CHAPTER 9

Periodic Table

EXERCISE # I

❑ **Only one correct answer :**

1. The correct order of first ionisation energies of the elements :-

(*a*) Al > Ga (*b*) P > S

(*c*) Br > Cl (*d*) Mg > Be

2. The corret order of first ionsiation energy of the elements :-

(*a*) C < O < N (*b*) C < N < O

(*c*) O < N < C (*d*) N < O < C

3. The electronegativity order of carbon in different groups :-

(*a*) $(C)_{CH_3} < (C)_{CCl_3} < (C)_{CF_3}$

(*b*) $(C)_{CF_3} < (C)_{CCl_3} < (C)_{CH_3}$

(*c*) $(C)_{CH_3} < (C)_{CF_3} < (C)_{CCl_3}$

(*d*) None

4. The most basic compound out of following compound

Methyl cyanide (*a*) ; Pyridine (B) ; Methyl amine (C); Aniline (D)

(*a*) Methyl cyanide (A) (*b*) Pyridine (B)

(*c*) Methyl amine (*d*) Aniline (D)

5. The most electronegative element and least electronegative element are respectively :-

(*a*) Cl, Na (*b*) Br, Li

(*c*) I, H (*d*) F, Cs

6. The 5^{th} period of periodic table contains x no. of elements. The value of x:-

(*a*) 2 (*b*) 8

(*c*) 18 (*d*) 32

7. The 6^{th} period of periodic table contains x no. of elements. The value of x:-

(*a*) 2 (*b*) 8

(*c*) 18 (*d*) 32

8. Which of the following order regarding electronegativity is correct ?

(*a*) Mo(II) > Mo(III) > Mo(IV) > Mo(V) > Mo(VI)

(*b*) Cl(VII) > Cl(V) > Cl(I) > Cl(III)

(*c*) sp carbon > sp^2 carbon > sp^3 carbon

(*d*) F > N > Cl > O

9. Which of the following statement is correct ?

(*a*) Be has first ionisation energy lower than that of boron

(*b*) Mg has first ionisation energy lower than that of aluminium

(*c*) From Zn to Hg, there is increase in ionisation energy

(*d*) Among all noble gases, (group 18 elements) Xe has least ionisation energy

10. Which noble gas has highest ionisation energy ?

(*a*) He (*b*) Ne

(*c*) Ar (*d*) Kr

11. Correct order of metallic character is :-

(*a*) Rb > K > Na > Li

(*b*) K > Mg > Al > B

(*c*) F > O > N > B

(*d*) Ba > Be > Mg > B

12. The most acidic oxide :-

(*a*) SO_2 (*b*) SO_3

(*c*) P_4O_{10} (*d*) BaO

13. The most basic oxide :-

(*a*) MgO (*b*) CaO

(*c*) SrO (*d*) BaO

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14. The electronic configuration of an element is written as follows $1s^2 2s^2 2p^6 3s^2 3p^6 3d^7 4s^2$, on removal of one electron, the electronic configuration will becomes :-

(*a*) $1s^2 2s^2 2p^6 3s^2 3p^5 3d^7 4s^2$

(*b*) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2$

(*c*) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^7 4s^1$

(*d*) $7s^1 2s^2 2p^6 3s^2 3p^6 3d^7 4s^2$

15. The least polar bond :-

(*a*) H–F (*b*) H–Cl

(*c*) H–Br (*d*) H–I

16. The most polar bond :-

(*a*) C–F (*b*) C–O

(*c*) C–N (*d*) C–C

17. The highest melting point for oxide of alkaline earth metal is observed for :-

(*a*) MgO (*b*) CaO

(*c*) SrO (*d*) BaO

18. The ionisation potential of two element X_1 and X_2 are 400 and 300 kcal mol^{-1} respectively. The electron affinities of X_1 and X_2 are 80 and 85 kcal mol^{-1} respectively. Electronegativity orderof X_1 and X_2 is :-

(*a*) $X_1 > X_2$ (*b*) $X_1 = X_2$

(*c*) $X_1 < X_2$ (*d*) Can not be predicted

19. The first ionisation energy of Al(g) is 577.5 kJ mol^{-1}. If second and third ionisation energy of Al are in the ratio 2 : 3 and if ΔH for $Al(g) \rightarrow Al^{3+}(g) + 3e^-$ is 5140 kJ mol^{-1} then IE_2 and IE_3 of Al are respectively :-

(*a*) 1825 kJ mol^{-1}, 2737.5 kJ mol^{-1}

(*b*) 2000 kJ mol^{-1}, 3000 kJ mol^{-1}

(*c*) 1200 kJ mol^{-1}, 1800 kJ mol^{-1}

(*d*) 5075 kJ mol^{-1}, 2525 kJ mol^{-1}

20. Highest size will be of :-

(*a*) Cl^- (*b*) Br

(*c*) Br^- (*d*) Br^+

21. The As–Cl bond distance in $AsCl_3$ is 2.2 Å. What is the single bond covalent radius of arsenic. (Assuming electronegativity of both to be same and radius of chlorine atom is 0.99Å)

(*a*) 0.24 Å (*b*) 0.77Å

(*c*) 1.21Å (*d*) 3.19Å

22. C is isomer of $PtCl_2(NH_3)_2$ = A

Trans isomer of $PtCl_2(NH_3)_2$ = B

If Pt–Cl bond distance is 2.32Å, then Cl–Cl bond distance in A & B :-

(*a*) 3.28 Å, 3.28 Å (*b*) 4.64 Å, 3.28 Å

(*c*) 4.64 Å, 4.64 Å (*d*) 3.28 Å, 4.64 Å

23. Ionisation energy of $AlCl_3$ is 5137 kJ mol^{-1}

Heat of hydration of Al^{3+} is –4665 kJ mol^{-1}

Heat of hydration of Cl^- is –381 kJ mol^{-1}

From the data, it is concluded that :-

(*a*) $AlCl_3$ in aqueous solution do not conduct electricity

(*b*) $AlCl_3$ in gaseous state conduct electricity due to presence of free ions.

(*c*) $AlCl_3$ in aqueous solution conduct electricity due to presence of hydrated ions.

(*d*) None of these

24. What is the electronegativity of Cl from the following data ?

Bond energy of F_2 = 38 Kcal mol^{-1}

Bond energy of Cl_2 = 58 Kcal mol^{-1}

Bond energy of Cl–F = 61 Kcal mol^{-1}

Electronegativity of F = 4

(*a*) 3 (*b*) 2.8

(*c*) 3.2 (*d*) 3.5

25. Which of the following does not reflect to periodicity of element ?

(*a*) Electronegativity

(*b*) Metallic behaviour

(*c*) Neutron / Proton ratio

(*d*) Ionisation potential

26. Two elements P and Q form 3 types of bonds P–P; Q–Q ; P–Q. Their bond dissociation energies are respectively 81 kcal mol^{-1} ; 64 kcal mol^{-1} ; 76 kcal mol^{-1}. If electronegativity of Q is 2.4 then the electronegativity of P will be approximately. (P is less electronegativite than Q)

(*a*) 2.81 (*b*) 1.8

(*c*) 1.99 (*d*) 1.33

27. If interionic distance between Na^+ and F^- ions is 2.31 Å then radii of Na^+ and F^- are :-

(*a*) 0.95 Å & 1.36 Å (*b*) 1.155 Å & 1.155 Å

(*c*) 1.36 Å & 0.95 Å (*d*) None of these

28. Moving form right to left in a periodic table, the atomic size is :-

(*a*) increased (*b*) decreased

(*c*) remains constant (*d*) None of these

29. The increasing order of electronegativity in the following elements :-

(*a*) C,N,Si,P (*b*) N,Si,C,P

(*c*) Si,P,C,N (*d*) P,Si,N,C

30. 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 :-

(*a*) highest value of IE (*b*) transition element

(*c*) isotone with $_{18}Ar^{38}$ (*d*) None of these

31. The number of paired electrons in oxygen is :-

(*a*) 6 (*b*) 16

(*c*) 8 (*d*) 32

32. The decreasing size of K^+, Ca^{2+}, Cl^- & S^{2-} follows the order :-

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

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

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

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

33. Which of the following oxide is neutral ?

(*a*) CO (*b*) SnO_2

(*c*) ZnO (*d*) SiO_2

34. Which of the following has the maximum number of unpaired electrons ?

(*a*) Mg^{2+} (*b*) Ti^{3+}

(*c*) V^{3+} (*d*) Fe^{2+}

35. The following acids have been arranged in the order of decreasing acid strength. Identify the correct order :-

ClOH(I) BrOH(II) IOH(III)

(*a*) I > II > III (*b*) II > I > III

(*c*) III > II > I (*d*) I > III > II

36. The incorrect statement among the following is :-

(*a*) the first ionisation potential of Al is less that the first ionisation potential of Mg

(*b*) the second ionisation potential of Mg is greater that the second ionisation potential of Na

(*c*) the first ionisation potential of Na is less that the first ionisation potential of Mg

(*d*) the third ionisation potential of Mg is greater that the third ionisation potential of Al

37. HOCl is example of acid. It can be explained by :-

(*a*) The electronegativity difference between O and Cl is higher than electronegativity difference between H and O atom. So Cl – O bond will rupture.

(*b*) The electronegativity difference between O and Cl is lower than electronegativity difference between H and O atom. So Cl – O bond will rupture.

(*c*) The electronegativity difference between O and Cl is higher than electronegativity difference between H and O atom. So O–H bond will rupture.

(*d*) The electronegativity difference between O and Cl is lower than electronegativity difference between H and O atom. So O–H bond will rupture.

38. Which of the following species is / are paramagnetic NO_2, NO, N_2O_4, N_2O_5 :-

(*a*) Only NO_2 (*b*) NO_2 , NO

(*c*) NO_2 , NO , N_2O_5 (*d*) All are paramagnetic

39. Bond order of CO_3^{2-} and CO^+ are respectively :-

(*a*) 1.33, 2.5 (*b*) 1.5, 3

(*c*) 1.75, 3.5 (*d*) None of these

40. Ionic radii of :-

(*a*) $Ti^{4+} < Mn^{7+}$ (*b*) $^{35}Cl^- < ^{37}Cl^-$

(*c*) $K^+ < F^-$ (*d*) $P^{3+} > P^{5+}$

41. Identify the correct order of acidic strengths of CO_2, CuO, CaO, H_2O :-

(*a*) $CaO < CuO < H_2O < CO_2$

(*b*) $H_2O < CuO < CaO < CO_2$

(*c*) $CaO < H_2O < CuO < CO_2$

(*d*) $H_2O < CO_2 < CaO < CuO$

42. Idenfity the least stable ion amongest the following:-
(*a*) Li^- (*b*) Be^-
(*c*) B^- (*d*) C^-

43. The set representing correct order of IP_1 is :-
(*a*) K > Na > Li (*b*) Be > Mg > Ca
(*c*) B > C > N (*d*) Fe > Si > C

44. The correct order of radii is -
(*a*) N < Be < B (*b*) $F^- < O^{2-} < N^{3-}$
(*c*) Na < Li < K (*d*) $Fe^{3+} < Fe^{2+} < Fe^{4+}$

45. Which set is expected to show the smallest difference in Ist ionisation energy ?
(*a*) Fe, Co, Ni (*b*) N, O, F
(*c*) Ca, Ca^+ Ca^{2+} (*d*) He, Ar, Xe

46. The formula of ferrous chloride is $FeCl_2$. The formula of sodium phosphate is Na_3PO_4. Then the formula of ferrous rhosphrate
(*a*) $FePO_4$ (*b*) $Fe_3(PO_4)_2$
(*c*) $Fe_2(PO_4)_3$ (*d*) $Fe_3(PO_4)$

47. What is the anhydride of lime water ?
(*a*) CaO_2 (*b*) CaO
(*c*) Ca (*d*) $Ca(OH)_2$

48. What is the oxidation state of Mo in ammonium phospho molybdate?
(*a*) + 4 (*b*) + 5
(*c*) + 6 (*d*) + 2

49. Which configuration of metal belongs to lowest melting point?
(*a*) $(n-1)d^{10}\,ns^2$ (*b*) $(n-1)d^{10}\,ns^1$
(*c*) $(n-1)d^8\,ns^2$ (*d*) $(n-1)d^6\,ns^2$

50. Which element forms only one oxoacid ?
(*a*) F
(*b*) Cl
(*c*) I
(*d*) N

51. The correct order of acidic strength of oxides
(*a*) $Na_2O < MgO < ZnO < P_4O_{10}$
(*b*) $Al_2O_3 < SiO_2 < P_4O_{10} < SO_3$
(*c*) $Cl_2O < ClO_2 < Cl_2O_7$
(*d*) All

52. The correct order of basic strength of oxide/ hydroxide
(*a*) BaO > SrO > CaO > MgO > BeO
(*b*) $Cs_2O > Rb_2O > K_2O > Na_2O > Li_2O$
(*c*) $CsOH > Mg(OH)_2 > Zn(OH)_2 > HOCl$
(*d*) All

53. 3d series is started and ended with element -
(*a*) Scandium and zinc respectively
(*b*) Titanium and copper respectively
(*c*) Titanium and mercury respectively
(*d*) Scandium and mercury respectively

54. 4d series is started and ended with element :-
(*a*) Yttrium & cadmium respectively
(*b*) Ytterbium & cadmium respectively
(*c*) Yttrium and mercury respectively
(*d*) Scandium and mercury respectively

55. 4f series is started and ended with element :-
(*a*) Cerium and lawrencium
(*b*) Thorium and lawrencium
(*c*) Cerium and lutetium
(*d*) Thorium and lutetium respectively

56. 5f series is started and ended with element :-
(*a*) Cerium and lawrencium
(*b*) Thorium and lawrencium
(*c*) Cerium and lutetium
(*d*) Thorium and lutetium respectively

57. Element tend to lose two electrons :-
(*a*) Mg (*b*) Ba
(*c*) Ca (*d*) All

58. Element with five electrons in the outer subshell :-
(*a*) Al (*b*) Si
(*c*) Se (*d*) As

59. For beryllium, Be^{2+} is more stable than Be^{3+} from that which of the following options are correct ?
(*a*) $(I_2 - I_1)$ of Be is much less than $(I_3 - I_2)$ of Be.
(*b*) $(I_2 - I_1)$ of Be is much more than $(I_3 - I_2)$ of Be.
(*c*) $(I_2 - I_1)$ of Be is equal than $(I_3 - I_2)$ of Be.
(*d*) $I_3 <<< I_2 < I_1$

60. Which elements has δ+ charge in compound A, B, C respectively:-

H–F ; Si–Cl ; C–O

A B C

(*a*) F, Cl, O (*b*) H, Si, C

(*c*) H, Cl, O (*d*) H, Si, O

61. Ist ionisation enthalpy and IInd ionisation enthalpy of Mg are 78 and 348 kcal mol^{-1} respectively. The ΔH for the process $M(g) \rightarrow M^{2+}(g) + 2e^-$ is:-

(*a*) +170 kcal mol^{-1} (*b*) +426 kcal mol^{-1}

(*c*) –426 kcal mol^{-1} (*d*) –170 kcal mol^{-1}

62. The largest species and smallest species among Mg, Mg^{2+}, Al, Al^{3+} are respectively -

(*a*) Mg, Mg^{2+} (*b*) Mg, Al^{3+}

(*c*) Al, Al^{3+} (*d*) Al, Mg^{2+}

63. The first ionisation enthalpy values of the 3rd period elements Na, Mg and Si are respectively 496, 737, 786 kJ mol^{-1}. The first ionisation enthalpy of Al should be :-

(*a*) less than 496 kJ mol^{-1}

(*b*) more than 786 kJ mol^{-1}

(*c*) more than 496 kJ mol^{-1} but less than 737 kJ mol^{-1}

(*d*) more than 737 kJ mol^{-1} but less than 786 kJ mol^{-1}

64. The oxidation state of oxygen of two oxygen containing compounds OF_2 and Na_2O are respectively :-

(*a*) +2, –2 (*b*) –2, –2

(*c*) +2, +2 (*d*) +1, –2

65. The correct order of metallic behaviour :-

(*a*) Na > Mg > Be > Si > P

(*b*) Mg > Be > Na > Si > P

(*c*) Be > Na > Mg > Si > P

(*d*) P > Be > Si > Na > Mg

66. If C–C bond distance is 1.54 Å, C=C bond distance is 1.34 Å, C≡C bond distance is 1.2 Å. Then C–C bond distance in benzene is approximately equal to :-

(*a*) 1.5 Å (*b*) 1.4 Å

(*c*) 1.6 Å (*d*) 1.3 Å

67. For an element the spin only magnetic moment is 3.83 BM. The number of unpaired electron in the valence shell of this element :-

(*a*) 1 (*b*) 2

(*c*) 3 (*d*) 4

68. Which of the following process is exothermic ?

(*a*) $O(g) \rightarrow O^-(g)$ (*b*) $O^-(g) \rightarrow O^{2-}(g)$

(*c*) $O(g) \rightarrow O^{2-}(g)$ (*d*) $He(g) \rightarrow He^-(g)$

69. Which of the following energy is not associated for the conversion $M^-(g) \rightarrow M^{4+}(g)$:-

(*a*) Ist ionisation energy of M(g)

(*b*) IInd ionisation energy of M(g)

(*c*) Ist electron gain enthalpy of M(g)

(*d*) IInd electron gain enthalpy of M(g)

70. In the first ninety elements , the number of s-block elements is :-

(*a*) 10 (*b*) 12

(*c*) 14 (*d*) 16

71. Which of the following order is correct :-

(*a*) $F_2 > Cl_2 > Br_2 > I_2$(Bond dissociation energy)

(*b*) $F^- > Cl^- > Br^- > I^-$(Stability)

(*c*) $F\cdot > Cl\cdot > Br\cdot > I\cdot$(Reactivity)

(*d*) F > Cl > Br > I(Electron gain enthalpy)

72. Select correct order regarding bond dissociation energy of hydrogen halide / hydrohalic acid :-

(*a*) HF > HCl > HBr > HI

(*b*) HCl > HBr > HF > HI

(*c*) HI > HBr > HCl > HF

(*d*) HF > HCl > HI > HBr

73. The I^{st}, II^{nd}, III^{rd}, IV^{th}, V^{th} ionisation energy of an element are 7.1, 14.3, 34.5, 46.8 & 162.2 eV respectively. The element can be :-

(*a*) K (*b*) Al

(*c*) Cl (*d*) Si

74. In a period, the elements having least melting point:-

(*a*) Pnicogens (*b*) Chalcogens

(*c*) Halogens (*d*) Noble gas

75. In a period , the elements having highest atomic volume :-

(*a*) Alkali metals (*b*) Alkaline earth metals

(*c*) Halogens (*d*) Noble gases

76. Covalent radius and Vanderwaal's radius of fluorine atom are respectively :-
(*a*) 71 pm and 71 pm (*b*) 147 pm and 147 pm
(*c*) 71 pm and 147 pm (*d*) 147 pm and 71 pm

77. If electronic configuration of A^- is [Ar] $3d^{10}4s^2 4p^6$, then which element has the configuration identical to the configuration of A^{2+} :-
(*a*) Ge (*b*) Ga
(*c*) As (*d*) Se

78. Decrease in size is maximum for which process :-
(*a*) $O(g) \rightarrow O^+(g)$ (*b*) $O^-(g) \rightarrow O(g)$
(*c*) $O^-(g) \rightarrow O^+(g)$ (*d*) All

79. Which of the following represents the correct order of increrasing first ionisation enthalpy for Ca, Ba, S, Se and Ar ?
(*a*) Ba < Ca < Se < S < Ar
(*b*) Ca < Ba < S < Se < Ar
(*c*) Ca < S < Ba < Se < Ar
(*d*) S < Se < Ca < Ba < Ar

80. The first ionisation potential of Na is 5.1 eV. The value of electron gain enthalpy of Na^+ will be :-
(*a*) –10.2 eV (*b*) +2.55 eV
(*c*) –2.55 eV (*d*) –5.1 eV

81. Among the following oxoacids, the correct decreasing order of acid strength is :-
(*a*) $HClO_4 > HClO_3 > HClO_2 > HOCl$
(*b*) $HClO_2 > HClO_4 > HClO_3 > HOCl$
(*c*) $HOCl > HClO_2 > HClO_3 > HOCl_4$
(*d*) $HClO_4 > HOCl > HClO_2 > HClO_3$

82. Fluorine is the most reactive among all the halogens, because of its :-
(*a*) high electron affinity
(*b*) low dissociation energy of F–F bond
(*c*) large size
(*d*) high dissociation energy of F–F bond

83. In the long form of the periodic table, the valence shell electronic configuration of $5s^25p^4$ corresponds to the element present in :-
(*a*) group 16 and period 5
(*b*) group 17 and period 6
(*c*) group 17 and period 5
(*d*) group 16 and period 6

84. The correct order of non metallic character :-
(*a*) B > C > Si > N > F
(*b*) Si > C > B > N > F
(*c*) F > N > C > B > Si
(*d*) F > N > C > Si > B

85. The correct order of oxidising property :-
(*a*) F > Cl > O > N (*b*) F > O > Cl > N
(*c*) Cl > F > O > N (*d*) O > F > N > Cl

86. The correct order of ionisation enthalpy :-
(*a*) B > Al > Ga > In > Tl
(*b*) B > Tl > Ga > Al > In
(*c*) Tl > In > Ga > Al > B
(*d*) Tl > Ga > B > Al > In

87. Among the second period element , for whcih property the following order is observed :-
Li < B < Be < C < O < N < F < Ne
(*a*) electronegativity (*b*) covalent radius
(*c*) ionisation energy (*d*) electron gain enthalpy

88. The correct order of metallic property :-
(*a*) B > Al > Mg > K (*b*) Al > Mg > B > K
(*c*) Mg > Al > K > B (*d*) K > Mg > Al > B

89. Electronegativity of nitrogen element is highest for which of its compound :-
(*a*) NO (*b*) NH_3
(*c*) NO_2 (*d*) N_2O_5

90. Formula of oxides of grou 14 element will be :-
(*a*) M_2O_5 (*b*) MO_3
(*c*) MO_2 (*d*) M_2O_3

91. What is the oxidation state and covalency of Mg in Grignard reagent (alkyl magnesium halide) :-
(*a*) +1, +1
(*b*) +2, +2
(*c*) +2, +4
(*d*) +2, +3

92. Uuu and Uub is symbol of :-
(*a*) Unununnium, Ununbium
(*b*) Unununium, Ununbium
(*c*) Ununium, Unbium
(*d*) Unununnim, Ununbium

93. The internuclear distance of Mg^{2+} and O^{2-} is 212 pm. The inter ionic distance of Mg^{2+} and S^{2-} is 256 pm. If radius of O^{2-} is 140 pm, what is the radius of S^{2-} ?

(*a*) 72 pm (*b*) 184 pm

(*c*) 82 pm (*d*) 116 pm

94. $(\text{Ionic radius})_{O2^-} = 126$ pm $(\text{Ionic radius})_{Na^+} = 116$ pm. Ionic radius of F^- should be

(*a*) 114 pm (*b*) 128 pm

(*c*) 119 pm (*d*) 110 pm

95. $(\text{Ionic radius})_{K^+} = 152$ pm $(\text{Ionic radius})_{Cl^-} = 167$ pm. Ionic radius of S^{2-} should be

(*a*) 148 pm (*b*) 158 pm

(*c*) 164 pm (*d*) 170 pm

96. After the filling of np orbitals, next orbital filled will be

(*a*) ns (*b*) (n–1)d

(*c*) (n+1)s (*d*) nd

97. The element having atomic number 117 has not yet been discovered. It should be placed in :-

(*a*) Group 14 (*b*) Group 15

(*c*) Group 16 (*d*) Group 17

98. The element having atomic number 120 has not yet been discovered. It should be placed in :-

(*a*) Group 1 (*b*) Group 2

(*c*) Group 3 (*d*) Group 4

99. Anything that influences the valene electrons will affect the chemistry of the element. Which one of the follwing factors does not affect the valence shell?

(*a*) Valence principal quantum number (n)

(*b*) Nuclear charge (z)

(*c*) Nuclear mass

(*d*) Number of core electrons

100. The size of isoelctronic species – F^-. Ne and Na^+ is affected by

(*a*) Nuclear charge (Z)

(*b*) Valence principal quantum number (n)

(*c*) Electron-electron intraction in the outer orbitals

(*d*) None of the factors because their size is the same

101. The bromine atom possesses 35 electrons. It contains 6 electrons in 2p orbital. 6 electrons in 3p orbital and 5 electrons in 4p orbital. Which of these electron experience the lowest effective nuclear charge ?

(*a*) 4s (*b*) 4p

(*c*) 4d (*d*) 4f

102. Which element has odd number of unpaired electron :-

(*a*) P (*b*) Si

(*c*) Cr (*d*) Fe

103. Increasing order of energy :-

(*a*) 5s < 5d < 4f < 6p < 6d

(*b*) 5s < 4f < 5d < 6p < 6d

(*c*) 4f < 5s < 5d < 6p < 6d

(*d*) 4f < 5s < 5d < 6d < 6p

104. The quantum number of four electrons are given below.

(I) $n = 4, \ell = 2, m_\ell = -2, m_s = -1/2$

(II) $n = 3, \ell = 2, m_\ell = 1, m_s = +1/2$

(III) $n = 3, \ell = 1, m_\ell = 1, m_s = +1/2$

(IV) $n = 4, \ell = 1, m_\ell = 0, m_s = +1/2$

Correct order of increasing energy is -

(*a*) I < IV < III < II (*b*) III < IV < II < I

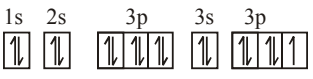
(*c*) III < II < IV < I (*d*) II < IV < III < I

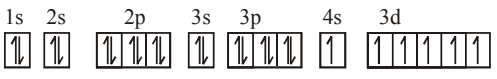
105. Which of the following has least pH in aqueous solution ?

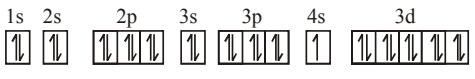
(*a*) HOCl (*b*) $HClO_2$

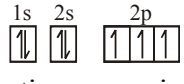
(*c*) $HClO_3$ (*d*) $HClO_4$

106. Which arrangement of electrons is wrongly written :-

(*a*) P : 

(*b*) Cr : 

(*c*) Cu : 

(*d*) N : 

107. I[st] ionisation energy is least with which atom :-

(*a*) Lead (*b*) Silicon

(*c*) Carbon (*d*) Tin

108. I[st] ionisation energy is least with which atom :-

(*a*) Boron (*b*) Indium

(*c*) Galium (*d*) Thallium

109. The highest oxidising power is shown by :-

(*a*) I_2 (*b*) B_2

(*c*) Cl_2 (*d*) F_2

110. Hydration energy is highest for :-

(*a*) Li^+ (*b*) Na^+

(*c*) K^+ (*d*) Cs^+

111. Hydration energy is highest for :-

(*a*) Li^+ (*b*) Be^{2+}

(*c*) Mg^{2+} (*d*) Al^{3+}

112. Correct order of stability of following anions :-

$CH_3\bar{C}H_2$; $CH_2=\bar{C}H$; $HC\equiv\bar{C}$; $\bar{N}H_2$; $\bar{O}H$

A B C D E

(*a*) E > D > C > B > A (*b*) E > A > B > C > D

(*c*) E > C > D > B > A (*d*) D > E > C > B > A

113. The ionisation energy of Zn is :-

(*a*) More than Cu and Ga

(*b*) Less than Cu and Ga

(*c*) More than Ga and less than Cu

(*d*) More than Cu and less than Ga

114. Which of the following property undergoes gradual steady shrinkage along the series :-

(*a*) Metallic radii of lanthanide elements

(*b*) Covalent radii of lanthanide elements

(*c*) Ionic radii of lanthanide elements

(*d*) All

115. For a particular principal quantum number, the penetrating power of the orbitals.

(*a*) nf > nd > np > ns (*b*) nd > nf > ns > np

(*c*) ns > np > nd > nf (*d*) np > ns > nf > nd

116. Reaction Energy involved

$P(g) \longrightarrow P^+(g) + e$ E_1

$S(g) \longrightarrow S^+(g) + e$ E_2

$P^+(g) \longrightarrow P^{2+}(g) + e$ E_3

$S^+(g) \longrightarrow S^{2+}(g) + e$ E_4

Correct option :-

(*a*) $E_1 > E_2 > E_3 > E_4$ (*b*) $E_4 > E_3 > E_1 > E_2$

(*c*) $E_4 > E_3 > E_2 > E_1$ (*d*) $E_3 > E_4 > E_1 > E_2$

117. Which is called superhalogen ?

(*a*) F (*b*) Cl

(*c*) Br (*d*) I

118. The preference of filling the shells runs :-

(*a*) K > L > M > N (*b*) L > M > N > K

(*c*) N > M > L > K (*d*) N > L > M > K

119. Reaction Energy Involved

$CO(g) \rightarrow CO^+(g) + e$ IE_1

$N_2(g) \rightarrow N_2^+(g) + e$ IE_2

$O_2(g) \rightarrow O_2^+(g) + e$ IE_3

Correct option :

(*a*) $IE_1 > IE_2 > IE_3$ (*b*) $IE_2 > IE_3 > IE_1$

(*c*) $IE_1 > IE_3 > IE_2$ (*d*) $IE_2 > IE_1 > IE_3$

120. Which of the following represent d^9 ion :-

(*a*) Cu^+ (*b*) Cu^{2+}

(*c*) Zn^{2+} (*d*) Ni^{2+}

121. Among alkaline earth metal which one has lowest ionisation energy value :-

(*a*) Mg (*b*) Ca

(*c*) Sr (*d*) Ba

122. The formula of magnesium nitride and sodium azide are :-

(*a*) Mg_3N_2, Na_3N respectively

(*b*) $Mg(N_3)_2$, NaN_3 respectively

(*c*) Mg_3N_2, NaN_3 respectively

(*d*) $Mg(N_3)_2$, Na_3N respectively

123. Formula of phosphide ion and sulphate ion are respectively P^{3-} and SO_4^{2-}. The formula of magnesium phosphide and aluminium sulphate are respectively :-

(*a*) MgP, $AlSO_4$ (*b*) Mg_3P_2, $AlSO_4$

(*c*) Mg_3P_2, $Al_2(SO_4)_3$ (*d*) MgP, $Al_2(SO_4)_3$

124. Which of the following is largest cation ?

(*a*) Na^+ (*b*) Mg^{2+}

(*c*) Ca^{2+} (*d*) Al^{3+}

125. Which of the following is smallest cation ?

(*a*) Li^+

(*b*) Be^{2+}

(*c*) Mg^{2+}

(*d*) Al^{3+}

126. What will be the period number, group number, block of the element having atomic number 20 ?

(*a*) 4, 3, p (*b*) 3, 2, s

(*c*) 4, 2, s (*d*) 3, 3, p

127. Which of the following is largest ?

(*a*) Mg (*b*) Mg^{+1}

(*c*) Mg^{2+} (*d*) Al^{3+}

128. The most electropositive element :-

(*a*) S (*b*) O

(*c*) Rb (*d*) K

129. Which of the following pair of atomic numbers represents s-block elements ?

(*a*) 3, 9 (*b*) 11, 38

(*c*) 55, 5 (*d*) 4, 33

130. Alkali metals and alkaline earth metals form the ion of the type :-

(*a*) M^{+1} ; M^{+2} (*b*) M^{+2} ; M^{+1}

(*c*) M^{-1} ; M^{-2} (*d*) M^{-2} ; M^{-1}

131. What is the electronic configuraiton for $Co^{3+}(g)$:-

(*a*) [Ar] $3d^5$ (*b*) [Ar] $3d^6$

(*c*) [Ar] $3d^7$ (*d*) [Ar] $4s^1 3d^5$

132. Which of the following element is example of metalloid ?

(*a*) N (*b*) As

(*c*) Al (*d*) Te

133. The outermost electron resides in K, Cr, Cl, respectively :-

(*a*) 4s, 4p, 3d orbital (*b*) 3s, 3d, 3p orbital

(*c*) 3s, 4d, 4p orbital (*d*) 4s, 3d, 3p orbital

134. If an element X forms the highest oxide of the formula X_2O_7 , then it belongs to group :-

(*a*) 14 (*b*) 15

(*c*) 16 (*d*) 17

135. In Mn, the maximum number of electrons having $m_s = -½$ is :-

(*a*) 15 (*b*) 14

(*c*) 16 (*d*) 20

136. In Mn, the minimum number of electrons having $m_s = +½$ is :-

(*a*) 10 (*b*) 12

(*c*) 14 (*d*) 15

137. The ratio of unpaired electrons present in the orbital of Mn^{2+} and Cr^{3+} :-

(*a*) 4 : 1 (*b*) 2 : 1

(*c*) 5 : 2 (*d*) 5 : 3

138. The five successive ionisation energies of an element are 800, 2427, 3658, 25024 and 32824 kJ mol^{-1} respectively. The number of valence electrons is :-

(*a*) 3 (*b*) 5

(*c*) 1 (*d*) 2

139. Which of the following oxide is examples of suboxide :-

(*a*) NO_2 (*b*) KO_2

(*c*) C_3O_2 (*d*) N_2O

140. NaOH is example of base it can be explained by :-

(*a*) The electronegativity difference between O and H is higher than electronegativity difference between Na and O atom. So Na – O bond will rupture.

(*b*) The electronegativity difference between O and H is lower than electronegativity difference between Na and O atom. So Na – O bond will rupture.

(*c*) The electronegativity difference between O and H is higher than electronegativity difference between Na and O atom. So O–H bond will rupture.

(*d*) The electronegativity difference between O and H is lower than electronegativity difference between Na and O atom. So O–H bond will rupture.

141. The energy required to convert all atoms of Mg to Mg^{2+} ion present in 24×10^{-3} g of Mg vapour is :-

(*a*) 2.67 kJ (*b*) 2.19 kJ

(*c*) 3.56 kJ (*d*) 4.38 kJ

142. Which of the following pair of elements belongs to the same period :-

(*a*) Ca & Cl (*b*) Na & Ca

(*c*) Mg & Sb (*d*) Ca & Zn

143. Which of the following has highest second ionisation energy ?

(*a*) Sc (*b*) Ti

(*c*) V (*d*) Cr

144. Which of the following has highest third ionisation energy ?

(*a*) Ca (*b*) Tl

(*c*) Mn (*d*) V

145. Correct ionisation energy order :-

(*a*) Cu > Ag > Au (*b*) Au > Cu > Ag

(*c*) Au > Ag > Cu (*d*) Cu > Au > Ag

146. Bond polarity order :-

(*a*) F–H > O–H > Cl–H > S–H

(*b*) F–H > Cl–H > O–H > S–H

(*c*) S–H > Cl–H > O–H > F–H

(*d*) Cl–H > S–H > F–H > O–H

147. Which orbital is filled after filling of np orbitals :-

(*a*) ns (*b*) nd

(*c*) (n–1)d (*d*) (n+1)s

148. If x, y, z are electronegativity on Mulliken scale, ionisation potential (in V) and electron affinity (+ in eV) respectively, then the electron affinity in the terms of electronegativity and ionisation potential will be :-

(*a*) $z = \frac{x+y}{2}$ (*b*) $y = \frac{x+y}{2}$

(*c*) $x = \frac{z-y}{2}$ (*d*) $z = 2x - y$

149. Fluorine has the highest electronegativity among the $ns^2\ np^5$ group on the Pauling scale, but the electron affinity of fluorine is less than that of chlorine because :-

(*a*) the atomic number of fluoride is less than that of chlorine

(*b*) fluorine being the first member of the family behaves in an unusual manner

(*c*) chlorine can accomodate an electron better than fluorine by utilising its cacant 3d-orbital

(*d*) small size, high electron density and an increased electron repulsion makes addition of an electron to fluorine less favourable than that in the case of chlorine in isolated stage.

150. First and second ionisation enthalpies of Mg are 720 kJ/mol and 1440 kJ/mol respectively. The % of Mg^+ ions, if one gram of Mg(g) absorbs 50 kJ of energy. (Given : Atomic mass of Mg = 24 amu):-

(*a*) 33.33 (*b*) 66.67

(*c*) 55.55 (*d*) 99.99

EXERCISE # II

❑ **One or More Than One Correct Answer :**

1. Which of the ion pair is isoelectronic :-

(*a*) F^-, K^+ (*b*) Cl^-, Na^+

(*c*) S^{2-}, Ca^{2+} (*d*) O^{2-}, Mg^{2+}

2. Which process requires energy to take place ?

(*a*) $Ne \rightarrow Ne^{-1}$ (*b*) $F \rightarrow F^{-1}$

(*c*) $O^{-1} \rightarrow O^{2-}$ (*d*) $Mg \rightarrow Mg^{2+}$

3. Which of the following reactions should , are nonspontaneous in gas phase :-

(*a*) $Xe + He^+ \rightarrow Xe^+ + He$

(*b*) $Si + Cl^+ \rightarrow Si^+ + Cl$

(*c*) $F^- + I \rightarrow I^- + F$

(*d*) $I^- + F \rightarrow F^- + I$

4. Bond dissociation energy order :-

(*a*) C–C > C–H > H–H

(*b*) F–F > Cl–Cl > Br–Br

(*c*) C≡C > C=C > C–C

(*d*) O=O > S=S > Se=Se

5. Which of these ions are paramagnetic ?

(*a*) Sr^{2+} (*b*) Fe^{3+}

(*c*) Co^{2+} (*d*) S^{2-}

6. Which of the following electronic configuration belongs to d block element ?

(*a*) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5 4s^1$

(*b*) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$

(*c*) $1s^2 2s^2 2p^6 3s^2 3p^6$

(*d*) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^1$

7. Which of the following statements are correct ?

(*a*) MgO is more basic than BaO

(*b*) $Na_2(g)$ molecule exhibit metallic properties

(*c*) Ca^{2+} has smaller ionic radius than K^+

(*d*) Atomic size order Cs > Na > Mg > Si > Cl

8. Which of the following statements are correct ?

(*a*) Lithium is better reducing agent than Ceasium

(*b*) Ionisation energy and sublimation energy of Li is less than Ceasium

(*c*) 2s orbital is lower in energy than 2p orbital

(*d*) The first ionisation energy of Berylium is more than that of boron

9. Which of the following statements are correct ?

(*a*) The electronic configuration of Cr is [Ar] $3d^5$ $4s^1$. (atomic number 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 number of Ag = 47)

(*d*) The oxidation state of nitrogen in HN_3 is –3

10. In which case, Ist bond is more polar than 2nd bond?

(*a*) P-Cl, P-Br (*b*) S-Cl, S-O

(*c*) N-O, N-F (*d*) B-F, B-Cl

11. Diagonal relationship is observed in

(*a*) F, Ne (*b*) C, P

(*c*) B, Si (*d*) Li, Mg

12. Electronic configuration $ns^2(n-1)\ d^{0-1}\ (n-2)f^{1-14}$ represents

(*a*) Representative elements

(*b*) Lanthanides

(*c*) Radioactive elements

(*d*) Actinides

13. Which of the following pair is isoelectronic?

(*a*) Te^{2-}, Xe (*b*) Mn^{2+}, Cr^{3+}

(*c*) Ni, Zn^{2+} (*d*) Br^-, Kr

14. Which of the following properties are correctly given?

(*a*) N > P > As > Sb(Third ionisation energy)

(*b*) $Na^+ < F^- < O^{2-}\ N^{3-}$(Ionic size)

(*c*) O > F > N > C(Second ionisation energy)

(*d*) Mg > Al > Si > P(Covalent radius)

15. Which of the following atoms has positive electron gain enthalpy ?

(*a*) N (*b*) Be

(*c*) Mg (*d*) Mn

16. Which of the following statements are correct ?

(*a*) The 5th period of periodic table contains 32 elements

(*b*) The 4f and 5f inner transition series of elements are placed separately at the bottom of the periodic table

(*c*) N_2 and CN^- are isoelectronic species.

(*d*) Third ionisation energy of phosphorous is more than sulphur.

17. Which of the following statements are incorrect ?

(*a*) Formation of Se^{2-} and Ar^-, both require absorption of energy

(*b*) Metallic and covalent radii of potassium are 203 and 230 pm respectively.

(*c*) If the same element is forming oxide in different oxidation state, then the oxide will be highest acidic in nature in which element will be in its highest oxidation state.

(*d*) The electron gain enthalpy of oxygen is more negative than that for sulphure.

18. Elements tend to gain two electron :-

(*a*) S (*b*) O

(*c*) Te (*d*) Cl

19. Glenn Seaborg took part in the discovery of ten of the periodic table's chemical elements. Which element it can be :-

(*a*) Nobelium (atomic number 102)

(*b*) Californium (atomic number 98)

(*c*) Berkelium (atomic number 97)

(*d*) Curium (atomic number 96)

20. Aqueous solution of which of the following oxide are acidic in nature :-

(*a*) Cl_2O_7 (*b*) CO_2

(*c*) BaO (*d*) BeO

21. Which of the following options are incorrect :-

(*a*) Second period element oxygen has more negative electron gain enthalpy than third period element sulphur.

(*b*) Second period element lithium has more negative electron gain enthalpy than third period element sodium.

(*c*) Second period element neon has more negative electron gain enthalpy than third period element argon.

(*d*) Second period element fluorine has more negative electron gain enthalpy than third period element chlorine.

22. In which case all M–O bond lengths are identical :-

(*a*) PO_4^{3-} (*b*) CO_3^{2-}

(*c*) MnO_4^- (*d*) CH_3CO_2H

23. Which of the following options are correct :-

(*a*) Across the period effective nuclear charge decreases

(*b*) Atomic gaseous of inert gases is highest in the period

(*c*) Ionisation energy of Ne is greater as compared to Ne^+

(*d*) Ionisation energy of Zn is higher as compared to Ga

24. Out of lithium and neon :-

(*a*) IE_2 of Li is more than IE_2 of Ne

(*b*) IE_2 of Li is less than IE_2 of Ne

(*c*) IE_1 of Li is more than IE_1 of Ne

(*d*) IE_1 of Li is less than IE_1 of Ne

25. Which of the following options are incorrect :- :-

(*a*) HF bond length is smaller then sum of radius of H atom and F atom

(*b*) Effective nuclear charge of inert gases is minium

(*c*) $C(g) \rightarrow C^{2+}(g)$ the energy involved in this process is called 2nd ionisation energy

(*d*) Electron affinity of oxygen atom is higher than that of sulphur atom

26. $2p_x$ orbital and $3p_x$ orbital of an atom have same :-

(*a*) size (*b*) orientation

(*c*) shape (*d*) nodal plane

27. Which of the following is associated with the removal of electron from d-subshell :-

(*a*) IE_1 for Mn (*b*) IE_2 for Mn

(*c*) IE_3 for Mn (*d*) IE_4 for Mn

28. The correct order of reactivity :-

(*a*) Cs > Rb > K > Na > Li

(*b*) I > Br > Cl > F

(*c*) Li > Na > K > Rb > Cs

(*d*) F > Cl > Br > I

29. Chemical elements discovered at Lawerance Berkeley National Laboratory are :-

(*a*) Technetium (*b*) Astatine

(*c*) Plutonium (*d*) Curium

30. Formula of oxide of group 15 elements can be :-

(*a*) M_2O_3 (*b*) M_2O_5

(*c*) M_4O_{10} (*d*) MO_2

31. Which formulas are correctly given :-

(*a*) Compound formed by silicon and bromine : $SiBr_4$ (Silicon tetrabromide)

(*b*) Compound formed by aluminium and sulphur : Al_2S_3 (Aluminium sulphide)

(*c*) Compound formed by mercury and iodine : HgI_2 (Mercuric iodid)

(*d*) Compound formed by lithium and oxygen : Li_2O (Lithium oxide)

32. Which of the following elements are called semimetals or metalloid :-

(*a*) Si (*b*) Ge

(*c*) I (*d*) As

34. Select correct option regarding Uuh(atomic number 116)

(*a*) It belongs to 7th period element

(*b*) It belongs to group 16 element

(*c*) It is p-block element

(*d*) It is an inert gas

35. Cl^{35} and Cl^- has

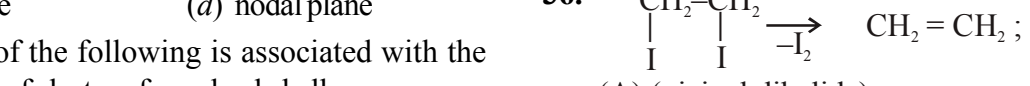
(*a*) Same number of electrons

(*b*) Same number of neutrons

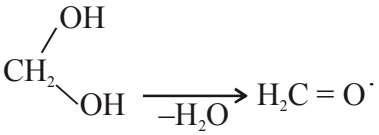
(*c*) Same number of protons

(*d*) Same stability

36.



(A) (vicinal dihalide)



(B) Gem diol

Correct option

(*a*) Vicinal diiodide does not exist because C–I has less bond dissociation energy

(*b*) Gem diol does not exist because C= O has high bond dissociation energy

(*c*) Vicinial diol does exist

(*d*) Gem diol exists

37. Which of the following statements are correct :-

(*a*) the size of hydride ion is greater than that of F^-

(*b*) (n+l) values for 5s and 4p orbitals are identical

(*c*) H^- is example of stronger reducing agent as compared to hydrogen atom

(*d*) The lanthanoid contraction is less as compared to actinide contraction

38. H–C≡CH can form salt with :-

(*a*) Ca metal (*b*) Na metal

(*c*) Li metal (*d*) K metal

39. Which of the elements with given atomic number belong to p block element ?

(*a*) Atomic number 83 (*b*) Atomic number 34

(*c*) Atomic number 54 (*d*) Atomic number 64

40. Which of the elements with given atomic number belong to inner transition series ?

(*a*) Atomic number 64 (*b*) Atomic number 42

(*c*) Atomic number 79 (*d*) Atomic number 91

41. The order of ionic mobility :-

(*a*) $K^+(aq.) > Na^+(aq.)$ (*b*) $Ca^{2+}(aq.) > Sr^{2+}(aq.)$

(*c*) $Rb^+(aq.) > Na^+(aq.)$ (*d*) $Na^+(aq.) > K^+(aq.)$

42. $CH_3I + OH^- \rightarrow CH_3OH + I^-$

Correct option regarding this reaction :-

(*a*) Here OH^- attacks δ^+ charge of carbon

(*b*) Here OH^- acts as nucleophile

(*c*) It is example of nucleophilic substitution

(*d*) $(\text{Electronegativity of carbon})_{CH_3 \text{ group}} >$ (Electronegativity of iodine)

43. Which of the following option are correct :-

(*a*) Pauling scale electronegativity is based on bond energy value

(*b*) Alred rochow scale electronegativity is based on Zeff and covalent radius

(*c*) Electronegativity in Muliken's scale is based on ionisation energy and electron affinity

(*d*) Electronegativity in Sanderson's scale is based on compactness of electron cloud around the nucleus

44. Ionic radii of :-

(*a*) $Ti^{4+} < Mn^{7+}$ (*b*) $^{35}Cl^- < {}^{37}Cl^-$

(*c*) $K^+ < Cl^-$ (*d*) $P^{3+} > P^{5+}$

45. Which of the following statements is/are true for the long form of the periodic table :-

(*a*) it reflects the sequence of filling the electrons in the order of sub-energy levels s,p,d and f.

(*b*) it helps to predict the stable valency states of the element

(*c*) it reflects trends in physical and chemical properties of the elements

(*d*) it helps to predict the relative ionicity of the bond between any two elements

46. Which of the following statements are true ?

(*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

47. Which one of the following statements are correct in relation to ionization enthalpy?

(*a*) Ionization enthalpy increases for each successive electron.

(*b*) The greatest increase in ionization enthalpy is experienced on removal of electron from core noble gas configuration.

(*c*) End of valence electrons is marked by a big jump in ionization enthalpy.

(*d*) Removal of electron from orbitals bearing lower n value is easier than from orbital having higher n value.

48. Which of the following statements are correct for the preiodic classification of elements ?

(*a*) The properties of elements are the periodic functions of their atomic number

(*b*) Non-metallic elements are lesser in number than metallic character

(*c*) The first ionisation energy of the element along a period do not vary in a regular manner with increase in atomic number

(*d*) For transition elements, the d-subshells are filled with electrons monotonically with increase in atomic number

49. The correct order of radii is :-
(*a*) N < Be < B (*b*) $F^- < O^{2-} < N^{3-}$
(*c*) Na < Li < K (*d*) $Fe^{3+} < Fe^{2+} < Fe^{4+}$

50. Which of the following statements are correct ?
(*a*) Among Sn, Pb, Fe, Ag ; +2 oxidation state is most stable for Pb
(*b*) Among $Mg^{2+}, Ti^{3+}, V^{3+}, Fe^{2+}$; maximum number of unpaired electron is present in Fe^{2+}
(*c*) Among O, F, N, C ; the highest second ionisation potential is observed for oxygen
(*d*) Among the following configuration [Ne] $3s^23p^1$, [Ne] $3s^23p^3$, [Ne] $3s^23p^2$, [Ne] $3d^{10}4s^24p^3$; [Ne] $3s^23p^3$ has highest ionisation energy

51. Which of the following sets contain only isoelectronic ions ?
(*a*) $Zn^{2+}, Ca^{2+}, Ga^{3+}, Al^{3+}$
(*b*) $K^+, Ca^{2+}, Sc^{3+}, Cl^-$
(*c*) $P^{3-}, S^{2-}, Cl^-, K^+$
(*d*) Ti^{4+}, Ar, Cr^{3+}, V^{5+}

52. Which of the following have no unit ?
(*a*) Electronegativity (*b*) Electron gain enthalpy
(*c*) Ionisation enthalpy (*d*) Metallic character

53. 0 :-
(*a*) 0 (*b*) 0
(*c*) 0 (*d*) 0

54. Which of the following pair of atomic numbers represents p-block elements ?
(*a*) 19, 33 (*b*) 14, 53
(*c*) 6, 35 (*d*) 30, 31

55. Which of the following pair of atomic numbers represents d-block elements :-
(*a*) 23, 49 (*b*) 24, 46
(*c*) 56, 28 (*d*) 80, 21

56. Correct electron affinity order :-
(*a*) Ir > Rh > Co (*b*) Pt > Pd > Ni
(*c*) Au > Ag > Cu (*d*) I > Cl > F

57. Which of the polyatomic anion are isoelectronic :-
(*a*) NO_3^-, CO_3^{2-}, BO_3^{3-}
(*b*) SO_4^{2-}, PO_4^{3-}, SiO_4^{4-}
(*c*) SeO_3^{2-}, SO_3^{2-}, TeO_3^{3-}
(*d*) N_3^-, CN_2^{2-}

58. Which of the following elements have non metallic properties :-
(*a*) Cs (*b*) Cl
(*c*) P (*d*) S

59. Reducing property is shown by which element :-
(*a*) Li (*b*) K
(*c*) Ba (*d*) Ca

60. Which of the following are example of interhalogen compound ?
(*a*) ClF_3 (*b*) HBr
(*c*) Cl_2O_7 (*d*) IF_7

61. Which of the following are example of pseudohalide ?
(*a*) CN^- (*b*) ICl_2^-
(*c*) SCN^- (*d*) $SeCN^-$

62. Correct order of stability of following ion / radical :-
(*a*) $F^- < Cl^- < Br^- < I^-$ (*b*) $F^+ < Cl^+ < Br^+ < I^+$
(*c*) $F^\bullet < Cl^\bullet < Br^\bullet < I^\bullet$ (*d*) $F^- > Cl^- > Br^- > I^-$

63. Which of the following ion are example of diamagnetic ?
(*a*) Co^{2+} (*b*) Zn^{2+}
(*c*) Ti^{4+} (*d*) Sc^{3+}

64. Which of the following ion represent d^6 ion ?
(*a*) Co^{2+} (*b*) Fe^{3+}
(*c*) Fe^{2+} (*d*) Co^{3+}

65. The correct order of ionic mobility :-
(*a*) $Li^+(g) > Na^+(g)$ (*b*) $Li^+(aq.) > Na^+(aq.)$
(*c*) $Be^{2+}(g) > Mg^{2+}(g)$ (*d*) $Be^{2+}(aq.) > Mg^{2+}(aq.)$

66. Which of the following orbitals are represented by n = 3, $\ell = 1$?
(*a*) $3p_y$ (*b*) $4p_x$
(*c*) $3d_{xy}$ (*d*) $3p_x$

67. Which of the following are example of isoelectronic species ?
(*a*) Cr^{6+}, Sc^{3+} (*b*) Te^{2-}, I^-
(*c*) N_2O, CS_2 (*d*) NO_2^+, O_3

68. In which pair, the first species has more size as compared to second species :-
(*a*) Ar, Ne (*b*) I^-, Cl^-
(*c*) $Na^+(aq), K^+(aq)$ (*d*) Na, Na^+

69. Correct options are :-

(*a*) F^- is larger than H^-

(*b*) Cl is more electronegative than Br

(*c*) Cs is more electropositive than Na

(*d*) Inert gas can form cation and anion easily

70. Correct order of acidic strength :-

(*a*) $HNO_2 > HNO_3$

(*b*) $H_2SO_4 > H_2SO_3$

(*c*) $HClO_3 > HBrO_3 > HIO_3$

(*d*) $H_3PO_2 > H_3PO_4 > H_3PO_3$

71. 1 eV $atom^{-1}$ is equivalent to:-

(*a*) 3.83×10^{-20} Cals $atom^{-1}$

(*b*) 1.6×10^{-19} J $atom^{-1}$

(*c*) 7.68×10^{-19} Cals $atom^{-1}$

(*d*) 2.26×10^{-19} Cals $atom^{-1}$

72. Which of the following are examples of mixed oxide :-

(*a*) Fe_3O_4 (*b*) Mn_3O_4

(*c*) N_2O_5 (*d*) KO_2

73. How many compound has more lattice energy than NaCl :-

(*a*) RbCl (*b*) MgO

(*c*) ScN (*d*) TiC

74. Which oxides are more basic than Li_2O :-

(*a*) Na_2O

(*b*) Al_2O_3

(*c*) BeO

(*d*) BaO

75. Which of the following ions have pseudo noble gas configuration ?

(*a*) Cu^{+1}

(*b*) Cd^{2+}

(*c*) Au^{+}

(*d*) Tl^{3+}

76. Correct option regarding As (atomic number 33)

(*a*) It is one of the typical element

(*b*) It belongs to 16^{th} group

(*c*) It is a 4^{th} period element

(*d*) It is a p-block element

77. The first element of a group differs in many ways from the other heavier members of the group. It is due to :-

(*a*) small size

(*b*) high electronegativity and high ionisation potential

(*c*) odd atomic number

(*d*) magic numbers of atomic weight

78. The first three ionisation energy of an element are 9.3, 18.2 and 553.8 eV. What inforamations are reflected by following data ?

(*a*) The element belongs to 15^{th} group of Modern periodic table

(*b*) The element has three electrons in the valence shell

(*c*) The element belongs to 2^{nd} group of Modern periodic table

(*d*) The element has two electrons in the valence shell

79. Correct molecular formula :-

(*a*) $Hg_2(N_3)_2$: Mercurous Azide

(*b*) HN_3 : Hydra acid which contains nitrogen

(*c*) Cl_2O_7 : Anhydride of $HClO_4$

(*d*) $Fe[Fe(CN)_6]$: Ferri-Ferri cyanide

80. Which of the following statements are correct :-

(*a*) The halogen that shows same oxidation state in all its compounds with other elements is chlorine.

(*b*) Most stable oxidation state of chromium is +3

(*c*) Among Na, Mg, Fe, Al ; Fe only exhibits more than one oxidation state (other than zero)

(*d*) The number of electrons present in its outermost shell of an element (whose most common oxidation state is –2) is six

81. What is the change in oxidation state during following conversion :-

(*a*) $PbS \rightarrow PbSO_4$: +2 to +6 for S

(*b*) $Br_2 \rightarrow BrO_3^-$: 0 to +5 for Br

(*c*) $H_2O_2 \rightarrow H_2O$: +1 to –2 for O

(*d*) $NH_3 \rightarrow NO$: –3 to +2 for N

82. $3p_y$ and $4p_y$ orbital of an atom have different :-

(*a*) Number of nodal plane

(*b*) Quantum number

(*c*) Size

(*d*) Shape

83. For the compound, $\overset{1}{C}H_3-\overset{2}{C}H=\overset{3}{N}-\overset{4}{C}\equiv\overset{5}{N}$

Th correct order of electronegativity :-

(*a*) $N^5 > N^3$ (*b*) $N^5 > C^4$

(*c*) $C^4 > C^2$ (*d*) $C^2 > C^1$

84. Which of the following options are correct regarding

$ns^2(n-1)d^{0-1}(n-2)f^{1-14}$ configuration ?

(*a*) For lanthanides n = 4

(*b*) For lanthanides n = 5

(*c*) For actinides n = 5

(*d*) For actinides n = 6

85. Which of the following sequences contain atomic numbers of only representative elements?

(*a*) 3,33,53,87 (*b*) 2,10,22,36

(*c*) 7,17,25,37,48 (*d*) 9,35,51,88

86. Ionic radii vary in :-

(*a*) inverse proportion to the effective nuclear charge

(*b*) inverse proportion to the square of effective nuclear charge

(*c*) direct proportion to the screening effect

(*d*) direct proportion to the square of screening effect

87. Those elements impart colour to the flame on heating in it, the atoms of which require low energy for the ioisation (i.e., absorbs energy in the visible region of spectrum). The elements of which of the following groups in Modern periodic table will impart colour to the flame ?

(*a*) 2 (*b*) 13

(*c*) 1 (*d*) 17

88. Which of the following elements will gain one electron more readily in comparison to other elements of their group :-

(*a*) S(g) (*b*) Na(g)

(*c*) O(g) (*d*) C(g)

89. Ionisation energy of atoms A and B are 350 and 250 $kcalmol^{-1}$ respectively. The electron affinities of these atoms are 70 and 90 $kcalmol^{-1}$ respectively. Then:-

(*a*) electron cloud is more attrached by A

(*b*) electron cloud is more attrached by B

(*c*) on Mulliken scale, electronegativity of A is more than B

(*d*) on Mulliken scale, electronegativity of A is less than B

90. Which of the following has/have no unit ?

(*a*) Electronegativity

(*b*) Electron gain enthalpy

(*c*) Ionisation enthalpy

(*d*) Metallic character

91. A , B and C are oxides of element X, Y and Z respectively. X, Y and Z are in the same period of the Modern periodic table. A gives an aqueous solution which turns blue litmus red. B reacts with both strong acids and strong alkalies. C gives an aqueous solution which is strongly alkaline. Which of the following statements is / are true ?

(*a*) All the three elements are metals

(*b*) The Pauling electronegativities decrease from X to Y to Z

(*c*) The atomic radius increases in the order X < Y < Z

(*d*) X, Y and Z could be phosphorus, aluminium and sodium respectively

92. If $\frac{N_0}{2}$ atoms of X(g) are conveted into $X^+(g)$ by energy E_1 and $\frac{N_0}{2}$ atoms of X(g) are conveted into $X^-(g)$ by energy E_2, then :-

(*a*) Ionisation potential of X would be $\frac{2E_1}{N_0}$

(*b*) Ionisation potential of X would be $2E_1$

(*c*) Electron affinity of X would be $\frac{2E_2}{N_0}$

(*d*) Electron affinity of X would be $2E_2$

93. Electronic configuration — Ist ionisation energy

ns^2np^1 — (IE)

ns^2np^3 — IE'

ns^2np^4 — IE''

ns^2np^5 — IE'''

then -

(*a*) IE > IE' (*b*) IE' > IE''

(*c*) IE'' > IE''' (*d*) IE''' > IE

94. Which of the following compounds exists :-

(*a*) BiF_5 (*b*) PbO_2

(*c*) PbI_4 (*d*) As_2O_3

95. In the long form of periodic table the valence shell electronic configuration of an element is $5s^25p^4$. The element resides in :-

(*a*) Group 17 (*b*) Group 16

(*c*) Period 5 (*d*) Period 6

96. Which of the following oxyacid are examples of – ic acid :-

(*a*) H_2SO_4 (*b*) HNO_2

(*c*) H_2CO_3 (*d*) H_2SO_3

97. Which of the following oxyacid are examples of – ous acid :-

(*a*) H_2SO_4 (*b*) HNO_2

(*c*) H_2CO_3 (*d*) H_2SO_3

98. Prefix pyro is attached to the names :-

(*a*) $S_2O_7^{2-}$ (*b*) $H_4As_2O_7$

(*c*) H_2SO_5 (*d*) $H_4B_2O_7$

99. Identify the meta acids :-

(*a*) HPO_3 (*b*) H_2SnO_3

(*c*) $HMnO_4$ (*d*) HBO_2

100. Which of the following options are correct :-

(*a*) The magnitude of Ist ionisation energy of Cl(g) is same as electron gain enthalpy of $Cl^+(g)$

(*b*) The corresponding thioether of ethyl methyl ether is $CH_3–S–C_2H_5$

(*c*) The last element of the p block in 6th peirod is represented by the outermost electronic configuration $4f^{14}5d^{10}6s^26p^6$

(*d*) The oxidation state and covalency of sulphur in sulphur molecule (S_8) are respectively 0 and 2

EXERCISE # III

❑ **Linked Comprehension Type :**

Passage for Q.1 to Q.3

$A(g) \rightarrow A^{2+}(aq.) + 2e^- \Delta H_1 = 700$ kJ mol^{-1}

$A^-(g) \rightarrow A^{2+}(g) + 3e^- \Delta H_2 = 1400$ kJ mol^{-1}

Electron gain enthalpy for $A^+(g) = -350$ kJ mol^{-1}

$IE_1 + IE_2$ for $A(g) = 950$ kJ mol^{-1}

1. What are IE_1 and IE_2 of A ?

(*a*) 600, 350 kJ mol^{-1} (*b*) 400, 550 kJ mol^{-1}

(*c*) 350, 600 kJ mol^{-1} (*d*) 500, 450 kJ mol^{-1}

2. Hydration energy of $A^{2+}(g)$ is

(*a*) – 200 kJ mol^{-1} (*b*) – 150 kJ mol^{-1}

(*c*) – 100 kJ mol^{-1} (*d*) – 250 kJ mol^{-1}

3. Electron gain enthalpy of A is -

(*a*) – 300 kJ mol^{-1} (*b*) – 350 kJ mol^{-1}

(*c*) – 400 kJ mol^{-1} (*d*) – 450 kJ mol^{-1}

Passage for Q.4 to Q.6

In periodic table, some of the elements are given with their atomic number.

Element	**Atomic number**
Cl	17
F	9
Cs	55
Al	13
C	6
Xe	54

4. The element with highest electronegativity and lowest ionisation potential are respectively.

(*a*) F, Xe (*b*) Cl, Cs

(*c*) C, Al (*d*) Xe, C

5. The element which has smallest radius and the element whose oxide is amphoteric are respectively.

(*a*) F, Al (*b*) F, C

(*c*) Cl, C (*d*) Cl, Al

6. The element which has 8 electrons in outer most shell.

(*a*) C (*b*) F

(*c*) Cs (*d*) Xe

Passage for Q.7 to Q.9

The IE_1 and the IE_2 in kJ/mol of few elements are given below

Element	IE_1	IE_2
P	2372	5270
Q	500	7300
R	900	1700
S	1680	3400

Based on the above information answer the following questions :

7. Which of the above elements is likely to be a reactive metal ?

(*a*) P (*b*) Q

(*c*) R (*d*) S

8. Which of the above elements is likely to be a reactive non metal ?

(*a*) P (*b*) Q

(*c*) R (*d*) S

9. Which represents a noble gas ?

(*a*) P (*b*) Q

(*c*) R (*d*) S

Passage for Q.10 to Q.12

When an electron is added to a neutral gaseous atom energy is released. This is called electron affinity which is defined as the amount of energy released when an electron is added to an isolated gaseous atom is called electron affinity. This process is represent as

$$\text{atom(g)} + \text{electron} \rightarrow \text{anion(g)} + \text{energy}$$

The magnitude of electron affinity measures the ability of an atom to hold an additional electron.

10. Which of the following process is endothermic -

(*a*) $P + e^- \rightarrow P^-$ (*b*) $O + e^- \rightarrow O^-$

(*c*) $Li + e^- \rightarrow Li^-$ (*d*) $N + e^- \rightarrow N^-$

11. Choose the correct pair regarding electron affinity (magnitude) -

(*a*) N > P (*b*) Li > Na

(*c*) Be > Li (*d*) N > C

12. According to Millikan's, if an atom has high electronegativity than other atom then it must have -

(*a*) high ionisation energy only

(*b*) high electron affinity only

(*c*) less s character in hybrid orbital

(*d*) high (ionisation energy + electron affinity)

Passage for Q.13 to Q.15

According to Aufbau principle , the atomic orbitals fill in the order of increasing (n + *l*) value when n is principle quantum number and *l* is azimuthal quantum number. Higher the (n + *l*) value for an orbital, higher will be the energy. If the two orbitals have the same value (n + *l*) the one which has lower value of n will be of lower energy and would be filled first.

13. The correct order of energy level for different orbitals -

(*a*) 6d < 8s < 5f < 7p

(*b*) 8s < 5f < 6d < 7p

(*c*) 5f < 6d < 7p < 8s

(*d*) 7p < 6d < 8s < 5f

14. For which orbitals (n+*l*) value becomes 7

(*a*) 4f (*b*) 5d

(*c*) 6p (*d*) All

15. The maximum number of electron if is denoted by N_{max} and if n is th principle quantum number then

(*a*) $N_{max} = 2n^2$ (*b*) $N_{max} = n^2$

(*c*) $N_{max} = 3n^2$ (*d*) $N_{max} = 4n^2$

Passage for Q.16 to Q.18

A solid melts when the force holding its constituent units in position is overcomed by thermal energy as a consequence of increase in temperature. The melting temperature is determined by a number of different factors : nature of packing the atoms, ions or molecules the lattice energy , association through hydgoren bond etc.

16. Which element of 2nd period has highest melting point?

(*a*) B (*b*) C

(*c*) N (*d*) O

17. Which element of 3rd period has highest melting point?

(*a*) Al (*b*) Si

(*c*) Cl (*d*) Ar

18. Correct melting point order

(*a*) P > N (*b*) S > O

(*c*) Cl > F (*d*) all

Passage for Q.19 to Q.21

In periodic table elements are devided with metals and non-metals. Metals comprise more than 78% of all known elements and appear on the left side on the periodic table. Non-metals which are located at the top high hard of the periodic table. Metallic character increases with increasing atomic number in a group whereas decreases from left to right in a period.

19. Non-metals are usually solids or gases at room temperature with low melting and boiling point. The exception is -

(*a*) F (*b*) B

(*c*) C (*d*) both Boron & carbon

20. Which properties are characteristic feature of metals.

(*a*) Metals are good conductor of heat of electricity

(*b*) Metals are malleable and ductile

(*c*) Metals are usually solid at room temperature

(*d*) All

21. Which of the following is not a metalloid/semi metal ?

(*a*) Bi (*b*) As

(*c*) Ge (*d*) Sb

Passage for Q.22 to Q.27

The first ($\Delta_i H_1$) and the second ($\Delta_i H_2$) ionization enthalpies (in kJ mol^{-1}) and the ($\Delta_{eg} H$) electron gain enthalpy (in kJ mol^{-1}) of a few elements are given below:

Element	ΔH_1	ΔH_2	$\Delta_{eg} H$
I	520	7300	–60
II	419	3051	–48
III	1681	3374	–328
IV	1008	1846	–295
V	2372	5251	+48
VI	738	1451	–40

22. The least reactive element.

(*a*) II (*b*) III

(*c*) IV (*d*) V

23. The most reactive element.

(*a*) II (*b*) III

(*c*) IV (*d*) V

24. The most reactive non metal.

(*a*) VI (*b*) III

(*c*) IV (*d*) V

25. The least reactive non metal.

(*a*) I (*b*) III

(*c*) IV (*d*) V

26. The metal which can form a stable binary halide of the formula MX_2 (X = halogen).

(*a*) I (*b*) III

(*c*) IV (*d*) V

27. The metal which can form a predominantly stable covalent halide of the formula MX (X = halogen).

(*a*) I (*b*) III

(*c*) IV (*d*) V

Passage for Q.28 to Q.30

When Schrodinger equation is solved for hydrogen atom, the solution gives the possible energy levels the electron can occupy and the corresponding wave functions (Ψ) of the electron associated with each energy level. The quantised energy states and the corresponding wave functions which are characterised by a set of quantum numbers (principal quantum number n, azimuthal quantum number *l*, magnetic quantum number m_l).

28. Principal quantum number n -

(*a*) Can be positive or can be negative

(*b*) Is always positive integer

(*c*) Can be zero

(*d*) Can be fraction

29. Principal quantum number determines -

(*a*) shape of the orbital

(*b*) the size and to large extent the energy of the orbital

(*c*) the spatial orientation of the orbital with respect to standard sets of coordination axis.

(*d*) the spin of electrons

30. The value of n is highest for

(*a*) 4s orbital

(*b*) 6s orbital

(*c*) 4f orbital

(*d*) 3d orbital

Passage for Q.31 to Q.33

Azimuthal quantum number 'ℓ' defines the three dimensional shape of the orbital. For a given value of n, ℓ can have n number of values ranging 0 to n–1. For example, when n = 1, value of ℓ is only zero. For n = 2, the possible value of ℓ can be 0 and 1. For n = 3 the possible values of ℓ are 0,1,2.

31. For $\ell = 4$, number of orbitals will be

(*a*) 5 (*b*) 7

(*c*) 9 (*d*) 11

32. Which orbitals are described by n = 5, $\ell = 3$ and n = 4, $\ell = 0$.

(*a*) 5f, 4p (*b*) 5g, 4d

(*c*) 5d, 4s (*d*) 5f, 4s

33. Value of $(n + \ell) = 5$ is applicable for which orbital

(*a*) 4p (*b*) 3d

(*c*) 4d (*d*) both (*a*) and (*b*)

Passage for Q.34 to Q.36

The diagonal relationship signifies the similarities in properties of the elements of the 2nd period with the respective diagonally opposite 3rd period elements between the succesive groups in the periodic table. Such diagonally opposite pairs are Li and Mg ; Be and Al ; B and Si.

34. Li and Mg resembles in which of the following way.

(*a*) Both Li and Mg reacts with water to give O_2 gas

(*b*) Both Li and Mg-nitride reacts with water to give NH_3 gas

(*c*) Both Li and Mg-nitrate undergo heating to give N_2 gas

(*d*) Both LiOH and $Mg(OH)_2$ are very much water soluble

35. Be and Al properties are similar,. It is supported by which fact

(*a*) Both Be and Al reacts with caustic soda to give berylate and aluminate with molecular formula $NaBeO_2$ and $NaAlO_2$

(*b*) Both Be-carbide and aluminium carbide react with water to give methane gas.

(*c*) Maximum covalency of both Be and Al are 6

(*d*) Maximum covalency of both Be and Al are 4

36. Similarities in the pair B and Si is illustrated by which of the following fact

(*a*) Oxides of boron and silicon both are reduced in electric furnance to give elemental B and Si respectively.

(*b*) Both B and Si forms oxyacid H_3BO_3 and H_4SiO_4 which are monobasic acid

(*c*) Both halides of boron and silicon are reduced by $LiAlH_4$ to produce their corresponding hydrides

(*d*) Maximum valency of boron and silicon are 6

Passage for Q.37 to Q.39

Phosphorous is an element with atomic number 15. It is considered as nonmetal. It forms some oxyacid like H_3PO_2, H_3PO_3, H_3PO_4. It has different allotropes like white phosphorous , red phosphorous, black phosphorous.

37. Total number of orbitals which have $(n+\ell) = 3$ for phosphorous atom

(*a*) 3 (*b*) 4

(*c*) 5 (*d*) 6

38. Total number of electrons which can have $m_l = 0$ for phosphorous atom

(*a*) 3 (*b*) 6

(*c*) 9 (*d*) 12

39. Total number of maximum electrons which can have $s = +^1/_2$ for phosphorous atom

(*a*) 6 (*b*) 9

(*c*) 12 (*d*) 15

Passage for Q.40 to Q.42

Atomic radii increase down a group, within the s and p block, decrease from left to right across a period. The lanthanoide contraction results in a decrease in atomic radius for elements following the f -block. All monoatomic anions are lareger than their parent atoms and all monoatomic cations are smaller.

40. The correct order of increasing atomic radius of the following elements is -

(*a*) S < O < Se < C

(*b*) O < C < Se < S

(*c*) O < C < S < Se

(*d*) C < O < S < Se

41. The order of increasing ionic radius of the following is

(*a*) $K^+ < Li^+ < Mg^{2+} < Al^{3+}$

(*b*) $Mg^{2+} < Al^{3+} < K^+ < Li^+$

(*c*) $Al^{3+} < Li^+ < Mg^{2+} < K^+$

(*d*) $Al^{3+} < Mg^{2+} < Li^+ < K^+$

42. The order of increasing ionic radius of the following is

(*a*) $S^{2-} < F^- < Br^- < Te^{2-}$

(*b*) $F^- < Br^- < Se^{2-} < Te^{2-}$

(*c*) $O^{2-} < Cl^- < I^- < Se^{2-}$

(*d*) $O^{2-} < Se^{2-} < Cl^- < Te^{2-}$

Passage for Q.43 to Q.45

The polarisability of an atom is its ability to be distorted by an electric field. An atom or ion (mostly anion) is highly polarisable if its electron distribution can be distorted readily. A polarisable atom or ion is one with orbitals that lie close in energy, large, heavy atoms and tend to be highly polarisable. On the other hand, species that effectively distorted the electron distribution of an neighbouring atom or cation are described as having polarising ability.

43. The anion which is most polarisable among halide ion is

(*a*) F^- (*b*) Cl^-

(*c*) Br^- (*d*) I^-

44. Correct option -

(*a*) Na^+ has less polarising power than Cs^+

(*b*) Te^{2-} has less polarisability than O^{2-}

(*c*) Ag^+ has more polarising power than K^+

(*d*) Hg^{2+} has less polarising power than Ca^{2+}

45. Which of th following has highest polarisability -

(*a*) F^- (*b*) O^{2-}

(*c*) S^{2-} (*d*) N_3^-

Passage for Q.46 to Q.47

Allred-Rochow equation regarding electronegativity of element is given as follows

$$en = \frac{0.36Z^*}{d} + 0.744$$

d = covalent radius of atom in Å

Z = effective nuclear charge of atom

46. What is the electronegativity of Arsenic atom (having atomic number 33). Given covalent radius of Arsenic = 120 pm

(*a*) 3.2 (*b*) 2.84

(*c*) 2.61 (*d*) 2.32

47. According to this equation -

(*a*) Down the group, electronegativity decreases

(*b*) Across a period, from left to right electronegativity increases

(*c*) Both (*a*) and (*b*) are correct

(*d*) Electronegativity does not depend on covelent radius

Passage for Q.48 to Q.50

Hund's rule suggest that the ground state of an atom should contain maximum number of unpaired electrons (within the same subshell). Also electrons in different orbitals of the same energy will have their spins parallel.

48. Spin multiplicity for np^3 electronic configuration

(*a*) 1 (*b*) 2

(*c*) 3 (*d*) 4

49. Spin multiplicity for nd^5 electronic configuration

(*a*) 4 (*b*) 5

(*c*) 6 (*d*) 7

50. For d^7 ion number of unpaired electron with parallel spin will be

(*a*) 1 (*b*) 2

(*c*) 3 (*d*) 4

Passage for Q.51 to Q.53

The half filled or full filled orbitals are more stable compared to the nearest half filled or full filled orbitals respectively. This enhanced stability for half filled and full filled orbitals will be explained with the help of exchange energy. d^{10} configuration has additional exchange energy which overcomes the disfavour created due to additional pairing.

51. The actual electronic configuration of Pd (atomic number = 46) is -

(*a*) [Kr] $4d^{10}\,5s^0$ (*b*) [Kr] $4d^9\,5s^1$

(*c*) [Kr] $4d^8\,5s^2$ (*d*) [Kr] $4d^{10}\,5s^1$

52. The actual electronic configuration of Ag (atomic number = 47) is -

(*a*) [Kr] $4d^{10}\,5s^0$ (*b*) [Kr] $4d^9\,5s^1$

(*c*) [Kr] $4d^8\,5s^2$ (*d*) [Kr] $4d^{10}\,5s^1$

53. The actual electronic configuration of Gd (atomic number = 64) is -

(*a*) $[Xe]\ 4f^8\ 5d^0\ 6s^2$ (*b*) $[Xe]\ 4f^7\ 5d^1\ 6s^2$

(*c*) $[Xe]\ 4f^7\ 5d^0\ 6s^2$ (*d*) $[Xe]\ 4f^8\ 5d^1\ 6s^1$

Passage for Q.54 to Q.56

Born-Haber cycle is the thermodynamic cycle which determines lattice energy of a compound. The most stable crystal structure of the compound is commonly the structure with the greatest lattice energy under prevailing condition

$$Na(s) + \frac{1}{2}Cl_2(g) \rightarrow NaCl(s) \text{ .....(i)}$$

$$Mg(s) + \frac{1}{2}O_2(g) \rightarrow MgO(s) \text{ .....(ii)}$$

$$Al(s) + \frac{3}{2}F_2(g) \rightarrow AlF_3(s) \text{ .....(iii)}$$

Given : Sublimation energy of sodium = 109 kJ mol^{-1}

Ionisation energy of sodium = 494 kJ mol^{-1}

Enthalpy of formation of NaCl(s) = –414 kJ mol^{-1}

Electrone gain enthalpy of Cl = –347 kJ mol^{-1}

Bond dissociation energy of Cl_2 = 242 kJ mol^{-1}

54. Lattice energy of NaCl(s) -

(*a*) 2560 kJ mol^{-1} (*b*) 791 kJ mol^{-1}

(*c*) 1582 kJ mol^{-1} (*d*) 320 kJ mol^{-1}

55. The correct expression of heat of formation of MgO with other thermodynamical data is

(*a*) $\Delta H_f = S + IE_1 + IE_2 + D - EA_1 - U$

(*b*) $\Delta H_f = S + IE_1 + IE_2 + D - EA_1 - EA_2 - U$

(*c*) $\Delta H_f = S + 2IE_1 + D/2 - 2(EA_1) - U$

(*δ*) $\Delta H_f = S + IE_1 + IE_2 + D/2 - (EA_1) - (EA_2) - U$

56. To prepare AlF_3 form Al(s) and $F_2(g)$, at first $Al^{3+}(g)$ and $F^-(g)$ has to be generated. Correct option

(*a*) For $Al(g) \rightarrow Al^{3+}(g)$ energy required is $3IE_1$

(*b*) For $Al(g) \rightarrow Al^{3+}(g)$ energy required is $IE_1 + IE_2 + IE_3$

(*c*) For $\frac{3}{2}F_2(g) \rightarrow 3F^-(g)$ energy required is $\frac{3D}{2} - 3EA_1$

(*d*) Both (*b*) and (*c*) are correct

Passage for Q.57 to Q.58

The principal quantum number of the outermost shell of M_1, M_2 and M_3 is n = 3. M_1 forms the only oxide $(M_1)_2O$ with oxygen. The oxide on being dissolved in water produces strong alkali. The covalent hydride of M_2 is $(M_2)H_3$ and the formula of highest oxides of M_2 is $(M_2)_2O_5$. The hydride of M_3 is strong acid and on being ionised M_3 produces M_3^- ion.

57. M_2 & M_3 are respectively -

(*a*) N, F

(*b*) P, Cl

(*c*) N, Cl

(*d*) P, F

58. Incorrect option regarding M_1 -

(*a*) M_1 is example of strong reducing element

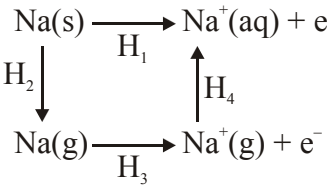
(*b*) M_1 is example of strong oxidising element

(*c*) M_1 is hightly reactive metal

(*d*) Dianion of M_1 does not exist

Passage for Q.59 to Q.60

If we have Born Haber cycle with this equation, then following energies are associated :



59. H_2 and H_3, H_4 refers :-

(*a*) Fusion energy of sodium, ionisation energy of sodium, hydration energy of sodium

(*b*) Vaporisation energy of sodium, electron affinity of sodium, hydration energy of sodium

(*c*) Sublimation energy of sodium, ionisation energy of sodium, hydration energy of sodium

(*d*) Bond dissociation energy of sodium, hydration energy of sodium

60. The expression of H_1 in terms of H_2, H_3, H_4 (with sign) is -

(*a*) $-H_1 = -H_2 - H_3 + H_4$

(*b*) $-H_1 = H_2 + H_3 - H_4$

(*c*) $-H_1 = -H_2 + H_3 - H_4$

(*d*) $-H_1 = H_2 - H_3 + H_4$

Matrix Match Type :

61. Match the column :-

Column - I	**Column - II**
Property	**Ordered**
(*a*) Electronegativity order	(P) N>B
(*b*) Electron affinity order	(Q) Se>Br
(*c*) Ionisation energy order	(R) C>B
(*d*) No. of valance electron	(S) O>S

62. Match the column :-

Column - I	**Column - II**
Electronic configuration	**Value of born exponent**
(*a*) $1s^2$	(P) 10
(*b*) $2s^22p^6$	(Q) 9
(*c*) $3s^23p^6$ or $3s^23p^63d^{10}$	(R) 7
(*d*) $4s^24p^6$ or $4s^24p^64d^{10}$	(S) 5

63. Match the column :-

Column - I	**Column - II**
Compound	**Melting point**
(*a*) $BeCl_2$	(P) 872°C
(*b*) $MgCl_2$	(Q) 772°C
(*c*) $CaCl_2$	(R) 712°C
(*d*) $SrCl_2$	(S) 405°C

64. Match the column :-

Column - I (Order)

(*a*) $Na^{\oplus} < F^{\ominus} < O^{2\ominus} < N^{3\ominus}$

(*b*) $Li^{\oplus} < Na^{\oplus} < K^{\oplus} < Rb^{\oplus} < Cs^{\oplus}$

(*c*) O > S > F > Cl

(*d*) $Cl^{\ominus} < K^{\ominus} < Ca^{2\ominus} < Sc^{3\oplus}$

Column - II (Property)

(P) Electronegativity

(Q) Mobility of hydrated ions

(R) Ionisation energy

(S) Electron affinity

(T) Ionic size

65. Match the column :-

Column - I	**Column - II**
Atomic number	**Feature**
(*a*) 38	(P) s-block element
(*b*) 51	(Q) p-block element
(*c*) 29	(R) d-block element
(*d*) 64	(S) 5th period element
	(T) Rare earth element

66. Match the column :-

Column - I	**Column - II**
Element	**Feature**
(*a*) Hg	(P) Solid at room temperature
(*b*) Mn	(Q) Liquid at room temperature
(*c*) Zn	(R) d-block element
(*d*) W	(S) Transition element
	(T) $(n-1)d^{10}\ ns^2$ or $(n-1)d^5\ ns^2$ configuration

67. Match the column :-

Column - I	**Column - II**
Element	**Feature**
(*a*) Osmium (Os)	(P) Inner transition element
(*b*) Promethium (Pm)	(Q) Transition element
(*c*) Magnesium (Mg)	(R) Highest positive oxidation state
(*d*) Germanium (Ge)	(S) Typical element
	(T) Used as semiconductor

68. Match the column :-

Column - I	**Column - II**
Pair of atoms	**Feature**
(*a*) S,Se	(P) Chalcogen family
(*b*) Cl, Br	(Q) Halogen family
(*c*) N, P	(R) Pnicogen family
(*d*) Be,Al	(S) Diagonal relationship
	(T) Non metals

69. Match the column :-

Column - I	**Column - II**
Order	**Property**
(*a*) As > Se	(P) Atomic number
(*b*) Se < Br	(Q) Atomic radius
(*c*) Mg < Al	(R) Electronegativity
(*d*) K < Mg	(S) Number of valance electrons
	(T) Ist ionisation energy

70. Match the column :-

Column - I	Column - II
Formula of hydride	**Elements**
(*a*) MH_4	(P) Groups 16 elements
(*b*) MH_3	(Q) Groups 15 elements
(*c*) MH_2	(R) Groups 14 elements
(*d*) MH	(S) Groups 13 elements
	(T) Groups 17 elements

71. Notation of IUPAC nomenclature of elements

Column - I	Column - II
Name	**Digit/Abbreviation**
(*a*) nil	(P) 0/n
(*b*) enn	(Q) 9/e
(*c*) sept	(R) 7/s
(*d*) un	(S) 1/u

72. Match the column :-

Column - I	Column - II
C–F bond distance	**Molecule**
(*a*) 139.1 pm	(P) CH_3F
(*b*) 135.8 pm	(Q) CH_2F_2
(*c*) 133.2 pm	(R) CHF_3
(*d*) 132 pm	(S) CF_4

73. Match the column :-

Column - I	Column - II
Molecular formula	**Atomic number**
(*a*) AB_2	(P) Atomic number of A and B are respectively 13 and 53
(*b*) A_3B_2	(Q) Atomic number of A and B are respectively 12 and 07
(*c*) AB_3	(R) Atomic number of A and B are respectively 56 and 09
(*d*) AB_5	(S) Atomic number of A and B are respectively 15 and 17

74. Match the column :-

Column - I	Column - II
Metal	**Metallic Radii (pm)**
(*a*) Rb	(P) 137 pm
(*b*) Ca	(Q) 157 pm
(*c*) Mn	(R) 197 pm
(*d*) Li	(S) 250 pm

75. Match the column :-

Column - I	Column - II
Metal ion	**Ionic radii (symmetric)**
(*a*) Mg^{2+}	(P) 202 pm
(*b*) Li^+	(Q) 179 pm
(*c*) I^-	(R) 102 pm
(*d*) Br^-	(S) 92 pm

76. Match the column :-

Consider chlorine atom for given property

Column - I	Column - II
(*a*) Electronegativity in Pauling Scale	(P) 1.732
(*b*) Spin magnetic moment in BM	(Q) 0
(*c*) Z/e ratio	(R) 3
(*d*) Number of vacant orbital in outermost shell	(S) 1

77. Match the column :-

Column - I	Column - II
Element	**Number of valence electrons**
(*a*) Group 13 elements	(P) 3
(*b*) Group 14 elements	(Q) 4
(*c*) Group 18 elements	(R) 8
(*d*) Group 2 elements	(S) 2

78. Match the column :-

Column - I	Column - II
Order	**Property**
(*a*) $Cl^- < K^+ < Ca^{2+} < Sc^{3+}$	(P) Electronegativity
(*b*) O < S< F <Cl	(Q) Nuclear charge
(*c*) $Li^+ < Na^+ > K^+ < Rb^+ < Cs^+$	(R) Size
(*d*) $Na^+ < F^- < O^{2-} < N^{3-}$	(S) Electron affinity
	(T) Ionisation energy

79. Match the column :-

Column - I	Column - II
(*a*) $Fe^{3+} \rightarrow Fe^{2+}$	(P) Exothermic in nature
(*b*) $Br \rightarrow Br^-$	(Q) Endothermic in nature
(*c*) $H \rightarrow H^-$	(R) Becomes diamagnetic
(*d*) $N_2 \rightarrow N$	(S) μ undergoes a change
	(T) Becomes paramagnetic

80. Match the column :-

Column - I	Column - II
(*a*) MnO	(P) Aqueous solution is basic in nature
(*b*) Mn_2O_7	(Q) Aqueous solution is acidic in nature
(*c*) Al_2O_3	(R) Amphoteric in nature
(*d*) ZnO	(S) Highest oxidation state
	(T) Transition metal oxide

81. Match the column :-

Column - I	Column - II
Element	**Atomic radius (pm)**
(*a*) Be	(P) 88
(*b*) C	(Q) 80
(*c*) O	(R) 77
(*d*) B	(S) 66

82. Match the column :-

Column - I	Column - II
Electronic configuration	**Electron gain enthalpy / kJ mol^{-1}**
(*a*) $1s^2\ 2s^2\ sp^6$	(P) –53
(*b*) $1s^2\ 2s^2\ 2p^6\ 3s^1$	(Q) –328
(*c*) $1s^2\ 2s^2\ 2p^5$	(R) –141
(*d*) $1s^2\ 2s^2\ 2p^4$	(S) +48

83. Match the column :-

Column - I	Column - II		
Element	ΔH_1	ΔH_2	$\Delta_{eg}H$
(*a*) Most reactive non metal	(P) 419	3051	–48
(*b*) Most reactive metal	(Q) 1681	3374	–328
(*c*) Least reactive element	(R) 738	1451	–328
(*d*) Metal forming binary halide	(S) 2372	5251	+48

84. Match the column :-

Column - I	Column - II
Electrons	**Z effective**
(*a*) 4d electron in Pd	(P) 6.85
(*b*) 3d electron in Ni	(Q) 3.9
(*c*) 3p electron in Ca	(R) 8.75
(*d*) 2s electron in N	(S) 7.55

85. Match the column :-

Column - I	Column - II
Orbital	**Number of nodal plane**
(*a*) p_y orbital	(P) Two nodal plane present in xy and yz plane
(*b*) d_{zx} orbital	(Q) One nodal plane present in xz plane
(*c*) d_{z^2} orbital	(R) Zero nodal plane present but two nodal cones are present
(*d*) s orbital	(S) Zero nodal plane is present.

86. Match the column :-

Column - I	Column - II
Overlap of orbitals	**Bond formation**
(*a*) $p_x + d_{xz}$ (z axis is internuclear axis)	(P) σ bond is formed
(*b*) $p_x + d_{x^2-y^2}$ (x axis is internuclear axis)	(Q) π bond is formed
(*c*) $d_{z^2} + d_{z^2}$ (z axis is internuclear axis)	(R) No bond is formed
(*d*) $p_x + d_{xy}$ (z axis is internuclear axis)	(S) Head on overlap
	(T) Side way overlap

87. Match the column :-

Column - I	Column - II
Oxidation state of sulphur	**Compound**
(*a*) Zero	(P) Dimethyl sulphoxide
(*b*) +6	(Q) Sulphuryl chloride
(*c*) +4	(R) Sulphonyl chloride
(*d*) –2	(S) Sodium sulphide
	(T) Sulphuric acid

88. Match the column :-

Column - I	Column - II
Shell	**Number of electrons in subshell or shell**
(*a*) K	(P) 2 electrons in s subshell
(*b*) L	(Q) 6 electrons in p subshell
(*c*) M	(R) 10 electrons in d subshell
(*d*) N	(S) 14 electrons in f subshell
	(T) Even number of electron in each shell

89. Match the column :-

Column - I	Column - II
Type of elements	**Elements**
(*a*) Typical elements	(P) Aluminium
(*b*) Eka-boron	(Q) Gallium
(*c*) Eka-silicon	(R) Scandium
(*d*) Eka-aluminium	(S) Germenium
	(T) Chlorine

90. Match the column :-

Column - I	Column - II
Period	**Number and types orbitals involved / No. of elements**
(*a*) 3rd	(P) s,p,d,f all orbitals involved
(*b*) 4th	(Q) 9, 18
(*c*) 6th	(R) 4, 8
(*d*) 7th	(S) 16, 32

91. Match the column :-

Column - I	Column - II
Elements	**Features**
(*a*) Chromium (At. No. 24)	(P) half filled d-orbitals
(*b*) Rhodium (At. No. 45)	(Q) full filled d-orbitals
(*c*) Platinum (At. No. 78)	(R) one electron present in ns orbitals
(*d*) Molybdenum (At. No. 42)	(S) eight electrons present in (n–1) d orbitals
	(T) nine electrons present in (n–1) d orbitals

92. Match the column :-

Column - I (Symbol Name)

(*a*) Unniltrium

(*b*) Ununqnadium

(*c*) F > O > N

(*d*) $F_2 > O_2 > N_2$

Column - II (Atomic number)

(P) 117

(Q) 108

(R) 103

(S) 114

93. Match the column :-

Column - I	Column - II
Oxide	**Nature of oxide**
(*a*) Cs_2O	(P) Acidic oxide
(*b*) Cl_2O_7	(Q) Basic oxide
(*c*) BeO	(R) Amphoteric oxide
(*d*) CO	(S) Neutral oxide

94. Match the column :-

Column - I	Column - II
Type of elements	**Example/Features**
(*a*) Inert gases	(P) He, Ne, Ar, Kr, Xe
(*b*) Representative elements	(Q) II-A to VII-A elements
(*c*) Transition elements	(R) Incomplete d-shell either in ground state or in most stable valency state
(*d*) Inner transition elements	(S) The last electron goes to the f-orbital of antepenultimate shell either in ground state or in any common oxidation state

95. Match the column :-

Column - I	Column - II
Elements	**Feature**
(*a*) Sc	(P) Not considered as transition elements
(*b*) Ti	(Q) Highest covalent radii
(*c*) Ni	(R) Least covalent radii
(*d*) Zn	(S) Odd number of unpaired d electrons
	(T) Even number of unpaired d electrons (excluding zero)

96. Match the column :-

Column - I	Column - II
Elements	**Feature**
(*a*) Na	(P) Transition element
(*b*) Ag	(Q) Member of the 4th peirod
(*c*) Co	(R) Behaves as metal
(*d*) Br	(S) Behaves as non metal
	(T) One unpaired electron

97. Match the column :-

Column - I (Pair of elements)

(*a*) Mg, Cl

(*b*) Se, Te

(*c*) V, Cd

(*d*) B, Si

Column - II (Feature)

(P) Same group

(Q) Diagonal relationship

(R) Same period

(S) Same block elements

(T) Both element in pair have atomic number less than 50

98. Match the column :-

Column - I	**Column - II**
Compounds	**Feature**
(*a*) Magnesium oxide	(P) $ns\,np^6$ configuration for both cation and anion
(*b*) Potassium chloride	(Q) Isoelectronic cation and anion
(*c*) Sodium fluoride	(R) Cation and anion have +1 and –1 oxiation state respectively
(*d*) Barium sulphide	(S) Cation and anion have 2 and –2 oxidation state respectively
	(T) Largest internuclear distance

99. Match the column :-

Column - I

Element

(*a*) Gadolinium

(*b*) Potasssium

(*c*) Chromium

(*d*) Gallium

Column - II

Fullfilled orbital	**Half filled orbital**
(P) 1s, 2s, 2p, 3s, 3p, 3d, 4s	4p
(Q) 1s, 2s, 2p, 3s, 3p,	3d, 4s
(R) 1s, 2s, 2p, 3s, 3p	4s
(S) 1s, 2s, 2p, 3s, 3p, 3d, 4s, 4p, 4d, 5s, 5p, 6s	4f

100. Match the column :-

Column - I	**Column - II**
Reactions	**Nature of reactions**
(*a*) $O(g) \rightarrow O^{2-}(g)$	(P) Endothermic process
(*b*) $O^{-}(g) \rightarrow O^{2-}(g)$	(Q) Exothermic process
(*c*) $O(g) \rightarrow O^{-1}(g)$	(R) I^{st} electron gain enthalpy of oxygen
(*d*) $O^{+1}(g) \rightarrow O^{2+}(g)$	(S) II^{nd} ionisation energy of oxygen
	(T) II^{nd} electron gain enthalpy ofoxygen

EXERCISE # IV

❑ **Integer Type :**

1. Number of elements present in group-17.

2. Number of elements present in group-18.

3. An element (M) has atomic number, A M^{2-} has electronic configuration resembles with inert gas configuration. That element belongs to 2^{nd} period. What is the atomic number of A.

4. An element has electronic configuration $[Kr]4d^7 5s^2$. On the basis of this electronic configuration, find out the group number of elements according to modern periodic table :-

5. Number of unpaired electron present in 4p orbital of arsenic atom.

6. Ionisation potential of Be^{x+} is found to be 217.6 electron volt. What is the value of x -

7. How many hydroxides are basic in nature ?

CsOH ; $Se(OH)_2$; IOH ; ClOH ; $Sr(OH)_2$; $P(OH)_3$

8. On the Pauling electronegativity scale, what is the atomic number of the element next to fluorine atom.

9. Find out electronegativity of chlorine atom on Pauling scale if ionisation energy of Cl^- is 4 eV and electron affinity of Cl^+ is 13 eV.

10. In the periodic table, if there are 10 periods, then what is the number of maximum elements present in 10^{th} period.

11. During formation of NaCl, from Na(s) and $Cl_2(g)$, how many steps are endothermic

(*a*) $Na(s) \rightarrow Na(g)$

(*b*) $\frac{1}{2}Cl_2(g) \rightarrow Cl(g)$

(*c*) $Na(g) - e^- \rightarrow Na^+(g)$

(*d*) $Cl(g) + e^- \rightarrow Cl^-(g)$

(*d*) $Na^+(g) + Cl^-(g) \rightarrow NaCl(s)$

12. Total number of gaseous molecules

He ; N_2 ; O_2 ; Cl_2; F_2 ; H_2; Xe ; Kr ; Ar

13. How many columns are present in p block elements ?

14. If columns are present in d block elements is p, then find out p–1

15. Find the number of elements which has higher EA_2 than EA_1

P; N ; C ; Se ; Br ; Na ; Be ; Mg ; O ; B

16. Count the number of properties which have higher values for nitrogen atom as compared to phosphorus atom (magnitude) :-

(i) electronegativity

(ii) electron affinity

(iii) ionisation potential

(iv) covalent radius

(v) proton electron ratio

17. Oxidation state of nitrogen is positive integer for how many of the following compounds :

(*a*) Hydrazoic acid

(*b*) Magnesium nitride

(*c*) Ammonium chloride

(*d*) Hydrazine

(e) Laughing gas

(f) Nitrosyl chloride

18. Find out lattice energy of KI

Given : Sublimation energy of $I_2 = 14$ kcals mol^{-1}

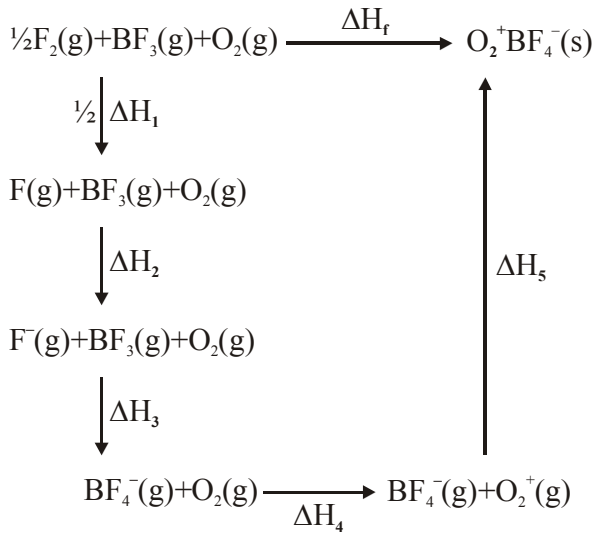
Sublimation energy of $K = 20$ kcals mol^{-1}

IE_1 of $K = 92$ kcals mol^{-1}

Dissociation energy of $I_2 = 28$ kcals mol^{-1}

Electron affinity of $I_2 = -70$ kcals mol^{-1}

19.



How many statements are correct :

(*a*) ΔH_1 corresponds to bond dissociation energy of F_2.

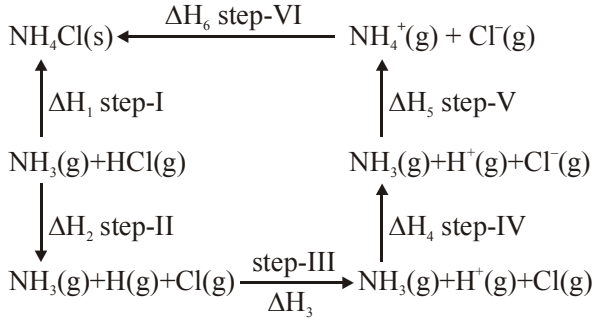
(*b*) ΔH_2 corresponds to electron affinity of F.

(*c*) ΔH_3 corresponds to electron affinity of BF_3.

(*d*) ΔH_4 corresponds to ionisation energy of O_2.

(e) ΔH_5 corresponds to lattice energy of $O_2^+BF_4^-$.

20.



How many statements are correct :

(*a*) ΔH_1 corresponds to heat of formation of NH_4Cl.

(*b*) ΔH_2 corresponds to bond dissociation energy of HCl.

(*c*) ΔH_3 corresponds to ionisation energy of H(g)

(*d*) ΔH_4 corresponds to electron gain enthalpy of Cl(g)

(e) ΔH_5 corresponds to proton affinity of NH_3

(f) ΔH_6 corresponds to lattice energy of NH_4Cl.

(g) Step II and Step III are endothermic process.

(h) Step IV and Step V are exothermic process.

(i) Step I is exothermic process

(j) Step VI is exothermic process.

21. Find the total number of cations for which I.P. of carbon is lower than the corresponding atom.

(*a*) Na^+ (*b*) Mg^+

(*c*) Sn^{4+} (*d*) Fe^{2+}

(*e*) Cl^+ (*f*) S^+

22. Find out the total number of acidic compound.

(*a*) $ClO_2(OH)$

(*b*) $BrO_3(OH)$

(*c*) $Sr(OH)_2$

(*d*) $NO_2(OH)$

(*e*) $Mg(OH)_2$ (f) $PO(OH)_3$

(*g*) $SO_2(OH)_2$

23. How many electrons satisfy n = 3, l = 2, s = +½

24. Calculate Zeff. of valence electron of Gd (atomic number 64)

25. Ionisation enthalpies of elements of second period are given below. (in Kcals $mole^{-1}$) [not in sequence]

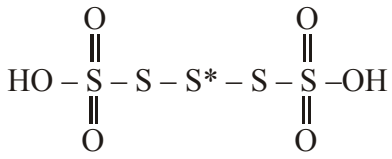
2080 ; 1086 ; 899 ; 1314 ; 801 ; 520 ; 1402 ; 1681

If the atomic number of element with ionisation energy 1314 Kcal $mole^{-1}$ is x.

If the atomic number of element with ionisation enthalpy 1080 Kcal moles is y.

Then find out x - y :

26.



What is the oxidation state of S* :

27. How many statements are correct ?

(*a*) Na^+ has higher value of ionisation enthalpy than Ne change both have same electronic configuration.

(*b*) Ist ionisation energy of nitrogen is higher than oxygen and opposite for 2nd ionisation energy.

(*c*) Electrons gain enthalpy of oxygen less negative than selenium.

(*d*) As and Sb are example of metalloid.

(*e*) d block elements generally exhibit variable valency.

(*f*) Mercury and Bromine are liquids at room temperature.

(*g*) Screening effect is not observed in He^{+1}, Li^{+2}, Be^{3+} ion.

(*h*) Oxidation state of S in S_2Cl_2 is +1.

28. Find out number of electrons lost by Cr atom to produce an isoelectronic ion of S^{2-} ion.

29. Number of electrons in Na (atomic number = 11) having m = 0.

30. Number of electrons in S (atomic number = 16) having $(n+\ell) = 3$.

31. Number of lanthanoids in Modern periodic table.

32. The maximum number of electrons in phosphorous atom for which $n + \ell + m = 3$.

33. Find out maximum number of electrons in Cr atom for which $\ell + m = 0$.

34. Electrons of one subshell do not participate in bonding due to inert pair effect. Find out $(n+\ell)$ for that subshell.

35. For one element shielding effect is not possible. What is the atomic number of that element ?

36. According to Long form of modern periodic table, chalcogens are elements of group number x. Find the value of x.

37. The elements which exhibit both vertical and horizontal similarities are called transition elements. What is the atomic number of the Ist element of transition elements.

38. An element has spin magnetic moment equal to 1.73 B.M.. It has atomic number in between 22 to 30. Find out atomic number of element which is just after it along a period in the modern periodic table.

39. How many compouds having higher melting point than TiC.

NaF, BeO, MgO, CaO, BaO, CsCl

40. How many elements have $3d^7$ electronic configuration in M^{+3} state. (Ti to Ni)

Co, Fe, Ni, Mn, Cu, Zn

41. How many ions are diamagnetic.

Sc^{3+}, Ti^{3+}, Ti^{2+}, V^{2+}, Cr^{3+}, Mn^{2+}, Fe^{2+}, Cu^{2+}, Co^{2+}, Zn^{2+}

42. Number of 3d block elements which can have +4 oxidation state.

43.

	Internuclear axis		
	x	y	z
P_x+P_x			
P_z+P_z			
P_z+P_z			

Number of overlap give σ bond = x.

Number of overlap giving π bond = y.

Find out x + y.

44. Total numbe of ions present in solution when TlI_3 dissociated with ions completely.

45. How many overlaps give σ bond. (If inter nuclear axis is x axis).

(i) s + s (v) $p_x + p_y$

(ii) $s + p_x$ (vi) $p_x + p_x$

(iii) $s + p_y$ (vii) $p_x + p_z$

(iv) $s + p_z$ (viii) $p_y + p_y$

46.

	Internuclear axis		
	x	y	z
$d_{xy}+d_{xy}$			
$d_{xz}+d_{xz}$			
$d_{x^2-y^2}+d_{x^2-y^2}$			
$d_{z^2}+d_{z^2}$			

Find out total how many overlaps give π bond.

47.

	Internuclear axis		
	x	y	z
$d_{xy}+d_{xy}$			
$d_{xz}+d_{xz}$			
$d_{x^2-y^2}+d_{x^2-y^2}$			
$d_{z^2}+d_{z^2}$			

Find out number of overlaps which give δ bond.

48. If number of pentagon and number of hexagon in fullerene C_{60} is x and y then find out y – x

49. How many of the following statements related to the modern periodic table is incorrect ?

(i) The p-block has 6 columns, because a maximum of 6 electrons can occupy all the orbitals in a p-shell.

(ii) The d-block has 8 columns, because a maximum of 8 electrons can occupy all the orbitals in a d-subshell.

(iii) Each block contains a number of columns equal to the number of electrons that can occupy that subshell.

(iv) The block indicates value of azimuthal quantum number (*l*) for the last subshell that received electrons in building up the electronic configuration.

(v) An element with mass number 37 possesses one unit of negative charge. If the ion contains 11.1% more neutrons than the electrons, then the symbol of ion is $^{37}_{17}Cl^{-1}$

(vi) An element with mass number 81 contains 31.7% more neutrons as compared to proton the atomic symbol of the element is $^{81}_{35}Br$.

50. If the number of electrons in the species H_2^+, H_2 and O_2^+ are x,y,z respectively then find out $\frac{z}{x+y}$.

EXERCISE # V (JEE- MAIN & ADVANCED)

1. The correct order of second ionisation potentital of carbon, nitrogen, oxygen and fluorine is : **[IIT-JEE, 1981]**

(*a*) C > N > O > F (*b*) O > N > F > C

(*c*) O > F > N > C (*d*) F > O > N > C

2. The element with the highest first ionization potential is : **[IIT-JEE, 1982]**

(*a*) boron (*b*) carbon

(*c*) nitrogen (*d*) oxygen

3. The first ionization potentials (in electron volts) of nitrogen and oxygen atoms are, respectively, given by : **[IIT-JEE, 1987]**

(*a*) 14.5, 13.6 (*b*) 13.6, 14.6

(*c*) 13.6, 13.6 (*d*) 14.6, 14.6

4. Atomic radii of fluorine and neon (in Angstron units) are, respectively given by : **[IIT-JEE, 1987]**

(*a*) 0.72, 1.60 (*b*) 1.60, 1.60

(*c*) 0.72, 0.72 (*d*) None of these

5. The electronegativity of the following elements increases in the order : **[IIT-JEE, 1987]**

(*a*) C, N, Si, P (*b*) N, Si, C, P

(*c*) Si, P, C, N (*d*) P, Si, N, C

6. The first ionization potentials of Na, Mg, Al and Si are in the order : **[IIT-JEE, 1988]**

(*a*) Na < Mg < Al < Si (*b*) Na > Mg > Al > Si

(*c*) Na < Mg < Al > Si (*d*) Na > Mg > Al < Si

7. Which of the following is smallest is size : **[IIT-JEE, 1988]**

(*a*) N^{3-} (*b*) O^{2-}

(*c*) F^- (*d*) Na^+

8. Among the following elements (whose electronic configurations are given below) , the one having the highest ionization energy : **[IIT-JEE, 1990]**

(*a*) $[Ne]3s^23p^1$ (*b*) $[Ne]3s^23p^3$

(*c*) $[Ne]3s^23p^2$ (*d*) $[Ne]3d^{10}4s^24p^1$

9. Which of the following statements is not correct for the periodic classification of elements ? **[IIT-JEE, 1992]**

(*a*) The properties of elements are the periodic functions of their atomic numbers.

(*b*) Non-metallic elements are lesser in number than metallic elements

(*c*) The first ionisation energies of elements along a period do not vary in a regular manner with increase in atomic number.

(*d*) For transition elements, the d-subshells are filled with electrons monotonically with increase in atomic number.

10. Which of the following has the most stable +2 oxidation state ? **[IIT-JEE, 1995]**

(*a*) Sn

(*b*) Pb

(*c*) Fe

(*d*) Ag

11. Which of the following has the maximum number of unpaired electrons : **[IIT-JEE, 1996]**

(*a*) Mg^{2+} (*b*) Ti^{3+}

(*c*) V^{3+} (*d*) Fe^{2+}

12. Which of the following statements is wrong ? **[IIT-JEE, 1997]**

(*a*) The first ionisation potential of Al is less than the first ionization potential of Mg.

(*b*) The second ionisation potential of Mg is greater than the second ionization potential of Na.

(*c*) The first ionisation potential of Na is less than the first ionization potential of Mg.

(*d*) The third ionisation potential of Mg is greater than the third ionization potential of Mg.

13. The correct order of acidic strength is :

(*a*) $Cl_2O_7 > SO_2 > P_4O_{10}$ **[IIT-JEE, 2000]**

(*b*) $CO_2 > N_2O_5 > SO_3$

(*c*) $Na_2O > MgO > Al_2O_3$

(*d*) $K_2O > CaO > MgO$

14. The correct order of radii is : **[IIT-JEE, 200]**

(*a*) N < Be < B

(*b*) $F^- < O^{2-} < N^{3-}$

(*c*) Na < Li < K

(*d*) $Fe^{3+} < Fe^{2+} < Fe^{4+}$

15. The incorrect statements among the following is : **[JEE, 1997]**

(*a*) The first ionisation energy of Al is less than first ionization energy of Mg

(*b*) The second ionisation energy of Mg is greater than second ionization energy of Na.

(*c*) The first ionisation energy of Na is less than first ionization energy of Mg.

(*d*) The third ionisation energy of Mg is greater than third ionization energy of Al.

16. Property of the alkaline earth metals that increases with their atomic number is : **[JEE, 2000]**

(*a*) ionisation energy

(*b*) solubility of their hydroxides

(*c*) solubility of their sulphates

(*d*) electronegativity

17. Arrange the following ions in order of their increasing size : Li^+, Mg^{2+}, K^+, Al^{3+}: **[JEE, 1997]**

18. Compounds that formally contain Pb^{4+} are easily reduced to Pb^{2+}. The stability of the lower oxidation state is due to ..... **[JEE, 1997]**

19. Asseration : F atom has a less negative electron affinity than Cl atom. **[JEE, 1998]**

Reason : Additional electron are repelled more effectively by 3p electrons in Cl atom than by 2p electrons in F atom.

(*a*) Both Asseration and Reason are true, and Reason is the correct explanation of Asseration.

(*b*) Both Asseration and Reason are true, and Reason is not correct explanation of Asseration.

(*c*) Asseration is true but Reason is false.

(*d*) Asseration is fasle but Reason is true.

20. Ionic radii of : **[JEE, 1999]**

(*a*) $Ti^{4+} < Mn^{7+}$

(*b*) $^{35}Cl^- < ^{37}Cl^-$

(*c*) $K^+ > Cl^-$

(*d*) $P^{3+} > P^{5+}$

21. Give reason for the following in one or two sentences only : **[JEE 1999]**

CrO_3 is an acid anhydride.

22. Asseration : The first ionization energy of Be is greater than that of B. **[JEE, 2000]**

Reason : 2p orbital is lower in energy than 2s.

(*a*) Both Asseration and Reason are true, and Reason is the correct explanation of Asseration.

(*b*) Both Asseration and Reason are true, and Reason is not correct explanation of Asseration.

(*c*) Asseration is true but Reason is false.

(*d*) Asseration is fasle but Reason is true.

23. The set representing the correct order of fist ionization potential is **[JEE, 2001]**

(*a*) K > Na > Li

(*b*) Be > Mg > Ca

(*c*) B > C > N

(*d*) Ge > Si > C

24. The set with correct order of acidity is : **[JEE, 2001]**

(*a*) $HClO < HClO_2 < HClO_3 < HClO_4$

(*b*) $HClO_4 < HClO_3 < HClO_2 < HClO$

(*c*) $HClO < HClO_4 < HClO_3 < HClO_2$

(*d*) $HClO_4 < HClO_2 < HClO_3 < HClO$

25. Identify the correct order of acidity strengths of CO_2, CuO, CaO, H_2O : **[JEE, 2002]**

(*a*) $CaO < CuO < H_2O < CO_2$

(*b*) $H_2O < CuO < CaO < CO_2$

(*c*) $CaO < H_2O < CuO < CO_2$

(*d*) $H_2O < CO_2 < CaO < CuO$

26. Identify the least stable ion amongst the following :

(*a*) Li^- **[JEE, 2002]**

(*b*) Be^-

(*c*) B^-

(*d*) C^-

27. Arrange the following oxides in the increasing order of Bronsted basicity : **[JEE, 2004]**

Cl_2O_7 , BaO , SO_3 , CO_2 , B_2O_3

28. Asseration : Pb^{4+} compounds are stronger oxidizing agents than Sn^{4+} compounds. **[JEE, 2008]**

Reason : The higher oxidation states for the group 14 elements are more stable for the heavier members of the group due to inert part effect.

(*a*) Both Asseration and Reason are true, and Reason is the correct explanation of Asseration.

(*b*) Both Asseration and Reason are true, and Reason is not correct explanation of Asseration.

(*c*) Asseration is true but Reason is false.

(*d*) Asseration is fasle but Reason is true.

29. Which one of the following ions has the highest value of ionic radius - **[AIEEE, 2004]**

(*a*) Li^+

(*b*) B^{3+}

(*c*) O^{2-}

(*d*) F^-

30. The formation of theoxide ion $O^{2-}(g)$ requires first an exothermic and then an endothermic step as shown below : **[AIEEE, 2004]**

$O(g) + e^- = O^-(g)$; $\Delta H° = -142$ kJmol^{-1}

$O^-(g) + e^- = O^{2-}(g)$; $\Delta H° = 844$ kJmol^{-1}

This is because -

(*a*) oxygen is more electronegative

(*b*) oxygen has high electron affinity

(*c*) O^- ion will tend to resist the addition of another electrons

(*d*) O^- ion has comparatively larger size than oxygen atom

31. Among Al_2O_3, SiO_2, P_2O_3 and SO_2 the correct order of acid strength is: **[AIEEE, 2004]**

(*a*) $SO_2 < P_2O_3 < SIO_2 < Al_2O_3$

(*b*) $SiO_2 < SO_2 < Al_2O_3 < P_2O_3$

(*c*) $Al_2O_3 < SiO_2 < SO_2 < P_2O_3$

(*d*) $P_2O_3 < SiO_2 < Al_2O_3 < SO_2$

32. Which of the following oxides is amphoteric in nature :: **[AIEEE, 2005]**

(*a*) CaO (*b*) CO_2

(*c*) SiO_2 (*d*) SnO_2

33. In which of the following arrangements the order is NOT according to the property indicated against it ? **[AIEEE, 2005]**

(*a*) $Al^{3+} < Mg^{2+} < Na^+ < F^-$ - increasing ionic size

(*b*) B < C < N < O - increasing first ionisation enthalpy

(*c*) I < Br < F < Cl - increasing electron gain enthalpy (with negative size)

(*d*) Li < Na < K < Rb - increasing metallic radius

34. Which of the following factors may be regarded as the main cause of lanthanide contraction : **[AIEEE, 2005]**

(*a*) greater shielding of 5d-electrons by 4f-electrons

(*b*) poorer shielding of 5d-electrons by 4f-electrons

(*c*) effective shielding of one of 4f-electrons by another in the sub-shell

(*d*) poor shielding of one of 4f-electrons by another in the sub-shell

35. The lanthanide contraction is responsible for the fact that : **[AIEEE 2005]**

(*a*) Zr and Y have about the same radius

(*b*) Zr and Nb have similar oxidation state

(*c*) Zr and Hf have about the same radius

(*d*) Zr and Zn have similar oxidation state

36. The increasing order of the first ionization enthalpies of the elements B, P, S and F (lowest first) is : **[AIEEE 2006]**

(*a*) F < S < P < B (*b*) P < S < B < F

(*c*) B < P < S < F (*d*) B < S < P < F

37. Which of the following statements is true ? **[AIEEE 2006]**

(*a*) H_3PO_4 is a stronger acid than H_2SO_3

(*b*) In aqueous medium, HF is stronger acid than HCl

(*c*) $HClO_4$ is a weaker acid than $HClO_3$

(*d*) HNO_3 is a stronger acid than HNO_2

38. Lanthanoid contraction is caused due to : **[AIEEE, 2007]**

(*a*) the appreciable shielding on outher electrons by 4f electrons from the nuclear charge

(*b*) the appreciable shielding on outher electrons by 5f electrons from the nuclear charge

(*c*) the same effecitive nuclear charge from Ce to Lu

(*d*) the imperfect shielding on outer electrons by 4f electrons from the nuclear charge

39. The stability of dihalides of Si, Ge, Sn and Pb increases steadily in the sequence : **[AIEEE, 2007]**

(*a*) $SiX_2 << GeX_2 << SnX_2 << PbX_2$

(*b*) $PbX_2 << SnX_2 << GeX_2 << SiX_2$

(*c*) $GeX_2 << SiX_2 << SnX_2 << PbX_2$

(*d*) $SiX_2 << GeX_2 << PbX_2 << SnX_2$

40. The set representing the correct order of ionic radius is: **[AIEEE, 2009]**

(*a*) $Na^+ > Li^+ > Mg^{2+} > Be^{2+}$

(*b*) $Li^+ > Na^+ > Mg^{2+} > Be^{2+}$

(*c*) $Mg^{2+} > Be^{2+} > Li^+ > Na^+$

(*d*) $Li^+ > Be^{2+} > Na^+ > Mg^{2+}$

41. In which of the following arrangements , the sequence is not strictly according to the property written against it ? **[AIEEE, 2009]**

(*a*) HF < HCl < HBr < HI : increasing acid strength

(*b*) $NH_3 < PH_3 < AsH_3 < SbH_3$: increasing basic strength

(*c*) B < C < O < N : increasing first ionization enthalpy

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

42. The correct sequence which shows decreasing order of the ionic radii of the elements is : **[AIEEE, 2010]**

(*a*) $Al^{3+} > Mg^{2+} > Na^+ > F^- > O^{2-}$

(*b*) $Na^+ > Mg^{2+} > Al^{3+} > O^{2-} > F^-$

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

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

43. The outer electron configuration of Gd (atomic number 64) is: **[AIEEE, 2011]**

(*a*) $4f^3 5d^5 6s^2$

(*b*) $4f^8 5d^{10} 6s^2$

(*c*) $4f^4 5d^5 6s^2$

(*d*) $4f^7 5d^1 6s^2$

44. Which of the following orders present the correct sequence of the increasing basic nature of the given oxides ? **[AIEEE 2011]**

(*a*) $Al_2O_3 < MgO < Na_2O < K_2O$

(*b*) $MgO < K_2O < Al_2O_3 < Na_2O$

(*c*) $Na_2O < K_2O < MgO < Al_2O_3$

(*d*) $K_2O < Na_2O < Al_2O_3 < MgO$

45. The correct order of electron gain enthalpy with negative sign of F, Cl, Br and I having atomic number 9, 17, 35 and 53 respectively as : **[AIEEE, 2012]**

(*a*) F > Cl > Br > I

(*b*) Cl > F > Br > I

(*c*) Br > Cl > I > F

(*d*) I > Br > Cl > F

46. The increasing order of the ionic radii of the given isoelectronic species is - **[AIEEE, 2012]**

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

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

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

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

47. Which of the following represent the correct order of increasing first ionization enthalpy for Ca, Ba, S, Se and Ar ? **[AIEEE, 2013]**

(*a*) Ca < S < Ba < Se < Ar

(*b*) S < Se < Ca < Ba < Ar

(*c*) Ba < Ca < Se < S < Ar

(*d*) Ca < Ba < S < Se < Ar

48. The first ionization potential of Na is 5.1 eV. The value of electron gain enthalpy of Na^+ will be: **[AIEEE, 2014]**

(*a*) –2.55 eV

(*b*) –5.1 eV

(*c*) –10.2 eV

(*d*) +2.55 eV

49. Among the followng oxoacids, the correct decreasing order of acid stength is: **[AIEEE, 2014]**

(*a*) $HClO_4 > HClO_3 > HClO_2 > HOCl$

(*b*) $HClO_2 > HClO_4 > HClO_3 > HOCl$

(*c*) $HOCl > HClO_2 > HClO_3 > HClO_4$

(*d*) $HClO_4 > HOCl > HClO_2 > HClO_3$

50. In the long form of the periodic table, the valence shell electronic configuration of $5s^2 5p^4$ corresponds to the element present in : **[AIEEE, 2015]**

(*a*) Group 16 and period 5

(*b*) Group 17 and period 6

(*c*) Group 17 and period 5

(*d*) Group 16 and period 6

51. In an atom, the total number of electrons having quantum numbers n = 4, $|m_l| = 1$ and $m_s = -½$ is : **[AIEEE, 2014]**

■■