Multiple Choice Questions

Position of elements in periodic table, Electronic configuration and oxidation state

[MHT-CET 2004]

1. Oxidation state of iron in Fe_3O_4 is
   a) $\frac{8}{3}$ b) $\frac{3}{4}$ c) $\frac{3}{2}$ d) $\frac{1}{2}$

[MHT-CET 2008]

2. The general electronic configuration of the transition elements is
   a) $(n-1)\,d^{10}\,(n+1)s^2$ b) $(n-1)\,d^{1-10}\,(n+1)s^{1-2}$
   c) $(n-1)\,d^{1-10}, np^6, ns^2$ d) $(n-1)\,d^{1-10}, ns^{1-2}$

[MHT-CET 2010]

3. Which gives + 7 oxidation state ?
   a) Mn(25) b) Cr(24) c) Cu(29) d) Fe(26)
4. Ce^{4+} is stable. This is because of
   a) half-filled d-orbital b) all paired electrons in d-orbital
   c) empty orbital d) fully filled d-orbital

[MHT-CET 2011]

5. Most common oxidation states shown by cerium are
   a) +2, +4 b) +3, +4 c) +3, +5 d) +2, +3

[MHT-CET 2012]

6. The oxidation state of Cr in $K_2Cr_2O_7$ is
   a) + 4 b) + 3 c) + 6 d) + 5

[MHT-CET 2018]

7. Identify the oxidation states of titanium (Z = 22) and copper (Z = 29) in their colourless compounds.
   a) Ti^{3+}, Cu^{2+} b) Ti^{2+}, Cu^{2+} c) Ti^{4+}, Cu^{1+} d) Ti^{4+}, Cu^{2+}

[MHT-CET 2019]

8. The highest oxidation state in plutonium (At. No = 94) is
   a) + 7 b) + 6 c) + 5 d) + 4

[MHT-CET 2020]

9. Which among the following lanthanoids, shows only +3 oxidation state ?
   a) Cerium b) Gadolinium c) Terbium d) Neodymium
10. What is the highest oxidation state exhibited by any transition element among all ?
    a) + 8 b) + 6 c) + 7 d) + 5
11. What is the highest oxidation state exhibited by actinoids ?
    a) + 6 b) + 3 c) + 4 d) + 7
12. Which element among the following exhibits electronic configuration as $[Xe]4f^7$ in its oxidation state ?
    a) Neodymium (Z = 60) b) Terbium (Z = 65)
    c) Praseodymium (Z = 59) d) Cerium

13. Which among the following actinoids exhibits highest oxidation state + 7 ?
a) Pu b) Lr c) Cf d) Th

14. Which element among the following exhibits electronic configuration as $[Xe]4f^0$ in + 4 oxidation state ?
a) Dysprosium (Z = 66) b) Praseodymium (Z = 59)
c) Neodymium (Z = 60) d) Cerium (Z = 58)

15. Which among the following pairs of elements in their respective oxidation states will have same value of effective magnetic moment ?
(Atomic number : Sc = 21, Ti = 22, Cr = 24, Co = 27, Ni = 28, Zn = 30)
a) Zn^{2+} and Cr^{3+} b) Ni^{2+} and Ti^{3+} c) Sc^{3+} and Ti^{3+} d) Cr^{3+} and Co^{2+}

16. Which of the following elements possesses one unpaired electron in 5d orbital in observed electronic configuration ?
a) Eu (Z = 63) b) Gd (Z = 64) c) Nd (Z = 60) d) Yb (Z = 70)

17. Which element among the following has empty 5d–orbital in observed electronic configuration ?
a) Lu (Z = 71) b) La (Z = 57) c) Yb (Z = 70) d) Gd (Z = 64)

18. Which from following elements exhibits oxidation states from + 1 to + 6 ?
a) Mn (Z = 25) b) Cr (Z = 24) c) Fe (Z = 26) d) Cu (Z = 29)

19. Which of the following elements has six unpaired electrons in observed electronic configuration ?
a) Cu (Z = 29) b) Cr (Z = 24) c) Mn (Z = 25) d) Fe (Z = 26)

[MHT-CET 2021]

20. Which element from following exhibits various different oxidation states from +2 to +7?
a) Mn b) Cr c) V d) Ni

21. Which of the following elements in their respective oxidation states does not develop spin only magnetic moment ? [Ti (Z = 22), Zn (Z = 30), V (Z = 23), Cu (Z = 29)]
a) Cu^{2+} b) Zn^{2+} c) Ti^{3+} d) V^{3+}

22. Which lanthanoid element from following has completely filled f–orbital in expected and observed electronic configurations ?
a) Yb b) Eu c) Gd d) Er

[MHT-CET 2022]

23. What is the general electronic configuration of elements of 4^{th} transition series ?
a) $[Xe]\ 5d^{1-10}\ 6s^2$ b) $[Rn]\ 6d^{1-10}\ 7s^2$ c) $[Ar]\ 3d^{1-10}\ 4s^2$ d) $[Kr]\ 4d^{1-10}\ 5s^2$

24. Which element from following has half-filled f-orbital in +3 oxidation state ?
a) Lr (Z = 103) b) Th (Z = 90) c) Cm (Z = 96) d) U (Z = 92)

25. Which from following pairs of elements have one electron in 5d–subshell in observed electronic configuration ?
a) La (Z = 57) and Dy (Z = 66) b) Pm (Z = 61) and Eu (Z = 63)
c) Gd (Z = 64) and Lu (Z = 71) d) Ce (Z = 58) and Nd (Z = 60)

[MHT-CET 2012]

41. Which of the following species shows the maximum magnetic moment ?
a) Mn^{6+} b) Ni^{2+} c) Fe^{3+} d) Ag^{+}

[MHT-CET 2014]

42. Select the coloured compound amongst the following. (Atomic no. of Ti = 22, Cr = 24, Cu = 29, Zn = 30)
a) $TiCl_4$ b) $CrCl_3$ c) $ZnCl_3$ d) CuCl

[MHT-CET 2016]

43. Identify the metal that forms colourless compounds.
a) Iron (Z = 26) b) Chromium (Z = 24)
c) Vanadium (Z = 23) d) Scandium (Z = 21)

[MHT-CET 2019]

44. Which of the following elements has highest second ionization enthalpy ?
a) $Cu_{(Z = 29)}$ b) $Zn_{(Z = 30)}$ c) $Co_{(Z = 27)}$ d) $Fe_{(Z = 26)}$

45. Cobalt – Thorium alloy is used as catalyst in the process of
a) manufacture of H_2SO_4 b) synthesis of gasoline
c) decomposition of $KClO_3$ to O_2 d) hydrogenation of oils

[MHT-CET 2020]

46. Which among the following elements has lowest density and is lightest ?
a) Scandium b) Cobalt c) Copper d) Iron

47. Which among the following elements is a soft element as compared to others ?
a) Zn b) Mo c) W d) Co

48. Which element from following forms colourless compounds in +2 oxidation state ?
a) Zn (Z = 30) b) Cu (Z = 29) c) Mn (Z = 25) d) Co (Z = 27)

49. What is the formula of calamine ?
a) $MgCO_3$, $CaCO_3$ b) Fe_2O_3 c) $ZnCO_3$ d) $FeCO_3$

50. Which from following elements has lowest tendency to form its oxide ?
a) Al b) Fe c) Hg d) Cr

51. What is the value of effective magnetic moment found in +3 oxidation state of Chromium (Z = 24) ?
a) 1.73 BM b) 4.90 BM c) 2.84 BM d) 3.87 BM

52. Identify the element having highest enthalpy of atomization from following.
a) Cu (Z = 29) b) Fe (Z = 26) c) Sc (Z = 21) d) Zn (Z = 30)

53. Identify the correct decreasing order of densities of d-block elements.
a) Ni > Fe > Cr > V b) Cr > Fe > V > Ni c) Fe > Ni > V > Cr d) V > Cr > Fe > Ni

54. Identify the element if its expected electronic configuration is [Ar] $3d^{10}4s^2$.
a) Cd b) Co c) Zn d) Hg

55. Which among the following elements possesses one electron in 4s orbital in observed electronic configuration ?
a) Cu (Z = 29) b) Ni (Z = 28) c) V (Z = 23) d) Mn (Z = 25)

71. Identify the reason for change in colour of cobalt chloride solution (pink to deep blue) when treated with concentrated HCl.
a) presence of unpaired d-electrons
b) change in geometry of complex
c) nature of ligand
d) d–d transition

72. What is the value of spin only magnetic moment found in Cu (Z = 29) in +2 oxidation state ?
a) 0.5 BM
b) 1.5 BM
c) 1.73 BM
d) 2.5 BM

73. Which catalyst from following is used for synthesis of gasoline by Fischer Tropsch process ?
a) MnO_2
b) Platinized asbestos
c) Co-Th alloy
d) Ni (finely divided)

74. Identify the correct decreasing order of tendency of cations to form stable complexes.
a) $Ni^{2+} > Cd^{2+} > Co^{2+} > Cu^{2+}$
b) $Cu^{2+} > Ni^{2+} > Co^{2+} > Cd^{2+}$
c) $Cd^{2+} > Co^{2+} > Ni^{2+} > Cu^{2+}$
d) $Cu^{2+} > Co^{2+} > Cd^{2+} > Ni^{2+}$

75. Which from following statements is NOT true for transition elements ?
a) Higher the oxidation state greater is effective nuclear charge.
b) Ionic radii of elements of same period are smaller than representative elements of that period.
c) Higher the oxidation state more is decrease in ionic radii.
d) These elements do not show variation in oxidation states.

76. Identify the element having smallest atomic radius from following.
a) Tb
b) Sm
c) Ce
d) Tm

77. Which among the following elements has completely filled 4d-orbital ?
a) Ag
b) Cd
c) Se
d) Zr

[MHT-CET 2022]

78. What is the position of copper in modern periodic table ?
a) Period - 4, Group - 10
b) Period - 4, Group - 11
c) Period - 5, Group - 9
d) Period - 3, Group - 9

79. Identify the geometry of complex formed when cobalt chloride is dissolved in water.
a) Tetrahedral
b) Square planar
c) Trigonal bipyramidal
d) Octahedral

80. Which among the following elements in their respective oxidation states develops lowest spin only magnetic moment ?
(Atomic No. : Cu = 29, Fe = 26, Ni = 28, Co = 27)
a) Fe^{2+}
b) Ni^{2+}
c) Co^{2+}
d) Cu^{2+}

81. Which statement from following is NOT correct ?
a) Electrons from d-orbitals offer smaller screening effect.
b) Atomic radii decrease gradually from left to right.
c) d-orbitals in atom are less penetrating
d) Effective nuclear charge decreases as atomic number increases in a period for transition elements.

Preparations, properties and uses of $KMnO_4$ and $K_2Cr_2O_7$

[MHT-CET 2015]

96. Potassium dichromate is a good oxidizing agent, in acidic medium the oxidation state of chromium changes by
a) 2 b) 3 c) 4 d) 5

[MHT-CET 2016]

97. How is sodium chromate converted into sodium dichromate in the manufacture of potassium dichromate from chromite ore ?
a) By the action of concentrated sulphuric acid
b) By roasting with soda ash
c) By the action of sodium hydroxide
d) By the action of limestone

[MHT-CET 2019]

98. The ionic charges on chromate ion and dichromate ion respectively are
a) $-2, -2$ b) $-3, -2$ c) $-2, -4$ d) $-4, -2$

99. When a mixture of manganese dioxide, potassium hydroxide and potassium chlorate is fused, the product obtained is
a) $KMnO_4$ b) K_2MnO_3 c) K_2MnO_4 d) K_2SO_4

100. The ionic charges of manganate and permanganate ions are respectively.
a) $-1, -2$ b) $-2, -1$ c) $-1, -1$ d) $-2, -2$

101. Select the ion which has maximum effective magnetic moment.
a) Mn^{3+} (Z = 25) b) V^{3+} (Z = 23) c) Cu^{2+} (Z = 29) d) Fe^{3+} (Z = 26)

102. Which among the following substances is used as a catalyst for thermal decomposition of potassium chlorate ?
a) MnO_2 b) $CuCl_2$ c) Fe d) V_2O_5

[MHT-CET 2020]

103. What is the formula of pyrolusite ore ?
a) MnO_2 b) $PbCrO_4$ c) Cu_2O d) Cr_2O_3

104. Which of the following is a product of first step and is used as reactant in next step for manufacture of $K_2Cr_2O_7$ from concentrated chromite ore ?
a) Sodium dichromate b) Sodium sulphate
c) Sodium chromate d) Potassium chromate

Metallurgy, extraction of iron

[MHT-CET 2008]

105. Calamine is
a) $CaCO_3$ b) $MgCO_3$ c) $ZnCO_3$ d) $CaCO_3 + CaO$

[MHT-CET 2012]

106. Which of the following is not an iron ore ?
a) Malachite b) Haematite c) Siderite d) Limonite

[MHT-CET 2021]

169. Which from following properties of f-block elements is NOT correct ?
a) Elements of both series form oxocations.
b) Both series exhibit +3 oxidation state.
c) Ionic radii of both series decrease with increase in atomic number.
d) Electronegativity of both series is low.

[MHT-CET 2022]

170. Identify non-radioactive element from following.
a) Cf b) U c) Np d) Nd

171. Which among the following is an actinoid element ?
a) Pa b) Lu c) Gd d) Pr

172. Which among the following elements has smallest ionic size in +3 oxidation state ?
a) Lr b) Pa c) Np d) Pu

173. Which among the following statements is NOT true about actinoids ?
a) These are more reactive than lanthanoids.
b) Oxidation number of these ranges from +2 to +8
c) General electronic configuration of actinoids is represented as $[Rn]5f^{0-14}\ 6d^{0-2}\ 7s^2$.
d) Most of these elements are not found in nature.

[MHT-CET 2023]

174. What is the total number of unpaired electrons in observed configuration of elements present at group - 11 and period - 4 in periodic table?
a) 1 b) 3 c) 4 d) 7

175. Identify the element if its expected and observed electronic configurations are represented respectively as [Ar] $3d^4\ 4s^2$ and [Ar] $3d^5\ 4s^1$.
a) Cd b) Cu c) Zn d) Cr

176. Which element from following exhibits various different oxidation states from +2 to +7?
a) Cr b) Fe c) Mn d) Ni

177. Which pair of elements in their respecitve oxidation states from following does NOT exhibit spin only magnetic moment?
a) Ti^{3+}, V^{3+} b) Zn^{2+}, Sc^{3+} c) Ni^{2+}, Zn^{2+} d) Co^{2+}, Ni^{2+}

178. Which from following elements is most stable in +3 state?
a) Cr b) Sc c) Cu d) Mn

179. Identify the correct decreasing order of atomic radii from following.
a) U > Np > Pa > Th b) Th > Pa > U > Np c) Pa > Th > Np > U d) Pa > U > Np > Th

180. Identify the element having lowest ionization enthalphy from following.
a) Sc b) Cr c) Co d) Cu

[MHT-CET 2024]

181. What is the total number of unpaired electrons in an element placed at period-4 and group - 12 either in excited or at ground state?
a) Zero b) One c) Two d) Three

182. Identify elements present in copper pyrites.
a) Cu, K, S b) Mg, Cu, P c) Ca, S, O d) Fe, Cu, S

MHT-CET

(NEET - 2024)

Match List I with List II.

List - I (Complex)	List - II (Type of isomerism)
A) $[Co(NH_3)_5(NO_2)]Cl_2$	i) Solvate isomerism
B) $[Co(NH_3)_5(SO_4)]Br$	ii) Linkage isomerism
C) $[Co(NH_3)_6][Cr(CN)_6]$	iii) Ionization isomerism
D) $[Co(H_2O)_6]Cl_3$	iv) Coordination isomerism

Choose the correct answer from the options given below:

a) A - ii, B - iii, C - iv, D - i
b) A- i, B - iii, C - iv, D - ii
c) A-i, B - iv, C - iii, D - ii
d) A - ii, B- iv, C - iii, D - i

Given below are two statements:

Statement I : $[Co(NH_3)_6]^{3+}$ is a homoleptic complex whereas $[Co(NH_3)_4Cl_2]^+$ is a heteroleptic complex.

Statement II : Complex $[Co(NH_3)_6]^{3+}$ has only one kind of ligands but $[Co(NH_3)_4Cl_2]^+$ has more than one kind of ligands.

In the light of the above statements, choose the correct answer from the options given below. **(NEET - 2024)**

a) Both Statement I and statement II are true.
b) Both statement I and Statement II are false
c) Statement I is true but statement II is false
d) Statement I is false but statement II is true.

The pair of lanthanoid ions which are diamagnetic is **(NEET - 2024)**

a) Ce^{4+} and Yb^{2+} b) Ce^{3+} and Eu^{2+} c) Gd^{3+} and Eu^{3+} d) Pm^{3+} and Sm^{3+}

Which has maximum oxidising power among the following ? **[JEE Main-2025 Phase-1]**

a) VO_2^+ b) $Cr_2O_7^{2-}$ c) MnO_4^- d) TiO_2

In the preparation of potassium permanganate from pyrolusite ore (MnO_2), the fusion of pyrolusite ore is done with an alkali metal hydroxide like KOH in the presence of air or an oxidising agent like KNO_3, which first porduces. **[JEE Main-2025 Phase-1]**

a) K_2MnO_6 b) K_2MnO_4 c) $KMnO_4$ d) K_2MnO

Given below are two statements:

Statement I : Ferromagnetism is considered as an extreme form of paramagnetism.

Statement II : The number of unpaired electrons in a Cr^{2+} ion (Z = 24) is the same as that of a Nd^{3+} ion (Z = 60) **(NEET - 2025)**

In the light of the above statements, choose the correct answer from the options given below.

a) Statement I is true but Statement II is fasle
b) Statement I is false but Statement II is true
c) Both Statement I and Statement II are true
d) Both Statement I and Statement II are false

The pairs(s) of diamagnetic ions is (are) **(JEE (Advanced) Paper I - 2025)**

a) La^{3+}, Ce^{4+} b) Yb^{2+}, Lu^{3+} c) La^{2+}, Ce^{3+} d) Yb^{3+}, Lu^{2+}