Ordinary Thinking

Objective Questions

Extended or long form of periodic table

1. Which of the following statement is not correct for the element having electronic configuration $1s^2, 2s^2p^6, 3s^1$

(a) It is a monovalent electropositive
(b) It forms basic oxide
(c) It is a non-metal
(d) It has low electron affinity

2. Which of these dose not reflect the periodicity of the elements **[UPSEAT 2001; BIT 1990; MP PMT 2001]**

(a) Bonding behaviour (b) Electronegativity
(c) Ionization energy (d) Neutron/proton ratio

3. If an atom has electronic configuration $1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^3\,4s^2$, it will be placed in **[CBSE PMT 2002]**

(a) Second group (b) Third group
(c) Fifth group (d) Sixth group

4. All the *s*–block elements of the periodic table are placed in the groups ... **[Orissa JEE 2002]**

(a) I*A* and II*A* (b) III*A* and IV*A*
(c) *B* sub groups (d) V*A* to VII*A*

5. The electronic configuration of halogen is **[MP PET/PMT 1998; Pb. PMT 2001]**

(a) ns^2np^6 (b) ns^2np^3
(c) ns^2np^5 (d) ns^2

6. Hydrogen by donating one electron forms H^+. In this property, it resembles with

(a) Transitional metals (b) Alkaline earth metals
(c) Alkali metals (d) Halogens

7. The tenth elements in the periodic table resembles with the **[CPMT 1988]**

(a) First period (b) Second period
(c) Fourth group (d) Ninth group

8. The element with quantum numbers $n = 2, l = 1, m = 1, s = -1/2$ has the following position in the periodic table

(a) Group VII-A, period II (b) Group 0, period II
(c) Group VII-A, period III (d)Group 0, period III

9. Who developed the long form of periodic table **[MP PET 1997]**

(a) Lothar Meyer (b) Niels Bohr
(c) Mendeleef (d) Moseley

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

(a) 33 (b) 34
(c) 31 (d) 49

11. In the periodic table, the element with atomic number 16 will be placed in the group **[MP PET/PMT 1998]**

(a) Third (b) Fourth
(c) Fifth (d) Sixth

12. The first element of rare–earth metals is **[AFMC 1992]**

(a) Cerium (b) Actinium
(c) Uranium (d) Lanthanum

13. The *d* -block elements consists mostly of **[MP PMT 1994]**

(a) Monovalent metals
(b) All non-metals
(c) Elements which generally form stoichiometric metal oxide
(d) Many metals with catalytic properties

14. "*The 6 properties of the elements are periodic function of their atomic numbers*." The statement was given by **[MNR 1995]**

(a) N. Bohr (b) J.W. Dobereiner
(c) D.I. Mendeleef (d) H.G.J. Moseley

15. The long form of periodic table has **[CPMT 1986; KCET 1998]**

(a) Eight horizontal rows and seven vertical columns
(b) Seven horizontal rows and eighteen vertical columns
(c) Seven horizontal rows and seven vertical columns
(d) Eight horizontal rows and eight vertical columns

16. The telluric helix was given by **[AFMC 1990]**

(a) De Chan Courtois (b) Newlands
(c) L. Meyer (d) Mendeleef

17. Which one of the following belongs to representative group of elements in the periodic table **[Kurukshetra CEE 1991]**

(a) Lanthanum (b) Argon
(c) Chromium (d) Aluminium

18. An element of atomic number 29 belongs to **[CPMT 1991; Kurukshetra CEE 1991; MP PET 2001]**

(a) *s* -block (b) *p* -block
(c) *d* -block (d) *f* -block

19. The element californium belongs to the family **[MNR 1987]**

(a) Actinide series (b) Alkali metal family
(c) Alkaline earth family (d) Lanthanide series

20. On moving from left to right across a period in the table the metallic character **[CPMT 1986]**

(a) Increases
(b) Decreases
(c) Remains constant
(d) First increases and then decreases

21. An element with atomic number 20 will be placed in which period of the periodic table **[MNR 1986; UPSEAT 19**

(a) 4 (b) 3
(c) 2 (d) 1

22. The electronic structure $(n-1)d^{1-10}ns^{0-2}$ is characteristic of **[CET Pune 1998]**

(a) Transition elements (b) Lanthanides
(c) Actinides (d) Rare gases

23. The elements with atomic number 10, 18, 36, 54 and 86 are all **[CPMT 1976]**

(a) Light metals (b) Inert gases
(c) Halogens (d) Rare–earths

24. Elements of atomic number 6 is placed in **[CPMT 1978]**

(a) IV group (b) IV period
(c) VI group (d) III group

25. Which of the following elements is a lanthanide (Rare–earth element) **[Manipal MEE 1995]**
(a) Cadmium (b) Californium
(c) Cerium (d) Cesium

26. Mendeleef's periodic law is based on
(a) Atomic weight (b) Atomic number
(c) Number of neutrons (d) None of the above

27. The heaviest atom amongst the following is **[CPMT 1976; NCERT 1976]**
(a) U (b) Ra
(c) Pb (d) Hg

28. Which of the following pairs has both members from the same group of the periodic table **[CPMT 1985; MP PET/PMT 1998]**
(a) $Mg - Ba$ (b) $Mg - Na$
(c) $Mg - Cu$ (d) $Mg - K$

29. Which of the following pairs has both members from the same period of the periodic table **[CPMT 1985; UPSEAT 2001; BHU 2003]**
(a) $Na - Ca$ (b) $Na - Cl$
(c) $Ca - Cl$ (d) $Cl - Br$

30. Diagonal relationship is shown by **[DPMT 1984]**
(a) Elements of first period
(b) Elements of second period
(c) Elements of third period
(d) (b) and (c) both

31. The elements having the electronic configuration, $[Kr]\ 4d^{10}f^{14}, 5s^2p^6d^2, 6s^2$ belongs to **[CPMT 1982]**
(a) s-block (b) p-block
(c) d-block (d) f-block

32. Chemical property of Li and Mg similar because **[RPMT 2002]**
(a) These belong to same group
(b) Both ionisation potential is same
(c) Shows diagonal relationship
(d) Both electron affinity is same

33. According to the periodic law of elements, the variation in properties of elements is related to their **[AIEEE 2003]**
(a) Atomic masses
(b) Nuclear masses
(c) Atomic numbers
(d) Nuclear neutron-proton number

34. The element with atomic number 36 belongs to ..... block in the periodic table **[KCET 2003]**
(a) p (b) s
(c) f (d) d

35. Which group of the periodic table contains only metals **[UPSEAT 2003]**
(a) IIA (b) IB
(c) IA (d) None of these

36. The elements in which s and p-orbitals are present
(a) Common elements
(b) Inert gases
(c) Halogens
(d) Transitional elements

37. Aluminium is diagonally related to (in periodic table) **[MP PET 1993]**
(a) Li (b) C
(c) B (d) Be

38. An element has the electronic configuration $1s^2, 2s^2 2p^6,\ 3s^2 3p^6 3d^5, 4s^1$. It is a
(a) s-block element (b) p-block element
(c) d-block element (d) Inert gas

39. Which of the following show diagonal relationship **[KCET 2003; MP PMT 2003]**
(a) B and Si (b) B and Al
(c) B and Ga (d) B and C

40. Which of the following dinegative anion is quite common **[CPMT 2000]**
(a) S^{2-} (b) Se^{2-}
(c) Te^{2-} (d) O^{2-}

41. An element has electronic configuration $1s^2 2s^2 2p^6 3s^2 3p^4$. Predict their period, group and block **[CPMT 2000]**
(a) Period = 3^{rd}, block = p, group = 16
(b) Period = 5^{th}, block = s, group = 1
(c) Period = 3^{rd}, block = p, group = 10
(d) Period = 4^{th}, block = d, group = 12

42. If the atomic number of an element is 33, it will be placed in the periodic table in the **[RPET 1999; UPSEAT 2**
(a) First gp (b) Third gp
(c) Fifth gp (d) Seventh gp

43. Which of the following is the atomic number of a metal **[AIIMS 2000]**
(a) 32 (b) 34
(c) 36 (d) 38

44. Which of the following statement is not correct regarding hydrogen atom **[AIIMS 2000]**
(a) It resembles halogens in some properties
(b) It resembles alkali metals in some properties
(c) It can be placed in 7^{th} group of periodic table
(d) It can not be placed in first group of periodic table

45. Lithium shows similarities to magnesium in its chemical behaviour because **[AFMC 2000]**
(a) Similar size, same electronegativity and lower polarizing power
(b) Similar size, greater electronegativity and similar polarizing power
(c) Similar size, same electronegativity and similar high polarizing power
(d) None of these

46. On going left to right in a period, in transition metals, their atomic volumes **[MP PMT 2003]**
(a) Decrease (b) Increase
(c) Remain same (d) None of these of correct

47. Electronic configuration of chalcons in their outermost orbit is
(a) s^2p^3 (b) s^2p^4

(c) s^2p^5 (d) s^2p^6

48. Which configuration represents a noble gas **[DPMT 2000]**

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

(b) $1s^2 2s^2 2p^6 3s^2 3p^6$

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

(d) $1s^2 2s^2 2p^6 3s^2$

49. Which of the following pair has elements containing same number of electrons in the outermost orbit **[Kurukshetra CEE 1998; AFMC 2000]**

(a) N, O (b) Na, Ca

(c) As, Bi (d) Pb, Sb

50. Dobereiner traids is **[RPMT 1997]**

(a) Na, K, Rb (b) Mg, S, As

(c) Cl, Br, I (d) P, S, As

51. As per the modern periodic law, the physical and chemical properties of elements are periodic functions of their **[RPMT 1997; EAMCET 1998]**

(a) Atomic volume

(b) Electronic configuration

(c) Atomic weight

(d) Atomic size

52. Elements after atomic number 103 have been discovered till now. If an element with atomic number 106 were ever discovered which of the following electronic configuration will it possess **[AIIMS 1982]**

(a) $[Rn]5f^{14}\ 6d^4\ 7s^2$ (b) $[Rn]5f^{14}\ 6d^5 7s^1$

(c) $[Rn]5f^{14}\ 6d^6\ 7s^0$ (d) $[Rn]5f^{14}\ 6d^1 7s^2\ 7p^3$

53. The element X, Y, Z and T have the indicated electronic configurations. Starting with the innermost shell, which is the most metallic element **[CPMT 1979, 93]**

(a) $X = 2,8,4$ (b) $Y = 2,8,8$

(c) $Z = 2,8,8,1$ (d) $T = 2,8,8,7$

54. Which pair of atomic numbers represents s-block elements **[EAMCET 1990; RPMT 1997; MP PET 2003]**

(a) 7, 15 (b) 6, 12

(c) 9, 17 (d) 3, 12

55. Which pair of elements has same chemical properties **[EAMCET 1987]**

(a) 13, 22 (b) 3, 11

(c) 4, 24 (d) 2, 4

56. Mosley's name is most closely associated with the discovery of

(a) Positron (b) Deutrons

(c) Atomic number (d) Atomic weight

57. In the periodic table going down in fluorine group **[CPMT 1981]**

(a) Reactivity will increase

(b) Electronegativity will increase

(c) Ionic radius will increase

(d) Ionization potential will increase

58. Beryllium resembles much with **[CPMT 1988]**

(a) Zn (b) Al

(c) Li (d) Ra

59. The last member in each period of the periodic table is **[DPMT 2001]**

(a) An inert gas element (b) A transition element

(c) A halogen (d) An alkali metal

60. Which one of the following combination represents a metallic element **[EAMCET 1979]**

(a) 2, 8, 7 (b) 2, 8, 8

(c) 2, 8, 4 (d) 2, 8, 2

61. The electronic configuration of an atom A is $1s^2$, $2s^2p^6$, $3s^2p^6d^{10}, 4s^2p^3$. The chemistry of A is therefore likely to be similar to that of **[MP PMT 1995]**

(a) Chlorine (b) Nitrogen

(c) Oxygen (d) Boron

62. The element having the electronic configuration $1s^2$, $2s^2\ 2p^6, 3s^2\ 3p^1$ is

(a) A transition element

(b) A representative element

(c) An inert gas

(d) An inner–transition element

63. The element with configuration $1s^2, 2s^2p^6, 3s^2$ would be **[CPMT 1986; MP PMT 1993]**

(a) A metal (b) A non-metal

(c) An inert gas (d) A metalloid

64. The long form of periodic table is based on **[CPMT 1997]**

(a) Shape of the atom

(b) Mass of the atom

(c) Atomic number of the atom

(d) Electronegativity

65. Chloride of an element A gives neutral solution in water. In the periodic table, the element A belongs to **[AIIMS 1992; UPSEAT 2001]**

(a) First group (b) Third group

(c) Fifth group (d) First transition series

66. The fundamental basis of the present-day Periodic Table is that elements are **[JIPMER 1999]**

(a) Arranged in the order of increasing atomic weights

(b) Grouped according to chemical properties

(c) Arranged in the order of increasing number of neutrons in the atomic nucleus

(d) Arranged in the order of increasing number of protons in the nucleus

67. All the elements in a group in the periodic table have the same **[NCERT 1974; MP PET 1996; MP PMT 1996]**

(a) Atomic number

(b) Electronic configuration

(c) Atomic weight

(d) Number of electrons in the outermost shell or number of electrons for bonding

68. The most predominantly ionic compounds will be obtained from the combination of elements belonging to

(a) 1 and 7 groups (b) 2 and 6 groups

(c) 3 and 5 groups (d) 0 and 7 groups

69. An atom with atomic number 21 belongs to the category of **[Kurukshetra CEE 1991]**

(a) s -block elements (b) p -block elements
(c) d -block elements (d) f -block elements

70. Which metal has 2 electrons in the outermost orbit
(a) *Na* (b) *Cu*
(c) *Au* (d) *Be*

71. In the modern periodic table, elements are arranged in **[MP PMT 1990; MP PET 1995; CPMT 1971, 73, 78, 80]**
(a) Increasing mass
(b) Increasing volume
(c) Increasing atomic number
(d) Alphabetically

72. Alkali metals in each period have **[MP PMT 1995]**
(a) Smallest size
(b) Lowest ionization potential
(c) Highest ionization potential
(d) Highest electronegativity

73. The elements on the right side of the periodic table are **[CPMT 1976]**
(a) Metals (b) Metalloids
(c) Non-metals (d) Transition elements

74. The screening effect of *d*-electons is **[RPMT 2000]**
(a) Equal to that of *p*-electrons
(b) More than that of *p*-electrons
(c) Same as *f*-electrons
(d) Less than *p*-electrons

75. Chemical behaviour of an atom is determined by
(a) Atomic number (b) Mass number
(c) Binding energy (d) Number of isotopes

76. Which of the following is a inert element
(a) *Na* (b) *Fe*
(c) *Li* (d) *He*

77. The lightest metal is **[CPMT 1976; NCERT 1976; AFMC 1988]**
(a) *Li* (b) *Mg*
(c) *Ca* (d) *Na*

78. Choose the typical element
(a) *K* (b) *Na*
(c) *Sc* (d) *He*

79. Of the following pairs, the one containing example of metalloid elements in the periodic table is
(a) Sodium and potassium
(b) Fluorine and chlorine
(c) Calcium and magnesium
(d) Boron and silicon

80. The number of elements in each of the long periods in the periodic table is
(a) 2 (b) 8
(c) 18 (d) 32

81. In the long form of the periodic table, all the non-metals are placed under **[EAMCET 1988]**
(a) *s*-block (b) *p*-block
(c) *d*-block (d) *f*-block

82. Elements with outer electronic configuration ns^2np^6 are **[MP PET/PMT 1998]**
(a) Alkaline earth metals (b) Transition elements
(c) Chalcogenes (d) Noble gases

83. Highest density is of ..... **[RPET 2000]**
(a) *Ir* (b) *Os*
(c) *Pb* (d) *Hg*

84. Lithium shows diagonal relationship with **[MP PET 1995, 96; EAMCET 1990]**
(a) *Al* (b) *Mg*
(c) *Be* (d) *B*

85. $1s^2 2s^2 2p^6 3s^2$ is the electronic configuration of the metal **[RPET 2000]**
(a) *Na* (b) *Mg*
(c) *Fe* (d) *Al*

86. Element having atomic number 17 is placed in **[MP PET 1995]**
(a) *I*-group (b) *V*-group
(c) *VIII*-group (d) *VII*-group

87. The most importasnt active step in the development of periodic table was taken by **[CPMT 1976]**
(a) Mendeleef (b) Dalton
(c) Avogadro (d) Cavendish

88. Who is called the father of chemistry **[CPMT 1972]**
(a) Faraday (b) Priestley
(c) Rutherford (d) Lavosier

89. The total number of rare–earth elements is **[CPMT 1993]**
(a) 8 (b) 32
(c) 14 (d) 10

90. Which is metalloid **[Bihar MEE 1997]**
(a) *Pb* (b) *Sb*
(c) *Bi* (d) *Zn*
(e) *Mg*

91. The element or elements whose position is anomalous in the periodic table is
(a) Halogens (b) *Fe*, *Co* and *Ni*
(c) Inert gases (d) Hydrogen

92. An element M has an atomic mass 19 and atomic number 9. Its ion is represented by
(a) M^+ (b) M^-
(c) M^{2+} (d) M^{2-}

93. The number of elements in the 5th period of the periodic table are
(a) 8 (b) 10
(c) 18 (d) 32

94. The element with atomic number 55 belongs to **[MP PMT 1995]**
(a) *s*-block (b) *p*-block
(c) *d*-block (d) *f*-block

95. Coloured salts are formed by **[Bihar MEE 1996]**
(a) Alkali metals (b) Lanthanides
(c) Actinides (d) Transition metals
(e) None of these

96. Which one of the following is an s - block element **[MP PMT 1999]**
(a) Aluminium (b) Chromium
(c) Niobium (d) Potassium

97. In the modern periodic table, the place of the element with atomic number 31 is in **[MP PMT 1999]**

(a) s - block (b) d- block

(c) p -block (d) f – block

98. Last element of group-IV is found to be **[DPMT 1996]**

(a) Strong metallic

(b) Weak metallic

(c) Strong non-metallic

(d) Weak non-metallic

99. Elements of d group are called **[DPMT 1996]**

(a) Transition elements (b) Transuranic elements

(c) Metals (d) Metalloids

100. Which of the following is a normal element

(a) Ce (b) He

(c) Li (d) Ar

101. Which of the following is metalloid **[BHU 1996; AMU 2000]**

(a) Pb (b) Zn

(c) As (d) None of these

102. Under normal condition which of the following electronic configuration is able to form dipositive ion **[RPET 2000]**

(a) $[Ar]4s^1$ (b) $[Ne]2s^2 3p^6$

(c) $[Ne]3s^2$ (d) None of these

103. The statement that is true for the long form of the periodic table is **[IIT 1988]**

(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 elements

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

(d) It helps to predict the relative ionicity of the bonds between any two elements

104. To which block is related an element having electronic configuration $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^1$ in the periodic table **[MP PMT 1995]**

(a) s - block (b) p - block

(c) d - block (d) f – block

105. $Ce-58$ is a member of

(a) s-block elements (b) p-block elements

(c) d-block elements (d) f-block elements

106. Atomic number of elements represent

(a) Number of protons in the nucleus

(b) Number of neutrons in the nucleus

(c) Number of protons and neutrons in nucleus

(d) The valency of an element

107. As we go from left to right in period two of the periodic table, gram atomic volume of the elements

(a) Will change indefinitely

(b) Increases at a constant rate

(c) First increases then decrease

(d) Decreases

108. The electronic configuration of the element which is just above the element with atomic number 43 in the same periodic group is **[MNR 1992; UPSEAT 1999, 2000, 02]**

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

(b) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^5$

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

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

109. The elements indicating following atomic numbers belong to same group **[RPMT 1997]**

(a) 11 and 37 (b) 19 and 15

(c) 39 and 88 (d) None of these

110. Elements in which $4f$ orbitals are progressively filled are called as **[MP PET 1996]**

(a) Transition elements (b) Lanthanides

(c) Actinides (d) Inert gases

111. Hydrogen can be put in halogen group because **[RPMT 2000]**

(a) It has deuterium and tritium as isotopes

(b) It forms hydrides like chlorides

(c) It contains one electron only

(d) It is light

112. In the main group elements (i) as we proceed down the same group in the periodic table and (ii) as we proceed from left to right in the same period, the atomic radius

(a) (i) Increase continuously; (ii) Decreases continuously

(b) (i) Decreases continuously; (ii) Increases continuously

(c) (i) Increases continuously; (ii) Decreases upto the group IV and then increases upto the end of the period.

(d) (i) Decreases continuously; (ii) Decreases upto the group IV and then increases upto the end of the period.

113. Cause of diagonal relationship is

(a) Similar electronic configuration of the elements

(b) Similar e/r ratio of the elements

(c) Same number of valency electrons in the elements

(d) Same atomic weights of the elements

114. From which of the following the hydration energy of Mg^{2+} is larger **[MP PET 2000]**

(a) Na^+ (b) Al^{3+}

(c) Be^{2+} (d) Cr^{3+}

115. Group comprising of all metals is **[RPET 2000]**

(a) IIIA (b) IVA

(c) VIIA (d) IIA

116. Whose name is not associated with the development of Periodic Table

(a) Prout's (b) Newlands

(c) Rutherford (d) Loother Meyer

117. Element of atomic number 23 is placed in the periodic table in **[MP PMT 1996]**

(a) s - block (b) p – block

(c) d - block (d) f - block

118. In which of the following groups all the three members are of the alkaline earth metals family

(a) Al, Sr, Ti (b) Li, Na, K

(c) Mg, Ba, Ca (d) Rb, Cs, Fr

119. Astatine is a **[RPET 2000]**

(a) Halogen

(b) Rare earth element

(c) Alkaline earth metal

(d) None of these

120. The nitride ion in lithium nitride is composed of **[CBSE PMT 2001]**

(a) $7P + 7e$ (b) $10P + 7e$

(c) $7P + 10e$ (d) $10P + 10e$

121. Which set has the same number of unpaired electrons in their ground state **[JIPMER 2000]**

(a) Cl^-, Fe^{3+}, Cr^{3+} (b) Na^+, Mg^{2+}, Al

(c) Na, P, Cl (d) N, P, V

122. Which of the following doesn't decompose on heating **[AMU 2002]**

(a) $MgCO_3$ (b) Na_2CO_3

(c) Li_2CO_3 (d) $Ca(HCO_3)_2$

123. Which of the following has smallest bond angle **[AMU 2002]**

(a) H_2O (b) NH_3

(c) CH_4 (d) CO_2

124. The metal-having highest melting point is **[AMU 2002]**

(a) Chromium (b) Tungston

(c) Diamond (d) Silver

125. The elements with atomic numbers 9, 17, 35, 53, 85 are all **[KCET 2004]**

(a) Noble gases (b) Halogens

(c) Heavy metals (d) Light metals

126. The atomic number of an element is derived from **[Kerala PMT 2004]**

(a) Number of electrons

(b) Number of protons

(c) Number of neutrons

(d) Number of isotopes

(e) Number of nucleons

127. Beryllium shows diagonal relationship with **[Pb.CET 2003]**

(a) Mg (b) Na

(c) B (d) Al

128. Which of the properties remains unchanged on descending a group in the periodic table **[MP PMT 1997; RPMT 2002]**

(a) Atomic size (b) Density

(c) Valence electrons (d) Metallic character

129. Which of the following element does not occur in liquid form **[RPMT 2002]**

(a) Hg (b) Li

(c) Ga (d) Br

130. The cause of periodicity of properties is

(a) Increasing atomic radius

(b) Increasing atomic weights

(c) Number of electrons in the valency orbit

(d) The re-occurrence of similar outer electronic configuration

131. The chemistry of lithium is very similar to that of magnesium even though they are placed in different groups **[NCERT 1982]**

(a) Both are found together in nature

(b) Both have nearly the same size

(c) Both have similar electronic configuration

(d) The ratio of their charge to size is nearly the same

Atomic and Ionic radii

1. The ratio between radii of He^+ ion and H atom is **[MP PET 1996]**

(a) $\frac{1}{2}$ (b) 1

(c) $\frac{3}{2}$ (d) 2

2. The smallest among the following ions is **[JIPMER 1999]**

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

(c) Ba^{2+} (d) Al^{3+}

3. Which is smallest in size **[RPMT 1997]**

(a) O^{2-} (b) C^{4-}

(c) F^- (d) N^{3-}

4. Which of the following has largest size **[MP PMT 1995, 2003; JIPMER (Med.) 2002]**

(a) Al (b) Al^+

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

5. Of the following, the one with largest size is **[EAMCET 1997; BHU 1999]**

(a) Cl^- (b) Ar

(c) K^+ (d) Ca^{2+}

6. Which cation has smallest radius **[RPET 2000]**

(a) K^+ (b) Na^+

(c) Li^+ (d) Be^{2+}

7. The radii of F, F^-, O and O^{-2} are in the order of **[AIIMS 1999; CPMT 1999]**

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

(c) $F^- > O^{2-} > F > O$ (d) $O^{2-} > O > F^- > F$

Which of the following has the smallest size **[CBSE PMT 1996]**

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

(c) Cl^- (d) F^-

9. Which of the following is largest **[CBSE PMT 1996]**

(a) Cl^- (b) S^{2-}

(c) Na^+ (d) F^-

10. Which of the following property displays progressive increase down a group in the Bohr's periodic table

(a) Electronegativity (b) Electron affinity
(c) Ionization potential (d) Size of the atom

11. Atomic radii of fluorine and neon in angstrom units are respectively given by **[IIT 1987]**
(a) 0.762, 1.60 (b) 1.60, 1.60
(c) 0.72, 0.72 (d) None of these values

12. Which ion has greatest radius in the following **[CPMT 1976; NCERT 1977]**
(a) H^- (b) F^-
(c) Br^- (d) I^-

13. Which has the maximum atomic radius **[CPMT 1975; AIIMS 1982; DPMT 1982]**
(a) Al (b) Si
(c) P (d) Mg

14. Which one of the following ions has the highest value of ionic radius **[AIEEE 2004]**
(a) O^{2-} (b) B^{3+}
(c) Li^+ (d) F^-

15. On going down a main sub-group in the periodic table (example Li to Cs in IA or Be to Ra in IIA), the expected trend of changes in atomic radius is a **[CPMT 1981; NCERT 1979]**
(a) Continuous increase
(b) Continuous decrease
(c) Periodic one, an increase followed by a decrease
(d) A decrease followed by increase

16. Which one of the following is the smallest in size **[IIT 1989]**
(a) N^{3-} (b) O^{2-}
(c) F^- (d) Na^+

17. Which one is the correct order of the size of the iodine species **[Pb. CET 1986; CBSE PMT 1997; Kurukshetra CEE 1998; RPMT 1999; DCE 1999; MP PET 2000; MP PMT 2001; BCECE 2005]**
(a) $I > I^+ > I^-$ (b) $I > I^- > I^+$
(c) $I^+ > I^- > I$ (d) $I^- > I > I^+$

18. Which one has larger radius **[CPMT 1997; KCET 2005]**
(a) Na^+ (b) F
(c) F^- (d) Na

19. In third row of periodic table the atomic radii from Na to Cl **[MP PMT 1986]**
(a) Continuosly decreases
(b) Continuosly increases
(c) Remains constant
(d) Increases but not continuously

20. The size of the following species increases in the order **[IIT-JEE 1990; AFMC 1995]**
(a) $Mg^{2+} < Na^+ < F^- < Al$
(b) $F^- < Al < Na^+ > Mg^{2+}$
(c) $Al < Mg < F^- < Na^+$
(d) $Na^+ < Al < F^- < Mg^{2+}$

21. In K^+F^- ionic radius of F^- is more while atomic radius of K^+ is **[CPMT 1997]**
(a) Less than F^- (b) More than F^-
(c) Equal of F^- (d) None of these

22. Which one of the following species possesses maximum size **[EAMCET 1993; MP PET 2001]**
(a) Na^+ (b) F^-
(c) Ne (d) O^{2-}

23. The ionic radii of N^{3-}, O^{2-}, F^- and Na^+ follow the order **[MP PET/PMT 1998; MP PMT 2000]**
(a) $N^{3-} > O^{2-} > F^- > Na^+$
(b) $N^{3-} > Na^+ > O^{2-} > F^-$
(c) $Na^+ > O^{2-} > N^{3-} > F^-$
(d) $O^{2-} > F^- > Na^+ > N^{3-}$

24. On moving down a group of regular elements, both atomic and ionic radii increases with increasing **[BMEE 1995]**
(a) Atomic number (b) Atomic weight
(c) Atomic mass (d) None of these

25. Which one of the following indicates the correct order of atomic size **[EAMCET 1989]**
(a) $Be > F > C > Ne$ (b) $Be < C < F < Ne$
(c) $Be > C > F > Ne$ (d) $F < Ne < Be < C$

26. Which has the smallest size **[MP PET 1999]**
(a) Na^+ (b) Mg^{2+}
(c) Al^{3+} (d) P^{5+}

27. A sodium cation has a different number of electrons from
(a) O^{2-} (b) F^-
(c) Li^- (d) Al^{3+}

28. Which of the following statement concerning lanthanides elements is false **[CBSE PMT 1994]**
(a) Lanthanides are separated from one another by ion exchange method
(b) Ionic radii of trivalent lanthanides steadily increases with increase in the atomic number
(c) All lanthanides are highly dense metals
(d) More characteristic oxidation state of lanthanide elements is +3

29. The lanthanide contraction is responsible for the fact that **[CBSE PMT 1997]**
(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 the same oxidation state

30. Elements of which group form anions most readily **[CBSE PMT 1992]**
(a) Oxygen family (b) Nitrogen group
(c) Halogens (d) Alkali metals

31. The unit representing atomic radii and ionic radii is
(a) nm (b) cm
(c) Å (d) m

32. The atomic radii in periodic table among elements from right to left **[MP PET 1995]**
(a) Decreases
(b) Increases
(c) Remain constant
(d) First decreases and then increases

33. Of the following the ion with the smallest ionic radius is **[MP PET 1996]**

(a) K^+ (b) Ca^{2+}

(c) Ti^{3+} (d) Ti^{4+}

34. Which of the following does not represent the correct order of the property indicated **[CBSE PMT 1997]**

(a) $Sc^{3+} > Cr^{3+} > Fe^{3+} > Mn^{3+}$ ionic radii

(b) $Sc < Ti < Cr < Mn$ Density

(c) $Mn^{2+} > Ni^{2+} < Co^{2+} < Fe^{2+}$ ionic radii

(d) $FeO < CaO > MnO > CuO$ Basic nature

35. The order of magnitude of ionic radii of ions Na^+, Mg^{2+}, Al^{3+} and Si^{4+} is **[MP PMT 1996]**

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

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

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

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

36. The order of the magnitude of ionic radii of ions N^{3-}, O^{2-} and F^- is **[MP PMT 1996]**

(a) $N^{3-} > O^{2-} > F^-$ (b) $N^{3-} < O^{2-} < F^-$

(c) $N^{3-} > O^{2-} > F^-$ (d) $N^{3-} < O^{2-} > F^-$

37. Which statement is correct

(a) For potassium, the atomic radius < ionic radius; but for bromine, the atomic radius > ionic radius

(b) For potassium and bromine both, the atomic radii > ionic radii

(c) For potassium and bromine both, the atomic radii < ionic radii

(d) For potassium, the atomic radius > ionic radius but for bromine, the atomic radius < ionic radius

38. Which of the following ion is the smallest ion **[AIIMS 2001]**

(a) O_2^+ (b) O_2^-

(c) O_2 (d) O_2^{-2}

39. The correct order of radii is **[IIT-JEE (Screening) 2000]**

(a) $N < Be < B$ (b) $F^- < O^{2-} < N^{3-}$

(c) $Na < Li < K$ (d) $Fe^{3+} < Fe^{2+} < Fe^{4+}$

40. Which one of the following should be most stable **[MP PET 2000]**

(a) H_2^+ (b) H^+

(c) H (d) H^-

41. Which of the following is the correct order of ionic radii **[BHU 2002]**

(a) $F > Li > Na > K$ (b) $F > K > Na > Li$

(c) $Na > K > F > Li$ (d) $Li > Na > K > F$

42. Smallest among these species is **[KCET 2002]**

(a) Lithium ion (b) Hydrogen

(c) Lithium (d) Helium

43. Which of the following ionic radius would be maximum **[MP PET 1997]**

(a) C^{4-} (b) N^{3-}

(c) O^{2-} (d) Mg^{2+}

44. Which is helpful in the formation of ionic bond

(a) Only small cation

(b) Only small anion

(c) Small cation and small anion both

(d) Low positive charge, large cation and small anion

45. Which of the following has largest ionic radius **[AFMC 1999; BHU 2003]**

(a) Cs^+ (b) Li^+

(c) Na^+ (d) K^+

46. Point out the wrong statement :

On moving horizontally from left to right across a period in the periodic table

(a) Metallic character decreases

(b) Electronegativity increases

(c) Gram atomic volume first decreases and then increases

(d) Size of the atoms increases for normal elements

47. Which of the following statements is correct **[MP PET 1997]**

(a) X^- ion is larger in size than X atom

(b) X^+ ion is larger in size than X atom

(c) X^+ ion is larger in size than X^- ion

(d) X^+ and X^- ions are equal in size

48. The atomic radius of elements of which of the following series would be nearly the same **[MP PET 1997]**

(a) *Na K Rb Cs* (b) *Li Be B C*

(c) *Fe Co Ni Cu* (d) *F Cl Br I*

49. The decreasing order of size of isoelectronic series K^+, Ca^{2+}, Cl^- and S^{2-} is **[Roorkee 1995]**

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

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

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

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

50. Which of the following sets of elements have the strongest tendency to form anions **[MP PET 1993]**

(a) *N, O, F* (b) *P, S, Cl*

(c) *As, Se, Br* (d) *Sb, Te, I*

51. Radius of the isoelectronic species **[MP PET 1994]**

(a) Increases with the increase of nuclear charge

(b) Decreases with the increase of nuclear charge

(c) Is the same for all

(d) First increases and then decreases

52. In which of the following pairs the difference between the covalent radii of the two metals is maximum **[MP PET 1994]**

(a) *K, Ca* (b) *Mn , Fe*

(c) *Co , Ni* (d) *Cr , Mn*

53. An atom of an element has electronic configuration 2, 8, 1. Which of the following statement is correct **[MP PMT 1994]**

(a) The element's valency is 7

(b) The element exists as a diatomic molecule

(c) The element is of non-metallic nature

(d) The element forms a basic oxide

54. Which of the following ions has the smallest radius

[KCET 1992]

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

(c) O^{2-} (d) F^{-}

55. Point out the *wrong* statement :

In a given period of the periodic table the *s* - block element has, in general, a lower value of [MP PMT 1997]

(a) Ionisation energy (b) Electronegativity

(c) Atomic radius (d) Electron affinity

56. Arrange the following in increasing order of their atomic radius : Na, K, Mg, Rb [AFMC 1995, 97; CPMT 1999]

(a) $Mg < K < Na < Rb$ (b) $Mg < Na < K < Rb$

(c) $Mg < Na < Rb < K$ (d) $Na < K < Rb < Mg$

57. In the isoelectronic species the ionic radii (Å) of N^{3-}, O^{2-} and F^{-} are respectively given by [Pb. CET 1989]

(a) 1.36, 1.40, 1.71 (b) 1.36, 1.71, 1.40

(c) 1.71, 1.40, 1.36 (d) 1.71, 1.36, 1.40

58. Al^{3+} has a lower ionic radius than Mg^{2+} because [EAMCET 1992]

(a) Mg atom has less number of neutrons than Al

(b) Al^{3+} has a higher nuclear charge than Mg^{2+}

(c) Their electronegativities are different

(d) Al has a lower ionisation potential than Mg atom

59. When a neutral atom is converted into cation, there is [EAMCET 1986]

(a) Decrease in the atomic number

(b) An increase in the atomic number

(c) A decrease in size

(d) An increase in size

60. A trend common to both groups I and VII elements in the periodic table as atomic number increases is [NCERT 1981; EAMCET 1980]

(a) Oxidising power increases

(b) Atomic radius increases

(c) Maximum valency increases

(d) Reactivity with water increases

61. Increasing order of atomic radii is [RPET 2003]

(a) $Mg^{2+} < Na^{+} < Ne < F^{-} < O^{2-}$

(b) $Na^{+} < Mg^{++} < Ne < F^{-} < O^{2-}$

(c) $O^{2-} < F^{-} < Ne < Na^{+} < Mg^{2+}$

(d) $Ne < O^{2-} < F^{-} < Na^{+} < Mg^{2+}$

62. Chloride ion and potassium ion are isoelectronic. Then [KCET 2002]

(a) Potassium ion is relatively bigger

(b) Depends on the other cation and anion

(c) Their size are same

(d) Chloride ion is bigger than potassium ion

63. Which of the following has the largest ionic radius [Pb. PMT 2002; BHU 2003]

(a) Na^{+} (b) Ni^{+}

(c) Cs^{+} (d) Mg^{+2}

64. The ionic radii of Li^{+}, Na^{+}, K^{+} are in which of the following order [MP PMT 2002]

(a) $K^{+} > Na^{+} > Li^{+}$ (b) $K^{+} > Na^{+} < Li^{+}$

(c) $K^{+} < Na^{+} < Li^{+}$ (d) $Li^{+} > Na^{+} < K^{+}$

65. Which of the following has smallest size [JIPMER (Med.) 2002]

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

(c) Al^{3+} (d) Si^{4+}

66. Which one of the following is expected to have largest size [UPSEAT 2004]

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

(c) Al^{+3} (d) N^{-3}

67. The trivalent ion having largest size in lanthanide series is [Pb.PMT 2004]

(a) Ti (b) Zr

(c) Hf (d) La

68. Which of the following alkali metal ions has lowest ionic mobility in aqueous solutions [DPMT 2004]

(a) Rb^{+} (b) Cs^{+}

(c) Li^{+} (d) Na^{+}

69. Ionic radii are [CBSE PMT 2003, 04]

(a) Directly proportional to effective nuclear charge

(b) Directly proportional to square of effective nuclear charge

(c) Inversely proportional to effective nuclear charge

(d) Inversely proportional to square of effective nuclear charge.

70. The correct sequence of increasing covalent character is represented by [CBSE PMT 2005]

(a) $LiCl < NaCl < BeCl_2$ (b) $BeCl_2 < NaCl < LiCl$

(c) $NaCl < LiCl < BeCl$ (d) $BeCl_2 < LiCl < NaCl$

71. Correct energy value order is [Orissa JEE 2004]

(a) $ns\ np\ nd(n-1)f$ (b) $ns\ np(n-1)d\ (n-2)f$

(c) $ns\ np(n-1)d\ (n-1)f$ (d) $ns(n-1)d\ n(n-1)f$

72. The ionic conductance of following cation in a given concentration are in the order [Orissa JEE 2004]

(a) $Li^{+} < Na^{+} > K^{+} < Rb^{+}$

(b) $Li^{+} > Na^{+} > K^{+} > Rb^{+}$

(c) $Li^{+} < Na^{+} > K^{+} > Rb^{+}$

(d) $Li^{+} = Na^{+} < K^{+} < Rb^{+}$

Ionisation energy

1. The incorrect statement among the following is [IIT-JEE 1997]

(a) The first ionisation potential of Al is less than the first ionisation potential of Mg

(b) The second ionisation potential of Mg is greater than the second ionisation potential of Na

(c) The first ionisation potential of Na is less than the first ionisation potential of Mg

(d) The third ionisation potential of Mg is greater than the third ionisation potential of Al

2. The second ionisation potential of an element M is the energy required to [JIPMER 1997]

(a) Remove one mole of electron from one mole of gaseous anion

(b) Remove one mole of electron from one mole of gaseous cation of the element

(c) Remove one mole of electron from one mole of monovalent gaseous cation of the element

(d) Remove 2 moles of electrons from one mole of gaseous atoms

3. The ionization energy of an element is

(a) The same as the electron affinity of the element

(b) Equal in magnitude but of opposite sign to the electron affinity of the element

(c) The energy released when an electron is added to an atom of the element

(d) The energy required to remove the outermost electron of an atom of the element

4. The first ionisation energies of alkaline earth metals are higher than those of the alkali metals. This is because **[MP PET 1996]**

(a) There is increase in the nuclear charge of the alkaline earth metals

(b) There is a decrease in the nuclear charge of the alkaline earth metals

(c) There is no change in the nuclear charge

(d) None of the above

5. The statement that is not correct for the periodic classification of elements is **[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 along a period do not vary in a regular manner with increase in atomic number

(d) For transition elements the d-sub-shells are filled with electrons monotonically with increase in atomic number

6. Choose the correct statement

(a) Ionization energy and electron affinity increases across a period

(b) Ionization energy increases but electron affinity decreases along a period

(c) Ionization energy decreases but electron affinity increases

(d) Both decreases along a period

7. In halogens, with the increase of atomic number which habit is found

(a) Habit to loose electrons decreases

(b) Ionic radii decreases

(c) Ionization potential decreases

(d) In MX_2 ($M =$ metal and $X =$ halogen), covalent properties decreases

8. Ionization potential is lowest for **[CPMT 1989; MP PET 2001]**

(a) Halogens (b) Inert gases

(c) Alkaline earth metals (d) Alkali metals

9. Which of the following explanation is best for not placing hydrogen in either the group of alkali metals or halogens **[NCERT 1978]**

(a) The ionization energy of hydrogen is to high for group of alkali metals, but too low of halogen group

(b) Hydrogen can form compounds with all other elements

(c) Hydrogen is much lighter element than the alkali metals or the halogens

(d) None of the above

10. The ionization energy of nitrogen is more than that of oxygen because **[MP PET 1993]**

(a) Nitrogen has half filled p-orbitals

(b) Nitrogen is left to the oxygen in the same period of the periodic table

(c) Nitrogen contains less number of electrons

(d) Nitrogen is less electronegative

11. The energy required to remove an electron of a gaseous atom from its ground state is called **[CPMT 1989, 9**

(a) Potential energy (b) Ionization energy

(c) Electrode potential (d) Activation energy

12. The first ionization energy of boron is less than that of beryllium because

(a) Boron has higher nuclear charge

(b) Atomic size of boron is more than that of beryllium

(c) Boron has only one electron in p-sub-shell

(d) Atomic size of boron is less than that of beryllium

13. $A \to A^+ + e,\ E_1$ and $A^+ \to A^{2+} + e,\ E_2$. The energy required to pull out the two electrons are E_1 and E_2 respectively. The correct relationship between two energy would be

(a) $E_1 < E_2$ (b) $E_1 = E_2$

(c) $E_1 > E_2$ (d) $E_1 \neq E_2$

14. Which of the following element has maximum, first ionisation potential **[AIIMS 2001]**

(a) V (b) Ti

(c) Cr (d) Mn

15. Highest energy will be absorbed to eject out the electron in the configuration **[RPMT 2000]**

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

(c) $1s^2 2s^2 2p^2$ (d) $1s^2 2s^2 2p^4$

16. In which of the following process highest energy is absorbed **[RPET 2000]**

(a) $Cu \to Cu^+$ (b) $Br \to Br^-$

(c) $I \to I^-$ (d) $Li \to Li^+$

17. The first ionization potential of *Na, Mg, Al* and *Si* are in the order **[IIT 1988; MP PMT 2000]**

(a) $Na < Mg > Al < Si$ (b) $Na > Mg > Al > Si$

(c) $Na < Mg < Al > Si$ (d) $Na > Mg > Al < Si$

18. How many ionisation energies can carbon have

(a) 1 (b) 2

(c) 4 (d) 6

19. Which of the following gaseous atoms has highest value of IE **[JIPMER 1997; CPMT 1997; AIIMS 2000]**

(a) P (b) Si

(c) Mg (d) Al

20. Hydrogen has high ionization energy than alkali metals, due to its **[AIIMS 1999]**

(a) Large size (b) Small size
(c) Ionic bond (d) Covalent bond

21. The first ionization potentials (eV) of Be and B respectively are **[CBSE PMT 1998]**
(a) $8.29eV$, $9.32eV$ (b) $9.32eV$, $9.32eV$
(c) $8.29eV$, $8.29eV$ (d) $9.32eV$, $8.29eV$

22. Which ionisation potential (IP) in the following equations involves the greatest amount of energy **[Pune CET 1998]**
(a) $Na \rightarrow Na^+ + e^-$ (b) $K^+ \rightarrow K^{2+} + e^-$
(c) $C^{2+} \rightarrow C^{3+} + e^-$ (d) $Ca^+ \rightarrow Ca^{2+} + e^-$

23. Which of the following has maximum ionization potential **[MH CET 1999]**
(a) K (b) Na
(c) Al (d) Mg

24. The first four ionization energy values of an element are 191, 578, 872 and 5962 *kcal*. The number of valence electrons in the element is
(a) 1 (b) 2
(c) 3 (d) 4

25. Which of the following has least ionization potential **[CPMT 1982, 93]**
(a) Li (b) Cs
(c) Cl (d) I

26. Which of the following element has the lowest ionization potential **[CPMT 1976; RPMT 2002]**
(a) Fe (b) H
(c) Li (d) He

27. As one moves along a given row in the periodic table, ionization energy **[CPMT 1976, 89; NCERT 1978; EAMCET 1985]**
(a) Remains same
(b) Increases from left to right
(c) First increases, then decreases
(d) Decreases from left to right

28. Ionization energy is highest for **[AFMC 2001; BVP 2003]**
(a) Noble gases
(b) Platinum metals
(c) Transition elements
(d) Inner–transition elements

29. Which one of the following elements has the highest ionisation energy **[IIT-JEE 1990]**
(a) $[Ne]3s^2\,3p^1$ (b) $[Ne]3s^2\,3p^2$
(c) $[Ne]3s^2\,3p^3$ (d) $[Ar]3d^{10}\,4s^2\,4p^2$

30. Which of the following elements has the lowest ionistion potential **[EAMCET 1993]**
(a) N (b) O
(c) F (d) Ne

31. Which of the following has lowest first ionisation potential **[CPMT 1993]**
(a) B (b) C
(c) N (d) O

32. If first orbit energy of He^+ is – 54.4 *eV*, then the second orbit energy will be **[Roorkee 1995]**
(a) – 54.4 *eV* (b) – 13.6 *eV*
(c) – 27.2 *eV* (d) + 27.2 *eV*

33. The screening effect of inner electrons of the nucleus causes **[MP PMT 1994]**
(a) A decrease in the ionisation potential
(b) An increase in the ionisation potential
(c) No effect on the ionisation potential
(d) An increase in the attraction of the nucleus to the electrons

34. Which of the following has highest first ionization energy **[MP PET 1994]**
(a) Sulphur (b) Oxygen
(c) Nitrogen (d) Phosphorus

35. The second ionization potential is **[Bihar CEE 1995; CET Pune 1998]**
(a) Less than the first ionization potential
(b) Equal to the first ionization potential
(c) Greater than the first ionization potential
(d) None of these

36. When the first ionization energies are plotted against atomic number the peaks are occupied **[CET Pune 1**
(a) Alkali metals (b) Halogens
(c) Rare gases (d) Transition elements

37. Among the following which has the highest first ionization energy
(a) K (b) Na
(c) B (d) Kr

38. The first ionisation potential will be maximum for **[CPMT 2000]**
(a) Lithium (b) Hydrogen
(c) Uranium (d) Iron

39. Arrange *S*, *P*, *As* in order of increasing ionisation energy **[JIPMER (Med.) 2002]**
(a) $S < P < As$ (b) $P < S < As$
(c) $As < S < P$ (d) $As < P < S$

40. With reference to concept of ionisation potential, which one of the following sets are correct **[Kurukshetra CE**
(a) $U > K > Cs$ (b) $B > U > K$
(c) $Cs > U > B$ (d) $Cs < U < K$

41. Which among the following species has the highest ionisation potential **[KCET 2001]**
(a) B (b) Li
(c) Ne (d) F

42. The set representing the correct order of first ionisation potential is **[IIT-JEE (Screening) 2001]**
(a) $K > Na > Li$ (b) $Be > Mg > Ca$
(c) $B > C > N$ (d) $Ge > Si > C$

43. Among the following options, the sequence of increasing first ionisation potential will be **[AIIMS 2000; MP PMT 2002]**
(a) $B < C < N$ (b) $B > C > N$
(c) $C < B < N$ (d) $N > C > B$

44. The decreasing order of the ionisation potential in the following elements is **[MP PMT 2001]**
(a) $Ne > Cl > P > S > Al > Mg$
(b) $Ne > Cl > P > S > Mg > Al$
(c) $Ne > Cl > S > P > Mg > Al$
(d) $Ne > Cl > S > P > Al > Mg$

45. Which is the correct order of the first ionization potential of *N*, *O* and *C* **[AMU 2000]**
(a) $C > N > O$ (b) $C < N > O$
(c) $O > N > O$ (d) $C > N \sim O$

46. Which of the following order is wrong **[CBSE 2002]**

(a) $NH_3 < PH_3 < AsH_3$ -acidic nature

(b) $Li^+ < Na^+ < K^+ < Cs^+$ -ionic radius

(c) $Al_2O_3 < MgO < Na_2O < K_2O$ -basic

(d) $Li < Be < B < C$ -1st ionisation potential

47. Which of the following has the least ionization potential **[MP PET 2002]**

(a) Lithium (Li) (b) Helium (He)

(c) Nitrogen (N) (d) Zinc (Zn)

48. The first ionisation energy of lithium will be **[EAMCET 1990]**

(a) Greater than Be (b) Less than Be

(c) Equal to that of Na (d) Equal to that of F

49. Spectrum of Li^{2+} is similar to that of **[AIIMS 2002]**

(a) H (b) He

(c) Be (d) Ne

50. Highest ionisation energy stands for **[DPMT 2000]**

(a) He (b) C

(c) N (d) H

51. Which of the following electrons should have the highest value of ionisation energy (for the same value of the principal quantum number)

(a) s (b) p

(c) d (d) f

52. The correct sequence of elements in decreasing order of first ionisation energy is **[MP PET 1997]**

(a) $Na > Mg > Al$ (b) $Mg > Na > Al$

(c) $Al > Mg > Na$ (d) $Mg > Al > Na$

53. Correct order of polarising power is **[MP PMT 2003; BHU 2003]**

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

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

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

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

54. Correct increasing order of first ionistion potential is **[UPSEAT 2003]**

(a) $Na < Mg > Al < Si$ (b) $Na < Mg < Al < Si$

(c) $Na > Mg > Al > Si$ (d) $Na < Mg < Al > Si$

55. The ionisation potential of hydrogen from ground state to the first excited state is **[DCE 2001]**

(a) $-13.6\ eV$ (b) $13.6\ eV$

(c) $-3.4\ eV$ (d) $3.4\ eV$

56. In view of their low ionisation energies the alkali metals are **[MP PMT 2002]**

(a) Weak oxidising agents

(b) Strong reducing agents

(c) Strong oxidising agents

(d) Weak reducing agents

57. Of the following iso-electronic ions, the one which has the lowest ionisation potential is **[AMU 1999]**

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

(c) F^- (d) O^{--}

58. Ionisation energy in group I-A varies in the decreasing order as **[Orissa JEE 2005]**

(a) $Li > Na > K > Cs$ (b) $Na > Li > K > Cs$

(c) $Li > Cs > K > Na$ (d) $K > Cs > Na > Li$

59. Which of the following relation is correct with respect to first (I) and second (II) ionization potentials of sodium and magnesium **[CPMT 1999]**

(a) $I_{Mg} = II_{Na}$ (b) $I_{Na} > I_{Mg}$

(c) $II_{Mg} > II_{Na}$ (d) $II_{Na} > II_{Mg}$

60. The order of the magnitude of first ionisation potentials of Be, B, N and O is **[MP PMT 1996]**

(a) $N > O > Be > B$ (b) $N > Be > O > B$

(c) $Be > B > N > O$ (d) $B > Be > O > N$

61. Which of the following transitions involves maximum amount of energy **[AIIMS 1992]**

(a) $M^-(g) \rightarrow M(g)$ (b) $M(g) \rightarrow M^+(g)$

(c) $M^+(g) \rightarrow M^{2+}(g)$ (d) $M^{2+}(g) \rightarrow M^{3+}(g)$

62. Which of the following species has lowest ionization potential **[KCET 1996]**

(a) O (b) O_2

(c) O_2^+ (d) O_2^-

63. Which of the following has minimum ionization energy **[JIPMER 1999]**

(a) Ge (b) Se

(c) As (d) Br

64. First I.P. of Mg is ..... than Al **[CPMT 1997]**

(a) Less (b) More

(c) Equal (d) None of these

65. The element with highest value of ionization potential is

(a) Potassium (b) Helium

(c) Hydrogen (d) Xenon

66. Which has the highest second ionisation potential **[AIIMS 1991]**

(a) Nitrogen (b) Carbon

(c) Oxygen (d) Fluorine

67. In ionisation of hydrogen, the energy required is **[CPMT 1996]**

(a) $13.6eV$ (b) $> 13.6eV$

(c) $< 13.6eV$ (d) $1.5eV$

68. Which of the following elements will have the lowest first ionisation energy **[KCET 1992]**

(a) Mg (b) Rb

(c) Li (d) Ca

69. In the long form of periodic table, the element having lowest ionisation potentials are present in **[EAMCET**

(a) I group (b) IV group

(c) VII group (d) Zero group

70. The process requiring the absorption of energy is **[Roorkee 1990]**

(a) $F \rightarrow F^-$ (b) $Cl \rightarrow Cl^-$

(c) $O \rightarrow O^{2-}$ (d) $H \rightarrow H^-$

71. In a period from Li to F, ionization potential **[CPMT 1982]**

(a) Increases (b) Decreases

(c) Remains same (d) None of the above

72. Ionization energy increases in the order
(a) Be, B, C, N (b) B, Be, C, N
(c) C, N, Be, B (d) N, C, Be, B

73. A neutral atom will have the lowest ionization potential when its electronic configuration is **[NCERT 1978; CBSE PMT 1991]**
(a) $1s^1$ (b) $1s^2, 2s^2p^6$
(c) $1s^2, 2s^2p^2$ (d) $1s^2, 2s^2p^6, 3s^1$

74. Which has maximum first ionization potential **[IIT 1982; EAMCET 1997; KCET (Med.) 1999; KCET 2000]**
(a) *C* (b) *N*
(c) *B* (d) *O*

75. Which one of the following elements has the highest ionisation energy
(a) *Na* (b) *Mg*
(c) *C* (d) *F*

76. Order of first ionization potentials of elements *Li, Be, B, Na* is **[Kerala CET 2005]**
(a) *Li* > *Be* >*B* > *Na* (b) *Be* >*B* > *Li* > *Na*
(c) *Na* > *Li* > *B* > *Be* (d) *Be* > *Li* > *B* > *Na*
(e) *B* > *Be* > *Li* > *Na*

77. The ionization energy of nitrogen is larger than that of oxygen because of **[RPMT 1997; DCE 1999]**
(a) Greater attraction of electrons by the nucleus
(b) The size of nitrogen atom being smaller
(c) The half-filled p-orbitals possess extra stability
(d) Greater penetration effect

78. If the IP of *Na* is 5.48 *eV*, the ionisation potential of *K* will be **[EAMCET 1988]**
(a) Same as that of *Na* (b) 5.68 *eV*
(c) 4.34 *eV* (d) 10.88 *eV*

79. *Mg* and *Li* are similar in their properties due to **[AFMC 2004]**
(a) Same *e/m* ratio (b) Same electron affinity
(c) Same group (d) Same ionic potential

80. The formation of the oxide ion $O^{2-}_{(g)}$ requires first an exothermic and then an endothermic step as shown below

$O_{(g)} + e^- = O^-_{(g)} \Delta H^0 = -142\ kJmol^{-1}$

$O^-_{(g)} + e^- = O^{2-}_{(g)} \Delta H^0 = 844\ kJmol^{-1}$

This is because **[AIEEE 2004]**
(a) O^- ion will tend to resist the addition of another electron
(b) Oxygen has high electron affinity
(c) Oxygen is more electronegative
(d) O^- ion has comparatively larger size than oxygen atom

81. Which is correct about ionisation potential **[MHCET 2003]**
(a) It is independent of atomic radii
(b) It increases with increase in atomic radii
(c) It remains constant with increase in atomic radii
(d) It decreases with increase in atomic radii

82. Flourine is the best oxidising agent because it has **[CPMT 2004]**
(a) Highest electron affinity
(b) Highest E^0_{red}
(c) Highest E^0_{oxid}
(d) Lowest electron affinity

83. Which among the following elements have lowest value of IE_1 **[CPMT 2004]**
(a) *Pb* (b) *Sn*
(c) *Si* (d) *C*

84. In a given shell, the order of screening effect is **[Kerala PMT 2004]**
(a) $s > p > d > f$ (b) $f > d > p > s$
(c) $p < d < s < f$ (d) $d > f < s > p$
(e) $f > p > s > d$

85. Which of the following has the highest first ionisation energy **[BHU 2004]**
(a) *Li* (b) *Be*
(c) *B* (d) *C*

86. Which one of the following sets of ions represents the collection of isoelectronic species **[AIEEE 2004]**
(a) $K^+, Cl^-, Mg^{2+}, Sc^{3+}$ (b) $Na^+, Ca^{2+}, Sc^{3+}, F^-$
(c) $K^+, Ca^{2+}, Sc^{3+}, Cl^-$ (d) $Na^+, Mg^{2+}, Al^{3+}, Cl$

87. The correct order of reactivity of halogens is **[MHCET 2003]**
(a) $F > Cl > Br > I$ (b) $F < Cl > Br < I$
(c) $F < Cl < Br < I$ (d) $F < Cl < Br > I$

88. The first ionisation potential is maximum for **[CPMT 2004]**
(a) *B* (b) *N*
(c) *O* (d) *Be*

89. The correct order of ionisation energy for comparing carbon, nitrogen and oxygen atoms is **[UPSEAT**
(a) $C > N > O$ (b) $C > N < O$
(c) $C < N > O$ (d) $C < N < O$

Electron affinity

1. Electron affinity depends on **[MP PMT 2002]**
(a) Atomic size
(b) Nuclear charge
(c) Atomic number
(d) Atomic size and nuclear charge both

2. Increasing order of electron affinity is **[RPET 2003]**
(a) $N < O < Cl < Al$ (b) $O < N < Al < Cl$
(c) $Al < N < O < Cl$ (d) $Cl < N < O < Al$

3. The correct order of electron affinity of *B, C, N, O* is **[MP PET 1997; J & K 2005]**
(a) $O > C > N > B$ (b) $B > N > C > O$
(c) $O > C > B > N$ (d) $O > B > C > N$

4. Which one has maximum electron affinity **[Roorkee 1995]**
(a) *N* (b) *Be*
(c) *B* (d) *Cl*

5. The electron affinity for the inert gases is **[Kurukshetra CEE 1998; MP PMT 2002]**
(a) Zero (b) High
(c) Negative (d) Positive

6. The electron affinities of halogens are $F = 322$, $Cl = 349$, $Br = 324$, $I = 295\,kJ\,mol^{-1}$. The higher value for Cl as compared to that of F is due to **[MP PMT 19**

(a) Weaker electron-electron repulsion in Cl

(b) Higher atomic radius of F

(c) Smaller electronegativity of F

(d) More vacant P - subshell in Cl

7. Which one of the following is an incorrect statement **[MP PMT 2001]**

(a) The ionisation potential of nitrogen is greater than that of oxygen

(b) The electron affinity of fluorine is greater than that of chlorine

(c) The ionisation potential of beryllium is greater than that of boron

(d) The electronegativity of fluorine is greater than that of chlorine

8. Electron affinity is the **[MP PMT 1993]**

(a) Energy absorbed when an electron is added to an isolated atom in the gaseous state

(b) Energy released when an electron is added to an isolated atom in the gaseous state

(c) Energy required to take out an electron from an isolated gaseous atom

(d) Power of an atom to attract an electron to itself

9. The electron affinity values for the halogens show the following trend **[Kerala PET 2002]**

(a) $F < Cl > Br > I$ (b) $F < Cl < Br < I$

(c) $F > Cl > Br > I$ (d) $F < Cl > Br < I$

10. Which element has maximum electron affinity

(a) Na (b) S

(c) Mg (d) Al

11. Which of the following has the least electron affinity in $kJmol^{-1}$ **[AFMC 2000]**

(a) Oxygen (b) Carbon

(c) Nitrogen (d) Boron

12. Fluorine has low electron affinity than chlorine because of **[CPMT 1997]**

(a) Smaller radius of fluorine, high density

(b) Smaller radius of chlorine, high density

(c) Bigger radius of fluorine, less density

(d) Smaller radius of chlorine, less density

13. For electron affinity of halogens which of the following is correct **[AIIMS 2004]**

(a) $Br > F$ (b) $F > Cl$

(c) $Br < Cl$ (d) $F > I$

14. Ionic compounds are formed most easily with **[DPMT 2005]**

(a) Low electron affinity, high ionisation energy

(b) High electron affinity, low ionisation energy

(c) Low electron affinity, low ionisation energy

(d) High electron affinity, high ionisation energy

15. In comparison with alkali metals, the electron affinity of halogens is

(a) Very high (b) Very low

(c) Nearly same (d) Exactly same

16. The electron affinity of **[CPMT 1994]**

(a) Carbon is greater than oxygen

(b) Sulphur is less than oxygen

(c) Iodine is greater than bromine

(d) Bromine is less than chlorine

17. The amount of energy which is released due to addition of extra electron to the outermost orbit of gaseous atom is called **[BHU 1996]**

(a) Electron capacity (b) Electron affinity

(c) Ionisation potential (d) Electronegativity

18. Which of the following species has the highest electron affinity **[KCET 1996]**

(a) F (b) O

(c) O^- (d) Na^+

19. The electron affinity values (in $kJ\,mol^{-1}$) of three halogens X, Y and Z are respectively – 349, – 333 and – 325. Then X, Y and Z are respectively **[EAMCET**

(a) F_2, Cl_2 and Br_2 (b) Cl_2, F_2 and Br_2

(c) Cl_2, Br_2 and F_2 (d) Br_2, Cl_2 and F_2

20. Nitrogen has lower electron affinity than its preceeding element carbon because

(a) Electron affinity decreases along a period

(b) Electron affinity generally increases along a period

(c) Nitrogen atom has half filled *p*-orbital

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

21. Electron affinity is the lowest for

(a) Nitrogen (b) Carbon

(c) Oxygen (d) Sulphur

22. Which one of the elements has the maximum electron affinity **[CPMT 1986; AFMC 1992, 95; Bihar MEE 1996; BHU 1997; CBSE PMT 1996, 99; MP PET 1995, 2001; AMU 2000]**

(a) F (b) Cl

(c) Br (d) I

23. Which among the following factors is the most important in making fluorine the strongest oxidizing halogen **[AIEEE 2004]**

(a) Hydration enthalpy

(b) Ionization enthalpy

(c) Electron affinity

(d) Bond dissociation energy

24. Which of the following pairs show reverse properties on moving along a period from left to right and from top to down in a group **[DCE 2003]**

(a) Nuclear charge and electron affinity

(b) Ionisation energy and electron affinity

(c) Atomic radius and electron affinity

(d) None of these

25. Which of the following properties show gradual decrease with increase in atomic number across a period in the periodic table **[Pb. CET 2003]**

(a) Electron affinity (b) Ionization potential

(c) Electronegativity (d) Size of atom

26. Order of electron affinity of F, Cl, Br and I is ..... **[AFMC 1999; Orissa JEE 2004,05]**

(a) $F < Cl > Br > I$ (b) $F > Cl > Br > I$

(c) $F < Cl < Br < I$ (d) $F > Cl < Br > I$

27. Which one of the following arrangements represents the correct order of electron gain enthalpy (with negative sign) of the given atomic species. **[CBSE PMT 2005]**

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

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

Electronegativity

1. Between HF, HCl, HBr and HI, HF has the highest ionic character because

(a) F has the highest electron affinity

(b) In HF, electronegativity difference is highest

(c) F^- ion has the highest value of ionic radius

(d) Atomic orbitals of H and F have almost similar energy

2. On going from right to left in a period in the periodic table the electronegativity of the elements **[MP PET/PMT 1998; MP PMT 2002]**

(a) Increases

(b) Decreases

(c) Remain unchanged

(d) Decreases first then increases

3. On Pauling scale which of the following does not have electronegativity ≥ 3.0 **[MP PET 1994]**

(a) Oxygen (b) Nitrogen

(c) Chlorine (d) Bromine

4. Which one of the following represents the electronic configuration of the most electropositive element **[AIIMS 1982; CPMT 1994; MP PMT 2000]**

(a) $[He]2s^1$ (b) $[Xe]6s^1$

(c) $[He]2s^2$ (d) $[Xe]6s^2$

5. An atom with high electronegativity has **[Kerala (Med.) 2003]**

(a) Large size

(b) High ionisation potential

(c) Low electron affinity

(d) Low ionisation potential

6. Two elements whose electronegativities are 1.2 and 3.0 the bond formed between them would be **[MP PET 2002]**

(a) Ionic (b) Covalent

(c) Coordinate (d) Metallic

7. The solubilities of carbonates decreases down the magnesium group due to a decrease in **[AIEEE 2003]**

(a) Lattice energies of solids

(b) Hydration energies of cations

(c) Inter-ionic attraction

(d) Entropy of solution formation

8. Which element has the highest electronegativity

or

Which of the following is the most electronegative **[CPMT 1981; Roorkee 1995; MP PMT 2003; EAMCET 1980; CPMT 1989; MNR 1994; MP PMT 1999]**

(a) F (b) He

(c) Ne (d) Na

9. Which element has the highest electronegativity **[MP PET/PMT 1998]**

(a) C (b) Mg

(c) O (d) S

10. Keeping in view the periodic law and the periodic table suggest which of the following elements should have the maximum electronegative character **[MNR 1985]**

(a) P (b) As

(c) Bi (d) Sb

11. The outermost electronic configuration of the most electronegative element is **[MP PET 1996; RPMT 1997; MP PET 2004]**

(a) ns^2np^3 (b) ns^2np^4

(c) ns^2np^5 (d) ns^2np^6

12. Going from fluorine to chlorine, bromine and iodine, the electronegativity **[MP PMT 2000]**

(a) Increases

(b) Decreases

(c) First decreases then increases

(d) Changes randomly

13. Of the following elements, which one has highest electro-negativity **[CPMT 1988; CBSE PMT 1991; BHU 1996; Kurukshetra CET 2002; Pb. PMT 2004]**

(a) I (b) Br

(c) Cl (d) F

14. Which of the following is most electronegative **[CPMT 1999]**

(a) Carbon (b) Silicon

(c) Lead (d) Tin

15. The property of attracting electrons by the halogen atom in a molecule is called **[CPMT 1996]**

(a) Ionisation potential (b) Electron affinity

(c) Electronegativity (d) Electronic attraction

16. In third row of periodic table from Na to Cl **[MP PET 1986]**

(a) Electronegativity increases

(b) Electronegativity decreases

(c) Ionization energy decreases

(d) Atomic volume increases

17. Which of the following is the most electropositive element **[AIIMS 1998]**

(a) Aluminium (b) Magnesium

(c) Phosphorus (d) Sulphur

18. Which of the following sets of atoms is arranged in order of increasing electronegativity

(a) *S, Si, P* (b) *S, P, Si*

(c) *Si, P, S* (d) *Si, S, P*

19. Which of the following property displays progressive increase with the rise in atomic number across a period in the periodic table

(a) Electronegativity (b) Electron affinity

(c) Ionization potential (d) Size of the atom

20. With respect to chlorine, hydrogen will be **[NCERT 1978; MP PMT 2003]**

(a) Electropositive (b) Electronegative

(c) Neutral (d) None of the above

21. The correct order of electropositive nature of *Li*, *Na* and *K* is

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

(c) *Na* > *K* > *Li* (d) *K* > *Na* > *Li*

22. Electronegativity is a measure of the capacity of an atom to **[CPMT 1989]**

(a) Attract electrons (b) Attract protons

(c) Repel electrons (d) Repel protons

23. With increasing atomic number in a certain period **[MP PMT 1987]**

(a) The chemical reactivity decreases

(b) The chemical reactivity increases

(c) The electropositive character increases

(d) The electronegative character increases

24. Which of the following have maximum electronegativity **[CPMT 1982]**

(a) *Al* (b) *S*

(c) *Si* (d) *P*

25. Which element has the lowest electronegativity **[CPMT 1976]**

(a) *Li* (b) *F*

(c) *Fe* (d) *Cl*

26. The attraction that an atom exerts on a pair of electrons that are being shared between that atom and another atom to which it is bonded by a covalent bond is referred to as its **[Manipal MEE 1995]**

(a) Electron affinity (b) Electronegativity

(c) Ionisation energy (d) Valence

27. The electronegativity of the following elements increases in the order **[IIT 1987]**

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

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

28. Choose the correct statement

(a) Electronegativity increases down a group

(b) Electronegativity decreases down a group

(c) Electronegativity decreases from left to right along a period

(d) Electronegativity changes along a group but remains constant along a period

29. In C, N, O and F the electronegativity **[DPMT 2001]**

(a) Decreases from carbon to fluorine

(b) Increases from carbon to fluorine

(c) Increases from carbon to oxygen and then decreases

(d) Decreases from carbon to oxygen and then increases

30. Which is the correct order of electronegativities **[EAMCET 1990]**

(a) $F > N < O > C$ (b) $F > N > O > C$

(c) $F < N < O < C$ (d) $F > N > O < C$

31. In the following, the element with the highest electropositivity is **[MP PET/PMT 1998]**

(a) Copper (b) Caesium

(c) Barium (d) Chromium

32. Which one of the following has the highest electronegativity **[UPSEAT 2004]**

(a) *Br* (b) *Cl*

(c) *P* (d) *Si*

33. Which or these have no unit **[AFMC 2004]**

(a) Electronegativity (b) Electron affinity

(c) Ionisation energy (d) Excitation potential

34. The polarising ability of which one of the following is highest **[DCE 2003]**

(a) Small highly +ve ion (b) Large +ve ion

(c) Small highly –ve ion (d) Large –ve ion

35. Among Al_2O_3, SiO_2, P_2O_3 and SO_2 the correct order of acid strength is **[AIEEE 2004]**

(a) $Al_2O_3 < SiO_2 < SO_2 < P_2O_3$

(b) $SiO_2 < SO_2 < Al_2O_3 < P_2O_3$

(c) $SO_2 < P_2O_3 < SiO_2 < Al_2O_3$

(d) $Al_2O_3 < SiO_2 < P_2O_3 < SO_2$

Valency and oxidation state

1. Which one of the following oxides is neutral **[IIT-JEE 1996]**

(a) *CO* (b) SnO_2

(c) *ZnO* (d) SiO_2

2. All element in 3rd period have **[JIPMER 1997]**

(a) An atomic number 3

(b) 3 complete sub-shells

(c) Valence electrons shell

(d) 3 electrons less than the octet

3. Which shows variable valency **[RPMT 1997]**

(a) *s* - block elements (b) *p* - block elements

(c) *d* - block elements (d) Radioactive elements

4. Most reducing agent is **[UPSEAT 1999]**

(a) *K* (b) *Mg*

(c) *Al* (d) *Ba*

5. Acidity of pentoxides in VA group **[CPMT 1982]**

(a) Decreases (b) Increases

(c) Remains same (d) None

6. If the valency shell electronic structure for an element is ns^2np^5, this element will belong to the group of **[CBSE PMT 1992]**

(a) Alkali metals (b) Inert metals

(c) Noble gases (d) Halogens

7. The order in which the following oxides are arranged according to decreasing basic nature is **[CPMT 19**

(a) Na_2O, MgO, Al_2O_3, CuO

(b) MgO, Al_2O_3, CuO, Na_2O

(c) Al_2O_3, MgO, CuO, Na_2O

(d) CuO, Na_2O, MgO, Al_2O_3

8. Strongest reducing agent is **[RPMT 1997]**

(a) Cl_2 (b) Cl^-

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

9. Metallic nature and basic nature of the oxides ..... as we move along a period

(a) Increases

(b) Decreases

(c) First increases then decreases

(d) Remains constant

10. The correct order of increasing order of oxidising power is **[DCE 2000]**

(a) $F_2 < Cl_2 < Br_2 < I_2$ (b) $F_2 < Br_2 < Cl_2 < I_2$

(c) $Cl_2 < Br_2 < F_2 < I_2$ (d) $I_2 < Br_2 < Cl_2 < F_2$

11. The most basic among these hydroxides, is **[MP PMT 2003]**

(a) $Be(OH)_2$ (b) $Mg(OH)_2$

(c) $Ca(OH)_2$ (d) $Ba(OH)_2$

12. In any period the valency of an element with respect to oxygen **[Kerala (Med.) 2003]**

(a) Increases one by one from I*A* to VII*A*

(b) Decreases one by one form I*A* to VII*A*

(c) Increases one by one from I*A* to IV*A* and then decreases from V*A* to VII*A* one by one

(d) Decreases one by one from I*A* to IV*A* and then increases from V*A* to VII*A* one by one

13. Which will show maximum non-metallic character **[UPSEAT 2003]**

(a) *B* (b) *Be*

(c) *Mg* (d) *Al*

14. Which of the following halogen acids is least acidic **[RPET 2003]**

(a) *HI* (b) *HCl*

(c) *HF* (d) *HBr*

15. Pentavalency in phosphorus is more stable when compared to that of nitrogen even through they belong to same group is due to **[KCET 2002]**

(a) Reactivity of phosphorus

(b) Inert nature of nitrogen

(c) Dissimilar electronic configuration

(d) Larger size of phosphorus atom

16. In the ground state of cobalt atom (Z = 27) there are ..... unpaired electrons and thus the atom is.....

(a) 2, diamagnetic (b) 2, paramagnetic

(c) 3, diamagnetic (d) 3, paramagnetic

17. Variable valency in general, is exhibited by **[CPMT 1974, 84, 89; DPMT 1981, 82; MP PET 2001]**

(a) Transition elements (b) Gaseous elements

(c) Non-metals (d) s -block elements

18. An element of atomic weight 40 has 2, 8, 8, 2 as the electronic configuration. Which one of the following statements regarding this element is not correct

(a) It belongs to II group of the periodic table

(b) It has 20 neutrons

(c) The formula of its oxide is MO_2

(d) It belongs to 4th period of the periodic table

19. Which of the following oxides is most basic **[MP PET 1994]**

(a) Na_2O (b) Al_2O_3

(c) SiO_2 (d) SO_2

20. In the periodic table, the metallic character of elements **[MP PET 1993]**

(a) Decreases from left to right across a period and on descending a group

(b) Decreases from left to right across a period and increases on descending a group

(c) Increases from left to right across a period and on descending a group

(d) Increases from left to right across a period and decreases on descending a group

21. The halogen that most easily reduced is **[MP PMT 2000]**

(a) F_2 (b) Cl_2

(c) Br_2 (d) I_2

22. Which of the following is the correct order of gradually decreasing basic nature of the oxides **[MP PMT 19**

(a) Al_2O_3, MgO, Cl_2O_7, SO_3

(b) MgO, Al_2O_3, SO_3, Cl_2O_7

(c) Cl_2O_7, SO_3, Al_2O_3, MgO

(d) SO_3, Cl_2O_7, MgO, Al_2O_3

23. The correct order of reactivity of halogen is **[BHU 2000]**

(a) Flourine > bromine > chlorine > iodine

(b) Flourine > chlorine > bromine > iodine

(c) Iodine > bromine > chlorine > flourine

(d) Bromine > chlorine > flourine > iodine

24. Elements A and B with their respective electronic configurations $3d^{10}\,4s^1$ and $4d^{10}\,5s^1$ in their outermost shell are

(a) Both non-metals

(b) Both coinage metals

(c) A is a non-metal and B is coinage metal

(d) A is a coinage metal and B is non-metal

25. Which is the best reducing agent **[MP PET 2000]**

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

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

26. Which of the following group of elements eliminates electron easily

(a) *N, P, As* (b) *O, S, Se*

(c) *Li, Na, K* (d) *Cl, Ba, I*

27. The maximum valency of an element with atomic number 7 is **[AFMC 2002]**

(a) 2 (b) 5

(c) 4 (d) 3

28. Which of the following metals exhibits more than one oxidation state **[MP PET 1999]**

(a) *Na* (b) *Mg*

(c) *Fe* (d) *Al*

29. Out of the following elements which one do you expect to be most reactive chemically **[CPMT 1983]**

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

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

30. Thalium shows different oxidation states because **[AIIMS 1982]**

(a) It is a transition element

(b) Of inert pair effect

(c) Of its amphoteric character

(d) Of its higher reactivity

31. Oxidising action increases in halogen in the following order **[DPMT 1990]**

(a) $Cl < Br < I < F$ (b) $Cl < I < Br < F$

(c) $I < F < Cl < Br$ (d) $I < Br < Cl < F$

32. Fluorine, chlorine, bromine and iodine are placed in the same group (17) of the periodic table, because **[KCET (Med.) 1999]**

(a) They are non-metals

(b) They are electronegative

(c) Their atoms are generally univalent

(d) They have 7 electrons in the outermost shell of their atom

33. Which of the following sequence correctly represents the decreasing acid nature of oxides **[AMU 2000]**

(a) $Li_2O > BeO > B_2O_3 > CO_2 > N_2O_3$

(b) $N_2O_3 > CO_2 > B_2O_3 > BeO > Li_2O$

(c) $CO_2 > N_2O_3 > B_2O_3 > BeO > Li_2O$

(d) $B_2O_3 > CO_2 > N_2O_3 > Li_2O > BeO$

34. Which of the following aqueous acid is most acidic **[AMU 2000]**

(a) HCl (b) HF

(c) HI (d) HBr

35. The correct order of the increasing ionic character is **[MP PET 2000]**

(a) $BeCl_2 < MgCl_2 < CaCl_2 < BaCl_2$

(b) $BeCl_2 < MgCl_2 < BaCl_2 > CaCl_2$

(c) $BeCl_2 < BaCl_2 < MgCl_2 < CaCl_2$

(d) $BaCl_2 < CaCl_2 < MgCl_2 < BeCl_2$

36. Which of the following elements is found in native state **[RPET 1999]**

(a) Al (b) Au

(c) Cu (d) Na

37. The basis of keeping the elements in the group of a periodic table is **[RPET 1999]**

(a) Ionisation potential

(b) Electronegativity

(c) Electron affinity

(d) Number of electrons in the valence shell

38. Which of the following electronic configurations in the outermost shell is characteristic of alkali metals **[Bihar CEE 1992]**

(a) $(n-1)s^2p^6, ns^2p^1$ (b) $(n-1)s^2p^6d^{10}, ns^1$

(c) $(n-1)s^2p^6, ns^1$ (d) $ns^2p^6d^1$

39. On moving down the group gradually increase

(a) Oxidising property (b) Electronegativity

(c) Acidic property (d) Metallic property

40. An ion which has 18 electrons in the outermost shell is

(a) K^+ (b) Ca^{2+}

(c) Na^+ (d) Cu^+

41. Increasing order of acid strength of halogen acid is **[DCE 2000]**

(a) $HF < HCl < HBr < HI$

(b) $HCl < HBr < HI < HF$

(c) $HF < HI < HBr < HCl$

(d) None of these

42. Which is the weakest base **[KCET 1993]**

(a) $NaOH$ (b) KOH

(c) $Ca(OH)_2$ (d) $Zn(OH)_2$

43. Which of the following elements shows maximum number of different oxidation states in its compounds **[CBSE PMT 1998]**

(a) Eu (b) La

(c) Gd (d) Am

44. The valency shell of calcium contains **[JIPMER 2000]**

(a) 8 electrons (b) 6 electrons

(c) 4 electrons (d) 2 electrons

45. 3 and 6 electrons are present in the outermost orbit of A and B respectively. The chemical formula of its compound will be

(a) A_3B_2 (b) A_2B_3

(c) A_2B (d) AB

46. Which of the following halogens doesn't exhibit positive oxidation state in its compounds **[MH CET 1999]**

(a) Cl (b) Br

(c) I (d) F

47. The most basic element is **[MP PET 2000; JIPMER 2000]**

(a) Fluorine (b) Iodine

(c) Chlorine (d) Bromine

48. Which of the following set has the strongest tendency to form anions **[AFMC 1999]**

(a) Ga, In and Te (b) Na, Mg and Al

(c) N, O and F (d) V, Cr and Mn

49. An element X which occurs in the first short period has an outer electronic structure s^2p^1. What are the formula and acid-base character of its oxides **[DCE 1999]**

(a) XO_3, basic (b) X_2O_3, basic

(c) X_2O_3, amphoteric (d) XO_2, acidic

50. Which of the following gas does not have an octet or eight electrons in the outer shell **[CBSE PMT 2001]**

(a) Ne (b) Ar

(c) Rn (d) He

51. Beryllium and aluminium exhibit many properties which are similar. But, the two elements differ in **[AIEEE 2**

(a) Forming covalent halides

(b) Forming polymeric hydrides

(c) Exhibiting maximum covalency in compounds

(d) Exhibiting amphoteric nature in their oxides

Critical Thinking

Objective Questions

1. Which of the following statement is correct with respect to the property of elements with an increase in atomic number in the carbon family (group 14) **[BHU 2004]**

(a) Atomic size decrease

(b) Ionization energy increase

(c) Metallic character decrease

(d) Stability of +2 oxidation state increase

2. The pair of amphoteric hydroxides is **[AIIMS 2005]**

(a) $Al(OH)_3$, $LiOH$

(b) $Be(OH)_2$, $Mg(OH)_2$

(c) $B(OH)_3$, $Be(OH)_2$

(d) $Be(OH)_2$, $Zn(OH)_2$

3. Which of the following oxides is amphoteric in character **[AIEEE 2005]**

(a) CaO (b) CO_2

(c) SiO_2 (d) SnO_2

4. Which has highest melting point **[RPMT 1997]**

(a) $LiCl$ (b) $BeCl_2$

(c) BCl_3 (d) CCl_4

5. Arrange S, O and Se in ascending order of electron affinity **[Roorkee 1990]**

(a) $Se < S < O$ (b) $Se < O < S$

(c) $S < O < Se$ (d) $S < Se < O$

6. Which of the following is not the correct increasing order of ionisation energy **[RPMT 2000]**

(a) $Cl^- < Ar < K^+$ (b) $Au < Ag < Cu$

(c) $Cs < Rb < K$ (d) $K < Ca < Sc$

7. 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 ionization enthalpy

(c) $I < Br < F < Cl$: Increasing electron gain enthalpy (with negative sign)

(d) $Li < Na < K < Rb$: Increasing metallic radius

8. Which element has the greatest tendency to loose electrons **[NCERT 1980]**

(a) F (b) S

(c) Fe (d) Be

9. Strongest acid is **[RPMT 1997]**

(a) Al_2O_3 (b) MgO

(c) Na_2O (d) CaO

10. Which one of the following arrangements represents the correct order of electron gain enthalpy (with negative sign) of the given atomic species **[CBSE PMT 2005]**

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

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

11. Increasing order of electronegativity is **[RPET 2003]**

(a) $Bi < P < S < Cl$ (b) $P < Bi < S < Cl$

(c) $S < Bi < P < Cl$ (d) $Cl < S < Bi < P$

12. What will be the order of Ist ionisation energy **[BHU 2005]**

(a) $Li > Na > K$ (b) $K > Li > Na$

(c) $Na > Li > K$ (d) $Li > K > Na$

13. Which of the following configurations represents atoms of the elements having the highest second ionization energy **[Pb. PMT 1998]**

(a) $1s^2 2s^2 2p^4$ (b) $1s^2 2s^2 2p^6$

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

14. The first ionization potentials in electron volts of nitrogen and oxygen atoms are respectively given by **[IIT 1987]**

(a) 14.6, 13.6 (b) 13.6, 14.6

(c) 13.6, 13.6 (d) 14.6, 14.6

15. The elements which occupy the peaks of ionisation energy curve, are **[CBSE 2000]**

(a) Na, K, Rb, Cs (b) Na, Mg, Cl, I

(c) Cl, Br, I, F (d) He, Ne, Ar, Kr

16. Which is the correct order of ionic sizes (At. No. : Ce = 58, Sn = 50, Yb = 70 and Lu = 71) **[AIEEE 2002]**

(a) $Ce > Sn > Yb > Lu$ (b) $Sn > Ce > Lu > Yb$

(c) $Lu > Yb > Sn > Ce$ (d) $Sn > Yb > Ce > Lu$

17. A sudden large jump between the values of second and third ionisation energies of an element would be associated with the electronic configuration **[CBSE PMT 1992; AFMC 1998; CPMT 1999]**

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

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

18. Which element having following electronic configurations has minimum ionization potential **[NCERT 1978; KCET 1991; CBSE PMT 1991; Pb. PET 1999; BHU 2000]**

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

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

19. Arrange F, Cl, O, N in the decreasing order of electronegativity

(a) $O > F > N > Cl$ (b) $F > N > Cl > O$

(c) $Cl > F > N > O$ (d) $F > O > N > Cl$

20. Ionic radii of **[IIT-JEE 1999]**

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

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

21. Which of the following have high electron affinity **[BHU 2000, 05]**

(a) F (b) Cl

(c) N (d) O

22. In which block 106th element belongs **[DCE 2000]**

(a) s-block (b) p-block

(c) d-block (d) f-block

AR Assertion & Reason

For AIIMS Aspirants

Read the assertion and reason carefully to mark the correct option out of the options given below :

(a) If both assertion and reason are true and the reason is the correct explanation of the assertion.
(b) If both assertion and reason are true but reason is not the correct explanation of the assertion.
(c) If assertion is true but reason is false.
(d) If the assertion and reason both are false.
(e) If assertion is false but reason is true.

1. Assertion : Positive ions will be wider than parent ato

Reason : Nuclear charge pulls them closer

2. Assertion : Dinegative anion of oxygen (O^{2-}) is quite common but dinegative anion of sulphur (S^{2-}) is less common

Reason : Covalency of oxygen is two **[AIIMS 2002]**

3. Assertion : The atomic radii of calcium is smaller than sodium.

Reason : Calcium has a lower nuclear charge than sodium **[AIIMS 1999]**

4. Assertion : The first ionization energy of *Be* is greater than that of *B*

Reason : 2*p* orbital is lower in energy than 2*s* of **[IIT-JEE Screening 2000]**

5. Assertion : *LiCl* is predominantly a covalent compound

Reason : Electronegativity difference between *Li* and *Cl* is too small **[IIT-JEE 1998]**

6. Assertion : *F* atom has a less negative electron affinity than *Cl* atom

Reason : Additional electrons are repelled more effectively by 3*p* electrons in *Cl* atom than by 2*p* electrons in *F* atom **[IIT-JEE 1998]**

7. Assertion : Noble gases have maximum electron affinity. **[AIIMS 1995]**

Reason : High electron affinity shows that the electron is loosely bonded to the atom.

8. Assertion : The first ionisation energy of *Be* is greater than boron **[AIIMS 2002]**

Reason : 2*p* orbitals have lower energy than 2*s* orbitals.

9. Assertion : Atomic number of the element ununbium is 112.

Reason : Name for digits 1 and 2 is un-and bi-respectively in latin words.

10. Assertion : Chemistry of Actinoids is more complicated than Lanthanoids.

Reason : Actinoid elements are radioactive.

11. Assertion : Ionization enthalpy is always negative.

Reason : Energy is always released when electrons are removed.

12. Assertion : Shielding effect increases as we go down the group.

Reason : More is the number of electrons in the penultimate shell, more is shielding.

13. Assertion : Ionization potential across the period is *Na* < *Al* < *Mg* < *Si*.

Reason : Ionization potential decreases with decrease in atomic size.

14. Assertion : More is the electron affinity greater is the reducing character.

Reason : Reducing character depends on number of electrons gained.

15. Assertion : Ground state configuration of *Cr* is $3d^5, 4s^1$.

Reason : A set of half filled orbitals containing one electron each with their spin parallel provides extra stability to the system.

16. Assertion : I.E. of $_7N$ is more than that of $_8O$ as well as $_6C$.

Reason : This is due to difference in reactivity towards oxygen.

17. Assertion : NO^- ion is isoelectronic with CN^- ion.

Reason : Isoelectronic ions have same number of elelctrons.

18. Assertion : Outermost electronic configuration of most electropositive elements is $ns^2\ np^3$.

Reason : $ns^2\ np^3$ is stable due to half filled subshell.

19. Assertion : First ionization energy for nitrogen is lower than oxygen.

Reason : Across a period effective nuclear charge decreases. **[AIIMS 2005]**

ANSWERS

Extended or long form of periodic table

1	c	2	d	3	c	4	a	5	c
6	c	7	b	8	b	9	b	10	a
11	d	12	a	13	d	14	d	15	b
16	a	17	d	18	c	19	a	20	b
21	a	22	a	23	b	24	a	25	c
26	a	27	a	28	a	29	b	30	d
31	c	32	c	33	c	34	a	35	b
36	b	37	d	38	c	39	a	40	d
41	a	42	c	43	d	44	d	45	c
46	a	47	b	48	b	49	c	50	c
51	b	52	b	53	c	54	d	55	b
56	c	57	c	58	b	59	a	60	d
61	b	62	b	63	a	64	c	65	a
66	d	67	d	68	a	69	c	70	d
71	c	72	b	73	c	74	c	75	a
76	d	77	a	78	b	79	d	80	c
81	b	82	d	83	b	84	b	85	b
86	d	87	a	88	d	89	c	90	b
91	d	92	b	93	c	94	a	95	d
96	d	97	c	98	b	99	a	100	c
101	c	102	c	103	abcd	104	c	105	d
106	a	107	d	108	a	109	a	110	b
111	b	112	a	113	b	114	a	115	d
116	c	117	c	118	c	119	a	120	c
121	d	122	b	123	a	124	b	125	b
126	b	127	d	128	c	129	b	130	d
131	d								

Atomic and Ionic radii

1	b	2	d	3	c	4	a	5	a
6	d	7	a	8	b	9	b	10	d
11	a	12	d	13	d	14	a	15	a
16	d	17	d	18	d	19	a	20	a
21	b	22	d	23	a	24	a	25	c
26	d	27	c	28	b	29	c	30	c
31	c	32	b	33	d	34	a	35	d
36	a	37	d	38	a	39	b	40	d
41	b	42	a	43	a	44	d	45	a
46	d	47	a	48	c	49	d	50	a
51	b	52	a	53	d	54	a	55	c
56	b	57	c	58	b	59	c	60	b
61	a	62	d	63	c	64	a	65	d
66	d	67	d	68	c	69	c	70	c
71	b	72	a						

Ionisation energy

1	b	2	c	3	d	4	a	5	c
6	a	7	c	8	d	9	a	10	a
11	b	12	c	13	a	14	d	15	b
16	a	17	a	18	c	19	a	20	b
21	d	22	b	23	d	24	c	25	b
26	c	27	b	28	a	29	c	30	b
31	a	32	b	33	a	34	c	35	c
36	c	37	d	38	b	39	c	40	a
41	c	42	b	43	a	44	b	45	b
46	d	47	a	48	b	49	a	50	a
51	a	52	d	53	a	54	a	55	c
56	b	57	a	58	a	59	d	60	a
61	d	62	d	63	a	64	b	65	b
66	c	67	a	68	b	69	a	70	c
71	a	72	b	73	d	74	b	75	d
76	b	77	c	78	c	79	d	80	a
81	d	82	b	83	b	84	a	85	d
86	c	87	a	88	b	89	c		

Electron affinity

1	d	2	c	3	c	4	d	5	a
6	a	7	b	8	b	9	a	10	b
11	c	12	a	13	c	14	b	15	a
16	d	17	b	18	a	19	b	20	c
21	b	22	b	23	d	24	c	25	d
26	a	27	b						

Electronegativity

1	b	2	b	3	d	4	b	5	b
6	a	7	b	8	a	9	c	10	a
11	c	12	b	13	d	14	a	15	c
16	a	17	b	18	c	19	a	20	a
21	d	22	a	23	d	24	b	25	a
26	b	27	c	28	b	29	b	30	a
31	b	32	b	33	a	34	a	35	d

Valency and oxidation state

1	a	2	c	3	c	4	a	5	a
6	d	7	a	8	d	9	b	10	d
11	d	12	c	13	a	14	c	15	d
16	d	17	a	18	c	19	a	20	b
21	a	22	b	23	b	24	b	25	d
26	c	27	b	28	c	29	d	30	b
31	d	32	d	33	b	34	c	35	a
36	b	37	d	38	c	39	d	40	d
41	a	42	d	43	d	44	d	45	b
46	d	47	b	48	c	49	c	50	d
51	d								

Critical Thinking Questions

1	d	2	d	3	d	4	b	5	a
6	b	7	b	8	c	9	a	10	b
11	a	12	a	13	c	14	a	15	d
16	b	17	d	18	c	19	d	20	d
21	b	22	c						

Assertion & Reason

1	d	2	b	3	c	4	c	5	c
6	c	7	d	8	a	9	a	10	b
11	d	12	a	13	c	14	e	15	a
16	c	17	e	18	e	19	b		

Answers

Extended or long form of periodic table

1	c	2	d	3	c	4	a	5	c
6	c	7	b	8	b	9	b	10	a
11	d	12	a	13	d	14	d	15	b
16	a	17	d	18	c	19	a	20	b
21	a	22	a	23	b	24	a	25	c
26	a	27	a	28	a	29	b	30	d
31	c	32	c	33	c	34	a	35	b
36	b	37	d	38	c	39	a	40	d
41	a	42	c	43	d	44	d	45	c
46	a	47	b	48	b	49	c	50	c
51	b	52	b	53	c	54	d	55	b
56	c	57	c	58	b	59	a	60	d
61	b	62	b	63	a	64	c	65	a
66	d	67	d	68	a	69	c	70	d
71	c	72	b	73	c	74	c	75	a
76	d	77	a	78	b	79	d	80	c
81	b	82	d	83	b	84	b	85	b
86	d	87	a	88	d	89	c	90	b
91	d	92	b	93	c	94	a	95	d
96	d	97	c	98	b	99	a	100	c
101	c	102	c	103	abcd	104	c	105	d
106	a	107	d	108	a	109	a	110	b
111	b	112	a	113	b	114	a	115	d
116	c	117	c	118	c	119	a	120	c
121	d	122	b	123	a	124	b	125	b
126	b	127	d	128	c	129	b	130	d
131	d								

Atomic and Ionic radii

1	b	2	d	3	c	4	a	5	a
6	d	7	a	8	b	9	b	10	d
11	a	12	d	13	d	14	a	15	a
16	d	17	d	18	d	19	a	20	a
21	b	22	d	23	a	24	a	25	c
26	d	27	c	28	b	29	c	30	c
31	c	32	b	33	d	34	a	35	d
36	a	37	d	38	a	39	b	40	d
41	b	42	a	43	a	44	d	45	a
46	d	47	a	48	c	49	d	50	a
51	b	52	a	53	d	54	a	55	c
56	b	57	c	58	b	59	c	60	b
61	a	62	d	63	c	64	a	65	d
66	d	67	d	68	c	69	c	70	c
71	b	72	a						

Ionisation energy

1	b	2	c	3	d	4	a	5	c
6	a	7	c	8	d	9	a	10	a
11	b	12	c	13	a	14	d	15	b
16	a	17	a	18	c	19	a	20	b
21	d	22	b	23	d	24	c	25	b
26	c	27	b	28	a	29	c	30	b
31	a	32	b	33	a	34	c	35	c
36	c	37	d	38	b	39	c	40	a
41	c	42	b	43	a	44	b	45	b
46	d	47	a	48	b	49	a	50	a
51	a	52	d	53	a	54	a	55	c
56	b	57	a	58	a	59	d	60	a
61	d	62	d	63	a	64	b	65	b
66	c	67	a	68	b	69	a	70	c
71	a	72	b	73	d	74	b	75	d
76	b	77	c	78	c	79	d	80	a
81	d	82	b	83	b	84	a	85	d
86	c	87	a	88	b	89	c		

Electron affinity

1	d	2	c	3	c	4	d	5	a
6	a	7	b	8	b	9	a	10	b
11	c	12	a	13	c	14	b	15	a
16	d	17	b	18	a	19	b	20	c
21	b	22	b	23	d	24	c	25	d
26	a	27	b						

Electronegativity

1	b	2	b	3	d	4	b	5	b
6	a	7	b	8	a	9	c	10	a
11	c	12	b	13	d	14	a	15	c
16	a	17	b	18	c	19	a	20	a
21	d	22	a	23	d	24	b	25	a
26	b	27	c	28	b	29	b	30	a

31	b	32	b	33	a	34	a	35	d

Valency and oxidation state

1	a	2	c	3	c	4	a	5	a
6	d	7	a	8	d	9	b	10	d
11	d	12	c	13	a	14	c	15	d
16	d	17	a	18	c	19	a	20	b
21	a	22	b	23	b	24	b	25	d
26	c	27	b	28	c	29	d	30	b
31	d	32	d	33	b	34	c	35	a
36	b	37	d	38	c	39	d	40	d
41	a	42	d	43	d	44	d	45	b
46	d	47	b	48	c	49	c	50	d
51	d								

Critical Thinking Questions

1	d	2	d	3	d	4	b	5	a
6	b	7	b	8	c	9	a	10	b
11	a	12	a	13	c	14	a	15	d
16	b	17	d	18	c	19	d	20	d
21	b	22	c						

Assertion & Reason

1	d	2	b	3	c	4	c	5	c
6	c	7	d	8	a	9	a	10	b
11	d	12	a	13	c	14	e	15	a
16	c	17	e	18	e	19	b		

AS Answers and Solutions

Extended or long form of periodic table

2. (d) n/p ratio is a cause of radioactivity.

5. (c) Halogens has 7 electrons in his valance shell (ns^2np^5).

6. (c) As alkali metals have tendency to loose e^-.

7. (b) Each period consists of a series of elements whose atom have the same principal quantum no. (n) of the outer most shell i.e. In second period $n=2$, this shell has four orbitals (one 2s and three $2p$) which can have eight electrons, hence second period contains 8 elements from atomic no. 3 to 10.

9. (b) Neils Bohr developed the long form of periodic table on the basis of Mosley's principle.

10. (a) $33-1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,3d^{10}\,4s^2\,4p^3$

11. (d) 16-$1s^2\,2s^2\,2p^6\,3s^2\,3p^4$ there are $6e^-$ in outer most shell therefore its group is VIthA.

13. (d) Many metals with catalytic properties because

(i) They provide surface area for reaction to occur

(ii) They decreases the ionisation energy.

(iii) They have vacant d-orbitals.

17. (d) Aluminium. As it belongs to p-block element.

18. (c) $Cu_{29}-[Ar]\;\;3d^{10}4s^1$.

21. (a) $1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,4s^2$ principal quantum no. is 4 so it belongs to 4^{th} period.

23. (b) Inert gases, these have ns^2np^6 configuration.

24. (a) $1s^2\,2s^2\,2p^2-$ there are $4e^-$ in valence shell therefore it goes to IV- group.

27. (a) $U > Ra > Pb > Hg$

28. (a) Mg – Ba. Both belongs to II-A group.

29. (b) $Na-Cl$. Both belongs to III period.

30. (d) Elements of second and third period

Diagonal relationship

II	Li	Be	B	C	N	O	F
III	Na	Mg	Al	Si	P	S	Cl

31. (c) d-Block because the last electron enters d-subshell.

34. (a) Kr has atomic no. 36 which is a noble gas and all noble gases are included in the p-block.

38. (c) d-block. As the last e^- enters in d-subshell.

40. (d) Due to its vacant p-orbital.

41. (a) By obserbing principal quantum number (n), Orbital (s, p, d, f) and equating no. of e^-'s we are able to find the period, block and group of element in periodic table.

42. (c) $33: 1s^2,\ 2s^2,\ 2p^6,\ 3s^2, 3p^6, 4s^2, 3d^{10}, 4p^3$

In its valence shell $5e^-$ are present so it is fifth (A) group element.

43. (d) 38 is the atomic no. of strontium (Sr) which is s-block element and all the elements of s-block are metals.

44. (d) Hydrogen resembles alkali metals in some properties so it can be placed in the first group of periodic table.

47. (b) Chalcons are oxygen family.

49. (c) Both belongs to VA group.

50. (c) According to Dobernier law of triads the atomic mass of the central element was nearly the arithmetic mean of atomic masses of other two elements.

Cl	*Br*	*I*	Arithmetic mean
31	75	120	$\frac{120+31}{2}=75.5$

53. (c) Z = 2,8,8,1. $\because$ it would donate e^- more easily.

54. (d) Last electron goes to *s*-subshell.

55. (b) Because they belong to same group.

57. (c) Ionic radius will increase as number of shells increases

58. (b) *Al*. Due to diagonal relationship.

60. (d) 2,8,2. $\because$ it would donate e^- more easily.

62. (b) A representative element as last e^- enters *p*-orbital.

63. (a) The configuration represents on alkaline earth metals.

65. (a) First group

e.g. $NaCl + H_2O \rightleftharpoons NaOH + HCl$

68. (a) Ionic bond is formed when there is large difference of electro-negativities between the atoms.

69. (c) *d*-block - $[Ar]3d^1 4s^2$

70. (d) $Be : 1s^2\ 2s^2$

71. (c) Increasing atomic number. Mosley found that atomic no. was better fundamental property than atomic weight.

72. (b) Lowest ionisation energy due to largest size.

73. (c) Elements on the right side of the periodic table are *p*-block. Mostly non-metals.

74. (c) Screening effect of *d* and *f* block elements is nearly same.

77. (a) Li because of its smallest size.

78. (b) In third group *Na* is a typical element.

85. (b) On equating no. of e^-'s atomic no. is 12 which is for Mg.

86. (d) $17 - 1s^2 2s^2 2p^6 3s^2 3p^5$.

89. (c) Lanthanide's are called rare earth metals.

91. (d) It show similarities with both alkali metals as well as halogens.

92. (b) M^- After gaining an e^- the metal attains stable configuration.

95. (d) Due to presence of vacant *d*-orbitals and they show *d*-*d* transition.

96. (d) Potassium, $K - [Ar]4s^1$.

97. (c) *p*-block; ${}_{31}Ga \rightarrow [Ar]3d^{10}4s^2p^1$.

102. (c) *Mg* has only two electrons in the 3*s*-orbital and hence its I.E. is lowest, i.e. it has the maximum tendency to form di-positive ions.

103. (a,b,c,d) It reflects trends in physical and chemical properties of the elements.

104. (c) As last e^- goes to *d*-subshell.

107. (d) First decreases to a minimum and then increases

108. (a) ${}_{25}Mn - 3d^5 4s^2$.

111. (b) Hydrogen, forms hydrides like halides, e.g. *HCl*.

114. (a) Hydration energy increases along the period.

115. (d) In IIA group all elements are metal while in IIIA, IVA and VIIA groups non-metallic elements are also present.

118. (c) Mg, Ba, Ca have ns^2 configuration.

119. (a) Elements of group halogen are : $F, Cl, Br\ I$ and At.

121. (d) N and P have 3 unpaired electrons in $2p$ and $3p$ respectively; V has 3 unpaired electrons in $3d$.

124. (b) Tungston (W) having highest m.p.

125. (b) These atomic no. gives the configuration ns^2np^5 which are of halogen group or VIIth group.

126. (b) The atomic no. of an element is derived from the no. of proton because during chemical reaction no. of electron undergoes for change

127. (d) Due to identical ionic radii and polarising power

$$\left[\frac{\text{Charge}}{\text{Size}}\ \text{ratio of pairs of these elements}\right]$$

Atomic and ionic radii

1. (b) Value of Z for hydrogen =1

Value of Z for helium = 2

Value of n for both is = 1

$$r_H = \frac{0.52\times 1^2}{1} \quad r_{He^+} = \frac{0.52\times 1^2}{1}$$

$$\frac{r_H}{r_{He^+}} = 1:1 \text{ or } r_{He^+} : r_H = 1:1$$

2. (d) The size of an species decreases with increasing nuclear charge because the attraction for the electrons increases. Thus Al^{3+} is smaller in size.

3. (c) As the nuclear charge per electron is maximum in F^-. Therefore it is smallest in size.

4. (a) During the formation of cation the size decreases.

6. (d) Highest the nuclear charge smallest the atomic size as well as radius also.

7. (a) Atomic radius decreases on going from left to right in a period. Thus size of $O > F$. As O^{2-} and F^- are isoelectronic, therefore, size of $O^{2-} > F^-$.

8. (b) As the nuclear charge per e^- is maximum in Mg^{+2}, it has smallest size among Na^+, Mg^{+2}, Cl^- and F^-.

9. (b) S^{2-} and Cl^- both are isoelectronic but nuclear charge of Cl^- is more than S^{2-}. So it has largest size.

10. (d) In completely filled shell inter atomic repulsion is more so have greater size.

12. (d) I^- as it has the biggest size.

13. (d) *Mg*, as we move across the period atomic radius decreases.

14. (a) O^{-2} has the highest value of ionic radii as this can be explained on the basis of $Z/e \left\{\frac{\text{Nucleaus charge}}{\text{No. of electron}}\right\}$

Whereas Z / e ration increases, the size decreases and when Z / e ration decreases the size increases.

15. (a) Continuous increase as no. of shells increases down the group.

16. (d) $Na^+ < F^- < O^{2-} < N^{3-}$

All are isoelectronic, effective number charge is highest for Na^+ so it has smallest size.

17. (d) $\underset{54}{I^-} > \underset{53}{I} > \underset{52}{I^+}$ atmoic number

19. (a) Continuously decreases as the effective nuclear charge increases.

20. (a) $Mg^{2+} < Na^+ < F^- < Al$

F^- has bigger size than Mg^{2+} and Na^+ due to small nuclear charge.

21. (b) More than F^- as K^+ has more no of shells in atomic state.

22. (d) All are isoelectronic but O^{2-} has lowest charge among them. So it is largest in size.

23. (a) As effective nuclear charge on Na^+ is maximum. It has smallest size.

25. (c) $Be > C > F > Ne$. Atomic size decreases across a period.

26. (d) As the nuclear charge per electron is maximum in P^{5+}. Therefore its size is smallest.

27. (c) $Na^+ - 10$ electron ; $Li^- - 4$ electron

28. (b) Ionic radius of trivalent lanthanide's almost remains constant with increase in the atomic number.

30. (c) Halogens are most electronegative elements.

33. (d) On moving from left to right in a period value of radius decreases.

34. (a) $Sc^{3+} > Cr^{3+} > Fe^{3+} > Mn^{3+}$ the correct order is $Cr^{+3} > Mn^{+3} > Fe^{+3} > Sc^{+3}$

35. (d) $Na^+ > Mg^{2+} > Al^{3+} > Si^{4+}$. All are isoelectronic but nuclear charge per electron is greatest for Si^{4+}. So it has smallest size and nuclear charge per electron for Na^+ is smallest. So it has largest size.

36. (a) $N^{3-} > O^{2-} > F^-$. All are isoelectronic but nuclear charge per electron is highest for F^-, so it has smallest size.

38. (a) Cation has small size than parent atom and anion has greater size than parent atom.

39. (b) Ionic radii decreases significantly from left to right in a period among representative elements.

40. (d) H^- is most stable due to its full filled 1s-orbital.

43. (a) C^{4-} has largest radius due to least nuclear charge per electron.

44. (d) For ionic bond formation low I.E., high electron affinity and high lattice energy is needed.

45. (a) Ionic radii increases in a group.

46. (d) Size of elements decreases across a period.

47. (a) X^- ion larger in size than X atoms. Because of low effective nuclear charge on X^-, X has a bigger size.

48. (c) Fe, Co, Ni, Cu. Due to shielding of *d*-electrons, the effect of increased nuclear charge due to increase in atomic no. neutralised. Consequently atomic radius remains almost unchanged after chromium.

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

52. (a) Covalent radii decreases on going from left to right in periods. However among the transition elements the size do not changes much because the electrons add to the pneultimate *d*-subshells *i.e.* $(n-1)d$ - subshell.

59. (c) During the conversion of neutral atom to cation size decreases because after removal one e^- or more

(i) Nuclear charge per electron increases.

(ii) Outermost shell is completely removed.

60. (b) Atomic radius increases as no. of shells increases.

62. (d) Chloride ion and potassium ion are isoelectronic, isoelectronic ions are those ions having same number of electrons.

$K = 2, 8, 8, 1$ $K^+ = 2, 8, 8$

$Cl = 2, 8, 7$ $Cl = 2, 8, 8$

63. (c) Cs^+ has the largest ionic radius in the periodic table.

64. (a) Ionic radii increases down the group.

65. (d) Si^{4+} is smallest in size due to their greater +ve charge.

66. (d) Due to having three electrons atomic size increases.

$F^- = 9 + 1 = 10$ electrons ; $O^{-2} = 8 + 2 = 10$ electrons

$Al + 3 = 13 - 3 = 10$ electrons ; $N^{3-} = 7 + 3 = 10\, e^-$.

Because electrostatic force between nucleus and $\bar{e}$ cloud is least in nitrogen.

67. (d) The trivalent ion having largest size in lanthanide series is lanthanum. This is due to lanthanide contraction.

68. (c) As we know that hydration power decreases on moving down the group hence among alkali metals *Li* has excessive hydration & hence it has low mobility in aqeous solution.

69. (c) Ionic radius in the nth orbit is given by $r_n = \frac{n^2 a}{z}$

or $r_n \propto \frac{1}{Z}$ where *n* is principal equation no., ao. bohr's radius of hydrogen atom and *Z* is the effective nuclear energy.

70. (c) Order of polarising power $Be^{++} > Li^+ > Na^+$

Hence order of covalent character $BeCl_2 > LiCl > NaCl$

71. (b) Higher the (*n*+1) value higher is the energy associated with orbitals.

72. (a) With the increase in size of cation the size of the hydrated ion decreases hence ionic conductance increases.

Ionisation energy

1. (b) I.E.(II) of Na is higher than that of Mg because in case of Na, the second e^- has to be remove from the noble gas core while in case of Mg removal of second e^- gives a noble gas core.

Mg has high first ionisation potential than Na because of its stable ns^2 configuration.

7. (c) Ionization potential decreases. Since, atomic size increases.

8. (d) Alkali metals, lower the no. of valence e^-, lower is the value of ionization potential.

9. (a) The ionization energy of hydrogen is to high for group of alkali metals, but too low for halogen group.

13. (a) $E_1 < E_2$ because second I.E. is greater than first I.E.

15. (b) Due to high stability of half-filled orbitals.

16. (a) In Cu it has completely filled *d*-orbital so highest energy is absorbed when it convert in Cu^+ ion.

18. (c) The energy required to remove an electron from outermost orbit of an isolated gaseous atom is called I.E. Now carbon has $4e^-$ in outermost shell. Thus it has 4 ionization energies.

19. (a) Since, stable half filled configuration.

21. (d) First I.P. of $Be > B$ because of stable ns^2 configuration.

22. (b) $K^+ \rightarrow K^{2+} + e^-$. Since e^- is to be removed from stable configuration.

24. (c) Since the IV, I.E. is very high. Thus electron is to be removed from stable configuration.

25. (b) Li and Cs belong to Ist group but Cs has larger size, hence low nuclear attraction force, thus low ionization energy.

26. (c) Li belongs to Ist group. There is $1e^-$ in outermost shell. Thus low I.E.

27. (b) Increases from left to right. Since, the size decreases.

28. (a) As the e^- is to be removed from stable configuration.

29. (c) Since e^- is to be removed from exactly half filled *p*-orbital.

31. (a) Ionisation potential increases across the period.

32. (b) $E = \frac{E_0}{n^2} = \frac{-54.4}{4} = -13.6\, eV$

34. (c) Due to stable half-filled orbitals.

35. (c) Greater than the first ionization energy because after removal one e^-, effective nuclear charge increases.

36. (c) Rare gases as the e^- is to removed from stable electron configuration.

37. (d) Since it is a noble gas.

38. (b) The first *I.P.* is maximum for hydrogen due to its small size.

41. (c) Due to his fullfilled configuration.

42. (b) 1st I.P. decreases down the group.

43. (a) 1st I.P. increases from left to right in a period.

45. (b) First I.P. for *C* is 11.3, for *N* is 14.5 and for *O* is 13.6

47. (a) *Li* has least I.P about 5.4.

48. (b) I.E. increases across the period.

50. (a) *He* has highest ionisation energy due to it full fill 1*s*-orbital.

51. (a) *s*-electrons are strongly bonded to the nucleus. So large amount of energy is required to remove an e^-.

52. (d) $Mg > Al > Na$. This is due to the presence of fully filled *s*-orbital in *Mg*.

55. (c) The 1st I.P. for hydrogen is 13.6 *volts*

56. (b) Alkali metals are strong reducing agents

58. (a) Due to the large size of group IA elements, the outermost electron is far from the nucleus and can easily be removed. their ionisation energies or ionisation potentials are relatively low.

	Li	*Na*	*K*	*Rb*	*Cs*
Ionisation potential (eV)	5.4	5.1	4.3	4.2	3.9

60. (a) $N > O > Be > B$ Ist ionisation energy of $N > O$ because of half filled p -orbital.

61. (d) $M^{2+} \rightarrow M^{3+}$ After the removal of $2e^-$ the nuclear charge per e^- increases, due to which high energy is required to remove $3e^-$.

63. (a) I.E. increases from left to right in a period.

64. (b) More because of stable configuration of *Mg*.

65. (b) *He* and *Xe* belongs to same group but *He* has higher ionisation energy because of small size.

66. (c) In second transition electron is to be removed from half filled orbital.

68. (b) As it belongs to IA group and has maximum size.

69. (a) Since, they have larger size as compared to other.

70. (c) The second I.E. is greater than first I.E. similarly second E.A. is greater than first E.A. the energy is to be supplied to force the second e^- into the anion.

71. (a) Increases as the atomic size decreases and hence effective nuclear charge increases.

72. (b) *B*, *Be*, *C*, *N* as I.E. increases across the period.

73. (d) Ionization potential is least for alkali metals and it decreases down the group.

74. (b) It has maximum ionization energy due to half filled orbitals.

75. (d) It has maximum no. of e^- in outermost shell. So it has maximum I.E.

76. (b) Ionization potential increases as we go from left to right in a period, while it decreases as we come down a group.

Be	*B*	*Li*	*Na*
9.3	8.3	5.4	5.1

77. (c) Half filled *p*-orbitals possess extra stability.

78. (c) Ionization potential decreases down the group.

79. (d) Li^+ and Mg^{+2} ions have similar polarising power or ionic potential and therefore have similar properties. This type of relationship of the first element of a group with the second element of the next group is known as diagonal relationship.

80. (a) The addition of second electron in an atom or ion is always endothermic.

81. (d) We know that ionisation potential gradually decreases of moving down the group while atomic size increases as we move down the group. Hence larger the atomic size, smaller is ionisation potential.

82. (b) Fluorine has highest E^o red {Equal to +2.9 *V*} due to which it can easily accept an electron & hence it is the best oxidising agent.

83. (b) The ionisation energy of tin {*Sn*} is less than that of lead (*Pb*). It is due to the poor shielding of *d*- and *f*-electron in *Pb* due to which it feels greater attraction from nucleus.

84. (a) The order of screening effect in a given shell are in order $s > p > d > f$.

85. (d) The ionisation energy of Li, Be, B and *C* is 520, 899, 801, 1086 *kJ / mol* respectively hence, carbon has highest IE_1.

86. (c) Isoelectronic species are those which have same no. of electrons.

$K^+ = 19 - 1 = 18$; $Ca^{+2} = 20 - 2 = 18$

$Sc^{+3} = 21 - 3 = 18$; $Cl^- = 17 + 1 = 18$

87. (a) We know that atomic no. of fluorine (*F*), chlorine (*Cl*), Bromine (*Br*) and Iodine (*I*) are 9, 17, 35 and 53 respectively. Therefore correct reactivity of halogens is $F > Cl > Br > I$

88. (b) Ionisation potential generally increases when we more in a period from left to right but IE_1 of N_2 is greater than that of O_2. It is due to the more stable (half-filled orbitals) configurations of *N*.

89. (c) Nitrogen has more ionisation potential than carbon & oxygen because, if outermost orbit is half filled so it is more stable & order is $C < N > O$

Electron affinity

3. (c) $\underset{140.9}{O} > \underset{122.3}{C} > \underset{83}{B} > \underset{0}{N}$ Value of electron affinity increases on going from left to right in periods but the value of electron affinity of V^{th} A elements is less than that of IV^{th} A element, this is due to half filled *p*-orbitals presence.

4. (d) Halogens have maximum electron affinity due to their smaller size.

5. (a) Zero, because of the stable electronic configuration the noble gases do not show any force of attraction towards the incoming electron.

8. (b) Energy released when an electron is added to an isolated atom in gaseous state.

9. (a) Electron affinity value of *Cl* is greater the *F* and then decreases down the group.

10. (b) Electron affinity increases across the period.

13. (c) Electron affinity of chorine is maximum.

14. (b) The formation of ionic bond depends upon easy formation of cation and anion. therefore the ionisation energy value of the metal atom should be low, so that it can easily form cation. on the other hand, the electron affinity value of the non-metal atom should be high so that it can easily form anion.

15. (a) Because it can easily accept an e^-.

18. (a) Halogens have the highest e^- affinity.

19. (b) In IB group all elements are metals.

22. (b) Flourine although have highest electronegativity due to its very small size, effective inter electronic repulsions are observed which brings down its electron affinity.

23. (d) The bond dissociation energy of *F-F* bond is very low. The weak *F-F* bond makes fluorine the strongest oxidising halogen.

24. (c) Atomic radius increase from top to bottom in a group while decrease from left to right in a period on the other hand electron affinity shows severe trends i.e. decrease from top to bottom in a group and increase from left to right in a period.

25. (d) It is a fact.

26. (a) Electron affinity of *Cl* is greater than fluorine so the order are as $F < Cl > Br > I$

27. (b) Halogens have very high electron affinity. It may be rated that the electron affinity of fluorine is unexpectedly low $(< Cl)$. This may perhaps be due to small size of *F* atom. The value of electron gain enthalpies for Cl, F, S and *O* are respectively 349, 333, 200 & 142 *KJ / mol* hence correct order is $Cl > F > S > O$

Electronegativity

2. (b) Decrease as atomic size increases.

4. (b) Electropositive nature increases down the group and decreases across the period.

5. (b) An atom with high electronegativity has high I.P.

6. (a) If electronegativity difference is greater than 1.7 bond is ionic, if less than 1.7, the bond is covalent.

7. (b) Due to decrease in hydration energy of cation and lattice energy remains almost unchanged.

8. (a) *F*, because of its smallest size.

9. (c) Because of small size and high nuclear charge.

10. (a) Electronegativity decreases down the group.

11. (c) Halogens are most electronegative.

12. (b) Electronegativity decreases down the group.

13. (d) Because of smallest size.

14. (a) Electronegativity decreases down the group.

16. (a) Electronegativity increases since the size decreases.

17. (b) Electropositive character decreases across the period as metallic character decreases.

18. (c) *Si, P, S*. As across the period electronegativity increases.

19. (a) Both electronegativity and electron affinity increases. This is because decrease in the size and increase in the nuclear charge. But electronegativity increases continuously.

20. (a) Electropositive nature increases down the group.

21. (d) Electropositive nature increases down the group.

23. (d) The electronegative character increases as the size decreases.

24. (b) Electronegativity increases across a period.

25. (a) $Li_3 - 1s^2 2s^1$ donates $1e^-$ easily.

28. (b) Electronegativity decreases down the group as atomic radius increases.

30. (a) Electronegativity increases across the period because size decreases.

31. (b) Alkali metals are most electropositive and moreover, electropositive character increases down the group.

32. (b) Electronegativity increases when moves towards period & decrease when moves toward group.

33. (a) Electronegativity is the property of a bonded atom. The relative tendency on an atom to attract the shared pair of electron toward itself is called electronegativity.

34. (a) Due to Raving small in size and electron defficient in nature it has highest polarising ability we can use Fazan's rule to understand it further.

35. (d) With decrease in size from *Al* to *S* the basic nature of oxide decrease and acidic nature increases.

$Al_2O_3 < SiO_2 < P_2O_3 < SO_2$

Al_2O_3 is amphoteric, SiO_2 is slightly acidic whereas P_2O_3 and SO_2 are the anhydrides of acids H_3PO_3 and H_2SO_3.

Valency and Oxidation state

1. (a) Examples of neutral oxides are CO, H_2O, N_2O. These oxides are neutral towards litmus paper.

5. (a) Basic or metallic character of pentaoxides in VA group increases down the group. Hence acidity decreases.

7. (a) Na_2O, MgO, Al_2O_3, CuO. More the metallic character higher the e^- donating tendency. Therefore lower the I.E. more the basic nature of oxide.

8. (d) As it can donate e^- easily due to low comparative attraction by the nucleus to the valence e^-.

9. (b) Because of the non-metallic character increases.

10. (d) Oxidizing power increases in a group.

14. (c) HF is least acidic due to the small size of fluorine.

16. (d) $Co-[Ar]3d^7 4s^2$, it has 3 unpaired e^- so it is a paramagnetic.

17. (a) Transition elements due to presence of vacant *d*-orbitals.

18. (c) Its valency is 2. So it will form *MO* type compound.

19. (a) Oxides of alkali metals are most basic.

21. (a) Fluorine is the most easily reduced in halogens.

22. (b) Across the period non-metallic character increases. Hence basic nature of oxide decreases.

23. (b) Fluorine is more reactive than chlorine, bromine and iodine.

24. (b) Both are coinage metals

$3d^{10}\ 4s^1 - Cu$; $4d^{10} 5s^1 - Ag$

26. (c) *Li*, *Na*, *K*, contains only one e^- in outer most orbit.

27. (b) Valency is according to valence shall configuration which here is $1s^2, 2s^2, 2p^3$, $ie.\ 5$

28. (c) *Fe* belongs to first transition series.

29. (d) Reactivity of alkaline earth metals increases down the group.

31. (d) Tendency to gain e^- and oxidising power are related. Among halogens F is the directly most powerful oxidising agent.

32. (d) Electronic configuration of outermost shell of group-17 or halogens are $ns^2\ np^5$.

33. (b) On passing from left to right in a period acidic character of the normal oxides of the element goes on increasing with increase in electronegativity.

36. (b) Gold is found in native state.

37. (d) The elements which having same number of electrons in the valence shell are placed in the same group of periodic table.

38. (c) Alkali metals have the configuration $(n-1)s^2 p^6, ns^1$

41. (a) As going down the group size increases, an liberation of H^+ ion becomes easy. So the order of acidity is : $HI > HBr > HCl > HF$

44. (d) Valence shell configuration for IIA group elements is : ns^2

45. (b) A_2B_3

$A \xrightarrow{-3e^-} A^{+3}$; $B \xrightarrow{+2e^-} B^{-2}$

47. (b) Lower the value of I.P. of an element, the greater will be the basic character of the element.

48. (c) *N*, *O* and *F* have strong tendency to attract the shared pair of electrons i.e. by gaining electrons to form anions.

49. (c) B_2O_3, Al_2O_3 are amphoteric oxides.

50. (d) He has the atomic number 2 so it does not have octet.

51. (c) Beryllium has the valency of +2 while aluminum exhibits its valency as +3

Critical Thinking Questions

1. (d) As we go down the group inertness of ns^2 pair increase hence tendency to exhibit +2 oxidation state increases and that of +4 oxidation state decreases.

2. (d) Both $Be(OH)_2$ and $Zn(OH)_2$ are amphoteric in nature.

3. (d) CaO is basic; CO_2 is acidic; SiO_2 is weakly acidic. SnO_2 is amphoteric.

4. (b) In $BeCl_2$ has the highest melting point due to ionic bond.

5. (a) Correct order of electron affinity is *Se* < *S* < *O*. In a group electron affinity decreases with increase in atomic number.

6. (b) The correct increasing order of I.E. is, $Cu < Ag < Au$.

7. (b) $B < C < N < O$; When we move from *B* to *O* in a periodic table the first ionisation enthalpy increase due to the attraction of nucleous towords the outer most of electron.

8. (c) Both Fe and Be are metal but Be has stable configuration so it is difficult to release e^- from it. So it has less metallic character than Fe.

9. (a) The basic nature of oxide decreases across the period as metallic character decreases. Therefore acidic nature of oxide increases.

10. (b) Halogens have very high electron affinities. It may be noted that the electron affinity of fluorine is unexpectedly low $(< Cl)$. This may perhaps be due to the small size of the F atom. The values of electron gain enthalpies for *Cl,F, S* and *O* are respectively 349, 333, 200 and 142 *kJ/mole* hence correct order is *Cl>F>S>O*.

11. (a) Increasing order of electronegativity is *Bi<P<S<Cl*.

12. (a) In a group, the ionisation potential decreases from top to bottom. In the alkali group, the ionisation potential decreases from *Li* to *Cs*.

	Li	*Na*	*K*	*Rb*	*Cs*
eV	5.3	5.1	4.3	4.2	3.9

13. (c) Because for removing second electron, it has to be taken out from stable configuration that needs a large amount of energy.

14. (a) First I.E. of $N >$ First I.E. of *O*.

15. (d) All the nobal gases occupy the peaks of I.E. curve.

16. (b) Correct order of ionic size is *Sn* > *Ce* > *Lu* > *Yb*.

17. (d) $1s^2 2s^2 p^6 3s^2$ - In III transition e^- is to be removed from stable configuration.

18. (c) $1s^2 2s^2 2p^6 3s^1$. It belongs to IA group which has least ionization potential and it decreases down the group

19. (d) Electronegativity increases on going from left to right in a period. Thus electronegativity of $F > O > N \simeq Cl$.

20. (d) Nuclear charge per electron is greater in P^{5+}. Therefore, its size is smaller.

21. (b) The electron affinities of some of the elements of second period (i.e., N, O, F etc.) are however, lower than the corresponding elements (i.e., *P, S, Cl*, etc.) of the third period. This is due to the reason that the elements of second period have the smallest atomic size amongst the elements in their respective groups. As a result, there are considerable electron-electron repulsion within the atom itself and hence the additional electron is not accepted with the same ease as is the case with the remaining elements in the same group.

22. (c) Element belongs to *d*-block is unnilhexium $(Unh)_{106}$.

Assertion and Reason

1. (d) Positive ions will be smaller than parent atoms.

3. (c) Calcium has a higher nuclear charge than sodium.

4. (c) 2*s* orbital has lower energy than 2*p*.

5. (c) *Cl* is more electronegative than *Li*. Although the difference is not much. Therefore the electron pair moves equally to both an thus forming a covalent compound.

6. (c) The lower value of electron affinity of *F* is due to electron-electron repulsion in 2-*p* orbitals of *F*-atom is stronger.

7. (d) All noble gases have stable configuration. Therefore, they can not take any electron means that they have no affinity for electrons. High electron affinity shows that electron is strongly bonded to the atom. Here both assertion and reason are false.

8. (a) The first ionization energy of *Be* is greater than Boron because it is difficult to remove electron from *Be* in comparison to boron. It is also true that the 2P orbitals have lower energy than 2 s-orbitals. Both assertion and reason are true and reason is correct explanation.

9. (a) Both assertion and reason are true and reason is the correct explanation of assertion.

10. (b) Both assertion and reason are true but reason is not the correct explanation of assertion.

Actinoids are more complicated due to the opssibility of large number oxidation states.

11. (d) Both assertion and reason are false.

Ionization enthalpies are always positive. Energy is always absorbed when electrons are removed from an atom.

12. (a) Both assertion and reason are true and reason is the correct explanation of assertion.

The phenomenon is which the Penultimate Shell $(n-1)$ electrons act as screen or shield in between nucleus and valence shell electrons thereby reducing the effective nuclear charge is known as shielding effect.

13. (c) Assertion is true but reason is false.

Ionisation potential decreases with increase in atomic size and also for a given a shell. I.E. is in given order.

$s > p > d > f$

14. (e) Assertion is false but reason is true.

More is the electron affinity, greater is the Oxidising character.

15. (a) Both assertion and reason are true and reason is the correct explanation of assertion.

I.E. of N is more than that of ${}_8O$ as well as ${}_6C$.

16. (c) Assertion is true but reason is false.

N is half-filled $(1s^2 2s^2 2p^3)$ and therefore more stable and hence energy required to lose electron is greater.

17. (e) Assertion is false but reason is true.

$NO^- = 7 + 8 + 1 = 16\ e^-$ whereas

$CN^- = 6 + 7 + 1 = 14\ e^-$. So both are not isoelectronic.

18. (e) Assertion is false but reason is true.

Outermost electronic configuration of most electropositive elements is ns^1

19. (b) First ionization energy for nitrogen is lower than oxygen due to decrease nuclear charge in nitrogen comparison than oxygen.