</sup> > Fe<sup>+2</sup> > Fe (D) All are incorrect
41. If the ionisation potential is IP, electron affinity is EA and electronegativity is x then which of the following relation is correct :-  
 (A) 2X - EA - IP = 0 (B) 2EA - X - IP = 0  
 (C) 2IP - X - EA = 0 (D) All of the above
42. Which are correct match :-  
 (A) O < C < S < Se — Atomic size  
 (B) Na < Al < Mg < Si — 1<sup>st</sup> I.P  
 (C) MgO < SrO < Cs<sub>2</sub>O < K<sub>2</sub>O — Basic character  
 (D) P<sub>4</sub>O<sub>10</sub> > SO<sub>3</sub> > Cl<sub>2</sub>O<sub>7</sub> - Acidic character

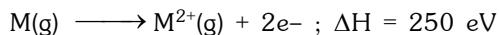
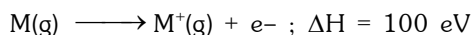
43. Which are correct match :-  
 (A)  $O > F > N > C$  — 2nd I.P.  
 (B)  $S^{2-} > Cl^- > K^+ > Ca^{+2}$  — Ionic radius  
 (C)  $N > C > P > Si$  — E. N.  
 (D)  $F > Na > Ne$  — 1st I.P.
44. In the third period Na to Cl seven element is/are called:-  
 (A) Lanthanides (B) Typical elements  
 (C) Halogen elements (D) Metalloids
45. Which of the following statement is/are not correct:-  
 (A) I.P. increases down the group  
 (B) IP of s-block elements is less than corresponding d- block elements  
 (C) If  $\Delta IP > 16$  eV higher oxidation state is more stable  
 (D) IP of halogen elements is maximum in their respective period
46. Out of the following statements which is/are correct :-  
 (A) H is an element of minimum atomic radius (B) He is an element of highest I.P.  
 (C) Cl is an element of highest EA (D) Li is an element of lowest I.P.
47. Triad - I [ $N^{3-}$ ,  $O^-$ ,  $Na^+$ ]  
 Triad - II [ $N^+$ ,  $C^+$ ,  $O^+$ ]  
 Choose the species of lowest IP from triad-I and highest IP from triad-II respectively  
 (A)  $N^{3-}$ ,  $O^+$  (B)  $Na^+$ ,  $C^+$  (C)  $N^{3-}$ ,  $N^+$  (D)  $O^-$ ,  $C^+$
48. The correct values of ionization energies (in  $\text{kJ mol}^{-1}$ ) of Be, Ne, He and N respectively are  
 (A) 899, 2080, 1403, 2372 (B) 2080, 899, 1403, 2372  
 (C) 899, 2080, 2372, 1403 (D) 899, 1403, 2080, 2372
49. Which of the following processes involve absorption of energy :-  
 (A)  $S(g) + e^- \rightarrow S^-(g)$  (B)  $O^-(g) + e^- \rightarrow O^{2-}(g)$   
 (C)  $Cl(g) + e^- \rightarrow Cl^-(g)$  (D)  $O(g) + e^- \rightarrow O^-(g)$
50. Following graph shows variation of I.P. with atomic number in second period (Li – Ne). Value of I.P. of Na (11) will be :-  
 (A) Above Ne  
 (B) Below Ne but above O  
 (C) Below Li  
 (D) Between N and O
- 
51.  $M(g) \rightarrow M^+(g) + e^-$ ,  $\Delta H = 100$  eV,  $M(g) \rightarrow M^{2+}(g) + 2e^-$ ,  $\Delta H = 250$  eV which is/are incorrect statement(s) :-  
 (A)  $IP_1$  of  $M(g)$  is 100 eV (B)  $IP_1$  of  $M^+(g)$  is 150 eV  
 (C)  $IP_2$  of  $M(g)$  is 250 eV (D)  $IP_2$  of  $M(g)$  is 150 eV
52. AB is predominantly ionic as  $A^+ B^-$  if :-  
 (A)  $(IP)_A < (IP)_B$  (B)  $(EA)_A < (EA)_B$  (C)  $(EN)_A < (EN)_B$  (D) Size of A < size of B
53. Which is correct order of size of O,  $O^{2-}$ ,  $F^-$  and F :-  
 (A)  $O^{2-} > O > F^- > F$  (B)  $O > O^{2-} > F > F^-$   
 (C)  $O^{2-} > F^- > F > O$  (D)  $O^{2-} > F^- > O > F$
54. Both metals and non-metals are found among.....elements in the periodic table :-  
 (A) p-block (B) d-block (C) Transition (D) Inner transition



55. In the plot of the first ionization energy against atomic number the peaks are occupied by :-  
 (A) Inert gases (B) Alkali metals  
 (C) Halogens (D) Transition elements
56. The correct values of ionization energies (in KJ mole<sup>-1</sup>) of Si, P, Cl and S respectively are  
 (A) 786, 1012, 999, 1256 (B) 1012, 786, 999, 1256  
 (C) 786, 1012, 1256, 999 (D) 786, 999, 1012, 1256
57. Which of the following sequence is correct for decreasing order of ionic radius :-  
 (A) Se<sup>-2</sup>, I<sup>-</sup>, Br<sup>-</sup>, O<sup>-2</sup>, F<sup>-</sup> (B) I<sup>-</sup>, Se<sup>-2</sup>, O<sup>-2</sup>, Br<sup>-</sup>, F<sup>-</sup>  
 (C) Se<sup>-2</sup>, I<sup>-</sup>, Br<sup>-</sup>, F<sup>-</sup>, O<sup>-2</sup> (D) I<sup>-</sup>, Se<sup>-2</sup>, Br<sup>-</sup>, O<sup>-2</sup>, F<sup>-</sup>
58. Which of the following orders for electron affinity is /are correct :-  
 (a) S > O < Se (b) Cl > F (c) S > O (d) O > S  
 (e) N > P (f) C > N  
 (A) a, b, c, e (B) a, b, c, f (C) b, c, d, e (D) b, c, f
59. The electronic configuration of some neutral atoms are given below :-  
 (1) 1s<sup>2</sup> 2s<sup>1</sup> (2) 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>3</sup> (3) 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>4</sup> (4) 1s<sup>2</sup> 2s<sup>2</sup> 2p<sup>6</sup> 3s<sup>1</sup>  
 In which of these electronic configuration would you expect to have highest :-  
 (i) IE<sub>1</sub> (ii) IE<sub>2</sub>  
 (A) 3, 1 (B) 2, 1 (C) 3, 2 (D) 2, 4
60. Which of the following pairs has elements containing same number of electrons in outer most orbit  
 (A) Sc, Cu (B) Na, Ca (C) Pb, Sb (D) As, Bi
61. Zinc does not show the variable valency as elements of d-block, because :  
 (A) This is soft metal (B) d-orbital is full  
 (C) Its melting point is low (D) Volatile Metal
62. The right order of ionization potential of Li, Be, B & C is :  
 (A) C > Be > B > Li (B) C > B > Be > Li (C) C > B > Li > Be (D) B > C > Be > Li
63. Increasing order of metallic characteristic of C, Sb, As, Bi, Si is shown by :  
 (A) C, Si, As, Sb, Bi (B) C, Si, Bi, Sb, As  
 (C) C, Si, Sb, Bi, As (D) C, Si, As, Bi, Sb
64. The correct order of second ionization potential of C, N, O and F is  
 (A) C > N > O > F (B) O > N > F > C (C) O > F > N > C (D) F > O > N > C
65. The correct sequence of the electron affinity of C, N, O and F is :  
 (A) C > N < O < F (B) O > N > C > F (C) C < N > O < F (D) C > N > O > F
66. The correct order of ionization energies of F<sup>-</sup>, Cl<sup>-</sup>, F and Cl is:  
 (A) Cl < F < Cl<sup>-</sup> < F<sup>-</sup> (B) Cl<sup>-</sup> < F<sup>-</sup> < Cl < F  
 (C) F<sup>-</sup> < Cl<sup>-</sup> < Cl < F (D) Cl<sup>-</sup> < Cl < F<sup>-</sup> < F
67. Atomic radii of alkali metals (M) follow the order Li < Na < K < Rb but ionic radii in aqueous solution follow the reverse order Li<sup>+</sup> > Na<sup>+</sup> > K<sup>+</sup> > Rb<sup>+</sup>. The reason of the reverse order is :  
 (A) Increase in the ionisation energy (B) Decrease in the metallic bond character  
 (C) Increase in the electropositive character (D) Decrease in the amount of hydration
68. The first ionization potentials (eV) of Be and B respectively are :  
 (A) 8.29eV, 9.32 eV (B) 9.32 eV, 9.32 eV  
 (C) 8.29 eV, 8.29 eV (D) 9.32 eV, 8.29 eV
69. The decreasing order of the ionization potential of the following elements is :  
 (A) Ne > Cl > P > S > Al > Mg (B) Ne > Cl > P > S > Mg > Al  
 (C) Ne > Cl > S > P > Mg > Al (D) Ne > Cl > S > P > Al > Mg

70. One element has atomic weight 39. Its electronic configuration is  $1s^2, 2s^2 2p^6, 3s^2 3p^6 4s^1$ . The true statement for that element is : [IIT 95]  
 (A) More (IE) (B) Transition element  
 (C) Isotone with  $^{36}_{18}\text{Ar}$ . (D) Stable oxide  $\text{M}_2\text{O}$
71. In which of the following arrangements the order is not according to the property indicated against it ?  
 (A)  $\text{Al}^{3+} < \text{Mg}^{2+} < \text{Na}^+ < \text{F}^-$  - increasing ionic size  
 (B)  $\text{B} < \text{C} < \text{N} < \text{O}$  - increasing first ionization potential  
 (C)  $\text{I} < \text{Br} < \text{F} < \text{Cl}$  - increasing electron gain enthalpy (with negative sign)  
 (D)  $\text{Li} < \text{Na} < \text{K} < \text{Rb}$  - increasing metallic radius
72. Lanthanoid contraction is caused due to :  
 (A) the same effective nuclear charge from Ce to Lu  
 (B) the imperfect shielding on outer electrons by 4f electrons from the nuclear charge  
 (C) the appreciable shielding on outer electrons by 4f electrons from the nuclear charge  
 (D) the appreciable shielding on outer electrons by 5d electrons from the nuclear charge
73. Is a data sufficiency problem in which it is to be decided on the basis of given statements whether the given question can be answered or not. (No matter whether the answer is yes or no)  
 If  $\Delta H_{\text{solution}} < 0$  then compound acts as ionic in aqueous solution. Is  $\text{AlCl}_3(\text{s})$  ionic in aqueous solution.  
**Statement 1** : L.E. of  $\text{AlCl}_3$  is 5137 kJ/mol  
**Statement 2** :  $\Delta H_{\text{HE}}$  of  $\text{Al}^{+3}$  ion is  $-4665 \text{ kJ/mol}^{-1}$  &  $\Delta H_{\text{HE}}$  of  $\text{Cl}^-$  is  $-381 \text{ kJ/mol}^{-1}$   
 (A) Statments (A) alone is sufficient but statement (B) is not sufficient  
 (B) Statments (B) alone is sufficient but statement (A) is not sufficient  
 (C) Both statement together are sufficient but neither statement alone is sufficient  
 (D) Statement (A) & (B) together are not sufficient
74. The properties which are common to the elements belonging to groups 1 and 17 of periodic tables are-  
 (A) Electropositive character increases down the group  
 (B) Reactivity decreases from top to bottom  
 (C) Atomic radii increases as atomic number increases  
 (D) Electronegativity decreases on moving down a group
75. The number of which subatomic particle is same in case of chlorine atom and chloride ion :  
 (A) Electron (B) Proton (C) Neutrons (D) All of the above
76. Which of the following show amphoteric behaviour :  
 (A)  $\text{Zn}(\text{OH})_2$  (B)  $\text{BeO}$  (C)  $\text{Al}_2\text{O}_3$  (D)  $\text{Pb}(\text{OH})_2$
77. Fluorine is stronger oxidizing agent than chlorine in aqueous solution. This can be attributed to the property :  
 (A) Heat of dissociation (B) Electron affinity  
 (C) Ionization potential (D) Heat of hydration
78. Electron affinify of the elements or ions shown correct :  
 (A)  $\text{S} > \text{O}^-$  (B)  $\text{O} > \text{S}^-$  (C)  $\text{O}^- > \text{S}^-$  (D)  $\text{N}^- > \text{S}$
79. Ionization energy of an element is :  
 (A) Equal in magnitude but opposite in sign to the electron gain enthalpy of the cation of the element  
 (B) Same as electron affinity of the element  
 (C) Energy required to remove one valence electron from an isolated gaseous atom in its ground state  
 (D) Equal in magnitude but opposite in sign to the electron gain enthalpy of the anion of the element
80. Select equations having endothermic step :  
 (A)  $\text{S}^-(\text{g}) \longrightarrow \text{S}^{2-}(\text{g})$   
 (B)  $\text{Na}^+(\text{g}) + \text{Cl}^-(\text{g}) \longrightarrow \text{NaCl}(\text{s})$   
 (C)  $\text{N}(\text{g}) \longrightarrow \text{N}^-(\text{g})$   
 (D)  $\text{Al}^{2+}(\text{g}) \longrightarrow \text{Al}^{3+}(\text{g})$

81. Consider the following ionization steps :



select correct statement(s) :

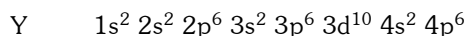
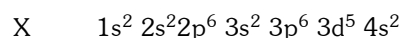
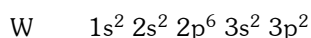
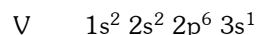
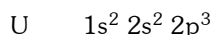
(A) I.E.<sub>1</sub> of M(g) is 100 eV

(B) I.E.<sub>1</sub> of M<sup>+</sup>(g) is 150 eV

(C) I.E.<sub>2</sub> of M(g) is 250 eV

(D) I.E.<sub>2</sub> of M(g) is 150 eV

82. The ground state electronic configurations of the elements, U, V, W, X and Y (these symbols do not have any chemical significance) are as follows :



Determine which sequence of elements satisfy the following statements :

(i) Element forms a carbonate which is not decomposed by heating

(ii) Element is most likely to form coloured ionic compounds

(iii) Element has largest atomic radius

(iv) Element forms only acidic oxide

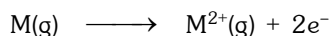
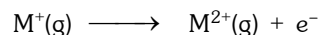
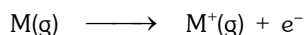
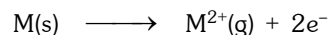
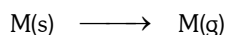
(A) V W Y U

(B) V X Y W

(C) V W Y X

(D) V X W U

83. Consider the following changes :



The second ionization energy of M could be calculated from the energy values associated with :

(A) 1 + 3 + 4

(B) 2 - 1 + 3

(C) 1 + 5

(D) 5 - 3

84. Which of the following statements are correct :

(A) F is the most electronegative and Cs is the most electropositive element.

(B) The electronegativity of halogens decreases from F to I

(C) The electron affinity of Cl is higher than that of F though their electronegativities are in the reverse order

(D) The electron affinity of noble gases is almost zero.

85. Diagonal relationships are shown by :

(A) Be and Al

(B) Li and Mg

(C) Mg and Al

(D) B and P

86. Match List I with List II and select the correct answer using the codes given below :

List I

List II

A.  $1s^2, 2s^2 2p^6, 3s^2 3p^6, 4s^2$

1. In

B.  $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^{10}, 4s^1$

2. Pd

C.  $1s^2, 2s^2 2p^6, 3s^2 3p^6 3d^{10}, 4s^2 4p^6 4d^{10}$

3. Ca

D.  $1s^2, 2s^2 2p^6, 3d^{10}, 4s^2 4p^6 4d^{10}, 5s^2 5p^1$

4. Cu

Code : A

B

C

D

(A) 1

2

3

4

(B) 1

3

2

4

(C) 3

4

2

1

(D) 1

4

3

2

87. Match List I (Atomic Number of Element) with List II (Block to which the Element Belongs) and select the correct answer using the codes given below :

List I		List II	
(Atomic Number of Element)		(Block to which the element belongs)	
A. 24		1. p	
B. 38		2. f	
C. 49		3. s	
D. 59		4. d	
<b>Code : A</b>	<b>B</b>	<b>C</b>	<b>D</b>
(A) 2	1	3	4
(B) 4	3	1	2
(C) 2	3	1	4
(D) 4	1	3	2

88. Match List I (Element) with List II (Electronegativity on Pauling Scale) and select the correct answer using the codes given below :

List I		List II	
(Element)		(Electronegativity on Pauling scale)	
A. Carbon		1. 0.8	
B. Nitrogen		2. 1.6	
C. Aluminium		3. 2.5	
D. Cesium		4. 3.0	
		5. 4.0	
<b>Code : A</b>	<b>B</b>	<b>C</b>	<b>D</b>
(A) 2	4	5	1
(B) 3	1	2	4
(C) 2	1	5	4
(D) 3	4	2	1

BRAIN TEASERS						ANSWER KEY				EXERCISE -2					
Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	B	A	B	D	D	D	C	B	D	D	B	C	D	C	D
Que.	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Ans.	B	D	C	D	B	D	C	B	B	D	C	A	C	A	C
Que.	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
Ans.	A	C	B	C	C	C	A	D	A	D	A	A,B	A, B, C	B	A, C, D
Que.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
Ans.	A, B, C	A	C	B	C	C	A,B,C	D	A	A	C	D	B	B	D
Que.	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
Ans.	B	A	A	C	A	C	D	D	B	D	B	B	C	A, C, D	B, C
Que.	76	77	78	79	80	81	82	83	84	85	86	87	88		
Ans.	A,B,C,D	A, B, D	A, B	A, C	A, C,D	A, B, D	B	D	A,B,C,D	A, B	C	B	D		

**EXERCISE-03****MISCELLANEOUS TYPE QUESTIONS****TRUE / FALSE**

1.  $\text{Al}_2\text{O}_3$  is an amphoteric oxide.
2. Third group of periodic table accommodates maximum number of elements.
3. First ionisation potential of Mg is higher than that of Al.
4. The ionic radii of trivalent lanthanides ( $\text{La}^{3+}$ ,  $\text{Ce}^{3+}$ ,  $\text{Pr}^{3+}$ ....) decreases with the increasing atomic number.
5. Successive ionisation potentials are lower.
6. The alkali metals show increasing electronegativities from Li to Cs.
7. In group I of alkali metals, the ionization potential decreases down the group. Therefore lithium is a poor reducing agent in gaseous state.
8. The decreasing order of electron affinity of F, Cl, Br is  $\text{F} > \text{Cl} > \text{Br}$  [IIT-1993]
9. The basic nature of the hydroxides of Group 13 (Gr. III B) decreases progressively down the group. [IIT-1992]

**FILL IN THE BLANKS**

1. Most electropositive elements belong to ..... group.
2. Most electronegative elements belong to ..... group.
3. Transition elements are characterised by ..... valency.
4. The second ionisation energy of calcium is ..... than the ..... ionisation energy of calcium.
5. The electronegativity of the elements C, N, Si and P increases in the order of .....
6. Total number of inner transition elements are ..... .
7. Two elements of equal electronegative values they form ..... bond.
8. Among Na, Mg, Al & Si elements ..... element has zero electron affinity.
9. Elements of group ..... have greater tendency to form positive ions than elements of group IIA.
10. In aqueous solution ..... is the best reducing agent among the alkali metals.
11.  $\text{Ca}^{2+}$  has a smaller ionic radius than  $\text{K}^+$  because it has ..... [IIT-1993]
12. Compounds that formally contain  $\text{Pb}^{4+}$  are easily reduced to  $\text{Pb}^{2+}$ . The stability of the lower oxidation state is due to ..... [IIT-1997]

**MATCH THE COLUMN**

1. Match Column-I (atomic number of elements) with Column-II (position of element in periodic table) and select the correct answer using the codes given below :

Column-I		Column-II	
(A)	19	(p)	p-block
(B)	22	(q)	f-block
(C)	32	(r)	d-block
(D)	64	(s)	s-block

2. Match Column-I (Elements) with Column-II (configuration of elements) and select the correct answer using the codes given below :

Column-I		Column-II	
(A)	The third alkali metal	(p)	$1s^2 2s^2 2p^6 3s^2 3p^5$
(B)	The second transition element	(q)	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6$
(C)	The fourth noble gas element	(r)	$1s^2 2s^2 2p^6 3s^2 3p^6 3d^2 4s^2$
(D)	The second halogen element	(s)	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

3.

Column-I	
(A)	Increasing ionisation potential
(B)	Increasing electronegativity
(C)	Decreasing $Z_{\text{eff}}$
(D)	Decreasing electron affinity

Column-II	
(p)	$N > O > F$
(q)	$N < O < F$
(r)	$O < N < F$
(s)	$O > C > N$

4.

Column-I	
(A)	Metalloid
(B)	Radioactive
(C)	Transition
(D)	Chalcogen

Column-II	
(p)	Selenium
(q)	Silver
(r)	Arsenic
(s)	Uranium

5.

Column-I	
(A)	Increasing atomic size
(B)	Decreasing atomic radius
(C)	Increasing electronegativity
(D)	Increasing effective nuclear charge

Column-II	
(p)	$Cl < O < F$
(q)	$Li < Be < B$
(r)	$Si < Al < Mg$
(s)	$N > O > F$

### ASSERTION & REASON QUESTIONS

These questions contains, Statement I (assertion) and Statement II (reason).

(A) Statement-I is true, Statement-II is true ; Statement-II is correct explanation for Statement-I.

(B) Statement-I is true, Statement-II is true ; Statement-II is NOT a correct explanation for statement-I

(C) Statement-I is true, Statement-II is false

(D) Statement-I is false, Statement-II is true

- Statement -1** : Two successive ionisation energies of Argon are 56.8 eV and 36.8 eV respectively.  
**because**

**Statement -2** : Zeff of Ar ( $3s^23p^6$ ) is greater than  $Ar^+$  ( $3s^23p^5$ ).
- Statement -1** : Electron affinity of fluorine is greater than chlorine.  
**because**

**Statement -2** : Ionisation potential of fluorine is less than chlorine.
- Statement -1** : Size of anion is larger than their parent atom.  
**because**

**Statement -2** : Zeff of anion is greater than that of their parent atom.
- Statement -1** : Atomic radius of inert gases is largest in the period  
**because**

**Statement -2** : Effective nuclear charge of inert gases is minimum
- Statement -1** : 2<sup>nd</sup> IP of alkali metals is maximum in the period.  
**because**

**Statement -2** : Alkali metals has smallest atomic size in the period.
- Statement -1** : First ionization energy of nitrogen is lower than oxygen.  
**because**

**Statement -2** : Across the period effective nuclear charge decreases.
- Statement -1** : The third period contains only 8 elements and not 18 like 4th period.  
**because**

**Statement -2** : In III period filling starts from  $3s^1$  and complete at  $3p^6$  whereas in IV period it starts from  $4s^1$  and complete after  $3d^{10}$  and  $4s^2$ .

## COMPREHENSION BASED QUESTIONS

### Comprehension # 1

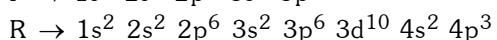
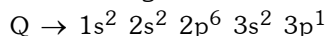
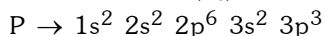
Ionization energies of five elements in kcal/mol are given below :

Atom	I	II	III
P	300	549	920
Q	99	734	1100
R	118	1091	1652
S	176	347	1848
T	497	947	1500

- Which element is a noble gas ?  
(A) P (B) T (C) R (D) S
- Which element form stable unipositive ion :  
(A) P (B) Q (C) R (D) S
- The element having most stable oxidation state +2 is :  
(A) Q (B) R (C) S (D) T
- Which is a non-metal (excluding noble gas) :  
(A) P (B) Q (C) R (D) S
- If Q reacts with fluorine and oxygen, the molecular formula of fluoride and oxide will be respectively :  
(A)  $\text{QF}_3$ ,  $\text{Q}_2\text{O}_3$  (B)  $\text{QF}$ ,  $\text{Q}_2\text{O}$  (C)  $\text{QF}_2$ ,  $\text{QO}$  (D) None of these
- Which of the following pair represents elements of same group :  
(A) Q, R (B) P, Q (C) P, S (D) Q, S

### Comprehension # 2

Four elements P,Q,R & S have ground state electronic configuration as :



- Which of the following option represent the correct order of true (T) and False (F) Statement:  
I. size of P < size of Q II. size of R < size of S  
III. size of P < size of R (appreciable difference) IV. size of Q < size of S (appreciable difference)  
(A) TTTT (B) TTTF (C) FFTT (D) TTFF
- Order of  $\text{IE}_1$  values among the following is :  
(A)  $\text{P} > \text{R} > \text{S} > \text{Q}$  (B)  $\text{P} < \text{R} < \text{S} < \text{Q}$  (C)  $\text{R} > \text{S} > \text{P} > \text{Q}$  (D)  $\text{P} > \text{S} > \text{R} > \text{Q}$

MISCELLANEOUS TYPE QUESTION	ANSWER KEY	EXERCISE -3
• <u>True / False</u>		
1. T      2. T      3. T      4. T      5. F      6. F      7. T      8. F      9. T		
• <u>Fill in the Blanks</u>		
1. IA group /1      2. VIIA/17      3. Variable      4. higher, first		
5. Si, P, C, N      6. 28      7. (non polar) covalent      8. Mg		
9. IA      10. Lithium      11. Higher effective nuclear charge      12. Iner pair effect		
• <u>Match the Column</u>		
1. (A)-s (B)-r (C)-p (D)-q      2. (A)-s (B)-r (C)-q (d)-p      3. (A)-r (B)-q (C)-p (D)-s		
4. (A)-r (B)-s (C)-q (D)-p      5. (A)-r (B)-s (C)-p (D)-q		
• <u>Assertion - Reason Questions</u>		
1. D      2. D      3. C      4. C      5. C      6. D      7. A		
• <u>Comprehension Based Questions</u>		
Comprehension #1 : 1. B      2. B,C      3. C      4.A      5.B      6.A		
Comprehension #2 : 1. B      2. A		

## CONCEPTUAL SUBJECTIVE EXERCISE

- Can an element with atomic number 126, if discovered, be accommodated in the present long form of periodic table ?
- Third period of the periodic table contains 8 and not 18 elements. Justify.
- If scientist succeed in obtaining element with atomic number 114, which well known element would you expect it to resemble ?
- 1<sup>st</sup> and 2<sup>nd</sup> IE of few elements have been given below –

IE <sub>1</sub> (KJ/mole)	IE <sub>2</sub> (KJ/mole)
(A) 520	7300
(B) 1680	3380
(C) 2370	5250
(D) 900	1760

  - Which is reactive metal ?
  - Which is reactive non metal ?
  - Which is inert gas ?
  - A metal that form a stable binary halide of formulae AX<sub>2</sub> (X = Halogen)
- Among the elements B, Al, C and Si,
  - which has the highest first ionization enthalpy?
  - which has the most negative electron gain enthalpy ?
  - which has the largest atomic radius ?
  - which has the most metallic character ?
- Which of the elements Na, Mg, Si and P would have the greatest difference between the first and second ionization enthalpies. Briefly explain your answer.
- The diagram below shows part of the skeleton of the periodic table in which element are indicated by letters which are not their usual symbols :

[illegible]

Answer the following on the basis of periodic table :

- (I) Alkali metal(s)
- (II) An elements with the outer configuration of  $d^8s^2$
- (III) Lanthanoids
- (IV) Representative elements(s)
- (V) Elements with incomplete f-subshell
- (VI) Halogen(s)
- (VII) s-block element(s)



(X) Non-transition element (s)

- [illegible]

(IV) Which element is monoatomic gas at room temperature

- 12.** Addition of an electron to  $\text{Na}_{(g)}$  is slightly exothermic process, whereas addition of electron to  $\text{Mg}_{(g)}$  is strongly endothermic. Explain.

### EXERCISE -4(A)

1. No. because there no provision for filling of g-block element in periodic table.
3. 14th group, carbon family
4. (i) Most reactive metal will be an alkali metal of 1st group with its  $IE_2 > > IE_1$ . Thus most reactive metal is (a).  
 (ii) Most reactive non-metal will be a halogen of 17th group. Its  $IE_1$  will be quite high. Thus most reactive non metal is (b).  
 (iii) A noble gas will have very, very high  $IE_1$ . Thus (c) is a noble gas.  
 (iv) A metal that forms a stable binary halide will be an alkaline earth metal of 2nd group. Its  $IE_2$  will not be much higher than  $IE_1$ . Thus (d) is such a metal that forms a stable binary halide of formula  $AX_2$ .
5. (a) C (b) Si (c) Al (d) Al
6. Na, because during  $IP_2$  electron is removed from stable octet configuration ( $ns^2 np^6$ ).
7. (i) B, (ii) H, (iii) A, (iv) B, C, F, J, I, (v) A, (vi) I (vii) B, J (viii) E, H, K (ix) G (x) L
8. (i) H, (ii)  $J^{2+}$ , (iii) H (iv) T
9. 11.2 10. 3.87 11. 10.435, 3.726

**EXERCISE-04 [B]****BRAIN STORMING SUBJECTIVE EXERCISE**

1. Arrange the following ions in increasing order of their radius ?  
 $V^{+5}$ ,  $K^+$ ,  $S^{2-}$ ,  $Mn^{+7}$ ,  $Ca^{+2}$ ,  $Cl^-$ ,  $P^{3-}$
2. The ionic radii of  $S^{2-}$  and  $Te^{2-}$  are 1.84 and 2.2 Å respectively. What would you predict for the ionic radius of  $Se^{2-}$ .
3. Out of  $Li^+$ ,  $Be^{+2}$  and  $B^{+3}$  ions, which has the smallest ionic radius and why ?
4. A student reported the radii of Cu,  $Cu^+$  and  $Cu^{2+}$  as 122 pm, 96 pm and 72 pm. Do you agree with the reported values. Justify the answer. Explain why ?
5. How many chlorine atoms will be ionised ( $Cl \rightarrow Cl^+ + e^-$ ) by the energy released from the process  $Cl + e^- \rightarrow Cl^-$  for  $6.023 \times 10^{23}$  atom (IP for Cl = 1250 kJ mole<sup>-1</sup> and EA = 350 KJ mole<sup>-1</sup>)
6. Na and  $Mg^+$  have same number of electrons. But removal of electron from  $Mg^+$  requires more energy. Explain.
7. The first ionisation energy of beryllium is greater than that of lithium but reverse is true for the second ionisation energy.
8. Based on location in P.T., which of the following would you expect to be acidic & which basic.  
(A) CsOH (B) IOH (C)  $Sr(OH)_2$  (D)  $Se(OH)_2$   
(E) FrOH (F) BrOH
9. From among the elements, choose the following : Cl, Br, F, Al, C, Li, Cs & Xe.  
(i) The element with highest electron affinity.  
(ii) The element with lowest ionisation potential.  
(iii) The element whose oxide is amphoteric.  
(iv) The element which has smallest radii.  
(v) The element whose atom has 8 electrons in the outermost shell.
10. For the gaseous reaction,  
 $K + F \longrightarrow K^+ F^-$ ,  $\Delta H$  was calculated to be 19 kcal under conditions where the cations and anions were prevented by electrostatic separation from combining with each other. The ionisation potential of K is 4.3 eV atom. What is the electron affinity of F ?
11. The ionisation potentials of atoms A and B are 400 and 300 kcal mol<sup>-1</sup> respectively. The electron affinities of these atoms are 80.0 and 85.0 kcal mol<sup>-1</sup> respectively. Prove that which of the atoms has higher electronegativity.
12. (a) If internuclear distance between Cl atoms in  $Cl_2$  is 10 Å & between H atoms in  $H_2$  is 2 Å, then calculate internuclear distance between H & Cl (Electronegativity of H = 2.1 & Cl = 3.0)  
(b) Compare the following giving reasons  
Acidic nature of oxides : CaO, CO,  $CO_2$ ,  $N_2O_5$ ,  $SO_3$
13. With the help of EN values [ $EN_A = 1.8$ ,  $EN_B = 2.6$ ,  $EN_C = 1.6$ ,  $EN_D = 2.8$ ] answer the following questions for the compounds  
HAO, HBO, HCO, HDO  
(a) Compounds whose aqueous solution is acidic and order of their acidic strength  
(b) Compounds whose aqueous solution is basic and order of their basic strength  
(c) Comment on the chances of being coloured on the basis of percent ionic character for the compounds CD & AB.

1.  $Mn^{+7} < V^{+5} < Ca^{+2} < K^{+} < Cl^{-} < S^{2-} < P^{3-}$

2. Ionic radius of  $Se^{2-}$  is expected to be in between the ionic radii of  $S^{2-}$  and  $Te^{2-}$ . Thus

$$\text{Ionic radius of } Se^{2-} = \frac{1.84 + 2.21}{2} = 2.025 \text{ \AA}$$

3.  $B^{+3}$  due to more  $z_{eff}$ .

4. Cu,  $Cu^{+}$  and  $Cu^{2+}$  have same number of protons but different number of electrons. In moving from Cu to  $Cu^{+}$  to  $Cu^{2+}$ , the number of electrons decreases thus effective nuclear charge and force of attraction between the nucleus and valence electron increases and hence size decreases. Thus the correct order is  $cu (0.122 \text{ nm}) > Cu^{+} (0.096 \text{ nm}) > Cu^{2+} (0.072 \text{ nm})$ .

5. Since  $1250 \text{ kJ mole}^{-1}$  energy is required to ionise  $6.023 \times 10^{23}$  atoms. But  $350 \text{ kJ mol}^{-1}$  energy is released hence the no. of ionised atoms –

$$= \frac{6.023 \times 10^{23} \times 350 \text{ kJ mole}^{-1}}{1250 \text{ kJ mole}^{-1}} = 1.686 \times 10^{23}$$

6.  $Mg^{+}$  has more  $Z_{eff}$ .

7. The electronic configuration of Li and Be are  $1s^2 2s^1$  and  $1s^2 2s^2$  respectively.

Since in beryllium 2s orbital is complete while in lithium it is incomplete, it requires more energy to pull out an electron from beryllium than from lithium. Moreover beryllium has higher nuclear charge.

After removal of one electron,  $Li^{+}$  and  $Be^{+}$  ions have electronic configuration  $1s^2$  and  $1s^2 2s^1$  respectively. Now it will be easier to remove  $2s^1$  electron rather than  $1s^2$ . Thus  $IE_2$  of Li higher.

8. (A) Basic, (B) Acidic, (C), Basic, (D) Acidic, (E) Basic, (F) Acidic.

9. (i) Cl, (ii) Cs, (iii) Al, (iv) F, (v) Xe.

10.  $3.476 \text{ eV}$ .

11.  $EN_1 > EN_2$

12. (a)  $5.919 \text{ \AA}$  (b)  $CaO < CO < CO_2 < N_2O_5 < SO_3$

13. (a) Acidic - HBO, HDO acidic strength -  $HDO > HBO$

(b) Basic - HAO, HCO Basic strength -  $HCO > HAO$

(c) % Ionic character =  $16 |X_A - X_B| + 3.5 (X_A - X_B)^2$

$$\text{for CD} = 16 (1.2) + 3.5 (1.2)^2$$

$$= 24.24 \%$$

$\therefore$  Colourless.

**EXERCISE - 05 [A]****JEE-[MAIN] : PREVIOUS YEAR QUESTIONS**

1. According to the Periodic law of elements, the variation in properties of elements is related to their :- [AIEEE-2003]  
(1) Nuclear masses (2) Atomic numbers  
(3) Nuclear neutron-proton number ratio (4) Atomic masses
2. The reduction in atomic size with increase in atomic number is a characteristic of elements of :- [AIEEE-2003]  
(1) d-block (2) f-block (3) Radioactive series (4) High atomic masses
3. Which of the following groupings represent a collection of isoelectronic species ? [AIEEE-2003]  
(At. no. Cs = 55, Br = 35)  
(1)  $\text{N}^{3-}$ ,  $\text{F}^-$ ,  $\text{Na}^+$  (2)  $\text{Be}$ ,  $\text{Al}^{3+}$ ,  $\text{Cl}^-$  (3)  $\text{Ca}^{2+}$ ,  $\text{Cs}^+$ ,  $\text{Br}$  (4)  $\text{Na}^+$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$
4. The atomic numbers of vanadium (V), chromium (Cr), manganese (Mn) and iron (Fe) are respectively 23, 24, 25 and 26. Which one of these may be expected to have the highest second ionization enthalpy ? [AIEEE-2003]  
(1) Cr (2) Mn (3) Fe (4) V
5. Which one of the following sets of ions represents the collection of isoelectronic species ? [AIEEE-2004]  
(1)  $\text{K}^+$ ,  $\text{Cl}^-$ ,  $\text{Mg}^{2+}$ ,  $\text{Sc}^{3+}$  (2)  $\text{Na}^+$ ,  $\text{Ca}^{2+}$ ,  $\text{Sc}^{3+}$ ,  $\text{F}^-$  (3)  $\text{K}^+$ ,  $\text{Ca}^{2+}$ ,  $\text{Sc}^{3+}$ ,  $\text{Cl}^-$  (4)  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Al}^{3+}$ ,  $\text{Cl}^-$
6. Which of the following ions has the highest value of ionic radius ? [AIEEE-2004]  
(1)  $\text{O}^{2-}$  (2)  $\text{B}^{3+}$  (3)  $\text{Li}^+$  (4)  $\text{F}^-$
7. Among  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$ ,  $\text{P}_2\text{O}_3$  and  $\text{SO}_2$ , the correct order of acid strength is :- [AIEEE-2004]  
(1)  $\text{Al}_2\text{O}_3 < \text{SiO}_2 < \text{SO}_2 < \text{P}_2\text{O}_3$  (2)  $\text{SiO}_2 < \text{SO}_2 < \text{Al}_2\text{O}_3 < \text{P}_2\text{O}_3$   
(3)  $\text{SO}_2 < \text{P}_2\text{O}_3 < \text{SiO}_2 < \text{Al}_2\text{O}_3$  (4)  $\text{Al}_2\text{O}_3 < \text{SiO}_2 < \text{P}_2\text{O}_3 < \text{SO}_2$
8. The formation of the oxide ion  $\text{O}^{2-}(\text{g})$  requires first an exothermic and then an endothermic step as shown below :- [AIEEE-2004]  
 $\text{O}(\text{g}) + \text{e}^- = \text{O}^-(\text{g}), \Delta H = -142 \text{ kJ mol}^{-1}$   
 $\text{O}^-(\text{g}) + \text{e}^- = \text{O}^{2-}(\text{g}), \Delta H = 844 \text{ kJ mol}^{-1}$   
This is because :-  
(1)  $\text{O}^-$  ion will tend to resist the addition of another electron  
(2) Oxygen has high electron affinity  
(3) Oxygen is more electronegative  
(4)  $\text{O}^-$  ion has comparatively larger size than oxygen atom
9. In which of the following arrangements the order is NOT according to the property indicated against it ? [AIEEE-2005]  
(1)  $\text{Al}^{3+} < \text{Mg}^{2+} < \text{Na}^+ < \text{F}^-$  - increasing ionic size  
(2)  $\text{B} < \text{C} < \text{N} < \text{O}$  - increasing first ionization enthalpy  
(3)  $\text{I} < \text{Br} < \text{F} < \text{Cl}$  - increasing electron gain enthalpy (with negative sign)  
(4)  $\text{Li} < \text{Na} < \text{K} < \text{Rb}$  - increasing metallic radius
10. Which of the following oxides is amphoteric in character ? [AIEEE-2005]  
(1)  $\text{SnO}_2$  (2)  $\text{SiO}_2$  (3)  $\text{CO}_2$  (4)  $\text{CaO}$
11. Pick out the isoelectronic structure from the following : [AIEEE-2005]  
I.  $^+\text{CH}_3$  II.  $\text{H}_3\text{O}^+$  III.  $\text{NH}_3$  IV.  $\text{CH}_3^-$   
(1) I and II (2) III and IV (3) I and III (4) II, III and IV
12. The lanthanide contraction is responsible for the fact that [AIEEE-2005]  
(1) Zr and Y have about the same radius (2) Zr and Nb have similar oxidation state  
(3) Zr and Hf have about the same radius (4) Zr and Zn have the same oxidation state



**EXERCISE - 05 [B]****JEE-[ADVANCED] : PREVIOUS YEAR QUESTIONS**

1. Moving from right to left in a periodic table, the atomic size is: [JEE 1995]  
(A) increased (B) decreased (C) remains constant (D) none of these
2. The increasing order of electronegativity in the following elements: [JEE 1995]  
(A) C, N, Si, P (B) N, Si, C, P (C) Si, P, C, N (D) P, Si, N, C
3. One element has atomic weight 39. Its electronic configuration is  $1s^2, 2s^2 2p^6, 3s^2 3p^6 4s^1$ . The true statement for that element is: [JEE 1995]  
(A) High value of IE (B) Transition element  
(C) Isotone with  ${}_{18}\text{Ar}^{38}$  (D) None
4. The number of paired electrons in oxygen atom is: [JEE 1995]  
(A) 6 (B) 16 (C) 8 (D) 32
5. The decreasing size of  $\text{K}^+$ ,  $\text{Ca}^{2+}$ ,  $\text{Cl}^-$  &  $\text{S}^{2-}$  follows the order: [JEE 1995]  
(A)  $\text{K}^+ > \text{Ca}^{+2} > \text{S}^{-2} > \text{Cl}^-$  (B)  $\text{K}^+ > \text{Ca}^{+2} > \text{Cl}^- > \text{S}^{-2}$   
(C)  $\text{Ca}^{+2} > \text{K}^+ > \text{Cl}^- > \text{S}^{-2}$  (D)  $\text{S}^{-2} > \text{Cl}^- > \text{K}^+ > \text{Ca}^{+2}$
6. Which of the following has the maximum number of unpaired electrons [JEE 1996]  
(A)  $\text{Mg}^{2+}$  (B)  $\text{Ti}^{3+}$  (C)  $\text{V}^{3+}$  (D)  $\text{Fe}^{2+}$
7. The incorrect statement among the following is: [JEE 1997]  
(A) the first ionisation potential of Al is less than the first ionisation potential of Mg  
(B) the second ionisation potential of Mg is greater than the second ionisation potential of Na  
(C) the first ionisation potential of Na is less than the first ionisation potential of Mg  
(D) the third ionisation potential of Mg is greater than the third ionisation potential of Al
8.  $\text{Li}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{K}^+$ ,  $\text{Al}^{3+}$  (Arrange in increasing order of radii) [JEE 1997]
9. Which one of the following statement (s) is (are) correct? [JEE 1998]  
(A) The electronic configuration of Cr is  $[\text{Ar}] 3d^5 4s^1$ . (Atomic No. of Cr = 24)  
(B) The magnetic quantum number may have a negative value  
(C) In silver atom, 23 electrons have a spin of one type and 24 of the opposite type. (Atomic No. of Ag = 47)  
(D) The oxidation state of nitrogen in  $\text{HN}_3$  is -3.
10. The electrons, identified by  $n$  &  $l$  ; [JEE 1999]  
(i)  $n = 4, l = 1$  (ii)  $n = 4, l = 0$  (iii)  $n = 3, l = 2$   
(iv)  $n = 3, l = 1$  can be placed in order of increasing energy, from the lowest to highest as :  
(A) (iv) < (ii) < (iii) < (i) (B) (iii) < (ii) < (iv) < (i)  
(C) (i) < (iii) < (ii) < (iv) (D) (iii) < (i) < (iv) < (ii)
11. Gaseous state electronic configuration of nitrogen atom can be represented as : [JEE 1999]  
(A)  $\uparrow\downarrow\uparrow\downarrow\uparrow\uparrow\uparrow$  (B)  $\uparrow\downarrow\uparrow\downarrow\uparrow\downarrow\uparrow$  (C)  $\uparrow\downarrow\uparrow\downarrow\uparrow\downarrow\downarrow$  (D)  $\uparrow\downarrow\uparrow\downarrow\downarrow\downarrow\downarrow$
12. The electronic configuration of an element is  $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$ . This represents its : [JEE 2000]  
(A) excited state (B) ground state (C) cationic form (D) none

13. **Assertion:** F atom has a less negative electron gain enthalpy than Cl atom. [JEE 2000]  
**Reason:** Additional electron is repelled more efficiently by 3p electron in Cl atom than by 2p electron in F atom.  
 (A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.  
 (B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.  
 (C) Statement-1 is true, statement-2 is false.  
 (D) Statement-1 is false, statement-2 is true.
14. The correct order of radii is: [JEE 2000]  
 (A)  $N < Be < B$  (B)  $F^- < O^{2-} < N^{3-}$  (C)  $Na < Li < K$  (D)  $Fe^{3+} < Fe^{2+} < Fe^{4+}$
15. The  $IE_1$  of Be is greater than that of B. [T/F] [JEE 2001]
16. The set representing correct order of  $IP_1$  is [JEE 2001]  
 (A)  $K > Na > Li$  (B)  $Be > Mg > Ca$  (C)  $B > C > N$  (D)  $Fe > Si > C$
17. Identify the least stable ion amongst the following: [JEE 2002]  
 (A)  $Li^-$  (B)  $Be^-$  (C)  $B^-$  (D)  $C^-$
18. The maximum number of electrons that can have principal quantum number  $n=3$ , and spin quantum number,  $m_s = -1/2$ , is [JEE 2011]

PREVIOUS YEARS QUESTIONS			ANSWER KEY		EXERCISE-5 [B]	
1. A	2. C	3. C	4. A	5. D		
6. D	7. B					
8. $Mg^{2+} < Li^+ < K^+$	Q.9 A,B,C	10. A				
11. A,D	12. B,C	13. C	14. B	15. True	16. B	
17. B	18. 9					