MDU M.Sc Entrance: 2015

Chemistry

❖ Question Paper

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

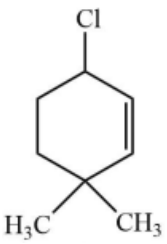
Q.1 The number of optically active isomers of $HOCH_2(CHOH)_4CHO$ is

(a) 4 (b) 8 (c) 16 (d) 24

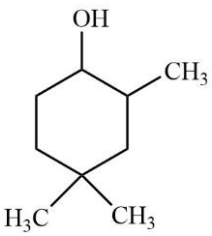
Q.2 Geometry of trifluoromethyl free radical is:

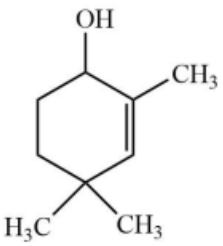
(a) planar (b) pyramidal (c) v-shaped (d) Tetrahedral

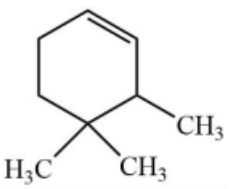
Q.3

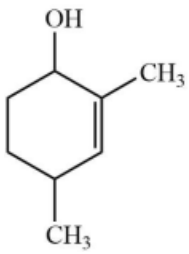


on treatment with aq. KOH gives

(a) 

(b) 

(c) 

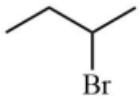
(d) 

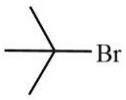
Q.4 Chloroform easily gets converted to poisonous phosgene in presence of air and sunlight. Which of the following substance is added to prevent formation of phosgene?

(a) Ethanol (b) Sodium carbonate

(c) Diethyl carbonate (d) Sodium hydroxide

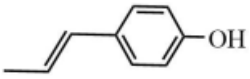
Q.5 n-Butane reacts with Br_2 at 130° to give more amount of:

(a) 

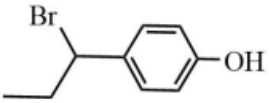
(b) 

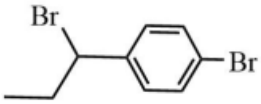
(c) 

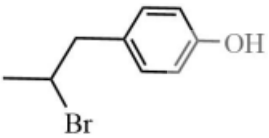
(d) All in equal amounts

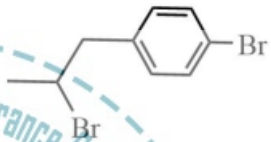
Q.6 The reaction of 

with HBr gives:

(a) 

(b) 

(c) 

(d) 

Q.7 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.8 Allyl alcohol is obtained when glycerol reacts with following at 260°C:

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

Q.9 Predict the major product:

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

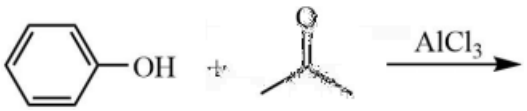
(c) $I-CH_2-CH_2-CH_2-CH_2-I$ (d) No reaction

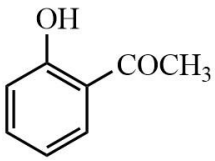
Q.10 Conversion of chlorobenzene into phenol of Dow's process is an example of:

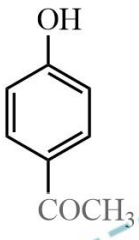
(a) Free radical substitution (b) Nucleophilic substitution

(c) Electrophilic substitution (d) Rearrangement

Q.11 Predict the products of reaction below:



(a) 

(b) 

(c) 

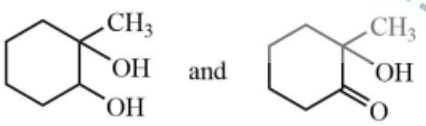
(d) Both (a) and (b)

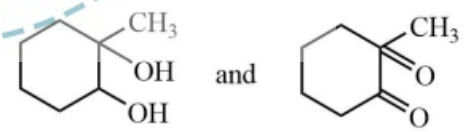
Q.12 The product formed in the following reaction $C_6H_5 - O - CH_3 \xrightarrow{HI,\ heat}$ are:

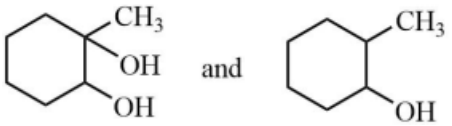
(a) C_6H_5OH and CH_3 (b) C_6H_5OH and CH_3OH

(c) C_6H_5I and CH_3I (d) C_6H_6 and CH_3OI

Q.13 A and B are in the following reaction

(a) 

(b) 

(c) 

(d) None of these

Q.14 3-methyl, 3-hexanol can be prepared by:

(a) CH_3MgI and 3-hexanone, followed by hydrolysis

(b) C_2H_5MgI and 2-pentanone, followed by hydrolysis

(c) C_3H_7MgI and 2-butanone, followed by hydrolysis

(d) Any of the above methods

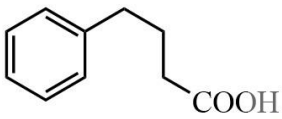
Q.15 Which of the following does not give ethylamine on reduction?

(a) Methyl cyanide (b) Ethyl nitrile (c) Nitroethane (d) Acetamide

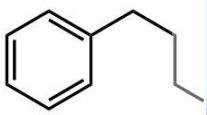
Q.16 Activation by benzene ring by $-NH_2$ in aniline can be reduced by treating with:

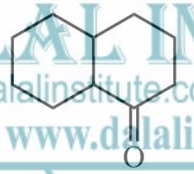
(a) Dilute HCl (b) Ethyl alcohol (c) Acetic acid (d) Acetyl chloride

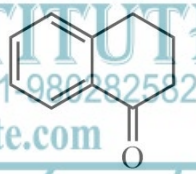
Q.17

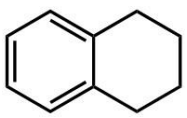


on reaction with $SOCl_2$ and then $AlCl_3$ forms:

(a) 

(b) 

(c) 

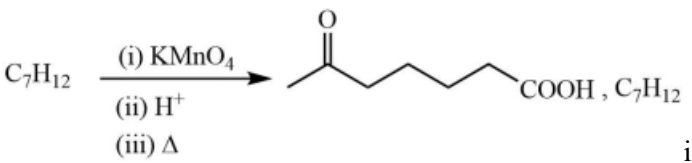
(d) 

Q.18 Hydrogenation of $C_6H_5CHOHCOOH$ over $Pd\text{-}Al_2O_3$ catalyst on methanol gives:

(a) C_6H_5COOH (b) $C_6H_{11}CHOHCOOH$

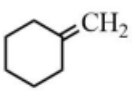
(c) $C_6H_5CHOHCH_2OH$ (d) $C_6H_{11}CH_2COOH$

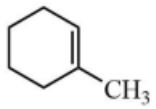
Q.19

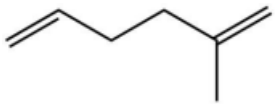


is

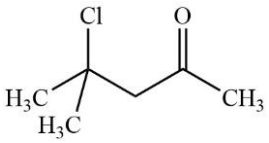
(a) 

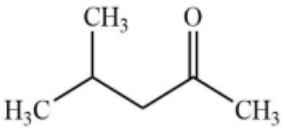
(b) 

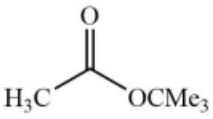
(c) 

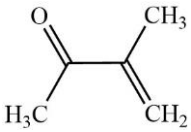
(d) 

Q.20 When 2-methyl propene is treated with acetyl chloride in the presence of $SnCl_2$, the product is

(a) 

(b) 

(c) 

(d) 

Q.21 A nitrogenous substance X is treated with HNO_2 and the product so formed is further treated with $NaOH$ solution, which produces blue colouration, X can be:

(a) $CH_3CH_2NH_2$ (b) $CH_3CH_2NO_2$ (c) CH_3CH_2ONO (d) $(CH_3)_2CHNO_2$

Q.22 The monomeric unit present in natural rubber is

(a) Butadiene (b) Terephthalic acid

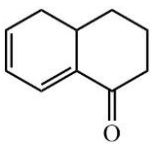
(c) Hexamethylenetetramine (d) Isoprene

Q.23 Ethyl acetoacetate reacts with hydroxylamine and product formed immediately loses a molecule of ethanol to form

(a) Methyl phenyl pyrazolone (b) 4-methylcoumarin

(c) Methyl oxazolone (d) Methyl isoxazolone

Q.24 In UV the following compound would show absorption at:



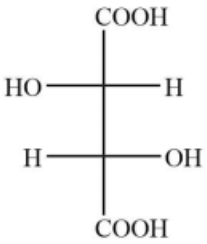
(a) 280 nm (b) 259 nm (c) 304 nm (d) 317 nm

Q.25 Which of following reaction involves rearrangement of nitrogen yields?

(a) Wittig reaction (b) Von-Richter reaction

(c) Sommlet-Hauser rearrangement (d) Pinacol-Pinacolone rearrangement

Q.26 Absolute configuration of this compound is



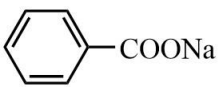
(a) 2S, 3S (b) 2R, 3R (c) 2S, 3R (d) 2R, 3S

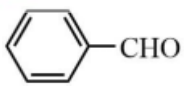
Q.27 Reagent used in given reaction is

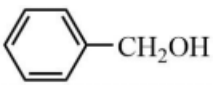
(a) $NaBH_4 / CH_3OH$ (b) MnO_4

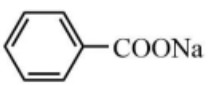
(c) SeO_4 (d) Br_2 followed by reaction with KOH

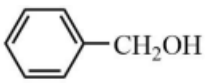
Q.28 Product in the following reaction is

(a) 

(b) 

(c) 

(d) Both 

and 

Q.29 Heterocyclic β-keto esters can be prepared by which one of the following reactions?

(a) 2,3-dimethoxycarbonyl pent-1,3-diene

(b) Micheal addition followed by Dieckmann condensation

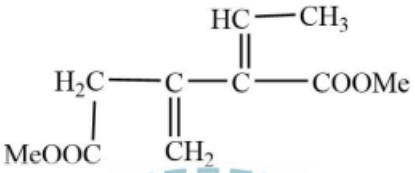
(c) Claisen ester condensation

(d) Micheal addition

Q.30 The artificial sweetner used in soft drinks is

(a) Glucose (b) Fructose (c) Asparatin (d) Glycerol

Q.31 The IUPAC name of compound is



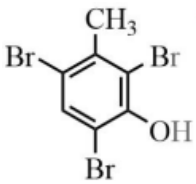
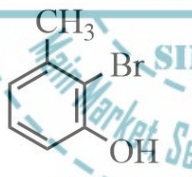
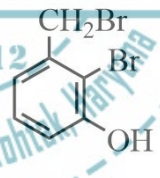
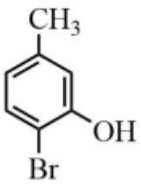
(a) 2,3-dimethoxycarbonyl pent-1,3-diene

(b) 2-Ethylidene-3-methylidene dimethyl pentan-1,5-dioate

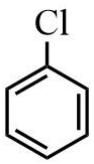
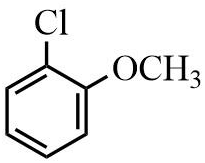
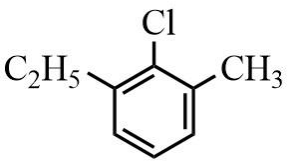
(c) 2-Ethylidene-3-methylidene methyl pentan-1,5-dioate

(d) None of these

Q.32 m-cresol on bromination gives

(a)  (b)  (c)  (d) 

Q.33 Which of the following compounds on reaction with KNH_2 in liq. NH_3 does not involve Benzyne intermediate?

(a)  (b)  (c)  (d) 

Q.34 Allylic halogen substitution can be done with

(a) Halogen at high temperature (b) NBS in sunlight

(c) Sulphuryl chloride in sunlight (d) All of these

Q.35 Which of the following sets of quantum numbers is not allowed?

(a) n = 3, l = 1, m = +2 (b) n = 3, l = 1, m = ±1

(c) n = 3, l = 0, m = 0 (d) n = 3, l = 2, m = ±2

Q.36 Which of the following orbitals has zero probability of finding the electron in yz-plane

(a) P_x (b) P_y (c) P_z (d) d_{yz}

Q.37 Which of the following orders regarding the ionization energy is correct?

(a) $N > O > F$ (b) $F > O > N$ (c) $N > O < F$ (d) $O > F > N$

Q.38 Most favourable condition to form a covalent bond is

(a) Large cation and small anion (b) large cation and large anion

(c) small cation and small anion (d) small cation and large anion

Q.39 Silicon doped with arsenic is an example of which type of semiconductor?

(a) p-type (b) n-type (c) n,p-type (d) intrinsic

Q.40 Which of the following defect, if present lowers the density of the crystal?

(a) Frenkel (b) Schottky

(c) Edge dislocation (d) Constitution of F-centre

Q.41 A hybrid orbital formed from *s* and *p* orbital can contribute to

(a) a σ bond only (b) π-bond only (c) either a σ or π bond (d) cannot be predicted

Q.42 During change of NO^+ to NO, the electron is added to

(a) σ- orbital (b) π- orbital (c) σ^*- orbital (d) π^*-orbital

Q.43 Intramolecular H-bonding is present in

(a) From nitrophenol (b) Salicylaldehyde

(c) Hydrogen chloride (d) Benzophenone

Q.44 Which forces are strongest amongst the following?

(a) Ion-ion interaction (b) Ion dipole forces

(c) Dipole-dipole forces (d) Dipole-induced dipole forces

Q.45 The product obtained in the reaction of diborane with excess of ammonia is

(a) $B_2H_6.NH_3$ (b) $B_2H_6.2NH_3$ (c) $(BN)_X$ (d) Borazine

Q.46 Pyrophosphoric acid is

(a) monobasic (b) dibasic (c) tribasic (d) tetrabasic

Q.47 The basic unit in layer and sheet silicates is

(a) SiO_4^{4-} (b) $Si_2O_7^{6-}$ (c) $(SiO_3)_n^{2n}$ (d) $(Si_2O_5)_n^{2n-}$

Q.48 Which of the following bonds is the strongest?

(a) *F–F* (b) *Cl–Cl* (c) *I–I* (d) *Br–Br*

Q.49 Hybridization and structure of XeF_4 is

(a) sp^3d, trigonal bipyramidal (b) sp^3, tetrahedral

(c) sp^3d^2, trigonal bipyramidal (d) sp^3d^2, hexagonal

Q.50 Which of the following transition element shows the highest oxidation state?

(a) *Mn* (b) *Fe* (c) *V* (d) *Cr*

Q.51 The planar complex (MABCD) gives

(a) two optical isomers (b) two geometrical isomers

(c) three optical isomers (d) three geometrical isomers

Q.52 Which one of the following compounds will behave as amino base in ammonia?

(a) $NaNH_2$ (b) NH_4OH (c) $(NH_4)_2SO_2$ (d) $(NH_4)_2CO_3$

Q.53 The +3 ion of which of the following has half-filled of subshell?

(a) *La* (b) *Lu* (c) *Cd* (d) *Ac*

Q.54 In a nuclear reactor, oxides of which of the following metals are used as a fuel material?

(a) Uranium and Actinium (b) Thorium and Actinium

(c) Uranium, thorium and Plutonium (d) Thorium, Actinium and Plutonium

Q.55 In qualitative analysis NH_4Cl is added before NH_4OH:

(a) To Decrease OH^- concentration (b) To increase OH^- concentration

(c) For making *HCl* (d) statement is wrong

Q.56 The brown ring test for NO_2^- and NO_3^- is due to the formation of complex ion having the formula

(a) $[Fe(H_2O)_6]^{2+}$ (b) $[Fe(NO)(CN)_5]^{2+}$ (c) $[Fe(H_2O)_5NO]^{2+}$ (d) $[Fe(H_2O)(NO)_5]^{2+}$

Q.57 The CFSE will be highest for

(a) $[CoF_6]^{3-}$ (b) $[Co(CNS)_4]^{2-}$ (c) $[Mn(H_2O)_6]^{2+}$ (d) $[Co(NH_3)_6]^{3+}$

Q.58 The expected spin-only magnetic moments for $[Fe(CN)_6]^{4-}$ and $[FeF_6]^{3-}$ respectively are

(a) 1.73 and 1.73 BM (b) 1.73 and 5.92 BM (c) 0.0 and 1.73 BM (d) 0.0 and 5.92 BM

Q.59 In tetrahedral geometry, which are of the following sets of electronic configurations will have orbital contribution to the magnetic moment?

(a) d^3, d^4, d^8 and d^9 (b) d^1, d^6, d^7 and d^9

(c) d^3, d^4, d^7 and d^9 (d) d^1, d^3, d^4 and d^9

Q.60 The most suitable route to prepare the trans isomer of $[PtCl_2(NH_3)(PPh_3)]$ is

(a) $[PtCl_4]^{2-}$ with PPh_3 followed by reaction with NH_3

(b) $[PtCl_4]^{2-}$ with NH_3 followed by reaction with PPh_3

(c) $[Pt(NH_3)_4]^{2+}$ with HCl followed by reaction with PPh_3

(d) $[Pt(NH_3)_4]^{2+}$ with PPh_3 followed by reaction with HCl

Q.61 The ground state term symbol for d^3 is

(a) $^4F_{3/2}$ (b) $^4F_{9/2}$ (c) $^4D_{5/2}$ (d) $^4P_{3/2}$

Q.62 The pair of metal carbonyl complexes that are isoelectronic is

(a) $[Ni(CO)_4]$ and $V(CO)_6$ (b) $[Ni(CO)_4]$ and $[Co(CO)_4]^-$

(c) $[Cr(CO)_6]$ and $V(CO)_6$ (d) $[Fe(CO)_4]^-$ and $[Cr(CO)_6]$

Q.63 Which of the following is a soft acid according to Pearson's concept of hard and soft acids?

(a) Ag^+ (b) I^{7+} (c) Sr^{2+} (d) Al^{3+}

Q.64 Which of the following chemical species can behave both as a Bronsted-Lowry acid and a base?

(a) H_3O^+ (b) HCO_3^- (c) NO_3^- (d) SO_4^-

Q.65 In oxyhaemoglobin *Fe* is in state

(a) Low spin and diamagnetic (b) Low spin and paramagnetic

(c) High spin and diamagnetic (d) High spin and paramagnetic

Q.66 Zeise's salt is represented by

(a) H_2PtCl_6 (b) $[PtCl_4]^{2-}$ (c) $[ZnCl_4]^{2-}$ (d) $[PtCl_3(n^2 - (C_2H_4)]^{2-}$

Q.67 The asymmetry in the electronic absorption spectrum in the visible region of is caused by

(a) Charge transfer (b) $t_2 \rightarrow e$ (c) $e \rightarrow t$ (d) John-teller effect

Q.68 Which of the following is correct?

(a) $[A^2, B] = \hat{A}[\hat{A}, \hat{B}] + [\hat{A}, \hat{B}]\hat{A}$ (b) $[A^2, B] = \hat{A}[\hat{B}, \hat{A}] + [\hat{A}, \hat{B}]\hat{A}$

(c) $[A^2, B] = \hat{A}[\hat{A}, \hat{B}] + \hat{A}[\hat{A}, \hat{B}]$ (d) None of the above

Q.69 The operator for square of linear momentum, is given by

(a) $\hat{p}^2 = \hbar^2\nabla^2$ (b) $h^2\nabla^2$ (c) $\hat{p}^2 = -\hbar^2\nabla^2$ (d) $i\hbar\nabla^2$

Q.70 Eigen value is always a

(a) Zero value (b) Infinite value (c) Positive value (d) Negative value

Q.71 Entropy is related to probability by relation

(a) $S = RlnW$ (b) $S = R/lnW$ (c) $S = klnW$ (d) $S = k/lnW$

Q.72 The organic compound C_2H_6O possess

(a) One equivalent CH_3 group (b) Two equivalent CH_3 groups

(c) Two non-equivalent CH_3 groups (d) None of these

Q.73 Thermal conductivity of gas is independent of

(a) Pressure (b) Temperature (c) Mean free path (d) Heat capacity at constant volume

Q.74 The vibrational degrees of freedom of a protein molecule containing 44,000 atoms are

(a) 13,410 (b) 44,700 (c) 31 (d) 1,34,100

Q.75 The equation for predicting atmospheric pressure called barometric formula is

(a) $P = P_0 exp\left(\frac{-Mgx}{RT}\right)$ (b) $P = P_0 exp\left(\frac{Mgx}{RT}\right)$

(c) $P = P_0 exp\left(\frac{Mg}{RT}\right)$ (d) $P = P_0 exp\left(\frac{Mgx^2}{RT}\right)$

Where x,g are the altitude and acceleration due to gravity.

Q.76 The Vander Waals equation for 'n' moles of gas is expressed by

(a) $P = \frac{RT}{V-nb} - \frac{an^2}{V^2}$ (b) $P = \frac{nRT}{V-nb} - \frac{an^2}{V^2}$

(c) $P = \frac{RT}{nV-b} - \frac{an^2}{V^2}$ (d) $P = \frac{nRT}{V-b} - \frac{an^2}{V^2}$

Q.77 The mass less particles are

(a) Protons (b) α-rays (c) gamma rays (d) β-particles

Q.78 Absorbance A of the solution is expressed as

(a) $\log\left(\frac{I}{I_0}\right)$ (b) $\frac{I}{I_0}$ (c) $\ln\left(\frac{I}{I_0}\right)$ (d) $\log\left(\frac{I_0}{I}\right)$

Q.79 A real gas most closely approaches the behaviour of a perfect gas at

(a) low pressure and high temperature (b) high pressure and low temperature

(c) low pressure and low temperature (d) high pressure and high temperature

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 Which aqueous solution of urea freezes at –0.93C

(a) 30 gm in one litre of solution (b) 150 gm in 5 litre of water

(c) 30 gm in 500 ml of water (d) 150 gm in five litre of solution

Q.89 The parameters of an orthorhombic unit cell is a = 50 pm, b = 100 pm, c = 150 pm. The spacing between (123) planes will be

(a) 29 pm (b) 0.029 pm (c) 0.29 pm (d) 2.9 pm

Q.90 Milk is a/an

(a) gel (b) emulsion (c) suspension (d) Pure solution

Q.91 The rate constant for a second-order reaction is If the initial

(a) 100 minutes (b) 10 minutes (c) 300 seconds (d) 1.0 minute

Q.92 Triple point is the point where

(a) Three components are in equilibrium
(b) The number of degrees of freedom is three
(c) The number of degrees of freedom is zero
(d) Three components are not in equilibrium

Q.93 For the distribution of organic solute between water (C_1) and benzene (C_2), partition coefficient $k = \sqrt{C_2}/\sqrt{C_1}$ suggest that

(a) Solute exist as monomer in Benzene
(b) Solute as exist as dimer in benzene
(c) Solute exist as dimer in water
(d) None of these

Q.94 In the lead acid battery during changing the cathodic reaction is

(a) Formation of $PbSO_4$
(b) Formation of PbO_4
(c) Reduction of Pb^{2+} to Pb^{1+}
(d) Reduction of Pb^{2+} to Pb

Q.95 Which of the following is not a state function?

(a) Work (b) Enthalpy (c) Heat (d) Gibbs free energy

Q.96 The pH of a solution obtained by mixing 25 ml of 0.2 M HCl with 50 ml of $NaOH$ ($k_w = 10^{-14}$ mol^2 dm^{-6}) will be:

(a) 10 (b) 1.3 (c) 13 (d) 12

Q.97 The emulsifiers consist of:

(a) Ionic compound
(b) Ionic surfactant
(c) Ionic and non-ionogenic surfactant
(d) Non-ionic surfactant

Q.98 The rotational spectra of a rigid diatomic rotator consists of equally spaced lines with spacing equal to

(a) 2B (b) B (c) 3B (d) 3B/2

Where B is the rotational constant.

Q.99 Strong covalent bond exists between polymer chains in:

(a) Thermoplasts (b) Thermosets (c) Elastomers (d) All polymers

Q.100 Choose the correct one:

(a) 1 eV = 806.56 cm^{-1}

(b) 1 eV = 80656 cm^{-1}

(c) 1 eV = 80.656 cm^{-1}

(d) 1 eV = 8065.6 cm^{-1}

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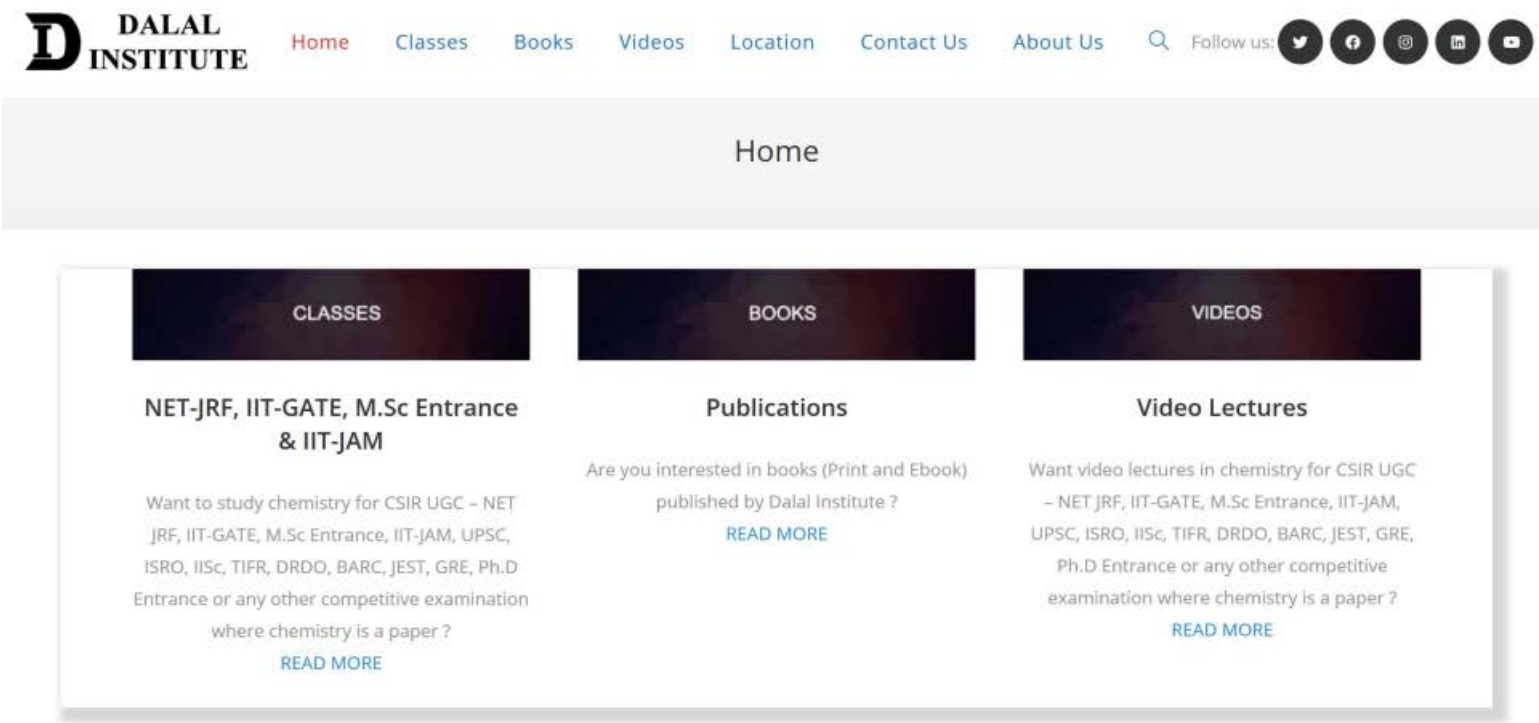

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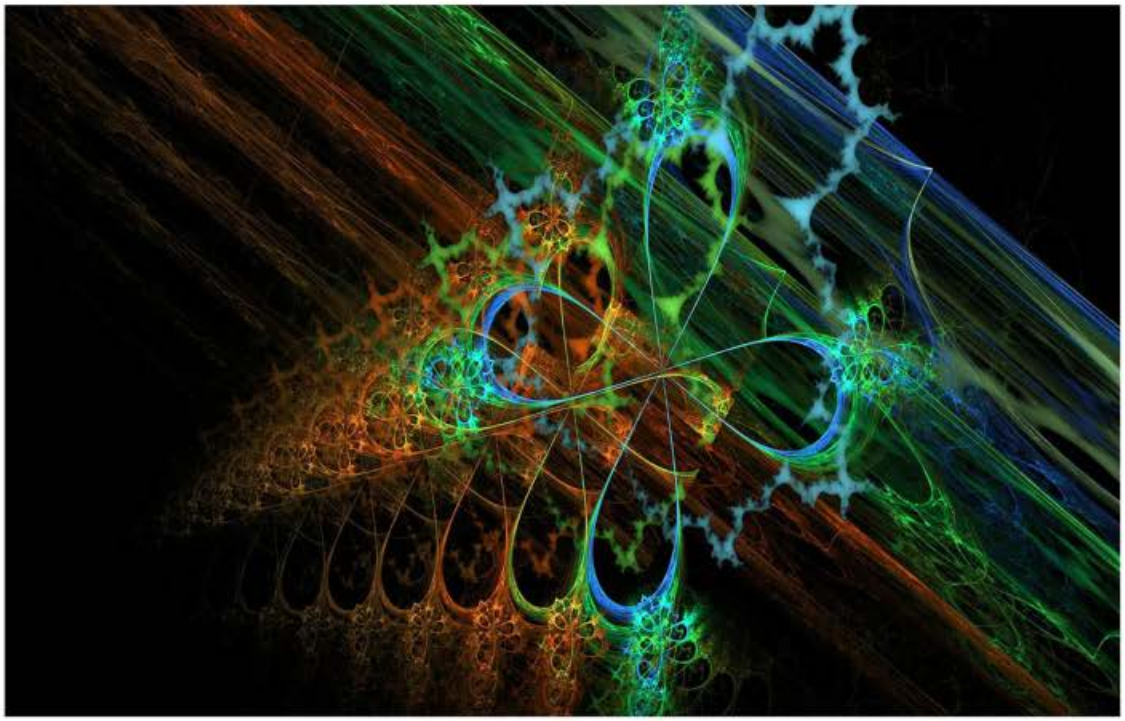

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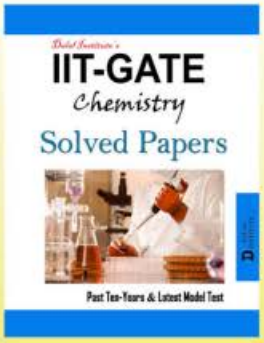

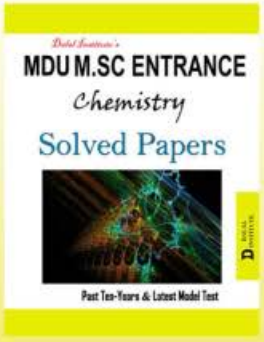

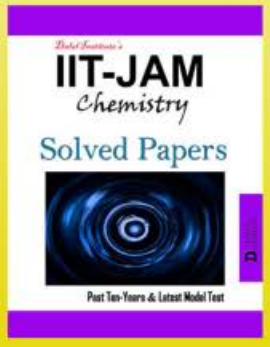

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