ABHINAV ACADEMY

UDUPI

CET25C4 THE D- AND F- BLOCK ELEMENTS

Class 12 - Chemistry

Time Allowed: 1 hour and 30 minutes **Maximum Marks: 75**

1. Gadolinium belongs to 4f series. Its atomic number is 64. Which of the following is the correct electronic configuration of gadolinium? **[1]**

   a) [Xe] 4f $6^5d^26s^2$ b) [Xe] $4f^75d^1$ $6s^2$

   c) [Xe] $4f^86d^2$ d) [Xe] $4f^95s^1$

2. Which among the following is a synthetic element? **[1]**

   a) Pa b) U

   c) Fm d) Th

3. Which of the following characteristics of transition metals is associated with their catalytic activity? **[1]**

   a) Paramagnetic nature b) High enthalpy of atomisation

   c) Variable oxidation states d) Colour of hydrated ions

4. Why is HCl not used to make the medium acidic in oxidation reactions of $KMnO_4$ in the acidic medium? **[1]**

   a) $KMnO_4$ acts as a reducing agent in the presence of HCl b) $KMnO_4$ oxidises HCl into Cl_2 which is also an oxidising agent.

   c) Both HCl and $KMnO_4$ act as oxidising agents. d) $KMnO_4$ is a weaker oxidising agent than HCl.

5. $KMnO_4$ is the oxo salt of **[1]**

   a) Mn_2O_3 b) MnO_3

   c) Mn_2O_7 d) MnO_2

6. How many carats are in 87.5% gold? **[1]**

   a) 15 b) 21

   c) 24 d) 18

7. Which one of the following element is the main metallic constituent of haemoglobin? **[1]**

   a) Mn b) Fe

   c) Cu d) Al

8. Generally transition elements form coloured salts due to the presence of unpaired electrons. Which of the following compounds will be coloured in solid state? **[1]**

   a) Cu_2Cl_2 b) Ag_2SO_4

c) CuF_2 d) ZnF_2

9. Which of the following oxidation state is common for all lanthanoids? **[1]**

a) + 5 b) + 2

c) + 4 d) + 3

10. The lanthanoid contraction is due to: **[1]**

a) Filling of 5d before 4f b) Filling of 4f before 4d

c) Filling of 4d before 4f d) Filling of 4f before 5d

11. The product of oxidation of I^- with MnO_4^- in acidic medium is: **[1]**

a) I_2 b) IO_3^-

c) IO^- d) IO_4^-

12. The interstitial compounds of transition metals are **[1]**

a) harder b) more ductile

c) softer d) more metallic

13. Haemoglobin and chlorophyll contain: **[1]**

a) Fe and Mg b) Fe and Mn

c) Fe and Co d) Mg and Fe

14. In which of the following does the central atom exhibit an oxidation state of +4? **[1]**

a) $[Pt(en)_2Cl_2]^{2+}$ b) $[Pt(NH_3)_2Cl_2]$

c) $K_2[Ni(CN)_4]$ d) $[Cu(NH_3)_4]^{2+}$

15. How many d–block elements have the ability to evolve hydrogen gas from 2% nitric acid? **[1]**

a) Many b) 1

c) 3 d) 2

16. Out of the following transition elements, the maximum number of oxidation states are shown by **[1]**

a) Mn (Z = 25) b) Sc (Z = 21)

c) Cr (Z = 24) d) Fe (Z = 26)

17. The ions of metals of Group 12 (Zn, Cd and Hg) have completely filled d orbitals and so they: **[1]**

a) are very high melting solids b) behave like superconductors

c) do not behave like transition metals d) behave like semiconductors

18. Lanthanoid contraction is: **[1]**

a) decrease in stability of higher oxidation states of lanthanides. b) the filling of 4f before 5d orbital resulting in a regular decrease in atomic radii.

c) ions of the same charge in a given series showing a progressive decrease in radius with increasing atomic number. d) the decrease in the ionic character of lanthanides with an increase in the oxidation state.

19. Ferrous sulphate on heating gives: **[1]**

a) SO_3 b) SO_2 and O_2

c) SO_2 d) SO_2 and SO_3

20. Which of the following is a strong oxidising agent? **[1]**
(At. No. Mn = 25, Zn = 30, Cr = 24, Sc = 21)

a) Cr^{3+} b) Mn^{3+}

c) Zn^{2+} d) Sc^{3+}

21. Which is least soluble in water? **[1]**

a) AgBr b) AgI

c) Ag_2S d) AgCl

22. Among the following, which bivalent ion of the first transition series shows a maximum magnetic moment? **[1]**

a) Co^{2+} b) Ni^{2+}

c) Mn^{2+} d) Fe^{2+}

23. The most common oxidation state for all lanthanoids is: **[1]**

a) + 5 b) + 4

c) + 2 d) + 3

24. The most stable ion is **[1]**

a) Fe^{2+} b) Mn^{2+}

c) Cr^{2+} d) All are equally stable

25. In which of the following does the central atom exhibit an oxidation state of +3? **[1]**

a) $K_4[Fe(CN)_6]$ b) $[Cu(NH_3)_4]^{2+}$

c) $[Fe(C_2O_4)_3]^{3-}$ d) $K_2[Ni(CN)_4]$

26. Among the following outermost configurations of transition metals which one shows the highest oxidation state? **[1]**

a) $3d^54s^2$ b) $3d^64s^2$

c) $3d^54s^1$ d) $3d^34s^2$

27. In dilute alkaline solution, MnO_4^- changes to: **[1]**

a) MnO_4^{2-} b) MnO_2

c) Mn_2O_3 d) MnO

28. On addition of small amount of $KMnO_4$ to concentrated H_2SO_4, a green oily compound is obtained which is highly explosive in nature. Identify the compound from the following. **[1]**

a) MnO_2 b) Mn_2O_7

c) $MnSO_4$ d) Mn_2O_3

29. Which of the following transition metals does **not** show variable oxidation state? **[1]**

a) Cr b) Sc

c) Cu d) Ti

30. Which of the following is paramagnetic as well as coloured ion? **[1]**

a) Ti^{4++} b) Cu^{+}

c) Sc^{3+} d) Cu^{2+}

31. Which of the following is not considered a transition metal? **[1]**

a) Zn b) Ac

c) Y d) La

32. When acidified $K_2Cr_2O_7$ solution is added to Sn^{2+} salts then Sn^{2+} changes to **[1]**

a) Sn^{+} b) Sn

c) Sn^{4+} d) Sn^{3+}

33. $KMnO_4$ acts as an oxidising agent in alkaline medium. When alkaline $KMnO_4$ is treated with KI, iodide ion is oxidised to: **[1]**

a) IO_3^- b) IO^-

c) I_2 d) IO_4^-

34. The percentage of nickel in the alloy steel that is used for making pendulum is: **[1]**

a) 19% b) 36%

c) 0% d) 10%

35. Which forms protective and non-corrosive oxide layer? **[1]**

a) Cu b) Zn

c) Cr d) Ni

36. Write the formula of a complex in which oxidation state of Ni is zero. **[1]**

a) $Ni(CO)_4$ b) $Ni(CN)_4$

c) $Ni(CN)_2$ d) $Ni(Cu)_2$

37. The magnetic moment is associated with its spin angular momentum and orbital angular momentum. Spin only magnetic moment value of Cr^{3+} ion is _____. **[1]**

a) 2.87 B.M b) 3.87 B.M

c) 3.57 B.M d) 3.47 B.M

38. Lanthanoid contraction is due to increase in: **[1]**

a) shielding by 4f electrons b) effective nuclear charge

c) atomic number d) atomic radius

39. The compound which is widely used as a white pigment is: **[1]**

a) ZnO b) Al_2O_3

c) $PbCO_3$ d) $CaCO_3$

40. Which of the following Cu^{2+} halide is **not** known? **[1]**

a) CuF_2 b) $CuCl_2$

c) $CuBr_2$ d) CuI_2

41. Oxidation state of central metal atom in the given complex is: **[1]**
$[Co(NH_3)_4(H_2O)_2]Cl_3$

a) +1 b) +3

c) +4 d) +2

42. Electronic configuration of Fe^{3+} is: **[1]**

a) $[Ar]\ 4s^2 3d^3$ b) $[Ar]\ 3d^5$

c) $[Ar]\ 4s^2 3d^6$ d) $[Ar]\ 4s^2 3d^4$

43. Silver ornaments turn black by the presence of which gas in the atmosphere? **[1]**

a) H_2S b) O_2

c) Cl_2 d) N_2

44. The incorrect statement about interstitial compounds is: **[1]**

a) They retain metallic conductivity. b) They are very hard.

c) They are chemically reactive. d) They have high melting point.

45. Which one among the following metals of 3d series has the lowest melting point? **[1]**

a) Cu b) Fe

c) Zn d) Mn

46. Which set of ions exhibit specific colours? (Atomic number of Sc = 21, Ti = 22, V = 23, Mn = 25, Fe = 26, Ni = 28, Cu = 29 and Zn = 30) **[1]**

a) Sc^{3+}, Zn^{2+}, Ni^{2+} b) Ti^{3+}, Ti^{4+}, Ni^{2+}

c) Sc^{3+}, Ti^{4+}, Mn^{3+} d) V^{3+}, V^{2+}, Fe^{3+}

47. The catalyst used in Deacon's process is: **[1]**

a) Cu_2Cl_2 b) $FeCl_2$

c) $FeCl_3$ d) $CuCl_2$

48. DMG test is used for the detection of **[1]**

a) Cu b) Ti

c) Co d) Ni

49. In a neutral solution, how many moles of $KMnO_4$ is required for the oxidation of 10 moles of ferric oxalate? **[1]**

a) 6 b) 5

c) 2 d) 4.5

50. Which of the following ions has the maximum number of unpaired d-electrons? **[1]**
[Atomic number : Fe = 26, V = 23, Ti = 22, Sc = 21]

a) V^{3+} b) Sc^{3+}

c) Fe^{3+} d) Ti^{3+}

51. Which of the following is a diamagnetic ion? (Atomic numbers of Sc, V, Mn and Cu are 21, 23, 25 and 29 respectively) **[1]**

a) V^{2} b) Mn^{3+}

c) Cu^{2+} d) Sc^{3+}

52. In the reaction, $HgCl_2 + 4KI \rightarrow A + 2KCl$ A is: **[1]**

a) HgI_2 b) $KHgI_3$

c) $K_2[HgI_4]$ d) K_2HgI_3

53. Which of the following reactions are disproportionation reactions? **[1]**

a. $Cu^{+} \longrightarrow Cu^{2+} + Cu$

b. $3MnO_4^{-} + 4H^{+} \longrightarrow 2MnO_4^{-} + MnO_2 + 2H_2O$

c. $2KMnO_4 \longrightarrow K_2MnO_4 + MnO_2 + O_2$

d. $2MnO_4^{-} + 3Mn^{2+} + 2H_2O \longrightarrow 5MnO_2 + 4H^{+}$

a) a, b, c b) b, c, d

c) a, b d) a, d

54. Electronic configuration of a transition element X in +3 oxidation state is $[Ar]3d^5$. What is its atomic number? **[1]**

a) 24 b) 26

c) 27 d) 25

55. Which of the following transition metals shows +1 and +2 oxidation states? **[1]**

a) Mn b) Zn

c) Cu d) Sc

56. A reduction in the atomic size with an increase in atomic number is characteristic of the elements of: **[1]**

a) radioactive series b) d–block

c) f-block d) high atomic masses

57. Ni^{2+} in traces can be tested using **[1]**

a) Dimethylglyoxime b) Potassium ferrocyanide

c) Ammonium sulphocyanide d) Sodium nitroprusside

58. When $KMnO_4$ solution is added to oxalic acid solution, the decolourisation is slow in the beginning but becomes instantaneous after some time because: **[1]**

a) CO_2 is formed as the products b) Reaction is exothermic

c) Mn^{2+} acts as autocatalyst

d) MnO_4^- catalysis the reaction

59. $KMnO_4$ acts as an oxidising agent in acidic medium. The number of moles of $KMnO_4$ that will be needed to react with one mole of sulphide ions in acidic solution is: **[1]**

a) $\frac{4}{5}$

b) $\frac{3}{5}$

c) $\frac{2}{5}$

d) $\frac{1}{5}$

60. The electronic configuration of Cu(II) is $3d^9$ whereas that of Cu(I) is $3d^{10}$. Which of the following is correct? **[1]**

a) Cu(II) is less stable

b) Cu(I) and Cu(II) are equally stable

c) Stability of Cu(I) and Cu(II) depends on nature of copper salts

d) Cu(II) is more stable

61. Ag^+ ion is isoelectronic with: **[1]**

a) Pd^{2+}

b) Cd^{2+}

c) Cu^+

d) Zn^{2+}

62. The magnetic nature of elements depends on the presence of unpaired electrons. Identify the configuration of transition element, which shows highest magnetic moment. **[1]**

a) $3d^2$

b) $3d^5$

c) $3d^7$

d) $3d^8$

63. Which property of transition metals enables them to behave as catalysts? **[1]**

a) Alloy formation

b) High melting point

c) Variable oxidation states

d) High ionisation enthalpy

64. The most common and stable oxidation state of a Lanthanoid is: **[1]**

a) +3

b) +4

c) +6

d) +2

65. Interstitial compounds are formed when small atoms are trapped inside the crystal lattice of metals. Which of the following is not the characteristic property of interstitial compounds? **[1]**

a) They retain metallic conductivity.

b) They have high melting points in comparison to pure metals.

c) They are chemically very reactive.

d) They are very hard.

66. How many electrons are involved in the reduction of $KMnO_4$ in the basic medium? **[1]**

a) 3

b) 1

c) 2

d) 4

67. There are 14 elements in the actinoid series. Which of the following elements does not belong to this series? **[1]**

a) U

b) Tm

c) Np

d) Fm

68. Lanthanoid contraction is a caused due to: **[1]**

a) Poor shielding effect of 4f electron
b) Effective nuclear charge
c) Size of 4f orbitals
d) Atomic number

69. Oxides of which of the lanthanides are used for making gas mantles? **[1]**

a) Bk
b) Lr
c) Dy
d) Ce

70. Which of the following is amphotric oxide? **[1]**

Mn_2O_7, CrO_3, Cr_2O_3, CrO, V_2O_5, V_2O_4.

a) V_2O_5, V_2O_4
b) V_2O_5 and Cr_2O_3
c) Mn_2O_7, CrO_3
d) CrO, V_2O_5

71. In which of the following elements, 5f orbitals are progressively filled? **[1]**

a) Transition element
b) Lanthanoids
c) Alkaline earth metals
d) Actinoids

72. Oxidation state of Mn in MnO_4^- is +7 indicating all electrons paired in Mn but MnO_4^- is coloured. This is due to: **[1]**

a) Current transfer
b) Both presence of unpaired electron in d-orbital in oxygen and charge transfer
c) Presence of unpaired electron in d-orbital in oxygen
d) Charge transfer

73. Which of the following is called chromic acid? **[1]**

a) CrO
b) H_2CrO_4
c) Cr_3O_4
d) Cr_2O_3

74. Red hot steel rods on suddenly immersing in water become: **[1]**

a) Soft and malleable
b) Hard and brittle
c) Tough and ductile
d) Fibrous

75. The yellow colour of the chromate changes to orange on acidification due to the formation of: **[1]**

a) $Cr_2O_7^{2-}$
b) Cr_2O_3
c) CrO_2
d) CrO_4^{2-}