MDU M.Sc Entrance: 2014

Chemistry

❖ Question Paper

All questions are compulsory (One mark each) **Total Marks: 100 (1.5 Hours)**

Q.1 The crystal showing Frenkel defect:

(a) Cannot show metal excess defect (b) Show increase in density

(c) Shows increase in dielectric constant (d) Have high coordination number

Q.2 A solution of sodium metal in liquid ammonia is blue and is a strong reducing agent, due to the presence of

(a) Sodium atoms (b) Sodium hydride

(c) Sodium amide (d) Solvated electrons and solvated metal ions

Q.3 In "Inorganic benzene" hybridization of B and N respectively is:

(a) Both have sp^2 (b) sp^2 and sp^3 (c) Both have sp^3 (d) sp^3 and sp^2

Q.4 Three oxygen atom of $[SiO_4]^{4-}$ are shared in:

(a) Pyrosilicate (b) Linear chain silicate (c) Sheet silicate (d) 3-D silicate

Q.5 Number of P-O-P bonds in cyclic metaphosphoric acid are

(a) zero (b) two (c) three (d) four

Q.6 Oxyacid of sulphur which contains lone pair on Sulphur is:

(a) Sulphuric acid (b) Pyrosulphuric acid (c) Peroxy disulphuric acid (d) Sulphurous acid

Q.7 Order of acidity of the following is:

(a) $HClO_4 < HClO_3 < HClO_2 < HClO$ (b) $HClO < HClO_4 < HClO_3 < HClO_2$

(c) $HClO < HClO_2 < HClO_3 < HClO_4$ (d) $HClO_4 < HClO_2 < HClO_3 < HClO$

Q.8 Which of the following have same number of electron pair on Xenon atom?

(I) XeO_3 (II) $XeOF_4$ (III) XeF_6

(a) Only I and II (b) Only II and III (c) Only I and III (d) I, II and III

Q.9 Which of the following pairs of ions represent cyclic and chain silicates?

(a) $Si_2O_7^{2-}$ and $(SiO_3)_n^{2n-}$ (b) $Si_3O_9^{6-}$ and $(Si_4O_{11})_n^{6n-}$

(c) $Si_2O_7^{2-}$ and $(SiO_5)_n^{2n-}$ (d) $Si_2O_7^{7-}$ and $(SiO_3)_n^{2n-}$

Q.10 White phosphorous has

(a) Six P-P single bonds (b) Four P-P single bonds

(c) Three lone pairs of electrons (d) PPP angle of 90°C

Q.11 The structure of thiosulphuric acid is

(a) $H_2S_2O_3$ (b) $H_2S_2O_4$ (c) H_2SO_4 (d) $H_2S_2O_2$

Q.12 Among the following conjugate bases of oxoacids of chlorine, which arrangement shows the correct order of increasing hydration energy and basic character?

(a) $ClO^- < ClO_2^- < ClO_3^- < ClO_4^-$ (b) $ClO^- < ClO_2^- < ClO_3^- < ClO_4^-$

(c) $ClO^- < ClO_2^- < ClO_3^- < ClO_4^-$ (d) $ClO^- < ClO_2^- < ClO_3^- < ClO_4^-$

Q.13 XeO_3 contains:

(a) Four π-bonds and the remaining four electron pair of a tetrahedron with one corner occupied by a lone pair

(b) Six electron pairs and two lone pairs

(c) Two π-bonds, two corners of a tetrahedron occupied by a lone pair

(d) Three π-bonds and the remaining four electron pairs form a tetrahedron with one corner occupied by a lone pair

Q.14 Which of the following transition metals exhibits the higher oxidation state?

(a) Pt (b) Os (c) Cr (d) Mn

Q.15 The coordination ratio of titanium and oxygen in rutile structure is

(a) 6 : 4 (b) 6 : 2 (c) 6 : 3 (d) 6 : 6

Q.16 $[Pt(NH_3)_2(NO_2)_2]$ can exhibit the following isomerism

(a) Linkage, Geometric (b) Ionisation, Geometric

(c) Hydrate, Linkage (d) Ionisation, Linkage

Q.17 In which of the following molecules the van der wall's forces is likely to be the most important in determining the m.pt. and b.pt.

(a) CO (b) H_2S (c) Br_2 (d) HC*l*

Q.18 Alkali metal hydrides react with water give

(a) Acidic solution (b) Basic solution (c) Neutral solution (d) Hydride ion

Q.19 Which is a planar molecule

(a) XeO_4 (b) XeF_4 (c) $XeOF_4$ (d) XeO_2F_2

Q.20 A silicate used in talcum powder

(a) consists of planar sheets which can slip over another

(b) is known as talc

(c) is a pure magnesium silicate of the form 3 $MgO.4SiO_2.H_2O$

(d) All of these

Q.21 Which of the following has the stronger bond

(a) F – B (b) F – C*l* (c) F – Br (d) C*l* – Br

Q.22 Which of the following metal ions is coloured

(a) Cu^+ (b) Zn^{2+} (c) Sc^{3+} (d) V^{4+}

Q.23 Among the lanthanides the one obtained by synthetic method is

(a) Lu (b) Pm (c) Pr (d) Gd

Q.24 Thorium element belongs to

(a) Alkali metal (b) Transition elements (c) Lanthanides (d) Actinides

Q.25 H_2S would separate the following at pH < 7

(a) Zn^{2+}, Co^{2+} (b) Cu^{2+}, Cd^{2+} (c) Cu^{2+}, Co^{2+} (d) Cu^{2+}, As^{2+}

Q.26 Nitrite (NO_2^-) interferes in the 'ring-test' of Nitrate (NO_3^-). Some of the following reagents can be used for the removal of Nitrate

(I) NH_4Cl (II) $(NH_2)_2CS$(thiourea) (III) NH_2SO_3H(sulphamic acid) (IV)Sulphanilic acid

Correct choice is

(a) I, II (b) I, II, IV (c) I, II, III (d) II, III, IV

Q.27 The oxidation number of Fe in $K_4[Fe(CN)_6]$ is

(a) 3 (b) 2 (c) 0 (d) 1

Q.28 Which one of the following exhibits rotational spectra?

(a) H_2 (b) N_2 (c) CO (d) CO_2

Q.29 In Ziegler-Natta catalysis the commonly used catalyst system is:

(a) $TiCl_4$, $Al(C_2H_5)_3$ (b) $(\eta^5 - Cp)_2TiC1_2$, $Al(OEt)_3$

(c) $VO(acac)_2$, $Al_2(CH_3)_6$ (d) $TiCl_4$, BF_3

Q.30 Oxidation occurs very easily in case of

(a) $(\eta^5 - C_5H_5)_2Fe$ (b) $(\eta^5 - C_5H_5)_2Co$ (c) $(\eta^5 - C_5H_5)_2Ru$ (d) $(\eta^5 - C_5H_5)_2Co^+$

Q.31 Complex in which organic ligand is having only σ – bond with metal is:

(a) $W(CH_3)_6$ (b) $(\eta^5 - C_5H_5)_2Fe$ (c) $K[PtCl_3(C_2H_4)]$ (d) $(\eta^6 - C_6H_6)_2Ru$

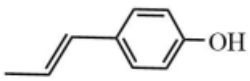
Q.32 In the molecules H_2O, NH_3 and CH_4.

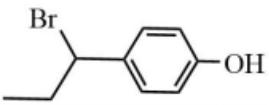
(a) The bond angles are same (b) The bond distances are same

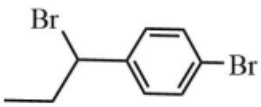
(c) The hybridizations are same (d) The shapes are same

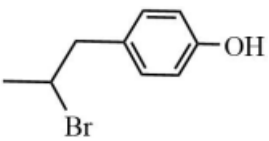
Q.33 The correct order of stability of difluorides is:

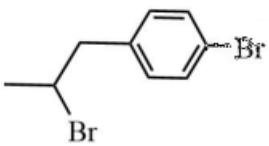
(a) $GeF_2 > SiF_2 > CF_2$ (b) $CF_2 > SiF_2 > GeF_2$ (c) $SiF_2 > GeF_2 > CF_2$ (d) $CF_2 > GeF_2 > SiF_2$

Q.34 The reaction of  with HBr gives:

(a) 

(b) 

(c) 

(d) 

Q.35 Preparation of alkyl halides in laboratory is least preferred by:

(a) Halide exchange (b) Direct halogenation of alkanes

(c) Treatment of alcohols (d) Addition of hydrogen halides to alkenes

Q.36 Allyl alcohol is obtained when glycerol reacts with following at 260°C:

(a) Formic acid (b) Oxalic acid (c) Both (d) None

Q.37 Predict the major product:

(a) $HO - CH_2 - CH_2 - CH_2 - CH_2 - I$ (b) $HO - CH_2 - CH_2 - CH_2 - CH_2 - OH$

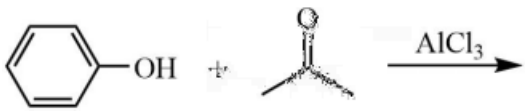
(c) $I - CH_2 - CH_2 - CH_2 - CH_2 - I$ (d) No reaction

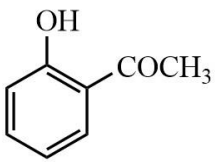
Q.38 Conversion of chlorobenzene into phenol of Dow's process is an example of:

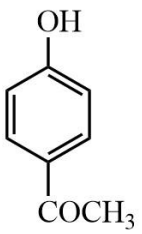
(a) Free radical substitution (b) Nucleophilic substitution

(c) Electrophilic substitution (d) Rearrangement

Q.39 Predict the products of reaction below:



(a) 

(b) 

(c) 

(d) Both (a) and (b)

Q.40 Which is incorrect about grading of sugars?

(a) Sucrose-1 (b) Fructose-1.75 (c) Lactose-6 (d) Saccharin-3500

Q.41 Which is a local anaesthetic?

(a) Cocaine (b) Quinine (c) Morphine (d) None

Q.42 Which enhances the absorption of Vitamin-A?

(a) Vit. K (b) Vit. C (c) DMG (d) None

Q.43 By which of the following reaction, acetophenone can be converted to phenol?

(a) m-CPBA followed by base catalysed hydrolysis (b) Conc. HNO_3

(c) Iodine and *NaOH* (d) Singlet Oxygen followed by hydrolysis

Q.44 Diazomethane with acetylene gives:

(a) Pyrazole (b) Pyrazoline (c) Piperidine (d) Pyrimidine

Q.45 Cinnamoyl alcohol with lead tetraacetate gives:

(a) Cinnamic acid (b) Cinnamoyl acetate (c) cinnamaldehyde (d) Acetophenone

Q.46 Betaine an intermediate in:

(a) Wittig reaction (b) Stobbe reaction (c) Stephenson reaction (d) MPV reduction

Q.47 If the migrating group in Beckmann rearrangement is chiral, then

(a) Its configuration will change (b) Its configuration will be retained

(c) Both (d) None

Q.48 Which reduces only carbonyl group in the presence of nitro, carboxyl, double bond and ester functional groups?

(a) LAH (b) Na/NH_3 (c) $NaBH_3$ (d) H_2/Ni

Q.49 Which of the following molecule shows hyper-conjugation?

(a) Benzophenone (b) 1,3-butadiene (c) Toluene (d) 1,3-butadiyne

Q.50 Which conformation of cyclohexane is least stable?

(a) Chair (b) Half-chair (c) Boat (d) Twist-boat

Q.51 Which of the following are used for separation of pair of enantiomers?

(a) Conversion to diastereoisomers and mechanical separation

(b) Differential absorption and deracemization

(c) Chiral recognition and biochemical process

(d) All of the above

Q.52 Choose the correct statement

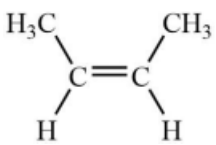
(a) Cyclopropyl methyl cation is more stable than the benzylic cation

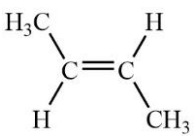
(b) Methyl anion in gas phase is having tetrahedral structure

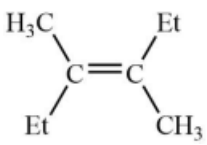
(c) It is steric hinderance to dimerization and not the resonance that is the cause of stability in triphenyl methyl radical

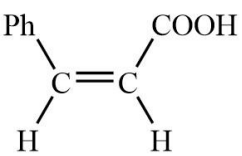
(d) Singlet methylene is bent with an angle of 103°

Q.53 Which of the following will give meso form with Baeyer's reagent?

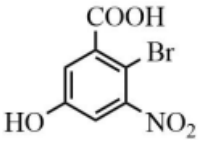
(a) 

(b) 

(c) 

(d) 

Q.54 The IUPAC name of compound is:



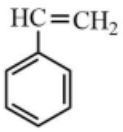
(a) 2-bromo-3-carboxy-5-hydroxy-1-nitrobenzene (b) 2-bromo-5-hydroxy-3-nitrobenzoic acid

(c) 4-bromo-3-carboxy-5-nitrophenol (d) 4-bromo-3-carboxy-5-nitro-1-hydroxybenzene

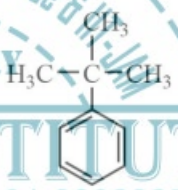
Q.55 In structural representation of molecules, the prefixes Z and E stands for:

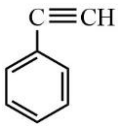
(a) Zeigler-Erythro (b) Zurammen-Estrogen (c) Zeigler-Erhard (d) Zusamann-Enteggen

Q.56 β-phenylethyl chloride is the minor product obtained by reaction of chlorine with:

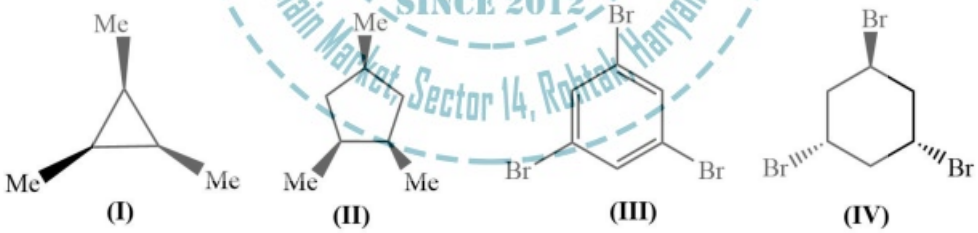
(a) 

(b) 

(c) 

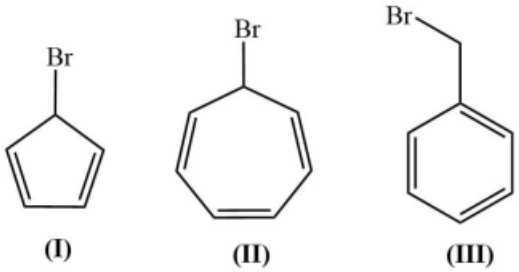
(d) 

Q.57 The compound having C_3-axis of symmetry are



(a) I, III and IV (b) I, II and III (c) I and III (d) III and IV

Q.58 The correct order of rate of solvolysis for the following compounds is



(a) III >II > I (b) II > I > III (c) III > I > II (d) II > III > I

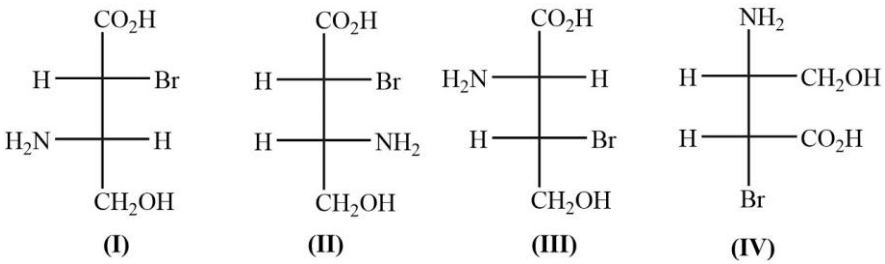
Q.59 In the following sequence of reactions, the overall yield (%) of O is

(a) 61 (b) 85 (c) 74 (d) 68

Q.60 Catalytic hydrogenation of the following compound produces saturated hydrocarbon(s). The number of stereoisomer(s) formed is

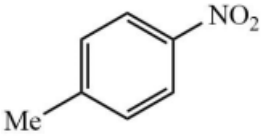
(a) 1 (b) 2 (c) 3 (d) 4

Q.61 Among the following compounds, the pair of enantiomers is

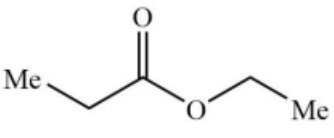


(a) I and IV (b) I and III (c) II and III (d) III and IV

Q.62 The number of proton NMR signals for the compounds P and Q, respectively, is



(P)



(Q)

(a) 3 and 4 (b) 3 and 5 (c) 4 and 3 (d) 5 and 4

Q.63 The correct set of reagents for the following conversion is

(a) (i) $NaNH_2$/liq. NH_3; (ii) $NaNO_2$/dil. HCl; (iii) CuCN, heat

(b) (i) HNO_3/H_2SO_4: (ii) Zn/HCl; (iii) $NaNO_2$/dil. HCl; (iv) CuCN, heat

(c) (i) Mg/ether, H_3O^+: (ii) $(EtO)_2CO$; (iii) NH_4OH; (iv) PCl_5

(d) (i) Mg/ether, H_3O^+: (ii) HNO_3/H_2SO_4; (iii) $NaNO_2$/dil. HCl; (iv) CuCN, heat

Q.64 Propyne and propene can be distinguished by

(a) Conc. H_2SO_4 (b) Br_2 in CCl_4 (c) Dil.$KMnO_4$ (d) $AgNO_3$ in ammonia

Q.65 Which of the following has the most acidic hydrogen

(a) 3-Hexanone (b) 2,4-Hexanedione (c) 2,5-Hexanedione (d) 2,3-Hexanedione

Q.66 Ammonia can be dried by

(a) Conc. H_2SO_4 (b) P_4O_{11} (c) CaO (d) Anhydrous $CaCl_2$

Q.67 Amongst H_2O, H_2S, H_2Se and H_2Te the one with the highest boiling point is

(a) H_2O because of hydrogen bonding (b) H_2S because of hydrogen bonding

(c) H_2Te because of Higher molecular weight (d) H_2Te because of Lower molecular weight

Q.68 The number of α and β particles emitted by $^{218}_{81}Ra$ in changing to a stable isotope of $^{206}_{82}Pb$ will be:

(a) 1 and 2 (b) 2 and 4 (c) 1 and 4 (d) 3 and 4

Q.69 Select the correct statement from the following:

(a) Work is a state function (b) Delayed fluorescence is phosphorescence

(c) Quantum yield of any reaction is always positive (d) The molar extinction coefficient is unitless

Q.70 There cannot be a quadrupole point on the phase diagram for one-component system, because the degree of freedom is:

(a) 3 (b) 4 (c) −1 (d) 0

Q.71 Milk is a/an:

(a) Gel (b) Emulsion (c) Suspension (d) Solution

Q.72 Isotonic solutions have the same:

(a) Viscosity (b) Surface tension (c) pH (d) Osmotic pressure

Q.73 The rotational spectra of *HCl* molecule suggest that rotational lines are equally separated by 22.70 cm^{-1}. The internuclear bond length will be estimated by (all notations have their usual meanings):

(a) $\left[\frac{h\times10^{-2}}{8\pi^2\mu C\times11.35}\right]^{1/2}$ (b) $\left[\frac{h\times10^{-2}}{8\pi^2\mu C\times22.70}\right]^{1/2}$ (c) $\left[\frac{h\times10^{-2}}{8\pi^2\mu^2 C\times11.35}\right]^{1/2}$ (d) $\left[\frac{h\times10^{-2}}{8\pi^2\mu C^2\times22.70}\right]^{1/2}$

Q.74 Cellulose nitrate relates to which of the following category of the polymers?

(a) Synthetic polymers (b) Natural polymer

(c) Semi Synthetic polymers (d) None of these

Q.75 Which of the following monomers are not suitable for condensation polymerisation?

(a) Butane-dioic acid and glycol
(b) Propanoic acid and ethanol
(c) Diamine and dicarboxylic acid
(d) Hydroxy acid

Q.76 The transition zone for Raman spectra is:

(a) between electronic levels
(b) between magnetic levels of nuclei
(c) between magnetic levels of unpaired electron
(d) between vibrational and rotational levels

Q.77 Dry ice is used for fire extinguishers. It is stored in the cylinder in solid dorm. When sprayed on a fire, it quickly changes into gas called CO_2. The changes of state is called:

(a) Sublimation (b) Evaporation (c) Condensation (d) Distillation

Q.78 For an isentropic change of state:

(a) dH = 0 (b) dT = 0 (c) dS = 0 (d) dS = 1

Q.79 Which of the following is a correct relation?

(a) $pH = ½ [pk_w + pk_a + pk_b]$
(b) $pH = ½ [pk_w + pk_a - pk_b]$
(c) $pH = ½ [pk_w + k_a - k_b]$
(d) $pH = ½ [pk_w - k_a + k_b]$

Where all the notation has their usual meanings.

Q.80 The boiling point of a liquid is 36°C. Assuming that it obeys Trouton's rule, its molar heat of vaporization will be

(a) 271.92 KJ mol^{-1} (b) 27.192 KJ mol^{-1} (c) 2719.2 KJ mol^{-1} (d) 2.7192 KJ mol^{-1}

Q.81 The Miller indices of crystal planes which cut through the crystal axis at (2a, –3b, –3c) are

(a) $(\bar{2}\ \bar{2}\ 3)$ (b) $(\bar{2}\ 3\ \bar{2})$ (c) $(3\ \bar{2}\ \bar{2})$ (d) (2 3 2)

Q.82 A tetragonal crystal possesses the following axis of symmetry

(a) two-fold (b) six-fold (c) four-fold (d) three-fold

Q.83 The temperature below which a gas becomes cooler on expansion is filled

(a) Boyle temperature (b) Inversion temperature

(c) Critical temperature (d) Boiling point

Q.84 For one mole of the gaseous mixture, the entropy of mixing is given by

(a) $\Delta S = -R\Sigma r_i lnx_I$ (b) $\Delta S = -R\Sigma lnx_I$

(c) $\Delta S = -R\Sigma r_i lnr_I$ (d) $\Delta S = -R\Sigma x_i lnx_I$

Where r_i, x_i represent activity coefficient and mole fraction of components in the mixture.

Q.85 Which of the following is correct?

(a) $\left(\frac{\partial S}{\partial P}\right)_T = -\left(\frac{\partial V}{\partial T}\right)_P$ (b) $\left(\frac{\partial S}{\partial P}\right)_T = \left(\frac{\partial V}{\partial S}\right)_P$

(c) $\left(\frac{\partial S}{\partial V}\right)_T = -\left(\frac{\partial P}{\partial T}\right)_V$ (d) $\left(\frac{\partial T}{\partial V}\right)_S = \left(\frac{\partial P}{\partial S}\right)_V$

Q.86 The standard state for a solid is the pure state of solid at

(a) One atmospheric pressure and 273°C (b) One atmospheric pressure and given temperature

(c) 273K (d) One atmospheric pressure and 273 K

Q.87 In the limit for crystal

(a) $S_T = C_P$ (b) $S_T = C_V$ (c) $S_T = C_{P/3}$ (d) $S_T = C_{V/T}$

Where C_p, C_v are heat capacity at constant pressure and volume respectively

Q.88 The fundamental vibrational frequency of carbon mono oxide (CO) molecule is 2500 cm^{-1}. The force constant of CO molecule will be

(a) $4\pi^2 c\mu(2050)^2 \times 10^4$ (b) $4\pi^2 c^2\mu^2(2050)^2 \times 10^{-4}$

(c) $4\pi^2 c^2\mu(2050)^2 \times 10^4$ (d) $4\pi^2 c^2\mu(2050)^2 \times 10^2$

Q.89 The operator for linear momentum of a particle moving in a direction parallel to x-axis is given by

(a) $\hat{P}_x = ih\frac{\partial}{\partial x}$ (b) $\hat{P}_x = -ih\frac{\partial}{\partial x}$ (c) $\hat{P}_x = -ih\frac{\partial^2}{\partial x^2}$ (d) $\hat{P}_x = -i\frac{h}{2\pi}\frac{\partial}{\partial \pi}$

Q.90 The average of an observable quantity x, is obtained by

(a) $\hat{x} = \frac{<\Psi x \Psi^@>}{<\Psi\Psi^@>}$ (b) $\hat{x} = \frac{<\Psi\Psi^@ x>}{<\Psi\Psi^@>}$ (c) $\hat{x} = \frac{<\Psi x^2 \Psi^@>}{<\Psi\Psi^@>}$ (d) $\hat{x} = \frac{<\Psi\Psi^@ x^2>}{<\Psi\Psi^@>}$

Q.91 Chromatography is based on

(a) Physical adsorption of the solute (b) Differential adsorption of different components

(c) Chemisorption of the solute (d) Solubility of the solute

Q.92 A hydrogen electrode and a normal calomel electrode had a voltage 0.435 V when placed in a certain solution at 298 K. What will be the pH of the solution

(a) 2.125 (b) 2.205 (c) 2.622 (d) 2.014

Q.93 A photon in 'X' region is more energetic than in the visible region. The 'X' is

(a) Microwave (b) Radio wave (c) IR (d) UV

Q.94 Select the correct statement

(a) Composite reactions differ from complex reactions

(b) Composite reactions involve more than one elementary reaction

(c) Composite reactions involve only one elementary reaction

(d) None of the above

Q.95 The value of van der waal's constant "a" for gases O_2, N_2, NH_3 and CH_4 are 1.36, 1.39, 4.17 and 2.253 litre^2 atm mole^{-2} respectively. The gas which can most easily be liquified is

(a) NH_3 (b) O_2 (c) N_2 (d) CH_4

Q.96 Frenkel defect appear in crystal in which

(a) Size of anion is equal to size of cation (b) Size of anion is less than size of cation

(c) Size of anion is much larger size of cation (d) None of the above

Q.97 Molar polarization P_m, is independent of

(a) Pressure (b) Temperature (c) Concentration (d) None of these

Q.98 At temperature near absolute zero gaseous molecule possess only

(a) Translational energy (b) Rotational energy

(c) Rotational and translational energy (d) Vibrational energy

Q.99 The molecule which is IR inactive but Raman active is

(a) HCl (b) N_2 (c) SO_2 (d) protein

Q.100 The cell potential is a

(a) Intensive property (b) Extensive property

(c) Thermodynamic property (d) Colligative property

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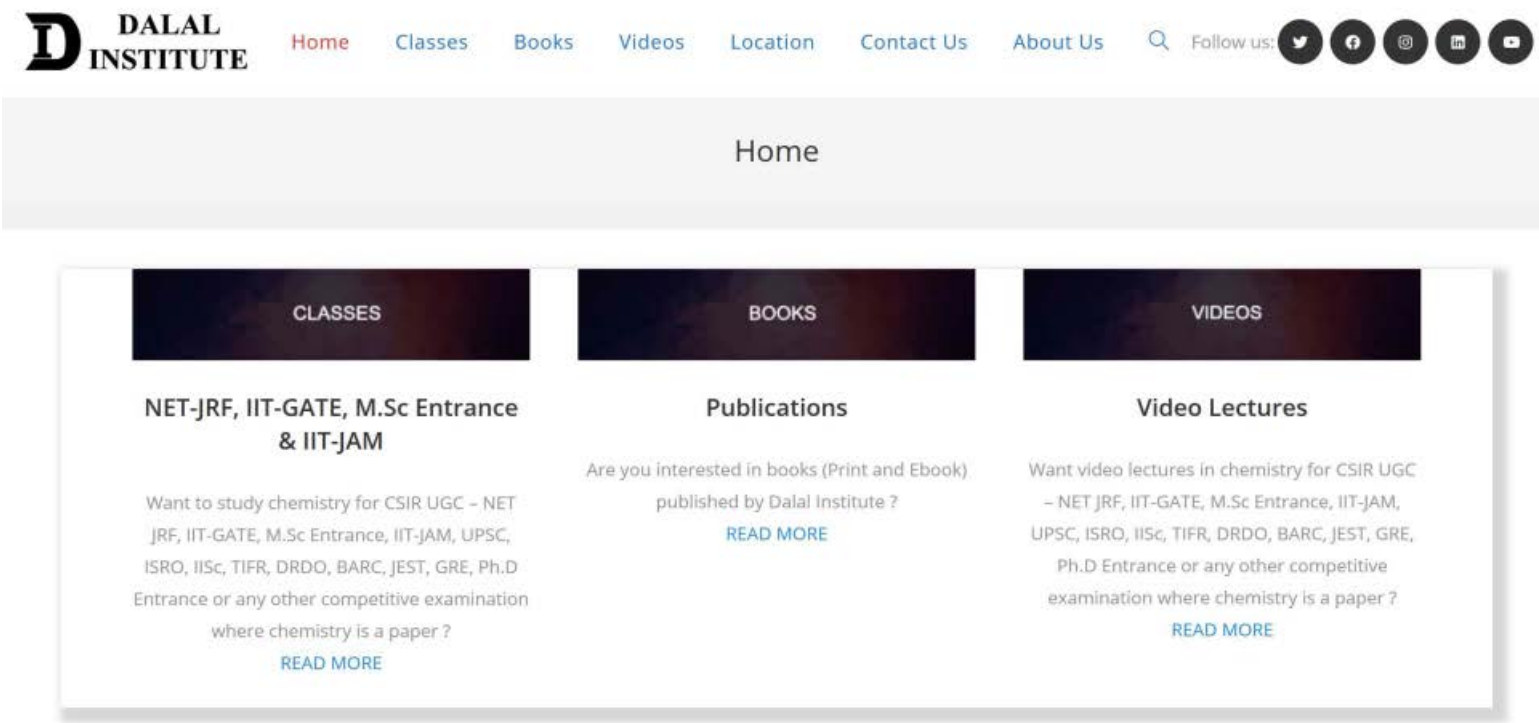

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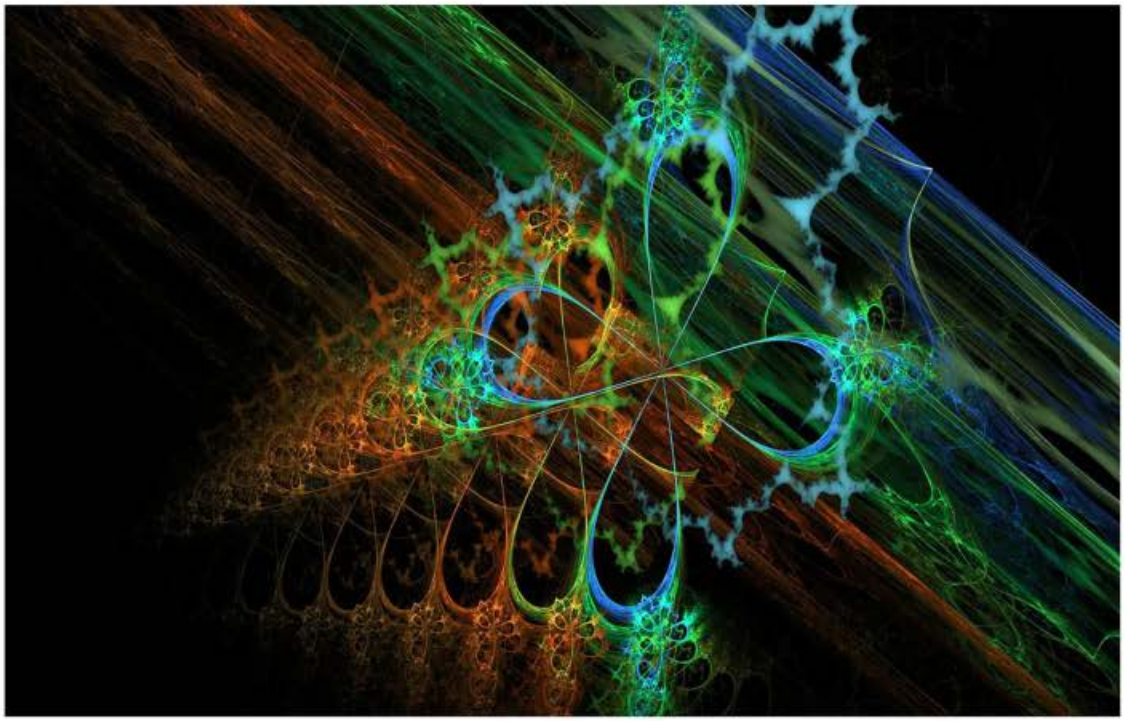

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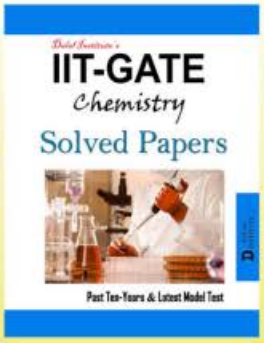

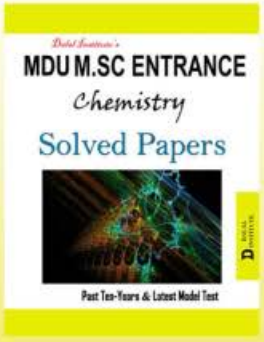

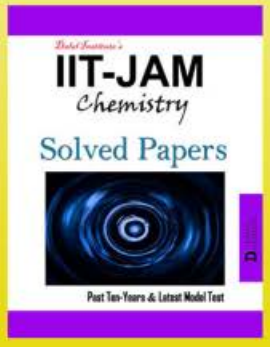

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