MDU M.Sc Entrance: 2019

Chemistry

Note: Owing to the combined nature of the entrance for Haryana universities, this paper was also for the following universities: Kurukshetra University, Kurukshetra; Chaudhary Devi Lal University, Sirsa; Bhagat Phool Singh Mahila Vishwavidyalya, Khanpur Kalan; Indira Gandhi University, Meerpur; Chaudhary Ranbir Singh University, Jind; Chaudhary Bansi Lal University, Bhiwani.

❖ Question Paper

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

Q.1 Which of the following has least de-Broglie wavelength?

(a) e^- (b) p (c) CO_2 (d) SO_2

Q.2 The geometry of AsF_5 is:

(a) Pyramidal (b) Tetrahedral (c) Trigonal bipyramidal (d) Octahedral

Q.3 The effective nuclear charge at the periphery of *Cr* atom, using slater rule is:

(a) 3.35 (b) 3.70 (c) 1.70 (d) 2.60

Q.4 The theoretical value of magnetic moment of Gd^{3+} is:

(a) 7.94 (b) 9.72 (c) 9.57 (d) 7.63

Q.5 Which of the following will not show H-bonding?

(a) HF (b) NH_3 (c) H_2O (d) CH_4

Q.6 The oxide which gives H_2O_2 on treatment with dilute acid is:

(a) PbO_2 (b) Na_2O_2 (c) MnO_2 (d) TiO_2

Q.7 Inorganic benzene is:

(a) BH_3OH_3 (b) $B_3N_3H_6$ (c) B_2H_6 (d) B_4H_{10}

Q.8 The correct order of increasing size is:

(a) $Na^+ < Li^+ < Be^{2+} < B^{3+}$ (b) $B^{3+} < Be^{2+} < Li^+ < Na^+$

(c) $Be^{2+} < B^{3+} < Na^+ < Li^+$ (d) $Li^+ < Na^+ < B^{3+} < Be^{2+}$

Q.9 Addition of *As* in trace amounts to pure *Ge* will result in the formation of:

(a) n-type semiconductor (b) Germanium arsenic

(c) p-type semiconductor (d) Super conducting-alloy

Q.10 Feron is:

(a) CCl_3H (b) CF_4 (c) CH_3F_3 (d) CCl_2F_2

Q.11 The aqueous solution of which of the following has maximum pH?

(a) $NaClO$ (b) $NaClO_2$ (c) $NaClO_3$ (d) $NaClO_4$

Q.12 Which of the following compounds will exhibit linkage isomerism?

(a) $[Pt(NH_3)_2Cl_2]$ (b) $[Co(NH_3)_5NO_2]Cl_2$

(c) $[Co(NH_3)_4\ Cl_2]Cl$ (d) $[Co(en)_2\ Cl_2]Cl_2$

Q.13 Which oxide of vanadium is most likely to be basic and ionic?

(a) VO (b) V_2O_3 (c) VO_2 (d) V_2O_5

Q.14 Which of the following complex is non-ionisable?

(a) $CoCl_3.6NH_3$ (b) $CoCl_3.5NH_3$ (c) $CoCl_3.4NH_3$ (d) $CoCl_3.3NH_3$

Q.15 EAN(effective atomic no.) of Fe^{2+} ion in $[Fe^{2+}(CN)_6]^{4-}$ is equal to

(a) 26 (b) 36 (c) 18 (d) 54

Q.16 Which is used in cancer chemotherapy?

(a) Zeise's salt (b) Auranofin (c) Cisplatin (d) None

Q.17 Which pairing is wrong?

(a) $[Fe(H_2O)_6]^{2+}$ – paramagnetic (b) $[Fe(CN)_6]^{4-}$ – paramagnetic

(c) $[CoF_6]^{3-}$ – paramagnetic (d) $Ni(CO)_4$ – paramagnetic

Q.18 Formula of pitch blende is:

(a) UO_2 (b) U_3O_8 (c) UF_4 (d) None of these

Q.19 which of the following is the best method of preparation of acetophenone?

(a) $PhCOOEt + CH_3MgBr \rightarrow$ (b) $PhCOCl + CH_3MgBr \rightarrow$

(c) $PhCONH_2 + CH_3MgBr \rightarrow$ (d) $PhCN + CH_3MgBr \rightarrow$

Q.20 Dilute HCl is used to separate following radical:

(a) Ag^+ (b) Ca^{2+} (c) Sn^{2+} (d) Ba^{2+}

Q.21 Wilson Disease is caused by the excess of:

(a) Zinc (b) Copper (c) Magnesium (d) Lead

Q.22 In the compound $Fe_4[Fe(CN)_6]$ the respective oxidation states of Fe are:

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

Q.23 In vitro reaction of excess of O_2 with free heme B in aqueous medium, end product is

(a) Hematin (b) Heme B CO_2 (c) $[O_2^- - Fe(III) - protoporphyrin - IX]$ (d) All of these

Q.24 The main reason for large number of oxidation states exhibited by the actinoids than the corresponding lanthanoids is:

(a) More energy difference between 5f and 6d orbitals than between 4f and 5d orbitals.

(b) Less energy difference between 5f and 6d orbitals than between 4f and 5d orbitals.

(c) Larger atomic size of actinoids than the lanthanoids.

(d) Greater reactive nature of actinoids than the lanthanoids.

Q.25 Which of the following has zero dipole moment?

(a) ClF (b) PCl_3 (c) SiF_4 (d) $CFCl_3$

Q.26 The correct order of ionic radii of Y^{3+}, La^{3+}, Eu^{3+} and Lu^{3+} is:

(Atomic No. Y = 39, La = 57, Eu = 63, Lu = 71)

(a) $Y^{3+} < La^{3+} < Eu^{3+} < Lu^{3+}$ (b) $Y^{3+} < Lu^{3+} < Eu^{3+} < La^{3+}$

(c) $Lu^{3+} < Eu^{3+} < La^{3+} < Y^{3+}$ (d) $La^{3+} < Eu^{3+} < Lu^{3+} < Y^{3+}$

Q.27 $AgCl$ is soluble in ammonia due to the formation of:

(a) $Ag(NH_2)Cl$ (b) $[Ag(NH_2)_2]Cl$ (c) $AgNH_2$ (d) $NH_4[Ag(NH_2)Cl]$

Q.28 Hydrogen directly combines with:

(a) Au (b) Cu (c) Ni (d) Ca

Q.29 Which is used in filling cavities in teeth?

(a) Cu (Hg) (b) Ag (Hg) (c) Zn (Hg) (d) Ni (Hg)

Q.30 Mg^{2+} is prepared in photosynthesis by chlorophyll because:

(a) It has strong spin-orbit coupling (b) It has weak spin-orbit coupling

(c) It is a heavy metal (d) It binds strongly with chlorophyll

Q.31 In synthesis of Grignard reagent, alkyl halide reacts with *Mg* in presence of:

(a) An ester (b) Dry ether (c) Alcohol (d) Amide

Q.32 The strongest acidic strength is that of:

(a) C_2H_5OH (b) H_2O (c) HCN (d) Cl_3CCOOH

Q.33 In which one of the following species the central atom has the type of hybridisation which is not the same as that present in the other three?

(a) PCl_5 (b) SF_4 (c) I_3^- (d) $SbCl_5^{2-}$

Q.34 The Compton wave length of an electron, is expressed as:

(a) $\frac{\lambda_c}{2\pi} = \frac{h}{m}$ (b) $\frac{\lambda_c}{2\pi} = \frac{\hbar}{mc}$ (c) $\frac{\lambda_c}{2\pi} = \frac{h}{mc}$ (d) $\frac{\lambda_c}{2\pi} = \frac{\hbar}{mc}$

Q.35 If $\hat{A}$ and $\hat{B}$ are two operators such that $[\hat{A}, \hat{B}] = 1$, then value of $[\hat{A}, \hat{B}^2]$ is:

(a) $\hat{B}$ (b) $2\hat{B}$ (c) $\hat{A}$ (d) $2\hat{A}$

Q.36 Which of the following is correct relation?

(a) $S = RlnW$ (b) $S = klnW$ (c) $C_P = \left(\frac{\partial H}{\partial T}\right)_V$ (d) $C_V = \left(\frac{\partial E}{\partial T}\right)_P$

(all the symbols have their usual meanings.)

Q.37 The degrees of freedom present in the system comprised of a gas in equilibrium with its solution in liquid will be:

(a) 2 (b) 1 (c) 3 (d) None of these

Q.38 Polydispersity Index (PDI) of a polymer molecular is expressed as:

(a) $\frac{M_w}{M_n}$ (b) $\frac{M_n}{M_w}$ (c) $M_w \times M_n$ (d) $M_w + M_n$

Where M_w and M_n are mass-average molar mass and number-average molar mass of a polymer sample.

Q.39 The radius of $^{27}_{13}Al$ nucleons is:

(a) 4.5×10^{-14} m (b) 4.5×10^{-15} m (c) 4.5×10^{-13} m (d) 4.5×10^{-16} m

Q.40 The temperature at which the virial coefficient of a real gas is zero is called:

(a) Boiling point (b) Eutectic point (c) Boyle temperature (d) Critical temperature

Q.41 The internal pressure pf an ideal gas is:

(a) zero (b) infinite (c) 1 (d) None of these

Q.42 The standard state for a solid is:

(a) Pure state of the solid at one atmospheric pressure

(b) Pure state of the solid at one atmospheric pressure and 273K temperature

(c) Pure state of the solid at one atmospheric pressure and 298K temperature

(d) Pure state of the solid at one atmospheric pressure at any given temperature

Q.43 The Millar indices of crystal planes cut through the crystal axis at (2a, 3b, c) are:

(a) (1 2 2) (b) (2 3 6) (c) (6 3 2) (d) (3 2 6)

Q.44 Which one of the following statements is true?

(a) Work is a state fuction.

(b) Entropies are additive and probabilities are multiplicative.

(c) Entropies are multiplicative and probabilities are additive.

(d) The entropy possessed by substance at 298K is called residual Entropy.

Q.45 A liquid is in equilibrium with its vapours at its boiling point. The molecules in the two phases have the same:

(a) Chemical potential (b) Enthalpy (c) Entropy (d) Nine of these

Q.46 In which of the following reactions, the collision theory of reaction rate is valid?

(a) Reaction between two diatomic molecules (b) Reaction between an atom and a diatomic molecule

(c) Reaction between two complex molecules (d) Reaction between two atoms

Q.47 The cell potential is a/an

(a) Colligative property (b) Thermodynamic property

(c) Extensive property (d) Intensive property

Q.48 For an isentropic change of state:

(a) $dS = 0$ (b) $dS = 1$ (c) $dH = 0$ (d) None of these

Q.49 Isotonic solutions have same:

(a) Viscosity (b) Surface tension (c) Freezing point (d) Osmotic pressure

Q.50 The rotational spectrum of a rigid diatomic rotator is comprised of equally spaced lines with spacing equal to:

(a) B (b) 2B (c) 2.5B (d) 3B

Q.51 The critical temperature of a liquid having boiling point 73°C is:

(a) 246°C (b) 219°C (c) 182°C (d) None of these

Q.52 Which of the following will show an ESR spectrum?

(a) Cu^+ ion (b) N_2 molecule (c) Cu^{2+} ion (d) CH_4 molecule

Q.53 The ESR spectrum could be used to map molecular orbitals by unpaired electron, which is aided by McConnel equation. The said equation is:

(a) $Q = a\rho$ (b) $Q = a + \rho$ (c) $a = Q\rho$ (d) $Q = a - \rho$

Where ρ is the unpaired electron density on carbon atom and a is hyperfine splitting constant.

Q.54 The molecular which is IR inactive and Raman active is:

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

Q.55 The pH of an aqueous solution of 1×10^{-7} M HCl is:

(a) 7 (b) slightly lower than 7 (c) slightly higher than 7 (d) None of these

Q.56 When a beam of light is passed through a colloidal solution, it suffers:

(a) Reflection (b) Refraction (c) Scattering (d) All of these

Q.57 Dry ice is used in the fire extinguishers. It is stored in solid form in the cylinder. When sprayed on a fire, it quickly changes into gas called CO_2. The Change of state is known as:

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

Q.58 Milk is a/an

(a) Suspension (b) Pure solution (c) Gel (d) Emulsion

Q.59 The IR absorption at 1665 cm^{-1} in salicylic acid is due to;

(a) C – H bending (b) O – H stretching (c) C = O stretching (d) O – H bending

Q.60 Strong covalent bonds exist between polymer chains in:

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

Q.61 Which of the following statements about tetramethylsilane is incorrect?

(a) It is inert

(b) It is used to provide a reference against which other peaks are measured

(c) It is volatile and can be easily distilled off and used again

(d) It produces a single peak at $\delta = 10$

Q.62 The ionic strength of 0.25 molal K_2SO_4 solution will be:

(a) 0.25 (b) 0.50 (c) 0.75 (d) 0.60

Q.63 Debye-Hückel limiting law equation relates:

(a) Activity coefficient with ionic strength of the solution

(b) Mean ionic coefficient with ionic strength of the solution

(c) Activity coefficient with square of the ionic strength of the solution

(d) None of these

Q.64 In lead-acid battery during charging, the cathode reaction is

(a) Reduction of Pb^{2+} *to* Pb (b) Formation of $PbSO_4$

(c) Formation of PbO_2 (d) None of these

Q.65 In the phenomenon of Larmor pression, the angular frequency of pression, "Larmor frequency" is expressed as:

(a) $w = r + B_z$ (b) $w = r - B_z$ (c) $w = r / B_z$ (d) $w = rB_z$

where $r = \frac{\mu}{I(h/2\pi)}$ and all the notations have usual meaning.

Q.66 Which of the following relations represent Clasius-Clayperon equation?

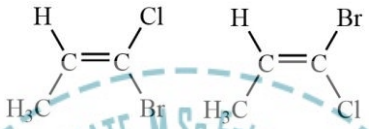
(a) $\left[\frac{\partial(G/T)}{\partial T}\right]_P = -\frac{H}{RT^2}$ (b) $\left[\frac{\partial(G/T)}{\partial T}\right]_P = H$ (c) $\frac{\partial lnk_P}{\partial T} = \frac{\Delta H^0}{RT^2}$ (d) $\frac{\partial lnP}{\partial T} = \frac{\Delta H^0_{vapourization}}{RT^2}$

Q.67 Which of the following reactions involves rearrangement of nitrogen yields?

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

(c) Sommlet-Hauser reaction (d) Pinacol-pinacolone reaction

Q.68 Following pair of compounds are:



(a) Enantiomers (b) Diastereomers (c) Geometrical isomers (d) Homomers

Q.69 Absolute configuration of:

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

Q.70 Which among the following reagents gives syn-addition with alkenes:

(1) Br_2 (2) Dil. $KMnO_4/OH^-$ (3) $OsOH/NaSO_3H/HOH$ (4) $H_2/Ni/\Delta$

Select the answer from the codes given below:

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

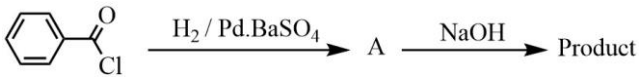
Q.71 Which of the following compounds shows a sharp IR absorption band at 1700 cm^{-1} and a broad band at 3300 cm^{-1}?

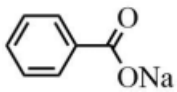
(a) Ethanol (b) Ethanoic acid (c) Propanone (d) Diethyl ether

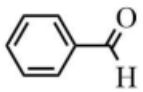
Q.72 A signal in NMR appears at 30Hz on a 60 MHz instrument. Same signal on a 400 MHz instrument will appear at:

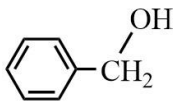
(a) 30 Hz (b) 90 Hz (c) 200 Hz (d) 400 Hz

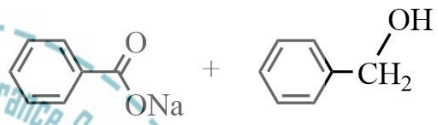
Q.73 The product in the reaction is:



(a) 

(b) 

(c) 

(d) 

Q.74 Which of the following compounds gives iodoform on reaction with *NaOH* and I_2?

(a) $CH_3CH_2\ CH_2OH$ (b) $CH_3\ CH_2\ CH(OH)\ CH_3$

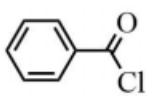
(c) $CH_3\ CH_2\ CO\ CH_2\ CH_3$ (d) $CH_3\ CH_2\ CH(CHO)\ CH_3$

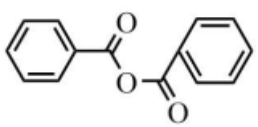
Q.75 Stability of $(CH_3)_3C^+$ can be explained by:

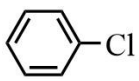
(a) Inductive effect (b) Mesomeric effect

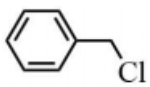
(c) Hyperconjugation (d) Both inductive effect and hyperconjugation

Q.76 Which of the following does not react with benzene in presence of anhydrous $AlCl_3$?

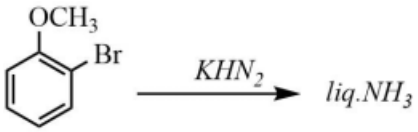
(a) 

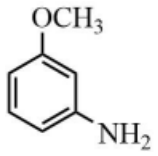
(b) 

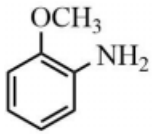
(c) 

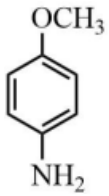
(d) 

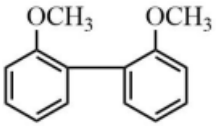
Q.77 The product obtained in below reaction is:



(a) 

(b) 

(c) 

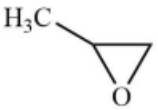
(d) 

Q.78 Phenol can be converted into salicylaldehyde using:

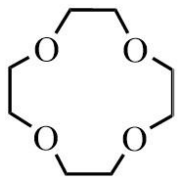
(a) Kolbe's reaction (b) Reimer-Tiemann reaction

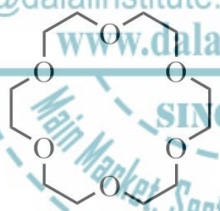
(c) Friedal crafts reaction (d) Cross aldol condensation

Q.79 $C_3H_6O(A)$ does not reduce Tollen's reagent, does not give iodoform test, but reacts with *HI*. A can be:

(a) CH_3COCH_3 (b) CH_3CH_2CHO (c) $CH_2 = CH–O– CH_3$ (d) 

Q.80 18-Crown-6 is represent by:

(a) 

(b) 

(c) Both are correct (d) None is correct

Q.81 Allylic halogen substitution can be done with:

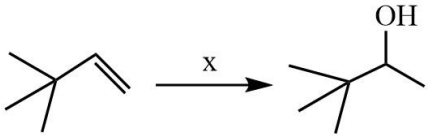
(a) Halogen at high temperature (b) NBS in sunlight

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

Q.82 Allylic alcohol is obtained when glycerol reacts with the following at 260°C:

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

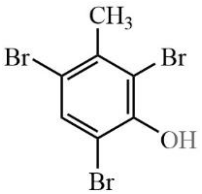
Q.83 X can be

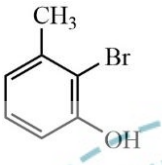


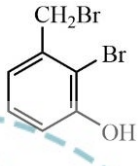
(a) $BH_3.THF / H_2O_2. {}^{-}OH$ (b) H_3O^+

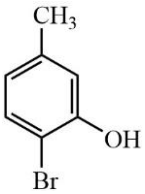
(c) $Hg(OAc)_2 / NaBH_4, NaOH$ (d) None

Q.84 m-cresol on bromination gives;

(a) 

(b) 

(c) 

(d) 

Q.85 Dipole moment is shown by:

(a) 2,2-dimethylpropane (b) Trans-2-pentene

(c) Trans-1,2-dichloroethene (d) 2,2,3,3-tetrabromobutane

Q.86 Which of the following does not give white precipitate when boiled with alcoholic silver nitrate?

(a) Methyl chloride (b) Carbon tetrachloride (c) Benzyl chloride (d) Vinyl chloride

Q.87 The formation of cyanohydrin from a ketone is an example of:

(a) Electrophilic addition (b) Nucleophilic addition

(c) Electrophilic substitution (d) Nucleophilic substitution

Q.88 When acetaldehyde is heated with Fehling solution it gives a precipitate of:

(a) *Cu* (b) *CuO* (c) Cu_2O (d) *Cu, CuO and* Cu_2O

Q.89 In the cannizaro reaction given below

$$2PhCHO \xrightarrow{\ominus OH} PhCH_2OH + PhCOO^{\ominus}$$

the slowest step is:

(a) Attack of $^{\ominus}OH$ at the carbonyl group

(b) Transfer of hydride to carbonyl group

(c) The abstraction of proton from carboxylic acid

(d) The deprotonation of $PhCH_2OH$

Q.90 Which of the following carboxylic acids undergo decarboxylation easily?

(a) $C_6H_5COCH_2COOH$

(b) $C_6H_5COCOOH$

(c) $C_6H_5CH(OH)COOH$

(d) $C_6H_5CH(NH_2)\,COOH$

Q.91 In benzylic acid rearrangement:

(a) Benzaldehyde is converted to benzoin

(b) Benzoin is converted to Benzylic acid

(c) Benzylic acid is converted to benzoin

(d) Benzil is converted to benzylic acid

Q.92 Grignard reagent shows addition on:

(a) – C = O (b) – C = S (c) – C ≡ N (d) All

Q.93 A positive carbylamines test is given by:

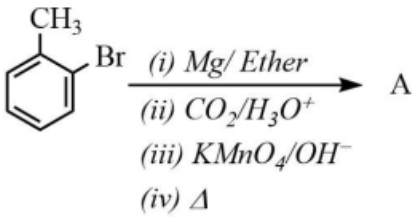
(a) N, N-Dimethylaniline

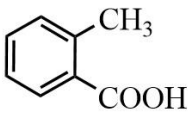
(b) 2, 4-Dimethylaniline

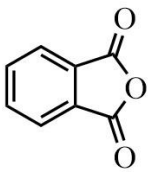
(c) N, N-dimethyl-p-nitroaniline

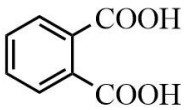
(d) p-methyl benzylamine

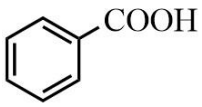
Q.94 A is:



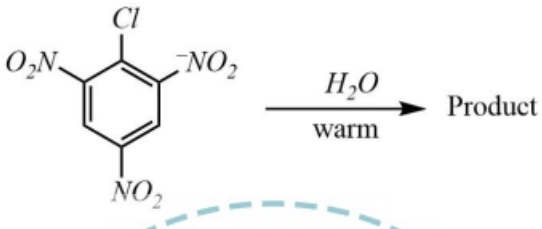
(a) 

(b) 

(c) 

(d) 

Q.95 Product is:



(a) Picric acid

(b) Phenol

(c) Chlorobenzene

(d) No reaction since (*C-Cl*) bond is stable

Q.96 A and B are:

(a) $HO-C_6H_5-NO, (CH_3)_2NH$

(b) $HO-C_6H_5-OH, (CH_3)_2NH$

(c) $HO-C_6H_5-NO, CH_3CH_2NH_2$

(d) None is correct

Q.97 A β-hydroxy carbonyl compound is obtained by the action of *NaOH* on:

(a) $R_3C.CHO$ (b) C_6H_5CHO (c) CH_3CHO (d) $HCHO$

Q.98 Which have acidic H, but not reacting with $NaHCO_3$?

(a) CH_3COOH (b) C_6H_5OH (c) CH_3COCH_2CN (d) NH_3

Q.99 Predominant product formed when *HCl* adds to2,4-hexadiene is:

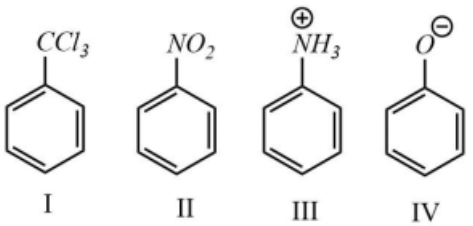
(a) 4-chloro-2-hexene

(b) 2-chloro-3-hexene

(c) 2-chloro-4-hexene

(d) 1-chloro-2-hexene

Q.100 Electrophilic NO_2^+ attacks the following:



In which cases NO_2^+ will be at meta position:

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

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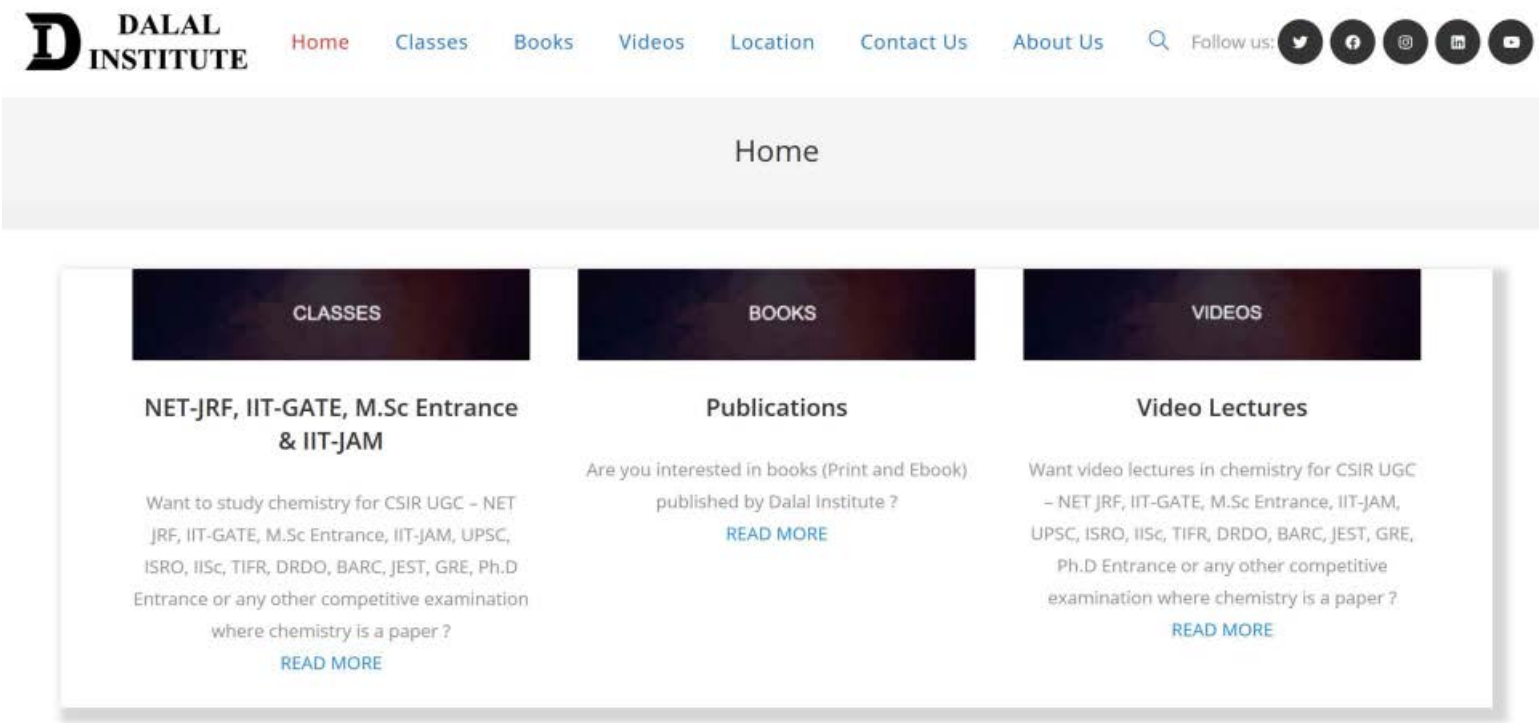

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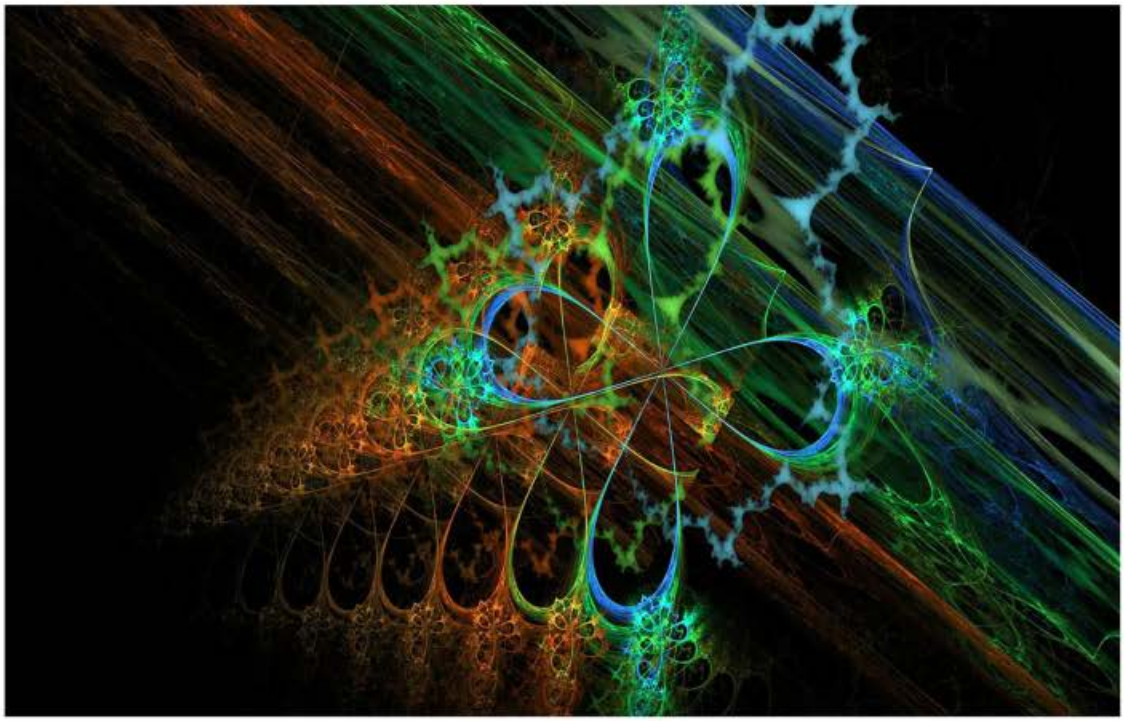

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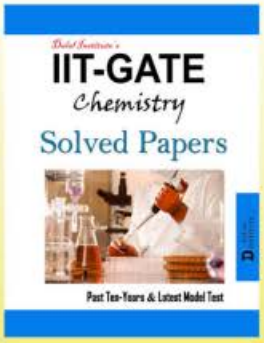

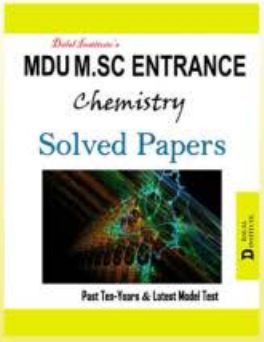

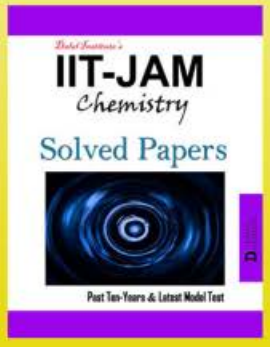

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