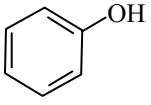
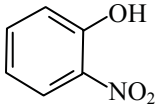
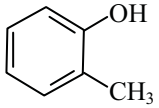
INDIAN ASSOCIATION OF CHEMISTRY TEACHERS
NATIONAL STANDARD EXAMINATION IN CHEMISTRY 2009-2010

This is question paper contains 80 multiple-choice question. Each correct answer carries 3 marks and 1 mark will be deduced for each wrong answer. No weightage II be given to unattempted question.

Q.1 The most acidic among the following compounds is

(A) $Cl–CH_2–CH_2–OH$ (B) 

(C)  (D) 

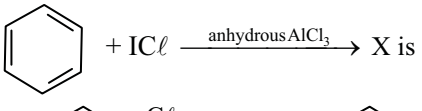
Q.2 The number of ether metamers represented by the molecular formula $C_4H_{10}O$ is

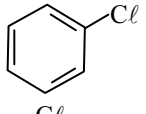
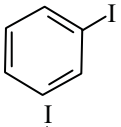
(A) 1 (B) 2
(C) 3 (D) 4

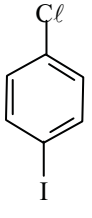
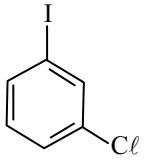
Q.3 An isocyanide on recuction with hydrogen in the presence of platinum gives

(A) amide (B) primary amine
(C) secondary amine (D) alcohol

Q.4 The compound X in the reaction,



(A)  (B) 

(C)  (D) 

Q.5 S_N reactivity of the following halides.

(i) $(CH_3)_3$ C Br
(ii) $(C_6H_5)_2$ CH Br
(iii) $(C_6H_5)_2$ C (CH_3) Br
(iv) $(CH_3)_2$ CH Br will be in the order

(A) iv > i > ii > iii (B) ii > i > iii > iv
(C) i > iii > ii > iv (D) iii > ii > i > iv

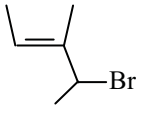
Q.6 An alcohol, an aldehyde and a carboxylic acid of comparable mass will have their boiling points in the order

(A) alcohol < carboylic acid < aldchyde
(B) aldehyde < alcohol < carboxylic acid
(C) alcohol < aldehyde < carboxylic acid
(D) carboxylic acid < aldehyde < alcohol

Q.7 The substances used for the preparation of ether by williamson's synthesis are

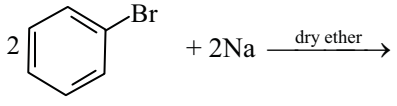
(A) $(CH_3)_3$ C Br and CH_3 O Na
(B) $(CH_3)_3$ C Br and CH_3OH
(C) CH_3 Br and $(CH_3)_3$ CO Na
(D) CH_3 Br and $(CH_3)_3$ C OH

Q.8 The IUPAC name of is

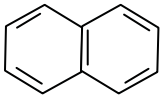


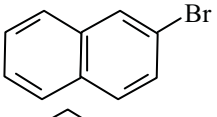
(A) 2-bromo-3-methylbut-3-ene
(B) 4-bromo-3-methylbut-2-ene
(C) 2-bromo-3-methylbut-3-ene
(D) 4-bromo-2,3-dimethylbut-2-ene

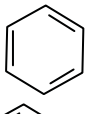
Q.9 The product A in the reaction

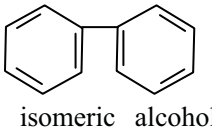


A + 2NaBr is

(A) 

(B) 

(C) 2 

(D) 

Q.10 The isomeric alcohol which has a chiral carbon atom is

(A) n-butyl alcohol
(B) iso-butyl alcohol
(C) sec-butyl alcohol
(D) tert-butyl alcohol

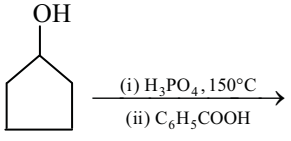
Q.11 Geometrical isomerism results because the molecule
(A) rotates the plane of polarized light
(B) has a plane of symmetry
(C) has a centre of symmetry
(D) has two dissimilar groups attached to both ends of double bond

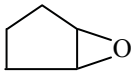
Q.12 During alcoholic ends fermentation of sugars, the enzyme which converts glucose (or fructose) into ethanol is
(A) zymase (B) invertase
(C) maltase (D) urease

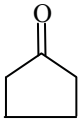
Q.13 Compound X on treatment with HI gives Y.Y on treatment with ethanolic KOH gives Z (an isomer of X). Ozonolysis of Z (with H_2O_2 workup) gives a two-carbon carboxylic acid and four carbon ketone. Hence, X is -
(A) 2-methyl-2-pentene
(B) 4-methyl-1-pentene
(C) 2,3-dimethyl-2-butene
(D) 3-methyl-1-pentene

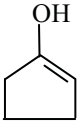
Q.14 The reagent which will be suitable to distinguish 1-methoxy-3-methyl-2-butene from isomeric 4-methyl-3-penten-1ol is-
(A) bromine in chloroform
(B) alkaline potassium permanganate
(C) ammoniacal silver nitrate
(D) sodium metal suspended in hexane

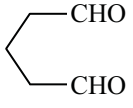
Q.15 The major product of the following reaction is



(A) 

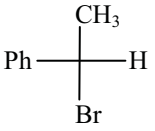
(B) 

(C) 

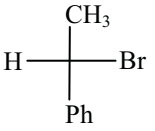
(D) 

Q.16 Among the following isomeric chloro compounds, the compound which will undergo S_N2 reaction readily is
(A) 4-chloro-1-butene
(B) 1-chloro-1-butene
(C) 1-chloro-2-butene
(D) 2-chloro-1-butene

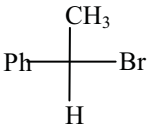
Q.17 The pair of enatiomers among the following compounds is -



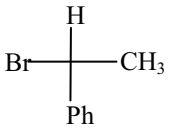
I



II



III

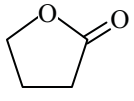


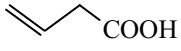
IV

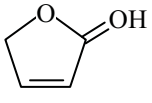
(A) I and IV (B) II and IV
(C) II and III (D) I and II

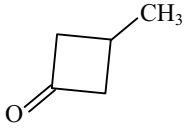
Q.18 Compund X ($C_5H_{10}O$) is a chiral alcohol. It is catalytically hydrogenated to an achiral alcohol Y ($C_2H_{12}O$) and oxidized by activated MnO_2 to an achiral carbonyl compound Z ($C_5H_{10}O$). Compound X is-
(A) 1-pentene-3-ol
(B) 4-penten-2-ol
(C) 3-methyl-2-buten-1-ol
(D) 2-methyl-2-buten-1-ol

Q.19 4-Oxobutanoic acid is reduced with Na-borohydride and the product is treated with aqueous acid. The final product is-

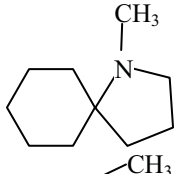
(A) 

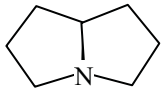
(B) 

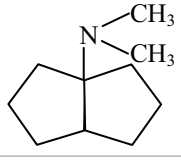
(C) 

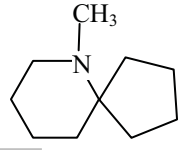
(D) 

Q.20 The nitrogen atom in the cyclic compounds can be removed as trimethylamine by successive Hoffmann eliminations (involving exhaustive methylation followed by heating with AgOH). The amine which will require a greater number of Hoffmann eliminations is -

(A) 

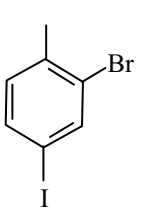
(B) 

(C) 

(D) 

Q.21 $X \xrightarrow[\text{ether}]{Mg} Y \xrightarrow[H^+]{\text{Dry } CO_2} Z \xrightarrow{\text{hot } KMnO_4} P$

The two isomeric compounds which will give the same tricarboxylic acid after the above sequence of reactions are-



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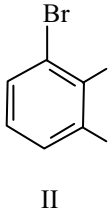

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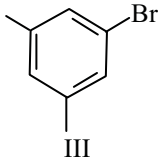
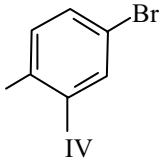


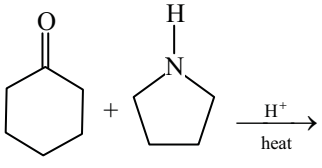
III

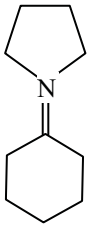


IV

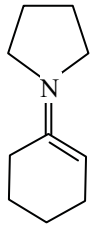
(A) I and II (B) III and IV
(C) I and IV (D) II and III

Q.22 The most favorable product of the following reaction is -

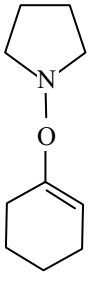




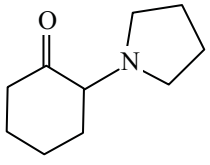
I



II



III



IV

(A) I (B) II (C) III (D) IV

Q.23 3.7 dm^3 of 1 M NaOH solution is mixed 5 dm^3 of 0.3 M NaOH solution. The molarity of the resulting solution is -

(A) 0.80 M (B) 0.10 M
(C) 0.73 M (D) 0.59 M

Q.24 An electric current is passed through a silver voltameter connected to a water voltameter. 0.324 g of silver was deposited on the cathode of the silver volameter. The volume of oxygen evolved at NTP is

(A) 5.6 cm^3 (B) 16.8 cm^3
(C) 11.2 cm^3 (D) 22.4 cm^3

Q.25 The hydrolysis constant of 0.5 M ammonium benzoate is 6.25×10^{6} . The percentage hydrolysis of the salt is-

(A) 0.25 (B) 0.177
(C) 0.125 (D) 0.50

Q.26 For a chemical reaction, $A + B \rightarrow C + D$, the following data was recorded :

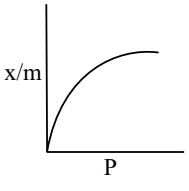
Set No.	Initial concentration of 'A'(mol. dm^3)	Initial Concentration of 'B'(mol.dm^3)	Rate of reaction (mol.dm^3 s^1)
1	4.00	3.00	0.10
2	12.00	3.00	0.90
3	12.00	6.00	0.90

The correct rate expression for the reaction is

(A) rate = k[A] [B] (B) rate = $k[A]^2[B]^2$
(C) rate = k $[A]^2$ (D) rate = k $[A][B]^2$

Q.27 The plot represting langmuri's adsorption isotherm is

(A)



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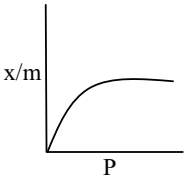

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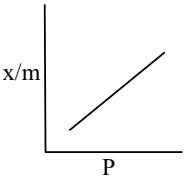

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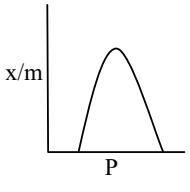


Q.28 For a dilute solution; Raoult's law states that-

(A) the lowering of vapour pressure is equal to the mole fraction of the solute.
(B) the relative lowering of vapour pressure is equal to the mole fraction of the solute
(C) the vapour pressure of solution is equal to the mole fraction of solution.
(D) the relative lowering of vapour pressure is proportional to the amount of solute in the solution

Q.29 For the reaction $2HI_{(g)} \rightleftharpoons H_{2(g)} + I_{2(g)}$

(A) $K_p = K_c$ (B) $K_p > K_c$

(C) $K_p < K_c$ (D) $K_c = \sqrt{K_p}$

Q.30 If the equilibrium constants of the reactions,

$2SO_3 \rightleftharpoons 2SO_2 + O_2$

and

$SO_2 + 1/2O_2 \rightleftharpoons SO_3$

are K_1 and K_2 respectively, the correct relation between the two equilibrium constants is,

(A) $K_2 = (K_1)^{1}$ (B) $K_2 = \frac{1}{\sqrt{K_1}}$

(C) $K_2 = (1/K_1)^2$ (D) $K_2 = \sqrt{K_1}$

Q.31 The amount of copper (At. wt. = 63.54) deposited by passing 0.2 faraday of electricity through copper sulphate is -

(A) 3.175 g (B) 6.350 g

(C) 31.75 g (D) 63.35 g

Q.32 A radioactive element has half life of 14 hours. The fraction of the radioactive isotope which will disintegrate in 56 hours is -

(A) 0.75 (B) 0.875

(C) 0.9375 (D) 0.60

Q.33 The fundamental particle responsible for keeping the nucleus together is

(A) meson (B) muon

(C) positron (D) hyperon

Q.34 The maximum number of electrons in $3d_Z^2$ orbital is-

(A) 2 (B) 4 (C) 5 (D) 10

Q.35 The ion which has 18 electrons in the outermost shell is-

(A) Cu^+ (Z = 29) (B) Al^{3+} (Z =13)

(C) K^+ (Z = 19) (D) Th^{4+} (Z = 29)

Q.36 Heating of a solution does not change

(A) the normality of the solution

(B) the molarity of the solution

(C) the molality of the solution

(D) the density of the solution

Q.37 The equilibrium constant K_c for the reaction.

$2NaHCO_{3(s)} \rightleftharpoons Na_2CO_3 + CO_{2(g)} + H_2O_{(g)}$

is represented by-

(A) $K_c = \frac{[Na_2CO_3][CO_2][H_2O]}{[NaHCO_3]^2}$

(B) $K_c = \frac{[Na_2CO_2]}{[NaHCO_3]^2}$

(C) $K_c = [CO_2]\,[H_2O]$

(D) $K_c = \rho_{CO_2} \times \rho_{H_2O}$

Q.38 When CO_2 dissolves in water, the following equilibrium is established

$CO_2 + 2H_2O \rightleftharpoons H_3O^{3+} + HC_3^{1}$

If the equilibrium constant for the reaction is 3.8×10^{7} and pH = 6, the ratio $\frac{[HCO_3^{1-}]}{[CO_2]}$ will be

(A) 3.8×10^{13} (B) 3.8×10^{13}

(C) 6.0 (D) 3.0

Q.39 For a zero order reaction, the unit of rate constant is

(A) S^{1} (B) $mol.dm^{3}\ s^{1}$

(C) $dm^3\ mol^{1}\ s^{1}$ (D) $mol^2.\ dm^{6}\ s^{1}$

Q.40 For the isobaric gaseous reaction, the enthalpy change given by-

(A) $\Delta H = \Delta E + \Delta nRT$

(B) $\Delta H = \Delta E + P\,\Delta\,V$

(C) $\Delta H = \Delta E + \Delta nP\Delta V$

(D) $\Delta H = \Delta E + V\,\Delta\,P$

Q.41 When aqueous solution of sodium chloride is electrolysed using platinum electrode the cathode reaction is,

(A) $Na^+ + e \longrightarrow Na$

(B) $H_2O + e \longrightarrow 1/2\ H_2 + OH$

(C) $Na^+ + OH \longrightarrow Na + H^+ + e$

(D) $Na^+ + H_2O + e \longrightarrow Na + H^+ + OH$

Q.42 0.14 g of a substance when burnt in oxygen yields 0.28 g of oxide. The substance is

(A) nitrogen (B) carbon

(C) sulphur (D) phosphorous

Q.43 Carbonic acid, H_2CO_3, is a diprotic acid for which $K_1 = 4.2 \times 10^{7}$. and $K_2 = 4.7 \times 10^{11}$ The solution which will have a pH closest to 9 is -
(A) 0.1 M H_2CO_3
(B) 0.1 M Na_2CO_3
(C) 0.1 M $NaHCO_3$
(D) 0.1 M $NaHCO_3$ + 0.1 M Na_2CO_3

Q.44 For a face centered cubic lattice, the unit cell content is
(A) 1 (B) 2
(C) 3 (D) 4

Q.45 The hybridization of the atomic orbitals of sulphur in SO_3,SO_4^{2} and SF_4 are respectively
(A) sp, sp^3, sp^2 (B) sp, sp^2, sp^3 d
(C) sp^2, sp, sp^3 (D) sp^2, sp^3, sp^3 d

Q.46 The number of molecules of hydration present in 252 mg of oxalic acid is
(A) 2.68×10^{18} (B) 2.52×10^{21}
(C) 1.83×10^{24} (D) 2.4×10^{21}

Q.47 The ozone hole in the upper atmospheres of the earth is due to the breakdown of ozone to oxygen. The reaction is catalyzed by-
(A) chloroflurocarbons
(B) oxygen generated during the reaction
(C) carbon dioxide present in the atmosphere
(D) chlorine formed by the decomposition of chlorofluorocarbons

Q.48 The compound with the lowest oxidation state of iron is-
(A) Fe_2O (B) Fe_3O_4
(C) $K_3Fe(CN)_6$ (D) $K_4Fe(CN)_6$

Q.49 The molecule which does not have a net dipole moment is -
(A) H_2O (B) NH_3
(C) BF_3 (D) BrF_5

Q.50 The electron-pair geometry of the central oxygen atom of ozone is-
(A) linear
(B) trigonal planar
(C) tetrahedral
(D) trigonal bipyramidal

Q.51 The molecular geometry for ammonia is-
(A) saw horse (B) trigonal planar
(C) tetrahedral (D) pyramidal

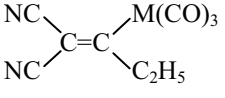
Q.52 The sequence of molecular orbitals for the carbide ion (C_2^{2}) is-
(A) $\sigma\ 1s^2\ \sigma^*1s^2\ \sigma\ 2s^2\ \sigma^*\ 2s^2\ \pi\ 2p^4$
(B) $\sigma\ 1s^2\ \sigma^*1s^2\ \sigma\ 2s^2\ \sigma^*\ 2s^2\ \pi\ 2p^2\ \sigma\ 2p^2$
(C) $\sigma\ 1s^2\ \sigma^*1s^2\ \sigma\ 2s^2\ \sigma^*\ 2s^2\ \pi\ 2p^4\ \sigma\ 2p^2\ \pi^*\ 2p^2$
(D) $\sigma\ 1s^2\ \sigma^*1s^2\ \sigma\ 2s^2\ \sigma^*\ 2s^2\ \pi\ 2p^4\ \sigma\ 2p^2\ \pi^*\ 2p^4$

Q.53 The correct balanced chemical equation for the reaction between Al and S is
(A) $16Al + 3S_8 \longrightarrow 8Al_2S_3$
(B) $12Al + S_8 \longrightarrow 4Al_3S_2$
(C) $8Al + S_8 \longrightarrow 8AlS$
(D) $4Al + S_8 \longrightarrow 4AlS_2$

Q.54 The standard electrode potential values for four metals K.L M and N are respectively, –3.05, –1.66, –0.40 and +0.80 V. The best reducing agnet is -
(A) L (B) K (C) N (D) M

Q.55 The strongest Bronsted base among the following compounds is-
(A) $NaCH_3$ (B) NaOH
(C) NaF (D) $NaNH_2$

Q.56 The number of sigma and pi bonds in the following compound is-



(A) 19.11 (B) 19,05
(C) 13,11 (D) 07,06

Q.57 The aqua ion which will be almost colorless is-
(A) Cu^{2+} (B) Cr^{2+} (C) Ti^{4+} (D) Mn^{2+}

Q.58 Among the following, the chiral complex is-
(A) $[Cr(Ox)_3]^3$
(B) cis $[PtCl_2(en)]$
(C) cis $[RhCl_2(NH_3)_4]^+$
(D) trans $[PtCl_2\,(en)]$

Q.59 MnO_4^{1} is of intense pink colour, though Mn is in +VII oxidation state. This is due
(A) d-d transition
(B) charge transfer when Mn gives electron to oxygen
(C) charge transfer when oxygen gives its electrons to Mn making it + VI
(D) absorption of IR frequencies

Q.60 $MgSO_4$ on reaction with NH_4OH and Na_2HPO_4 forms a white crystalline precipitate. The formula of the precipitate is-
(A) $Mg(NH_4)\,PO_4$ (B) $Mg_3(PO_4)_2$
(C) $MgCl_2.\,MgSO_4$ (D) $MgSO_4$

Q.61 The species having tetrahedral shape is-
(A) $[PdC\ell_4]^2$ (B) $[Ni(CN)_4]^2$
(C) $[Pd(CN)_4]^2$ (D) $[Ni(C\ell)_4]^2$

Q.62 The types of isomerism shown by $Co(NH_3)_4Br_2Cl$ are-
(A) Geometrical and ionization
(B) Optical and ionization
(C) Geometrical and optical
(D) Geometrical only

Q.63 The silicates formed from $[SiO_4]^4$ tetrahedral units by sharing three oxygen atoms are
(A) Sheet silicates
(B) Pyrosilicates
(C) Linear Chain silicates
(D) Three dimensional dilicates

Q.64 The species cotaining the maximum number of lone pairs in the central atom is -
(A) CIO^3 (B) XeF_4 (C) SF_4 (D) I^3

Q.65 The nucleic acid which bears a codon in its structure in its structure is-
(A) r RNA (B) t RNA
(C) m RNA (D) DNA

Q.66 Protein synthesis does not involve-
(A) amino acids (B) t RNA
(C) m RNA (D) DNA

Q.67 The most likely change occurring in a protein sample when treated with 6M HCl is-
(A) formation of disulphide bond
(B) formation of peptide bond
(C) hydrolysis of peptide bond
(D) oxidation of disulphide bond

Q.68 The order of the energy released by biological oxidation of equal amounts (moles) of glucose, sucrose and starch is-
(A) starch > sucrose > glucose
(B) starch > glucose > sucrose
(C) sucrose > glucose > starch
(D) glucose > sucrose > starch

Q.69 Precipitation of protein from a solution is generally achieved by using ammonium sulphate solution this could be a result of-
(A) neutralization of the charge of the protein
(B) increase in hydrophilicity of the protein
(C) increase in hydrophobicity of the protein
(D) formation of salt protein complex

Q.70 Enzymatic break down of cellulose will yield monomers of -
(A) Galactose (B) Glucose
(C) Fructose (D) Ribose

Q.71 The trend of isoelectric point (PI) of the amino acids, glycine, lysine and aspartic acid is-
(A) glycine > lysine > aspartic acid
(B) aspartic acid > lysine > glycine
(C) aspartic acid > glycine > lysine
(D) lysine > aspartic acid > glycine

Q.72 The chemical substance which can be used to isolate a protein present inside the cell membrane is
(A) Chelating agent (B) Dilute acid
(C) Detergent (D) Urea solutions

Q.73 The chemical force playing an important role in binding of codon to anticodon is
(A) covalent bond
(B) co-ordinate bond
(C) hydrogen bond
(D) hydrophobic bond

Q.74 The ionization of benzoic acid is represented by the equation

$C_6H_5COOH_{(sq)} \rightleftharpoons H^+ (aq) + C_6H_5COO_{(aq)}$

If a 0.045 M solution of benzoic acid has an $[H^+] = 1.7 \times 10^{-3}$, then the K_a of benzoic acid is-

(A) 7.7×10^{-5} (B) 6.4×10^{-5}

(C) 3.8×10^{-2} (D) 8.4×10^{-1}

Q.75 If the Ksp of CaF_2 at 25°C is 1.6×10^{-10}, then the number of moles of the salt that must be dissolved in 2.0 L of water at 25°C to form a saturated solution is

(A) 2.6×10^{-2} mol (B) 1.3×10^{-3} mol

(C) 6.8×10^{-4} mol (D) 3.4×10^{-4} mol

Q.76 The oxidation-reduction reaction reaction among the following is

(A) $H_2SO_4 + 2NH_3 \longrightarrow (NH_4)_2SO_4$

(B) $H_2SO_4 + Na_2CO_3 \longrightarrow Na_2SO_4 + H_2O + CO_2$

(C) $2K_2Cr_2O_4 + H_2SO_4 \longrightarrow K_2Cr_2O_7 + K_2SO_4 + H_2O$

(D) $2H_2SO_4 + Cu \longrightarrow CuSO_4 + 2H_2O + SO_2$

Q.77 Silver metal reacts with nitric acid according to the equation

$3Ag(s) + 4HNO_3\ (aq) \longrightarrow 3AgNO_3(aq) + NO(g) + 2H_2O\ (l)$

The volume of 1.15 M HNO_3 (aq) required to react with 0.784g of silver is-

(A) 4.74 mL (B) 6.32 mL

(C) 8.43 mL (D) 25.3 mL

Q.78 $P_4(s) + 3OH\ (aq) + 3H_2O\ (l) \longrightarrow PH_3(g) + 3H_2PO_2\ (aq)$

In the above equation, the species H_2PO_2 getting oxidized and reduced respectively are

(A) P_4 and OH (B) OH and P_4

(C) P_4 and H_2O (D) P_4 and P_4

Q.79 $10Cl\ (aq) + 2MnO_4\ (aq) + 16H^+(aq) \longrightarrow 5Cl_2\ (g) + 2Mn^{2+}(aq) + 8H_2O(l)$ The value of E° for the above reaction at 25°C is 0.15V. Hence, the value of K for this reaction is-

(A) 2.4×10^{25} (B) 4.9×10^{12}

(C) 1.2×10^{5} (D) 3.4×10^{2}

Q.80 The magnetic moment of a transition metal ion is found to be 3.87 Bohr magneton (BM). The number of unpaired electrons present in it is

(A) 2 (B) 3

(C) 4 (D) 5

ANSWER KEY

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