E-TECH ACADEMY

PRESENTS

CHEMISTRY
MODULE

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INDEX

ELECTROCHEMISTRY

LEVEL-1

1. Strong electrolytes are those which :

1) dissolve in water

2) does not conduct electricity

3) dissociate into ions even at high concentration

4) dissociate into ions at high dilution

2. Solid sodium chloride does not conduct electricity due to the absence of :

1) free NaCl 2) free ions

3) free molecules 4) free atoms of Na and Cl

3. Electrolytic conduction is due to the movement of

1) molecules 2) atoms

3) ions 4) electrons

4. Which of the following solutions of KCl has the lowest value of equivalent conductance?

1) 1 M 2) 0.1 M

3) 0.01 M 4) 0.001 M

5. If the specific resistance of a solution of concentration C geq L^{-1}. Then its equivalent conductance is:

1) 100R/C 2) RC/1000

3) 1000/RC 4) C/1000R

6. The specific conductance's in ohm^{-1} cm^{-1} of four electrolytes P, Q, R and S are given in brackets: P (5.0×10^{-5}) Q (7.0×10^{-8}) R (1.0×10^{-10}) S (9.2×10^{-3}) The one that offers highest resistance to the passage of electric current is

1) P 2) S 3) R 4) Q

7. The specific conductance of a salt of 0.01 M concentration is 1.061×10^{-4} S cm^{-1}. Molar conductance of the same solution will be :

1) 1.061×10^{-4} S cm^2 mol^{-1}

2) 1.061 S cm^2 mol^{-1}

3) 10.61 S cm^2 mol^{-1}

4) 106.1 Scm^2 mol^{-1}

8. Which statement is not correct:

1) Conductance of an electrolytic solution increases with dilution

2) Conductance of an electrolytic solution decreases with dilution

3) Specific conductance of an electrolytic solution decreases with dilution

4) Equivalent conductance of an electrolytic solution increases with dilution.

9. The resistance of 0.01 N solution of an electrolyte was found to be 210 ohm at 298 K using a conductivity cell of cell constant 0.66 cm^{-1}. The equivalent conductance of solution is:

1) 314.28 mho cm^2 eq^{-1}

2) 3.14 mho cm^2 eq^{-1}

3) 314.28 mho^{-1} cm^2 eq^{-1}

4) 3.14 mho^{-1} cm^2 eq^{-1}

10. Electrolytic conduction differs from metallic conduction from the fact that in the former.

1) The resistance increases with increasing temperature

2) The resistance decreases with increasing temperature

3) The resistance remains constant with increasing temperature

4) The resistance is independent of the length of the conductor

11. The specific conductance of a 0.01 M solution of KCl is 0.0014 ohm^{-1} cm^{-1} at 25° C. Its equivalent conductance (cm^2 ohm^{-1} eq^{-1}) is :-

1) 140 2) 14 3) 1.4 4) 0.14

12. Which one of the following is wrong: -

1) Specific conductance increases on dilution.

2) Specific conductance decreases on dilution.

3) Equivalent conductance increases on dilution.

4) Molar conductance increases on dilution.

13. At infinite dilution, the equivalent conductance's of CH_3COONa, HCl and CH_3COOH are 91, 426 and 391 mho cm^2 eq^{-1} respectively at 25°C. The eq. conductance of NaCl at infinite dilution will be:

1) 126 2) 209 3) 391 4) 908

14. For HCl solution at 25 °C, equivalent conductance at infinite dilution is 425 ohm^{-1} cm^2 eq^{-1}. The specific conductance of a solution of HCl is 3.825 ohm-1 cm^{-1}. If the degree of dissociation is 90%, the normality of the solution is:

1) 0.90 N 2) 1.0 N 3) 10 N 4) 1.2 N

15. The molar conductivities Λ^0_{NaOAc} and Λ^0_{HCl} at infinite dilution in water at 25°C are 91.0 and 426.2Scm^2 mol^{-1} respectively. To calculate A^0_{HOAc} the additional value required is :

1) Λ^0 NaCl 2) Λ^0 H_2O

3) Λ^0KCl 4) Λ^0NaOH

16. The molar conductance of $AgNO_3$, AgCl and NaCl at infinite dilution are 116.5, 121.6 and 110.3 Scm^2mol^{-1} respectively. the molar conductance of $NaNO_3$ is :

1) 111.4 S cm^2 mol^{-1} 2) 105.2 S cm^2 mol^{-1}

3) 130.6Scm^2mol^{-1} 4) 150.2Scm^2mol^{-1}

17. The conductivity of a saturated solution of $BaSO_4$ is 3.06 × 10^{-6} ohm^{-1} cm and its molar conductance is 1.53 ohm^{-1} cm^2 mol^{-1}. The K_{sp} of $BaSO_4$ will be

1) 4×10^{-12} 2) 2.5×10^{-9}

3) 2.5×10^{-13} 4) 4×10^{-6}

18. Kohlrausch's law states that at :-

1) Infinite dilution, each ion makes definite contribution to conductance of an electrolyte whatever be the nature of the other ion of the electrolyte.

2) Infinite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte whatever be the nature of the other ion of the electrolyte.

3) Finite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte whatever be the nature of the other ion of the electrolyte.

4) Infinite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte depending on the nature of the other ion of electrolyte.

19. In the galvanic cell

Cu(s) $|Cu^{2+}$ (1 M) || Ag+ (1 M) | Ag(s)

the electrons will travel in the external circuit:

1) from Ag to Cu 2) from Cu to Ag

3) electrons do not travel in the external circuit

4) in any direction

20. The direction of current in the Daniell cell when Zn and Cu electrodes are connected is :

1) from Cu to Zn in the cell

2) from Cu to Zn outside the cell

3) from Zn to Cu outside the cell

4) in any direction in the cell

21. The equation representing the process by which standard reduction potential of zinc can be defined is

1) Zn^{2+} (s) + $2e^- \rightarrow$ Zn (s)

2) Zn (g) $\rightarrow$ Zn^{2+} (g) + $2e^-$

3) Zn^{2+} (g) + $2e^- \rightarrow$ Zn (s)

4) Zn^{2+} (aq.) + $2e^- \rightarrow$ Zn (s)

22. A standard hydrogen electrode has zero electrode potential because:

1) Hydrogen is easiest to oxidize.

2) This electrode potential is assumed to be zero.

3) Hydrogen atom has only one electron.

4) Hydrogen is the lightest element.

23. Which is not true for a standard hydrogen electrode?

1) The hydrogen ion concentration is 1 M.

2) Temperature is 25°C.

3) Pressure of hydrogen is 1 bar.

4) It contains a metallic conductor which does not adsorb hydrogen.

24. E° for the half cell Zn^{2+} | Zn is -0.76 V.

E.M.F. of the cell

Zn | Zn^{2+} (1M) | | $2H^+$ (1M) | H_2 (1 atm) is :

1) -0.76 V 2) +0.76 V

3) -0.38 V 4) + 0.38 V

25. Cu(s)|Cu (1 M)| |Zn (1 M)|Zn(s)

A cell represented above should have emf.

1) Positive 2) Negative

3) Zero 4) Cannot be predicted

26. Given electrode potentials :

Fe^{3+} + e $\rightarrow$ Fe^{2+} ; E° = 0.771 V

I_2 + 2e- $\rightarrow$ $2I^-$; E° = 0.536 V

E°cell for the cell reaction

$2Fe^{3+} + 2I^- \rightarrow 2Fe^{2+} + I_2$ is –

1) (2 × 0.771 - 0.536) = 1.006 V

2) (0.771 - 0.5 × 0.536) = 0.503 V

3) 0.771 - 0.536 = 0.235 V

4) 0.536 - 0.771 = -0.235 V

27. Which of the following is not an anodic reaction:-

1) Ag $\rightarrow$ Ag^+ +e- 2) Cu $\rightarrow$ Cu^{2+} + $2e^-$

3) $Fe^{2+} \rightarrow Fe^{3+}$ + e^- 4) $4OH^- \rightarrow 2H_2O + O_2 + 4e^-$

28. Which of the following statements is correct:-

1) Oxidation occurs at anode in both galvanic and electrolytic cell.

2) Reduction occurs at anode in both galvanic and electrolytic cell

3) Reduction occurs at anode in electrolytic cell whereas oxidation occurs at cathode in galvanic cell

4) Oxidation occurs at anode in electrolytic cell whereas reduction occurs at anode in a galvanic cell

29. Other things being equal, the life of a Daniell cell may be increased by :-

1) Keeping low temperature

2) Using large copper electrode

3) Decreasing concentration of copper ions

4) Using large zinc electrodes

30. Zn can not displace following ions from their aqueous solution:-

1) Ag^+ 2) Cu^{2+} 3) Fe^{2+} 4) Na^+

31. The standard reduction potentials at 25 °C for the following half reactions are given against each :-

Zn^{2+} (aq) + $2e^- \rightarrow$ Zn(s), -0.762 V

Cr^{3+} (aq) + $3e^- \rightarrow$ Cr(s), -0.740 V

$2H^+$ + $2e^- \rightarrow$ H_2 (g), 0.00 V

Fe^{3+} + $2e^- \rightarrow$ Fe^{2+}, 0.77 V

Which is the strongest reducing agent?

1) Zn 2) Cr 3) H_2 (g) 4) Fe^{2+}(aq)

32. Using the standard electrode potential values given below, decide which of the statements, I, II, III and IV are correct.

Choose the right answer from (1), (2), (3) and (4).

$Fe^{2+} + 2e^- \rightleftharpoons Fe$; $E° = -0.44$ V

$Cu^{2+} + 2e^- \rightleftharpoons Cu$; $E° = +0.34$ V

$Ag_+ + e^- \rightleftharpoons Ag$; $E° = +0.80$ V

I. Copper can displace iron from $FeSO_4$ solution.

II. Iron can displace copper from $CuSO_4$ solution.

III. Silver can displace copper from $CuSO_4$ solution.

IV. Iron can displace silver from AgNO3 solution.

1) I and II 2) II and III

3) II and IV 4) I and IV

33. The standard electrode potentials for the elements A, B and C are 0.68, -2.50 and 0.50 V respectively. The order of their reducing power is:

1) A > B > C 2) A > C > B

3) C > B > A 4) B > C > A

34. The oxidation potential of Zn, Cu, Ag, H_2 and Ni electrodes are 0.76 V, -0.34 V, -0.80 V, 0 V, 0.55 V respectively. Which of the following reaction will provide maximum voltage?

1) $Zn + Cu^{2+} \rightarrow Cu + Zn^{2+}$

2) $Zn + 2Ag^+ \rightarrow 2Ag + Zn^{2+}$

3) $H_2 + Cu^{2+} \rightarrow 2H^+ + Cu$

4) $H_2 + Ni^{2+} \rightarrow 2H^+ + Ni$

35. The standard reduction potential at 25 °C of Li^+ / Li, Ba^{2+} / Ba, Na^+ / Na and Mg^{2+} / Mg are -3.05 V, -2.73 V, -2.71 V and -2.37 V respectively. Which one of the following is the strongest oxidizing agent?

1) Na^+ 2) Li^+ 3) Ba^{2+} 4) Mg^{2+}

36. A gas X at 1 atm is bubbled through a solution containing a mixture of 1 M Y^- and 1 M Z^- at 25°C. If the reduction potential of Z > Y > X then:

1) Y will oxidize X and not Z

2) Y will oxidize Z and not X

3) Y will oxidize both X and Z

4) Y will reduce both X and Z

37. The standard electrode potential of Zn, Ag and Cu electrodes are -0.76 V, 0.80 V and 0.34 V respectively, then:

1) Ag can oxidize Zn and Cu

2) Ag can reduce Zn^{2+} and Cu^{2+}

3) Zn can reduce Ag^+ and Cu^{2+}

4) Cu can oxidize Zn and Ag

38. Standard reduction potentials of four metal electrodes are

A = - 0.250 V , B = - 0.140 V

C = - 0.126 V , D = - 0.402 V

The metal that displaces A from aqueous solution of its compounds is :-

1) B 2) C 3) D 4)None of the above

39. The following four colorless salt solutions are placed in separate test tubes and a strip of Cu is placed in each solution. Which solution finally turns blue:

1) $Zn(NO_3)_2$ 2) $Mg(NO_3)_2$

3) KNO_3 $AgNO_3$

40. Which of the following displacement does not occur:

1) $Zn + 2H^+ \rightarrow Zn^{2+} + H_2 \uparrow$

2) $Fe + 2Ag^+ \rightarrow Fe^{2+} + Ag \downarrow$

3) $Cu + Fe^{2+} \rightarrow Cu^{2+} + Fe \downarrow$

4) $Zn + Pb^{2+} \rightarrow Zn^{2+} + Pb \downarrow$

41. On the basis of the following E° values, the strongest oxidizing agent is :-

$[Fe(CN)_6]^{4-} \rightarrow [Fe(CN)_6]^{3-} + e^{-1}$; E° = - 0.35 V

$Fe^{2+} \rightarrow Fe^{3+} + e^{-1}$; E° = - 0.77 V

1) Fe^{3+} 2) $[Fe(CN)6]^{3-}$

3) $[Fe(CN)6]^{4-}$ 4) Fe^{2+}

42. $E°(Ni^{2+}/Ni) = -0.25$ V $E°\ (Au^{3+}\ /\ Au) = 1.50$ V
The emf of the voltaic cell
Ni | Ni^{2+} (1.0 M) | | Au^{3}+ (1.0 M) | Au is :

1) 1.2 V 2) -1.75 V 3) 1.75 V 4) 4.0 V

43. The emf of the cell
Tl (s)|Tl^+ (0.0001 M)| | Cu^{2+} (0.01M) |Cu(s) is 0.83 V
The emf of this cell will be increased by :-

1) Increasing the concentration of Cu^{+2} ions

2) Decreasing the concentration of Tl^+

3) Increasing the concentration of both

4) 1 & 2 both

44. Which of the following represents the electrode potential of silver electrode dipped into 0.1 M $AgNO_3$ solution at 25° C?

1) E°red 2) (E°red + 0.059)

3) (E° ox - 0.059) 4) (E°red - 0.059)

45. The electrode potential of a hydrogen electrode dipped in solution of pH = 1 is

1) 0.059 V 2) 0.00 V

3) -0.059 V 4) 0.59 V

46. Consider the reaction
Cl_2 (g) + $2Br^-$ (aq) $\rightarrow$ $2Cl^-$ (aq) + Br_2 (l)
The emf of the cell when $[Cl^-] = [Br^-] = 0.01$ M and Cl2 gas at 0.25 atm pressure will be (E° for the above reaction is = 0.29 V)

1) 0.54 V 2) 0.272 V

3) 0.29 V 4) -0.29 V

47. The standard emf for the cell reaction
$Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$ is 1.10 V at 25 °C.
The emf for the cell reaction when 0.1 M Cu^{2+} and 0.1 M Zn^{2+} solution are used at 25 °C is :

1) 1.10 V 2) 0.110 V

3) -1.10 V 4) -0.110 V

48. E° for F^{2+} $2e^- \rightarrow 2F^-$ is 2.8 V,
E° for ½ $F_2 + e^- \rightarrow F^-$ is?

1) 2.8 V 2) 1.4 V 3) -2.8 V 4) -1.4 V

49. How much will the potential of Mg | Mg^{2+} change if the solution of Mg^{2+} is diluted 10 times

1) increases by 0.03 V 2) decreases by 0.03 V

3) increases by 0.059 V 4) decreases by0.059 V

50. How much will the potential of a hydrogen electrode change when its solution initially at pH = 0 is neutralised to pH = 7 ?

1) increases by 0.059 V

2) decreases by 0.059 V

3) increases by 0.41 V 4) decreases by 0.41 V

51. Which of the following will increase the voltage of the cell with following cell reaction
Sn(s) + $2Ag^+$ (aq) $\rightarrow$ Sn^{+2} (aq) + 2Ag(s)

1) Increase in the size of silver rod

2) Increase in the concentration of Sn^{+2} ions

3) Increase in the concentration of Ag^+ ions

4) Decrease in the concentration of Ag^+ ions

52. E° for the reaction $Fe + Zn^{2+} \rightarrow Zn + Fe^{2+}$ is -0.35 V. The given cell reaction is :

1) spontaneous 2) non-spontaneous
3) in equilibrium 4) can't say anything.

53. For a reaction - $A(s) + 2B^{+} / A^{2+} + 2B(s)$ KC has been found to be 1012. The E°cell is:

1) 0.354 V 2) 0.708 V 3) 0.0098 V 4) 1.36 V

54. The standard electrode potential (E°) for $0OCl^{-}/Cl^{-}$ and Cl^{-} 1/2 Cl_2 respectively are 0.94 V and -1.36 V. The E° value of OCl^{-} 1/2 Cl_2 will be :

1) -2.20 V 2) -0.42 V
3) 0.52 V 4) 1.04 V

55. The hydrogen electrode is dipped in a solution of pH = 3 at 25 °C. The electrode potential of the half-cell would be:

1) 0.177 V 2) - 0.177 V
3) 0.087 V 4) 0.059 V

56. What is the potential of the cell containing two hydrogen electrodes as represented below Pt; H_2 (g)|H^{+} (10^{-8})M || H^{+} (0.001 M) | H_2 (g) IPt ;

1) - 0.295 V 2) - 0.0591 V
3) 0.295 V 4) 0.0591 V

57. Consider the cell $Cu|Cu^{+2}$ || $Ag^{+}|Ag$. If the concentration of Cu^{+2} and Ag^{+} ions becomes ten times, then the emf of the cell will :-

1) Becomes 10 times
2) Remains same
3) Increases by 0.0295 V
4) Decreases by 0.0295 V

58. The emf of the cell

$Ni|Ni^{2+}$(1.0 M) ||Au^{+3} (0.1M)|Au

[E° for $Ni^{+2}|Ni$ = -0.25V, E° for $Au^{+3}|Au$ = 1.50 V] is given as:-

1) 1.25 V 2) - 1.75 V
3) 1.78 V 4) 1.73 V

59. The equilibrium constant (in approx) of the cell reaction:

$Cu(s) + 2Ag^{+}$ (aq.) $\rightleftharpoons$ Cu^{+2}(aq.) + 2Ag(s)

if E°cell = 0.465 V at 298 K is :-

1) 2.0×10^{10} 2) 3.16×10^{12}
3) 3.16×10^{15} 4) 4×10^{10}

60. The emf of the cell in which the following reaction

$Zn(s) + Ni^{2+}$ (C = 0.1) $\rightleftharpoons$ Zn^{2+} (C = 1.0) + Ni(s)

occurs, is found to be 0.5105 V at 298 K. The standard e.m.f. of the cell is :-

1) -0.5105 V 2) 0.5400 V
3) 0.4810 V 4) 0.5696 V

61. If $E^{0}_{Fe+2/Fe}$ = - 0.441V and $E^{0}_{Fe+3/Fe+2}$ = 0.771V the standard EMF of the reaction

$Fe + 2Fe^{+3} \rightleftharpoons 3Fe^{+2}$ will be :

1) 0.330 V 2) 1.653 V
3) 1.212 V 4) 0.111 V

62. When an electric current is passed through acidified water, 112 mL of hydrogen gas at STP collects at the cathode in 965 s. The current passed in ampere is :

1) 1.0 2) 0.5 3) 0.1 4) 2.0

63. Two electrolytic cells one containing acidified ferrous chloride and another acidified ferric chloride are connected in series. The ratio of iron deposited at cathodes in the two cells when electricity is passed through the cells will be :

1) 3 :1 2) 2 : 1 3) 1 : 1 4) 3 : 2

64. A current of 9.65 A flowing for 10 minute deposits 3.0 g of a metal. The equivalent weight of the metal is:

1) 10 2) 30 3) 50 4) 96.5

65. How many coulombs of electric charge are required for the oxidation of 1 mol of H_2O to O_2?

1) 9.65×10^4 C 2) 4.825×10^5 C

3) 1.93×10^5 C 4) 1.93×10^4 C

66. On passing 10800 C through electrolytic solution, 2.977 g of metal (atomic mass 106.4 g/ mol) was deposited, the charge on the metal cation is –

1) +4 2) +3 3) +2 4) +1

67. On passing electricity through dilute H_2SO_4 solution the amount of substance liberated at the cathode and anode are in the ratio:

1) 1 : 8 2) 8 : 1 3) 16 : 1 4) 1 : 16

68. During electrolysis of fused calcium hydride, the hydrogen is produced at:

1) Cathode

2) Anode

3) Hydrogen gas is not liberated at all

4) H_2 produced reacts with oxygen to form water'

69. A silver cup is plated with silver by passing 965 A current for one second, the mass of Ag deposited is: (At. wt. of Ag = 107.87)

1) 9.89 g. 2) 107.87 g.

3) 1.0787 g. 4) 100.2 g.

70. When electricity is passed through a solution of $AlCl_3$, 13.5g Al is deposited. The number of Faradays must be :-

1) 5.0 2) 1.0

3) 1.5 4) 3.0

71. A solution of sodium sulphate in water is electrolyzed using inert electrodes. The product at the cathode and anode are respectively:

1) H_2 , SO_2 2) O_2 , H_2

3) O_2 , Na 4) H_2 ,O_2

72. One Faraday of electricity will liberate one mole of the metal from the solution of

1) Auric chloride 2) Silver nitrate

3) Calcium chloride 4) Copper sulphate

73. When 96500 C of electricity are passed through barium chloride solution, the amount of barium deposited will be :-

1) 0.5 mol 2) 1.0 mol

3) 1.5 mol 4) 2.0 mol

74. A factory produces 40 kg of calcium in two hours by electrolysis. How much aluminium can be produced by the same current in two hours :-

1) 22 kg 2) 18 kg

3) 9 kg 4) 27 kg

75. What would be the ratio of moles of Ag, Cu, Fe that would be deposited by passage of same quantity of electricity through solutions of salts containing Ag^+, Cu^{+2}, Fe^{+3}:

1) 1 : 1 : 1 2) $1:\frac{1}{2}:\frac{1}{3}$

3) $\frac{1}{3}:\frac{1}{2}:1$ 4) 1 : 2 : 3

76. Electrolysis of aq. $CuSO_4$ causes :-

1) An increase in pH

2) A decrease in pH

3) Either decrease or increase in pH

4) None

77. The passage of current liberates H_2 at cathode and Cl_2 at anode. The solution is :-

1) $CuSO_4$ (aq) 2) $CuCl_2$ (aq.)

3) NaCl (aq.) 4) Water

78. When lead accumulator is charged, it acts as:

1) an electrolytic cell 2) a galvanic cell

3) a Daniel cell 4) none of the above

79. The thermodynamic efficiency of cell is given by –

1) They are more efficient

2) They are free from pollution

3) They run till reactants are active

4) Fuel burned with O_2

80. When a lead storage battery is charged it act as:

1) a fuel cell 2) a Galvanic cell

3) a electrolytic cell 4) a concentration cell

81. Which of the following statement is false for Fuel cells?

1) They are more efficient

2) They are free from pollution

3) They run till reactants are active

4) Fuel burned with O_2

LEVEL-1 KEY

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
3	2	3	1	3	3	3	2	1	2
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
1	1	1	3	1	2	4	2	2	2
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
4	2	4	2	2	3	1	1	4	4
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
1	3	4	2	4	1	3	3	4	3
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
1	3	4	4	3	2	1	1	1	4
51	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
3	2	1	3	2	3	3	4	3	2
61	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**
3	1	4	3	3	1	1	2	3	3
71	**72**	**73**	**74**	**75**	**76**	**77**	**78**	**79**	**80**
4	2	1	2	2	2	3	1	3	3
81									
2									

LEVEL-2

1. The chemical reaction,

$2AgCl(s) + H_2(g) \longrightarrow 2HCl(aq) + 2Ag(s)$

taking place in a galvanic cell is represented by the notation :

1) Pt(s) | H_2(g), 1 bar | 1 M KCl (aq) | AgCl (s) | Ag(s)

2) Pt(s) | H_2(g), 1 bar | 1 M HCl (aq) | 1 M Ag^+ (aq) | Ag (s)

3) Pt (s) | H_2(g), 1 bar | 1M HCl(aq) | AgCl(s) | Ag (s)

4) Pt (s) | H_2(g), 1 bar | 1 M HCl (aq) | Ag(s) | AgCl(s)

2. For the reduction of silver ions with copper metal, the standard cell potential was found to be + 0.46 V at 25°C. The value of standard Gibbs energy ΔG^o will be (F = 96500 C mol^{-1})

1) – 89.0 kJ 2) – 89.0 J

3) – 44.5 kJ 4) – 98.0 kJ

3. Assertion : Galvanised iron does not rust.

Reason : Zinc has a more negative electrode potential than iron.

1) If both assertion and reason are true and reason is the correct explanation of assertion.

(2) If both assertion and reason are true but reason is not the correct explanation of assertion.

3) If Assertion is true but reason is false.

4) If both assertion and reason are false.

4. The products formed when an aqueous solution of NaBr is electrolysed in a cell having inert electrodes are :

1) Na and Br_2 2) Na and O_2

3) H_2, Br_2 and NaOH 4) H_2 and O_2

5. **Assertion :** For the Daniel cell Zn | Zn^{2+} | | Cu^{2+} | Cu with E_{cell} = 1.1 V, the application of opposite potential greater than 1.1 V results into flow of electron from cathode to anode.

Reason : Zn is deposited at anode and Cu is oxidised at cathode.

1) If both assertion and reason are true and reason is the correct explanation of assertion.

2) If both assertion and reason are true but reason is not the correct explanation of assertion.

3) If Assertion is true but reason is false.

4) If both assertion and reason are false.

6. **A current of 96.5 A is passed for 18 min between nickel electrodes in 500 mL solution of 2M $Ni(NO_3)_2$. The molarity of solution after electrolysis would be :**

1) 0.46 M 2) 2 M

3) 0.625 M 4) 1.25 M

7. **Assertion :** According to Kohlrausch law the molar conductivity of a strong electrolyte at infinite dilution is sum of molar conductivities of its ions.

Reason : The current carried by cation and anion is always equal.

1) If both assertion and reason are true and reason is the correct explanation of assertion.

2) If both assertion and reason are true but reason is not the correct explanation of assertion.

3) If Assertion is true but reason is false.

4) If both assertion and reason are false.

8. **Assertion :** The cell potential of mercury cell is 1.35 V, which remains constant.

Reason : In mercury cell, the electrolyte is a paste of KOH and ZnO.

1) If both assertion and reason are true and reason is the correct explanation of assertion.

2) If both assertion and reason are true but reason is not the correct explanation of assertion.

3) If Assertion is true but reason is false.

4) If both assertion and reason are false.

9. **The reduction potential at pH = 14 for the Cu^{2+}/Cu couples is :**

(Given $E^0_{Cu^{2+}/Cu}$ = 0.34 V ; $K_{sp}[Cu(OH)_2] = 1 \times 10^{-19}$)

1) 0.34 V 2) – 0.34 V 3) 0.22 V 4) – 0.22 V

10. **The minimum voltage required to electroyse alumina in the Hall-Heroult process is :**

(Given, ΔG^0_f (Al_2O_3) = – 1520 $kJmol^{-1}$; ΔG^0_f (CO_2) = – 394 $kJmol^{-1}$)

1) 1.575 V 2) 1.60 V

3) 1.312 V 4) – 2.62 V

11. **The pH of 0.5 L of 1.0 M NaCl after the electrolysis for 965 s using 5.0 A current, is:**

1) 1.0 2) 12.7 3) 13.0 4) 1.30

12. **The potential of hydrogen electrode having a solution of pH = 4 at 25°C is:**

1) –0.177 V 2) –0.236 V

3) +0.177 V 4) +0.236 V

13. **Assertion :** A reactions spontaneous if E_{cell} = +ve.

Reason : For E_{cell} = +ve, □ G is always –ve.

1) If both assertion and reason are true and reason is the correct explanation of assertion.

2) If both assertion and reason are true but reason is not the correct explanation of assertion.

3) If Assertion is true but reason is false.

4) If both assertion and reason are false.

14. The cell constant of a given cell is 0.47 cm^{-1}. The resistance of a solution placed in this cell is measured to be 31.6 ohm. The conductivity of the solution (in S cm^{-1} where S has usual meaning) is :

1) 0.15 2) 1.5 3) 0.015 4) 150

15. The standard reduction potentials at 298 K for the following half reactions are given against each

$Zn^{2+}(aq) + 2e \rightleftharpoons Zn(s)$; –0.762 V

$Cr^{3+}(aq) + 3e \rightleftharpoons Cr(s)$;–0.740 V

$2H^{+}(aq) + 2e \rightleftharpoons H_2(g)$;0.00 V

$Fe^{3+}(aq) + e \rightleftharpoons Fe^{2+}(aq)$;0.770 V

Which is the strongest reducing agent?

1) Zn (s) 2) Cr (s) 3) H_2 (g) 4) Fe^{3+} (aq)

16. A 1.0 M with respect to each of the metal halides AX_3, BX_2, CX_3 and DX_2 is electrolysed using platinum electrodes. If $E^{\circ}_{A^{3+}/A} = 1.50V, E^{\circ}_{B^{2+}/B} = 0.3V, E^{\circ}_{C^{3+}/C} = -0.74$ V, $E^{\circ}_{D^{2+}/D} = -2.37$ V.

The correct sequence in which the various metals are deposited at the cathode is -

1) A,B,C,D 2) A,B,C

3) D,C,B,A 4) C,B,A

17. When Br_2 is treated with aqueous solutions of NaF, NaCl and Nal separately

1) F_2, Cl_2 and I_2 are liberated

2) only F_2 and CI_2 are liberated

3) only I_2 is liberated

4) only Cl_2 is liberated

18. Assertion : On increasing dilution, the specific conductance keep on increasing.

Reason : On increasing dilution, the degree of ionisation of weak electrolyte increases and molality of ions also increases.

1) If both assertion and reason are true and reason is the correct explanation of assertion.

2) If both assertion and reason are true but reason is not the correct explanation of assertion.

3) If Assertion is true but reason is false.

4) If both assertion and reason are false.

19. Assertion : During electrolysis of $CuSO_4$(aq) using copper electrodes, copper is dissolved at anode and deposited at cathode.

Reason : Oxidation takes place at anode and reduction at cathode.

1) If both assertion and reason are true and reason is the correct explanation of assertion.

2) If both assertion and reason are true but reason is not the correct explanation of assertion.

3) If Assertion is true but reason is false.

4) If both assertion and reason are false.

20. Calculate the emf of the cell in which of the following reaction takes place

$Ni(s) + 2Ag^{+}$ (0.002M) $\rightarrow Ni^{2+}$ (0.160 M) + 2Ag(s) (Give the E^{0}_{cell} = 1.05 V)

1) 0.73 V 2) 0.91 V 3) 0.62 V 4) 0.34 V

21. The equivalent conductance of an aqueous solution of 1.0283×10^{-3} g equivalent acetic acid per litre is 48.15 ohm^{-1} cm^2 $equiv^{-1}$ at 25°C. At infinite dilution value is 390.7 ohm^{-1} cm^2 $equive^{-1}$. Calculate the degree of ionisation and ionisation constant of acetic acid.

1) 0.1232, 1.78×10^{-5} 2) 0.223, 102×10^{-5}

3) 0.229, 1.78×10^{-5} 4) 0.531, 2.85×10^{-5}

22. The number of coulombs required to reduce 12.3 g of nitrobenzene to aniline is

1) 96500 C 2) 5790 C

3) 95700C 4) 57900 C

23. Assertion (A) : E_{cell} increase with increase in concentration of Ag^+ ions

Reason (R) : E_{cell} has positive value.

1) If both assertion and reason are true and reason is the correct explanation of assertion.

2) If both assertion and reason are true but reason is not the correct explanation of assertion.

3) If Assertion is true but reason is false.

4) If both assertion and reason are false.

24. Cell equation :

$A + 2B^+ \longrightarrow A^{2+} + 2B$

$A^{2+} + 2e \longrightarrow A$

E^o = + 0.34 V and $\log_{10}$ K = 15.6 at 300 K for cell reactions

Find E^o for $B^+ + e \longrightarrow B$

Given $\left[\frac{2.303RT}{nF}=0.059\right]_{at300K}$

1) 0.80 2) 1.26 3) – 0.54 4) + 0.94

25. 0.1 mole, per litre solution present in conductivity cell where electrode of 100 cm^2 area placed at 1 cm and resistance observe is 5 x 10^3 Ohm, what is molar conductivity of solution?

1) 5 x10^2 S cm^2 $mole^{-1}$ 2) 10^4 S cm^2 $mole^{-1}$

3) 200 S cm^2 $mole^{-1}$ 4) 0.02 S cm^2 $mole^{-1}$

26. In following cell reaction

$Mg(s)+2Ag^+(0.001M)\longrightarrow Mg^{2+}(0.20M)+2Ag(S)$

Calculate E_{cell} for the reaction [E^o = 3.17 V , $\frac{2.30\,RT}{F}=0.054$]

1) 2.63 V 2) 3.01 V 3) 3.33 V 4) 3.51 V

27. Consider the following E^0 values :

$E^0_{Fe^{3+}/Fe^{2+}}$ = + 0.77 V ; $E^0_{Sn^{2+}/Sn}$ = – 0.14 V

Under standard conditions, the cell potential for the reaction given below is :

$Sn(s) + 2Fe^{3+}(aq) \rightarrow 2Fe^{2+}(aq) + Sn^{2+}(aq)$

1) 1.68 V 2) 1.40 V *3) 0.91 V 4) 0.63 V

28. The limiting molar conductivities Λ^o for NaCl, KBr and KCl are 126, 152 and 150 S cm^2 mol^{-1} respectively. The value of Λ^o for NaBr is :

*1) 128 S cm^2 mol^{-1} 2) 176 S cm^2 mol^{-1}

3) 278 S cm^2 mol^{-1} 4) 302 S cm^2 mol^{-1}

29. The molar conductivities Λ^0_{NaOAc} and Λ^0_{HCl} at infinite dilution in water at 25°C are 91.0 and 426.2 Scm^2/mol respectively. To calculate Λ^0_{HOAc}, the additional value required is :

1) $\Lambda^0_{H_2O}$ 2) Λ^0_{KCl} 3) Λ^0_{NaOH} *4) Λ^0_{NaCl}

30. The equivalent conductance of NaCl at concentration C and at infinite dilution are Λ_C and Λ_∞, respectively. The correct relationship between Λ_C and Λ_∞ is given as : (where the constant B is positive)

1) $\Lambda_C = \Lambda_\infty + (B)C$ 2) $\Lambda_C = \Lambda_\infty - (B)C$

*3) $\Lambda_C = \Lambda_\infty - (B)\sqrt{C}$ 4) $\Lambda_C = \Lambda_\infty + (B)\sqrt{C}$

31. The metal that cannot be obtained by electrolysis of an aqueous solution of its salts is:

1) Ag *2) Ca 3) Cu 4) Cr

32. Given below are the half-cell reactions :

$Mn^{2+} + 2e^- \rightarrow Mn$; $E^o = -1.18$ V

$2(Mn^{3+} + e^- \rightarrow Mn^{2+})$; $E^o = +1.51$ V

The E^o for $3Mn^{2+} \rightarrow Mn + 2Mn^{3+}$ will be:

*1) –2.69 V ; the reaction will not occur

2) –2.69 V ; the reaction will occur

3) –0.33 V ; the reaction will not occur

4) –0.33 V ; the reaction will occur

			LEVEL-2 KEY						
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
3	1	1	3	1	2	3	2	4	2
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
3	2	1	3	1	2	3	1,4	2	2
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
1	4	2	1	4	2	3	1	4	3
31	**32**								
2	1								

LEVEL-3(PREVIOUS YEARQUESTIONS)

1. If $E^0_{Fe^{+2}/Fe} = -0.441\,V$ and $E^0_{Fe^{+3}/Fe^{+2}} = -0.771\,V$ the standard EMF of the reaction

$Fe + 2Fe^{+3} \rightarrow 3Fe^{+2}$ will be (AIPMT 2006)

1) 0.330 V 2) 1.653 V

3) 1.212 V 4) 0.111 V

2. A hypothetical electrochemical cell is shown

A I A^+ (xM) || B^+ (yM) | B (AIPMT 2006)

1) $A^+ + B \rightarrow A + B^+$

2) $A^+ + e^- \rightarrow A$, $B^+ + e^- \rightarrow B$

3) $A + B+ \rightarrow A^+ + B$

4) The cell reaction cannot be predicted.

3. The equilibrium constant of the reaction:

$Cu(s) + 2Ag^+ (aq.) \rightarrow Cu= (aq.) + 2Ag(s)$

$E^0 = 0.46$ V at 298 K is: (AIPMT 2008)

1) 2.0×10^{10} 2) 4.0×10^{10}

3) 4.0×10^{15} 4) 2.4×10^{10}

4. On the basis of the following E0 values, the strongest oxidizing agent is- (AIPMT 2008)

$[Fe(CN)_6]^{4-} \rightarrow [Fe(CN)_6]^{3-} + e^{-1}$; $E^0 = -0.35$ V

$Fe^{2+} \rightarrow Fe^{3+} + e^{-1}$; $E^0 = -0.77$ V

1) Fe^{3+} 2) $[Fe(CN)_6]^{3-}$

3) $[Fe(CN)_6]^{4-}$ 4) Fe^{2+}

5. Kohlrausch's law states that at :-

1) Infinite dilution, each ion makes definite contribution to conductance of an electrolyte whatever be the nature of the other ion of the electrolyte. **(AIPMT 2008)**

2) Infinite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte whatever be the nature of the other ion of the electrolyte.

3) Finite dilution, each ion makes definite contribution to equivalent conductance of an

electrolyte whatever be the nature of the other ion of the electrolyte.

4) Infinite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte depending on the nature of the other ion of electrolyte.

6. Given : (AIPMT 2009)

(i) $Cu^{2+} + 2e^- \rightarrow Cu$, $E^0 = 0.337$ V

(ii) $Cu^{2+} + e^- \rightarrow Cu^+$, $E^0 = 0.153$ V

Electrode potential, E^0 for the reaction,

Cu+, $e^- \rightarrow$ Cu, will be-

1) 0.38 V 2) 0.52 V 3) 0.90 V 4) 0.30 V

7. The equivalent conductance of $\frac{M}{32}$ solution of a weak monobasic acid is 8.0 ohm cm^2 eq^{-1} and at infinite dilution is 400 ohm cm^2 eq^{-1}. The dissociation constant of this acid is:

1) 1.25×10^{-4} 2) 1.25×10^{-5} **(AIPMT 2009)**

3) 1.25×10^{-6} 4) 6.25×10^{-4}

8. Al_2O_3 is reduced by electrolysis at low potential and high current. If 4.0×10^4 A of current is passed through molten Al_2O_3 for 6 hours, what mass of aluminium is produced? (Assume 100% current efficiency, (At. mass of Al = 27 g mol^{-1})

1) 1.3×10^4 g 2) 9.0×10^3g **(AIPMT 2009)**

3) 8.1×10^4 g 4) 2.4×10^5 g

9. An increase in equivalent conductance of a strong electrolyte with dilution is mainly due to:- (AIPMT 2010)

1) Increase in number of ions.

2) Increase in ionic mobility of ions.

3)100% ionisation of electrolyte at normal dilution.

4) Increase in both i.e. number of ions and ionic mobility of ions.

10. Consider the following relations for emf of a electrochemical cell :- (AIPMT 2010)

(a) emf of cell =(Oxidation potential of anode) - (Reduction potential of cathode)

(b) emf of cell = (Oxidation potential of anode) + (Reduction potential of cathode)

(c) emf of cell = (Reduction potential of anode) + (Reduction potential of cathode)

(d) emf of cell = (Oxidation potential of anode) - (Oxidation potential of cathode)

Which of the above relations are correct:

1) (a) and (b) 2) (c) and (d)

3) (b) and (d) 4) (c) and (a)

11. Which of the following expressions correctly represents the equivalent conductance at infinite dilution of $Al_2(SO_4)_3$. Given that $\Lambda^0_{Al^{3+}}$ and $\Lambda^0_{SO_4^{2-}}$ are the equivalent conductance at infinite dilution of the respective ions:-

1) $\Lambda^0_{Al^{3+}} + \Lambda^0_{SO_4^{2-}}$ 2) $\left(\Lambda^0_{Al^{3+}} + \Lambda^0_{SO_4^{2-}}\right) \times 6$

3) $\frac{1}{2}\Lambda^0_{Al^{3+}} + \frac{1}{2}\Lambda^0_{SO_4^{2-}}$ 4) $2\Lambda^0_{Al^{3+}} + 3\Lambda^0_{SO_4^{2-}}$ **(AIPMT 2010)**

12. For the reduction of silver ions with copper metals, the standard cell potential was found to be + 0.46 V at 25^0C. The value of standard Gibbs energy. ΔG^0 will be [F = 96500 C mol^{-1}]

1) -98.0 kJ 2) -89.0 kJ **(AIPMT 2010)**

3) -89.0 J 4) -44.5 kJ

13. Standard electrode potential of three metals X, Y and Z are -1.2 V, +0.5 V and -3.0 V respectively. The reducing power of these metals will be :- (AIPMT 2011)

1) Y > Z > X

2) Y > X > Z

3) Z > X > Y 4) X > Y > Z

14. The electrode potentials for

$Cu^{2+}(aq) + e^- \rightarrow Cu^+(aq)$ and

$Cu^+(aq) + e^- \rightarrow Cu(s)$

are +0.15 V and + 0.50 V respectively. The value of $E^0_{Cu^{2+}/Cu}$ will be :- (AIPMT 2011)

1) 0.500 V 2) 0.325 V 3) 0.650 V 4) 0.150 V

15. Standard electrode potential for Sn^{4+}/ Sn^{2+} couple is +0.15 V and that for the Cr^{3+}/Cr couples is -0.74 V. These two couples in their standard state are connected to make a cell. The cell potential will be:- (AIPMT 2011)

1) +1.19 V 2) +0.89 V 3) +0.18 V 4) +1.83 V

16. If the E^0_{Cell} for a given reaction has a negative value, then which of the following gives the correct relationship for the values of ΔG^0 and K_{eq}? (AIPMT 2011)

1) $\Delta G_0 > 0$; $K_{eq} > 1$ 2) $\Delta G_0 < 0$; $K_{eq} > 1$

3) $\Delta G_0 < 0$; $K_{eq} < 1$ 4) $\Delta G_0 > 0$; $K_{eq} < 1$

17. A solution contains Fe^{2+}, Fe^{3+} and I^- ions. This solution was treated with iodine at 35^0C. E_0 for Fe^{3+}/ Fe^{2+} is +0.77 V and E^0 for $I_2 / 2I^- = 0.536$ V. The favourable redox reaction is:-

1) Fe^{2+} will be oxidized to Fe^{3+} **(AIPMT 2011)**

2) I_2 will be reduced to I^-

3) There will be no redox reaction

4) I^- will be oxidized to I_2

18. Molar conductivities ($\Lambda_m°$) at infinite dilution of NaCl, HCl and CH_3COONa are 126.4, 425.9 and 91.0 S cm^2 mol^{-1} respectively. $\Lambda_m°$ for CH_3COOH will be :- (AIPMT 2012)

1) 290.8 S cm^2 mol^{-1} 2) 390.5 S cm^2 mol^{-1}

3) 425.5 S cm^2 mol^{-1} 4) 180.5 S cm^2 mol^{-1}

19. Limiting molar conductivity of NH_4OH are i.e $\lambda^0_m(NH_4OH)$ is equal to :- (AIPMT 2012)

1) λ^0_m (NH_4OH) + λ^0_m (NH_4Cl) - λ^0_m (HCl)

2) λ^0_m (NH_4Cl) + λ^0_m (NaOH) - λ^0_m (NaCl)

3) λ^0_m (NH_4Cl) + λ^0_m (NaCl) - λ^0_m (NaOH)

4) λ^0_m (NaOH) + λ^0_m (NaCl) - λ^0_m (NH_4Cl)

20. At 250C molar conductance of 0.1 molar aqueous solution of ammonium hydroxide is 9.54 ohm^{-1} cm^2 mol^{-1} and at infinite dilution its molar conductance is 238 ohm^{-1} cm^2 mol^{-1}. The degree of ionization of ammonium hydroxide at the same concentration and temperature is:

1) 40.800 % **(NEET 2013)**

2) 2.080%

3) 4.008% 4) 4.008%

21. A hydrogen gas electrode is made by dipping platinum wire in a solution of HCl of pH = 10 and by-passing hydrogen gas around the platinum wire at 1 atm pressure. The oxidation potential of electrode would be ?

1) 1.18 V 2) 0.059 V **(NEET 2013)**

3) 0.59 V 4) 0.118 V

21. A button cell used in watches function as following

$Zn(s) + Ag_2O(s) + H_2O(l) \rightarrow 2Ag(s) + Zn^{2+}(aq) + 2OH^-(aq)$

If half-cell potentials are

$Zn^{2+}(aq) + 2e^- \rightarrow Zn(s)$; E° = -0.76 V

$Ag_2O(s) + H_2O(l) + 2e^- \rightarrow 2Ag(s) + 2OH^-(aq)$;

E° = 0.34 V

The cell potential will be: (NEET 2013)

1) 1.34 V 2) 1.10 V 3) 0.42 V 4) 0.84 V

22. When 0.1 mol MnO_4^{2-} is oxidised the quantity of electricity required to completely oxidise MnO_4^{2-} to MnO_4^- is :- (AIPMT 2014)

1) 96500 C 2) 2 × 96500 C

3) 9650 C 4) 96.50 C

23. The weight of silver (at wt. = 108) displaced by a quantity of electricity which displaces 5600 mL of O_2 at STP will be :- (AIPMT 2014)

1) 5.4 g 2) 10.8 g

3) 54.0 g 4) 108.0 g

24. A device that converts energy of combustion of fuels like hydrogen and methane, directly into electrical energy is known as:- (AIPMT 2015)

1) Electrolytic cell 2) Dynamo

3) Ni-Cd cell 4) Fuel Cell

25. The pressure of H_2 required to make the potential of H_2 -electrode zero in pure water at 298 K is :- (NEET 2016)

1) 10^{-14} atm 2) 10^{-12} atm

3) 10^{-10} atm 4) 10^{-4} atm

26. The molar conductivity of a 0.5 mol/dm^3 solution of $AgNO_3$ with electrolytic conductivity of 5.76×10^{-3} S cm^{-1} at 298 K is:- (NEET 2016)

1) 0.086 S cm^2/mol

2) 28.8 S cm^2/mol

3) 2.88 S cm^2/mol

4) 11.52 S cm^2/mol

27. During the electrolysis of molten sodium chloride, the time required to produce 0.10 mol of chlorine gas using a current of 3 A is

1) 220 minutes **(NEET 2016)**

2) 330 minutes

3) 55 minutes 4) 110 minutes

28. If the E^0_{Cell} for a given reaction has a negative value, which of the following gives the correct relationships for the values of $\Delta G°$ and K_{eq}?

1) $\Delta G° < 0; K_{eq} > 1$ **(NEET 2016)**

2) $\Delta G° < 0; K_{eq} < 1$

3) $\Delta G° > 0; K_{eq} < 1$ 4) $\Delta G° > 0; K_{eq} > 1$

29. The number of electrons delivered at the cathode during electrolysis by a current of 1 A in 60 s is (charge on electron = 1.60×10^{-19} C)

1) 3.75×10^{20} 2) 7.48×10^{23} **(NEET 2016)**

3) 6×10^{23} 4) 6×10^{20}

30. In the electrochemical cell:-

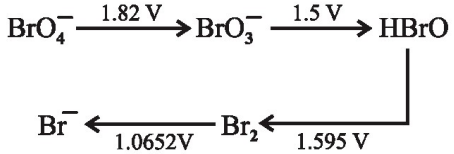
Zn | $ZnSO_4$(0.01 M) | | $CuSO_4$(1.0 M) | Cu, the emf of this Daniel cell is Ei. When the concentration of $ZnSO_4$ is changed to 1.0 M and that of $CuSO_4$ changed to 0.01 M, the emf changes to E_2. Which one of the relationships is correct between E_1 and E_2? (NEET 2017)

(Given, $\frac{RT}{F} = 0.059$) F

1) $E_1 < E_2$ 2) $E_1 > E_2$

3) $E_2 = 0 \# E_1$ 4) $E_1 = E_2$

31. Consider the change in oxidation state of Bromine corresponding to different EMF values as shown in the diagram below:



Then the species undergoing disproportionation is: (NEET 2018)

1) BrO_3^- 2) BrO_4^-

3) Br_2 4) HBrO

32. For a cell involving one electron E^0_{Cell} = 0.59V at 298 K, the equilibrium constant for the cell reaction is :- (NEET 2019)

[Given that $\frac{2.303RT}{F}$ = 0.059 V at T = 298K]

1) 1.0×10^2 2) 1.0×10^5

3) 1.0×10^{10} 4) 1.0×10^{30}

33. For the cell reaction

$2Fe^{3+}(aq) + 2I^-(aq) \rightarrow 2Fe^{2+}(aq) + I_2(aq)$

E^0_{Cell} = 0.24V at 298 K.

The standard Gibbs energy (A tG_0) of the cell reaction is : (NEET 2019)

[Given that Faraday constant F = 96500 C mol^{-1}]

1) - 46.32 kJ mol^{-1} 2) - 23.16 kJ mol^{-1}

3) 46.32 kJ mol^{-1} 4) 23.16 kJ mol^{-1}

34. Following limiting molar conductivities are given as

$\lambda^0_m(H_2SO_4)$ = x Scm^2 mol^{-1}

$\lambda^0_m(K_2SO_4)$= y S cm^2 mol^{-1}

$\lambda^0_m(CH_2COOK)$ = z S cm^2mol^{-1}

λ^0_m (in S cm^2 mol^{-1}) for CH_3COOH will be-

1) x - y + 2 z 2) x + y - z **(NEET 2019)**

3) x - y + z 4) $\frac{x-y}{2} + z$

35. The standard electrode potential (E°) values of $Al^{3+}|Al$, $Ag^+|Ag$, $K^+|K$ and $Cr^{3+}|Cr$ are -1.66 V, 0.80V, -2.93 V and -0.74 V respectively. The correct decreasing order of reducing power of the metal is : (NEET 2019)

1) Ag > Cr > Al > K

2) K > Al > Cr > Ag

3) K > Al > Ag > Cr

4) Al > K > Ag > Cr

36. The number of Faradays (F) required to produce 20 g of calcium from molten $CaCl_2$ (Atomic mass of Ca = 4a g mol^{-1}) is:

1) 2 2) 3 3) 4 4) 1

37. On electrolysis of dil. sulphuric acid using Platinum (Pt) electrode, the product obtained at anode will be : (NEET 2020)

1) Hydrogen gas 2) Oxygen gas

3) H_2S gas 4) SO_2 gas

38. The number of Faradays(F) required to produce 20 g of calcium from molten $CaCl_2$ (Atomic mass of Ca = 40 g mol^{-1}) is: (NEET 2020)

1) 1 2) 2 3) 3 4) 4

39. The molar conductivity of 0.007 M acetic acid is 20 S cm^2 mol^{-1}. What is the dissociation constant of acetic acid? Choose the correct option. (NEET 2021)

$\Lambda^0_{H^+}$ = 350 S cm^2 mol^{-1}

$\Lambda^0_{CH_3COO^-}$ = 50 S cm^2mol^{-1}

1) 1.75×10^{-4} mol L^{-1}

2) 2.50×10^{-4} mol L^{-1}

3) 1.75×10^{-5} mol L^{-1}

4) 2.50×10^{-5} mol L^{-1}

40. At 298 K, the standard electrode potentials of Cu^{2+} / Cu, Zn^{2+} / Zn, Fe^{2+} / Fe and Ag+ / Ag are 0.34 V, -0.76 V, -0.44 V and 0.80 V, respectively.

On the basis of standard electrode potential, predict which of the following reaction cannot occur? (NEET 2022)

1) $CuSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Cu(s)$

2) $CuSO_4(aq) + Fe(s) \rightarrow FeSO_4(aq) + Cu(s)$

3) $FeSO_4(aq) + Zn(s) \rightarrow ZnSO_4(aq) + Fe(s)$

4) $2CuSO_4(aq) + 2Ag(s) \rightarrow 2Cu(s) + Ag_2SO_4(aq)$

41. Given below are half-cell reactions:

$MnO_4^- + 8H^+ + 5e^- \rightarrow Mn^{2+} + 4H_2O$,

$E^0_{Mn2+/MnO4-} = -1.510V$

$\frac{1}{2}O_2 + 2H^+ + 2e^- \rightarrow H_2O$,

$E^0_{O2/H2O} = +1.223$ V (NEET 2022)

Will the permanganate ion, MnO_4^- liberate O_2 from water in the presence of an acid?

1) Yes, because E^0_{cell} = + 0.287 V

2) No, because E^0_{cell} = - 0.287 V

3) Yes, because E^0_{cell} = + 2.733 V

4) No, because E^0_{cell} = - 2.733 V

42. Find the emf of the cell in which the following reaction takes place at 298 K

$Ni(s) + 2Ag^+ (0.001\ M) \rightarrow Ni^{2+} (0.001\ M) + 2Ag(s)$ (NEET 2022)

$\left(E^0_{Cell} = 10.5\ V, \frac{2.303RT}{F} = 0.059 \text{ at } 298K\right)$

1) 1.0385 V 2) 1.385 V

3) 0.9615 V 4) 1.05 V

43. The conductivity of centimolar solution of KC1 at 25°C is 0.0210 $ohm^{-1}\ cm^{-1}$ and the resistance of the cell containing the solution at 25°C is 60 ohm. The value of cell constant is –

1) 3.28 cm^{-1} 2) 1.26 cm^{-1} **(NEET 2023)**

3) 3.34 cm^{-1} 4) 1.34 cm^{-1}

44. Given below are two statements: one is labelled as (NEET 2023)

Assertion A: In equation $\Delta_r G = -nFE_{cell}$, value of Δr_G depends on n.

Reasons R: E_{cell} is an intensive property and $\Delta_r G$ is an extensive property.

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

1) Both A and R are true and R is NOT the correct explanation of A.

2) A is true but R is false

3) A is false but R is true

4) Both A and R are true and R is the correct explanation of A.

45. Homoleptic complex from the following (NEET 2023)

1) Diamminechloridonitrito-N-platinum (II)

2) Pentaamminecarbonatocobalt (III) chloride

3) Triamminetriaquachromium (III) chloride

4) Potassium trioxalatoaluminate (III)

LEVEL-3 KEY

1	2	3	4	5	6	7	8	9	10
3	2	2	1	1	2	4	1	4	2
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
4	4	2	3	3	2	4	3	3	3
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
3	3	1	2	2	3	2	3	4	1
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
2	3	1	2	4	4	2	1	3	4
41	**42**	**43**	**44**	**45**					
1	3	2	4	4					

CO-ORDINATION COMPOUNDS

LEVEL-1

1. Coordination number is maximum in

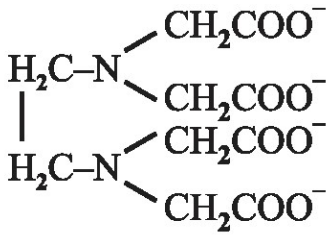
1) $[Co(NH_3)_6]^{3+}$

2) $[Co(C_2O_4)_3]^{3-}$

3) $[CoCl_3(H_2O)_3]$

4) All have same coordination number

2. Which of the following compound can give 2 mole AgCl per mole of the compound with excess of $AgNO_3$?



1) $NiCl_2.6H_2O$ 2) $CuCl_2.4NH_3$

3) CO_3^{2-} 4) NH_3

3. Find the correct statement about the ligand given below

I. This is ethylenediamine tetraacetate ion

II. This is flexidentate ligand

III. This ligand forms optically active complex with Co^{3+}

IV. This ligand is used for estimation of hardness of water

1) I, II 2) II, III 3) I, II, III 4) I, II, III, IV

4. The number of secondary and primary valency of Pentaammine chloridcobalt (III) chloride is

1) 6, 2 2) 5, 2 3) 6, 3 4) 5, 3

5. What is the secondary valency of cobalt in the complex $[Co(en)_2F_2]ClO_4$?

1) 4 2) 5 3) 3 4) 6

6. In the complex $[Pt(Py)_4]$ $[PtCl_4]$, the oxidation number of Pt atom in former and later part of the compound are respectively

1) 0 and 0 2) + 4 and + 2

3) +2 and +2 4) 0 and +4

7. Coordination number of Cr is 6. A complex entity with $C_2O_4^{2-}$, end and superoxide as ligand is $[Cr(C_2O_4)_x(en)_y(O_2)_z]^+$. The ratio x : y : z is

1) 1 : 1 : 2 2) 1 : 1 : 1

3) 1 : 2 : 2 4) 2 : 1 : 1

8. In the complex, potassium pentacyanonitrosyl vanadate (0), the number of counter ions per molecule and the coordination number of central metal ion are respectively

1) 5, 5 2) 4, 6 3) 5, 6 4) 4, 4

9. In $[Fe\eta^5 - C_5H_5)_2]$ the coordination number and oxidation state of iron are respectively

1) 10, +2 2) 6, +3 3) 4, 0 4) 4, +2

10. Select the correct statement

1) Flexidentate ligands can also be called ambidentate ligands

2) NO_2^{Θ} is a π -acid lignad

3) Ambidentate ligands are monodentate ligands

4) $[PtCl_4]^{-2}$ is an outer orbital complex

11. What are the oxidation states of Ni in the complexes $[Ni(dmg)_2]$ & $Ni(CO)_4$?

1) +6, +4 2) +2, 0 3) +2, +4 4) +6, 0

12. Which is not an example of ambidentate ligands?

1) SCN^{Θ} 2) NO^{Θ}

3) $CN^{\ominus}$ 4) $\ddot{N}H_2CH_2CH_2\ddot{N}H_2$

13. The two complexes $PtCl_4.2NH_3$ and $PtCl_4 2KCl$ do not give precipitate of AgCl when treated with $AgNO_3$. They give zero and three moles of ions respectively in solutions for one mole of complex. The structural formulae of both complexes are

1) $[PtCl_2(NH_3)]Cl_2$ and $K_2[PtCl_6]$ respectively

2) $[PtCl_4(NH_3)_2]$ and $K_2[PtCl_2(NH_3)_2]$ respectively

3) $[PtCl_4(NH_3)_2]$ and $K_2[Pt\ Cl_6]$ respectively

4) $[PtCl_4].2NH_3)]$ and $[PtCl_4].2KCl$ respectively

14. Which of the following can act as flexidentate ligand?

1) dipy 2) dmg 3) gly 4) $edta^{4-}$

15. Oxidation number and effective atomic number of central metal ion in ferrocene respectively is

1) +1, 35 2) +2, 35

3) +3, 36 4) +2, 36

16. The coordination number and primary valence of Cr in trisoxalato chromium (III) ion is

1) 3, 3 (2) 6, 3

3) 6, 6 4) Unpredictable

17. What is the secondary valency of the metal in the complex bis(ethane-1, 2-diammine) difluorido cobalt (III) perchlorate?

1) 4 2) 2 3) 3 4) 6

18. The coordination number and oxidation number of x in the compound $[x(SO_4)(NH_3)_5]Cl$ will be

1) 6 and 4 2) 10 and 3

3) 2 and 6 4) 6 and 3

19. In complex $MCl_3.5H_2O$, the secondary valency of metal is 6 and it has no molecule of water present out of coordination sphere. Calculate the volume of 0.1 M $AgNO_3$ solution needed to precipitate the free chloride ions in 200 ml of 0.01 M solution of the complex

1) 80 ml 2) 40 ml

3) 20 ml 4) 120 ml

20. The effective atomic number of Fe in $Fe(CO)_5$ is

1) 34 2) 26

3) 36 4) 54

21. What are the oxidation states of Ni in the complexes $[Ni(dmg)_2]$ & $Ni(CO)_4$?

1) +6, +4 2) +2, 0

3) +2, +4 4) +6, 0

22. π acid ligands is

1) CO 2) NO_2

3) CO_3^{2-} 4) NH_3

23. The oxidation state of iron in $Fe[\eta^5 - (C_6H_5)_2]$ is

1) + 1 2) + 3 3) + 2 4) – 3

24. Which of the following is a π -complex?

1) $[Fe(\eta^5 - C_5H_5)_4]$ 2) $[CoCl_2(en)_2]SO_4$

3) $[CuCl_4]^{2-}$ 4) $Li(AlH_4)$

25. Which of the following statement(s) is correct?

1) Bond length of C-O in metal carbonyl is less than in CO molecular state

2) Shape of $[PtCl_4]^{2-}$ is square planar

3) In square planar complexes, metal assumes sp^3 hybridization

4) The complex $[Co(NH_3)_3Cl_3]$ gives white ppt. with $AgNO_3$ solution

26. Arrange the following metal carbonyl in increasing order of bond length of CO

$Ni(CO)_4$, $[Co(CO)_4]^-$, $[Fe(CO)_4]^{2-}$

I II III

1) III < I < II 2) I < II < III

3) I < III < II 4) III < II < I

27. The neutral binary complexes formed by metal and CO ligands are collectively called

1) Heteroleptic carbonyls
2) Homoleptic carbonyls
3) Polycarboxy complexes
4) Polynuclear complexes

28. Which of the following is a π - acid ligand?

1) ONO^- 2) CO
3) NO_2^- 4) Cl^-

29. Ferrocene is

1) $Fe(\eta^6 - C_5H_5)_2$ 2) $Fe(\eta^2 - C_5H_5)_2$
3) $Cr(\eta^5 - C_5H_5)_2$ 4) $Os(\eta^5 - C_5H_5)_2$

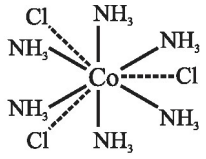
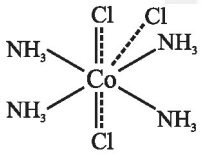
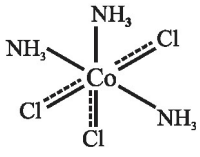
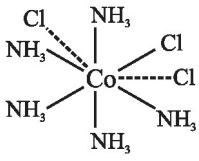
30. The total number of π - bonds possible in $[Ni(CO)_4]$ is

1) 4 2) 8
3) 12 4) 6

31. Which water of the following is π - acid ligand?

1) CO 2) NO^+
3) $CH_2 = CH_2$ 4) All of these

32. The solution of which of the following complexes will be non-conducting?

1) 
2) 
3) 
4) 

33. Maximum number of isomers are formed by

1) $[Fe(H_2O)_6]^{3+}$
2) $[Fe(C_2O_4)_3]^{3-}$
3) $[Pt(NH_3)\ BrCl(NO_2)]SO_4$
4) $[CO(NH_3)_4(H_2O)_2]Cl_3$

34. Which of the following is an example of coordination isomerism?

1) $[Co(NH_3)_5Br]SO_4$ and $[Co(NH_3)SO_4]Br$
2) $[Co(NH_3)_5NO_2]Cl_2$ and $[Co(NH_3)_5ONO]Cl_2$
3)$[Co(NH_3)_6][Cr(CN)_6]$and $[Cr(NH_3)_6[Co(CN)_6]$
4) All of these

35. Total number of geometrical isomers for $[Pt(NH_3)(Br)(Cl)(l)(NO_2)(py)]$ is

1) 6 2) 36 3) 10 4) 15

36. The coordination compound $[Co(NH_3)_6]$ $[Cr(CN)_6]$ can exhibit

1) Hydrate isomerism
2) Ionisation isomerism
3) Coordination isomerism
4) All of these

37. The complex $[M(CO)_5(SCN)]Cl$ and $[Mn(CO)_5(NCS)]Cl$ are

1) Resonating forms
2) Linkage isomers
3) Co-ordination isomers
4) Ionisation isomers

38. Which of the following square planar complexes will be able to show geometrical isomerism?

1) MX_4 2) MX_3Y
3) $M(XX')_2$ 4) $M(YY)_2$

39. The number of possible isomer for the complex ion $[Coen(Cl)_2Br_2^-]$ is

1) 2 2) 3 3) 4 4) 6

40. Which is an example of coordination isomerism?

1) $[Co(NO_2)(NH_3)_5]^{2+}$, $[Co(ONO)(NH_3)_5]^{2+}$
2) $[Co(NO_3)(NH_3)_5]SO_4$, $[Co(SO_4)(NH_3)_5]NO_3$
3) $[Cr(H_2O)_6]Cl_3$, $[CrCl(H_2O)_5]\ Cl_2.H_2O$
4)$[Co(NH_3)_6][Cr(CN)_6]$ & $[Cr(NH_3)_6]\ [Co(CN)_6]$

41. $[Pt(NH_3)(py)(CN)(NO_2)]$ can have maximum number of geometrical isomers equal to

1) 2 2) 3 3) 4 4) 5

42. The correct IUPAC name of $[Pt(en)_2Cl(ONO)]^{++}$is

1) Chlorodiethylenediaminenitritoplantinum (IV) ion

2) Bis(ethylenediamine)chloronitro-o- platinum (IV) ion

3) Chloridobis(ethylenediamine) nitritoplatinum (IV) ion

4) Chlorodiethylenediaminenitro-o- platinum(IV) ion

43. Which of the following is/are correct regarding this complex? $[CrCl_2(OH_2)(NH_3)_2]^-$

a) It shows geometrical isomerism

b) It shows optical isomerism

c) It shows ionization isomerism

d) It shows hydrate isomerism

1) a only 2) Both a & b

3) a, b & c 4) a, b, c & d

44. Which type of isomerism is shown by cis $[Co(en)_2Br_2]^+$?

1) Geometrical and co-ordination

2) Optical

3) Geometrical and linkage

4) Both (1) & (2)

45. Which of the following type of complex can exhibit facial and meridional isomers?

1) $[MA_4B_2]$ 2) $[MA_3B_3]$

3) $[MA_2B_2]$ 4) [MABCDEF]

46. $[CoCl_2(en)_2]^+ \rightarrow$ (I)

$[Co(NH_3)Cl(en)_2]^{2+} \rightarrow$ (II)

$[Co(NH_3)_2Cl_2(en)]$+ (cis) $\rightarrow$ (III)

Which of the following set of compounds is optically active?

1) I & II only 2) I & III only

3) II & III only 4) I, II & III

47. $[Pt(NH_3)_4Cl_2]Br_2$ and $[Pt(NH_3)4Br_2]Cl_2$ related to each other as

1) Optical isomers 2) Linkage isomers

3) Ionization isomers 4) Co-ordination isomers

48. Identify the false statement

1) The general electronic configuration of the transition elements is (n-1) $d^{1-10}ns^{1-2}$

2) IUPAC name of $K_3[Al(C_2O_4)_3]$ is potassium tris (oxalate) aluminate (III)

3) Oxidation state of Na in sodium amalgam is +1

4) BF_3 is weakest Lewis acid amongst all BX_3

49. The complex having square planar geometry is

1) $[PtCl_4]^{2-}$ 2) $[CuCl_4]^{2-}$

3) $[NiCl_4]^{2-}$ 4) All of these

50. The complex with maximum number of stereoisomers is

1) $[PtCl_3(C_2H_4)]^-$ 2) $[CuBr_2Cl_2]^{-2}$

3) $[Co(ox)_3]^{-3}$ 4) $[Cr(NH_3)_2(en)_2]^{+3}$

51. Facial and meridional isomerism is exhibited by which of the following complex?

1) MA_4B_2 2) MA_3B_3

3) $M(AA)_3$ 4) $M(AB)_3$

52. In aqueous solution, complex $[Co(NH_3)_6][Cr(CN)_6]$ exists as

1) $[Co(NH_3)_6]^{3+}$ and $[Cr(CN)e]^{3-}$

2) $[Co(NH_3)_6]^{2+}$ and $[Cr(CN)e]^{2-}$

3) $[Co(NH_3)_6]^{3-}$ and $[Cr(CN)e]^{3+}$

4) Does not dissociate

53. The IUPAC name of the following complex $[(CO)_3Fe(CO)_3Fe(CO)_3]$ is

1) Tricarbonyl iron (0) - μ -tricarbonyl iron (0)

2) Non-carbonyl di iron (l)

3) Hexacarbonyl iron (0) - μ - tricarbonyl iron (II)

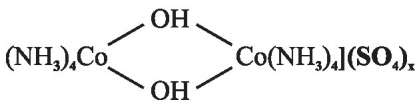
4) Tri- μ -carbonyl-bis (tricarbonyl iron (0)

54. Which of the following complex can exhibit geometrical isomerism?

1) $[Pt(ox)_2]^{-2}$ 2) $[Pt(gly)_2]$

3) $[Pt(en)_2]^{+2}$ 4) All of these

55. The value of 'x' in the complex is



1) 5 2) 2 3) 6 4) 4

56. fac-mer isomerism is exhibited by

1) $[Co(NH_3)_3Cl_3]$ 2) $[Co(H_2O)_5Cl]Cl_2$

3) $[Cr(ox)_3]^{3-}$ (4) $[MnCl_4]^{2-}$

57. Which type of isomerism is shown by both complex A and B?

$[Cr(H_2O_6)]\ Cl_3$ and $[Cr(H_2O)_4]\ Cl_2.\ 2H_2O$

A B

1) Electronic isomerism 2) Hydrate isomerism

3) Ionisation isomerism 4) No isomerism

58. What is the overall dissociation constant for the $[M(NH_3)_4]^{2+}$ ion if p for this complex is 2.1×10^{13}?

1) 2.1×10^{13} 2)1.05×10^{13}

3) 4.2×10^{13} 4) 4.7×10^{-14}

59. dmg + $NiCl_2$ + NH_4OH → Complex (A) + NH_4Cl + H_2O. The hybridization, Magnetic character and oxidation state of nickel in complex (A) are respectively

1) dsp^2, diamagnetic,+2 2) dsp^2, paramagnetic,+2

3) sp^3, diamagnetic, 0 4) sp^3, paramagnetic, +2

60. Which of the following is **incorrect?**

1) $[NiCl_4]^{2-}$ is

2) dsp^2, paramagnetic, +2

3) sp^3, diamagnetic, 0

4) sp^3, paramagnetic, +2

61. Highest magnetic moment is possessed by

1) $[Ni\ (H_2O)_6]^{2+}$ 2) $[Co\ (NH_3)_6]Cl_3$

3) $[Zn\ (H_2O)_6]^{2+}$ 4) Cis-platin

62. Which of the following complex has highest magnetic moment?

1) $[FeFe]^{3-}$ 2) $[Co\ (NH_3)_6]^3+$

3) $[Fe\ (CN)_6]^{4-}$ 4) $[Ni\ (CN)_4]^{2-}$

63. The stability constants of the complexes formed by a metal ion (M^{2+}) with NH_3, CN^-, H_2O and en are of the order of 10^{11}, 10^{27}, 10^{15} and 10^8 respectively. Then

1) en is the strongest ligand

2) CN^- is the strongest ligand

3) The strength of the ligands has no relationship with given values

4) All ligands are equally strong

64. If a multidentate ligand is cyclic in nature and there are no unfavourable steric factors, then the stability of complex is greatly enhanced. This is called

1) Ligand effect 2) Co-ordination effect

3) Macrocyclic effect 4) Synergic effect

65. Which is a diamagnetic complex?

1) $[Fe(H_2O)_6]^{3+}$ 2) $[Fe(H_2O)_6]^{2+}$

3) $[Fe(CN)_6]^{3-}$ (4) $[Fe(CN)_6]^{4-}$

66. What is the correct relationship of splitting of tetrahedral and octahedral system?

1) $\Delta_t = -\Delta_0$ 2) $\Delta_t = \frac{4}{9}\Delta_0$

3) $\Delta_0 = 4\Delta_t$ 4) $\Delta_t = \frac{9}{4}\Delta_0$

67. What is the wrong statement regarding stability of coordination compounds?

1) Greater the charge on central metal greater the stability of the compound

2) Chelation increases stability

3) Conjugation on chelating decreases stability

4) Stability is a thermodynamics concept

68. Which of the following is not the property of $Mn_2(CO)_{10}$?

1) 1 Mn-Mn bond

2) 10 Mn-CO bond

3) It has two square pyramidal unit

4) It is a liquid

69. Irving-William's order for increasing stability of complexes formed by Co, Ni, Cu and Fe in +2 oxidation state is

1) Co < Ni < Cu < Fe

2) Fe < Cu < Ni < Co

3) Fe < Co < Ni < Cu

4) Ni < Co < Cu < Fe

70. Which one species is square planar is geometry?

1) $[Cu(NH_3)_4]^{2+}$ 2) $[NiCl_4]^{-2}$

3) $[Ni(CO)_4]$ 4) $[FeCl_6]^{4-}$

71. In which pair of complex the EAN of metal atom/ ion is same?

1) $[Ni(en)_2]^{2+}$, $[Sc(H_2O)_6]^{3+}$

2) $[Fe(CN)_6]^{3-}$,$[Co(CN)_6]^{3-}$

3) $[Ni(CO)_4]$, $[Fe(CN)_6]^{4-}$

4) $[Ni(en)_2]$, $[Fe(H_2O)_6]^{2+}$

72. Which one of the following statement is incorrect?

1) Greater the stability constant of complex greater is its stability

2) Greater the charge on the central metal ion greater is the stability of complex

3) Greater is the basic character of the ligand, greater is the stability of the complex

4) Chelate complexes have low stability constant

73. Which among the following complex is/are outer orbital complex?

$[Co(CN)_6]^{3-}$ $[Fe(H_2O)_6]^{2+}$

(I) (II)

$[FeF_6]^{3-}$ $[CoF_6]^{3-}$

(III) (IV)

1) II, III, IV 2) II, III only

3) I, IV only 4) II only

74. Which of the following pairs contains only tetrahedral complex?

1) $[ZnCl_4]^{2-}$ & $[MnCl_4]^{2-}$

2) $[Zn(NH_3)_4]^2$+ & $[Cu(NH_3)_4]^{2+}$

3) $[MnCl_4]^2$- & $[Ni(CN)_4]^{2-}$

4) $[ZnCl_4]^{2-}$ & $[Ni(CN)]^{2-}$

75. Which among the following complex will have zero dipole moment?

(I) - $[Ni(CN)_4]^{2-}$ (II) - cis-$[Pt(NH_3)_2Cl_2]$

(III) - trans-$[Pt(NH_3)_2Cl_2]$

1) III only 2) I, III 3) I only 4) II, III

76. Which of the following pair are having same hybridization of central atom?

1) $[PtCl_4]^{2-}$ and $[NiCl_4]^{2-}$

2) $[cu(NH_3)_4]^{2+}$ and $[PtCl_4]^{2-}$

3) $[Ni(CO)_4]$ and $[Ni(CN)_4]^{2-}$

4) All of these

77. Find the correct match:

Complex	**Nature**
1) $K_4[Fe(CN)_6]$	Paramagnetic
2) $[FeF_6]^{4-}$	sp^3d^2 hybridisation
3) $[Ni(CO)_4]$	Square planar complex
4) $[Cu(NH_3)_4]^{2+}$	Diamagnetic, square planar Complex

78. Which is mismatched regarding spin only magnetic moment of the complexes?

1) $[FeFe]^{3-}$ = 5.92 BM

2) $Cr(CO)_6$ = 0.00 BM

3) $[Ni(CN)_4]^{2-}$ = 0.00 BM

4) cis Platin = 2.84 BM

79. The EAN of Mn in $Mn_2(CO)_{10}$ is

1) 35 2) 38 3) 36 4) 37

80. Of the following complexes, the one with the largest value of the crystal field splitting is

1) $[Fe(H_2O)_6]^{+3}$ 2) $[Ru(CN)_6]^{3-}$

3) $[Fe(H_2O)_6]^{+2}$ 4) $[Fe(NH_3)_6]^{3+}$

81. Magnetic moment of $[Ag(CN)_2]^-$ is zero. How many unpaired electrons are there?

1) Zero 2) 4 3) 3 4) 1

82. The hybridization of beryllium in the complex $[Be(H_2O)_4](NO_3)_2]$ is

1) sp 2) sp^2 3) sp^3 4) sp^3d^2

83. When O_2 reacts with PtF_6, which one of the following is formed?

1) $O_2^{\oplus}PtF_6^{(-)}$ 2) $PtOF_5$

3) $O_2^{(-)}PtF_6^{\oplus}$ 4) $PtOF_4$

84. Choose the correct statement

1) In $[NiCl_4]^{--}$, Ni has dsp^2-hybridisation

2) $[PtCl_2(NH_3)_2]$ has three stereisomers and two

3) $[Fe(CN)_6]^{4(-)}$ is diamagnetic

4) $[Cr(ox)_3]^{3(-)}$ has three stereiosomers and two structural isomers possible

85. In $[Fe(H_2O)_6]^{2+}$, hybridization of the central atom and geometry is

1) sp^3d^2, octahedral 2) d^2sp^3, octahedral

3) sp^3d, pentagonal 4) sp^3, tetrahedral

86. The CFSE value of d^5 ion in a weak octahedral ligand field is

1) -8 Dq 2) 4 Dq 3) -6 Dq 4) 0 Dq

87. The factors which can increase the stability of complex is

1) Presence of chelate rings

2) Synergic effect

3) Macrocyclic effect

4) All of these

88. Identify the metal that form a tetrahedral complex with Cl^- ligand and of magnetic moment 5.91 BM in +2 oxidation state

1) Ni 2) Mn 3) Cr 4) Fe

89. Which one of the following statements is true about $[Cu(NH_3)_4]^{+2}$ primary valency and EAN ?

1) +1, 35 2) +2, 35

3) +3, 36 4) +2, 36

90. Which of the following has highest magnetic moment?

1) $K_4[Fe(CN)_6]$ 2) $[Fe(H_2O)_6]SO_4$

3) $K_3[Fe(CN)_6]$ 4) $[Co(NH_3)_6]SO_4$

91. Low spin complex is formed by

1) sp^3d^2 2) d^2sp^3 hybridization

3) sp^3hybridisatin 4) sp^3 hybridization

92. In which of the following complex, central metal is dsp^2 hybridized?

1) $[PtCl_4]^{2-}$ 2) $[NiCl_4]^{2-}$

3) $[cuCl_4]^{2-}$ 4) All of these

93. The geometry of $[NiCl_4]^{2-}$ and $[PtCl_4]^{2-}$ are

1) Tetrahedral

2) Square planar

3) Square planar and tetrahedral respectively

4) Tetrahedral and square planar respectively

94. Which of the following complex ion is expected to absorb visible light?

1) $[Ni(CO)_4]$

2) $[Zn(NH_3)_6]^{2+}$

3) $[Sc(H_2O)_3(NH_3)_3]^{3+}$ 4) $[Cr(NH_3)_6]^{3+}$

95. Hybrid state of Sn in $[Sn(OH)_6]^{2-}$

1) sp^3 2) sp^3d^2 3) sp^3d 4) sp^3d^3

96. Amongst the following ions which one has the highest magnetic moment value?

1) $[Cr(H_2O)_6]^{3+}$ 2) $[Fe(H_2O)_6]^{2+}$

3) $[Zn(H_2O)_6]^{2}+$ 4) $[FeFe]^{3-}$

97. The geometries of $Ni(CO)_4$ and $[Cu(NH_3)_4]^{+2}$ are respectively

1) Tetrahedral and square planar

2) Both tetrahedral

3) Square planar and tetrahedral

4) Both square planar

98. Which of the following complexes is the example of dsp^2hybridisation?

1) $[Ni(CO)_4]$ 2) $[Ni(CN)_4]^{-2}$

3) $[Zn(NH_3)_4]^{-2}$ 4) $[ZnCl_4]^{2-}$

99. The outer orbital complexes among the following are

I. $[Co(CN)_6]^{-3}$ II. $[Fe(H_2O)_6]^{+2}$

III. $[Co(NH_3)_6]^{+3}$ IV. $[CoFe_6]^{-3}$

1) II & IV 2) II & III

3) I & IV 4) I & II

100. The spin only magnetic moment of metal ion having d^8 system in square planar complex with strong ligand field is

1) Zero 2) 2.83 BM

3) 3.87 BM 4) 4.90 BM

101. Which of the following is most stable complex?

1) $[Fe(CN)_6]^{4-}$ 2) $[Fe(H_2O)_6]^{3+}$

3) $[FeFe]^{3-}$ 4) $[Fe(NH_3)_6]^{3+}$

102. Which one of the following complex is expected to be of violet colour?

1) $[Ni(H_2O)_6]^{2e}$ (aq) 2) $[Ni(H_2O)_4(en)]^{2\oplus}$ (aq)

3) $[Ni(H_2O)_2(en)]^{2\oplus}$ (aq) 4) $[Ni(en)_3]^{2\oplus}$ (aq)

103. Which one of the following complex has maximum energy difference between t_{2g} and e_g set of orbitals?

1) $[Ni(NH_3)_6]^{2+}$ 2) $[Cr(NH_3)_6]^{3+}$

3) $[Mo(NH_3)_6]^{3+}$ 4) $[W(NH_3)_6]^{3+}$

104. The hybridization of Ni in $[NiCl_4]^-$ and Pt in $[PtCl_4]^-$ respectively are

1) sp^3, sp^3 2) dsp^2 and dsp^2

3) dsp^2 and sp^3 4) sp^3 and dsp^2

105. The outer orbital complex is

1) $[Cr(NH_3)_6]^{3+}$ (2) $[Ni(H_2O)_6]^{2+}$

3) $[V(H_2O)_6]^{3+}$ (4) $[Co(NH_3)_6]^{3+}$

106. Among the divalent ions of first row of transition element, the tendency to form stable complexes increases as

1) $Mn^{II} < Fe^{II} < Ni^{II} < Cu^{II}$

2) $Mn^{II} > Cu^{II} > Ni^{II} < Fe^{II}$

3) $Cu^{II} > Mn^{II} > Fe^{II} < Ni^{II}$

4) $Ni^{II} > Mn^{II} > Cu^{II} > Fe^{II}$

107. Organometallic compound is

1) Na_2CO_3 2) $Na\text{-}O\text{-}CH_3$

3) $NaNH_2$ (4) Na_2C_2

108. Zinc but not copper is used for the recovery of Ag from the complex $[Ag(CN)_2]^-$ because

1) Zinc is cheaper

2) Zn is more powerful reducing agent

3) Cu does not form complex

4) Both (1) & (2)

109. Dimethyl glyoxime reagent is used as co-ordinating reagent in the quantitative estimation of

1) Copper 2) Palladium

3) Silver 4) Nickel

110. The number of five membered and six membered ring that can be formed in $Ni(dmg)_2$ respectively is

1) 1, 1 2) 2, 2 3) 1, 2 4) 2, 1

111. Match the information given in Column-I and Column-II.

Column-I	**Column-II**
a) Brown ring	(i) $Fe_4[Fe(CN)_6]_3$
b) Prussian tube	(ii) $K[PtCl_3(\eta^2\text{-}C_2H_4)]$
c) Zeiss's salt	(iii) $(Ph_3P)_3RhCl$
d)Wilkinson catalyst	(iv) $[Fe(H_2O)_5NO]^{+2}$

1) a(i), b(iv), c(iii), d(ii)

2) a(i), b(iv), c(ii), d(iii)

3) a(iv), b(i), c(ii), d(iii)

4) a(iv), b(i), c(iii), d(ii)

112. Identify incorrect statement

1) Tetrahedral complex containing two unsymmetrical bidentate ligand can exhibit optical activity as they lack plane of symmetry

2) Zeise's salt is an organometallic compound containing C_2H_4 molecule as one of this ligand

3) EAN (effective atomic number) of Fe in its complex is always 36

4) All of these

113. Dimethyl glyoxime gives a red precipitate with Ni^{2+} which is used for its detection. To get this precipitate readily, the best p^H range is

1) < 1 2) 2 – 3 3) 3-4 4) 9 - 11

LEVEL-2 KEY

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
4	4	4	3	4	3	1	3	1	3
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
2	4	3	4	4	2	4	4	2	3
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
2	1	3	1	2	2	2	2	1	3
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
4	3	3	3	4	3	2	3	3	4
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
2	3	2	2	2	4	3	3	1	4
51	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
1	2	4	2	2	1	2	4	1	1
61	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**
1	1	2	3	4	2	3	4	3	1
71	**72**	**73**	**74**	**75**	**76**	**77**	**78**	**79**	**80**
3	4	1	1	2	2	2	4	3	2
81	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**
1	3	1	3	1	4	4	2	2	2
91	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**100**
2	1	4	4	2	4	1	2	1	1
101	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**
1	4	4	4	2	1	4	4	4	2
111	**112**	**113**							
3	3	4							

LEVEL-2

1. In which of the following pairs, both the complexes show optical isomerism?

1) cis-$[Cr(C_2O_4)_2Cl_2]^{3-}$, cis-$[Co(NH_3)_4Cl_2]$

2) $[Co(en)_3]\ Cl_3$,cis-$[Co(en)_2Cl_2]Cl$

3) $[PtCl(dien)Cl]$, $[NiCl_2Br_2]^{2-}$

4) $[Co(NO_3)_3(NH_3)_3]$, cis-$[Pt(en)_2Cl_2]$

2. The correct order for the wavelength of absorption in the visible region is :

1) $[Ni(NO_2)_6]^{4-}<[Ni(NH_3)_6]^{2+} < [Ni(H_2O)_6]^{2+}$

2) $[Ni(NO_2)_6]^{4-} < [Ni(H_2O)_6]^{2+} < [Ni(NH_3)_6]^{2+}$

3) $[Ni(H_2O)_6]^{2+} < [Ni(NH_3)_6]^{2+} < [Ni(NO_2)_6]^{4+}$

4) $[Ni(NH_3)_6]^{2+} < [Ni(H_2O)_6]^{2+} < [Ni(NO_2)_6]^{4-}$

3. Assertion : Potassium ferrocyanide is diamagnetic, whereas potassium ferricyanide is paramagnetic.

Reason : Crystal field splitting in ferrocyanide ion is greater than that of ferricyanide ion.

1) If both Assertion and Reason are true and the reason is the correct explanation of Assertion.

2) If both Assertion and Reason are true but reason is not the correct explanation of Assertion.

3) If Assertion is true but Reason is false.

4) If both Assertion and Reason are false.

4. Among the following, the species having square planar geometry for central atom are :

i. $[XeF_4]$ ii. SF_4

iii. $[NiCl_4]^{2-}$ iv. $[PtCl_4]^{2-}$

1) i and iv 2) i and ii

3) ii and iii 4) iii and iv

5. The pair in which both species have the same magnetic moment (spin only) value is :

1) $[Cr(H_2O)_6]^{2+}$, $[CoCl_4]^{2-}$

2) $[Cr(H_2O)_6]^{2+}$, $[Fe(H_2O)_6]^{2+}$

(3) $[Mn(H_2O)_6]^{2+}$, $[Cr(H_2O)_6]^{2+}$

4) $[CoCl_4]^{2-}$, $[Fe(H_2O)_6]^{2+}$

6. The number of possible isomers of an octahedral complex $[Co(C_2O_4)_2(NH_3)_2]^-$ is :

1) 1 2) 2 3) 3 4) 4

7. The ligands in anti-cancer drug cis-platin are :

1) NH_3,Cl 2) NH_3,H_2O

3) Cl, H_2O 4) NO, Cl

8. Which of the following coordination entities should be expected to absorb light of lowest frequency?

1) $[Cr(en)_3]^{3+}$ 2) $[CrCl_6]^{3-}$

3) $[Cr(NH_3)_6]^{3+}$ 4) $[Cr(CN)_6]^{3-}$

9. Assertion : When NO reacts with $FeSO_4$, a brown coloured complex is formed.

Reason : In the complex, the coordination number of Fe is 6.

1) Both A and R are true and R is the correct explanation of A.

2) Both A and R are true but R is not correct explanation of A

3) A is true but R is false

4) A is false but R is true

5) Both A and R are false

10. Assertion : CO and CN are referred as π acid ligands.

Reason : In CO and CN vacant π type orbitals are present.

1) Both A and R are true and R is the correct explanation of A.

2) Both A and R are true but R is not correct explanation of A

3) A is true but R is false

4) A is false but R is true

5) Both A and R are false

11. Which one has the highest paramagnetism ?

1) $Ni(CO)_4$ 2) $[Co(NH_3)_6]Cl_3$

3) $[Ni(NH_3)_6]Cl_2$ 4) $[Cu(NH_3)_4]Cl_2$

12. For the square planar complex [M(1) (2) (3) (4)] (where, M =central metal ; a, b, c and d are monodentate ligands) the number of possible geometrical isomers are

1) 1 2) 2 3) 3 4) 4

13. When $AgNO_3$ is added to a solution of $Co(NH_3)_5Cl_3$, the precipitate of AgCl shows two ionizable chloride ions. This means :

1) Two chlorine atoms satisfy primary valency and one secondary valency

2) One chlorine atom satisfies primary as well as secondary valency

3) Three chlorine atoms satisfy secondary valency

4) Three chlorine atoms satisfy secondary valency

14. The hypothetical complex Chlorodiaquatriamminecobalt (III) chloride can be represented as

1) $[CoCl(NH_3)_3(H_2O)_2]Cl_2$

2) $[Co(NH_3)_3(H_2O)]Cl_3]$

3) $[Co(NH_3)_3(H_2O)_2]Cl]$

4) $[Co(NH_3)_3(H_2O)_3]Cl_3$

15. Which one amongst of the following isomerism is shown by $[Pt(NH_3)_2Cl_2]$?

1) Structural 2) Geometrical

3) Optical 4) Conformational

16. $[Fe(H_2O)_5NO]^{2+}$ is a complex formed during the brown ring test for NO_3^- ion. In this complex,

1) There are three unpaired electron so that its magnetic moment is 3.87 BM

2) NO transfer its electron to Fe^{2+} so that iron as Fe(I) and NO as NO^+

3) The colour is because of charge transfer

4) All of the above statements are correct.

17. Mixture X = 0.02 mole of $[Co(NH_3)_5SO_4]Br$ and 0.02 mole of $[Co(NH_3)_5Br]SO_4$ was prepared in 2L of solution

1 L of mixture X + excess $AgNO_3 \rightarrow Y$

1 L of mixture X + excess $BaCl_2 \rightarrow Z$

Number of moles Y and Z are

1) 0.03, 0.02 2) 0.01, 0.02

3) 0.02, 0.01 4) 0.02, 0.02

18. Assertion : $[Ti(H_2O)_6]^{3+}$ is coloured while $[Sc(H_2O)_6]^{3+}$ is colourless.

Reason : d–d transition is not possible in $[Sc(H_2O)_6]^{3+}$ because no d-electron is present

1) If both assertion and reason are true and reason is the correct explanation of assertion.

2) If both assertion and reason are true but reason is not the correct explanation of assertion.

3) If assertion is true but reason is false.

4) If both assertion and reason are false.

19. Assertion : After spilitting of d-orbitals during complex formation, the orbitals form two sets of orbitals t_{2g} and e_g octahedral field.

Reason : Splitting of d-orbitals occurs only in the case of strong field ligands such as CN^-

1) If both assertion and reason are true and reason is the correct explanation of assertion.

2) If both assertion and reason are true but reason is not the correct explanation of assertion.

3) If assertion is true but reason is false.

4) If both assertion and reason are false.

20. $CuSO_4.5H_2O$ is blue in colour while $CuSO_4$ is colourless, because

1) H_2O is a strong field ligand than SO_4^{2-}

2) SO_4^2 is a strong field ligand

3) $CuSO_4$ cannot form the complex

4) No d-d transition is possible in $CuSO_4$

21. Assertion (A) : Complexes of MX_6 and MX_5L type (X and L are unidentate) do not show geometrical isomerism.

Reason (R) : Geometrical isomerism is not shown by complexes of coordinate number –6

1) If both assertion and reason are true and reason is the correct explanation of assertion.

2) If both assertion and reason are true but reason is not the correct explanation of assertion.

3) If assertion is true but reason is false.

4) If both assertion and reason are false.

22. Trien is

1) Hexa dentate, Mono anionic

2) tetradentate, neutral

3) tetradentate, dianion

4) Mono dentate, anion

23. Which of the following is diamagnetic complex

1) $[Co(OX)_3]^{3-}$, $[Fe(CN)_6]^{4-}$ 2) $[Co(Ox)_3]^{3-}$, $[FeF_6]^{3-}$

3) $[Fe(Ox)_3]^{3-}$, $[FeF_6]^{3-}$ 4) $[Fe(CN)_6]^{3-}$, $[CoF_6]^{3-}$

24. Which of the following can be reduce easily

1) $V(CO)_6$ 2) $Mo(CO)_6$

3) $[Co(CO)_4]^-$ 4) $Fe(CO)_5$

25. Cr^{+3} in aquous medium form green coloured complex with NH_3 ligand. How many ligand associated

1) 3 2) 4 3) 5 4) 6

26. Which one has largest number of isomers ?

1) $[Co(en)_2Cl_2]^+$

2) $[Co(NH_3)_5Cl]^{2+}$

3) $[Ir(PhR_3)_2H(CO)]^{2+}$

4) $[Ru(NH_3)_4Cl_2]^+$

27. The correct order of magnetic moments (only spin value in BM) among is :

1) $[Fe(CN)_6]^{4-} > [CoCl_4]^{2-} > [MnCl_4]^{2-}$

2) $[MnCl_4]^{2-} > [Fe(CN)_6]^{4-} > [CoCl_4]^{2-}$

3) $[Fe(CN)_6]^{4-} > [MnCl_4]^{2-} > [CoCl_4]^{2-}$

4) $[MnCl_4]^{2-} > [CoCl_4]^{2-} > [Fe(CN)_6]^{4-}$

28. The oxidation state of Cr in $[Cr(NH_3)_4Cl_2]^+$ is:

1) 0 2) +1 3) +2 4) +3

29. Which of the following will show optical isomerism?

1) $[Cu(NH_3)_4]^{2+}$ 2) $[ZnCl_4]^{2-}$

3) $[Cr(C_2O_4)_3]^{3-}$ 4) $[Co(CN)_6]^{3-}$

30. The value of 'spin only' magnetic moment for one of the following configurations is 2.84 BM. The correct one is:

1) d^4 (in strong field ligand)

2) d^4 (in weak field ligand)

3) d^3 (in weak as well as strong field ligand)

4) d^5 (in strong field ligand)

31. Which one of the following complexes would exhibit the lowest value of paramagnetic behaviour ?

1) $[Co(CN)_6]^{3-}$ 2) $[Fe(CN)_6]^{3-}$

3) $[Mn(CN)_6]^{3-}$ 4) $[Cr(CN)_6]^{3-}$

32. The IUPAC name for the complex $[Co(NO_2)(NH_3)_5]Cl_2$ is :

1) Nitrito-N-pentaamminecobalt(III) chloride

2) Nitrito-N-pentaamminecobalt(II) chloride

3) Pentaamminenitrito-N-cobalt(II) chloride

4) Pentaamminenitrito-N-cobalt(III) chloride

33. In $Fe(CO)_5$, the Fe – C bond possesses :

1) π-character only 2) both σ and π characters

3) ionic character only 4) σ-character only

34. How many EDTA (ethylenediaminetetraacetic acid) molecules are required to make an octahedral complex with a Ca^{2+} ion?

1) Six 2) Three 3) One 4) Two

35. The 'spin only' magnetic moment (in units of Bohr magneton, μ_B) of Ni^{2+} in aqueous solution would be (atomic number Ni = 28)

1) 2.84 2) 4.80 3) 0 4) 1.73

36. Which one of the following has a square planar geometry?

1) $[NiCl_4]^{2-}$ 2) $[PtCl_4]^{2-}$

3) $[CoCl_4]^{2-}$ 4) $[FeCl_4]^{2-}$

(At. no. Co = 27, Ni = 28, Fe = 26, Pt = 78)

37. The coordination number and the oxidation state of the element 'E' in the complex $[E(en)_2(C_2O_4)]NO_2$ (when 'en' is ethylene diamine) are, respectively,

1) 4 and 2 2) 4 and 3 3) 6 and 3 4) 6 and 2

38. In which of the following octahedral complexes of Co (at no. 27), will the magnitude of Δ_0 be the highest?

1) $[Co(C_2O_4)_3]^{3-}$ 2) $[Co(H_2O)_6]^{3+}$

3) $[Co(NH_3)_6]^{3+}$ 4) $[Co(CN)_6]^{3-}$

39. Which of the following has an optical isomer ?

1) $[Co\ (en)\ (NH_3)_2]^{2+}$ 2) $[Co(H_2O)_4\ (en)]^{3+}$

3) $[Co\ (en)_2\ (NH_3)_2]^{3+}$ 4) $[Co\ (NH_3)_3\ Cl]^{+}$

40. Which of the following pairs represents linkage isomers ?

1) $[Pd(PPh_3)_2\ (NCS)_2]$ and $[Pd(PPh_3)_2\ (SCN)_2]$

2) $[Co(NH_3)_5\ NO_3]\ SO_4$ and $[Co\ (NH_3)_5\ (SO_4)]\ NO_3$

3) $[PtCl_2\ (NH_3)_4\ Br_2$ and $[Pt\ Br_2\ (NH_3)_4]\ Cl_2$

4) $[Cu\ (NH_3)_4]\ [Pt\ Cl_4]$ and $[Pt\ (NH_3)_4\ [CuCl_4]$

41. Which one of the following has an optical isomer ?

1) $[Zn(en)(NH_3)_2]^{2+}$ 2) $[Co(en)_3]^{3+}$

3) $[Co(H_2O)_4(en)]^{3+}$ 4) $[Zn(en)_2]^{2+}$

(en = ethylenediamine)

42. Which of the following facts about the complex $[Cr(NH_3)_6]Cl_3$ is wrong ?

1) The complex involves d^2sp^3 hybridisation and is octahedral in shape.

2) The complex is paramagnetic.

3) The complex is an outer orbital complex.

4) The complex gives white precipitate with silver nitrate solution.

43. The magnetic moment (spin only) of $[NiCl_4]^{2-}$ is :

1) 1.82 BM 2) 5.46 BM

3) 2.82 BM 4) 1.41 BM

44. Which among the following will be named as dibromidobis (ethylene diamine) chromium (III) bromide?

1) $[Cr(en)_3]Br_3$ 2) $[Cr(en)_2Br_2]Br$

3) $[Cr(en)Br_4]^-$ 4) $[Cr(en)Br_2]Br$

45. Which of the following complex species is not expected to exhibit optical isomerism ?

1) $[Co(en)_3]^{3+}$ 2) $[Co(en)_2\ Cl_2]^+$

3) $[Co(NH_3)_3\ Cl_3]$ 4) $[Co(en)\ (NH_3)_2\ Cl_2]^+$

46. The octahedral complex of a metal ion M^{3+} with four monodentate ligands L_1, L_2, L_3 and L_4 absorb wavelengths in the region of red, green, yellow and blue, respectively. The increasing order of ligand strength of the four ligands is :

1) $L_4 < L_3 < L_2 < L_1$ 2) $L_1 < L_3 < L_2 < L_4$

3) $L_3 < L_2 < L_4 < L_1$ 4) $L_1 < L_2 < L_4 < L_3$

47. The number of geometric isomers that can exist for square planar [Pt (Cl) (py) (NH_3) $(NH_2OH)]^+$ is (py = pyridine) :

1) 2 2) 3 3) 4 4) 6

48. The pair having the same magnetic moment is : [At. No.: Cr = 24, Mn = 25, Fe = 26, Co = 27]

1) $[Cr(H_2O)_6]^{2+}$ and $[Fe(H_2O)_6]^{2+}$

2) $[Mn(H_2O)_6]^{2+}$ and $[Cr(H_2O)_6]^{2+}$

3) $[CoCl_4]^{2-}$ and $[Fe(H_2O)_6]^{2+}$

4) $[Cr(H_2O)_6]^{2+}$ and $[CoCl_4]^{2-}$

49. Which one of the following complexes shows optical isomerism ? (en = ethylenediamine)

1) *cis*$[Co(en)_2Cl_2]Cl$ 2) *trans*$[Co(en)_2Cl_2]Cl$

3) $[Co(NH_3)_4Cl_2]Cl$ 4) $[Co(NH_3)_3Cl_3]$

50. On treatment of 100 mL of 0.1 M solution of $CoCl_3.6H_2O$ with excess $AgNO_3$; 1.2×10^{22} ions are precipitated. The complex is :

1) $[Co(H_2O)_3Cl_3].3H_2O$

2) $[Co(H_2O)_6]Cl_3$

3) $[Co(H_2O)_5Cl]Cl_2.H_2O$

4) $[Co(H_2O)_4Cl_2]Cl.2H_2O$

51. Consider the following reaction and statements:

$Co(NH_3)_4Br_2]^+ + Br^- \rightarrow [Co(NH_3)_3Br_3] + NH_3$

(I) Two isomers are produced if the reactant complex ion is a cis-isomer.

(II) Two isomers are produced if the reactant complex ion is a *tran*-isomer.

(III) Only one isomer is produced if the reactant complex ion is a *trans*-isomer.

(IV) Only one isomer is produced if the reactant complex ion is a *cis*-isomer.

The correct statements are:

1) (III) and (IV) 2) (II) and (IV)

3) (I) and (II) 4) (I) and (III)

52. The oxidation states of Cr in $[Cr(H_2O)_6]Cl_3$, $[Cr(C_6H_6)_2]$, and $K_2[Cr(CN)_2(O)_2(O_2)(NH_3)]$ respectively are :

1) +3, 0, and +6 2) +3, 0, and +4

3) +3, +4, and +6 4) +3, +2, and +4

53. Homoleptic octahedral complexes of a metal ion 'M^{3+}' with three monodentate ligands L_1, L_2 and L_3 absorb wavelengths in the region of green, blue and red respectively. The increasing order of the ligand strength is :

1) $L_1 < L_2 < L_3$

2) $L_3 < L_2 < L_1$

3) $L_2 < L_1 < L_3$

4) $L_3 < L_1 < L_2$

54. The complex that has highest crystal field splitting energy (Δ), is :

1) $K_2[COCl_4]$ 2) $[CO(NH_3)_5(H_2O)]Cl_3$

3) $[CO(NH_3)_5Cl]Cl_2$ 4) $K_3[CO(CN)_6]$

55. Two complexes $[Cr(H_2O)_6]Cl_3$ (A) and $[Cr(NH_3)_6]Cl_3$ (B) are violet and yellow coloured respectively. The incorrect statement regarding them is :

1) Δ_0 value for (A) is less than that of (B).

2) both absorb energies corresponding to their complementary colors.

3) Δ_0 values of (A) and (B) are calculated from the energies of violet and yellow light, respectively.

4) both are paramagnetic with three unpaired electrons.

56. The difference in the number of unpaired electrons of a metal ion in its high-spin and low-spin octahedral complexes is two. The metal ion is:

1) Co^{2+} 2) Fe^{2+} 3) Mn^{2+} 4) Ni^{2+}

57. A reaction of cobalt(III) chloride and ethylenediamine in a 1 : 2 mole ratio generates two isomeric products A (violet coloured) and B(green coloured). A can show optical activity, but, B is optically inactive. What type of isomers does A and B represent?

1) Ionisation isomers

2) Linkage isomer

3) Coordination isomers

4) Geometrical isomers

58. The total number of isomers for a square planar complex [M(F) (Cl) (SCN) (NO_2)] is :

1) 16 2) 4 3) 12 4) 8

59. The coordination number of Th in $K_4[Th(C_2O_4)_4(OH_2)_2]$ is : $\left(C_2O_4^{2-} = \text{Oxalato}\right)$

1) 14 2) 10 3) 6 4) 8

60. The number of bridging CO ligand(s) and Co-Co bond (s) in $Co_2(CO)_8$, respetively are :

1) 4 and 0 2) 0 and 2

3) 2 and 1 4) 2 and 0

61. Match the metals (column I) with the coordination compound(s)/ emzyme (s) (column II):

(column I) Metal	**(column II) Coordination compound(s) /enzyme(s)**
(A) Co	(i) Wilkinson catalyst
(B) Zn	(ii) ChlorophyII
(C) Rh	(iii) Vitamin B_{12}
(D) Mg	(iv) Carbonic anhydrase

1) (A)-(i);(B)-(ii);(C)-(iii);(D)-(iv)

2) (A)-(iv);(B)-(iii);(C)-(i);(D)-(ii)

3) (A)-(iii);(B)-(iv);(C)-(i);(D)-(ii)

4) (A)-(ii);(B)-(i);(C)-(iv);(D)-(iii)

62. The magnetic moment of an octahedral homoleptic Mn(II) complex is 5.9 BM. The suitable ligand for this complex is:

1) Ethylenediamine 2) CN^-

3) NCS^- 4) CO

63. $Mn_2(CO)_{10}$ is an organometallic compound due to the presence of :

1) Mn – C bond 2) C – O bond

3) Mn – O bond 4) Mn – Mn bond

64. The metal d-orbitals that are directly facing the ligands in $K_3[Co(CN)_6]$ are :

1) d_{xz}, d_{yz} and d_{z^2} 2) d_{xy} and $d_{x^2-y^2}$

3) d_{xy}, d_{xz} and d_{yz} 4) $d_{x^2-y^2}$ and d_{z^2}

LEVEL-2 KEY									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
2	1	3	1	2	3	1	2	2	1
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
3	3	2	1	2	4	3	1	3	4
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
3	2	1	1	4	1	4	4	3	1
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
1	4	2	3	1	2	3	4	3	1
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
2	3	3	2	3	2	2	1	1	3
51	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
4	1	4	4	3	1	4	3	2	3
61	**62**	**63**	**64**						
3	3	1	4						

LEVEL-3(PREVIOUS YEARQUESTIONS)

1. Copper sulphate dissolves in excess of KCN to give [AIPMT-2006]

1) $Cu(CN)_2$ 2) CuCN

3) $[Cu(CN)_4]^{3-}$ 4) $[Cu(CN)_4]^{2-}$

2. $[Co(NH_3)_4(NO_2)_2]Cl$ exhibits [AIPMT-2006]

1) linkage isomerism, geometrical isomerism and optical isomerism

2) linkage isomerism, ionization isomerism and optical isomerism

3) linkage isomerism, ionization isomerism and geometrical isomerism

4) ionization isomerism, geometrical isomerism and optical isomerism

3. Which of the following will give a pair of enantiomers [AIPMT-2007]

1) $[Cr(NH_3)_6][Co(CN)_6]$

2) $[Co(en)_2Cl_2]Cl$

3)$[Pt(NH_3)_4][PtCl_6]$

4) $[Co(NH_3)_4Cl_2]\ NO_2$

4. The d electron configurations of Cr^{2+}, Mn^{2+}, Fe^{2+} and Ni^{2}+ are $3d^4$, $3d^5$, $3d^6$ and $3d^8$ respectively which one of the following aqua complexes will exhibit the minimum paramagnetic behaviour [AIPMT-2007]

1) $[Fe(H_2O)_6]^{2+}$ 2) $[Ni(H_2O)_6]^{2+}$

3) $[Cr(H_2O)_6]^{2+}$ 4) $[Mn(H_2O)_6]^{2}$

5. Which of the following complexes exhibits the highest paramagnetic behaviour ? Where gly = glycine, en = ethylenediamine and bpy=bipyridyl moities) [AIPMT-2008]

1) $[Co(OX)_2\ (H_2O)_2]^-$

2) $[Ti(NH_3)_6]^3$+

3) $[V\ (gly)_2(OH)_2(NH_3)_2]^+$

4) $[Fe(en)\ (bpy)\ (NH_3)_2]^{2+}$

6. In which of the following coordination entities the magnitude of Δ_0 (CFSE in octahedral field) will be maximum? [AIPMT-2008]

1) $[Co(CN)_6]^{3-}$ 2) $[Co(C_2O_4)_3]^{3-}$

3) $[Co(H_2O)_6]^{3+}$ 4) $[Co(NH_3)_6]^{3+}$

7. Which of the following complex ions is expected to absorb visible light? [AIPMT-2009]

1) $[Zn(NH_3)_6]^{2+}$ 2) $[Sc(H_2O)_3(NH_3)_3]^{3+}$

3) $[Ti(en)_2(NH_3)_2]^{4+}$ 4) $[Cr(NH_3)_6]^{3+}$

8. Out of TiF_6^{2-}, CoF_6^{3-}, Cu_2Cl_2 and $NiCl_4^{2-}$ colourless species are : [AIPMT-2009]

1) $CoFe^3$- and $NiCl_4^{2-}$

2) TiF_6^{2-} and $CoFe^2$-

3) Cu_2Cl_2 and $NiCl_4^{2-}$

4) TiF_6^{2-} and Cu_2Cl_2

9. Which of the following does not show optical isomerism? [AIPMT-2009]

1) $[Co(en)_3]^{3+}$ (2) $[Co(en)_2Cl_2]^+$

3) $[Co(NH_3)_3Cl_3]^0$ 4) $[Co(en)Cl_2(NH_3)_2]^+$

10. Which one of the following complexes is not expected to exhibit isomerism:- [AIPMT-2009]

1) $[Pt\ (NH_3)_2Cl_2]$ 2) $[NiCl_4]^{2-}$

3) $[Ni\ (en)_3]^{2+}$ 4) $[Ni(NH_3)_4(H_2O)_2]^{2+}$

11. Which of the following complex ion is not expected to absorb visible light? [AIPMT-2010]

1) $[Ni(H_2O)_6]^{2+}$ 2) $[Ni(CN)_4]^{2-}$

3) $[Cr(NH_3)_6]^{3+}$ 4) $[Fe(H_2O)_6]^{2+}$

12. The existence of two different coloured complexes with the composition of $[Co(NH_3)_4Cl_2]^+$ is due to:- [AIPMT-2010]

1) Ionization isomerism

2) Linkage isomerism

3) Geometrical isomerism

4) Coordination isomerism

13. Crystal field stabilization energy for high spin d4 octahedral complex is :- [AIPMT-2010]

1) -0.6 Δ_0 2) -1.8 Δ_0

3) -1.6 Δ_0 + P 4) -1.2 Δ_0

14. Of the following complex ions, which is diamagnetic in nature? [Pre-AIPMT-2011]

1) $[NiCl_4]^{2-}$ 2) $[Ni(CN)_4]^{2-}$

3) $[CuCl_4]^{2-}$ 4) $[CoF_6]^{3-}$

15. The complex $[Co(NH_3)_6][Cr(CN)_6]$ and $[Cr(NH_3)_6]$ $[Co(CN)_6]$ are the examples of which type of isomerism ? [Pre-AIPMT-2011]

1) Linkage isomerism

2) Ionization isomerism

3) Coordination isomerism

4) Geometrical isomerism

16. The complex $[Pt(Py)(NH_3)BrCl]$ will have how many geometrical isomers ? [Pre-AIPMT-2011]

1) 3 2) 4 3) 0 4) 2

17. Which of the following carbonyls will have the strongest C-O bond? [AIPMT Mains 2011]

1) $[Fe(CO)_5]$ 2) $6[Mn(CO)]^+$

3) $[Cr(CO)_6]$ 4) $[V(CO)_6]^-$

18. Which of the following complex compounds will exhibit highest paramagnetic behaviour :- (At. No. Ti = 22, Cr = 24, Co = 27, Zn = 30)

1) $[Zn(NH_3)_6]^{2+}$ **[AIPMT Mains 2011]**

2) $[Ti(NH_3)_6]^{3+}$

3) $[Cr(NH_3)_6]^{3+}$

4) $[Co(NH_3)_6]^{3+}$

19. Which one of the following is an outer orbital complex and exhibits paramagnetic behaviour?

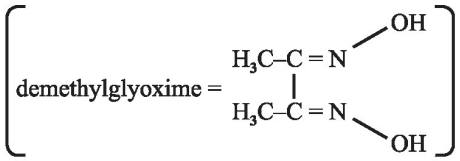
1) $[Cr(NH_3)_6]^{3+}$ **[AIPMT Pre. 2012]**

2) $[Co(NH_3)_6]^{3+}$

3) $[Ni(NH_3)_6]^{2+}$

4) $[Zn(NH_3)_6]^{2+}$

20. Red precipitate is obtained when ethanol solution of dimethylglyoxime is added to ammoniacal Ni(II). Which of the following statements is not true ? [AIPMT Mains 2012]



1) Red complex has a tetrahedral geometry.

2) Dimethylglyoxime functions as bidentate ligand.

3) Red complex has a square planar geometry.

4) Complex has symmetrical H-bonding.

21. Low spin complex of d^6-cation in an octahedral field will have the following energy :- (Δ_0 = Crystal field splitting energy in an octahedral field, P = Electron pairing energy) [AIPMT Mains 2012]

1) $\frac{-2}{5}\Delta_0 + 2P$ 2) $\frac{-2}{5}\Delta_0 + P$

3) $\frac{-12}{5}\Delta_0 + P$ 4) $\frac{-12}{5}\Delta_0 + 3P$

22. A magnetic moment of 1.73 BM will be shown by one among the following :[NEET-UG 2013]

1) $[CoCl_6]^{4-}$ 2) $[Cu(NH_3)_4]^{2+}$

3) $[Ni(CN)_4]^{2-}$ 4) $TiCl_4$

23. Which of the following complexes is used to be as an anticancer agent? [AIPMT 2014]

1) mer-$[Co(NH_3)_3Cl_3]$ 2) cis-$[PtCl_2(NH_3)_2]$

3) cis-$K_2[PtCl_2Br_2]$ 4) Na_2CoCl_4

24. Cobalt (III) chloride forms several octahedral complexes with ammonia. Which of the following will not give test of chloride ions with silver nitrate at 25°C? [AIPMT 2015]

1) $CoCl_3 . 4NH_3$ 2) $CoCl_3.5NH_3$

3) $CoCl_3 . 6NH3$ 4) $CoCl_3 . 3NH$

25. Which of these statements about $[Co(CN)_6]^{3-}$ is true:- [AIPMT 2015]

1) $[Co(CN)6]^{3-}$ has four unpaired electrons and will be in a low-spin configuration.

2) $[Co(CN)6]^{3-}$ has four unpaired electrons and will be in a high spin configuration.

3) $[Co(CN)6]^{3-}$ has no unpaired electrons and will be in a high-spin configuration.

4) $[Co(CN)6]^{3-}$ has no unpaired electrons and will be in a low-spin configuration.

26. The name of complex ion, $[Fe(CN)6]^{3-}$ is :-

1) Tricyanoferrate (III) ion [**Re-AIPMT 2015]**

2) Hexacyanidoferrate (III) ion

3) Hexacyanoiron (III) ion

4) Hexacyanitoferrate (III) ion

27. The hybridization involved in complex $[Ni(CN_4)]^{2-}$ is(At.No. Ni = 28)

1) $d^2 sp^2$ 2) $d^2 sp^3$[**Re-AIPMT 2015]**

3) dsp^2 4) sp^3

28. The sum of coordination number and oxidation number of the metal M in the complex $[M(en)_2(C_2O_4)]Cl$ [Re-AIPMT 2015] (where en is ethylenediamine) is:

1) 7 2) 8 3)9 4) 6

29. Number of possible isomers for the complex $[Co(en)_2Cl_2]$ Cl will be : (en = ethylenediamine) [Re-AIPMT 2015]

1)3 2) 4 3) 2 4) 1

30. Which of the following has longest C-O bond length? (Free C-O bond length in CO is $1.128A^0$). [NEET-I 2016]

1) $Ni(CO)_4$ 2) $[Co(CO)_4]^1$

3) $[Fe(CO)_4]^{2-}$ (4) $[Mn(CO)_6]^+$

31. The correct increasing order of trans-effect of the following species is : [NEET-II 2016]

1) $Br^- > CN^- > NH_3 > C_6H_5^-$

2) $CN^- > Br^- > C_6H_5^- > NH_3$

3) $NH_3 > CN^- > Br^- > C_6H_5^-$

4) $CN^- > C_6H_5^- > Br^- > NH_3$

32. Jahn-Teller effect not observed in high spin complexes of [NEET-II 2016]

1) d^4 2) d^9 3) d^7 4) d^8

33. An example of a sigma bonded organometallic compound is : [NEET(UG) 2017]

1) Grignard's reagent2) Ferrocene

3) Cobaltocene 4) Ruthenocene

34. Pick out the correct statement with respect to $[Mn(CN)_6]^{3-}$:- [NEET(UG) 2017]

1) It is sp^3d^2 hybridised and tetrahedral

2) It is d^2sp^3 hybridised and octahedral

3) It is dsp^2 hybridised and square planar

4) It is sp^3d^2 hybridised and octahedral

35. Correct increasing order for the wavelengths of absorption in the visible region the complexes of $Co^{3+}$is [NEET(UG) 2017]

1) $[Co(H_2O)_6]^{3+}$, $[Co(en)_3]^{3+}$, $[Co(NH3)_6]^{3+}$

2) $[Co(H_2O)_6]^{3+}$, $[Co(NH_3)_6]^3+$, $[Co(en)_3]^3+$

3) $[Co(NH_3)_6]^{3+}$, $[Co(en)_3]^{3+}$, $[Co(H_2O)_6]^3+$

4) $[Co(en)_3]^{3+}$, $[Co(NH3)_6]^{3+}$, $[Co(H_2O)_6]^3+$

36. The type of isomerism shown by the complex $[CoCl_2(en)_2]$ is [NEET(UG) 2018]

1) Geometrical isomerism

2) Coordination isomerism

3) Ionization isomerism

4) Linkage isomerism

37. The geometry and magnetic behaviour of the complex $[Ni(CO)_4]$ are [NEET(UG) 2018]

1) square planar geometry and diamagnetic
2) tetrahedral geometry and diamagnetic
3) square planar geometry and paramagnetic
4) tetrahedral geometry and paramagnetic

38. Iron carbonyl, $Fe(CO)_5$ is[NEET(UG) 2018]

1) tetranuclear 2) mononuclear
3) trinuclear 4) dinuclear

39. What is the correct electronic configuration of the central atom in $K_4[Fe(CN)_6]$ based on crystal field theory ? [NEET(UG) 2019]

1) $t^2{}_4e_g{}^2$ 2) $t^6{}_4\ e_g{}^0$
3) $e^3\ t^3{}_2$ 4) $e^4\ t^2{}_2$

40. The Crystal Field Stabilisation Energy (CFSE) for $[CoCl6]^{4-}$ is 18000 cm^{-1}. The CFSE for $[CoCk]^{2-}$ will be-[NEET(UG) 2019 (ODISHA)]

1) 6000 cm^{-1} 2) 16000 cm^{-1}
3) 18000 cm^{-1} 4) 8000 cm^{-1}

41. Which of the following is the correct order of increasing field strength of ligands to form coordination compounds? [NEET(UG) 2020]

1) $SCN^- < F^- < C_2O_4{}^{2-} < CN^-$
2) $SCN^- < F^- < CN^- < C_2O_4{}^{2-}$
3) $F^- < SCN^- < C_2O_4{}^{2-} < CN^-$
4) $CN^- < C_2O_4{}^{2-} < SCN^- < F^-$

42. Urea reacts with water to form A which will decompose to form B. B when passed through Cu^2+ (aq), deep blue colour solution C is formed. What is the formula of C from the following? [NEET(UG) 2020]

1) $CuSO_4$ 2) $[Cu(NH_3)_4]^{2+}$
3) $Cu(OH)_2$ 4) $CuCO_3.Cu(OH)_2$

43. Ethylene diaminetetraacetate (EDTA) ion is:

1) Hexadentate ligand with four "O" and two "N" donor atoms [NEET(UG) 2021]
2) Unidentate ligand
3) Bidentate ligand with two "N" donor atoms
4) Tridentate ligand with three "N" donor atoms

44. Match List-I wit List-II. [NEET(UG) 2021]

List-I	List-II
a. $[Fe(CN)_6]^{3-}$	(i) 5.92 BM
b. $[Fe(H_2O)_6]^{3+}$	(ii) 0 BM
c. $[Fe(CN)_6]^{4-}$	(iii) 4.90 BM
d. $[Fe(H_2O)_6]^{2+}$	(iv) 1.73 BM

Choose the correct answer from the options given below

1) (a)-(iv), (b)-(ii), (c)-(i), (d)-(iii)
2) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)
3) (a)-(i), (b)-(iii), (c)-(iv), (d)-(ii)
4) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

45. The IUPAC name of the complex-$[Ag(H_2O)_2][Ag(CN)_2]$ is:[NEET(UG) 2022]

1) dicyanidosilver(II) diaquaargentate(II)
2) diaquasilver(II) dicyanidoargentate(II)
3) dicyanidosilver(I) diaquaargentate(I)
*4) diaquasilver(I) dicyanidoargentate(I)

46. The order of energy absorbed which is responsible for the color of complexes

(A) $[Ni(H_2O)_2(en)_2]^{2+}$ [NEET(UG) 2022]
(B) $[Ni(H_2O)_4(en)]^{2+}$ and (C) $[Ni(en)_3]^{2+}$ is
1) (A) > (B) > (C) 2) (C) > (B) > (A)
3) (C) > (A) > (B) 4) (B) > (A) > (C)

47. Which complex compound is most stable?

1) $[Co\ (NH_3)_3\ (NO3)_3]$ [NEET(UG) 2023]
2) $[CoCl_2(en)_2]\ NO_3$
3) $[Co\ (NH_3)_6]_2\ (SO_4)_3$
4) $[Co\ (NH_3)_4\ (H_2O)\ Br](NO_3)_2$

			LEVEL-3 KEY						
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
3	3	2	2	2	1	4	4	3	2
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
2	3	1	2	3	1	2	3	3	1
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
4	2	2	4	4	2	3	3	1	3
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
4	4	1	2	4	1	2	2	2	4
41	**42**	**43**	**44**	**45**	**46**	**47**			
1	2	1	4	4	3	2			

d & f block elements

LEVEL-1

1. The transition elements have a general electronic configuration:

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) none.

2. The general electronic configuration of Zn, Cd and Hg is represented by :

1) $(n-1)d^{10}\ ns^2$ 2) $(n-1)\ d^9\ 4s^2$

3) $(n-1)\ d^{10}4s^1$ 4) $(n-1)\ d^{10}\ 4s^0$

3. The d-block of the periodic table contains the elements of the groups:

1) 2 – 11 2) 3 – 12 3) 3 – 11 4) 5–14

4. Which of the following statements is incorrect about transition elements?

1) The last electron enters into them in (n-1) d-orbital.

2) Their properties are in between those of s- and p-block elements.

3) The transition element with smallest atomic number is scandium.

4) None of these

5. The total number of electrons in (n–1) d-orbitals in each element, Pd, Ag and Cd respectively are:

1) 8, 9, 10 2) 8, 10, 10

3) 10, 10, 10 4) none

6. Which of the following has largest metallic radius?

1) V 2) Mn 3) Ti 4) Co

7. Amongst the following metals, which has highest melting point ?

1) Ti 2) Cr 3) Fe 4) Cu

8. The melting point of Zn is lower as compared to those of the other elements of 3d series because :

1) the d-orbitals are completely filled.

2) the d-orbitals are partially filled.

3) d-electrons do not participate in metallic bonding.

4) (1) and (3) both.

9. Among the following series of transition metal ions, the one where all metal ions have $3d^2$ electronic configuration is :

1) Ti^{3+} , V^{2+} , Cr^{3+} , Mn^{4+}

2) Ti^{+} , V^{4+} , Cr^{6+} , Mn^{7+}

3) Ti^{2+} , V^{3+} , Cr^{2+} , Mn^{3+}

4) Ti^{2+} , V^{3+} , Cr^{4+} , Mn^{5+} .

10. Which of the statements is **False** ?

1) In 3d series, there is a regular increase in the first ionisation enthalpy of transition elements from left to right.

2) In 3d series, the negative value of standard electrode potential (E/V) for M^{2+}/M decreases in the order Ti > Mn > Cr > Fe.

3) The decreases in metallic radius coupled with increase in atomic mass results in a general increase in the density of transition elements from Ti to Cu.

4) The higher oxidation state are favoured by the heavier elements (i.e. heavier members) in the groups of d-block.

11. Maximum oxidation sate is shown by :

1) Os

2) Mn

3) Cr

4) Co

12. The highest oxidation state is exhibited by the transition metals with configuration :

1) $(n-1)\,d^3ns^2$

2) $(n-1)\,d^5ns^1$

3) $(n-1)\,d^5ns^2$ 4) $(n-1)\,d^8ns^2$.

13. Low oxidation states are found in transition elements when a complex compound has :

1) ligands capable of π acceptor character.

2) ligands capable of σ donor character.

3) ligands capable of π acceptor character as well as σ donor character.

4) ligands incapable of π acceptor character as well as σ donar character.

14. Which of the following statements is correct?

1) The lesser number of oxidation states in 3d-series in the beginning of the series is due to the presence of too few electrons to loose or share

2) The lesser number of oxidation states in 3d-series towards the end of the series is due to the presence of too many electrons and thus fewer empty orbitals to share electrons with the ligands

3) (1) and (2) both

4) None is correct

15. The stability of particular oxidation state of a metal in aqueous solution is determined by:

1) enthalpy of sublimation of the metal

2) ionisation energy

3) enthalpy of hydration of the metal ion

4) all of these.

16. Which of the following is true for the species having $3d^4$ configuration?

1) Cr^{2+} is reducing in nature.

2) Mn^{3+} is oxidising in nature.

3) Both (1) and (2)

4) None of these

17. First IE of 5d series elements are higher than those of 3d and 4d series elements. This is due to :

1) bigger size of atoms of 5d-series elements than 3d-series elements.

2) greater effective nuclear charge is experienced by valence electrons because of the weak shielding of the nucleus by 4*f*-electrons in 5d series.

3) (1) and (2) both.

4) None of these.

18. Which amongst the following can give the greater number of oxidation states?

1) V 2) Mn 3) Cr 4) Fe

19. Which of the following has the maximum number of unpaired d-electron?

1) Zn^{2+} 2) Fe^{2+} 3) Ni^{3+} 4) Cu^{2+}

20. Magnetic moment of Cr^{+2} (Z =24), Mn^{+2} (Z = 25) and Fe^{2+}(Z = 26) are x,y,z. They are in order:

1) $x < y < z$ 2) $x > y > z$

3) $z < x = y$ 4) $x = z < y$

21. Which one of the following transition metal ions is diamagnetic?

1) Co^{2+} 2) Ni^{2+} 3) Cu^{2+} 4) Zn^{2+}

22. Which of the following ions give colourless aqueous solution?

1) Ni^{2+} 2) Fe^{2+} 3) Cu^{2+} 4) Cu^{+}

23. A metal ion from the first transition series has a magnetic moment (calculated) of 3.87 B.M. How many unpaired electrons are expected to be present in the ion?

1) 1 2) 2 3) 3 4) 4

24. The magnetic moment of $_{25}Mn$ in ionic state is 4.83 B.M, then Mn is in :

1) +2 state 2) +3 state

3) +4 state 4) +5 state

25. The colour of transition metal ions is attributed to:

1) exceptionally small size of cations

2) absorption of ultraviolet rays

3) incomplete (n – 1) d - subshell

4) absorption of infrared radiations

26. The catalytic activity of the transition metals and their compounds is ascribed to :

1) their chemical reactivity.

2) their magnetic behaviour.

3) their unfilled d-orbitals.

4) their ability to adopt multiple oxidation state and their complexing ability.

27. Which forms interstitial compounds?

1) Fe 2) Co 3) Ni 4) All

28. Which of the following statement is correct?

1) Transition metals and their many compounds act as good catalyst.

2) The enthalpies of atomistation of the transition metals are high.

3) The transition metals generally form interstitial compounds with small atoms like C, B, H etc.

4) All of these

29. The yellow colour of chromates changes to orange on acidification due to formation of:

1) Cr^{3+} 2) Cr_2O_3 3) $Cr_2O_7^{2-}$ 4) CrO_4^-

30. When acidified solution of $K_2Cr_2O_7$ is shaken with aqueous solution of $FeSO_4$, then :

1) $Cr_2O_7^{2-}$ ion is reduced to Cr^{3+} ions

2) $Cr_2O_7^{2-}$ ion is converted to CrO_4^{2-} ions

3) $Cr_2O_7^{2-}$ ion is reduced to Cr

4) $Cr_2O_7^{2-}$ ion is converted to CrO_3

31. Which of the following compounds is used as the starting material for the preparation of potassium dichromate?

1) $K_2SO_4.Cr_2(SO_4)_3.24H_2O$ (chrome alum)

2) $PbCrO_4$ (chrome yellow)

3) $FeCr_2O_4$ (chromite)

4) $PbCrO_4.PbO$ (chrome red)

32. Manganous salt in presence of catalyst zinc sulphate or zinc oxide is oxidised by potassium permanganate in neutral of faintly alkaline medium to :

1) MnO_2 2) Mn_2O_7

3) Mn_2O_3 4) Can not be oxidized

33. $KMnO_4$ is the oxo salt of :

1) MnO_2 2) Mn_2O_7 3) MnO_3 4) Mn_2O_3

34. Which of the following statements is false ?

1) An acidified solution of $K_2Cr_2O_7$ liberates iodine from potassium iodide

2) In acidic solution, dichromate ions are converted to chromate ions.

3) Potassium dichromate on heating undergoes decomposition to give Cr_2O_3 and O_2 gas.

4) Potassium dichromate is used as a titrant of Fe^{2+} ion.

35. $KMnO_4$ on heating at temperature 513 K decomposes to give :

1) K_2MnO_4, MnO_2 and O_2

2) K_2O, MnO_2 and O_2

3) K_2MnO_4, Mn_2O_7 and KO_2

4) K_2MnO_4 and MnO_2

36. When SO_2 is passed through acidified $K_2Cr_2O_7$ solution :

1) the solution turns blue.

2) SO_2 is reduced.

3) green $Cr_2(SO_4)_3$ is formed.

4) the solution is decolourised.

37. Mohr's salt is :

1) $Fe_2(SO_4)_3.(NH_4)_2SO_4.6H_2O$

2) $MgSO_4.7H_2O$

3) $FeSO_4.(NH_4)_2SO_4.6H_2O$

4) $FeSO_4.7H_2O$

38. The f-block of the periodic table contains those elements in which:

1) only 4f orbitals are progressively filled in 6th period.

2) only 5f orbitals are progressively filled in 7th period.

3) 4f and 5f orbitals are progressively filled in 6th and 7th periods respectively.

4) none

39. Among the lanthanoides the one obtained by synthetic method is :

1) Lu 2) Pm 3) Pr 4) Gd

40. The most common lanthanoide is :

1) lanthanum 2) cerium

3) samarium 4) plutonium

41. Across the lanthanide series, the basicity of the lanthanoide hydroxides :

1) increases

2) decreases

3) first increases and then decreases

4) does not change

42. The +3 ion of which one of the following has half filled 4f subshell?

1) La 2) Lu 3) Gd 4) Ac

43. Actinides :

1) are all synthetic elements

2) includes element 104

3) have only short lived isotopes

4) have variable valency

44. The lanthonoide contraction is reponsible 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 Ce have the same oxidation state

45. Lanthanoid and actinides resemble in :

1) electronic configuration

2) oxidation state

3) ionization energy

4) formation of complexes

46. The separation of lanthanoids by ion exchange method is based on

1) sizes of the ions

2) oxidation state of the ions

3) the solubility of their nitrates

4) basicity of hydroxides of lanthanides

LEVEL-1 KEY									
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
3	1	2	4	3	3	2	4	4	1
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
1	3	3	3	4	3	2	2	2	4
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
4	4	3	3	3	4	4	4	3	1
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
3	1	2	2	1	3	3	3	2	2
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
2	3	4	3	1	1				

LEVEL-2

1. Amongst the following set of transition metal ions, the one in which all metal ions do not have d-electrons ?

1) Cr(VI), Ti(IV), Mn (VII)

2) V(V), Mn(VI), Ni(IV)

3) Sc(III), V (V), Ti (III)

4) Cr(VI), Sc(III), Mn(VI)

2. The radii (metallic) of Fe,Co and Ni are nearly same.

This is due to the fact that:

1) lanthanide contraction

2) increased interelectronic repulsion is balanced by increased nuclear charge.

3) increase in radii due to increase in 'n' is compensated by decrease in radii due to increase in effective nuclear charge (Z).

4) atomic radii do not remain constant but decrease in a normal gradation.

3. Which of the following statements is incorrect?

1) In each row i.e. transition series melting points of transition metals rise to a maximum at d^5 (excludes, Cr, Mn and Tc) and fall regularly as the atomic number increases.

2) The transition metals are very much hard and have low volatility.

3) The metals of the second and third series have greater enthalpies of atomisation than the corresponding elements of the first seires.

4) None

4. Which of the following transition metal ions has the lowest density?

1) Copper 2) Nickel

3) Scandium 4) Zinc

5. The names transition and inner transition metals are used to indicate the elements of :

1) d-block elements only

2) f-block elements only

3) p- and d-blocks elements respectively

4) d- and f-blocks elements respectively

6. Which of the following does not belong to 3d series of transition elements?

1) Titanium 2) Iron

3) Palladium 4) Vanadium.

7. Which of the following is the most suitable description of transition elements ?

1) Low melting points

2) No catalytic activity.

3) Show variable oxidation states.

4) Exhibit inert pair effect.

8. In which of the following pairs of elements, the (n–1) d-orbitals have same number of electrons?

1) Mn, Fe 2) Cr, Mn

3) Cu, Zn 4) (2) and (3)

9. Which of the following factor may be regarded as the main cause of Lanthanide contraction?

1) Poor shielding by 4f-electrons as compared to the electrons in the other sub-shells.

2) Effective shielding of one of the 4f-electrons by another in the sub-shell.

3) Poorer shielding by 5d electron of 4f-electrons.

4) Greater shielding of 5 d electron by 4f-electron.

10. Copper has higher second ionization energy than that of both adjacent elements. This is because of :

1) smaller size of copper (I) ion.

2) d^{10} configuration of copper (I) ion.

3) higher nuclear charge of copper (I) ion.

4) Larger size of copper (I) ion.

11. E^{Θ} values for the couples Cr^{3+}/Cr^{2+} and Mn^{3+}/Mn^{2+} are – 0.41 and + 1.51 volts respectively. Considering these values select the correct option from the following statements.

1) Cr^{2+} acts as a reducing agent and Mn^{2+} acts as an oxidising agent in their aqueous solutions.

2) Cr^{2+} (aq.) is more stable than Cr^{3+} (aq.).

3) Mn^{3+} (aq.) is more stable than Mn^{2+} (aq).

4) None of these.

12. Which oxide of manganese is most acidic in nature ?

1) MnO 2) Mn_2O_7

3) Mn_2O_3 4) MnO_2 .

13. The maximum oxidation state shown by V(Z = 23), Cr(Z = 24), Co(Z = 27), Sc(Z = 21) are respectively :

1) + 5 , + 6 , + 3 , + 3 2) + 3 , + 4 , + 5, + 2

3) + 5, + 3 , + 2 , + 1 4) + 4 in each case.

14. In which compound does vanadium have an oxidation number of + 4 ?

1) NH_4VO_2 2) $K_4[V(CN)_6]$

3) VSO_4 4) $VOSO_4$

15. In general, the transition elements exhibit their highest oxidation states in their compounds with elements like:

1) C 2) S 3) S and P 4) F and O.

16. The E^{Θ} (M^{2+}/M) value for copper is positive (+ 0.34V). It is due to :

1) its higher enthalpy of atomization.

2) its lower enthalpy of hydration.

3) both (1) and (2)

4) none

17. Which of the following pairs of ions has magnetic moment of 5.93 B.M.?

1) Mn^{2+}, Fe^{3+} 2) Mn^{2+}, Cr^{3+}

3) Fe^{2+}, Co^{3+} 4) None

18. Amongst the following the lowest degree of paramagnetism per mole of the compound at 298 K will be shown by:

1) $MnSO_4.4H_2O$ 2) $CuSO_4.5H_2O$

3) $FeSO_4.6H_2O$ 4) $NiSO_4.6H_2O$

19. Compound that is both paramagnetic and coloured is :

1) $K_2Cr_2O_7$ 2) $(NH_4)_2$ $[TiCl_6]$

3) $VOSO_4$ 4) $K_3[Cu(CN)_4]$

20. The ions from among the following which are colourless are :

(i) Ti^{4+} , (ii) Cu^{+1} ,

(iii) Co^{3+}, (iv) Fe^{2+} .

1) (i) and (ii) only 2) (i), (ii) and (iii)

3) (iii) and (iv) 4) (ii) and (iii).

21. Which of the followig group of ions is paramagnetic in nature :

1) Cu^{+}, Zn^{2+}, Sc^{3+} 2) Mn^{2+}, Fe^{3+}, Ni^{2+}

3) Cr^{2+}, Mn^{3+}, Sc^{3+} 4) Cu^{2+}, Ni^{2+}, Ti^{4+}

22. Of the ions Zn^{2+} , Ni^{2+} and Cr^{3+} (atomic number Zn = 30, Ni = 28, Cr = 24) :

1) only Zn^{2+} is colourless and Ni^{2+} and Cr^{3+} are coloured.

2) all three are colourless.

3) all three are coloured.

4) only Ni^{2+} is coloured and Zn^{2+} and Cr^{3+} are colourless.

23. Which of the following is more paramagnetic?

1) Fe^{2+} 2) Fe^{3+} 3) Cr^{3+} 4) Mn^{3+}

24. The highest number of unpaired elelctrons are in :

1) Fe

2) Fe^{2+}

3) Fe^{3+}

4) all have equal number of unpaired electrons

25. The least stable oxide at room temperature is :

1) ZnO 2) CuO

3) Sb_2O_3 4) Ag_2O

26. Titanium shows magnetic moment of 1.73 BM in its compound. What is the oxidation number of Ti in the compound?

1) +1 2) +4 3) +3 4) +2

27. Which one of the following characteristics of the transition metals is associated with their catalytic activity ?

1) Colour of hydrated ions.

2) Variable oxidation states.

3) High enthalpy of atomization.

4) Paramagnetic behaviour.

28. Geman silver is:

1) silver made in Germany

2) an alloy of silver

3) an alloy of copper

4) a silver white paint.

29. Which one of the following alloys contain only Cu and Zn?

1) Bronze

2) Brass

3) Gun metal 4) Bell metal

30. Which of the following can be used for the conversion of potassium manganate to potassium permanganate?

1) O_3 2) Cl_2 3) CO_2 4) All.

31. The number of moles of $KMnO_4$ that will be needed to react with one mole of sulphite ion in acidic medium is:

1) 2/5 2)3/5 3) 4/5 4) 1

32. In the iodometric estimation in the laboratory which process is involved?

1) $Cr_2O_7^{2-} + H^+ + I^- \rightarrow 2Cr^{3+} + I_2$

$I_2 + S_2O_3^{2-} \rightarrow S_4O_6^{2-} + I^-$

2) $MnO_4^- + H^+ + I^- \rightarrow Mn^{2+} + I_2$

$I_2 + S_2O_3^- \rightarrow S_4O_6^{2-} + I^-$

3) $MnO_4^- + OH^- + I^- \rightarrow MnO_2 + I_2$

$I_2 + S_2O_3^{2-} \rightarrow S_4O_6^{2-} + I^-$

4) $Cr_2O_7^{2-} + OH^- + I^- \rightarrow 2Cr^{3+} + I_2$

$I_2 + S_2O_3^{2-} \rightarrow S_4O_6^{2-} + I^-$

33. $K_2Cr_2O_7$ reacts with NH_4Cl in presence of H_2SO_4. The product formed is :

1) chromyl chlorate with green vapour
2) chromous chloride with white vapour
3) chromous chloride with blue vapour
4) chromyl chloride with deep red colour

34. Potassium dichromate can be converted into potassium chromate using:

1) KOH 2) H_2SO_4 3) KCI 4) KNO_2

35. When hydrogen peroxide is added to acidified potassium dichromate, a blue colour is produced due to formation of :

1) CrO_3 2) Cr_2O_3 3) CrO_5 4) CrO_4^{2-}

36. Which of the following statements is not correct?

1) $La(OH)_3$ is less basic than $Lu(OH)_3$

2) In lanthanide series ionic radius of Ln^{3+} ions decreases

3) La is actually an element of transition series rather than lanthanide series

4) Atomic radii of Zr and Hf are same because of lanthanide contraction

37. Transuranic elements begin with

1) Np 2) Cm 3) Pu 4) U

38. Lanthanide contraction is due to increase in :

1) shielding by 4f electrons
2) atomic number
3) effective nuclear charge
4) size of 4f orbitals

39. Which of the following is not an actinoide?

1) Curium 2) Californium
3) uranium 4) terbium

40. When MnO_2 is fused with KOH, a coloured compound is formed. The product and its colour is :

1) K_2MnO_4, green 2) Mn_2O_3, brown
3) Mn_2O_4, black 4) $KMnO_4$, purple

41. Among the following, the coloured compound is :

1) CuCl 2) $K_3[Cu(CN)_4]$
3) CuF_2 4) $[Cu(CH_3CN)_4]BF_4$

42. Among the following pairs of ions, the lower oxidation state in aqueous solution is more stable than the other, in :

1) Tl^+, Tl^{3+} 2) Cu^+ , Cu^{2+}
3) Cr^{2+} , Cr^{3+} 4) V^{2+}, VO^{2+}

43. Which of the following is an amphoteric oxide?

1) CrO_3
2) Cr_2O_3
3) V_2O_3 4) TiO

44. For the reaction,

$Cr_2O_7^{2-} \xrightarrow{pH=x} CrO_4^{2-} \xrightarrow{pH=y} Cr_2O_7^{2-}$ **pH values 'x' and 'y' can be**

1) 4 and 5 2) 4 and 8

3) 8 and 4 4) 8 and 9

45. Assertion : Separation of Zr and Hf is difficult

Reason : Zr and Hf lie in the same group of the periodic table.

1) If both assertion and reason are true and reason is a correct explanation of assertion.

2) If both assertion and reason are true but reason is not a correct explanation of assertion.

3) If assertion is true but reason is false.

4) If assertion and reason both are false.

46. Which is least stable in aqueous medium

1) Fe^{+2} 2) Co^{+2} 3) Ni^{+2} 4) Mn^{+2}

47. The radius of La^{3+} (Atomic number of La = 57) is 1.06Å. Which one of the following given values will be closest to the radius of Lu^{3+} (Atomic number of Lu = 71) ?

1) 1.60Å 2) 1.40Å 3) 1.06Å 4) 0.85Å

48. The ''spin-only'' magnetic moment [in units of Bohr magneton, (μ_B) of Ni^{2+} in aqueous solution would be (atomic number of Ni = 28)

1) 2.84 2) 4.90 3) 0 4) 1.73

49. Identify the incorrect statement among the following.

1) The chemistry of various lanthanoids is very similar.

2) 4f and 5f orbitals are equally shielded.

3) d-block elements show irregular and erratic chemical properties among themselves.

4) La and Lu have partially filled d orbitals and no other partially filled orbitals.

50. The correct order of $E^{\circ}_{M^{2+}/M}$ values with negative sign for the four successive elements Cr, Mn, Fe and Co is

1) Mn > Cr > Fe > Co

2) Cr > Fe > Mn > Co

3) Fe > Mn > Cr > Co

4) Cr > Mn > Fe > Co

51. The outer electronic configuration of Lu (Atomic No : 71) is :

1) $4f^3\ 5d^5\ 6s^2$ 2) $4f^8\ 5d^0\ 6s^2$

3) $4f^4\ 5d^4\ 6s^2$ 4) $4f^{14}\ 5d^1\ 6s^2$

LEVEL-2 KEY

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	2	4	3	4	3	3	4	1	2
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
1	2	1	4	4	3	1	2	3	1
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
2	1	2	3	4	3	2	3	2	4
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
1	1	4	1	3	1	1	3	4	1
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
3	1	2	3	2	1	4	1	2	1
51									
4									

LEVEL-3(PREVIOUS YEARQUESTIONS)

1. Which of the following statement is not correct? [AIPMT 01]

1) $La(OH)_3$ is less basic than $Li(OH)_3$.

2) In lanthaniode series, ionic radius of Ln^{3+} ion decreases.

3) La is actually an element of transition series rather than lanthaniodes.

4) Atomic radius of Zn and Hf are same because of lanthaniode contraction.

2. The transition metals are mostly [AIPMT 01]

1) diamagnetic

2) paramagnetic

3) neither diamagnetic nor paramagnetic

4) both diamagnetic and paramagnetic

3. General electronic configuration of lanthanides is: [AIPMT 02]

1) $(n–2)\ f^{1–14}\ (n-1)s^2\ p^6\ d^{0–1}\ ns^2$

2) $(n–2)\ f^{10–14}\ (n-1)d^{0–1}\ ns^2$

3) $(n–2)\ f^{0–14}\ (n-1)\ d^{10}\ ns^2$

4) $(n–2)\ d^{0–1}\ (n-1)\ f^{1–14}\ ns^2$

4. The correct order of ionic radii of Y^{3+}, La^{3+}, Eu^{3+} and Lu^{3+} is : [AIPMT 03]

1) $Y^{3+} < Lu^{3+} < Eu^{3+} < La^{3+}$

2) $Lu^{3+} < Y^{3+} < Eu^{3+} < La^{3+}$

3) $Lu^{3+} < Eu^{3+} < La^{3+} < Y^{3+}$

4) $La^{3+} < Eu^{3+} < Lu^{3+} < Y^{3+}$

5. The basic character of the transition metal monoxide follows the order: [AIPMT 03]
(At. no. : Ti = 22, V = 23, Cr = 24, Fe = 26)

1) VO > CrO > TiO > FeO

2) CrO > VO > FeO > TiO

3) TiO > FeO > VO > CrO

4) TiO > VO > CrO > FeO

6. Lanthanides are : [AIPMT 04]

1) 14 elements in the sixth period (At. No. 90 to 103) that are filling 4f sublevel.

2) 14 elements in the seventh period (At. No. 90 to 103) that are filling 5f subshell.

3) 14 elements in the sixth period (At. No. 58 to 71) that are filling the 4f subshell.

4) 14 elements in the seventh period (At. No. 58 to 71) that are filling the 4f subshell.

7. The correct order of decreasing second ionization enthalpy of Ti (22), V (23), Cr (24) and Mn (25) is : [AIPMT 05]

1) Cr > Mn > V > Ti

2) V > Mn > Cr > Ti

3) Mn > Cr > Ti > V

4) Ti > V > Cr > M

8. Four successive members of the first row transition elements are listed below with their atomic numbers. Which one of them is expected to have the highest third ionization enthalpy? [AIPMT 05]

1) Vanadium (Z = 23) 2) Manganese (Z = 25)

3) Chromium (Z = 24) 4) Iron (Z = 26)

9. The aqueous solution containing which one of the following ions will be colourless? [AIPMT 05]

(At. No. Sc = 21, Fe = 26, Ti = 22, Mn = 25)

1) Fe^{2+} 2) Mn^{2+} 3) Ti^{3+} 4) Sc^{3+}

10. In which of the following pairs are both the ions coloured in aqueous solution? [AIPMT 06]

(At. No. Sc= 21, Ti = 22, Ni = 28, Cu = 29, Co = 27)

1) Sc^{3+}, Co^{2+} 2) Ni^{2+}, Cu^{+}

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

11. Identify the incorrect statement among the following. [AIPMT 2007]

1) Shielding power of 4f electrons is quite weak

2) There is a decrease in the radii of the atoms or ions as one proceeds from La to Lu

3) Lanthanoid contraction is the accumulation of successive shrinkages.

4) As a result of lanthanoid contraction, the properties of 4d series of the transition elements have no similarities with the 5d series of elements.

12. Which of the following ions will exhibit colour in aqueous solutions ? [AIPMT 2010]

1) La^{3+} (Z = 57)

2) Ti^{3+} (Z = 22)

3) Lu^{3+} (Z = 71) 4) Sc^{3+} (Z = 21)

13. Which of the following ions has electronic configuration [Ar]$3d^6$? [AIPMT 2010]

1) Ni^{3+}

2) Mn^{3+}

3) Fe^{3+} 4) Co^{3+}

14. Which of the following pairs has the same size?

1) Fe^{2+}, Ni^{2+} **[AIPMT 2010]**

2)Zr^{4+},Ti^{4+}

3) Zr^{4+}, Hf^{4+} 4) Zn^{4+}, Hf^{4+}

15. For the four successive transion elements (Cr, Mn, Fe and Co), the stability of +2 oxidation state will be there in which of the following order ? [AIPMT 2011]

(At. nos. Cr = 24, Mn = 25, Fe = 26, Co = 27)

1) Mn > Fe > Cr > Co

2) Fe > Mn > Co > Cr

3) Co > Mn > Fe > Cr 4) Cr > Mn > Co > Fe

16. The d-electron configurations of Cr^{2+}, Mn^{2+}, Fe^{2+} and Co^{2+} are d^4, d^5, d^6 and d^7 respectively. Which one of the following will exhibit minimum paramagnetic behaviour ?

(At, nos. Cr = 24, Mn = 25, Fe = 26, Co = 27)

1)$[Mn(H_2O)_6]^{2+}$ **[AIPMT 2011]**

2)$[Fe(H_2O)_6]^{2+}$

3) $[Co(H_2O)_6]^{2+}$

4) $[Cr(H_2O)_6]^{2+}$

17. Which one of the following does not correctly represent the correct order of the property indicated against it? [AIPMT 2012]

1) Ti < V < Cr < Mn : increasing number of oxidation states

2) $Ti^{3+} < V^{3+} < Cr^{3+} < Mn^{3+}$: increasing magnetic moment

3) Ti < V < Cr < Mn : increasing melting points

4) Ti < V < Mn < Cr : increasing 2^{nd} ionization enthalpy

18. Four successive members of the first series of the transition metals are listed below. For which one of them the standard potential $\left(E^0_{M^{2+}/M}\right)$ value has a positive sign ?

[AIPMT 2012]

1) Co (Z = 27) 2) Ni (Z = 28)

3) Cu (Z = 29) 4) Fe (Z = 26)

19. The catalytic activity of transition metals and their compounds is ascribed mainly to :

1) their magnetic behaviour **[AIPMT 2012]**

2) their unfilled d-orbitals

3) their ability to adopt variable oxidation state

4) their chemical reactivity

20. Which of the following exhibit only + 3 oxidation state? [AIPMT 2012]

1) U 2) Th 3) Ac 4) Pa

21. Which of the following lanthanoid ions is diamagnetic ? [AIPMT 2013]

(At nos. Ce = 58, Sm = 62, Eu = 63, Yb = 70)

1) Sm^{2+} 2) Eu^{2+} 3) Yb^{2+} 4) Ce^{2+}

22. Which of the following statements about the interstitial compounds is incorrect?

1) They are chemically reactive. **[AIPMT 2013]**

2) They are much harder than the pure metal.

3) They have higher melting points than the pure metal.

4) They retain metallic conductivity.

23. Magnetic moment 2.83 BM is given by which of the following ions? [AIPMT 2014]

(At.nos.Ti=22, Cr=24, Mn=25, Ni=28)

1) Ti^{3+} 2)Ni^{2+} 3) Cr^{3+} 4) Mn^{2+}

24. Which of the following processes does not involve oxidation of iron ? [AIPMT-1 2015]

1) Decolourization of blue $CuSO_4$ solution by iron

2) Formation of $Fe(CO)_5$ from Fe

3) Liberation of H_2 from steam by iron at high temperature

4) Rusting of iron sheets

25. Gadolinium belongs to 4f series. It's atomic number is 64. Which of the following is the correct electronic configuration of gadolinium?

1) [Xe]$4f^8 6d^2$ **[AIPMT-2 2015]**

2) [Xe]$4f^9 5s^1$

3) [Xe] $4f^7 5d^1 6s^2$

4) [Xe] $4f^6 5d^2 6s^2$

26. Which one of the following statements related to lanthanons is incorrect? [NEET-2016]

1) Ce (+4) solutions are widely used as oxidizing agent in volumetric analysis.

2) Europium shows +2 oxidation state.

3) The basicity decreases as the ionic radius decreases from Pr to Lu

4) All the lanthanous are much more reactive than aluminium

27. The reason for greater range of oxidation states in actinoids is attributed to : [NEET -2017]

1) The radioactive nature of actinoids

2) Actinoid contraction

3) 5f, 6d and 7s levels having comparable energies

4) 4f and 5d levels being close in energies

28. Name the gas that can readily decolourise acidified $KMnO_4$ solution: [NEET 2017]

1) CO_2 2) SO_2 3) NO_2 4) P_2O_5

29. Match the might ions given in Column I with the spin magnetic moments of the ions given in Column II and assign the correct code :

Column I **Column II[NEET 2018]**

(a) Co^{3+} (i) $\sqrt{8}$ B.M.

(b) Cr^{3+} (ii) $\sqrt{35}$ B.M.

(c) Fe^{3+} (iii) $\sqrt{3}$ B.M.

(d) Ni^{2+} (iv) $\sqrt{24}$ B.M.

(v) $\sqrt{15}$ B.M.

	a	b	c	d
1)	iv	v	ii	i
2)	iii	v	I	ii
3)	iv	I	ii	iii
4)	I	ii	iii	iv

30. The manganate and permanganate ions are tetrahedral, due to: [NEET-1- 2019]

1) The π–bonding involves overlap of d-orbitals of oxygen with d-orbitals of manganese.

2) The π–bonding involves overlap of p-orbitals of oxygen with d-orbitals of manganese.

3) There is no π–bonding.

4) The π–bonding involves overlap of p-orbitals of oxygen with p-orbitals of manganese.

31. The number of hydrogen bonded water molecule(s) associated with $CuSO_4.5H_2O$ is –

1) 3 2) 1 3) 2 4) 5**[NEET- 2019]**

32. When neutral or faintly alkaline $KMnO_4$ is treated with potassium iodide, iodide ion is converted into 'X', 'X' is - [NEET-2- 2019]

1) I_2 2) IO_4^- 3) IO_3^- 4) IO^-

33. The calculated spin only magnetic moment of Cr^2 + ion is : [NEET- 2020]

1) 3.87 BM 2) 4.90 BM

3) 5.92 BM 4) 2.84 BM

34. Identify the incorrect statement.[NEET- 2020]

1) Cr^{2+} (d^4) is a stronger reducing agent than Fe^{2+}(d^6) in water.

2) The transition metals and their compounds are known for their catalytic activity due to their ability to adopt multiple oxidation states and to form complexes.

3) Interstitial compounds are those that are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.

4) The oxidation states of chromium in $C_rO_4^{2-}$ and $C_rO_7^{2-}$ are not the same.

35. Zr (Z =40) and Hf (Z =72) have similar atomic and ionic radii because of : [NEET- 2021]

1) belonging to same group

2) diagonal relationship

3) lanthanoid contraction

4) having similar chemical properties

36. Gadolinium has a low value of third ionisation enthalpy because of [NEET- 2022]

1) small size

2) high exchange enthalpy

3) high electronegativity

4) high basic character

37. In the neutral or faintly alkaline medium, $KMnO_4$ oxidises iodide into iodate. The change in oxidation state of manganese in this reaction is from [NEET- 2022]

1) +7 to +4 2) +6 to +4

3) +7 to +3 4) +6 to +5

38. The stability of Cu^{2+} is more than Cu^+ salts in aqueous solution due to – [NEET- 2023]

1) enthalpy of atomization.

2) hydration energy.

3) second ionisation enthalpy.

4) first ionisation enthalpy.

LEVEL-3 KEY

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	2	1	1	4	3	1	2	4	3
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
4	2	4	3	1	3	3	3	3	3
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
3	1	2	2	3	3	3	2	1	2
31	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
2	3	2	4	3	2	1	2		

E-TECH ACADEMY Study Center

OPEN TO ALL

PEACEFUL ENVIORNMENT

FREE WIFI

DOUBT SUPPORT

SEPARATE DESK

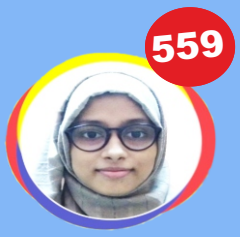
TOPPERS 2023


615
SARFARAJ ALAM
NEET 2023


615
ANAS GAUR
NEET 2023

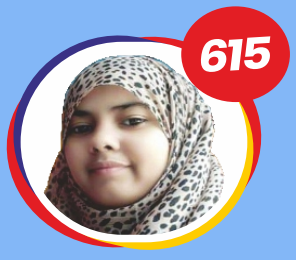

565
MOHD AFFAN
NEET 2023


560
AMAN SHAH
NEET 2023


559
AQSA KHAN
NEET 2023

TOPPERS 2022


615
AFREEN BANO
NEET 2022

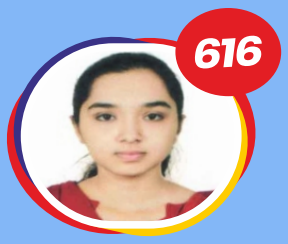

615
SONIYA PARVEEN
NEET 2022


604
MOHD ZEESHAN
NEET 2022


575
SHAH MOHD IZHAR
NEET 2022

TOPPERS 2021


636
SANTOSH
KUMAR YADAV
NEET 2021


616
AKABANI
SADAF YUSUF
NEET 2021


600
SUSHIL
KUMAR GUPTA
NEET 2021


560
ARISHA
ANSARI
NEET 2021

NEET FACULTIES


HASHIM SIR
BIOLOGY FACULTY


EJAZ SIR
CHEMISTRY FACULTY


AMAN SIR
PHYSICS FACULTY


NAFISA MAM
ZOOLOGY FACULTY

E-TECH ACADEMY

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