विध्न विचारत भीरु जन, नहीं आरम्भे काम, विपति देख छोड़े तुरंत मध्यम मन कर श्याम।
पुरुष सिंह संकल्प कर, सहते विपति अनेक, 'बना' न छोड़े ध्येय को, रघुबर राखे टेक।।

रचितः मानव धर्म प्रणेता
सद्गुरु श्री रणछोड़दासजी महाराज

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COMPLEX COMPOUNDS

Q.1 There are four complexes of Ni. Select the complex(es) which will be attracted by magnetic field:
(I) $[Ni(CN)_4]^{2-}$ (II) $[NiCl_4]^{2-}$ (III) $Ni(CO)_4$ (IV) $[Ni(H_2O)_6]^{2+}$
(A) I only (B) II and IV only (C) II, III and IV (D) II and IV

Q.2 The magnetic moments of complexes given below are in the order:
(I) $Ni(CO)_4$ (II) $[Mn(CN)_6]^{4-}$ (III) $[Cr(NH_3)_6]^{3+}$ (IV) $[CoF_6]^{3+}$
(A) I > II > III > IV (B) I < II < III < IV (C) IV >II > I >III (D) IV < II < I < III

Q.3 Which is low spin complex:
(A) $[Fe(CN)_6]^{3-}$ (B) $[Co(NO_2)_6]^{3-}$ (C) $[Mn(CN)_6]^{3-}$ (D) all of these

Q.4 Which of the following are diamagnetic?
(I) $K_4[Fe(CN)_6]$ (II) $K_3[Cr(CN)_6]$ (III) $K_3[Co(CN)_6]$ (IV) $K_2[Ni(CN)_4]$
Select the correct answer using the codes given below:
(A) I, II & IV (B) I, III & IV (C) II & III (D) I & IV

Q.5 Which kind of isomerism is exhibited by octahedral $[Co(NH_3)_4Br_2]$ Cl:
(A) Geometrical and ionization (B) Geometrical and optical
(C) Optical and ionization (D) Geometrical only

Q.6 The spin magnetic moment of cobalt in $Hg[Co(SCN)_4]$ is:
(A) $\sqrt{3}$ (B) $\sqrt{8}$ (C) $\sqrt{15}$ (D) $\sqrt{24}$

Q.7 The species having tetrahedral shape is:
(A) $[PdCl_4]^{2-}$ (B) $[Ni(CN)_4]^{2}$ (C) $[Pd(CN)_4]^{2-}$ (D) $[NiCl_4]^{2-}$

Q.8 The complex ion which has no 'd' electron in the central metal atom is:
(A) $[MnO_4]^{-}$ (B) $[Co(NH_3)_6]^{3+}$ (C) $[Fe(CN)_6]^{3-}$ (D) $[Cr(H_2O)_6]^{3+}$

Q.9 The value of 'spin only' magnetic moment for one of the following configuration is 2.84 BM. The correct one is :
(A) d^4 (in strong field ligand)
(B) d^2 (in weak field ligand)
(C) d^3 (in weak as well as in strong field ligand)
(D) d^5 (in strong field ligand)

Q.10 Which one of the following has lowest value of paramagnetic behaviour:
(A) $[Cr(CN)_6]^{3-}$ (B) $[Mn((CN)_6]^{3-}$ (C) $[Fe(CN)_6]^{3-}$ (D) $[Co(CN)_6]^{3-}$

Q.11 Which one of the following has the regular tetrahedral structure:
(A) $[Ni(CN)_4]^{2-}$ (B) SF_4 (C) BF_4^- (D) XeF_4

Q.12 The coordination number of a central metal atom in a complex is determined by:
(A) The number of only anionic ligands bonded to the metal ion
(B) The number of ligands around a metal ion bonded by p-bonds
(C) The number of ligands around a metal ion bonded by s and p-bonds both
(D) The number of ligands around a metal ion bonded by s bonds

Q.13 Coordination compounds have great importance in biological systems. In this context which of the following statements is incorrect:
(A) Carboxypeptidase –A is an enzyme and contains zinc
(B) Haemoglobin is the red pigment of blood and contains iron
(C) Cyanocobalamin is B^{12} and contains cobalt
(D) Chlorophylls are green pigments in plants and contain calcium

Q.14 The correct order of magnetic moments (spin values in B.M.) among is:
(A) $[Fe(CN)_6]^{4-} > [CoCl_4]^{2-} > [MnCl_4]^{2-}$ (B) $[MnCl_4]^{2-} > [Fe(CN)_6]^{4-} > [CoCl_4]^{2-}$
(C) $[Fe(CN)_6]^{4-} > [MnCl_4]^{2-} > [CoCl_4]^{2-}$ (D) $[MnCl_4]^{2-} > [CoCl_4]^{2-} > [Fe(CN)_6]^{4-}$

Q.15 Which one of the following has largest number of isomers:
(A) $[Co(en)_2Cl_2]^+$ (B) $[Co(NH_3)_5Cl]^{2+}$
(C) $[Ir(PR_3)_2H(CO)]^{2+}$ (D) $[Ru(NH_3)_4Cl_2]^+$

Q.16 Which of the following complex is an outer orbital complex:
(A) $[Ni(NH_3)_6]^{2+}$ (B) $[Mn(CN)_6]^{4-}$ (C) $[Co(NH_3)_6]^{3+}$ (D) $[Fe(CN)_6]^{4-}$

Q.17 Which one of the following statement is correct:
(A) Ferric ions give a deep green precipitate on adding potassium ferrocyanide solution
(B) On boiling a solution having K^+, Ca^{2+} and HCO_3^- ions, we get a precipitate of $K_2Ca(CO_3)_2$
(C) Manganese salt give a violet borax test in reducing flame
(D) From a mixed precipitate of AgCl and AgI, ammonia solution dissolves only AgCl

Q.18 The most stable ion is:
(A) $[Fe(C_2O_4)_3]^{3-}$ (B) $[Fe(Cl)_6]^{3-}$ (C) $[Fe(CN)_6]^{3-}$ (D) $[Fe(H_2O)_6]^{3+}$

Q.19 A square planar complex is formed by hybridisation of which atomic orbitals:
(A) s, p_x, p_y, d_{yz} (B) s, p_x, p_y, $d_{x^2-z^2}$ (C) s, p_x, p_y, d_{z^2} (D) dsp^2, sp^3, sp^3

Q.20 Which one of the following high-spin complexes has the largest CFSE (Crystal field stabilization energy)?
(A) $[Mn(H_2O)_6]^{2-}$ (B) $[Cr(H_2O_6)]^{2+}$ (C) $[Mn(H_2O)_6]^{3+}$ (D) $[Cr(H_2O)_6]^{3+}$

Q.21 Match List-I (Complex ions) with List-II (Number of unpaired electrons) and select the correct answer using the codes given below the lists:

	List-I (Complex ions)		**List-II(Number of unpaired electrons)**
(i)	$[CrF_6]^{4-}$	(a)	One
(ii)	$[MnF_6]^{4-}$	(b)	Two
(iii)	$[Cr(CN)_6]^{4-}$	(c)	Three
(iv)	$[Mn(CN)_6]^{4-}$	(d)	Four
		(e)	Five

	(i)	(ii)	(iii)	(iv)
(A)	d	a	b	e
(B)	b	e	c	a
(C)	d	e	b	a
(D)	b	a	c	e

Q.22 Match List-I (Complexes) with List-II (Hybridization of Central atom) and select the correct answer using the codes given below the lists:

	List-I		**List-II**
(i)	$Ni(CO)_4$	(a)	sp^3
(ii)	$[Ni(CN)_4]^{2-}$	(b)	dsp^2
(iii)	$[Fe(CN)_6]^{4-}$	(c)	sp^3d^2
(iv)	$[MnF_6]^{4-}$	(d)	d^2sp^3
		(e)	sp^2d

	(i)	(ii)	(iii)	(iv)
(A)	a	c	b	d
(B)	e	b	d	c
(C)	e	c	b	d
(D)	a	b	d	c

Q.23 Match List-I (Coordination compounds) with List-II (Type of isomerism) and select the correct answer using the codes given below the lists:

	List-I		**List-II**
(i)	$[Co(NH_3)_4Cl_2]$	(a)	Optical isomerism
(ii)	Cis-$[Co(en)_3Cl_2]$	(b)	Ionization isomerism
(iii)	$[Co(en)_2(NO)_2Cl]SCN$	(c)	Coordination isomerism
(iv)	$[Co(NH_3)_6]\,[Cr(CN)_6]$	(d)	Geometrical isomerism

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

Q.24 Which one of the following complexes exhibit chirality?
(A) $[Cr(ox)_3]^3$ (B) cis- $[PtCl_2(en)]$
(C) cis- $[RhCl_2(NH_3)_4]^+$ (D) mer-$[Cor(NO_2)_3(trien)]$

Q.25 Which one of the following platinum complexes is used in cancer chemotherapy?
(A) cis-$[PtCl_2(NH_3)_2]$ (B) trans-$[PtCl_2(NH_3)]$
(C) $[Pt(NH_3)_4]^{2+}$ (D) $[Pt(Cl_4)]^{2-}$

Q.26 Consider the following isomerisms:
(i) Ionization (ii) Hydrate (iii) Coordination (iv) Geometrical
(v) Optical
Which of the above isomerisms are exhibited $[Cr(NH_3)_2(OH)_2Cl_2]^{-1}$?
(A) (i) and (v) (B) (ii) and (iii) (C) (iii) and (iv) (D) (iv) and (v)

Q.27 The mononuclear complex salt having the molecular composition $[Co(en)_2(SCN)(NO_2)]Br$ can exist in a number of isomeric forms. The total number of possible isomer of all type is
(A) six (B) nine (C) twelve (D) twenty-four

Q.28 A metal complex of coordination number six having three different types of ligands a, b and c of composition $Ma_2b_2c_2$ can exist in several geometrical isomeric forms; the total number of such isomers is
(A) 3 (B) 5 (C) 7 (D) 9

Q.29 Which of the following is used to separated Cd^{2+} in presence of Cu^{2+}:
(A) Dimethylglyoxime (B) EDTA
(C) Excess of KCN (D) NaCN

Q.30 IUPAC name of $[Fe(O_2)(CN)_4Cl]^{4-}$ is:
(A) Chlorotetracynodioxoferrate (II) ion
(B) Chlorotetracyano peroxoferrate (II) ion
(C) Chlorotetracyano superoxoferrate (II) ion
(D) None of these

Q.31 Which statement about coordination number of a cation is true:
(A) Most metal ions exhibit only a single characterisitic coordination number
(B) The coordination number is equal to the number of ligands bonded to the metal atom
(C) The coordination number is determined soley by the tendency to surround the metal atom with the same number of electrons as one of the rare gases.
(D) For most cations, the coordination number depends on the size, structure and charge of the ligands

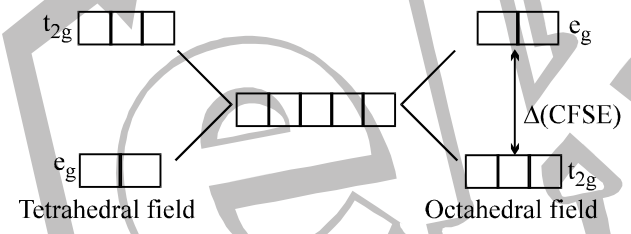
Q.32 Which complex is likely to show optical activity:
(A) Trans-$[Co(NH_3)_4Cl_2]^+$ (B) $[Cr(H_2O)_6]^{3+}$
(C) Cis-$[Co(NH_3)_2(en)_2]^{3+}$ (D) Trans-$[Co(NH_3)_2(en)_2]^{3+}$

Q.33 Mixture X of 0.02 mole of $[Co(NH_3)_5SO_4]Br$ and 0.02 mole of $[Co(NH_3)_5Br]\ SO_4$ was prepared in 2 litre of solution:
1 litre of mixture X + Excess of $AgNO_3 \rightarrow Y$
1 litre of mixture X + Excess of $BaCl_2 \rightarrow Z$
Number of moles of Y and Z respectively are:
(A) 0.01, 0.02 (B) 0.02, 0.01 (C) 0.01, 0.02 (D) 0.02, 0.02

Q.34 Which one of the following pairs of isomers and types of isomerism are correctly matched?
(i) $[Co(NH_3)_5(NO_2)]\ Cl_2$ and $[Co(NH_3)_5\ (ONO)]\ Cl_2$ .....Linkage
(ii) $[Cu(NH_3)_4][PtCl_4]$ and $[Pt(NH_3)_4]\ [CuCl_4]$.....Coordination
(iii) $[Pt(NH_3)_4Cl_2]Br_2$ and $[Pt(NH_3)_4Br_2]Cl_2$ .....Ionization
Select the correct answer using the codes given below:
(A) (ii) and (iii) (B) (i),(ii) and (iii) (C) (i) and (iii) (D) (i) and (ii)

Question No. 35 to 41 (7 questions)

When degenerate d-orbitals of an isolated atom / ion come under influence of magnetic field of ligands, the degeneracy is lost. The two sets t_{2g} (d_{xy}, d_{yz}, d_{xz}) and e_g (d_{z^2}, $d_{x^2-y^2}$) are either stabilized or destabilized depending upon the nature of magnetic field. It can be expressed diagrammatically as:



Value of CFSE depends upon nature of ligand and a spectro-chemical series has been made experimentally, for tetrahedral complexes, Δ is about 4/9 times to Δ_0 (CFSE for octahedral complex). This energy lies in visible region and i.e. why electronic transition $t_{2g}\ e_g$ are responsible for colour. Such transitions are not possible with d^0 and d^{10} configuration.

Q.35 The value of CFSE (Δ_0) for complexes given below follow the order:
(I) $[Co(NH_3)_6]^{3+}$ (II) $[Rh(NH_3)_6]^{3+}$ (III) $[Ir(NH_3)_6]^{3+}$
(A) I < II < III (B) I > II > III (C) I < II > III (D) I = II = III

Q.36 Cr^{3+} form four complexes with four different ligands which are $[Cr(Cl)_6]^{3-}$, $[Cr(H_2O)_6]^{3+}$, $[Cr(NH_3)_6]^{3+}$ and $[Cr(CN)_6]^{3-}$. The order of CFSE (Δ_0) in these complexes is in the order:
(A) $[CrCl_6]^{3-} = [Cr(H_2O)_6]^{3+} = [Cr(NH_3)_6]^{3+} = [Cr(CN)_6]^{3-}$
(B) $[CrCl_6]^{3-} < [Cr(H_2O)_6]^{3+} < [Cr(NH_3)_6]^{3+} < [Cr(CN)_6]^{3-}$
(C) $[CrCl_6]^{3-} > [Cr(H_2O)_6]^{3+} > [Cr(NH_3)_6]^{3+} > [Cr(CN)_6]^{3-}$
(D) $[CrCl_6]^{3-} < [Cr(H_2O)_6]^{3+} = [Cr(NH_3)_6]^{3+} < [Cr(CN)_6]^{3-}$

Q.37 The d-orbitals, which are stabilized in an octahedral magnetic field, are:
(A) d_{xy} and d_{z^2} (B) $d_{x^2-y^2}$ and d_{z^2} (C) d_{xy}, d_{xz} and d_{yz} (D) d_{z^2} only

Q.38 For an octahedral complex, which of the following d-electron configuration will give maximum CFSE?
(A) High spin d^6 (B) low spin d^4 (C) low spin d^5 (D) High spin d^7
–0.4 –1.6 –2.0 –0.8

Q.39 $Ti^{3+}_{(aq.)}$ is purple while $Ti^{4+}_{(aq.)}$ is colourless because:
(A) There is no crystal field effect in Ti^{4+}
(B) The energy difference between t_{2g} and e_g of Ti^{4+} is quite high and does not fall in the visible region
(C) Ti^{4+} has d^0 configuration
(D) Ti^{4+} is very small in comparison to Ti^{3+} and hence does not absorb any radiation.

Q.40 Which of the following is correct arrangement of ligands in terms of the Dq values of their complexes with any particular 'hard' metal ion:
(A) $Cl^- < F^- < NCS^- < NH_3 < CN^-$ (B) $NH_3 < F^- < Cl^- < NCS^- < CN^-$
(C) $Cl^- < F^- < NCS^- < CN^- < NH_3$ (D) $NH_3 < CN^- < NCS^- < Cl^- < F^-$

Q.41 The extent of crystal field splitting in octahedra complexes of the given metal with particular weak field ligand are such that:
(A) Fe(III) < Cr (III) < Rh (III) < Ir (III) (B) Cr (III) < Fe (III) < Rh (III) < Ir (III)
(C) Ir (III) < Rh (III) < Fe (III) < Cr (III) (D) Fe (III) = Cr (III) < Rh (III) < Ir (III)

Question No. 42 to 43 (2 questions)
On the basis of stability of complex entity in the solution, complexes may be of two types, perfect and imperect complexes. The stability depends upon the extent of dissociation which in turn depends upon the strength of metal -ligand bond. The stability of complex also depends upon charge on central metal atom, basic nature of ligand, chelation, and nature of metal ion and ligand according to HSAB principle.

Q.42 Which one of the following does not follow EAN rule?
(A) $Fe(CO)_5$ (B) $V(CO)_6$ (C) $K_4[Fe(CN)_6]$ (D) $Mn_2(CO)_{10}$

Q.43 Which complex is most stable?
(A) $[Cu(CN)_2]^-$ $K_d = 1 \times 10^{-16}$ (B) $[Fe(CN)_6]^{4-}$ $K_d = 1 \times 10^{-37}$
(C) $[Fe(CN)_6]^{3-}$ $K_d = 1 \times 10^{-44}$ (D) $[Ag(CN)_2]^-$ $K_d = 1 \times 10^{-20}$

METALLURGY

Q.44 Which pair of elements can form alloy:
(A) Zn and Pb (B) Fe and Hg (C) Fe and Cr (D) C and Pt

Q.45 Extraction of silver from its ore involving NaCN, air and an active metal is known as:
(A) Pattinson's method (B) Amalgamation method
(C) Mc Arthur-forest method (D) Parke's method

Q.46 Electric furances are lined with magnesia because:
(A) It is not affected by acids (B) It liberates oxygen on heating
(C) It melts at very high temperature (D) It has no effect of electricity

Q.47 Chalcogens are:
(A) Hydrocarbons (B) Ore forming elements
(C) Oxide forming elements (D) Those having ability to catenate

Q.48 Plumbo-solvency refers to:
(A) Oxidation of lead to lead oxide
(B) Oxidation of lead to red lead
(C) Dissolution of lead in water containing air
(D) Making lead wires by forcing heated metal through a die

Q.49 In Goldschmidt aluminothermic process, thermite mixture contains:
(A) 3 parts Fe_2O_3 and 2 parts Al (B) 3 parts Al_2O_3 and 4 parts Al
(C) 1 part Fe_2O_3 and 12 part Al (D) 3 parts Fe_2O_3 and 1 part Al

Q.50 The pyrometallurgical operations involves the use of:
(A) High temperature (B) Sulphide ores
(C) Electrolysis (D) Complexation

Q.51 The most common elements present in the crust of the Earth are:
(A) oxygen, silicon, aluminium (B) oxygen, iron, magnesium
(C) silicon, iron, potassium (D) oxygen, iron, silicon

Q.52 Match the following:

(I)	Bauxite	(a)	Copper
(II)	Monazite	(b)	Uranium
(III)	Malachite	(c)	Thorium
(IV)	Pitch blends	(d)	Aluminium

(A) I-d, II-b, III-c, IV-d (B) I-b, II-c, III-d, IV-a
(C) I-c, II-a, III-b, IV-d (D) I-d, II-c, III-a, IV-b

Q.53 In the cyanide process for extraction of gold and silver from ores, the cyanide solution acts as a
(A) reducing agent to reduce the gold and silver compounds present in the ores into the metallic states
(B) leaching agent to bring the gold and silver into solution as cyanide complexes and thus separate these metals from the ores
(C) leaching agent to dissolve all the other constituents of the ores leaving the gold and silver as metals
(D) leaching agent to bring the ores into solution.

Q.54 Reduction of a metal oxide by excess carbon at high temperature is a method for the commercial preparation of some metals. This method can be successfully applied in the case of
(A) BeO and Al_2O_3 (B) ZnO and Fe_2O_3 (C) CaO and Cr_2O_3 (D) BaO and U_3O_8

Q.55 Match List-I (Metal) with List-II (Process of Extraction) and select the correct answer using the codes given below the lists:

	List-I (Metal)		List-II (Process of Extraction)
(a)	Aluminium	(1)	Blast furance
(b)	Iron	(2)	Mond process
(c)	Nickel	(3)	Bayer process
(d)	Copper	(4)	Cyanide process
		(5)	Froth floatation

	(a)	(b)	(c)	(d)
(A)	2	5	4	1
(B)	3	1	2	5
(C)	2	1	4	5
(D)	3	5	2	1

Q.56 The metal extracted by leaching with cyanide is:
(A) Mg (B) Ag (C) Cu (D) Na

Q.57 When the sample of Cu with Zn impurity is to be purified by electrolysis, the appropriate electrodes are:

	Cathode	**Anode**
(A)	Pure Zn	Pure Cu
(B)	Impure sample	Pure Cu
(C)	Impure Zn	Impure sample
(D)	Pure copper	Impure sample

Q.58 The substance not likely to contain $CaCO_3$ is:
(A) Sea shells (B) Dolomite (C) Marble statue (D) Calcined gypsum

Q.59 Which of the following ores is best concentrated by froth floatation process:
(A) Malachite (B) Cassiterite (C) Galena (D) Magnetite

Q.60 During the process of electrorefining of copper some metals present as impurity settle as anode mud. These are:
(A) Sn and Ag (B) Pb and Zn (C) Ag and Au (D) Fe and Ni

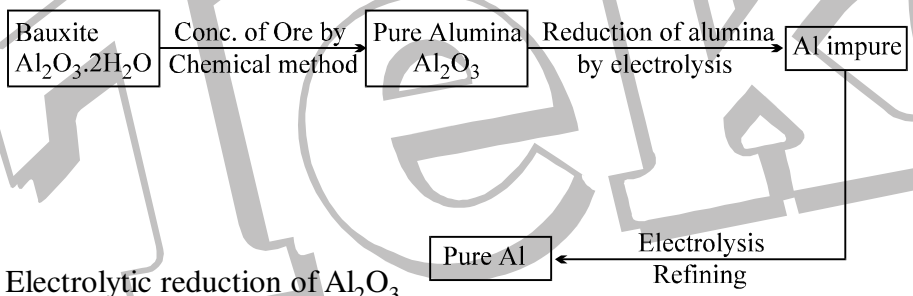
Q.61 On heating a mixture of Cu_2O and Cu_2S, we get:
(A) $Cu + SO_2$ (B) $Cu + SO_3$ (C) $CuO + CuS$ (D) Cu_2SO_3

Q.62 Electrolyte reduction of alumina to aluminium by Hall-Heroult process is carried out:
(A) In the presence of NaCl
(B) In the presence of BaF_2
(C) In the presence of cryolite which forms a melt with lower melting temperature
(D) In the presence of cryolite which forms a melt with higher melting temperature

Q.63 By which process Pb and Sn are extracted respectively are:
(A) Carbon reduction and self reduction
(B) Self reduction and carbon reduction
(C) Electrolytic reduction and cyanide process
(D) Cyanide process and electrolytic reduction

Question No.64 to 67 (4 questions)

Extraction of Aluminium can be understand by



Electrolytic reduction of Al_2O_3
Electrolyte : Al_2O_3 + Cryolite + CaF_2
Cathode : Graphite inside the Fe container
Anode : Graphite rods

Q.64 The purpose of adding cryolite is:
(A) to increase the electrical conductivity of pure aluminium
(B) to lower the melting point of Al_2O_3
(C) to remove the impurities as slag
(D) to increase the Al % in the yield

Q.65 Coke powder is spreaded over the molten electrolyte due to:
(A) prevent the heat radiation from the surface
(B) prevent the corrosion of graphite anode
(C) prevent oxidation of molten aluminium by air
(D) (A) & (B)

Q.66 The molten electrolytes contains Na^+, Al^{3+}, Ca^{2+} but only Al gets deposited at cathode because:
(A) Standard reduction potential of Al is more than those of Na & Ca
(B) Standard oxidation potential of Al is more than those of Na & Ca
(C) Discharge potential of Al^{3+} is higher than Na^+ & Ca^{2+}
(D) Graphite reacts only with Al^{3+} and not with Na^+ & Ca^{2+}

Q.67 What is wrong if anode is made of nickel instead of graphite?
(A) Ni is costly
(B) Anode will be affected by produced Cl_2
(C) Graphite remain unaffected by produced Cl_2
(D) Ni may be affected by high temp.

CHEMICAL BONDING

Q.68 Which species has the maximum number of lone pair of electrons on the central atom:
(A) $[ClO_3]^-$ (B) XeF_4 (C) SF_4 (D) $[I_3]^-$

Q.69 Which statement is correct about O_2^+:
(A) Paramagnetic and bond order < O_2 (B) Paramagnetic and bond order > O_2
(C) Diamagnetic and bond order < O_2 (D) Diamagnetic and bond order > O_2

Q.70 Total number of lone pair of electrons in $XeOF_4$ is:
(A) 0 (B) 1 (C) 2 (D) 3

Q.71 Which of the following are isoelectronics and isostructural:

$NO_3^-, CO_3^{2-}, ClO_3^-, SO_3$

(A) NO_3^-, CO_3^{2-} (B) SO_3, NO_3^- (C) ClO_3^-, CO_3^{2-} (D) CO_3^{2-}, SO_3

Q.72 The common features among the species CN^-, CO and NO^+ are:
(A) Bond order 3 and isoelectronics
(B) Bond order 3 and weak field ligands
(C) Bond order 2 and π-acceptor
(D) Isoelectric and weak field ligands

Q.73 Molecular shape of SF_4, CF_4 and XeF_4 are:
(A) The same with 2, 0 and 1 lone pair of electron respectively
(B) The same with 1, 1 and 1 lone pair of electron respectively
(C) Different with 0, 1 and 2 lone pairs of electron respectively
(D) Different with 1, 0 and 2 lone pairs of electron respectively

Q.74 Which contains both polar and non-polar bonds:
(A) NH_4Cl (B) HCN (C) H_2O_2 (D) CH_4

Q.75 The two carbon atoms in calcium carbide are held by which of the following bonds:
(A) Three sigma bonds (B) Ionic bonds
(C) Two pi and one sigma bonds (D) Ionic and covalent bonds

Q.76 Number of paired electrons in O_2 molecule is:
(A) 7 (B) 8 (C) 16 (D) 14

Q.77 Which of the following does not contain isoelectronic species:
(A) PO_4^{3-}, SO_4^{2-}, ClO_4^- (B) CN^-, N_2, C_2^{2-}
(C) SO_3^{2-}, CO_3^{2-}, NO_3^- (D) BO_3^{3-}, CO_3^{2-}, NO_3^-

Q.78 The bond order in NO is 2.5 while that in NO^+ is 3. Which statement is true:
(A) Bond length is unpredictable
(B) Bond length in NO is greater than in NO^+
(C) Bond length in NO^+ is equal to that in NO
(D) Bond length in NO^+ is greater than in NO

Q.79 The maximum number of 90° angles between bond pair-bond pair of electron is observed in:
(A) sp^3d^2 hybridisation (B) sp^3d hybridisation
(C) dsp^2 hybridisation (D) dsp^3 hybridisation

Q.80 The states of hybridisation of boron and oxygen atoms in boric acid (H_3BO_3) ate respectively:
(A) sp^3 and sp^3 (B) sp^2 and sp^3 (C) sp^3 and sp^2 (D) sp^2 and sp^2

Q.81 The correct order of bond angles is:
(A) $H_2S < NH_3 < BF_3 < SiH_4$ (B) $NH_3 < H_2S < SiH_4 < BF_3$
(C) $H_2S < NH_3 < SiH_4 < BF_3$ (D) $H_2S < SiH_4 < NH_3 < BF_3$

Q.82 Which among the following has smallest bond angles:
(A) H_2S (B) NH_3 (C) SO_2 (D) H_2O

Q.83 Number of sigma bonds in P_4O_{10} is:
(A) 6 (B) 7 (C) 17 (D) 16

Q.84 Match List-I (Ionic species) with Lis-II (Shapes) and select the correct answer using the codes given below the lists:

	List-I (Ionic species)		**List-II (Shapes)**
(a)	XeF_5^+	(1)	Tetrahedral
(b)	SiF_5^-	(2)	Square planar
(c)	AsF_4^+	(3)	Trigonal bipyramidal
(d)	ICl_4^-	(4)	Square pyramidal
		(5)	Octahedral

	(a)	(b)	(c)	(d)		(a)	(b)	(c)	(d)
(A)	1	2	5	3	(B)	4	3	1	2
(C)	1	3	5	2	(D)	4	2	1	3

Q.85 Match List-I (Molecule) with Lis-II (Shape) and select the correct answer using the codes given below the lists:

	List-I (Molecule)		**List-II (Shape)**
(a)	P_4	(1)	Crown
(b)	S_8	(2)	Polymeric (Dimeric)
(c)	$AlCl_3$	(3)	Tetrahedral
(d)	PCl_5	(4)	Trigonal bipyramid

	(a)	(b)	(c)	(d)		(a)	(b)	(c)	(d)
(A)	3	1	2	4	(B)	1	3	2	4
(C)	3	1	3	2	(D)	2	1	3	4

Q.86 Match List-I (Species) with Lis-II (Hybrid orbitals) and select the correct answer using the codes given below the lists:

	List-I (Species)		**List-II (Hybrid orbitals)**
(a)	$MnCl_5^{3-}$	(1)	sp^3
(b)	$CuCl_5^{3-}$	(2)	dsp^2
(c)	$AuCl_4^-$	(3)	$sp^3 d_{z^2}$
(d)	ClO_4^-	(4)	$d_{(x^2-y^2)}sp^3$

	(a)	(b)	(c)	(d)		(a)	(b)	(c)	(d)
(A)	1	3	2	4	(B)	3	4	2	1
(C)	4	2	1	3	(D)	4	3	2	1

Q.87 Match List-I (Hybrid bond orbitals) with Lis-II (Species) and select the correct answer using the codes given below the lists:

	List-I (Hybrid orbitals)		**List-II (Species)**
(a)	d^3s	(1)	ICl_4^-
(b)	dsp^2	(2)	$TeCl_4$
(c)	sp^3d	(3)	MnO_4^-
(d)	sp^3d^2	(4)	$Ni(CN)_4^{2-}$

	(a)	(b)	(c)	(d)		(a)	(b)	(c)	(d)
(A)	4	3	1	2	(B)	4	3	2	1
(C)	3	4	1	2	(D)	3	4	2	1

Q.88 Match List-I (Hybrid bond orbitals) with Lis-II (Species) and select the correct answer using the codes given below the lists:

	List-I (Hybrid orbitals)		**List-II (Species)**
(a)	d^3s	(1)	ICl_4^-
(b)	dsp^2	(2)	$TeCl_4$
(c)	sp^3d	(3)	MnO_4^-
(d)	sp^3d^2	(4)	$Ni(CN)_4^{2-}$

	(a)	(b)	(c)	(d)		(a)	(b)	(c)	(d)
(A)	4	3	1	2	(B)	4	3	2	1
(C)	3	4	1	2	(D)	3	4	2	1

Q.89 Match List-I (Molecule) with Lis-II (Shape) and select the correct answer using the codes given below the lists:

	List-I (Molecule)		**List-II (Shape)**
(a)	$(CH_3)_3B$	(1)	Square planar
(b)	NH_4Cl	(2)	Trigonalbipyramid
(c)	$[ICl_4]^-$	(3)	Tetrahedral
(d)	PCl_5	(4)	Trigonal planar

	(a)	(b)	(c)	(d)		(a)	(b)	(c)	(d)
(A)	1	3	4	2	(B)	4	3	1	2
(C)	4	2	1	3	(D)	1	2	4	3

Q.90 Which of the following species have undistorted octahedral structures?

1. SF_6 2. PF_6^- 3. SiF_6^{2-} 4. XeF_6

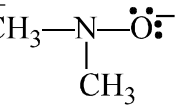
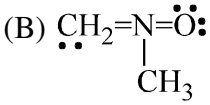
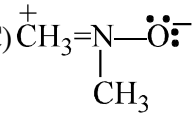
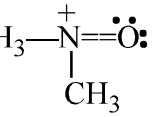
Select the correct answer using the codes given below:

(A) 2, 3 and 4 (B) 1, 3 and 4 (C) 2 and 3 (D) 1, 2 and 3

Q.91 Which of the following would have permanent dipole moment:

(A) SF_4 (B) XeF_4 (C) SiF_4 (D) BF_3

Q.92 Which is not a permissible resonating structure:

(A)  (B)  (C)  (D) 

Q.93 N–O–N bond angle is maximum in:

(A) NO_2^+ (B) NO_2 (C) NO_3 (D) N_2O_3

Q.94 Which statement is wrong about H_2O:
(A) It has high specific heat relative to other liquids or solids due to strong intermolecular H-bonding
(B) H_2O molecule has capacity to form 4 H-bonds
(C) H_2O has open cage like structure due to intermolecular H-bonding which give rise to low density to ice than liquid H_2O
(D) H_2O has maximum density at 4°C since upto 4°C, the intermolecular H-bonding persists more and thereby decreasing volume and increasing density

Q.95 Which statement is incorrect for OSF_4:
(A) S atom has sp^3d hybridisation
(B) OSF_4 have disterted trigonal pyramidal geometry
(C) O atom at one of the two axial positions having S=O bond
(D) O atom at one of the equatorial position having S=O bond

Q.96 The O–O bond length in O_2, O_2 $[AsF_4]$ and $K[O_2]$ is:
(A) $O_2[AsF_4] < O_2 < K[O_2]$ (B) O_2 $[AsF_4] < K[O_2] < O_2$
(C) $O_2 < O_2$ $[AsF_4] > K$ $[O_2]$ (D) $K[O_2] < O_2 < O_2$ $[AsF_4]$

Q.97 The correct order in which the O–O bond length increases in the following :
(A) $H_2O_2 < O_2 < O_3$ (B) $O_3 < H_2O_2 < O_3$ (C) $O_2 < H_2O_2 < O_3$ (D) $O_2 < O_3 < H_2O_2$

Q.98 The solubility of KCl is relatively more in:
(A) C_6H_6(D=0) (B) $(CH_3)_2CO$=(D=2) (C) CH_3OH (D=32) (D) CCl_4(D=0)

Q.99 Which are true statements among the following:
(1) PH_5 and $BiCl_5$ do not exist
(2) $p\pi$-$d\pi$ bonds are present in SO_2
(3) Electrons travel with speed of light
(4) SeF_4 and CH_4 have same shape
(5) I_3^+ has bent geometry
(A) 1, 3 (B) 1, 2, 5 (C) 1, 3, 5 (D) 1, 2, 4

Q.100 A molecule which can not exist theoretically is:
(A) SF_4 (B) OF_2 (C) OF_4 (D) O_2F_2

ANSWER KEY

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

