

## D&F-BLOCK ELEMENTS

### INTRODUCTION

- The following belongs to d-block but it is not a transition element  
1) Mn 2) Fe 3) Zn 4) Cr
- The following is not a typical transition element  
1) Cu 2) Ag 3) Au 4) Mn
- Which of the following statement regarding transition elements is false  
1) Their atoms contain partially filled 'd' orbitals  
2) They are capable of showing variable valencies  
3) All of their ions are colourless  
4) They form complexes readily
- Which set of elements is transitional in character?  
1) Fe, Co, Ni 2) Ru, Rh, Pd 3) Os, Ir, Pt 4) all the above
- Which of following is a true transition element?  
1) Zinc 2) Cadmium 3) Aluminium 4) Iron
- Which of the following is not an element of first transition series?  
1) Fe 2) Co 3) Ni 4) Ag
- Which of the following set of elements does not belongs to transitional elements?  
1) Fe, Co, Ni 2) Cu, Ag, Au 3) Ti, Zr, Hf 4) Ga, In, Tl
- In the transition elements the incoming electron occupies [n-1]d sublevel in preference to  
1) np 2) ns 3) [n-1]d 4) [n+1]s
- Catalytic activity of transition elements and their compounds is due to their  
1) Small size 2) Vacant d-orbitals  
3) Higher densities 4) Colour
- Best conductor of electricity is  
1) Cu 2) Al 3) Au 4) Ag
- Transition metals are good electrical conductors because  
1) They are metals 2) They are solids  
3) They have free electrons in outer energy levels 4) they are hard.
- Which of the following set of elements are transition elements?  
1) Po, At, Rn 2) Ga, In, Tl 3) Cs, Ba, La 4) Ac, Ku, Ha
- Which of the following is not correct about transition metals?  
1) Their melting and boiling points are high  
2) Their compounds are generally coloured  
3) They can form ionic or covalent compounds  
4) They do not exhibit variable valency
- The only liquid element in 'd' block is  
1) Hg 2) Sc 3) Zn 4) Th
- Total number of elements present in VIII B group is  
1) 3 2) 6 3) 12 4) 8
- Chemically Zinc group elements closely resemble  
1) I A group 2) II A group 3) III A group 4) IV A group
- The following is not a noble metal  
1) Au 2) Cu 3) Ag 4) Pt

18. The transition metal present in vitamin B<sub>12</sub> is  
1) Fe    2) Co    3) Ni    4) Na
19. Incorrect statement is  
1) d-block elements usually form coloured ions  
2) Mn<sup>+2</sup> ions are much more capable of forming complexes than the Zn<sup>+2</sup> ions  
3) Alkali metals are strong reducing agents  
4) All the cations of d-block elements are paramagnetic

### ELECTRONIC CONFIGURATION

20. General electron configuration of d-block elements is  
1)  $ns^2 np^6 nd^{1-10}$     2)  $(n-1) d^{1-10} ns^{0-2} np^{0-6}$   
3)  $(n-1) d^{1-10} ns^{1-2}$     4)  $nd^{1-9} ns^{0-2}$
21. The ground state electronic configuration of chromium is against  
1) Hund's rule    2) Pauli's principle  
3) Auf-bau principle    4) Boyle principle
22. Which of the following is the stable electron configuration of Fe<sup>+3</sup> ion?  
1)  $3d^6 4s^0$     2)  $3d^5 4s^0$     3)  $3d^6 4s^2$     4)  $3d^4 4s^2$
23. The following has pseudo-inert gas configuration in the (n-1) shell.  
1) Typical transition elements    2) Zinc group elements  
3) Both    4) Neither
24. The general configuration  $(n-1) d^3 ns^2$  indicates that particular element belongs to the following group  
1) II B    2) I B    3) V B    4) III B
25. Which of the following ion has same number of unpaired electrons as that of V<sup>3+</sup> ion  
1) Cr<sup>+3</sup>    2) Mn<sup>+2</sup>    3) Ni<sup>+2</sup>    4) Fe<sup>+3</sup>
26. Which one of the following pairs of ions has the same electronic configuration?  
1) Fe<sup>+2</sup> and Mn<sup>+2</sup>  
2) Fe<sup>+3</sup> and Mn<sup>+2</sup>  
3) Pr<sup>+3</sup> and Fe<sup>+3</sup>  
4) Mn<sup>+2</sup> and Ni<sup>+2</sup>
27. In which of the following elements, the configuration is against Auf-bau rule?  
1) Ni, Pd, Pt    2) Sc, Ti, Zr    3) Pd, Pt, Cu    4) Fe, Cr, Mn
28. The configuration of chromium atom in ground state is  
1)  $[Ar] 3d^4 4s^1$     2)  $[Ar] 3d^5 4s^1$     3)  $[Ar] 3d^6 4s^2$     4)  $[Ar] 3d^7 4s^2$
29. Which of the following has more unpaired d-electrons?  
1) Zn<sup>+</sup>    2) Fe<sup>2+</sup>    3) Ni<sup>+</sup>    4) Cu<sup>+</sup>
30. The outer electron configuration of first transition series is  $(n-1)d^{1-10} ns^{1-2}$ . The value of n is  
1) 3    2) 4    3) 5    4) 6
31. A transition metal 'x' has the configuration  $[Ar] 3d^4$  in its +3 oxidation state. The element is  
1) Mn    2) Fe    3) Ti    4) K

32. The outer electronic configuration of the element Mo ( Z=42 ) is  
1)  $5s^2 4d^4$       2)  $5s^1 4d^5$       3)  $5s^2 5p^4$       4)  $4s^2 3d^4$
33. In which group of the d-block the electronic configuration is not as expected  
1) III B      2) IV B      3) VI B      4) II B
34. The outside energy levels of an atom have the configuration  $s^2 p^6 d^5 s^2$ . The atom belongs to  
1) Copper family    2) Zinc family    3) Iron family    4) Manganese family
35. The atomic number (Z) of an element is 25 in its ground state, how many electrons are present in the "N" shell?  
1) 13      2) 2      3) 15      4) 3
36. Of the following outer electronic configurations of atoms, the highest oxidation state is achieved by which one of them?  
1)  $(n-1)d^8 ns^2$     2)  $(n-1)d^5 ns^1$     3)  $(n-1)d^3 ns^2$     4)  $(n-1)d^5 ns^2$
37. Abnormal electronic configurations are observed in  
1) Cu, Cr      2) Pd, Pt      3) Cr, Ni      4) Both 1 & 2

### OCCURANCE OF TRANSITION ELEMENTS

38. In the following pair of d-block elements, the first member is a liquid at room temperature and the second member is mostly available in the earth's crust. The pair is  
1) Hg, Fe      2) Hg, Tc      3) Hg, Zn      4) Hg, Au
39. The chemical formula of siderite  
1)  $Fe_2O_3$       2)  $Fe_3O_4$       3)  $FeCO_3$       4)  $MnO_2$
40. The mineral of silver is  
1) Argentite    2) Horn silver    3) Sylvine      4) Both 1 and 2
41. The mineral of Manganese is  
1) Pyrolusite    2) Haematite    3) Siderite      4) Rulite
42. Calamine is the mineral of  
1) Fe      2) Zn      3) Co      4) Ti
43. The chemical formula of chromite mineral  
1)  $FeO.Cr_2O_3$     2)  $FeS_2$     3)  $ZnS$       4)  $Ag_2S$

### CHARACTERISTIC OF 3d SERIES

44. Which of the following group elements exhibits high melting and boiling points  
1) IVB      2) VB      3) VIB      4) IIB
45. Transition elements have high MP& BP due to  
1) Use of ns electrons      2) use of (n-1)d electrons only  
3) Both ns and (n-1)d electrons      4) use of np electrons
46. Which group elements exhibits highest densities  
1) IIIB      2) IVB      3) VIB      4) VIIB
47. Which element exhibits highest density in 3d series  
1) Sc      2) Cr      3) Zn      4) Cu

48. The only element that exhibits positive SRP value  
1) V                      2) Zn                      3) Fe                      4) Cu

### OXIDATION STATES OF 3d SERIES

49. The following does not show variable valency  
1) Mn                      2) Fe                      3) Zn                      4) Cr
50. Element which can show +2, +3, +4 +6 and +7 oxidation states is  
1) Cr                      2) Mn                      3) Co                      4) V
51. Maximum oxidation state exhibited by Osmium is  
1) +8                      2) +7                      3) +6                      4) +5
52. An element M has the electron configuration  $[Ar] 3d^5 4s^2$ . Which one of its oxide is unlikely to exist?  
1)  $MO_2$                       2)  $M_2O_3$                       3)  $MO_4$                       4)  $M_2O_7$
53. Which of the following element exhibits maximum oxidation state  
1) Mn                      2) Co                      3) Fe                      4) Zn
54. In which of the following compounds iron has the lowest oxidation state  
1)  $Fe(CO)_5$                       2)  $Fe_2O$                       3)  $K_4[Fe(CN)_6]$                       4)  $FeSO_4 \cdot (NH_4)_2SO_4 \cdot 6H_2O$
55. The stable oxidation states of Cr are  
1) +3, +6                      2) +3, +4                      3) +1, +4                      4) +2, +5
56. Which of the following element forms an oxide with highest Valency.  
1) V                      2) Cr                      3) Mn                      4) Fe
57. An element has  $[Ar]3d^4$  configuration in its +3 oxidation state Atomic number of the element is  
1) 25                      2) 26                      3) 22                      4) 19
58. Number of d-electrons in chromium of  $[Cr(H_2O)_6]^{+3}$  ion are  
1) 1                      2) 2                      3) 3                      4) 4
59. Maximum number of unpaired electrons is present in  
1)  $Ti^{+2}$                       2)  $Sc^{+3}$                       3)  $Cr^{+3}$                       4)  $Mn^{+2}$
60. Due to the loss of the following electrons, Transition metals exhibit variable valency  
1) ns                      2) ns and np                      3) (n-1) d                      4) (n-1)d and ns

### ATOMIC AND IONIC RADII OF 3d SERIES

61. Which of the following pairs of elements have same radii?  
1) Zr, Hf                      2) Sc, Y                      3) La, AC                      4) Zn, Cd
62. The correct order of atomic sizes is  
1)  $Sc < Y < La$                       2)  $Ti < Zr < Hf$                       3)  $Sc > Y > La$                       4) All

### COLOURS OF TRANSITION METAL IONS

63. Which of the following cation is colourless in its aqueous solution?  
1)  $Cu^{+2}$                       2)  $Sc^{+3}$                       3)  $Fe^{+3}$                       4)  $Co^{+3}$

64. Which of the following ion is coloured in its aqueous solution?  
 1)  $\text{Cd}^{+2}$                       2)  $\text{Zn}^{+2}$     3)  $\text{Sc}^{+3}$                       4)  $\text{Ti}^{+3}$
65. Transition metals are coloured due to the following electronic transition  
 1) d - s                      2) d - d    3) s - p                      4) f - s
66. Cuprous ion is colorless while cupric ion is coloured because,  
 1) Cuprous ion has completed d-orbitals while cupric ion has incomplete d-orbitals  
 2) Cuprous ion has exactly half-filled 'd' orbitals  
 3) Cupric ion has completely filled 'd' orbitals, while Cuprous ion has incompletely filled 'd' orbitals  
 4) Cupric ion has half - filled d-orbitals
67. The following ion is colored in aqueous solution  
 1)  $\text{Zn}^{2+}$                       2)  $\text{Cd}^{+2}$                       3)  $\text{Co}^{3+}$                       4) all the above
68. Colour of ferrous ion is  
 1) Red                      2) Blue                      3) Pale green                      4) Pale yellow
69. In which pair, both ions are coloured in aqueous medium  
 1)  $\text{Sc}^{+3}$ ,  $\text{Zn}^{+2}$     2)  $\text{Cu}^{+2}$ ,  $\text{Ti}^{+4}$     3)  $\text{Ti}^{+3}$ ,  $\text{Co}^{+3}$                       4)  $\text{Cd}^{+2}$ ,  $\text{Mn}^{+2}$
70. The absorbed and emitted colours of hydrated ion are respectively  
 1) Pink and green    2) blue and red    3) red and blue    4) green and pink
71. The following ion shows colour not due to d-d transition  
 1)  $\text{Cr}_2\text{O}_7^{2-}$                       2)  $\text{MnO}_4^-$                       3)  $\text{CrO}_4^{2-}$                       4) All
72. The compound having Blue colour is  
 1)  $\text{CuSO}_4$                       2)  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$   
 3)  $\text{PbSO}_4$                       4)  $\text{HgSO}_4$
73. Coloured complexes absorb radiations in the  
 1) Visible region    2) infrared region    3) ultraviolet region                      4) far infrared
74. The splitting of degenerated d-orbitals takes place into which of the following two sets.  
 1)  $d_{xy}, d_{z^2}, d_{xz}$  and  $d_{yz}, d_{x^2-y^2}$   
 2)  $d_{xy}, d_{yz}, d_{zx}$  and  $d_{x^2-y^2}, d_{z^2}$   
 3)  $d_{xy}, d_{x^2-y^2}, d_{z^2}$  and  $d_{yz}, d_{xz}$   
 4)  $d_{xy}, d_{x^2-y^2}, d_{xz}$  and  $d_{yz}, d_{z^2}$
75. The colour of  $\text{MnO}_4^-$  ion is due to  
 1) Unpaired' electrons                      2) d - d transition  
 3) d - p transition                      4) charge transfer
76. During the splitting of degenerate d-orbitals under the influence of ligand the average d-orbital energy  
 1) remains same                      2) increases  
 3) decreases                      4) may increase or decrease
77. The order of colours exhibited by and ions are respectively  
 1) green, blue, yellow                      2) blue, green, yellow  
 3) yellow, blue, green                      4) blue, yellow, green

78. Which one of the following compound is both coloured and paramagnetic?  
1)  $\text{ScCl}_3$                       2)  $\text{TiCl}_4$                       3)  $\text{CrCl}_3$                       4)  $\text{CuCl}$
79. The aqueous solution of the following salt has colour  
1)  $\text{Zn}(\text{NO}_3)_2$                       2)  $\text{NiSO}_4$                       3)  $\text{CaCl}_2$                       4)  $\text{NaCl}$
80.  $\text{Ti}^{3+}$  is purple, but  $\text{Ti}^{4+}$  is colourless. This is because  
1)  $d^1$  configuration of  $\text{Ti}^{3+}$  and  $d^0$  configuration of  $\text{Ti}^{4+}$   
2)  $d^1$  configuration of  $\text{Ti}^{3+}$  and  $d^{10}$  configuration of  $\text{Ti}^{4+}$   
3)  $d^0$  configuration of  $\text{Ti}^{3+}$  and  $d^1$  configuration of  $\text{Ti}^{4+}$   
4)  $d^{10}$  configuration of  $\text{Ti}^{3+}$  and  $d^1$  configuration of  $\text{Ti}^{4+}$

### CATALYTIC PROPERTIES

81. The catalyst used in the oxidation of  $1^\circ$  alcohol to aldehydes  
1)                      2)  $\text{Fe} + \text{Mo}$                       3)  $\text{Pt} + \text{Ir}$                       4) Raney Ni
82. Which of the following is used as Catalyst in the hydrogenation of oils?  
1)  $\text{V}_2\text{O}_5$                       2) Pd                      3) Fe                      4) Ni
83. The catalyst used in the polymerization of ethylene is  
1)  $R_3\text{Al} + \text{TiCl}_4$                       2)  $\text{SnCl}_4$   
3) Ni                      4) Pt

### MAGNETIC PROPERTIES

84. The ion having maximum magnetic moment is  
1)  $\text{Co}^{+3}$                       2)  $\text{Cr}^{+3}$                       3)  $\text{Ni}^{+2}$                       4)  $\text{Cu}^{+1}$
85. Which of the following ion is diamagnetic?  
1)  $\text{Zn}^{+2}$                       2)  $\text{Cr}^{+3}$                       3)  $\text{Fe}^{+3}$                       4)  $\text{Mn}^{+2}$
86. The following metal shows ferromagnetic nature  
1) Co                      2) Cr                      3) Cu                      4) Mn
87. The following species is repelled by a magnetic field  
1)  $\text{Hg}^{+2}$                       2)  $\text{Fe}^{+2}$                       3)  $\text{Co}^{+3}$                       4)  $\text{Ni}^{+2}$
88. For a paramagnetic substance, the field strength of substance ( B ) and applied field strength ( H ) are related as  
1)  $B = H$                       2)  $B < H$                       3)  $B > H$                       4)  $B \gg \gg H$
89. The following is not a ferromagnetic  
1) Fe                      2) Co                      3) Y                      4) Ni
90. Substances which are repelled by the external magnetic field are called  
1) Diamagnetic                      2) paramagnetic  
3) Ferromagnetic                      4) antiferromagnetic
91. Magnetic moment of diamagnetic substance in Bohr Magnetons is  
1) 1.73                      2) 2.83                      3) 5000                      4) zero

92. The magnetic moment of  $\text{Fe}^{2+}$  in B.M
- 1) 2.84                      2) 3.87                      3) 1.73                      4) 4.90
93. For first row transition metal ions the magnetic moment in Bohr magnetons is calculated by the formula
- 1)  $\sqrt{n(n+1)}$                       2)  $\sqrt{4S(S+1)}$                       3)  $\sqrt{n(n+2)}$                       4) both 2 & 3
94. For 2nd row and 3rd row transition metal ions the magnetic moment in Bohr magnetons is calculated by the formula
- 1)  $\sqrt{4S(S+1)+L(L+1)}$                       2)  $\sqrt{4S(S+1)}$                       3)  $\sqrt{n(n+2)}$                       4) All
95. If the magnetic moment of a complex compound is 2.8 B.M. the number of unpaired electrons in the compound is
- 1) 1                      2) 2                      3) 3                      4) 4
96. Bohr Magneton value in S.I. Units is
- 1)  $9.273 \times 10^{-24} \text{ erg T}^{-1}$                       2)  $9.273 \times 10^{-24} \text{ JT}^{-1}$
- 3)  $9.273 \times 10^{-17} \text{ JT}^{-1}$                       4)  $9.273 \times 10^{-10} \text{ cal T}^{-1}$
97. The observed magnetic moment value ( $\mu_{\text{obs}}$ ) is higher than calculated magnetic moment value for ( $\mu_{\text{cal}}$ )
- 1)  $\text{Ti}^{+3}$                       2)  $\text{V}^{+2}$                       3)  $\text{Co}^{+2}$                       4)  $\text{Cr}^{+2}$

### INTERSTITIAL COMPOUNDS

98. Which of the following elements form interstitial compounds?
- 1) Alkali metals                      2) Transition metals
- 3) Halogens                      4) Noble gases
99. Hydrogen occupies the following holes, C and N occupy the following holes
- 1) Tetrahedral and octahedral                      2) Octahedral and tetrahedral
- 3) Octahedral and octahedral                      4) Tetrahedral and tetrahedral
100. Formation of interstitial compound makes the transition metal
- 1) More softer                      2) more ductile                      3) more metallic                      4) more hard
101. Which of the following is not a interstitial compounds?
- 1) TiC                      2) MoC                      3)  $\text{Fe}_{0.82}\text{O}$                       4)  $\text{Cr}_2\text{O}_3$
102. ZnO is white in cold and yellow when hot because
- 1) ZnO sublimes                      2) ZnO melts
- 3) It forms non stoichiometric compound at high temperatures                      4) All

### ALLOY FORMATION

103. The non transition metal present in German silver is
- 1) Cu                      2) Zn                      3) Ni                      4) Pb



104. Transition metal present in the alloy Gun metal is  
1) Ni                      2) Zn                      3) Sn                      4) Cu
105. The alloy used in the reduction of nitrites to ammonia is  
1) Gun metal              2) Devarda's alloy      3) Solder metal      4) Bronze
106. Invar is used in  
1) Furnaces              2) Pendulum rods      3) Guns                      4) Bells.
107. The common metal present in german silver, bell metal and brass is  
1) Fe                      2) Cu                      3) Zn                      4) Sn
108. Which of the following is an alloy of a metal and a non-metal?  
1) Bronze              2) electron              3) nichrome              4) steel
109. Which of the following elements is alloyed with copper to form brass  
1) Pb                      2) Bi                      3) Sb                      4) Zinc
110. Gun metal is made from  
1) Cu, Sn, Zn              2) Cu, Sn                      3) Ni, Fe, Cr              4) Cu, Zn
111. Which of the following methods can be used for the preparation of alloys?  
1) Melting a mixture of metals  
2) Simultaneous electrolytic deposition of metals  
3) By mixing the aqueous solution of the metal salts  
4) Both 1 & 2
112. Which of the following is non-ferrous alloy?  
1) Invar                      2) Nichrome              3) Wood metal              4) Steel
113. Which of the following properties of elements can be modified by the formation of alloys?  
1) resistance to corrosion                      2) toughness  
3) malleability & ductility                      4) All

### POTASSIUM PERMANGANATE

114. When reacts with acidified  
1) Only is oxidized                      2) Only is oxidized  
3) Is oxidized and is reduced      4) and oxidized
115. In permanganate ion, manganese has an oxidation number of +7. Therefore it is  
1) oxidized              2) hybridized      3) hydrolyzed      4) Aniseed
116. When acts as oxidizing agent in acidic medium, the oxidation number of Mn decreases by  
1) 1                      2) 2                      3) 3                      4) 5
117. Potassium permanganate acts as an oxidant in neutral, alkaline as well as acidic media. The final products obtained from it in the three conditions are, respectively  
1)  $MnO_4^{2-}$ ,  $Mn^{3+}$  and  $Mn^{2+}$   
2)  $MnO_2$ ,  $MnO_2$  and  $Mn^{2+}$   
3)  $MnO_2$ ,  $MnO_2^+$  and  $Mn^{2+}$   
4)  $MnO$ ,  $MnO_2$  and  $Mn^{2+}$



118. When is fused with KOH, a colored compound is formed, the product and its color is  
1), purple green      2) , purple      3) , brown      4) , black

### POTASSIUM DICHROMATE

119. Number of moles of reduced by one mole of iodide ions is

- 1) 3                      2) 1/3                      3) 6                      4) 1/6

120. Chromyl chloride when dissolves in NaOH solution gives yellow solution. The yellow solution contains

- 1)  $Cr_2O_7^{2-}$       2)  $Cr_2O_4^{2-}$       3)  $CrO_5$       4)  $Cr_2O_3$

121. When chromite ore is fused with NaOH in the presence of air, the product formed is

- 1)  $Na_2Cr_2O_7$       2)  $Cr_2O_3$       3)  $Na_2CrO_4$       4)  $K_2Cr_2O_7$

122. Number of moles of reduced by one mole of ions is

- 1) 1/3                      2) 3                      3) 1/6                      4) 6

123. Number of Cr-O bonds in dichromate ion is

- 1) 6                      2) 7                      3) 8                      4) 4

124. In dichromate dianion

- 1) 4 Cr-O bonds are equivalent                      2) 6 Cr-O bonds are equivalent  
3) all Cr-O bonds are equivalent                      4) all Cr-O bonds are non-equivalent

125. Chromite ore has the formula

- 1)  $FeCr_2O_4$       2)  $FeO.Cr_2O_3$       3)  $FeCr_2O_7$       4) Both (1) and (2)

126. When is passed through acidified solution

- 1) The solution turns blue                      2) The solution is decolourised  
3) Is reduced                      4) Green is formed

### KEY

#### LEVEL - I

- 01) 3    02) 4    03) 3    04) 4    05) 4  
06) 4    07) 4    08) 1    09) 2    10) 4  
11) 3    12) 4    13) 4    14) 1    15) 3  
16) 2    17) 2    18) 2    19) 4    20) 3  
21) 3    22) 2    23) 3    24) 3    25) 3  
26) 2    27) 3    28) 2    29) 2    30) 2  
31) 1    32) 2    33) 3    34) 4    35) 2  
36) 4    37) 4    38) 1    39) 3    40) 4  
41) 1    42) 2    43) 1    44) 2    45) 3  
46) 4    47) 4    48) 4    49) 3    50) 2  
51) 1    52) 3    53) 1    54) 1    55) 1  
56) 3    57) 1    58) 3    59) 4    60) 4  
61) 1    62) 1    63) 2    64) 4    65) 2  
66) 1    67) 3    68) 3    69) 3    70) 4

- 71) 4    72) 2    73) 1    74) 2    75) 4  
76) 1    77) 2    78) 3    79) 2    80) 1  
81) 1    82) 4    83) 1    84) 1    85) 1  
86) 1    87) 1    88) 3    89) 3    90) 1  
91) 4    92) 4    93) 4    94) 1    95) 2  
96) 2    97) 3    98) 2    99) 1    100) 4  
101) 4    102) 3    103) 2    104) 4    105) 2  
106) 2    107) 2    108) 4    109) 4    110) 1  
111) 4    112) 3    113) 4    114) 3    115) 2  
116) 4    117) 2    118) 1    119) 4    120) 2  
121) 3    122) 1    123) 3    124) 2    125) 4  
126) 4

## F-BLOCK ELEMENTS

### LANTHANIDES INTRODUCTION

- Lanthanoids are:
  - 14 elements in the seventh period  
(At. no. 90 to 103) that are filling 5f sublevel.
  - 14 elements in the sixth period  
(At. No. 58 to 71) that are filling 4f sublevel
  - 14 elements in the seventh period  
(At. No.58 to 71) that are filling 4f sublevel.
  - 14 elements in the sixth period (At.No.90 to 103)
- Which of the following Lanthanoid is radioactive?
  - 1) Cerium                      2) Promethium
  - 3) Thulium                    4) Lutetium
- The most common Lanthanoid is
  - 1) Lanthanum                2) Cerium
  - 3) Samarium                4) Plutonium
- Non-Lanthanoid atom is
  - 1) La                            2) Lu
  - 3) Pr                            4) Pm
- Lanthanides are characterized by the filling of the
  - 1) Penultimate 4f energy level
  - 2) antipenultimate 4f energy level
  - 3) penultimate 5f energy level
  - 4) antipenultimate 5f energy level

6. d-block elements form complexes because they have :
- 1) Vacant orbitals
  - 2) small sizes
  - 3) Higher nuclear charge
  - 4) all of the above
7. Which sub shell is filled up progressively in actinoids
- 1) 4f
  - 2) 5f
  - 3) 6d
  - 4) 7s
8. The correct statement (s) from among the following is/are:
- i) All the d and f-block elements are metals.
  - ii) All d and f-block elements form coloured ions.
  - iii) All d and f-block elements are paramagnetic.
- 1) i only
  - 2) i and ii
  - 3) ii and iii
  - 4) All

### ELECTRONIC CONFIGURATION AND OXIDATION STATES

9. Which of the following is not the configuration of Lanthanoid
- 1)  $[\text{Xe}]4f^{10}.6s^2$
  - 2)  $[\text{Xe}] 4f^{15}d^1.6s^2$
  - 3)  $[\text{Xe}]4f^{14}5d^{10}6s^1$
  - 4)  $[\text{Xe}]4f^7 5d^1.6s^2$
10. The electronic configuration of f-block elements is represented by
- 1)  $(n-2) f^{1-14}(n-1) d^{0-1}ns^2$
  - 2)  $(n-2) f^{1-14}(n-1) d^{0-5}ns^{0-2}$
  - 3)  $(n-2) f^{1-14}(n-1) d^{0-10}ns^{1-2}$
  - 4)  $(n-2) f^{1-14}(n-1) d^{0-2} (n-1)s^2$
11. The electronic configuration of cerium is
- 1)  $[\text{Xe}] 4f^0 5d^1 6s^2$
  - 2)  $[\text{Xe}] 4f^1 5d^1 6s^2$
  - 3)  $[\text{Xe}] 4f^2 5d^0 6s^2$
  - 4) Both 2 and 3
12. The most common oxidation state of Lanthanoids is
- 1) +4
  - 2) +3
  - 3) +6
  - 4) +2
13. The most common oxidation states of cerium are
- 1) +2 and +4
  - 2) +3 and +4
  - 3) +3 and +5
  - 4) +2 and +3
14. The outer shell electronic configuration of Gd (Z = 64) is
- 1)  $4f^7 5d^1 6s^2$
  - 2)  $4f^8 6s^2$
  - 3)  $4f^9 6s^1$
  - 4)  $4f^7 5d^2 6s^1$
15. The +3 ion of which one of the following has half filled 4f sub shell?
- 1) La
  - 2) Lu
  - 3) Gd
  - 4) Ac
16. Which of the following elements shows more number of oxidation states in its compounds?
- 1) Am
  - 2) Gd
  - 3) La
  - 4) Eu
17. Lanthanoid for which +2 and +3 oxidation states are common is
- 1) La
  - 2) Eu
  - 3) Ce
  - 4) Nd

18. Cerium ( $Z = 58$ ) is an important member of the Lanthanides. Which of the following statements about cerium is incorrect?
- 1) The +3 oxidation state of cerium is more stable than the +4 oxidation state.
  - 2) The common oxidation states of cerium are +3 and +4
  - 3) Cerium (IV) acts as an oxidizing agent
  - 4) The +4 oxidation state of cerium is not known in solutions.
19. The element with the electronic configuration  $[\text{Xe}] 4f^{14}5d^16s^2$  is a
- 1) Representative element
  - 2) Transition element
  - 3) Actinide element
  - 4) Lanthanide element

### CHEMICAL REACTIVITY OF LANTHANIDES

20. Which of the following ion is paramagnetic?
- 1)  $\text{La}^{3+}$  ( $Z = 57$ )
  - 2)  $\text{Lu}^{3+}$  ( $Z = 71$ )
  - 3)  $\text{Yb}^{3+}$  ( $Z = 70$ )
  - 4)  $\text{Sm}^{3+}$  ( $Z = 62$ )
21. Which of the following is the strongest base?
- 1)  $\text{Lu}(\text{OH})_3$
  - 2)  $\text{Ce}(\text{OH})_3$
  - 3)  $\text{Sm}(\text{OH})_3$
  - 4)  $\text{Tb}(\text{OH})_3$
22. In aqueous solution  $\text{Eu}^{2+}$  acts as?
- 1) an oxidising agent
  - 2) reducing agent
  - 3) can act as either of these
  - 4) can not act as either of these
23. The colour of Lanthanoids and Actinoids is due to
- 1) s-f transitions
  - 2) p-f transitions
  - 3) d-f transitions
  - 4) f-f transitions
24. Which of the following has tendency to act as an oxidising agent?
- 1)  $\text{Ce}^{4+}$
  - 2)  $\text{Sm}^{2+}$
  - 3)  $\text{Lu}^{3+}$
  - 4)  $\text{Gd}^{3+}$
25. Which of the following statement is not correct?
- 1) is less basic than
  - 2) In Lanthanoid series ionic radius of  $\text{Ln}^{3+}$  ions decreases
  - 3) La is actually an element of transition series rather than Lanthanoid series
  - 4) Atomic radii of Zr and Hf are same because of Lanthanoid contraction
26. Many Lanthanoid elements are used to prepare
- 1) Ceramic materials
  - 2) water softener
  - 3) Superconducting materials
  - 4) Enzyme catalysts

27. Which of the following statement concerning Lanthanide elements is false?
- 1) All Lanthanoids are highly dense metals.
  - 2) Most characteristic oxidation state of Lanthanide elements is +3.
  - 3) The ionic radii of trivalent Lanthanides steadily increase with increase in the atomic number
  - 4) Lanthanoids are separated from one another by ion exchange methods

### LANTHANIDES CONTRACTION ITS CONSEQUENCES

28. A reduction in atomic size with increase in atomic number is a characteristic of elements of
- 1) d-block
  - 2) f-block
  - 3) Radioactive series
  - 4) high atomic masses.
29. The Lanthanoid contraction refers to
- 1) Valence electrons of the Lanthanide series
  - 2) Ionic radius of the series
  - 3) The density of the series
  - 4) Nuclear mass of the series
30. The atomic and ionic radii ( $M^{3+}$  ions) of Lanthanide elements decrease with increase in atomic number. This effect is called
- 1) Lanthanoid contraction
  - 2) Lanthanoid expansion
  - 3) Actinoid contraction
  - 4) Actinoid expansion
31. Lanthanoid contraction occurs because
- 1) the 4f electrons, which are gradually added, create a strong shielding effect
  - 2) the 4f orbitals are greater in size than the 3d and 3f orbitals
  - 3) the 5f orbitals strongly penetrate into the 4f orbitals
  - 4) the poor shielding effect of 4f electrons is coupled with increased attraction between the nucleus and the added electrons.
32. The Lanthanoids contraction is responsible for the fact that
- 1) Zr and Y have about the same radius
  - 2) Zr and Nb have similar oxidation state
  - 3) Zr and Hf have about the same radius
  - 4) Zr and Zn have the same oxidation state
33. The radius of  $La^{3+}$  (At.No.ofLa=57) is 1.06Å. Which one of the following given values will be closest to the radius of  $Lu^{3+}$  (Atomic No. of Lu=71)
- 1) 1.40Å
  - 2) 1.06Å
  - 3) 0.85Å
  - 4) 1.60Å
34. The separation of Lanthanoids by ion exchange method is based on
- 1) basicity of the hydroxides
  - 2) size of the ions
  - 3) the solubility of their nitrates
  - 4) oxidation state of the ion.

## ACTINOIDS

35. The actinoids showing +7 oxidation states are  
1) U, Np      2) Pu, Am  
3) Np, Pu      4) Am, Cm
36. Which of the following elements belongs to actinide series?  
1) Lu    2) Gd    3) Th      4) La
37. The electronic configuration of actinides cannot be assigned with degree of certainty because of  
1) Overlapping of inner orbitals  
2) Free movement of electrons over all the orbitals  
3) Small energy difference between 5f and 6d levels  
4) None of the above

### KEY

- 1) 2    2) 2    3) 2    4) 1    5) 2  
6) 4    7) 2    8) 1    9) 3    10) 1  
11) 4    12) 2    13) 2    14) 1    15) 3  
16) 3    17) 2    18) 4    19) 4    20) 4  
21) 2    22) 2    23) 4    24) 1    25) 1  
26) 3    27) 3    28) 2    29) 2    30) 1  
31) 4    32) 3    33) 3    34) 2    35) 3  
36) 3    37) 1