INDIAN ASSOCIATION OF CHEMISTRY TEACHERS
## NATIONAL STANDARD EXAMINATION IN CHEMISTRY 2010-2011

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 orange colour of carrot is due to the presence of β-carotene in it. β-carotene is coloured due to the presence of
(A) Aromatic ring
(B) Extended conjugation
(C) Cyclic conjugation
(D) Carbonyl group

Q.2 Keto and enol forms of a compound are related to each other as
(A) Resonacne structure
(B) Conformations
(C) Configurational isomers
(D) Constitutional isomers

Q.3 A solution of 0.10 M NaZ has pH = 8.90. The Ka of HZ is
(A) 1.6×10^{4}
(B) 1.6×10^{5}
(C) 6.3×10^{10}
(D) 6.3×10^{11}

Q.4 The structure of SF_4 is
(A) Trigonal bipyramidal
(B) Square planar
(C) Tetrahedral
(D) Octahedral

Q.5 The conversion which represents oxidation is
(A) $NO_2 \rightarrow N_2$
(B) $VO_2^{+} \rightarrow VO_3$
(C) $ClO \rightarrow Cl$
(D) $CrO_4^{2} \rightarrow Cr_2O_7^{2}$

Q.6 The number of all types of isomers of chlorobutane is
(A) 2   (B) 4   (C) 6   (D) 5

Q.7 The secondary structure of a protein molecule can be promoted by the presence of
(A) Proline residues
(B) Glycine residues
(C) Leucine residues
(D) Aspartic acid residues

Q.8 A container having volume V contains an ideal gas at 1 atm pressure. It is connected to another evaculated container having volume 0.5 dm^3 through a tube having negligible volume. After some time the first container is found to have pressure 570 mm of Hg. If temperature is constant V is
(A) 1.0 dm^3
(B) 1.5 dm^3
(C) 2.0 dm^3
(D) 2.5 dm^3

Q.9 The set that contains all nucleophiles is
(A) H_2O, BF_3, Cl , NH_3
(B) CH_3NH_2, H_2O, I , CH_3–SH
(C) $AlCl_3$, H^{+}, BF_3, I_2
(D) $AlCl_4$, OH , Br , H_2

Q.10 The pair which contains both molecules polar is
(A) O_2 & H_2O
(B) CO_2 & PCl_3
(C) SO_2 & SCl_2
(D) CS_2 & NO_2

Q.11 The intermediate formed in the following reaction is

$$CH_3\ CH_2\ \underset{\underset{CH_3}{|}}{\overset{\overset{Cl}{|}}{C}}\ CH_3 + NaOH \longrightarrow CH_3\ CH_2\ \underset{\underset{CH_3}{|}}{\overset{\overset{OH}{|}}{C}}\ CH_3 + NaCl$$

(A) $CH_3–CH_2–\underset{\underset{\delta^{-}Cl}{|}}{\overset{\overset{CH_3}{|}}{\overset{\delta^{+}}{C}}}–CH_3$

(B) $\underset{H_3C \quad CH_3}{HO - - - \overset{\overset{CH_2CH_3}{|}}{C} - - - Cl}$

(C) $CH_3–CH_2–\overset{+}{\underset{\underset{CH_3}{|}}{C}}–CH_3$

(D) $CH_3–CH_2–\underset{\oplus}{\overset{\overset{CH_3}{|}}{C}}–CH_3$

Q.12 The formula of tetraammineaquochlorocobalt (III) chloride is

(A) $[Co(NH_2)_4(H_2O)Cl]Cl_2$
(B) $[Co(NH_2)_4(H_2O)Cl]Cl$
(C) $[Co(NH_3)_4(H_2O)Cl]Cl_2$
(D) $[Co(NH_3)_4(OH)Cl_2]Cl$

Q.13 The IUPAC nane of the following compound is
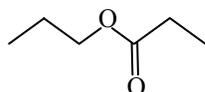
(A) n-propyl ethanoate
(B) ethyl propanoate
(C) pentanoic anhydride
(D) n-propyl propanoate

Q.14 The compound which would undergo S_N2 reaction fastest is

(A)

(B)

(C)

(D)
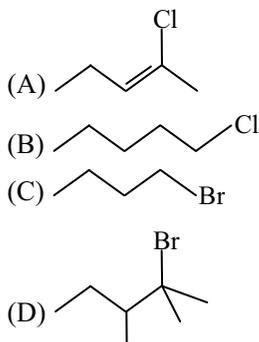
Q.15 A reaction will never be spontaneous at any temperature and pressure if

(A) $\Delta S = +ve$, $\Delta H = +ve$
(B) $\Delta S = +ve$, $\Delta H = -ve$
(C) $\Delta S = +ve$, $\Delta H = -ve$
(D) $\Delta S = -ve$, $\Delta H = -ve$

Q.16 The species that contains maximum number of electrons in the antibonding molecular orbitals is

(A) O_2^{2} (B) O_2 (C) O_2 (D) O_2^{+}

Q.17 Body-centred cubic lattice has a co-ordination number of

(A) 8   (B) 10   (C) 6   (D) 4

Q.18 Cyclohexene reacts with limited amount of bromine in the presence of light to form product X (C_6H_9Br). The statement correct about X is

(A) It is racemate
(B) It is a product of an addition reaction
(C) It is formed through a cationic intermediate
(D) It is optically active

Q.19 The compound that would undergo hydration very easily is

(A) CH_3COCH_2Cl
(B) CH_3CH_2CHO
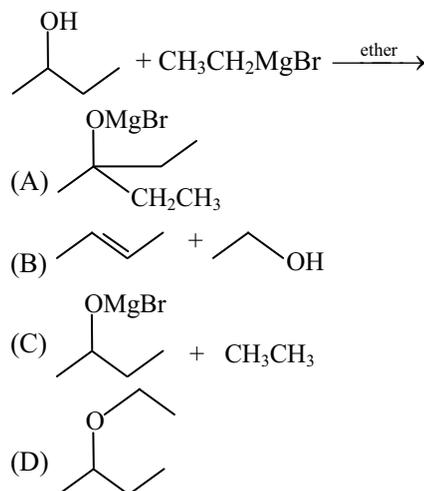(C) Cl_3C-CHO
(D) $Cl_3CCH_2COCH_3$

Q.20 In a DNA molecule -

(A) $A = C$ (B) $A + G = C + T$
(C) $T = G$ (D) $A/T = 2$

Q.21 Some heavy water is added to pure water. The numbers of different molecules and ions present in the mixture at equilibrium are

(A) 2, 0   (B) 6, 3
(C) 3, 6   (D) 3 , 4

Q.22 The product/s of the following reaction is/are

(A)

(B)

(C)

(D)

Q.23 A compound containing beryllium has the following composition. Be = 6.1% N = 37.8% Cl = 48%, H = 8.1% One mole of the compound has mass of 148 g and average atomic mass of beryllium is 9. The molecular formula of the compound is
(A) $BeN_4H_{12}Cl_2$ (B) $BeN_2H_{10}Cl$
(C) $BeN_4H_2Cl_3$ (D) $Be_2N_4H_{10}Cl_2$

Q.24 The product formed when chlorine gas is passed over hot iron is -
(A) Iron (II) chloride is formed
(B) Iron (III) chloride is formed
(C) A mixture of iron (II) chloride and iron (III) chloride is formed
(D) No reactions will take place

Q.25 The major product of the following reaction is

$(CH_3)_2C=CH–CH_2–CH_3 \xrightarrow{\text{(i) } B_2H_6,\text{ether (ii)} H_2O_2.NaOH}$
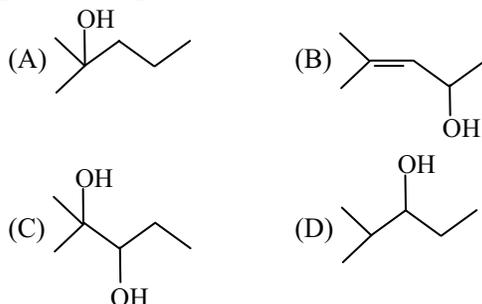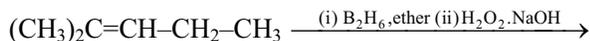
Q.26 20g of compound X are dissolved in 500 mL of water and the osmotic pressure of the resulting solution is 500 mm of Hg at 10°C. The average molecular mass of X is
(A) 1115.42   (B) 1150.70
(C) 1412.84   (D) 1163.88

Q.27 The compound that has the highest ionic character associated with the X–Cl bond is
(A) PCl_5 (B) BCl_3 (C) CCl_4 (D) $SiCl_4$

Q.28 When an apple is cut, the exposed part begins to turn brown. Often the browning action can be arrested by adding a few drops of lemon juice to the exposed area. The basis for this treatment is
(A) lemon juice is an antioxident
(B) denaturation of proteins of the enzymes
(C) decolourization due to lemon juice
(D) activation of decolourizing enzymes under acidic medium

Q.29 (i) $CH_2=CH–CH_2–CH=CH_2$
(ii) $CH_2=CH–CH=CH–CH_3$
(iii) $CH_3–CH=CH–CH=CH–CH_3$
The numbers of possible geometric isomers for the above compounds respectively are
(A) 0,2,4   (B) 2,2,4   (C) 0,3,3   (D) 0,2,3

Q.30 The velocity of an electron in the second Bohr orbit of an atom of an element is 1.1×10^6 m sec^{-1}. Its velocity in the third orbit is
(A) 3.3×10^6 m sec^{-1}
(B) 2.2×10^6 m sec^{-1}
(C) 7.333×10^5 m sec^{-1}
(D) 3.666×10^5 m sec^{-1}

Q.31 The compound which does not react with bromine easily at room temperature is
(A) phenol   (B) 2-butyne
(C) chlorobenzene   (D) 1-pentene

Q.32 The oxidation number and co-ordination number of chromium in complex ion $[Cr(C_2O_4)_2 (H_2O)_2]$ are
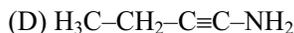(A) 3,6   (B) 2,6   (C) 2,8   (D) 3,8

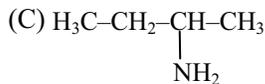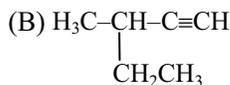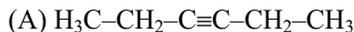**Q.33** The change in hybridization of aluminum when. Al_2Cl_6 decomposes in the gas phase is
(A) $sp^2 \rightarrow sp^3$ (B) $sp \rightarrow sp^2$
(C) $sp \rightarrow sp^3$ (D) $sp^3 \rightarrow sp^2$

Q.34 The molarity of 20% w/w sulphuric acid of density 1.14g cm^{-3} is
(A) 2.32   (B) 2.02   (C) 2.12   (D) 2.22

Q.35 The pH of a solution made by mixing 200 mL of 0.0657 M NaOH, 140 mL of 0.107M HCl and 160 mL of water is
(A) 3.04   (B) 2.43   (C) 2.74   (D) 2.27

Q.36 An inorganic bromide impurity in a sample is precipitated as silver bromide. 2.00g of the sample required 6.4 mL of 0.20 M AgNO$_3$ to completly precipitate the impurity. The mass percentage of the impurity is
(A) 5.11   (B) 2.56
(C) 9.15   (D) 1.28

Q.37 The major product of the following reaction is $CH_3-CH_2-C\equiv CH$ $\xrightarrow{\text{(i) NaNH}_2 \text{ (ii) CH}_3\text{CH}_2\text{Br}}$

(A) $H_3C-CH_2-C\equiv C-CH_2-CH_3$

(B) $H_3C-CH-C\equiv CH$
　　　　 |
　　　 CH_2CH_3

(C) $H_3C-CH_2-CH-CH_3$
　　　　　　 |
　　　　　 NH_2

(D) $H_3C-CH_2-C\equiv C-NH_2$

Q.38 The compound which can act as an oxidizing agent as well as a reducing agent is
(A) HNO_2 　　　　　　　 (B) HI
(C) HCN 　　　　　　　　 (D) HCOOH

Q.39 The sum of all the quantum numbers of hydrogen atom is
(A) –1 　　 (B) 0 　　 (C) +1/2 　　 (D) 3/2

Q.40 The bond having the highest bond energy is
(A) C=C 　 (B) C=S 　 (C) C=O 　 (D) P=N
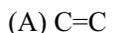
Q.41 Adding powdered Pb and Fe to a solution containing 1M each of Pb^{2+} and Fe^{2+} ions would result in the formation of
($E^0_{Pb^{2+}/Pb}$ = –0.126V and $E^0_{Fe^{2+}/Fe}$ = –0.44V)
(A) more of Pb and Fe^{2+} ions
(B) more of Fe and Pb^{2+} ions
(C) more of Pb and Fe
(D) more of Pb^{2+} and Fe^{2+} ions

Q.42 The formal charge on the sulphur atom in the structure given below is
$CH_3-CH_2-CH_2-SO-CH_3$
(A) 0 　　 (B) +1 　　 (C) –1 　　 (D) +2

Q.43 The number of transition state/s and intermediate/s in a unimolecular nucleophilic substitution reaction are respectively-
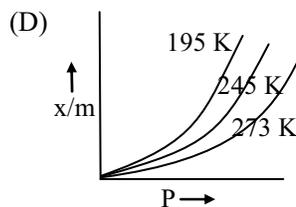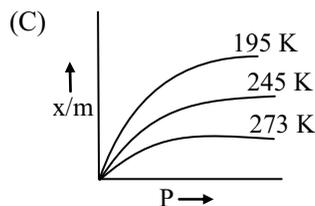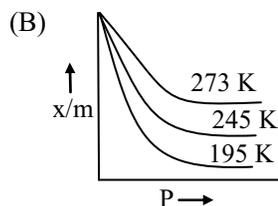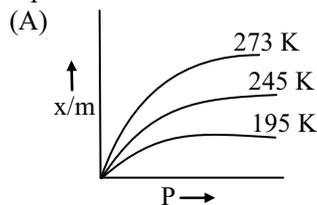(A) 3,1 　　 (B) 2,2 　　 (C) 2,1 　　 (D) 1,1

Q.44 Cyclohexanone oxime is converted into ε-caprolactam by the treatment with
(A) dil HCl 　　　　　　 (B) $NaOC_2H_5$
(C) ammonia 　　　　　 (D) conc H_2SO_4

Q.45 Freundlich adsorption isotherms are properly represented as in

(A)

(B)

(C)

(D)

Q.46 The cell $Al_{(s)}|Al^{3+}_{(aq)}$ (0.001 M) | | $Cu^{2+}_{(aq)}$ (0.10 M) | $Cu_{(s)}$ has a standard cell potenti $E°$=2.00V at 25°C. The cell potential at the given concentrations will be
(A) 2.07V 　　　　　　　 (B) 2.03V
(C) 1.97 V 　　　　　　　 (D) 1.94V

Q.47 Ethylene undergoes polymerization to polyethylene. The monomer/s of the following polymer is/are
$(-CH_2-CH(OCOCH_3)-CH_2-CH(OCOCH_3)-)_n$
(A) $CH_2=CH-OH+CH_3COCl$
(B) $CH_2=CH-COOCH_3$
(C) $CH_2=CH-OCOCH_3$
(D) $CH\equiv C-OCOCH_3$
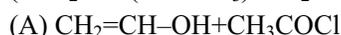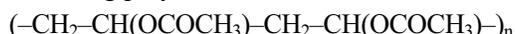
Q.48 Though proteins have a range of molecular weights and different compositions, the percentage of carbon in any protein is
(A) 50–55% 　　　　　　 (B) 40–45%
(C) 60–65% 　　　　　　 (D) 70–75%

Q.49 The mass of copper deposited when a current of 10A is passed through a solution of copper (II) nitrate for 30.6s is
(A)   (B)
(C)   (D)

Q.50 The coreect order of acidity of the following compounds is
(I) CH_3COOH (II) $ClCH_2COOH$
(III) O_2NCH_2COOH (IV) $HOCH_2COOH$
(A) IV > II > III > I   (B) I > IV > II > III
(C) II > III > I > IV   (D) III > II > IV > I

Q.51 Maximum number of moles of barium phosphate formed when 0.9 mole of barium chloride is mixed with 0.4 mole of sodium phosphate is
(A) 0.2   (B) 0.4   (C) 0.9   (D) 1.3

Q.52 The internal energy change involved when a system goes from state A to state B is 40kJ. It the system goes from A to B by a reversible path and return to A by an irreversible path, the net change in internal energy is
(A) 40kJ   (B) > 40kJ
(C) < 40kJ   (D) zero

Q.53 The molarity of NH_3 solution of pH 12.0 at 25°C is (K_b of NH_3 at 25°C is 1.8×10^{5})
(A) 0.55 M   (B) 5.5 M
(C) 0.01 M   (D) 11.7 M

Q.54 The highest magnetic moment is shown by a transition metal ion with the outer electronic configuration
(A) $3d^2$ (B) $3d^5$ (C) $3d^7$ (D) $3d^9$

Q.55 A ring system is aromatic if it is planar, has cyclic closed conjugation and has $(4n + 2)\pi$ electrons delocalized over the ring. Here **n** is
(A) number of rings
(B) an integer including zero
(C) an integer excepts zero
(D) number of π-bonds

Q.56 For the following reaction, the value of K changes with
$N_2(g) + O_2(g) \ll 2NO(g)$ $\Delta H = + 180$ kJ mol^{1}
(A) change in pressure
(B) change in concentration of oxygen
(C) introduction of NO(g)
(D) change in temperature

Q.57 The part of a DNA molecule responsible for the absorption of UV light is
(A) Deoxyribose
(B) Nitrogen base
(C) Phosphodiester bond
(D) Phosphate group

Q.58 A weak acid HA has K_a 1.00×10^{5} at 25°C. If 0.100 mole of this acid is dissolved in1L water, the percentage of the acid dissociated at equilibrium will be closest to
(A) 0.100% (B) 99.0% (C) 1.00% (D) 99.9%

Q.59 Thorium-232 loses a total of 6α particles and 4β particles in a decay process. The isotope produced at the end is
(A) $^{208}_{78}Pt$ (B) $^{208}_{82}Pb$ (C) $^{202}_{78}Pb$ (D) $^{208}_{83}Bi$

Q.60 Ethyl phenyl ether is treated with conc HI at 0°C and the mixture of products is treated with thionyl chloride. The products formed are
(A) Ethanol + Chlorobenzene
(B) Phenol + Iodoethane
(C) Iodoethane + Chlorobenzne
(D) Chloroethane + Phenol

Q.61 The correct order of the size of the species is
(A) $Ca^{2+} < Ar < K^+ < Cl$
(B) $Ca^{2+} < K^+ < Ar < S^2$
(C) $K^+ < Ar < Cl < S^2$
(D) $Ar < Ca^{2+} < K^+ < Cl$

Q.62 Pure germanium is an example of
(A) an intrinsic semiconductor
(B) a n-type semiconductor
(C) a p-type semiconductor
(D) a n-p type semiconductor

Q.63 A nonapeptide in rat on hydrolysis gave the following identifiable tripeptides :
Gly-Ala-Phe, Ala-Leu-Val, Gly-Ala-Leu, Phe-Glu-His, and His-Gly-Ala, The sequence in the nonapetide is
(A) Gly-Ala-Leu-Val-Phe-Glu-His-His-Gly
(B) Ala-Phe-Leu-Val-Gly-Leu-Phe-Glu-His
(C) Gly-Ala-Phe-Glu-His-Gly-Ala-Leu-Val
(D) Phe-Ala-Leu-Val-Gly-Glu-His-Gly-Ala

Q.64 The enthalpy of formation of carbon dioxide and water are $-395kJ$ and $-285kJ$, respectively, and the enthalpy of combustion of acetic acid is $-869kJ$. Hence the enthalpy of formation of acetic acid is
(A) 235 kJ   (B) -235 kJ
(C) 420 kJ   (D) 491 kJ

Q.65 The complex that exhibits co-ordination isomerism is
(A) $[Cr(NCS)(H_2O)_5]^{2+}$
(B) $[Cr(NH_3)_6]Cl_3$
(C) $[Cr(NH_3)_6] [Co(CN)_6]$
(D) $[CoCl_2(NH_3)_4] Cl.H_2O$

Q.66 The solubility of a salt MX is 3.60×10^{5} mol dm^{3}. The K_{sp} of MX is
(A) 3.60×10^{5} (B) 12.96×10^{10}
(C) 7.20×10^{5} (D) 1.80×10^{10}

Q.67 The correct order of increasing first ionization energy is
(A) $Ca < K < Ne < P < F$
(B) $F < Ca < Ne < P < K$
(C) $K < Ca < P < F < Ne$
(D) $Ne < F < P < Ca < K$

Q.68 The strong field liqand is
(A) SCN   (B) NO_2 (C) I   (D) S^2

Q.69 When an inert atmosphere is required in metallurgical operation nitrogen is commonly used. However in the extraction of titanium from $TiCl_4$ using magnesium, helium is used as nitrogen reacts with
(A) $TiCl_4$ to form titanium nitride
(B) magnesium to form magnesium nitride
(C) titanium to form titanium nitride
(D) chlorine to form nitrogen chloride which inhibits the reaction

Q.70 If the size of gene is 1000kD, the approximate molecular weight of the corresponding m RNA is
(A) 250kD   (B) 500kD
(C) 1000kD   (D) 2000kD

Q.71 The following curve represents the titration of

Volume NaOH
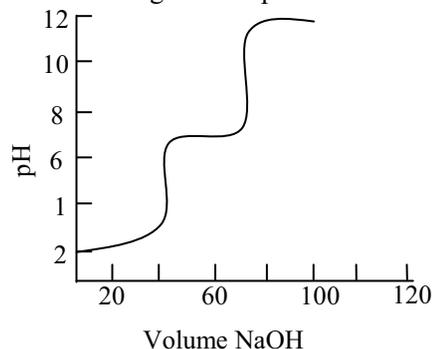
(A) a diporotic acid
(B) two monoprotic acids with the same K_a, but different concentrations
(C) two monoprotic acids with different K_a, but the same concentration
(D) two monoprotic acids with different K_a, and different concentrations

Q.72 The formation of ammonia from nitrogen and hydrogen gases can be written by the following two equations
(a) $1/2\ N_2(g) + 3/2H_2(g)\ << NH_3(g)$
(b) $1/3\ N_2(g) + H_2(g)\ << 2/3\ NH_3(g)$
The two equations have equilibrium constans K_1 and K_2, respectively. The relationship between the equilibrium constants is
(A) $K_1 = K_2^{2}$ (B) $K_1^{3} = K_2^{2}$
(C) $K_1^{2/3} = K_2$ (D) $K_1 = K_2^{3/2}$

Q.73 The largest number of molecules are present in
(A) 70g of sulphur dioxide
(B) 64g of Nitrogen pentoxide
(C) 36g of water
(D) 34g of carbon dioxide

Q.74 For a first order reaction, the half-life $t_{1/2}$ is related to the constant (k) by the relation
(A) $t_{(1/2)} = \dfrac{2.303}{k} \log 2$ (B) $t_{(1/2)} = \dfrac{1}{k}$
(C) $t_{(1/2)} = \dfrac{k}{2.303} \log 2$ (D) $t_{(1/2)} = \dfrac{2.303}{k}$

Q.75 A mixture of two liquids which boils without change in composition is called
(A) Stable mixture
(B) Binary liquid mixture
(C) Azeotropic mixture
(D) Zerotropic mixture

Q.76 The aqueous solution having osmotic pressure nearest to that of an equimolar solution of $K_4[Fe(CN)_6]$ is
(A) K_2SO_4 (B) Na_3PO_4
(C) $Al_2(SO_4)_3$ (D) $C_6H_{12}O_6$

Q.77 For the reaction $N_2 (g) + 3H_2 (g) \rightarrow 2NH_3(g)$
Which of the following is correct ?
(A) $\Delta H = \Delta E$ (B) $\Delta H > \Delta E$
(C) $\Delta H < \Delta E$ (D) $\Delta H = 2\Delta E$

Q.78 A gold sol is prepared by
(A) dissolving glod in Aqua-reqia and precipitation by dilution
(B) double decomposition of $AuCl_3$
(C) Bredy's arc method
(D) grinding in a colloidal mill

Q.79 The rate constants k_1 and k_2 of two reactions are in the ratio 2:1. The corresponding energies of activation of the two reactions will be related by
(A) $E_1 > E_2$ (B) $E_1 < E_2$
(C) $E_1 = E_2$ (D) $E_1 = 2E_2$

Q.80 The correct statement about order of reaction is
(A) it can be predicted from the stoichimetric coefficients of the reactants
(B) it has always positive integral values
(C) it has always positive integral or fractional values
(D) it has to be determined experimentally

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.	B	D	C	A	B	D	C	B	B	C	C	C	D	C	C	A	A	A	C	B	C	C	A	B	D
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	D	B	D	C	C	A	D	A	B	A	A	A	D	C	A	B	C	D	C	B	C	A	A	D
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.	A	D	A	B	B	D	B	C	B	D	B	A	C	D	C	B	C	B	B	B	D	C or D	C	A	C
Que.	76	77	78	79	80																				
Ans.	C	C	C	B	D																				