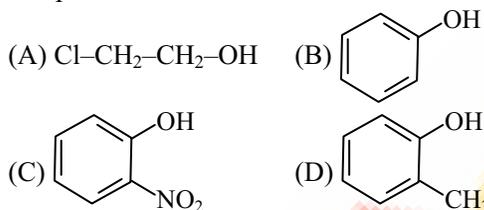


**INDIAN ASSOCIATION OF CHEMISTRY TEACHERS**  
**NATIONAL STANDARD EXAMINATION IN CHEMISTRY 2009-2010**

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

**Q.1** The most acidic among the following compounds is



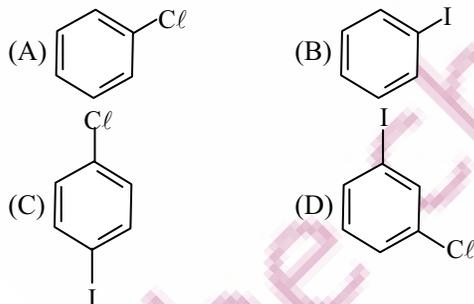
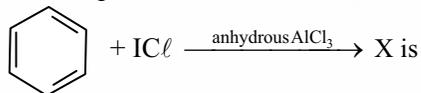
**Q.2** The number of ether metamers represented by the molecular formula  $\text{C}_4\text{H}_{10}\text{O}$  is

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

**Q.3** An isocyanide on reduction 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,



**Q.5**  $\text{S}_\text{N}$  reactivity of the following halides.

- (i)  $(\text{CH}_3)_3\text{C Br}$   
 (ii)  $(\text{C}_6\text{H}_5)_2\text{CH Br}$   
 (iii)  $(\text{C}_6\text{H}_5)_2\text{C}(\text{CH}_3)\text{ Br}$   
 (iv)  $(\text{CH}_3)_2\text{CH Br}$  will be in the order  
 (A)  $\text{iv} > \text{i} > \text{ii} > \text{iii}$  (B)  $\text{ii} > \text{i} > \text{iii} > \text{iv}$   
 (C)  $\text{i} > \text{iii} > \text{ii} > \text{iv}$  (D)  $\text{iii} > \text{ii} > \text{i} > \text{iv}$

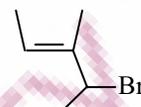
**Q.6** An alcohol, an aldehyde and a carboxylic acid of comparable mass will have their boiling points in the order

- (A) alcohol < carboxylic acid < aldehyde  
 (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

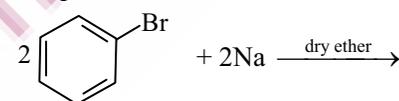
- (A)  $(\text{CH}_3)_3\text{C Br}$  and  $\text{CH}_3\text{O Na}$   
 (B)  $(\text{CH}_3)_3\text{C Br}$  and  $\text{CH}_3\text{OH}$   
 (C)  $\text{CH}_3\text{ Br}$  and  $(\text{CH}_3)_3\text{CO Na}$   
 (D)  $\text{CH}_3\text{ Br}$  and  $(\text{CH}_3)_3\text{COH}$

**Q.8** The IUPAC name of is

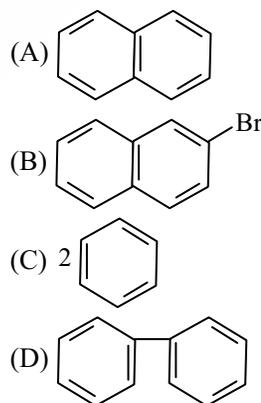


- (A) 2-bromo-3-methylbut-3-ene  
 (B) 4-bromo-3-methylbut-2-ene  
 (C) 2-bromo-3-methylbut-2-ene  
 (D) 4-bromo-2,3-dimethylbut-2-ene

**Q.9** The product A in the reaction



A + 2NaBr is



**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

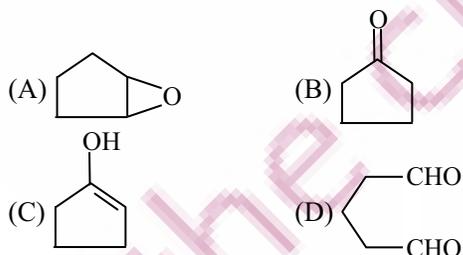
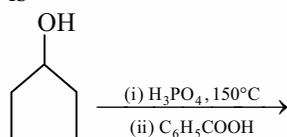
**Q.11** Geometrical isomerism results because the molecule  
 (A) rotates the plane of polarized light  
 (B) has a plane of symmetry  
 (C) has a centre of symmetry  
 (D) has two dissimilar groups attached to both ends of double bond

**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  $\text{H}_2\text{O}_2$  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

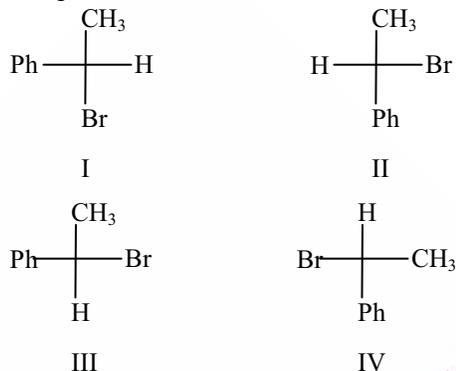
**Q.14** The reagent which will be suitable to distinguish 1-methoxy-3-methyl-2-butene from isomeric 4-methyl-3-penten-1-ol is -  
 (A) bromine in chloroform  
 (B) alkaline potassium permanganate  
 (C) ammoniacal silver nitrate  
 (D) sodium metal suspended in hexane

**Q.15** The major product of the following reaction is



**Q.16** Among the following isomeric chloro compounds, the compound which will undergo  $\text{S}_{\text{N}}2$  reaction readily is  
 (A) 4-chloro-1-butene  
 (B) 1-chloro-1-butene  
 (C) 1-chloro-2-butene  
 (D) 2-chloro-1-butene

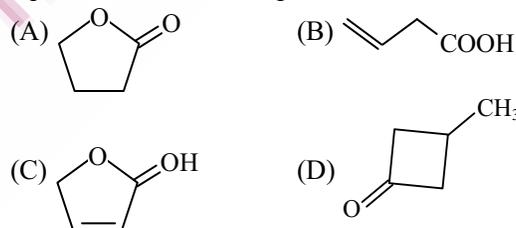
**Q.17** The pair of enantiomers among the following compounds is -



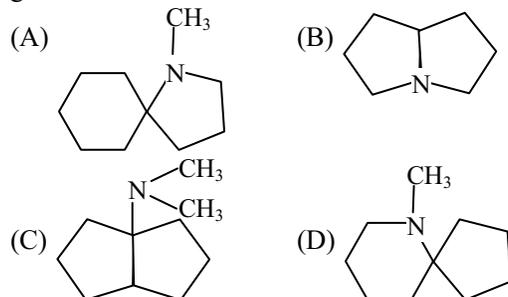
(A) I and IV (B) II and IV  
 (C) II and III (D) I and II

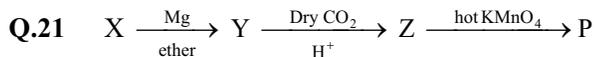
**Q.18** Compound X ( $\text{C}_5\text{H}_{10}\text{O}$ ) is a chiral alcohol. It is catalytically hydrogenated to an achiral alcohol Y ( $\text{C}_2\text{H}_{12}\text{O}$ ) and oxidized by activated  $\text{MnO}_2$  to an achiral carbonyl compound Z ( $\text{C}_5\text{H}_{10}\text{O}$ ). Compound X 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 -

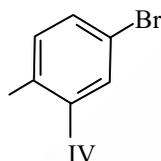
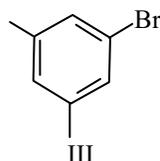
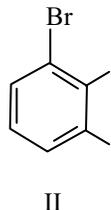
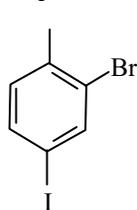


**Q.20** The nitrogen atom in the cyclic compounds can be removed as trimethylamine by successive Hoffmann eliminations (involving exhaustive methylation followed by heating with  $\text{AgOH}$ ). The amine which will require a greater number of Hoffmann eliminations is -





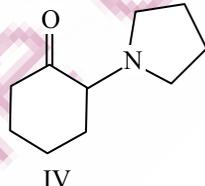
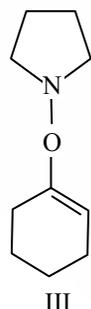
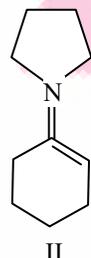
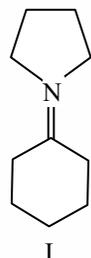
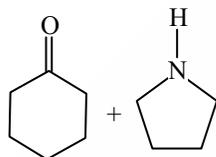
The two isomeric compounds which will give the same tricarboxylic acid after the above sequence of reactions are-



- (A) I and II  
(C) I and IV

- (B) III and IV  
(D) II and III

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



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

Q.23 3.7 dm<sup>3</sup> of 1 M NaOH solution is mixed 5 dm<sup>3</sup> 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<sup>3</sup> (B) 16.8 cm<sup>3</sup>  
(C) 11.2 cm<sup>3</sup> (D) 22.4 cm<sup>3</sup>

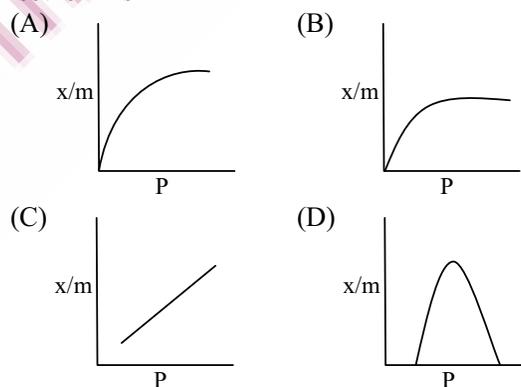
Q.25 The hydrolysis constant of 0.5 M ammonium benzoate is  $6.25 \times 10^{-6}$ . The percentage hydrolysis of the salt is-  
(A) 0.25 (B) 0.177  
(C) 0.125 (D) 0.50

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

Set No.	Initial concentration of 'A' (mol. dm <sup>-3</sup> )	Initial Concentration of 'B' (mol. dm <sup>-3</sup> )	Rate of reaction (mol. dm <sup>-3</sup> s <sup>-1</sup> )
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]<sup>2</sup>[B]<sup>2</sup>  
(C) rate = k[A]<sup>2</sup> (D) rate = k[A][B]<sup>2</sup>

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



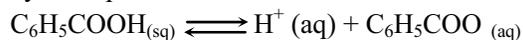
Q.28 For a dilute solution; Raoult's law states that-  
(A) the lowering of vapour pressure is equal to the mole fraction of the solute.  
(B) the relative lowering of vapour pressure is equal to the mole fraction of the solute  
(C) the vapour pressure of solution is equal to the mole fraction of solution.  
(D) the relative lowering of vapour pressure is proportional to the amount of solute in the solution

- Q.29** For the reaction  $2\text{HI}_{(g)} \rightleftharpoons \text{H}_{2(g)} + \text{I}_{2(g)}$   
 (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,  
 $2\text{SO}_3 \rightleftharpoons 2\text{SO}_2 + \text{O}_2$   
 and  
 $\text{SO}_2 + 1/2\text{O}_2 \rightleftharpoons \text{SO}_3$   
 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)  $\text{Cu}^+$  ( $Z = 29$ ) (B)  $\text{Al}^{3+}$  ( $Z = 13$ )  
 (C)  $\text{K}^+$  ( $Z = 19$ ) (D)  $\text{Th}^{4+}$  ( $Z = 29$ )
- 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.  
 $2\text{NaHCO}_{3(s)} \rightleftharpoons \text{Na}_2\text{CO}_3 + \text{CO}_{2(g)} + \text{H}_2\text{O}_{(g)}$   
 is represented by-  
 (A)  $K_c = \frac{[\text{Na}_2\text{CO}_3][\text{CO}_2][\text{H}_2\text{O}]}{[\text{NaHCO}_3]^2}$   
 (B)  $K_c = \frac{[\text{Na}_2\text{CO}_2]}{[\text{NaHCO}_3]^2}$   
 (C)  $K_c = [\text{CO}_2][\text{H}_2\text{O}]$   
 (D)  $K_c = \rho_{\text{CO}_2} \times \rho_{\text{H}_2\text{O}}$
- Q.38** When  $\text{CO}_2$  dissolves in water, the following equilibrium is established  
 $\text{CO}_2 + 2\text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^{3+} + \text{HC}_3^{1-}$   
 If the equilibrium constant for the reaction is  $3.8 \times 10^{-7}$  and  $\text{pH} = 6$ , the ratio  $\frac{[\text{HCO}_3^{1-}]}{[\text{CO}_2]}$  will be  
 (A)  $3.8 \times 10^{13}$  (B)  $3.8 \times 10^{-13}$   
 (C) 6.0 (D) 3.0
- Q.39** For a zero order reaction, the unit of rate constant is  
 (A)  $\text{s}^{-1}$  (B)  $\text{mol} \cdot \text{dm}^{-3} \cdot \text{s}^{-1}$   
 (C)  $\text{dm}^3 \cdot \text{mol}^{-1} \cdot \text{s}^{-1}$  (D)  $\text{mol}^2 \cdot \text{dm}^{-6} \cdot \text{s}^{-1}$
- 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)  $\text{Na}^+ + e \longrightarrow \text{Na}$   
 (B)  $\text{H}_2\text{O} + e \longrightarrow 1/2 \text{H}_2 + \text{OH}$   
 (C)  $\text{Na}^+ + \text{OH} \longrightarrow \text{Na} + \text{H}^+ + e$   
 (D)  $\text{Na}^+ + \text{H}_2\text{O} + e \longrightarrow \text{Na} + \text{H}^+ + \text{OH}$
- 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.59**  $\text{MnO}_4^-$  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**  $\text{MgSO}_4$  on reaction with  $\text{NH}_4\text{OH}$  and  $\text{Na}_2\text{HPO}_4$  forms a white crystalline precipitate. The formula of the precipitate is-  
 (A)  $\text{Mg}(\text{NH}_4)\text{PO}_4$  (B)  $\text{Mg}_3(\text{PO}_4)_2$   
 (C)  $\text{MgCl}_2 \cdot \text{MgSO}_4$  (D)  $\text{MgSO}_4$
- Q.61** The species having tetrahedral shape is-  
 (A)  $[\text{PdCl}_4]^{2-}$  (B)  $[\text{Ni}(\text{CN})_4]^{2-}$   
 (C)  $[\text{Pd}(\text{CN})_4]^{2-}$  (D)  $[\text{Ni}(\text{C}\ell)_4]^{2-}$
- Q.62** The types of isomerism shown by  $\text{Co}(\text{NH}_3)_4\text{Br}_2\text{Cl}$  are-  
 (A) Geometrical and ionization  
 (B) Optical and ionization  
 (C) Geometrical and optical  
 (D) Geometrical only
- Q.63** The silicates formed from  $[\text{SiO}_4]^{4-}$  tetrahedral units by sharing three oxygen atoms are  
 (A) Sheet silicates  
 (B) Pyrosilicates  
 (C) Linear Chain silicates  
 (D) Three dimensional silicates
- Q.64** The species containing the maximum number of lone pairs in the central atom is -  
 (A)  $\text{ClO}_3^-$  (B)  $\text{XeF}_4$  (C)  $\text{SF}_4$  (D)  $\text{I}^3$
- 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



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

- (A)  $7.7 \times 10^{-5}$                       (B)  $6.4 \times 10^{-5}$   
(C)  $3.8 \times 10^{-2}$                       (D)  $8.4 \times 10^{-1}$

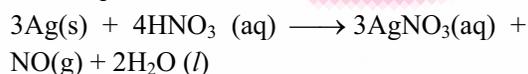
**Q.75** If the  $K_{sp}$  of  $\text{CaF}_2$  at  $25^\circ\text{C}$  is  $1.6 \times 10^{-10}$ , then the number of moles of the salt that must be dissolved in 2.0 L of water at  $25^\circ\text{C}$  to form a saturated solution is

- (A)  $2.6 \times 10^{-2}$  mol                      (B)  $1.3 \times 10^{-3}$  mol  
(C)  $6.8 \times 10^{-4}$  mol                      (D)  $3.4 \times 10^{-4}$  mol

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

- (A)  $\text{H}_2\text{SO}_4 + 2\text{NH}_3 \longrightarrow (\text{NH}_4)_2\text{SO}_4$   
(B)  $\text{H}_2\text{SO}_4 + \text{Na}_2\text{CO}_3 \longrightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{O} + \text{CO}_2$   
(C)  $2\text{K}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{SO}_4 \longrightarrow \text{K}_2\text{Cr}_2\text{O}_7 + \text{K}_2\text{SO}_4 + \text{H}_2\text{O}$   
(D)  $2\text{H}_2\text{SO}_4 + \text{Cu} \longrightarrow \text{CuSO}_4 + 2\text{H}_2\text{O} + \text{SO}_2$

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



The volume of 1.15 M  $\text{HNO}_3$  (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**  $\text{P}_4(\text{s}) + 3\text{OH}^-(\text{aq}) + 3\text{H}_2\text{O}(\text{l}) \longrightarrow \text{PH}_3(\text{g}) + 3\text{H}_2\text{PO}_2^-(\text{aq})$

In the above equation, the species  $\text{H}_2\text{PO}_2^-$  getting oxidized and reduced respectively are

- (A)  $\text{P}_4$  and  $\text{OH}^-$                       (B)  $\text{OH}^-$  and  $\text{P}_4$   
(C)  $\text{P}_4$  and  $\text{H}_2\text{O}$                       (D)  $\text{P}_4$  and  $\text{P}_4$

**Q.79**  $10\text{Cl}^-(\text{aq}) + 2\text{MnO}_4^-(\text{aq}) + 16\text{H}^+(\text{aq}) \longrightarrow 5\text{Cl}_2(\text{g}) + 2\text{Mn}^{2+}(\text{aq}) + 8\text{H}_2\text{O}(\text{l})$  The value of  $E^\circ$  for the above reaction at  $25^\circ\text{C}$  is 0.15V. Hence, the value of  $K$  for this reaction is-

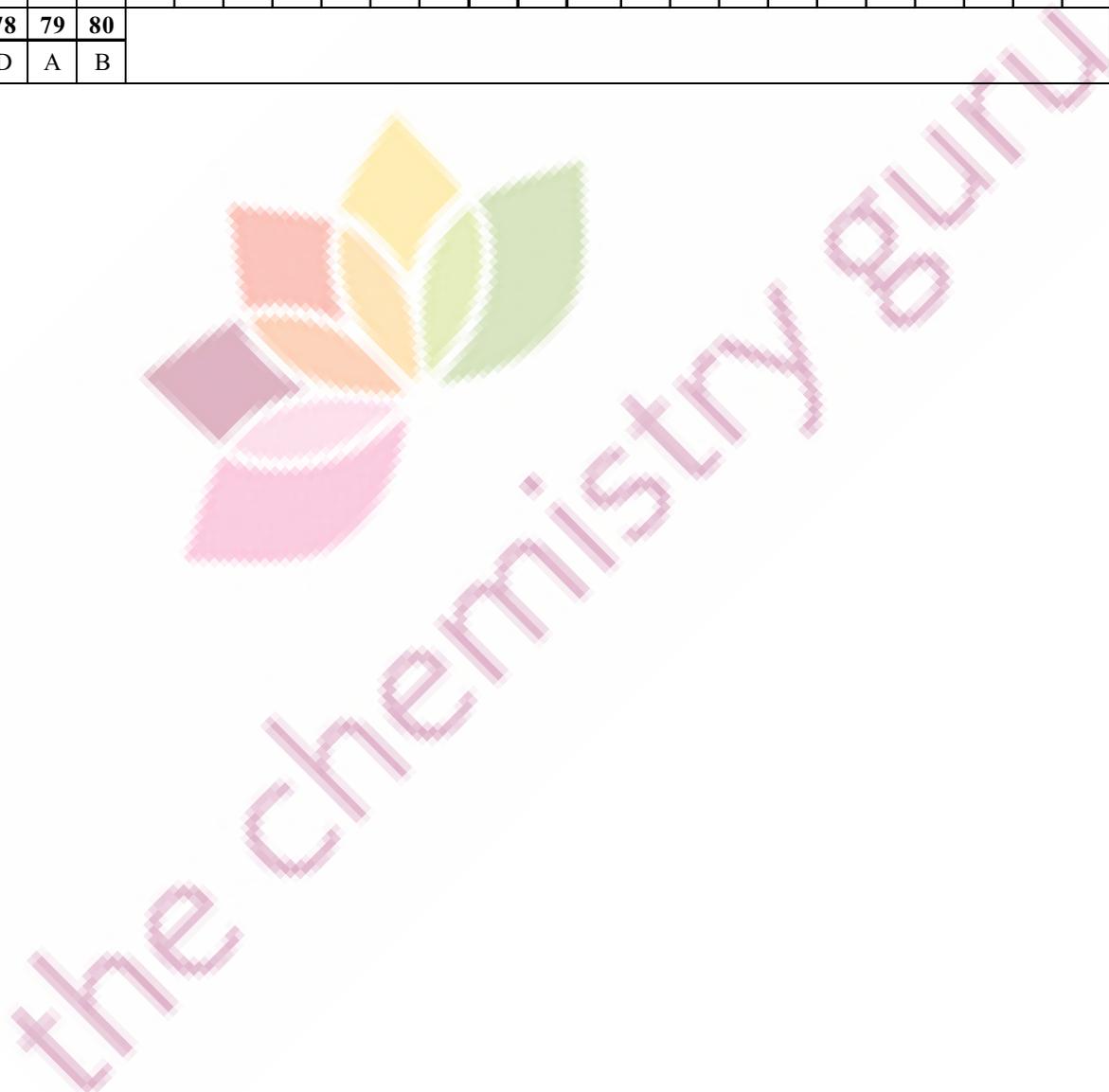
- (A)  $2.4 \times 10^{25}$                       (B)  $4.9 \times 10^{12}$   
(C)  $1.2 \times 10^5$                       (D)  $3.4 \times 10^2$

**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																				



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