

Question No.	Questions
1.	Which atom requires the least amount of energy to form its cation ? (1) Na (2) Rb (3) Al (4) Mg
2.	When an electron is added to a gaseous atom : (1) its size decreases (2) energy is released (3) it changes to positive ion (4) its tendency to accept electron increases
3.	According to VSEPR theory, the geometry of $ICl_2^-$ ion is : (1) trigonal planar (2) square planar (3) angular (4) linear
4.	During the change of $NO^+$ to $NO$ , the electron is added in a : (1) $\sigma$ -orbital (2) $\pi$ -orbital (3) $\sigma^*$ -orbital (4) $\pi^*$ -orbital
5.	The molecular orbital configuration of $B_2$ molecule is : (1) $KK (\sigma 2s)^2 (\sigma 2p)^2 (\sigma^* 2s)^2$ (2) $KK (\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2pz)^2$ (3) $KK (\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2px)^1 (\pi 2py)^1$ (4) $KK (\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2px)^2$
6.	Which of the following is not a hard acid ? (1) $Na^+$ (2) $Mg^{2+}$ (3) $Pd^{2+}$ (4) $Ti^{4+}$



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13.	There is no S-S bond in : (1) $S_2O_4^{2-}$ (2) $S_2O_5^{2-}$ (3) $S_2O_3^{2-}$ (4) $S_2O_7^{2-}$
14.	Polyphosphates are used as water softening agents because they : (1) form soluble complexes with anionic species (2) precipitate anionic species (3) form soluble complexes with cationic species (4) precipitate cationic species
15.	Which of the following is paramagnetic ? (1) $Cu^{2+}$ (2) $Ag^+$ (3) $Zn^{2+}$ (4) $Au^+$
16.	$KMnO_4$ on heating gives : (1) $K_2MnO_4, Mn_2O_3$ (2) $K_2MnO_4, MnO, O_2$ (3) $K_2MnO_4, MnO_2, O_2$ (4) $K_2MnO_4, MnO_2, O_3$
17.	Which of the following is an organometallic compound ? (1) Lithium methoxide (2) Lithium acetate (3) Lithium dimethylamide (4) Methyl lithium
18.	The IUPAC name of $[Pt(NH_3)_4NO_2Cl]SO_4$ is : (1) chloronitrotetraammine platinum (IV) sulphate (2) tetraamminechloronitro platinum (IV) sulphate (3) nitrochlorotetraammine platinum (IV) sulphate (4) platinum (IV) tetraamminenitrochloro sulphate

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19.	<p>The type of magnetism exhibited by <math>[\text{Mn}(\text{H}_2\text{O})_6]^{2+}</math> ion is :</p> <p>(1) diamagnetism                      (2) paramagnetism  (3) ferromagnetism                    (4) antiferromagnetism</p>
20.	<p>Which of the following organometallic compound does not obey EAN rule ?</p> <p>(1) <math>\text{CO}(\text{CO})_3 (\pi\text{-C}_3\text{H}_5)</math>                      (2) <math>(\text{C}_2\text{H}_5) \text{Cr}(\text{CO})_3 (\pi\text{-C}_2\text{H}_5)</math>  (3) <math>[\text{Mn}(\text{CO})_5 (\text{C}_2\text{H}_5)^+</math>                      (4) <math>\text{Co} (\text{C}_6\text{H}_6)_2</math></p>
21.	<p>Wilkinson's catalyst is used for :</p> <p>(1) hydrogenation of alkenes    (2) hydrogenation of alkynes  (3) hydrogenation of alkanes    (4) hydrogenation of unsaturated oils</p>
22.	<p>An aqueous solution contains <math>\text{Hg}^+</math>, <math>\text{Pb}^{2+}</math> and <math>\text{Cd}^{2+}</math>. The addition of 6N <math>\text{HCl}</math> precipitates :</p> <p>(1) <math>\text{Hg}_2\text{Cl}_2</math> only                      (2) <math>\text{PbCl}_2</math> only  (3) <math>\text{Hg}_2\text{Cl}_2 + \text{PbCl}_2</math>                      (4) <math>\text{PbCl}_2 + \text{HgCl}_2</math></p>
23.	<p>Which one among the following pairs cannot be separated by <math>\text{H}_2\text{S}</math> in dil <math>\text{HCl}</math> ?</p> <p>(1) <math>\text{Bi}^{3+}</math>, <math>\text{Sn}^{4+}</math>                      (2) <math>\text{Al}^{3+}</math>, <math>\text{Hg}^{2+}</math>  (3) <math>\text{Zn}^{2+}</math>, <math>\text{Sn}^{4+}</math>                      (4) <math>\text{Ni}^{2+}</math>, <math>\text{Cu}^{2+}</math></p>
24.	<p>Oxymyoglobin contains :</p> <p>(1) <math>\text{O}_2</math> at trans position to histidine chain  (2) <math>\text{O}_2</math> in the hole of porphyrin  (3) <math>\text{O}_2</math> bonded by coordinated bond to <math>\text{Mg} (\text{II})</math>  (4) does not contain <math>\text{O}_2</math></p>











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45.	<p>The correct statement about the difference of second and first excited state energies (<math>\Delta E</math>) of a particle in 1-D, 2-D square and 3-D cubic boxes with same length for each, is :</p> <p>(1) <math>\Delta E</math> (1 - D box) = <math>\Delta E</math> (2 - D box) = <math>\Delta E</math> (3 - D box)            (2) <math>\Delta E</math> (1 - D box) &gt; <math>\Delta E</math> (2 - D box) &gt; <math>\Delta E</math> (3 - D box)            (3) <math>\Delta E</math> (1 - D box) &gt; <math>\Delta E</math> (2 - D box) = <math>\Delta E</math> (3 - D box)            (4) <math>\Delta E</math> (1 - D box) &lt; <math>\Delta E</math> (2 - D box) &lt; <math>\Delta E</math> (3 - D box)</p>
46.	<p>According to Eyring transition state theory for a bimolecular reaction, the activated complex has :</p> <p>(1) no vibrational degrees of freedom.            (2) vibrational degrees of freedom but they never participate in product formation.            (3) one high frequency vibration that leads to product formation.            (4) one low frequency vibration that leads to product formation.</p>
47.	<p>The molecule with the smallest rotational constant (in the microwave spectrum) among the following is :</p> <p>(1) <math>N \equiv CH</math> (2) <math>HC \equiv CCl</math>            (3) <math>ClC \equiv CF</math> (4) <math>B \equiv CCl</math></p>
48.	<p>The electronic transition energy from <math>\pi_1 \rightarrow \pi_2</math> in propenyl radical is 4.8 eV. Within the frame work of Huckel theory, the transitions energy from <math>\pi_1 \rightarrow \pi_3</math> would be :</p> <p>(1) 2.4 eV (2) 4.8 eV            (3) 14.4 eV (4) 9.6 eV</p>



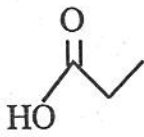
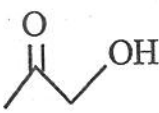
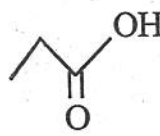

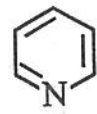
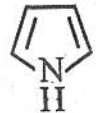
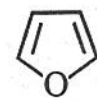
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54.	<p>An element exists in two crystallographic modifications with FCC and BCC structures. The ratio of the densities of the FCC and BCC modifications in terms of the volumes of their unit cells (<math>V_{\text{FCC}}</math> and <math>V_{\text{BCC}}</math>) is :</p> <p>(1) <math>V_{\text{BCC}} : V_{\text{FCC}}</math>                      (2) <math>2V_{\text{BCC}} : V_{\text{FCC}}</math>  (3) <math>V_{\text{BCC}} : 2V_{\text{FCC}}</math>                      (4) <math>V_{\text{BCC}} : \frac{1}{2} V_{\text{FCC}}</math></p>
55.	<p>One molecular orbital of a polar molecule AB has the form <math>C_A \Psi_A + C_B \Psi_B</math>, where <math>\Psi_A</math> and <math>\Psi_B</math> are normalized atomic orbitals centred on A and B, respectively. The electron in this orbital is found on atom B with a probability of 90%. Neglecting the overlap between <math>\Psi_A</math> and <math>\Psi_B</math>, a possible set of <math>C_A</math> and <math>C_B</math> is :</p> <p>(1) <math>C_A = 0.95, C_B = 0.32</math>                      (2) <math>C_A = 0.32, C_B = 0.95</math>  (3) <math>C_A = -0.32, C_B = 0.95</math>                      (4) <math>C_A = 0.32, C_B = -0.95</math></p>
56.	<p>The first order rate constant for a unimolecular gas phase reaction <math>A \rightarrow</math> products that follows Lindemann mechanism is <math>2.0 \text{ s}^{-1}</math> at <math>p_A = 1 \text{ atm}</math> and <math>4.0 \text{ s}^{-1}</math> at <math>p_A = 2 \text{ atm}</math>. The rate constant for the activation step is :</p> <p>(1) <math>1.0 \text{ atm}^{-1} \text{ s}^{-1}</math>                      (2) <math>4.0 \text{ atm}^{-1} \text{ s}^{-1}</math>  (3) <math>2.0 \text{ atm}^{-1} \text{ s}^{-1}</math>                      (4) <math>8.0 \text{ atm}^{-1} \text{ s}^{-1}</math></p>
57.	<p>A reversible expansion of 1.0 mol of an ideal gas is carried out from 1.0 L to 4.0 L under isothermal condition at 300K. <math>\Delta G</math> for this process is :</p> <p>(1) <math>300R \ln 2</math>                      (2) <math>600R \ln 2</math>  (3) <math>-600R \ln 2</math>                      (4) <math>300 \ln 2</math></p>
58.	<p>Upon application of a weak magnetic field, a line in the microwave absorption spectrum of rigid rotor splits into 3 lines. The quantum number (J) of the rotational energy level from which the transition originates is :</p> <p>(1) 0                      (2) 1  (3) 2                      (4) 3</p>

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59.	<p>For a particle of mass <math>m</math> confined in a rectangular box with sides <math>2a</math> and <math>a</math>, the energy and degeneracy of the first excited state, respectively, are :</p> <p>(1) <math>\frac{h^2}{8m} \left( \frac{2}{a^2} \right), 1</math>                      (2) <math>\frac{h^2}{8m} \left( \frac{17}{4a^2} \right), 2</math></p> <p>(3) <math>\frac{h^2}{8m} \left( \frac{5}{4a^2} \right), 1</math>                      (4) <math>\frac{h^2}{8m} \left( \frac{5}{a^2} \right), 2</math></p>
60.	<p>For the chemical reaction in aqueous solution,</p> $\text{CH}_2\text{ClCOO}^- + \text{OH}^- \rightarrow \text{CH}_2\text{OHCOO}^- + \text{Cl}^-$ <p>the correct statement is :</p> <p>(1) increase of pressure increases the rate constant</p> <p>(2) increase of dielectric constant increases the rate constant</p> <p>(3) increase of ionic strength decreases the rate constant</p> <p>(4) the entropy of activation is positive</p>
61.	<p>In simple molecular orbital theory of hydrogen molecule, bonding <math>\sigma_g</math> and anti-bonding <math>\sigma_u</math> molecular orbitals are constructed as linear combinations of atomic orbitals of two hydrogen atoms. The spatial part of a purely covalent singlet wavefunction is obtained by :</p> <p>(1) <math>\sigma_g^2 + \sigma_u^2</math>                      (2) <math>\sigma_g^2</math></p> <p>(3) <math>\sigma_g^2 - \sigma_u^2</math>                      (4) <math>\sigma_g^2 + \frac{1}{2} \sigma_u^2</math></p>
62.	<p>The simultaneous eigen functions of angular momentum operators <math>L^2</math> and <math>L_z</math> are :</p> <p>(1) all of <math>2s, 2p_x, 2p_y</math> and <math>2p_z</math> orbitals    (2) only <math>2s, 2p_x,</math> and <math>2p_y</math> orbitals</p> <p>(3) only <math>2s</math> and <math>2p_z</math> orbitals                      (4) only <math>2p_z</math> orbital</p>

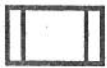



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63.	The single-particle partition function ( $f$ ) for a certain system has the form $f = A Ve^{BT}$ . The average energy per particle will then be ( $k$ is the Boltzmann constant) : (1) $BkT$ (2) $BkT^2$ (3) $kT/B$ (4) $kT/B^2$
64.	Which of the following statements is INCORRECT ? (1) A Slater determinant is an antisymmetrized wave function (2) Electronic wavefunction should be represented by Slater determinants (3) A Slater determinant always corresponds to a particular spin state (4) A Slater determinant obeys the Pauli exclusion principle
65.	1 poise is equal to : (1) $10 \text{ N sm}^{-2}$ (2) $100 \text{ N sm}^{-2}$ (3) $1/100 \text{ N sm}^{-2}$ (4) $1/10 \text{ N sm}^{-2}$
66.	Find the probability of the link in polymers where average values of links are : (1) (a) 0.99, (b) 0.98 and (c) 0.90 (2) (a) 0.98, (b) 0.90, (c) 0.99 (3) (a) 0.90, (b) 0.98, (c) 0.99 (4) (a) 0.90, (b) 0.99, (c) 0.98
67.	Which of the following can not react as a nucleophile ? (1) $(\text{CH}_3)_3\text{O}^+$ (2) $(\text{CH}_3)_3\text{B}$ (3) $(\text{CH}_3)_3\text{CH}$ (4) $(\text{CH}_3)_3\text{N}$
68.	Which of the following reacts by the E1 mechanism ? (1) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$ (2) $(\text{CH}_3)_2\text{CHCH}_2\text{Br}$ (3) $(\text{CH}_3)_3\text{CBr}$ (4) $\text{CH}_3\text{CH}_2\underset{\text{Br}}{\text{CH}}-\text{CH}_3$

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69.	Nicotine alkaloid belong to : (1) Phenylethylamine group    (2) Indole group (3) Pyrrolidine-Pyridine group    (4) Iso quinoline group
70.	The protein in which prosthetic group is carbohydrate are known as : (1) Chromoprotein                      (2) Lipoprotein (3) Nucleoprotein                      (4) Mucoprotein
71.	Which one of the following is most abundant of all the hydrocarbons pollutants in the atmosphere ? (1) Methane                              (2) HCH (3) Benzene                              (4) Propane
72.	Which of the following is not one of the twelve principles of green chemistry ? (1) Minimising the use of solvents (2) Using high temperatures to speed up reactions (3) Maximisation of atom economy (4) Minimising toxic reagents used in a synthesis
73.	How many signals does the unsaturated ketone $(\text{CH}_3)_2\text{CHCH}_2\text{C(O)CH}=\text{CH}_2$ have in $^1\text{H}$ NMR and $^{13}\text{C}$ NMR spectra ? (1) Five $^1\text{H}$ signals and six $^{13}\text{C}$ signals (2) Five $^1\text{H}$ signals and seven $^{13}\text{C}$ signals (3) Six $^1\text{H}$ signals and seven $^{13}\text{C}$ signals (4) Six $^1\text{H}$ signals and six $^{13}\text{C}$ signals


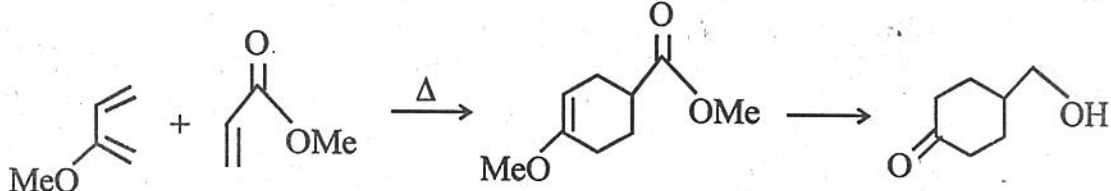
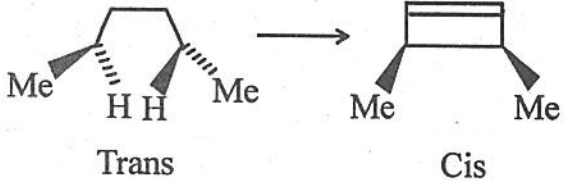
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74.	A single strong absorption near $1800\text{ cm}^{-1}$ in IR spectroscopy indicates the presence of : (1) Thioketones (2) Sulphoxide (3) Acid halide (4) Azo compounds
75.	Which of the following statements is true ? (1) Drugs are generally smaller than drug targets. (2) Drugs and drug targets generally have similar molecular weights. (3) Drugs are generally larger than drug targets (4) There is no general rule regarding the relative size of drugs and their targets
76.	Oxidative cleavage of pent-2-yne with alkaline $\text{KMnO}_4$ gives : (1) Ethanoic acid (2) Propanoic acid (3) Pentanone (4) 2-Methyl propanoic acid
77.	Which reaction will not provide a synthesis of 1, 1-diphenylethanol ? (1) $\text{Ph}_2\text{C=O} + \text{MeMgBr} \xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) Et}_2\text{O}}$ (2) $\text{PhC(=O)Me} + \text{PhMgBr} \xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) Et}_2\text{O}}$ (3) $\text{PhCHO} + \text{PhCH}_2\text{MgBr} \xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) Et}_2\text{O}}$ (4) $\text{CH}_3\text{COOEt} + 2\text{PhMgBr} \xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) Et}_2\text{O}}$




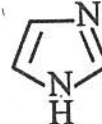
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78.	<p>Which compound is not a carboxylic acid ?</p> <p>(1) <math>\text{CH}_3\text{CH}_2\text{CH}_2\overset{\text{O}}{\parallel}\text{C}-\text{OH}</math>      (2) </p> <p>(3)       (4) </p>
79.	<p>Which of the following is most reactive in electrophilic aromatic substitution ?</p> <p>(1)       (2) </p> <p>(3)       (4) </p>
80.	<p>The IUPAC name of the compound shown below is :</p> $\text{CH}_3-\overset{\text{Cl}}{\underset{ }{\text{CH}}}-\overset{\text{CH}_3}{\underset{ }{\text{C}}}=\text{CHCH}_3$ <p>(1) 3-Methyl-4-chloropent-2-ene      (2) 4-chloro-3-methyl pent-2-ene  (3) 2-chloro-3-methyl pent-3-ene      (4) 3-Methyl-2-chloro pent-3-ene</p>
81.	<p>The organic chloro compound, which shows complete stereochemical inversion during a <math>\text{S}_\text{N}^2</math> reaction is :</p> <p>(1) <math>\text{CH}_3\text{Cl}</math>      (2) <math>(\text{C}_2\text{H}_5)_2\text{CHCl}</math>  (3) <math>(\text{CH}_3)_3\text{CCl}</math>      (4) <math>(\text{CH}_3)_2\text{CHCl}</math></p>
82.	<p>What intermolecular force is most responsible for molecular iodine, <math>\text{I}_2</math> being a solid at room temperature ?</p> <p>(1) Dipole-dipole      (2) Ionic-bonding  (3) Ion-dipole      (4) London dispersion force</p>



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83.	<p>The process of separation of enantiomers from a racemic mixture is known as :</p> <p>(1) Racemic modification                      (2) Resolution  (3) Inversion                                      (4) Specific rotation</p>
84.	<p>Which one of the following is aromatic compound ?</p> <p>(1)                       (2) </p> <p>(3)                       (4) </p>
85.	<p>The conversion of cis-isomers to trans-isomers or trans-isomers to cis-isomers is known as :</p> <p>(1) Conformations                                      (2) Diaxial interaction  (3) Conformational analysis                      (4) Stereomutation</p>
86.	<p>Which of the following statements regarding cyclopropene is wrong ?</p> <p>(1) It is cyclic  (2) It does not exhibit continuous delocalization  (3) It obeys Huckel's rule  (4) It is aromatic</p>
87.	<p>Which of the following is the most stable carbocation ?</p> <p>(1) <math>C_6H_5\overset{+}{C}H_2</math>                                      (2) <math>CH_3\overset{+}{C}H_2</math>  (3) <math>C_6H_5\overset{+}{C}HC_6H_5</math>                                      (4) <math>C_6H_5CH_2\overset{+}{C}H_2</math></p>
88.	<p>Which of the following is an electrophile ?</p> <p>(1) <math>H_2O</math>    (2) <math>AlCl_3</math>  (3) <math>NH_3</math>    (4) <math>C_2H_5NH_2</math></p>


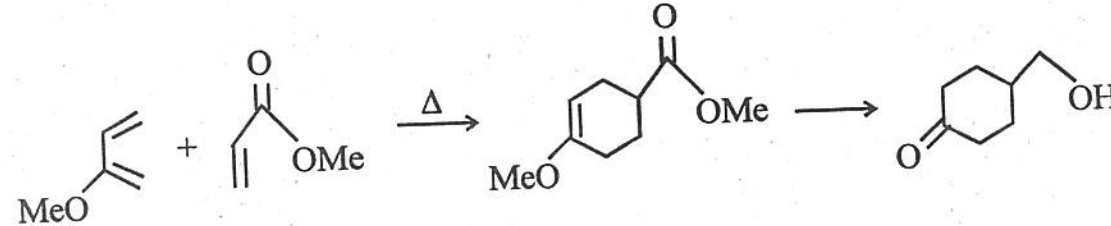
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89.	<p>The most reactive nucleophile among the following is :</p> <p>(1) <math>\text{C}_6\text{H}_5\text{O}^-</math> (2) <math>(\text{CH}_3)_3\text{CO}^-</math></p> <p>(3) <math>\text{CH}_3\text{O}^-</math> (4) <math>(\text{CH}_3)_2\text{CHO}^-</math></p>
90.	<p>A group whose use makes possible to react a less reactive functional group selectively in the presence of a more reactive group is known as :</p> <p>(1) Umpolung (2) Synthons</p> <p>(3) Synthetic equivalent (4) Protecting group</p>
91.	<p>Which of the following definitions of an asymmetric reaction is the most accurate ?</p> <p>(1) A reaction that involves a chiral reagent.</p> <p>(2) A reaction that creates a new chiral centre in the product.</p> <p>(3) A reaction which creates a new chiral centre with selectivity for one enantiomer/diastereoisomer over another.</p> <p>(4) A reaction that is carried out on an asymmetric starting material</p>
92.	<p>What is meant by a reaction going in 94% enantiomeric excess ?</p> <p>(1) The product contains 94% of one enantiomer and 6% of the other enantiomer.</p> <p>(2) The product contains an enantiomer which is 94% pure.</p> <p>(3) The product contains 94% of one enantiomer and 6% of other products</p> <p>(4) The product contains 97% of an enantiomer and 3% of other enantiomer.</p>

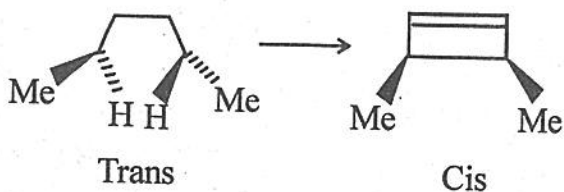
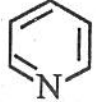


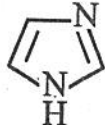
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93.	<p>Which reaction condition are not appropriate for the following transformation ?</p>  <p>(1) <math>\text{Zn (Hg) / HCl}</math>      (2) <math>\text{NH}_2\text{NH}_2 / \text{NaOH}</math>  (3) <math>\text{LiAlH}_4 / \text{Et}_2\text{O}</math>      (4) <math>\text{HS-CH}_2\text{CH}_2\text{CH}_2\text{SH} / \text{H}^+</math>, then <math>\text{H}_2 / \text{Ni}</math></p>
94.	<p>4-Hydroxymethyl cyclohexanone can be synthesized from a Diels-Alder adduct in the following reactions. Which combination of reagents is appropriate for the second step ?</p>  <p>(1) (i) <math>\text{NaBH}_4 / \text{MeOH}</math> ; (ii) <math>\text{H}_3\text{O}^+</math>  (2) (i) <math>\text{NaBH}_4 / \text{THF}</math> ; (ii) <math>\text{NaOH} / \text{H}_2\text{O}</math>  (3) (i) <math>\text{LiAlH}_4 / \text{Et}_2\text{O}</math> ; (ii) <math>\text{H}_3\text{O}^+</math>  (4) (i) <math>\text{LiAlH}_4 / \text{Et}_2\text{O}</math> ; (ii) <math>\text{NaOH} / \text{H}_2\text{O}</math></p>
95.	<p>The following transformation is feasible by :</p>  <p>(1) Thermal disrotatory process  (2) Photochemical disrotatory process  (3) Thermal conrotatory process  (4) Photo chemical conrotatory process</p>

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96.	<p>Which compound is most basic ?</p> <p>(1)  (2) </p> <p>(3)  (4) </p>
97.	<p>Which one of the following gas is responsible for maximum contribution in green house effect ?</p> <p>(1) CFC (2) O<sub>2</sub></p> <p>(3) CO<sub>2</sub> (4) CH<sub>4</sub></p>
98.	<p>The <sup>13</sup>C chemical shifts normally range between :</p> <p>(1) δ = 0-200 ppm (2) δ = 100-200 ppm</p> <p>(3) δ = 50-100 ppm (4) δ = 200-250 ppm</p>
99.	<p>What is meant by a drug's 'specification' ?</p> <p>(1) The molecular dimensions of the molecule</p> <p>(2) The physical properties of a drug</p> <p>(3) The purity tests and purity standards required for a drug</p> <p>(4) The functional groups on a drug that are important to its activity</p>
100.	<p>The order of aromaticity of furan, thiophene and pyrrole is as :</p> <p>(1) Thiophene &gt; furan &gt; pyrrole</p> <p>(2) Furan &gt; Pyrrole &gt; thiophene</p> <p>(3) Thiophene &gt; Pyrrole &gt; furan</p> <p>(4) Pyrrole &gt; thiophene &gt; furan</p>

Question No.	Questions
1.	<p>The reaction</p> ${}^2_1\text{D} + {}^7_4\text{T} \longrightarrow {}^4_2\text{He} + {}^1_0\text{n}$ <p>is an example of :</p> <p>(1) nuclear fission                      (2) nuclear fusion  (3) artificial radioactivity              (4) radioactive disintegration</p>
2.	<p>The inert pair effect is predominant in :</p> <p>(1) Si    (2) Ge  (3) Sn                                         (4) Pb</p>
3.	<p>There is no S-S bond in :</p> <p>(1) <math>\text{S}_2\text{O}_4^{2-}</math>                                  (2) <math>\text{S}_2\text{O}_5^{2-}</math>  (3) <math>\text{S}_2\text{O}_3^{2-}</math>                                  (4) <math>\text{S}_2\text{O}_7^{2-}</math></p>
4.	<p>Polyphosphates are used as water softening agents because they :</p> <p>(1) form soluble complexes with anionic species  (2) precipitate anionic species  (3) form soluble complexes with cationic species  (4) precipitate cationic species</p>
5.	<p>Which of the following is paramagnetic ?</p> <p>(1) <math>\text{Cu}^{2+}</math>                                      (2) <math>\text{Ag}^+</math>  (3) <math>\text{Zn}^{2+}</math>                                      (4) <math>\text{Au}^+</math></p>
6.	<p><math>\text{KMnO}_4</math> on heating gives :</p> <p>(1) <math>\text{K}_2\text{MnO}_4, \text{Mn}_2\text{O}_3</math>                      (2) <math>\text{K}_2\text{MnO}_4, \text{MnO}, \text{O}_2</math>  (3) <math>\text{K}_2\text{MnO}_4, \text{MnO}_2, \text{O}_2</math>                  (4) <math>\text{K}_2\text{MnO}_4, \text{MnO}_2, \text{O}_3</math></p>

Question No.	Questions
7.	Which of the following is an organometallic compound ? (1) Lithium methoxide                      (2) Lithium acetate (3) Lithium dimethylamide                (4) Methyl lithium
8.	The IUPAC name of $[\text{Pt}(\text{NH}_3)_4\text{NO}_2\text{Cl}]\text{SO}_4$ is : (1) chloronitrotetraammine platinum (IV) sulphate (2) tetraamminechloronitro platinum (IV) sulphate (3) nitrochlorotetraammine platinum (IV) sulphate (4) platinum (IV) tetraamminenitrochloro sulphate
9.	The type of magnetism exhibited by $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ ion is : (1) diamagnetism                              (2) paramagnetism (3) ferromagnetism                            (4) antiferromagnetism
10.	Which of the following organometallic compound does not obey EAN rule ? (1) $\text{CO}(\text{CO})_3 (\pi\text{-C}_3\text{H}_5)$ (2) $(\text{C}_2\text{H}_5) \text{Cr}(\text{CO})_3 (\pi\text{-C}_2\text{H}_5)$ (3) $[\text{Mn}(\text{CO})_5 (\text{C}_2\text{H}_5)^+$ (4) $\text{Co} (\text{C}_6\text{H}_6)_2$
11.	Which of the following definitions of an asymmetric reaction is the most accurate ? (1) A reaction that involves a chiral reagent. (2) A reaction that creates a new chiral centre in the product. (3) A reaction which creates a new chiral centre with selectivity for one enantiomer/diastereoisomer over another. (4) A reaction that is carried out on an asymmetric starting material

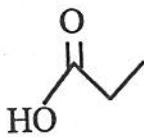
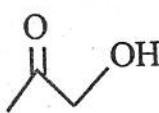
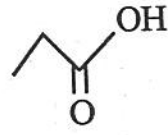

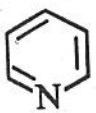
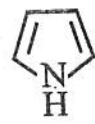
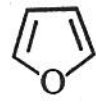
Question No.	Questions
12.	<p>What is meant by a reaction going in 94% enantiomeric excess ?</p> <p>(1) The product contains 94% of one enantiomer and 6% of the other enantiomer.</p> <p>(2) The product contains an enantiomer which is 94% pure.</p> <p>(3) The product contains 94% of one enantiomer and 6% of other products</p> <p>(4) The product contains 97% of an enantiomer and 3% of other enantiomer.</p>
13.	<p>Which reaction condition are not appropriate for the following transformation ?</p> <div style="text-align: center;">  </div> <p>(1) Zn (Hg) / HCl      (2) NH<sub>2</sub>NH<sub>2</sub> / NaOH</p> <p>(3) LiAlH<sub>4</sub> / Et<sub>2</sub>O      (4) HS CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>SH / H<sup>+</sup>, then H<sub>2</sub> / Ni</p>
14.	<p>4-Hydroxymethyl cyclohexanone can be synthesized from a Diels-Alder adduct in the following reactions. Which combination of reagents is appropriate for the second step ?</p> <div style="text-align: center;">  </div> <p>(1) (i) NaBH<sub>4</sub> / MeOH ; (ii) H<sub>3</sub>O<sup>+</sup></p> <p>(2) (i) NaBH<sub>4</sub> / THF ; (ii) NaOH / H<sub>2</sub>O</p> <p>(3) (i) LiAlH<sub>4</sub> / Et<sub>2</sub>O ; (ii) H<sub>3</sub>O<sup>+</sup></p> <p>(4) (i) LiAlH<sub>4</sub> / Et<sub>2</sub>O ; (ii) NaOH / H<sub>2</sub>O</p>

Question No.	Questions
15.	<p>The following transformation is feasible by :</p> <div style="text-align: center;">  <p style="margin-left: 100px;">Trans</p> <p style="margin-left: 200px;">Cis</p> </div> <p>(1) Thermal disrotatory process            (2) Photochemical disrotatory process            (3) Thermal conrotatory process            (4) Photo chemical conrotatory process</p>
16.	<p>Which compound is most basic ?</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>(1) </p> </div> <div style="text-align: center;"> <p>(2) </p> </div> <div style="text-align: center;"> <p>(3) </p> </div> <div style="text-align: center;"> <p>(4) </p> </div> </div>
17.	<p>Which one of the following gas is responsible for maximum contribution in green house effect ?</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>(1) CFC</p> <p>(3) CO<sub>2</sub></p> </div> <div style="text-align: center;"> <p>(2) O<sub>2</sub></p> <p>(4) CH<sub>4</sub></p> </div> </div>
18.	<p>The <sup>13</sup>C chemical shifts normally range between :</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>(1) δ = 0-200 ppm</p> <p>(3) δ = 50-100 ppm</p> </div> <div style="text-align: center;"> <p>(2) δ = 100-200 ppm</p> <p>(4) δ = 200-250 ppm</p> </div> </div>
19.	<p>What is meant by a drug's "specification" ?</p> <p>(1) The molecular dimensions of the molecule            (2) The physical properties of a drug            (3) The purity tests and purity standards required for a drug            (4) The functional groups on a drug that are important to its activity</p>



Question No.	Questions				
20.	<p>The order of aromaticity of furan, thiophene and pyrrole is as :</p> <ol style="list-style-type: none"><li>(1) Thiophene &gt; furan &gt; pyrrole</li><li>(2) Furan &gt; Pyrrole &gt; thiophene</li><li>(3) Thiophene &gt; Pyrrole &gt; furan</li><li>(4) Pyrrole &gt; thiophene &gt; furan</li></ol>				
21.	<p>Which one of the following is most abundant of all the hydrocarbons pollutants in the atmosphere ?</p> <table border="0" style="width: 100%;"><tr><td style="width: 50%;">(1) Methane</td><td style="width: 50%;">(2) HCH</td></tr><tr><td>(3) Benzene</td><td>(4) Propane</td></tr></table>	(1) Methane	(2) HCH	(3) Benzene	(4) Propane
(1) Methane	(2) HCH				
(3) Benzene	(4) Propane				
22.	<p>Which of the following is not one of the twelve principles of green chemistry ?</p> <ol style="list-style-type: none"><li>(1) Minimising the use of solvents</li><li>(2) Using high temperatures to speed up reactions</li><li>(3) Maximisation of atom economy</li><li>(4) Minimising toxic reagents used in a synthesis</li></ol>				
23.	<p>How many signals does the unsaturated ketone <math>(\text{CH}_3)_2\text{CHCH}_2\text{C(O)CH}=\text{CH}_2</math> have in <math>^1\text{H}</math> NMR and <math>^{13}\text{C}</math> NMR spectra ?</p> <ol style="list-style-type: none"><li>(1) Five <math>^1\text{H}</math> signals and six <math>^{13}\text{C}</math> signals</li><li>(2) Five <math>^1\text{H}</math> signals and seven <math>^{13}\text{C}</math> signals</li><li>(3) Six <math>^1\text{H}</math> signals and seven <math>^{13}\text{C}</math> signals</li><li>(4) Six <math>^1\text{H}</math> signals and six <math>^{13}\text{C}</math> signals</li></ol>				

Question No.	Questions
24.	A single strong absorption near $1800\text{ cm}^{-1}$ in IR spectroscopy indicates the presence of : (1) Thioketones (2) Sulphoxide (3) Acid halide (4) Azo compounds
25.	Which of the following statements is true ? (1) Drugs are generally smaller than drug targets. (2) Drugs and drug targets generally have similar molecular weights. (3) Drugs are generally larger than drug targets (4) There is no general rule regarding the relative size of drugs and their targets
26.	Oxidative cleavage of pent-2-yne with alkaline $\text{KMnO}_4$ gives : (1) Ethanoic acid (2) Propanoic acid (3) Pentanone (4) 2-Methyl propanoic acid
27.	Which reaction will not provide a synthesis of 1, 1-diphenylethanol ? (1) $\text{Ph}_2\text{C=O} + \text{MeMgBr} \xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) Et}_2\text{O}}$ (2) $\text{PhC(=O)Me} + \text{PhMgBr} \xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) Et}_2\text{O}}$ (3) $\text{PhCHO} + \text{PhCH}_2\text{MgBr} \xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) Et}_2\text{O}}$ (4) $\text{PhCOEt} + 2 \text{PhMgBr} \xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) Et}_2\text{O}}$

Question No.	Questions
28.	<p>Which compound is not a carboxylic acid ?</p> <p>(1) <math>\text{CH}_3\text{CH}_2\text{CH}_2\overset{\text{O}}{\parallel}\text{C}-\text{OH}</math>      (2) </p> <p>(3)       (4) </p>
29.	<p>Which of the following is most reactive in electrophilic aromatic substitution ?</p> <p>(1)       (2) </p> <p>(3)       (4) </p>
30.	<p>The IUPAC name of the compound shown below is :</p> $\text{CH}_3-\overset{\text{Cl}}{\underset{ }{\text{CH}}}-\overset{\text{CH}_3}{\underset{ }{\text{C}}}=\text{CHCH}_3$ <p>(1) 3-Methyl-4-chloropent-2-ene      (2) 4-chloro-3-methylpent-2-ene  (3) 2-chloro-3-methylpent-3-ene      (4) 3-Methyl-2-chloropent-3-ene</p>
31.	<p>The specific conductance of a solution is <math>0.176 \Omega^{-1} \text{cm}^{-1}</math>. If the cell constant is <math>0.255 \text{cm}^{-1}</math>, the conductance (<math>\Omega^{-1}</math>) of that solution is :</p> <p>(1) 1.449      (2) 0.690  (3) 0.045      (4) 0.431</p>

Question No.	Questions
32.	<p>A polydisperse polymer sample has ten molecules of molar mass 20,000 g mol<sup>-1</sup> and fifteen molecules of molar mass 10,000 g mol<sup>-1</sup>. The number-average molar mass (g mol<sup>-1</sup>) (<math>\overline{M}_n</math>) of the sample is :</p> <p>(1) 13,000                                  (2) 15,000            (3) 14,000                                  (4) 16,000</p>
33.	<p>Two phases (<math>\alpha</math> and <math>\beta</math>) of a species are in equilibrium. The correct relations observed among the variables, T, p and <math>\mu</math> are :</p> <p>(1) <math>T_\alpha = T_\beta, p_\alpha \neq p_\beta, \mu_\alpha = \mu_\beta</math>      (2) <math>T_\alpha \neq T_\beta, p_\alpha = p_\beta, \mu_\alpha = \mu_\beta</math>            (3) <math>T_\alpha = T_\beta, p_\alpha = p_\beta, \mu_\alpha = \mu_\beta</math>      (4) <math>T_\alpha = T_\beta, p_\alpha = p_\beta, \mu_\alpha \neq \mu_\beta</math></p>
34.	<p>An element exists in two crystallographic modifications with FCC and BCC structures. The ratio of the densities of the FCC and BCC modifications in terms of the volumes of their unit cells (<math>V_{\text{FCC}}</math> and <math>V_{\text{BCC}}</math>) is :</p> <p>(1) <math>V_{\text{BCC}} : V_{\text{FCC}}</math>                                  (2) <math>2V_{\text{BCC}} : V_{\text{FCC}}</math>            (3) <math>V_{\text{BCC}} : 2V_{\text{FCC}}</math>                                  (4) <math>V_{\text{BCC}} : \frac{1}{2} V_{\text{FCC}}</math></p>
35.	<p>One molecular orbital of a polar molecule AB has the form <math>C_A \Psi_A + C_B \Psi_B</math>, where <math>\Psi_A</math> and <math>\Psi_B</math> are normalized atomic orbitals centred on A and B, respectively. The electron in this orbital is found on atom B with a probability of 90%. Neglecting the overlap between <math>\Psi_A</math> and <math>\Psi_B</math>, a possible set of <math>C_A</math> and <math>C_B</math> is :</p> <p>(1) <math>C_A = 0.95, C_B = 0.32</math>                      (2) <math>C_A = 0.32, C_B = 0.95</math>            (3) <math>C_A = -0.32, C_B = 0.95</math>                (4) <math>C_A = 0.32, C_B = -0.95</math></p>
36.	<p>The first order rate constant for a unimolecular gas phase reaction <math>A \rightarrow</math> products that follows Lindemann mechanism is 2.0 s<sup>-1</sup> at <math>p_A = 1</math> atm and 4.0 s<sup>-1</sup> at <math>p_A = 2</math> atm. The rate constant for the activation step is :</p> <p>(1) 1.0 atm<sup>-1</sup> s<sup>-1</sup>                                      (2) 4.0 atm<sup>-1</sup> s<sup>-1</sup>            (3) 2.0 atm<sup>-1</sup> s<sup>-1</sup>                                      (4) 8.0 atm<sup>-1</sup> s<sup>-1</sup></p>

Question No.	Questions
37.	<p>A reversible expansion of 1.0 mol of an ideal gas is carried out from 1.0 L to 4.0 L under isothermal condition at 300K. <math>\Delta G</math> for this process is :</p> <p>(1) <math>300R \ln 2</math> (2) <math>600R \ln 2</math>  (3) <math>-600R \ln 2</math> (4) <math>300 \ln 2</math></p>
38.	<p>Upon application of a weak magnetic field, a line in the microwave absorption spectrum of rigid rotor splits into 3 lines. The quantum number (J) of the rotational energy level from which the transition originates is :</p> <p>(1) 0 (2) 1  (3) 2 (4) 3</p>
39.	<p>For a particle of mass m confined in a rectangular box with sides 2a and a, the energy and degeneracy of the first excited state, respectively, are :</p> <p>(1) <math>\frac{h^2}{8m} \left( \frac{2}{a^2} \right), 1</math> (2) <math>\frac{h^2}{8m} \left( \frac{17}{4a^2} \right), 2</math>  (3) <math>\frac{h^2}{8m} \left( \frac{5}{4a^2} \right), 1</math> (4) <math>\frac{h^2}{8m} \left( \frac{5}{a^2} \right), 2</math></p>
40.	<p>For the chemical reaction in aqueous solution,  <math>\text{CH}_2\text{ClCOO}^- + \text{OH}^- \rightarrow \text{CH}_2\text{OHCOO}^- + \text{Cl}^-</math>  the correct statement is :</p> <p>(1) increase of pressure increases the rate constant  (2) increase of dielectric constant increases the rate constant  (3) increase of ionic strength decreases the rate constant  (4) the entropy of activation is positive</p>
41.	<p>The isomer shift in Mossbaurs in iron complexes changes with increase in S-electrons density :</p> <p>(1) increases (2) decreases  (3) no change (4) none of these</p>

Question No.	Questions
42.	Which of the following carbonyls does not possess bridged CO ? (1) $\text{Fe}(\text{CO})_9$ (2) $\text{Fe}_3(\text{CO})_{12}$ (3) $\text{Ru}_3(\text{CO})_{12}$ (4) $\text{Co}_2(\text{CO})_8$
43.	$\text{H}_2\text{Os}_6(\text{CO})_{18}$ is a cluster : (1) closo (2) nido (3) Arachno (4) none of these
44.	The ionization energy of hydrogen atom in its ground state is approximately 13.6 eV. The potential energy of $\text{He}^+$ , in its ground state is approximately : (1) -54.4 eV (2) -27.2 eV (3) -13.6 eV (4) -108.8 eV
45.	The intensity of a light beam decreases by 50% when it passes through a sample of 1.0 cm path length. The percentage of transmission of the light passing through the same sample, but of 3.0 cm path length would be : (1) 50.0 (2) 25.0 (3) 16.67 (4) 12.5
46.	For the liquid $\rightleftharpoons$ vapour equilibrium of a substance $\frac{dP}{dT}$ at 1 bar and 400 K is $8 \times 10^{-3} \text{ bar K}^{-1}$ . If the molar volume in the vapour form is $200 \text{ L mol}^{-1}$ and the molar volume in the liquid form is negligible, the molar enthalpy of vapourisation is (1.0 bar L = 100 J) : (1) $640 \text{ kJ mol}^{-1}$ (2) $100 \text{ kJ mol}^{-1}$ (3) $80 \text{ kJ mol}^{-1}$ (4) $64 \text{ kJ mol}^{-1}$



Question No.	Questions
51.	Wilkinson's catalyst is used for : (1) hydrogenation of alkenes      (2) hydrogenation of alkynes (3) hydrogenation of alkanes      (4) hydrogenation of unsaturated oils
52.	An aqueous solution contains $\text{Hg}^+$ , $\text{Pb}^{2+}$ and $\text{Cd}^{2+}$ . The addition of 6N HCl precipitates : (1) $\text{Hg}_2\text{Cl}_2$ only      (2) $\text{PbCl}_2$ only (3) $\text{Hg}_2\text{Cl}_2 + \text{PbCl}_2$ (4) $\text{PbCl}_2 + \text{HgCl}_2$
53.	Which one among the following pairs cannot be separated by $\text{H}_2\text{S}$ in dil HCl ? (1) $\text{Bi}^{3+}$ , $\text{Sn}^{4+}$ (2) $\text{Al}^{3+}$ , $\text{Hg}^{2+}$ (3) $\text{Zn}^{2+}$ , $\text{Sn}^{4+}$ (4) $\text{Ni}^{2+}$ , $\text{Cu}^{2+}$
54.	Oxymyoglobin contains : (1) $\text{O}_2$ at trans position to histidine chain (2) $\text{O}_2$ in the hole of porphyrin (3) $\text{O}_2$ bonded by coordinated bond to Mg (II) (4) does not contain $\text{O}_2$
55.	Heme is a porphyrin complex of : (1) Fe (II)      (2) Fe (III) (3) Mg (II)      (4) Zn (II)
56.	The metal present in chlorophyll is : (1) Mg (II)      (2) Ca (II) (3) Zn (II)      (4) Fe (II)
57.	During biological nitrogen fixations nitrifying bacteria convert : (1) $\text{NO}_3^-$ to $\text{NH}_4^+$ (2) $\text{N}_2$ to $\text{NH}_4^+$ (3) $\text{NH}_4^+$ to $\text{NO}_3^-$ (4) $\text{NO}_3^-$ to $\text{N}_2$



Question No.	Questions
58.	How many fundamental vibrations are possible in $\text{SO}_2$ molecule ? (1) Two (2) Three (3) Four (4) Six
59.	The EPR spectrum of $\text{NO}_2$ will show : (1) One peak (2) Two peaks (3) Three peaks (4) Four peaks
60.	How many bands are obtained in the electronic spectra of $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$ complex ion ? (1) Two (2) Three (3) One (4) Four
61.	The temperature-dependence of the vapour pressure of solid A can be represented by $\log p = 10.0 - \frac{1800}{T}$ , and that of liquid A by $\log p = 8.0 - \frac{1400}{T}$ . The temperature of the triple point of A is : (1) 200 K (2) 300 K (3) 400 K (4) 500 K
62.	In Kohlrausch law $\Lambda_m = \Lambda_m^0 - k\sqrt{c}$ , $\Lambda_m^0$ and k (1) depend only on stoichiometry (2) depend only on specific identity of the electrolyte (3) are independent of specific identity of the electrolyte (4) are mainly dependent on specific identity of the electrolyte and stoichiometry, respectively





Question No.	Questions
63.	<p>A first order gaseous reaction is 25% complete in 30 minutes at 227°C and in 10 minutes at 237°C. The activation energy of the reaction is closest to (<math>R = 2 \text{ cal K}^{-1} \text{ mol}^{-1}</math>):</p> <p>(1) 27 kcal mol<sup>-1</sup>                                      (2) 110 kcal mol<sup>-1</sup> (3) 55 kcal mol<sup>-1</sup>                                      (4) 5.5 kcal mol<sup>-1</sup></p>
64.	<p>A carnot takes up 90 J of heat from the source kept at 300 K. The correct statement among the following is :</p> <p>(1) It transfers 60 J of heat to the sink at 200 K (2) It transfers 50 J of heat to the sink at 200 K (3) It transfers 60 J of heat to the sink at 250 K (4) It transfers 50 J of heat to the sink at 250 K</p>
65.	<p>The correct statement about the difference of second and first excited state energies (<math>\Delta E</math>) of a particle in 1-D, 2-D square and 3-D cubic boxes with same length for each, is :</p> <p>(1) <math>\Delta E (1 - D \text{ box}) = \Delta E (2 - D \text{ box}) = \Delta E (3 - D \text{ box})</math> (2) <math>\Delta E (1 - D \text{ box}) &gt; \Delta E (2 - D \text{ box}) &gt; \Delta E (3 - D \text{ box})</math> (3) <math>\Delta E (1 - D \text{ box}) &gt; \Delta E (2 - D \text{ box}) = \Delta E (3 - D \text{ box})</math> (4) <math>\Delta E (1 - D \text{ box}) &lt; \Delta E (2 - D \text{ box}) &lt; \Delta E (3 - D \text{ box})</math></p>
66.	<p>According to Eyring transition state theory for a bimolecular reaction, the activated complex has :</p> <p>(1) no vibrational degrees of freedom. (2) vibrational degrees of freedom but they never participate in product formation. (3) one high frequency vibration that leads to product formation. (4) one low frequency vibration that leads to product formation.</p>

Question No.	Questions
67.	The molecule with the smallest rotational constant (in the microwave spectrum) among the following is : (1) $N \equiv CH$ (2) $HC \equiv CCl$ (3) $ClC \equiv CF$ (4) $B \equiv CCl$
68.	The electronic transition energy from $\pi_1 \rightarrow \pi_2$ in propenyl radical is 4.8 eV. Within the frame work of Huckel theory, the transitions energy from $\pi_1 \rightarrow \pi_3$ would be : (1) 2.4 eV (2) 4.8 eV (3) 14.4 eV (4) 9.6 eV
69.	Four distinguishable molecules are distributed in energy levels $E_1$ and $E_2$ with degeneracy of 2 and 3, respectively. Number of microstates, with 3 molecules in energy level $E_1$ and one in energy level $E_2$ , is : (1) 4 (2) 12 (3) 96 (4) 192
70.	Metallic silver crystallizes in face-centred-cubic lattice structure with a unit cell of length 40 nm. The first order diffraction angle of X-ray beam from (2, 1, 0) plane of silver is $30^\circ$ . The wavelength of X-ray used is close to : (1) 11 nm (2) 18 nm (3) 25 nm (4) 32 nm
71.	In simple molecular orbital theory of hydrogen molecule, bonding $\sigma_g$ and anti-bonding $\sigma_u$ molecular orbitals are constructed as linear combinations of atomic orbitals of two hydrogen atoms. The spatial part of a purely covalent singlet wavefunction is obtained by : (1) $\sigma_g^2 + \sigma_u^2$ (2) $\sigma_g^2$ (3) $\sigma_g^2 - \sigma_u^2$ (4) $\sigma_g^2 + \frac{1}{2}\sigma_u^2$





Question No.	Questions
84.	During the change of $\text{NO}^+$ to $\text{NO}$ , the electron is added in a : (1) $\sigma$ -orbital (2) $\pi$ -orbital (3) $\sigma^*$ -orbital (4) $\pi^*$ -orbital
85.	The molecular orbital configuration of $\text{B}_2$ molecule is : (1) $\text{KK} (\sigma_{2s})^2 (\sigma_{2p})^2 (\sigma_{2s}^*)^2$ (2) $\text{KK} (\sigma_{2s})^2 (\sigma_{2s}^*)^2 (\sigma_{2p})^2$ (3) $\text{KK} (\sigma_{2s})^2 (\sigma_{2s}^*)^2 (\pi_{2px})^1 (\pi_{2py})^1$ (4) $\text{KK} (\sigma_{2s})^2 (\sigma_{2s}^*)^2 (\pi_{2px})^2$
86.	Which of the following is not a hard acid ? (1) $\text{Na}^+$ (2) $\text{Mg}^{2+}$ (3) $\text{Pd}^{2+}$ (4) $\text{Ti}^{4+}$
87.	$\text{CH}_3\text{OH}$ is : (1) soft-soft (2) hard-hard (3) soft-hard (4) hard-soft
88.	Arrange the order of increasing solubilities of alkali metal halides in liquid $\text{SO}_2$ of the following, $\text{NaCl}$ , $\text{NaBr}$ , $\text{NaF}$ and $\text{NaI}$ : (1) $\text{NaI} > \text{NaBr} > \text{NaCl} > \text{NaF}$ (2) $\text{NaI} > \text{NaBr} < \text{NaCl} > \text{NaF}$ (3) $\text{NaI} < \text{NaBr} < \text{NaCl} < \text{NaF}$ (4) $\text{NaI} < \text{NaBr} > \text{NaCl} < \text{NaF}$
89.	Which is not emitted by a radioactive substance ? (1) $\alpha$ -rays (2) $\beta$ -rays (3) positron (4) proton
90.	In a nuclear reaction ${}^7_3\text{Li} + \text{Z} \longrightarrow {}^7_4\text{Be} + {}^1_0\text{n}$ the bombarding projectile Z is : (1) $\alpha$ -particle (2) deuterium (3) neutron (4) proton

Question No.	Questions
91.	<p>The organic chloro compound, which shows complete stereochemical inversion during a <math>S_N^2</math> reaction is :</p> <p>(1) <math>CH_3Cl</math> (2) <math>(C_2H_5)_2CHCl</math>  (3) <math>(CH_3)_3CCl</math> (4) <math>(CH_3)_2CHCl</math></p>
92.	<p>What intermolecular force is most responsible for molecular iodine, <math>I_2</math> being a solid at room temperature ?</p> <p>(1) Dipole-dipole (2) Ionic-bonding  (3) Ion-dipole (4) London dispersion force</p>
93.	<p>The process of separation of enantiomers from a racemic mixture is known as :</p> <p>(1) Racemic modification (2) Resolution  (3) Inversion (4) Specific rotation</p>
94.	<p>Which one of the following is aromatic compound ?</p> <p>(1)  (2)   (3)  (4) </p>
95.	<p>The conversion of cis-isomers to trans-isomers or trans-isomers to cis-isomers is known as :</p> <p>(1) Conformations (2) Diaxial interaction  (3) Conformational analysis (4) Stereomutation</p>
96.	<p>Which of the following statements regarding cyclopropene is wrong ?</p> <p>(1) It is cyclic  (2) It does not exhibit continuous delocalization  (3) It obeys Huckel's rule  (4) It is aromatic</p>

Question No.	Questions
97.	<p>Which of the following is the most stable carbocation ?</p> <p>(1) <math>\text{C}_6\text{H}_5\text{CH}_2^+</math>                      (2) <math>\text{CH}_3\text{CH}_2^+</math>  (3) <math>\text{C}_6\text{H}_5\text{CH}^+\text{C}_6\text{H}_5</math>                (4) <math>\text{C}_6\text{H}_5\text{CH}_2\text{CH}_2^+</math></p>
98.	<p>Which of the following is an electrophile ?</p> <p>(1) <math>\text{H}_2\text{O}</math>                                (2) <math>\text{AlCl}_3</math>  (3) <math>\text{NH}_3</math>                                 (4) <math>\text{C}_2\text{H}_5\text{NH}_2</math></p>
99.	<p>The most reactive nucleophile among the following is :</p> <p>(1) <math>\text{C}_6\text{H}_5\text{O}^-</math>                            (2) <math>(\text{CH}_3)_3\text{CO}^-</math>  (3) <math>\text{CH}_3\text{O}^-</math>                              (4) <math>(\text{CH}_3)_2\text{CHO}^-</math></p>
100.	<p>A group whose use makes possible to react a less reactive functional group selectively in the presence of a more reactive group is known as :</p> <p>(1) Umpolung                            (2) Synthons  (3) Synthetic equivalent              (4) Protecting group</p>






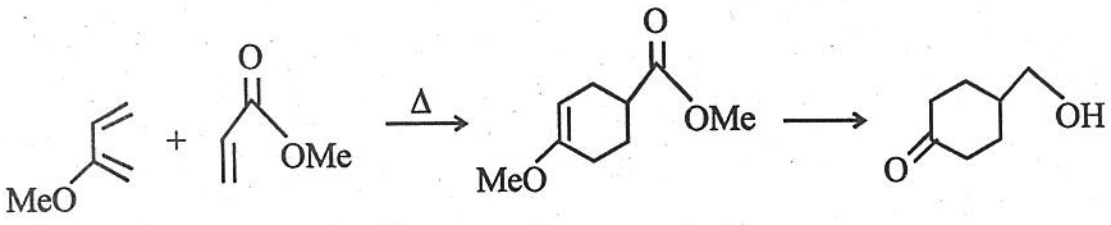
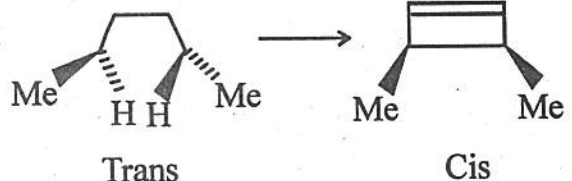










Question No.	Questions
22.	When an electron is added to a gaseous atom : (1) its size decreases (2) energy is released (3) it changes to positive ion (4) its tendency to accept electron increases
23.	According to VSEPR theory, the geometry of $ICl_2^-$ ion is : (1) trigonal planar                      (2) square planar (3) angular                                  (4) linear
24.	During the change of $NO^+$ to $NO$ , the electron is added in a : (1) $\sigma$ -orbital                              (2) $\pi$ -orbital (3) $\sigma^*$ -orbital                              (4) $\pi^*$ -orbital
25.	The molecular orbital configuration of $B_2$ molecule is : (1) $KK (\sigma 2s)^2 (\sigma 2p)^2 (\sigma^* 2s)^2$ (2) $KK (\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2pz)^2$ (3) $KK (\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2px)^1 (\pi 2py)^1$ (4) $KK (\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2px)^2$
26.	Which of the following is not a hard acid ? (1) $Na^+$ (2) $Mg^{2+}$ (3) $Pd^{2+}$ (4) $Ti^{4+}$
27.	$CH_3OH$ is : (1) soft-soft    (2) hard-hard (3) soft-hard    (4) hard-soft



Question No.	Questions
33.	<p>Which reaction condition are not appropriate for the following transformation ?</p>  <p>(1) <math>\text{Zn (Hg) / HCl}</math>      (2) <math>\text{NH}_2\text{NH}_2 / \text{NaOH}</math>  (3) <math>\text{LiAlH}_4 / \text{Et}_2\text{O}</math>      (4) <math>\text{HSCH}_2\text{CH}_2\text{CH}_2\text{SH} / \text{H}^+</math>, then <math>\text{H}_2 / \text{Ni}</math></p>
34.	<p>4-Hydroxymethyl cyclohexanone can be synthesized from a Diels-Alder adduct in the following reactions. Which combination of reagents is appropriate for the second step ?</p>  <p>(1) (i) <math>\text{NaBH}_4 / \text{MeOH}</math> ; (ii) <math>\text{H}_3\text{O}^+</math>  (2) (i) <math>\text{NaBH}_4 / \text{THF}</math> ; (ii) <math>\text{NaOH} / \text{H}_2\text{O}</math>  (3) (i) <math>\text{LiAlH}_4 / \text{Et}_2\text{O}</math> ; (ii) <math>\text{H}_3\text{O}^+</math>  (4) (i) <math>\text{LiAlH}_4 / \text{Et}_2\text{O}</math> ; (ii) <math>\text{NaOH} / \text{H}_2\text{O}</math></p>
35.	<p>The following transformation is feasible by :</p>  <p>(1) Thermal disrotatory process  (2) Photochemical disrotatory process  (3) Thermal conrotatory process  (4) Photochemical conrotatory process</p>

Question No.	Questions
36.	<p>Which compound is most basic ?</p> <p>(1)  (2) </p> <p>(3)  (4) </p>
37.	<p>Which one of the following gas is responsible for maximum contribution in green house effect ?</p> <p>(1) CFC (2) O<sub>2</sub></p> <p>(3) CO<sub>2</sub> (4) CH<sub>4</sub></p>
38.	<p>The <sup>13</sup>C chemical shifts normally range between :</p> <p>(1) δ = 0-200 ppm (2) δ = 100-200 ppm</p> <p>(3) δ = 50-100 ppm (4) δ = 200-250 ppm</p>
39.	<p>What is meant by a drug's "specification" ?</p> <p>(1) The molecular dimensions of the molecule</p> <p>(2) The physical properties of a drug</p> <p>(3) The purity tests and purity standards required for a drug</p> <p>(4) The functional groups on a drug that are important to its activity</p>
40.	<p>The order of aromaticity of furan, thiophene and pyrrole is as :</p> <p>(1) Thiophene &gt; furan &gt; pyrrole</p> <p>(2) Furan &gt; Pyrrole &gt; thiophene</p> <p>(3) Thiophene &gt; Pyrrole &gt; furan</p> <p>(4) Pyrrole &gt; thiophene &gt; furan</p>



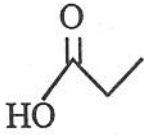
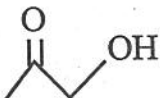
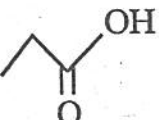
Question No.	Questions
41.	In simple molecular orbital theory of hydrogen molecule, bonding $\sigma_g$ and anti-bonding $\sigma_u$ molecular orbitals are constructed as linear combinations of atomic orbitals of two hydrogen atoms. The spatial part of a purely covalent singlet wavefunction is obtained by :  (1) $\sigma_g^2 + \sigma_u^2$ (2) $\sigma_g^2$ (3) $\sigma_g^2 - \sigma_u^2$ (4) $\sigma_g^2 + \frac{1}{2} \sigma_u^2$
42.	The simultaneous eigen functions of angular momentum operators $L^2$ and $L_z$ are : (1) all of $2s, 2p_x, 2p_y$ and $2p_z$ orbitals (2) only $2s, 2p_x,$ and $2p_y$ orbitals (3) only $2s$ and $2p_z$ orbitals (4) only $2p_z$ orbital
43.	The single-particle partition function ( $f$ ) for a certain system has the form $f = A V e^{B/T}$ . The average energy per particle will then be ( $k$ is the Boltzmann constant) : (1) $BkT$ (2) $BkT^2$ (3) $kT/B$ (4) $kT/B^2$
44.	Which of the following statements is INCORRECT ? (1) A Slater determinant is an antisymmetrized wave function (2) Electronic wavefunction should be represented by Slater determinants (3) A Slater determinant always corresponds to a particular spin state (4) A Slater determinant obeys the Pauli exclusion principle
45.	1 poise is equal to : (1) $10 \text{ N cm}^{-2}$ (2) $100 \text{ N cm}^{-2}$ (3) $1/100 \text{ N cm}^{-2}$ (4) $1/10 \text{ N cm}^{-2}$


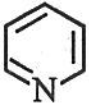


Question No.	Questions
46.	Find the probability of the link in polymers where average values of links are : (1) (a) 0.99, (b) 0.98 and (c) 0.90      (2) (a) 0.98, (b) 0.90, (c) 0.99 (3) (a) 0.90, (b) 0.98, (c) 0.99      (4) (a) 0.90, (b) 0.99, (c) 0.98
47.	Which of the following can not react as a nucleophile ? (1) $(\text{CH}_3)_3\text{O}^+$ (2) $(\text{CH}_3)_3\text{B}$ (3) $(\text{CH}_3)_3\text{CH}$ (4) $(\text{CH}_3)_3\text{N}$
48.	Which of the following reacts by the E1 mechanism ? (1) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$ (2) $(\text{CH}_3)_2\text{CHCH}_2\text{Br}$ (3) $(\text{CH}_3)_3\text{CBr}$ (4) $\text{CH}_3\text{CH}_2\underset{\text{Br}}{\text{C}}\text{H}-\text{CH}_3$
49.	Nicotine alkaloid belong to : (1) Phenylethylamine group      (2) Indole group (3) Pyrrolidine-Pyridine group      (4) Iso quinoline group
50.	The protein in which prosthetic group is carbohydrate are known as : (1) Chromoprotein      (2) Lipoprotein (3) Nucleoprotein      (4) Mucoprotein
51.	The isomer shift in Mossbaurs in iron complexes changes with increase in S-electrons density : (1) increases      (2) decreases (3) no change      (4) none of these





Question No.	Questions
52.	Which of the following carbonyls does not possess bridged CO ?  (1) Fe(CO) <sub>9</sub> (2) Fe <sub>3</sub> (CO) <sub>12</sub> (3) Ru <sub>3</sub> (CO) <sub>12</sub> (4) Co <sub>2</sub> (CO) <sub>8</sub>
53.	H <sub>2</sub> Os <sub>6</sub> (CO) <sub>18</sub> is a cluster :  (1) closo (2) nido (3) Arachno (4) none of these
54.	The ionization energy of hydrogen atom in its ground state is approximately 13.6 eV. The potential energy of He <sup>+</sup> , in its ground state is approximately :  (1) -54.4 eV (2) -27.2 eV (3) -13.6 eV (4) -108.8 eV
55.	The intensity of a light beam decreases by 50% when it passes through a sample of 1.0 cm path length. The percentage of transmission of the light passing through the same sample, but of 3.0 cm path length would be :  (1) 50.0 (2) 25.0 (3) 16.67 (4) 12.5
56.	For the liquid $\rightleftharpoons$ vapour equilibrium of a substance $\frac{dP}{dT}$ at 1 bar and 400 K is $8 \times 10^{-3}$ bar K <sup>-1</sup> . If the molar volume in the vapour form is 200 L mol <sup>-1</sup> and the molar volume in the liquid form is negligible, the molar enthalpy of vapourisation is (1.0 bar L = 100 J) :  (1) 640 kJ mol <sup>-1</sup> (2) 100 kJ mol <sup>-1</sup> (3) 80 kJ mol <sup>-1</sup> (4) 64 kJ mol <sup>-1</sup>

Question No.	Questions
57.	<p>A system consists of gaseous <math>H_2</math>, <math>O_2</math>, <math>H_2O</math> and <math>CO_2</math> where the amount of <math>CO_2</math> is specified and the equilibrium constant for the reactions <math>2H_2(g) + O_2(g) \rightleftharpoons 2H_2O(g)</math> is known. The number of degrees of freedom of the system is :</p> <p>(1) 2 (2) 3 (3) 4 (4) 5</p>
58.	<p>The vibrational frequency and anharmonicity constant of an alkali halide are <math>300\text{ cm}^{-1}</math> and <math>0.0025</math> respectively. The positions (in <math>\text{cm}^{-1}</math>) of its fundamental mode and first overtone are respectively :</p> <p>(1) 300, 600 (2) 298.5, 595.5 (3) 301.5, 604.5 (4) 290, 580</p>
59.	<p>If <math>U</math> is a function of <math>V</math> and <math>T</math>, <math>\left(\frac{dU}{dT}\right)_P</math> is equal to <math>\pi</math> and <math>\alpha</math> are the internal pressure and the coefficient of thermal expansion, respectively :</p> <p>(1) <math>C_P</math> (2) <math>C_P - \pi V \alpha</math> (3) <math>C_P + \pi V \alpha</math> (4) <math>C_V</math></p>
60.	<p>The translational, rotational and vibrational partition functions for a molecule are <math>f_{\text{translational}} \cong 10^{10}\text{ m}^{-1}</math>, <math>f_{\text{rotation}} = f_{\text{vibration}} \cong 1</math>, <math>(k_B T/H) = 10^{13}</math> at room temperature, <math>N_A = 6 \times 10^{23}</math>, using the approximate data given above, the frequency factor (A) for a reaction of the type :</p> <p>atom + diatomic molecule <math>\rightarrow</math> non-linear transition state <math>\rightarrow</math> product, according to the conventional transition state theory is :</p> <p>(1) <math>2 \times 10^3</math> (2) <math>6 \times 10^7</math> (3) <math>2 \times 10^{12}</math> (4) <math>6 \times 10^{13}</math></p>

Question No.	Questions
61.	Which one of the following is most abundant of all the hydrocarbons pollutants in the atmosphere ? (1) Methane (2) HCH (3) Benzene (4) Propane
62.	Which of the following is not one of the twelve principles of green chemistry ? (1) Minimising the use of solvents (2) Using high temperatures to speed up reactions (3) Maximisation of atom economy (4) Minimising toxic reagents used in a synthesis
63.	How many signals does the unsaturated ketone $(\text{CH}_3)_2\text{CHCH}_2\text{C(O)CH}=\text{CH}_2$ have in $^1\text{H}$ NMR and $^{13}\text{C}$ NMR spectra ? (1) Five $^1\text{H}$ signals and six $^{13}\text{C}$ signals (2) Five $^1\text{H}$ signals and seven $^{13}\text{C}$ signals (3) Six $^1\text{H}$ signals and seven $^{13}\text{C}$ signals (4) Six $^1\text{H}$ signals and six $^{13}\text{C}$ signals
64.	A single strong absorption near $1800\text{ cm}^{-1}$ in IR spectroscopy indicates the presence of : (1) Thioketones (2) Sulphoxide (3) Acid halide (4) Azo compounds
65.	Which of the following statements is true ? (1) Drugs are generally smaller than drug targets. (2) Drugs and drug targets generally have similar molecular weights. (3) Drugs are generally larger than drug targets (4) There is no general rule regarding the relative size of drugs and their targets

Question No.	Questions
66.	Oxidative cleavage of pent-2-yne with alkaline $\text{KMnO}_4$ gives : (1) Ethanoic acid                      (2) Propanoic acid (3) Pentanone                          (4) 2-Methyl propanoic acid
67.	Which reaction will not provide a synthesis of 1, 1-diphenylethanol ?  (1) $\text{Ph}-\overset{\text{O}}{\parallel}{\text{C}}-\text{Ph} + \text{MeMgBr} \xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) Et}_2\text{O}}$  (2) $\text{Ph}-\overset{\text{O}}{\parallel}{\text{C}}-\text{Me} + \text{PhMgBr} \xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) Et}_2\text{O}}$  (3) $\text{Ph}-\overset{\text{O}}{\parallel}{\text{C}}-\text{H} + \text{PhCH}_2\text{MgBr} \xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) Et}_2\text{O}}$  (4) $\text{Me}-\overset{\text{O}}{\parallel}{\text{C}}-\text{OEt} + 2 \text{PhMgBr} \xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) Et}_2\text{O}}$
68.	Which compound is not a carboxylic acid ?  (1) $\text{CH}_3\text{CH}_2\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{OH}$ (2)   (3)  (4) 

Question No.	Questions
69.	<p>Which of the following is most reactive in electrophilic aromatic substitution ?</p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;"> <p>(1) </p> </div> <div style="text-align: center;"> <p>(2) </p> </div> </div> <div style="display: flex; justify-content: space-around; align-items: flex-start; margin-top: 10px;"> <div style="text-align: center;"> <p>(3) </p> </div> <div style="text-align: center;"> <p>(4) </p> </div> </div>
70.	<p>The IUPAC name of the compound shown below is :</p> $\text{CH}_3 - \underset{\text{Cl}}{\text{CH}} - \overset{\text{CH}_3}{\text{C}} = \text{CHCH}_3$ <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 45%;"> <p>(1) 3-Methyl-4-chloropent-2-ene</p> <p>(3) 2-chloro-3-methyl pent-3-ene</p> </div> <div style="width: 45%;"> <p>(2) 4-chloro-3-methyl pent-2-ene</p> <p>(4) 3-Methyl-2-chloro pent-3-ene</p> </div> </div>
71.	<p>The organic chloro compound, which shows complete stereochemical inversion during a <math>\text{S}_{\text{N}}2</math> reaction is :</p> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 45%;"> <p>(1) <math>\text{CH}_3\text{Cl}</math></p> <p>(3) <math>(\text{CH}_3)_3\text{CCl}</math></p> </div> <div style="width: 45%;"> <p>(2) <math>(\text{C}_2\text{H}_5)_2\text{CHCl}</math></p> <p>(4) <math>(\text{CH}_3)_2\text{CHCl}</math></p> </div> </div>
72.	<p>What intermolecular force is most responsible for molecular iodine, <math>\text{I}_2</math> being a solid at room temperature ?</p> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 45%;"> <p>(1) Dipole-dipole</p> <p>(3) Ion-dipole</p> </div> <div style="width: 45%;"> <p>(2) Ionic-bonding</p> <p>(4) London dispersion force</p> </div> </div>
73.	<p>The process of separation of enantiomers from a racemic mixture is known as :</p> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 45%;"> <p>(1) Racemic modification</p> <p>(3) Inversion</p> </div> <div style="width: 45%;"> <p>(2) Resolution</p> <p>(4) Specific rotation</p> </div> </div>

Question No.	Questions
74.	Which one of the following is aromatic compound ? (1)  (2)  (3)  (4) 
75.	The conversion of cis-isomers to trans-isomers or trans-isomers to cis-isomers is known as : (1) Conformations (2) Diaxial interaction (3) Conformational analysis (4) Stereomutation
76.	Which of the following statements regarding cyclopropene is wrong ? (1) It is cyclic (2) It does not exhibit continuous delocalization (3) It obeys Huckel's rule (4) It is aromatic
77.	Which of the following is the most stable carbocation ? (1) $C_6H_5CH_2^+$ (2) $CH_3CH_2^+$ (3) $C_6H_5CHC_6H_5^+$ (4) $C_6H_5CH_2CH_2^+$
78.	Which of the following is an electrophile ? (1) $H_2O$ (2) $AlCl_3$ (3) $NH_3$ (4) $C_2H_5NH_2$
79.	The most reactive nucleophile among the following is : (1) $C_6H_5O^-$ (2) $(CH_3)_3CO^-$ (3) $CH_3O^-$ (4) $(CH_3)_2CHO^-$



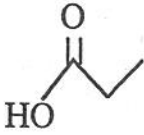
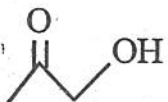
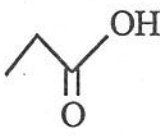
Question No.	Questions
80.	<p>A group whose use makes possible to react a less reactive functional group selectively in the presence of a more reactive group is known as :</p> <p>(1) Umpolung (2) Synthone (3) Synthetic equivalent (4) Protecting group</p>
81.	<p>The reaction</p> ${}^2_1\text{D} + {}^7_4\text{T} \longrightarrow {}^4_2\text{He} + {}^1_0\text{n}$ <p>is an example of :</p> <p>(1) nuclear fission (2) nuclear fusion (3) artificial radioactivity (4) radioactive disintegration</p>
82.	<p>The inert pair effect is predominant in :</p> <p>(1) Si (2) Ge (3) Sn (4) Pb</p>
83.	<p>There is no S-S bond in :</p> <p>(1) <math>\text{S}_2\text{O}_4^{2-}</math> (2) <math>\text{S}_2\text{O}_5^{2-}</math> (3) <math>\text{S}_2\text{O}_3^{2-}</math> (4) <math>\text{S}_2\text{O}_7^{2-}</math></p>
84.	<p>Polyphosphates are used as water softening agents because they :</p> <p>(1) form soluble complexes with anionic species (2) precipitate anionic species (3) form soluble complexes with cationic species (4) precipitate cationic species</p>
85.	<p>Which of the following is paramagnetic ?</p> <p>(1) <math>\text{Cu}^{2+}</math> (2) <math>\text{Ag}^+</math> (3) <math>\text{Zn}^{2+}</math> (4) <math>\text{Au}^+</math></p>


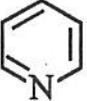


Question No.	Questions
86.	<p>KMnO<sub>4</sub> on heating gives :</p> <p>(1) K<sub>2</sub>MnO<sub>4</sub>, Mn<sub>2</sub>O<sub>3</sub>                      (2) K<sub>2</sub>MnO<sub>4</sub>, MnO, O<sub>2</sub></p> <p>(3) K<sub>2</sub>MnO<sub>4</sub>, MnO<sub>2</sub>, O<sub>2</sub>                      (4) K<sub>2</sub>MnO<sub>4</sub>, MnO<sub>2</sub>, O<sub>3</sub></p>
87.	<p>Which of the following is an organometallic compound ?</p> <p>(1) Lithium methoxide                      (2) Lithium acetate</p> <p>(3) Lithium dimethylamide                      (4) Methyl lithium</p>
88.	<p>The IUPAC name of [Pt(NH<sub>3</sub>)<sub>4</sub>NO<sub>2</sub>Cl] SO<sub>4</sub> is :</p> <p>(1) chloronitrotetraammine platinum (IV) sulphate</p> <p>(2) tetraamminechloronitro platinum (IV) sulphate</p> <p>(3) nitrochlorotetraammine platinum (IV) sulphate</p> <p>(4) platinum (IV) tetraamminenitrochloro sulphate</p>
89.	<p>The type of magnetism exhibited by [Mn(H<sub>2</sub>O)<sub>6</sub>]<sup>2+</sup> ion is :</p> <p>(1) diamagnetism                      (2) paramagnetism</p> <p>(3) ferromagnetism                      (4) antiferromagnetism</p>
90.	<p>Which of the following organometallic compound does not obey EAN rule ?</p> <p>(1) CO(CO)<sub>3</sub> (π-C<sub>3</sub>H<sub>5</sub>)                      (2) (C<sub>2</sub>H<sub>5</sub>) Cr(CO)<sub>3</sub> (π-C<sub>2</sub>H<sub>5</sub>)</p> <p>(3) [Mn(CO)<sub>5</sub> (C<sub>2</sub>H<sub>5</sub>)<sup>+</sup>                      (4) Co (C<sub>6</sub>H<sub>6</sub>)<sub>2</sub></p>
91.	<p>The specific conductance of a solution is 0.176 Ω<sup>-1</sup> cm<sup>-1</sup>. If the cell constant is 0.255 cm<sup>-1</sup>, the conductance (Ω<sup>-1</sup>) of that solution is :</p> <p>(1) 1.449                      (2) 0.690</p> <p>(3) 0.045                      (4) 0.431</p>

Question No.	Questions
92.	<p>A polydisperse polymer sample has ten molecules of molar mass 20,000 g mol<sup>-1</sup> and fifteen molecules of molar mass 10,000 g mol<sup>-1</sup>. The number-average molar mass (gmol<sup>-1</sup>) (<math>\bar{M}_n</math>) of the sample is :</p> <p>(1) 13,000 (2) 15,000  (3) 14,000 (4) 16,000</p>
93.	<p>Two phases (<math>\alpha</math> and <math>\beta</math>) of a species are in equilibrium. The correct relations observed among the variables, T, p and <math>\mu</math> are :</p> <p>(1) <math>T_\alpha = T_\beta, p_\alpha \neq p_\beta, \mu_\alpha = \mu_\beta</math> (2) <math>T_\alpha \neq T_\beta, p_\alpha = p_\beta, \mu_\alpha = \mu_\beta</math>  (3) <math>T_\alpha = T_\beta, p_\alpha = p_\beta, \mu_\alpha = \mu_\beta</math> (4) <math>T_\alpha = T_\beta, p_\alpha = p_\beta, \mu_\alpha \neq \mu_\beta</math></p>
94.	<p>An element exists in two crystallographic modifications with FCC and BCC structures. The ratio of the densities of the FCC and BCC modifications in terms of the volumes of their unit cells (<math>V_{\text{FCC}}</math> and <math>V_{\text{BCC}}</math>) is :</p> <p>(1) <math>V_{\text{BCC}} : V_{\text{FCC}}</math> (2) <math>2V_{\text{BCC}} : V_{\text{FCC}}</math>  (3) <math>V_{\text{BCC}} : 2V_{\text{FCC}}</math> (4) <math>V_{\text{BCC}} : \frac{1}{2} V_{\text{FCC}}</math></p>
95.	<p>One molecular orbital of a polar molecule AB has the form <math>C_A \Psi_A + C_B \Psi_B</math>, where <math>\Psi_A</math> and <math>\Psi_B</math> are normalized atomic orbitals centred on A and B, respectively. The electron in this orbital is found on atom B with a probability of 90%. Neglecting the overlap between <math>\Psi_A</math> and <math>\Psi_B</math>, a possible set of <math>C_A</math> and <math>C_B</math> is :</p> <p>(1) <math>C_A = 0.95, C_B = 0.32</math> (2) <math>C_A = 0.32, C_B = 0.95</math>  (3) <math>C_A = -0.32, C_B = 0.95</math> (4) <math>C_A = 0.32, C_B = -0.95</math></p>
96.	<p>The first order rate constant for a unimolecular gas phase reaction <math>A \rightarrow</math> products that follows Lindemann mechanism is 2.0 s<sup>-1</sup> at <math>p_A = 1</math> atm and 4.0 s<sup>-1</sup> at <math>p_A = 2</math> atm. The rate constant for the activation step is :</p> <p>(1) 1.0 atm<sup>-1</sup> s<sup>-1</sup> (2) 4.0 atm<sup>-1</sup> s<sup>-1</sup>  (3) 2.0 atm<sup>-1</sup> s<sup>-1</sup> (4) 8.0 atm<sup>-1</sup> s<sup>-1</sup></p>

Question No.	Questions
97.	<p>A reversible expansion of 1.0 mol of an ideal gas is carried out from 1.0 L to 4.0 L under isothermal condition at 300K. <math>\Delta G</math> for this process is :</p> <p>(1) <math>300R \ln 2</math> (2) <math>600R \ln 2</math>  (3) <math>-600R \ln 2</math> (4) <math>300 \ln 2</math></p>
98.	<p>Upon application of a weak magnetic field, a line in the microwave absorption spectrum of rigid rotor splits into 3 lines. The quantum number (J) of the rotational energy level from which the transition originates is :</p> <p>(1) 0 (2) 1  (3) 2 (4) 3</p>
99.	<p>For a particle of mass <math>m</math> confined in a rectangular box with sides <math>2a</math> and <math>a</math>, the energy and degeneracy of the first excited state, respectively, are :</p> <p>(1) <math>\frac{h^2}{8m} \left( \frac{2}{a^2} \right), 1</math> (2) <math>\frac{h^2}{8m} \left( \frac{17}{4a^2} \right), 2</math>  (3) <math>\frac{h^2}{8m} \left( \frac{5}{4a^2} \right), 1</math> (4) <math>\frac{h^2}{8m} \left( \frac{5}{a^2} \right), 2</math></p>
100.	<p>For the chemical reaction in aqueous solution,</p> $\text{CH}_2\text{ClCOO}^- + \text{OH}^- \rightarrow \text{CH}_2\text{OHCOO}^- + \text{Cl}^-$ <p>the correct statement is :</p> <p>(1) increase of pressure increases the rate constant  (2) increase of dielectric constant increases the rate constant  (3) increase of ionic strength decreases the rate constant  (4) the entropy of activation is positive</p>

Question No.	Questions
1.	<p>Which one of the following is most abundant of all the hydrocarbons pollutants in the atmosphere ?</p> <p>(1) Methane (2) HCH (3) Benzene (4) Propane</p>
2.	<p>Which of the following is not one of the twelve principles of green chemistry ?</p> <p>(1) Minimising the use of solvents (2) Using high temperatures to speed up reactions (3) Maximisation of atom economy (4) Minimising toxic reagents used in a synthesis</p>
3.	<p>How many signals does the unsaturated ketone <math>(CH_3)_2CHCH_2C(O)CH=CH_2</math> have in <math>^1H</math> NMR and <math>^{13}C</math> NMR spectra ?</p> <p>(1) Five <math>^1H</math> signals and six <math>^{13}C</math> signals (2) Five <math>^1H</math> signals and seven <math>^{13}C</math> signals (3) Six <math>^1H</math> signals and seven <math>^{13}C</math> signals (4) Six <math>^1H</math> signals and six <math>^{13}C</math> signals</p>
4.	<p>A single strong absorption near <math>1800\text{ cm}^{-1}</math> in IR spectroscopy indicates the presence of :</p> <p>(1) Thioketones (2) Sulphoxide (3) Acid halide (4) Azo compounds</p>
5.	<p>Which of the following statements is true ?</p> <p>(1) Drugs are generally smaller than drug targets. (2) Drugs and drug targets generally have similar molecular weights. (3) Drugs are generally larger than drug targets (4) There is no general rule regarding the relative size of drugs and their targets</p>

Question No.	Questions
6.	Oxidative cleavage of pent-2-yne with alkaline $\text{KMnO}_4$ gives : (1) Ethanoic acid                      (2) Propanoic acid (3) Pentanone                          (4) 2-Methyl propanoic acid
7.	Which reaction will not provide a synthesis of 1, 1-diphenylethanol ?  (1) $\text{Ph}_2\text{C=O} + \text{MeMgBr} \xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) Et}_2\text{O}}$ (2) $\text{PhMeC=O} + \text{PhMgBr} \xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) Et}_2\text{O}}$ (3) $\text{PhCHO} + \text{PhCH}_2\text{MgBr} \xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) Et}_2\text{O}}$ (4) $\text{CH}_3\text{COOEt} + 2 \text{PhMgBr} \xrightarrow[\text{ii) H}_3\text{O}^+]{\text{i) Et}_2\text{O}}$
8.	Which compound is not a carboxylic acid ?  (1) $\text{CH}_3\text{CH}_2\text{CH}_2\text{C}(=\text{O})\text{OH}$ (2)  (3)  (4) 

Question No.	Questions
9.	<p>Which of the following is most reactive in electrophilic aromatic substitution ?</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>(1) </p> </div> <div style="text-align: center;"> <p>(2) </p> </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;"> <p>(3) </p> </div> <div style="text-align: center;"> <p>(4) </p> </div> </div>
10.	<p>The IUPAC name of the compound shown below is :</p> $\text{CH}_3 - \overset{\text{Cl}}{\underset{ }{\text{CH}}} - \overset{\text{CH}_3}{\underset{ }{\text{C}}} = \text{CHCH}_3$ <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 45%;"> <p>(1) 3-Methyl-4-chloropent-2-ene</p> <p>(3) 2-chloro-3-methyl pent-3-ene</p> </div> <div style="width: 45%;"> <p>(2) 4-chloro-3-methyl pent-2-ene</p> <p>(4) 3-Methyl-2-chloro pent-3-ene</p> </div> </div>
11.	<p>The specific conductance of a solution is <math>0.176 \Omega^{-1} \text{ cm}^{-1}</math>. If the cell constant is <math>0.255 \text{ cm}^{-1}</math>, the conductance (<math>\Omega^{-1}</math>) of that solution is :</p> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 45%;"> <p>(1) 1.449</p> <p>(3) 0.045</p> </div> <div style="width: 45%;"> <p>(2) 0.690</p> <p>(4) 0.431</p> </div> </div>
12.	<p>A polydisperse polymer sample has ten molecules of molar mass <math>20,000 \text{ g mol}^{-1}</math> and fifteen molecules of molar mass <math>10,000 \text{ g mol}^{-1}</math>. The number-average molar mass (<math>\text{gmol}^{-1}</math>) (<math>\bar{M}_n</math>) of the sample is :</p> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 45%;"> <p>(1) 13,000</p> <p>(3) 14,000</p> </div> <div style="width: 45%;"> <p>(2) 15,000</p> <p>(4) 16,000</p> </div> </div>
13.	<p>Two phases (<math>\alpha</math> and <math>\beta</math>) of a species are in equilibrium. The correct relations observed among the variables, <math>T</math>, <math>p</math> and <math>\mu</math> are :</p> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <div style="width: 45%;"> <p>(1) <math>T_\alpha = T_\beta, p_\alpha \neq p_\beta, \mu_\alpha = \mu_\beta</math></p> <p>(3) <math>T_\alpha = T_\beta, p_\alpha = p_\beta, \mu_\alpha = \mu_\beta</math></p> </div> <div style="width: 45%;"> <p>(2) <math>T_\alpha \neq T_\beta, p_\alpha = p_\beta, \mu_\alpha = \mu_\beta</math></p> <p>(4) <math>T_\alpha = T_\beta, p_\alpha = p_\beta, \mu_\alpha \neq \mu_\beta</math></p> </div> </div>

Question No.	Questions
14.	<p>An element exists in two crystallographic modifications with FCC and BCC structures. The ratio of the densities of the FCC and BCC modifications in terms of the volumes of their unit cells (<math>V_{\text{FCC}}</math> and <math>V_{\text{BCC}}</math>) is :</p> <p>(1) <math>V_{\text{BCC}} : V_{\text{FCC}}</math>                      (2) <math>2V_{\text{BCC}} : V_{\text{FCC}}</math>  (3) <math>V_{\text{BCC}} : 2V_{\text{FCC}}</math>                      (4) <math>V_{\text{BCC}} : \frac{1}{2} V_{\text{FCC}}</math></p>
15.	<p>One molecular orbital of a polar molecule AB has the form <math>C_A \Psi_A + C_B \Psi_B</math>, where <math>\Psi_A</math> and <math>\Psi_B</math> are normalized atomic orbitals centred on A and B, respectively. The electron in this orbital is found on atom B with a probability of 90%. Neglecting the overlap between <math>\Psi_A</math> and <math>\Psi_B</math>, a possible set of <math>C_A</math> and <math>C_B</math> is :</p> <p>(1) <math>C_A = 0.95, C_B = 0.32</math>                      (2) <math>C_A = 0.32, C_B = 0.95</math>  (3) <math>C_A = -0.32, C_B = 0.95</math>                      (4) <math>C_A = 0.32, C_B = -0.95</math></p>
16.	<p>The first order rate constant for a unimolecular gas phase reaction <math>A \rightarrow</math> products that follows Lindemann mechanism is <math>2.0 \text{ s}^{-1}</math> at <math>p_A = 1 \text{ atm}</math> and <math>4.0 \text{ s}^{-1}</math> at <math>p_A = 2 \text{ atm}</math>. The rate constant for the activation step is :</p> <p>(1) <math>1.0 \text{ atm}^{-1} \text{ s}^{-1}</math>                      (2) <math>4.0 \text{ atm}^{-1} \text{ s}^{-1}</math>  (3) <math>2.0 \text{ atm}^{-1} \text{ s}^{-1}</math>                      (4) <math>8.0 \text{ atm}^{-1} \text{ s}^{-1}</math></p>
17.	<p>A reversible expansion of 1.0 mol of an ideal gas is carried out from 1.0 L to 4.0 L under isothermal condition at 300K. <math>\Delta G</math> for this process is :</p> <p>(1) <math>300R \ln 2</math>                      (2) <math>600R \ln 2</math>  (3) <math>-600R \ln 2</math>                      (4) <math>300 \ln 2</math></p>
18.	<p>Upon application of a weak magnetic field, a line in the microwave absorption spectrum of rigid rotor splits into 3 lines. The quantum number (J) of the rotational energy level from which the transition originates is :</p> <p>(1) 0                      (2) 1  (3) 2                      (4) 3</p>




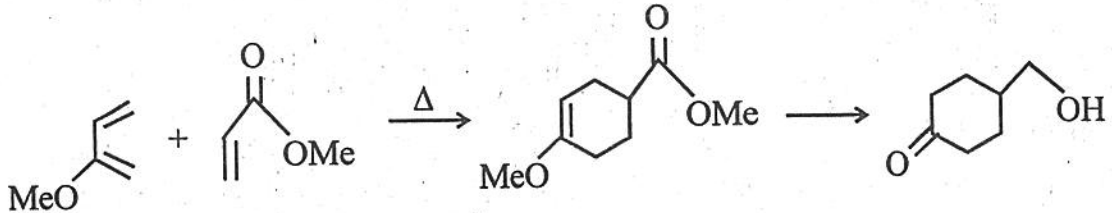
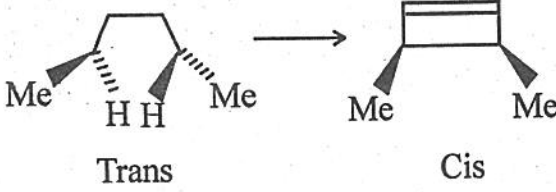
Question No.	Questions
19.	<p>For a particle of mass <math>m</math> confined in a rectangular box with sides <math>2a</math> and <math>a</math>, the energy and degeneracy of the first excited state, respectively, are :</p> <p>(1) <math>\frac{h^2}{8m} \left( \frac{2}{a^2} \right), 1</math>                      (2) <math>\frac{h^2}{8m} \left( \frac{17}{4a^2} \right), 2</math></p> <p>(3) <math>\frac{h^2}{8m} \left( \frac{5}{4a^2} \right), 1</math>                      (4) <math>\frac{h^2}{8m} \left( \frac{5}{a^2} \right), 2</math></p>
20.	<p>For the chemical reaction in aqueous solution,</p> $\text{CH}_2\text{ClCOO}^- + \text{OH}^- \rightarrow \text{CH}_2\text{OHCOO}^- + \text{Cl}^-$ <p>the correct statement is :</p> <p>(1) increase of pressure increases the rate constant</p> <p>(2) increase of dielectric constant increases the rate constant</p> <p>(3) increase of ionic strength decreases the rate constant</p> <p>(4) the entropy of activation is positive</p>
21.	<p>The isomer shift in Mossbaurs in iron complexes changes with increase in S-electrons density :</p> <p>(1) increases                                      (2) decreases</p> <p>(3) no change                                      (4) none of these</p>
22.	<p>Which of the following carbonyls does not possess bridged CO ?</p> <p>(1) <math>\text{Fe}(\text{CO})_9</math>                                      (2) <math>\text{Fe}_3(\text{CO})_{12}</math></p> <p>(3) <math>\text{Ru}_3(\text{CO})_{12}</math>                                      (4) <math>\text{Co}_2(\text{CO})_8</math></p>
23.	<p><math>\text{H}_2\text{Os}_6(\text{CO})_{18}</math> is a cluster :</p> <p>(1) closo    (2) nido</p> <p>(3) Arachno    (4) none of these</p>




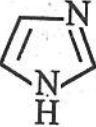
Question No.	Questions
24.	<p>The ionization energy of hydrogen atom in its ground state is approximately 13.6 eV. The potential energy of <math>\text{He}^+</math>, in its ground state is approximately :</p> <p>(1) -54.4 eV                                  (2) -27.2 eV  (3) -13.6 eV                                  (4) -108.8 eV</p>
25.	<p>The intensity of a light beam decreases by 50% when it passes through a sample of 1.0 cm path length. The percentage of transmission of the light passing through the same sample, but of 3.0 cm path length would be :</p> <p>(1) 50.0    (2) 25.0  (3) 16.67    (4) 12.5</p>
26.	<p>For the liquid <math>\rightleftharpoons</math> vapour equilibrium of a substance <math>\frac{dP}{dT}</math> at 1 bar and 400 K is <math>8 \times 10^{-3}</math> bar <math>\text{K}^{-1}</math>. If the molar volume in the vapour form is <math>200 \text{ L mol}^{-1}</math> and the molar volume in the liquid form is negligible, the molar enthalpy of vapourisation is (1.0 bar L = 100 J) :</p> <p>(1) 640 kJ <math>\text{mol}^{-1}</math>                                  (2) 100 kJ <math>\text{mol}^{-1}</math>  (3) 80 kJ <math>\text{mol}^{-1}</math>                                  (4) 64 kJ <math>\text{mol}^{-1}</math></p>
27.	<p>A system consists of gaseous <math>\text{H}_2</math>, <math>\text{O}_2</math>, <math>\text{H}_2\text{O}</math> and <math>\text{CO}_2</math> where the amount of <math>\text{CO}_2</math> is specified and the equilibrium constant for the reactions <math>2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{H}_2\text{O}(\text{g})</math> is known. The number of degrees of freedom of the system is :</p> <p>(1) 2    (2) 3  (3) 4    (4) 5</p>
28.	<p>The vibrational frequency and anharmonicity constant of an alkali halide are <math>300 \text{ cm}^{-1}</math> and 0.0025 respectively. The positions (in <math>\text{cm}^{-1}</math>) of its fundamental mode and first overtone are respectively :</p> <p>(1) 300, 600    (2) 298.5, 595.5  (3) 301.5, 604.5                                  (4) 290, 580</p>

Question No.	Questions
29.	If $U$ is a function of $V$ and $T$ , $\left(\frac{dU}{dT}\right)_p$ is equal to $\pi$ and $\alpha$ are the internal pressure and the coefficient of thermal expansion, respectively : (1) $C_p$ (2) $C_p - \pi V \alpha$ (3) $C_p + \pi V \alpha$ (4) $C_v$
30.	The translational, rotational and vibrational partition functions for a molecule are $f_{\text{translational}} \cong 10^{10} \text{ m}^{-1}$ , $f_{\text{rotation}} = f_{\text{vibration}} \cong 1$ , $(k_B T/H) = 10^{13}$ at room temperature, $N_A = 6 \times 10^{23}$ , using the approximate data given above, the frequency factor (A) for a reaction of the type : atom + diatomic molecule $\rightarrow$ non-linear transition state $\rightarrow$ product, according to the conventional transition state theory is : (1) $2 \times 10^3$ (2) $6 \times 10^7$ (3) $2 \times 10^{12}$ (4) $6 \times 10^{13}$
31.	The reaction ${}^2_1\text{D} + {}^7_4\text{T} \longrightarrow {}^4_2\text{He} + {}^1_0\text{n}$ is an example of : (1) nuclear fission (2) nuclear fusion (3) artificial radioactivity (4) radioactive disintegration
32.	The inert pair effect is predominant in : (1) Si (2) Ge (3) Sn (4) Pb
33.	There is no S-S bond in : (1) $\text{S}_2\text{O}_4^{2-}$ (2) $\text{S}_2\text{O}_5^{2-}$ (3) $\text{S}_2\text{O}_3^{2-}$ (4) $\text{S}_2\text{O}_7^{2-}$

Question No.	Questions
34.	Polyphosphates are used as water softening agents because they : (1) form soluble complexes with anionic species (2) precipitate anionic species (3) form soluble complexes with cationic species (4) precipitate cationic species
35.	Which of the following is paramagnetic ? (1) $\text{Cu}^{2+}$ (2) $\text{Ag}^+$ (3) $\text{Zn}^{2+}$ (4) $\text{Au}^+$
36.	$\text{KMnO}_4$ on heating gives : (1) $\text{K}_2\text{MnO}_4, \text{Mn}_2\text{O}_3$ (2) $\text{K}_2\text{MnO}_4, \text{MnO}, \text{O}_2$ (3) $\text{K}_2\text{MnO}_4, \text{MnO}_2, \text{O}_2$ (4) $\text{K}_2\text{MnO}_4, \text{MnO}_2, \text{O}_3$
37.	Which of the following is an organometallic compound ? (1) Lithium methoxide (2) Lithium acetate (3) Lithium dimethylamide (4) Methyl lithium
38.	The IUPAC name of $[\text{Pt}(\text{NH}_3)_4\text{NO}_2\text{Cl}] \text{SO}_4$ is : (1) chloronitrotetraammine platinum (IV) sulphate (2) tetraamminechloronitro platinum (IV) sulphate (3) nitrochlorotetraammine platinum (IV) sulphate (4) platinum (IV) tetraamminenitrochloro sulphate

Question No.	Questions
39.	<p>The type of magnetism exhibited by <math>[\text{Mn}(\text{H}_2\text{O})_6]^{2+}</math> ion is :</p> <p>(1) diamagnetism                      (2) paramagnetism  (3) ferromagnetism                      (4) antiferromagnetism</p>
40.	<p>Which of the following organometallic compound does not obey EAN rule ?</p> <p>(1) <math>\text{Co}(\text{CO})_3 (\pi\text{-C}_3\text{H}_5)</math>                      (2) <math>(\text{C}_2\text{H}_5) \text{Cr}(\text{CO})_3 (\pi\text{-C}_2\text{H}_5)</math>  (3) <math>[\text{Mn}(\text{CO})_5 (\text{C}_2\text{H}_5)^+</math>                      (4) <math>\text{Co} (\text{C}_6\text{H}_6)_2</math></p>
41.	<p>Which of the following definitions of an asymmetric reaction is the most accurate ?</p> <p>(1) A reaction that involves a chiral reagent.  (2) A reaction that creates a new chiral centre in the product.  (3) A reaction which creates a new chiral centre with selectivity for one enantiomer/diastereoisomer over another.  (4) A reaction that is carried out on an asymmetric starting material</p>
42.	<p>What is meant by a reaction going in 94% enantiomeric excess ?</p> <p>(1) The product contains 94% of one enantiomer and 6% of the other enantiomer.  (2) The product contains an enantiomer which is 94% pure.  (3) The product contains 94% of one enantiomer and 6% of other products  (4) The product contains 97% of an enantiomer and 3% of other enantiomer.</p>





Question No.	Questions
43.	<p>Which reaction condition are not appropriate for the following transformation?</p>  <p>(1) <math>\text{Zn (Hg) / HCl}</math>      (2) <math>\text{NH}_2\text{NH}_2 / \text{NaOH}</math>  (3) <math>\text{LiAlH}_4 / \text{Et}_2\text{O}</math>      (4) <math>\text{HSCH}_2\text{CH}_2\text{CH}_2\text{SH} / \text{H}^+</math>, then <math>\text{H}_2 / \text{Ni}</math></p>
44.	<p>4-Hydroxymethyl cyclohexanone can be synthesized from a Diels-Alder adduct in the following reactions. Which combination of reagents is appropriate for the second step?</p>  <p>(1) (i) <math>\text{NaBH}_4 / \text{MeOH}</math> ; (ii) <math>\text{H}_3\text{O}^+</math>  (2) (i) <math>\text{NaBH}_4 / \text{THF}</math> ; (ii) <math>\text{NaOH} / \text{H}_2\text{O}</math>  (3) (i) <math>\text{LiAlH}_4 / \text{Et}_2\text{O}</math> ; (ii) <math>\text{H}_3\text{O}^+</math>  (4) (i) <math>\text{LiAlH}_4 / \text{Et}_2\text{O}</math> ; (ii) <math>\text{NaOH} / \text{H}_2\text{O}</math></p>
45.	<p>The following transformation is feasible by :</p>  <p>(1) Thermal disrotatory process  (2) Photochemical disrotatory process  (3) Thermal conrotatory process  (4) Photochemical conrotatory process</p>

Question No.	Questions
46.	<p>Which compound is most basic ?</p> <p>(1)  (2) </p> <p>(3)  (4) </p>
47.	<p>Which one of the following gas is responsible for maximum contribution in green house effect ?</p> <p>(1) CFC (2) O<sub>2</sub></p> <p>(3) CO<sub>2</sub> (4) CH<sub>4</sub></p>
48.	<p>The <sup>13</sup>C chemical shifts normally range between :</p> <p>(1) δ = 0-200 ppm (2) δ = 100-200 ppm</p> <p>(3) δ = 50-100 ppm (4) δ = 200-250 ppm</p>
49.	<p>What is meant by a drug's "specification" ?</p> <p>(1) The molecular dimensions of the molecule</p> <p>(2) The physical properties of a drug</p> <p>(3) The purity tests and purity standards required for a drug</p> <p>(4) The functional groups on a drug that are important to its activity</p>
50.	<p>The order of aromaticity of furan, thiophene and pyrrole is as :</p> <p>(1) Thiophene &gt; furan &gt; pyrrole</p> <p>(2) Furan &gt; Pyrrole &gt; thiophene</p> <p>(3) Thiophene &gt; Pyrrole &gt; furan</p> <p>(4) Pyrrole &gt; thiophene &gt; furan</p>

Question No.	Questions
51.	<p>In simple molecular orbital theory of hydrogen molecule, bonding <math>\sigma_g</math> and anti-bonding <math>\sigma_u</math> molecular orbitals are constructed as linear combinations of atomic orbitals of two hydrogen atoms. The spatial part of a purely covalent singlet wavefunction is obtained by :</p> <p>(1) <math>\sigma_g^2 + \sigma_u^2</math> (2) <math>\sigma_g^2</math>  (3) <math>\sigma_g^2 - \sigma_u^2</math> (4) <math>\sigma_g^2 + \frac{1}{2}\sigma_u^2</math></p>
52.	<p>The simultaneous eigen functions of angular momentum operators <math>L^2</math> and <math>L_z</math> are :</p> <p>(1) all of 2s, <math>2p_x</math>, <math>2p_y</math> and <math>2p_z</math> orbitals (2) only 2s, <math>2p_x</math>, and <math>2p_y</math> orbitals  (3) only 2s and <math>2p_z</math> orbitals (4) only <math>2p_z</math> orbital</p>
53.	<p>The single-particle partition function (<math>f</math>) for a certain system has the form <math>f = A Ve^{BT}</math>. The average energy per particle will then be (<math>k</math> is the Boltzman constant) :</p> <p>(1) <math>BkT</math> (2) <math>BkT^2</math>  (3) <math>kT/B</math> (4) <math>kT/B^2</math></p>
54.	<p>Which of the following statements is INCORRECT ?</p> <p>(1) A Slater determinant is an antisymmetrized wave function  (2) Electronic wavefunction should be represented by Slater determinants  (3) A Slater determinant always corresponds to a particular spin state  (4) A Slater determinant obeys the Pauli exclusion principle</p>
55.	<p>1 poise is equal to :</p> <p>(1) <math>10 \text{ N sm}^{-2}</math> (2) <math>100 \text{ N sm}^{-2}</math>  (3) <math>1/100 \text{ N sm}^{-2}</math> (4) <math>1/10 \text{ N sm}^{-2}</math></p>



Question No.	Questions
56.	Find the probability of the link in polymers where average values of links are : (1) (a) 0.99, (b) 0.98 and (c) 0.90      (2) (a) 0.98, (b) 0.90, (c) 0.99 (3) (a) 0.90, (b) 0.98, (c) 0.99      (4) (a) 0.90, (b) 0.99, (c) 0.98
57.	Which of the following can not react as a nucleophile ? (1) $(\text{CH}_3)_3\text{O}^+$ (2) $(\text{CH}_3)_3\text{B}$ (3) $(\text{CH}_3)_3\text{CH}$ (4) $(\text{CH}_3)_3\text{N}$
58.	Which of the following reacts by the E1 mechanism ? (1) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Br}$ (2) $(\text{CH}_3)_2\text{CHCH}_2\text{Br}$ (3) $(\text{CH}_3)_3\text{CBr}$ (4) $\text{CH}_3\text{CH}_2\overset{\text{Br}}{\underset{ }{\text{C}}}\text{H}-\text{CH}_3$
59.	Nicotine alkaloid belong to : (1) Phenylethylamine group      (2) Indole group (3) Pyrrolidine-Pyridine group      (4) Iso quinoline group
60.	The protein in which prosthetic group is carbohydrate are known as : (1) Chromoprotein      (2) Lipoprotein (3) Nucleoprotein      (4) Mucoprotein
61.	The organic chloro compound, which shows complete stereochemical inversion during a $\text{SN}^2$ reaction is : (1) $\text{CH}_3\text{Cl}$ (2) $(\text{C}_2\text{H}_5)_2\text{CHCl}$ (3) $(\text{CH}_3)_3\text{CCl}$ (4) $(\text{CH}_3)_2\text{CHCl}$
62.	What intermolecular force is most responsible for molecular iodine, $\text{I}_2$ being a solid at room temperature ? (1) Dipole-dipole      (2) Ionic-bonding (3) Ion-dipole      (4) London dispersion force

Question No.	Questions
63.	<p>The process of separation of enantiomers from a racemic mixture is known as :</p> <p>(1) Racemic modification                      (2) Resolution  (3) Inversion    (4) Specific rotation</p>
64.	<p>Which one of the following is aromatic compound ?</p> <p>(1)                       (2) </p> <p>(3)                       (4) </p>
65.	<p>The conversion of cis-isomers to trans-isomers or trans-isomers to cis-isomers is known as :</p> <p>(1) Conformations                                      (2) Diaxial interaction  (3) Conformational analysis                      (4) Stereomutation</p>
66.	<p>Which of the following statements regarding cyclopropene is wrong ?</p> <p>(1) It is cyclic  (2) It does not exhibit continuous delocalization  (3) It obeys Huckel's rule  (4) It is aromatic</p>
67.	<p>Which of the following is the most stable carbocation ?</p> <p>(1) <math>C_6H_5\overset{+}{C}H_2</math>                                      (2) <math>CH_3\overset{+}{C}H_2</math>  (3) <math>C_6H_5\overset{+}{C}HC_6H_5</math>                                      (4) <math>C_6H_5CH_2\overset{+}{C}H_2</math></p>
68.	<p>Which of the following is an electrophile ?</p> <p>(1) <math>H_2O</math>    (2) <math>AlCl_3</math>  (3) <math>NH_3</math>    (4) <math>C_2H_5NH_2</math></p>

Question No.	Questions
69.	The most reactive nucleophile among the following is : (1) $C_6H_5O^-$ (2) $(CH_3)_3CO^-$ (3) $CH_3O^-$ (4) $(CH_3)_2CHO^-$
70.	A group whose use makes possible to react a less reactive functional group selectively in the presence of a more reactive group is known as : (1) Umpolung (2) Synthons (3) Synthetic equivalent (4) Protecting group
71.	The temperature-dependence of the vapour pressure of solid A can be represented by $\log p = 10.0 - \frac{1800}{T}$ , and that of liquid A by $\log p = 8.0 - \frac{1400}{T}$ . The temperature of the triple point of A is : (1) 200 K (2) 300 K (3) 400 K (4) 500 K
72.	In Kohlrausch law $\Lambda_m = \Lambda_m^0 - k\sqrt{c}$ , $\Lambda_m^0$ and k (1) depend only on stoichiometry (2) depend only on specific identity of the electrolyte (3) are independent of specific identity of the electrolyte (4) are mainly dependent on specific identity of the electrolyte and stoichiometry, respectively
73.	A first order gaseous reaction is 25% complete in 30 minutes at 227°C and in 10 minutes at 237°C. The activation energy of the reaction is closest to ( $R = 2 \text{ cal K}^{-1} \text{ mol}^{-1}$ ): (1) 27 kcal mol <sup>-1</sup> (2) 110 kcal mol <sup>-1</sup> (3) 55 kcal mol <sup>-1</sup> (4) 5.5 kcal mol <sup>-1</sup>

Question No.	Questions
74.	<p>A carnot takes up 90 J of heat from the source kept at 300 K. The correct statement among the following is :</p> <p>(1) It transfers 60 J of heat to the sink at 200 K</p> <p>(2) It transfers 50 J of heat to the sink at 200 K</p> <p>(3) It transfers 60 J of heat to the sink at 250 K</p> <p>(4) It transfers 50 J of heat to the sink at 250 K</p>
75.	<p>The correct statement about the difference of second and first excited state energies (<math>\Delta E</math>) of a particle in 1-D, 2-D square and 3-D cubic boxes with same length for each, is :</p> <p>(1) <math>\Delta E</math> (1 - D box) = <math>\Delta E</math> (2 - D box) = <math>\Delta E</math> (3 - D box)</p> <p>(2) <math>\Delta E</math> (1 - D box) &gt; <math>\Delta E</math> (2 - D box) &gt; <math>\Delta E</math> (3 - D box)</p> <p>(3) <math>\Delta E</math> (1 - D box) &gt; <math>\Delta E</math> (2 - D box) = <math>\Delta E</math> (3 - D box)</p> <p>(4) <math>\Delta E</math> (1 - D box) &lt; <math>\Delta E</math> (2 - D box) &lt; <math>\Delta E</math> (3 - D box)</p>
76.	<p>According to Eyring transition state theory for a bimolecular reaction, the activated complex has :</p> <p>(1) no vibrational degrees of freedom.</p> <p>(2) vibrational degrees of freedom but they never participate in product formation.</p> <p>(3) one high frequency vibration that leads to product formation.</p> <p>(4) one low frequency vibration that leads to product formation.</p>
77.	<p>The molecule with the smallest rotational constant (in the microwave spectrum) among the following is :</p> <p>(1) <math>N \equiv CH</math></p> <p>(2) <math>HC \equiv CCl</math></p> <p>(3) <math>ClC \equiv CF</math></p> <p>(4) <math>B \equiv CCl</math></p>



Question No.	Questions
84.	Oxymyoglobin contains : (1) $O_2$ at trans position to histidine chain (2) $O_2$ in the hole of porphyrin (3) $O_2$ bonded by coordinated bond to Mg (II) (4) does not contain $O_2$
85.	Heme is a porphyrin complex of : (1) Fe (II)                      (2) Fe (III) (3) Mg (II)                      (4) Zn (II)
86.	The metal present in chlorophyll is : (1) Mg (II)                      (2) Ca (II) (3) Zn (II)                      (4) Fe (II)
87.	During biological nitrogen fixations nitrifying bacteria convert : (1) $NO_3^-$ to $NH_4^+$ (2) $N_2$ to $NH_4^+$ (3) $NH_4^+$ to $NO_3^-$ (4) $NO_3^-$ to $N_2$
88.	How many fundamental vibrations are possible in $SO_2$ molecule ? (1) Two                              (2) Three (3) Four                              (4) Six
89.	The EPR spectrum of $NO_2$ will show : (1) One peak                      (2) Two peaks (3) Three peaks                      (4) Four peaks
90.	How many bands are obtained in the electronic spectra of $[Ni(H_2O)_6]^{2+}$ complex ion ? (1) Two                              (2) Three (3) One                              (4) Four

Question No.	Questions
91.	Which atom requires the least amount of energy to form its cation ? (1) Na (2) Rb (3) Al (4) Mg
92.	When an electron is added to a gaseous atom : (1) its size decreases (2) energy is released (3) it changes to positive ion (4) its tendency to accept electron increases
93.	According to VSEPR theory, the geometry of $ICl_2^-$ ion is : (1) trigonal planar (2) square planar (3) angular (4) linear
94.	During the change of $NO^+$ to $NO$ , the electron is added in a : (1) $\sigma$ -orbital (2) $\pi$ -orbital (3) $\sigma^*$ -orbital (4) $\pi^*$ -orbital
95.	The molecular orbital configuration of $B_2$ molecule is : (1) $KK (\sigma 2s)^2 (\sigma 2p)^2 (\sigma^* 2s)^2$ (2) $KK (\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2pz)^2$ (3) $KK (\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2px)^1 (\pi 2py)^1$ (4) $KK (\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2px)^2$
96.	Which of the following is not a hard acid ? (1) $Na^+$ (2) $Mg^{2+}$ (3) $Pd^{2+}$ (4) $Ti^{4+}$
97.	$CH_3OH$ is : (1) soft-soft (2) hard-hard (3) soft-hard (4) hard-soft

Question No.	Questions
98.	Arrange the order of increasing solubilities of alkali metal halides in liquid $\text{SO}_2$ of the following, NaCl, NaBr, NaF and NaI : (1) $\text{NaI} > \text{NaBr} > \text{NaCl} > \text{NaF}$ (2) $\text{NaI} > \text{NaBr} < \text{NaCl} > \text{NaF}$ (3) $\text{NaI} < \text{NaBr} < \text{NaCl} < \text{NaF}$ (4) $\text{NaI} < \text{NaBr} > \text{NaCl} < \text{NaF}$
99.	Which is not emitted by a radioactive substance ? (1) $\alpha$ -rays      (2) $\beta$ -rays (3) positron      (4) proton
100.	In a nuclear reaction ${}_3^7\text{Li} + \text{Z} \longrightarrow {}_4^7\text{Be} + {}_0^1\text{n}$ the bombarding projectile Z is : (1) $\alpha$ -particle      (2) deuterium (3) neutron      (4) proton



URS/Ph.D Answer Key - Deptt. of Chemistry

Sr. No.	Set A	Set B	Set C	Set D ✓
1	2	2	1	1 ✓
2	2	4	4	2 ✓
3	4	4	3	4 ✓
4	4	3	1	3 ✓
5	3	1	3	1 ✓
6	3	3	4	2 ✓
7	3	4	3	3 ✓
8	1	2	4	3 ✓
9	4	2	3	3 ✓
10	1	4	2	2 ✓
11	2	3	1	2 ✓
12	4	4	3	3 ✓
13	4	3	1	3 ✓
14	3	3	1	2 ✓
15	1	3	1	2 ✓
16	3	3	1	3 ✓
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18	2	1	2	1 ✓
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23	1	4	4	2 ✓
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30	2	2	1	2 ✓
31	2	2	3	2 ✓
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34	4	2	3	3 ✓
35	4	2	3	1 ✓
36	4	3	3	3 ✓
37	2	3	3	4 ✓
38	2	1	1	2 ✓
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41	1	2	3	3 ✓
42	4	3	3	4 ✓
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44	1	4	3	3 ✓
45	3	4	1	3 ✓
46	4	4	3	3 ✓
47	3	2	4	3 ✓
48	4	2	3	1 ✓
49	3	3	3	4 ✓
50	2	2	4	3 ✓

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