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 $IC\ell_2^-$ 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) σ-orbital (2) π-orbital
	(3) $\sigma^*$ -orbital (4) $\pi^*$ -orbital
5.	The molecular orbital configuration of $B_2$ molecule is :
	(1) KK $(\sigma 2s)^2 (\sigma 2p2)^2 (\sigma^* 2s)^2$ (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?
a de	(1) Na <sup>+</sup> (2) Mg <sup>2+</sup>
52 N	(3) Pd <sup>2+</sup> (4) Ti <sup>4+</sup>

Question No.	Questions					
7.	CH <sub>3</sub> OH is:					
	(1) soft-soft (2) hard-hard					
	(3) soft-hard (4) hard-soft					
8.	Arrange the order of increasing solubilities of alkali metal halides in liquid $SO_2$ of the following, NaC $\ell$ , NaBr, NaF and NaI:					
	(1) $NaI > NaBr > NaC\ell > NaF$ (2) $NaI > NaBr < NaC\ell > NaF$					
	(3) $NaI < NaBr < NaC\ell < NaF$ (4) $NaI < NaBr > NaC\ell < NaF$					
9.	Which is not emitted by a radioactive substance?					
	(1) α-rays (2) β-rays					
<i>i</i>	(3) positron (4) proton					
10.	In a nuclear reaction					
	$_{3}^{7}\text{Li} + Z \longrightarrow _{4}^{7}\text{Be} + _{0}^{1}\text{n}$					
. = 111 3	the bombarding projectile Z is:					
	(1) α-particle (2) denterium					
	(3) neutron (4) proton					
11.	The reaction					
	$^{2}_{1}D + ^{7}_{4}T \longrightarrow ^{4}_{2}He + ^{1}_{0}n$ is an example of:					
	(1) nuclear fission (2) nuclear fusion					
	(3) artificial radioactivity (4) radioactive disintegration					
12.	The inert pair effect is predominant in:					
2.7	(1) Si (2) Ge					
1 2 V	(3) Sn (4) Pb					

No.	Questions  There is no S-S bond in:					
13.						
	(1) $S_2O_4^{2-}$ (2) $S_2O_5^{2-}$ (3) $S_2O_3^{2-}$ (4) $S_2O_7^{2-}$					
	(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					
ra e	(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 <sup>2+</sup> (4) Au <sup>+</sup>					
16.	KMnO <sub>4</sub> on heating gives:					
1 : 48	$(1)  K_2MnO_4, Mn_2O_3 \qquad (2)  K_2MnO_4, MnO, O_2$					
	(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>					
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 $[Pt(NH_3)_4NO_2C\ell]$ SO <sub>4</sub> is:					
4	(1) chloronitrotetraammine platinum (IV) sulphate					
	(2) tetraamminechloronitro platinum (IV) sulphate					
	(3) nitrochlorotetraammine platinum (IV) sulphate					
	(4) platinum (IV) tetraamminenitrochloro sulphate					

Question No.	Questions						
19.	The type of magnetism exhibited by $[Mn(H_2O)_6]^{2+}$ ion is :						
8.	(1) diamagnetism (2) paramagnetism						
	(3) ferromagnetism (4) antiferromagnetism						
20.	Which of the following organometallic compound does not obey EAN rule?						
	(1) $CO(CO)_3 (\pi - C_3 H_5)$ (2) $(C_2 H_5) Cr(CO)_3 (\pi - C_2 H_5)$						
***	(3) $[Mn(CO)_5 (C_2H_5)^+$ (4) $Co (C_6H_6)_2$						
21.	Wilkinson's catalyst is used for:						
	(1) hydrogenation of alkenes (2) hydrogenation of alkynes						
	(3) hydrogenationof alkanes (4) hydrogenation of unsaturated oils						
22.	An aqueous solution contains $Hg^+$ , $Pb^{2+}$ and $Cd^{2+}$ . The addition of 6N $HC\ell$ precipitates :						
	(1) $\operatorname{Hg}_{2}\operatorname{C}\ell_{2}$ only (2) $\operatorname{PbC}\ell_{2}$ only						
	(3) $\operatorname{Hg}_{2}\operatorname{C}\ell_{2} + \operatorname{PbC}\ell_{2}$ (4) $\operatorname{PbC}\ell_{2} + \operatorname{HgC}\ell_{2}$						
23.	Which one among the following pairs cannot be separated by $H_2S$ in dil $HC\ell$ ?						
	(1) $Bi^{3+}$ , $Sn^{4+}$ (2) $A\ell^{3+}$ , $Hg^{2+}$						
-	(3) Zn <sup>2+</sup> , Sn <sup>4+</sup> (4) Ni <sup>2+</sup> , Cu <sup>2+</sup>						
24.	Oxymyoglobin contains:						
	(1) O <sub>2</sub> at trans position to histidine chain						
	(2) O <sub>2</sub> in the hole of porphyrin						
	(3) O <sub>2</sub> bonded by coordinated bond to Mg (II)						
	(4) does not contain O <sub>2</sub>						

Question No.	Questions						
25.	Heme is a porphyrin complex of:						
	(1) Fe (II)	(2)	Fe (III)				
20	(3) Mg (II)	(4)	Zn (II)				
26.	The metal present in chloro	phyll is:					
	(1) Mg (II)	(2)	Ca (II)				
	(3) Zn (II)	(4)	Fe (II)				
27.	During biological nitrogen f	ixations	nitrifying bacteria convert :				
	(1) $NO_3^-$ to $NH_4$	(2)	N <sub>2</sub> to NH <sub>4</sub>				
	(3) NH <sub>4</sub> to NO <sub>3</sub>	(4)	$\mathrm{NO_3^-}$ to $\mathrm{N_2}$				
28.	How many fundamental vibrations are possible in SO <sub>2</sub> molecule?						
	(1) Two	(2)	Three				
	(3) Four	(4)	Six				
29.	The EPR spectrum of $NO_2$ v	vill show	:				
	(1) One peak	(2)	Two peaks				
	(3) Three peaks	(4)	Four peaks				
30.	How many bands are obta complex ion?	ined in t	he electronic spectra of $[Ni(H_2O)_6]^{2+}$				
	(1) Two	(2)	Three				
	(3) One	(4)	Four				
31.	The isomer shift in Mossbar S-electrons density:	urs in iro	n complexes changes with increase in				
	(1) increases	(2)	decreases				
	(3) no change	(4)	none of these				

uestion	Questions						
No.		9 1 12 9 13					
32.	Which	of the follow	ving carbo	nyls doe	s not posses	s bridged	CO?
	(1) F	re (CO) <sub>9</sub>	24	(2)	$\mathrm{Fe_3}\left(\mathrm{CO}\right)_{12}$		
	(3) F	$\mathrm{Ru}_{_3}\left(\mathrm{CO}\right)_{_{12}}$		(4)	$Co_2(CO)_8$		27 R
33.	H <sub>2</sub> Os	(CO) <sub>18</sub> is a c	cluster :		# ## ## ## ## ## ## ## ## ## ## ## ## #		1
	(1) c	closo		(2)	nido		
	(3) A	Arachno		(4)	none of the	ese	
34.	appro	ionization oximately 13.	energy of 6 eV. The	hydro potentia	gen atom i lenergy of I	in its gro He <sup>+</sup> , in its	ound state i ground state i
	(1) -	- 54.4 eV		(2)	$-27.2\mathrm{eV}$		
	(3) -	– 13.6 eV		(4)	$-108.8\mathrm{eV}$		
35.	gamr	ale of 1.0 cm	oath lengtl	h. The po	ercentage of	transmiss	sses through sion of the ligh th would be :
	(1)	50.0		(2)	25.0		est s
	(3)	16.67		(4)	12.5		
36.	For	the liquid $ eq$	vapo	our equi	librium of a	substanc	$\frac{dP}{dT}$ at 1 be
	200	$400~{ m K~is~8}  imes { m L~mol^{-1}}$ and ar enthalpy o	the molar	volume	e in the liqu	id form is	vapour form negligible, t
	(1)	640 kJ mol-		(2)	1 T		
	(-/	77704			64 kJ mol		

Question No.	I WIIESTIONS					
37.	A system consists of gaseous $H_2$ , $O_2$ , $H_2O$ and $CO_2$ where the amount of $CO_2$ is specified and the equilibrium constant for the reactions $2H_2(g) + O_2(g) \rightleftharpoons 2H_2O(g)$ is known. The number of degrees of freedom of the system is:					
	(1) 2 (2) 3 (3) 4 (4) 5					
	(4) 5					
38.	The vibrational frequency and anharmonicity constant of an alkali halide are 300 cm <sup>-1</sup> and 0.0025 respectively. The positions (in cm <sup>-1</sup> ) of its fundamental mode and first overtone are respectively:					
	(1) 300, 600 (2) 298.5, 595.5					
lum :	(3) 301.5, 604.5 (4) 290, 580					
39.	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) $C_v$					
40.	The translational, rotational and vibrational partition functions for a molecule are $f_{translational} \cong 10^{10} \text{ m}^{-1}$ , $f_{rotation} = f_{vibration} \cong 1$ , $(k_BT/H) = 10^{13}$ 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) $6 \times 10^7$					
8 2.2	(3) $2 \times 10^{12}$ (4) $6 \times 10^{13}$					

Question No.	Questions
110.	
41.	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
42.	In Kohlrausch law $\Lambda_m = \Lambda_m^0 - k \sqrt{c}$ , $\Lambda_m^0$ and k
	(1) depend only on stoichiometry
W to the second	(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
43.	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) $27 \text{ kcal mol}^{-1}$ (2) $110 \text{ kcal mol}^{-1}$
	(3) $55 \text{ kcal mol}^{-1}$ (4) $5.5 \text{ kcal mol}^{-1}$
44.	A carnot takes up 90 J of heat from the source kept at 300 K. The correct statement among the following is:
	(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

Question No.	Questions				
45.	The correct statement about the difference of second and first excited state energies ( $\Delta E$ ) of a particle in 1-D, 2-D square and 3-D cubic boxes with same length for each, is:				
	(1) $\Delta E (1 - D box) = \Delta E (2 - D box) = DE (3 - D box)$				
	(2) $\Delta E (1 - D box) > \Delta E (2 - D box) > DE (3 - D box)$				
	(3) $\Delta E (1 - D box) > \Delta E (2 - D box) = DE (3 - D box)$				
	(4) $\Delta E (1 - D box) < \Delta E (2 - D box) < DE (3 - D box)$				
46.	According to Eyring transition state theory for a bimolecular reaction, the activated complex has:				
	(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.				
47.	The molecule with the smallest rotational constant (in the microwave spectrum) among the following is:				
	(1) $N \equiv CH$ (2) $HC \equiv CC\ell$				
-	(3) $C\ell C \equiv CF$ (4) $B \equiv CC\ell$				
48.	The electronic transition energy from $\pi_1 \to \pi_2$ in propenyl radical is 4.8 eV. Within the frame work of Huckel theory, the transitions energy from $\pi_1 \to \pi_3$ would be:				
	(1) 2.4 eV (2) 4.8 eV				
	(3) 14.4 eV (4) 9.6 eV				

Question No.	Questions						
49.	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						
50.	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°. The wavelength of X-ray used is close to:						
	(1) 11 nm (2) 18 nm						
	(3) 25 nm (4) 32 nm						
51.	The specific conductance of a solution is $0.176~\Omega^{-1}~cm^{-1}$ . If the cell constant is $0.255~cm^{-1}$ , the conductance ( $\Omega^{-1}$ ) of that solution is :						
	(1) 1.449 (2) 0.690						
	(3) 0.045 (4) 0.431						
52.	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> ) ( $\overline{M}_n$ ) of the sample is :						
,-	(1) 13,000 (2) 15,000						
	(3) 14,000 (4) 16,000						
53.	Two phases ( $\alpha$ and $\beta$ ) of a species are in equilibrium. The correct relations observed among the variables, T, p and $\mu$ are :						
	(1) $T_{\alpha} = T_{\beta}$ , $p_{\alpha} \neq p_{\beta}$ , $\mu_{\alpha} = \mu_{\beta}$ (2) $T_{\alpha} \neq T_{\beta}$ , $p_{\alpha} = p_{\beta}$ , $\mu_{\alpha} = \mu_{\beta}$						
*	(3) $T_{\alpha} = T_{\beta}$ , $p_{\alpha} = p_{\beta}$ , $\mu_{\alpha} = \mu_{\beta}$ (4) $T_{\alpha} = T_{\beta}$ , $p_{\alpha} = p_{\beta}$ , $\mu_{\alpha} \neq \mu_{\beta}$						

Questions			
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 ( $V_{FCC}$ and $V_{BCC}$ is:			
$(1)  V_{BCC}: V_{FCC} \qquad (2)  2V_{BCC}: V_{FCC}$			
(3) $V_{BCC}: 2V_{FCC}$ (4) $V_{BCC}: \frac{1}{2}V_{FCC}$			
One molecular orbital of a polar molecule AB has the form $C_A \Psi_A + C_B \Psi_B$ , where $\Psi_A$ and $\Psi_B$ , 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 $\Psi_A$ and $\Psi_B$ , a possible set of $C_A$ and $C_B$ is:			
(1) $C_A = 0.95, C_B = 0.32$ (2) $C_A = 0.32, C_B = 0.95$			
(3) $C_A = -0.32$ , $C_B = 0.95$ (4) $C_A = 0.32$ , $C_B = -0.95$			
The first order rate constant for a unimolecular gas phase reaction $A \rightarrow \text{products that follows Lindemann mechanism is } 2.0 \text{ s}^{-1} \text{ at p}_A = 1 \text{ atm}$ and $4.0 \text{ s}^{-1} \text{ at p}_A = 2 \text{ atm}$ . The rate constant for the activation step is :			
(1) $1.0 \text{ atm}^{-1} \text{ s}^{-1}$ (2) $4.0 \text{ atm}^{-1} \text{ s}^{-1}$			
(3) $2.0 \text{ atm}^{-1} \text{ s}^{-1}$ (4) $8.0 \text{ atm}^{-1} \text{ s}^{-1}$			
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. $\Delta G$ for this process is :			
(1) $300R \ln 2$ (2) $600R \ln 2$			
(3) $-600R \ln 2$ (4) $300 \ln 2$			
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:			
(1) 0 (2) 1			

Question No.	Questions
59.	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:
	(1) $\frac{h^2}{8  \text{m}} \left(\frac{2}{a^2}\right)$ , 1 (2) $\frac{h^2}{8  \text{m}} \left(\frac{17}{4  a^2}\right)$ , 2
	(3) $\frac{h^2}{8  \text{m}} \left( \frac{5}{4  \text{a}^2} \right)$ , 1 (4) $\frac{h^2}{8  \text{m}} \left( \frac{5}{\text{a}^2} \right)$ , 2
60.	For the chemical reaction in aqueous solution,
00.	$CH_2C\ell COO^- + OH^- \rightarrow CH_2OHCOO^- + C\ell^-$
	the correct statement is:
	(1) increase of pressure increases the rate constant
, T	(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
61.	In simple molecular orbital theory of hydrogen molecule, bonding $\sigma_g$ and anti-bonding $\sigma_u$ molecular orbitals are constructed as linear combination 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) $\sigma_g^2 + \frac{1}{2}\sigma_u^2$
62.	The simultaneous eigen functions of angular momentum operator L2 and Lz are:
	(1) all of 2s, 2p <sub>x</sub> , 2p <sub>y</sub> and 2p <sub>z</sub> orbitals (2) only 2s, 2p <sub>x</sub> , and 2p <sub>y</sub> orbital
	(3) only 2s and 2p <sub>z</sub> orbitals (4) only 2p <sub>z</sub> orbital

Question No.	Questions
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 Boltzman constant):
	(1) BkT (2) BkT <sup>2</sup> (3) kT/B (4) kT/B <sup>2</sup>
64.	Which of the following statements in INCORRECT?
	<ol> <li>A Slater determinant is an antisymmetrized wave function</li> <li>Electronic wavefunction should be represented by Slater</li> </ol>
	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) $(CH_3)_3O^+$ (2) $(CH_3)_3B$
	(3) $(CH_3)_3 CH$ (4) $(CH_3)_3 N$
68.	Which of the following reacts by the E1 mechanism?
	(1) $CH_3CH_2CH_2CH_2Br$ (2) $(CH_3)_2CHCH_2Br$ Br
51 A	(3) $(CH_3)_3 CBr$ (4) $CH_3CH_2CHCH_3$

uestion No.	Questions
140.	
69.	Nicotine alkaloid belong to:
	(1) Phenylethylamine group (2) Indoe 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 atmoshphere?
	(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
	(CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> C(O) CH = CH <sub>2</sub> have in <sup>1</sup> H NMR and <sup>13</sup> C NM spectra?
	(1) Five <sup>1</sup> H signals and six <sup>13</sup> C signals
	(2) Five <sup>1</sup> H signals and seven <sup>13</sup> C signals
	(3) Six <sup>1</sup> H signals and seven <sup>13</sup> C signals
1	(4) Six <sup>1</sup> H signals and six <sup>13</sup> C signals

Question No.	Questions	
74.	A single strong absorption near 1800 cm <sup>-1</sup> in IR spectroscopy indicate the presence of:	
	(1) Thioketones (2) Sulphoxide	
	(3) Acid halide (4) Azo compounds	
75.	Which of the following statements is true?	
e le	(1) Drugs are generally smaller than drug targets.	
4	(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 KMnO <sub>4</sub> 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?	
	O	
	$(1) \qquad Ph \qquad Ph \qquad + MeMgBr \qquad \xrightarrow{i) Et_2O} \qquad \xrightarrow{ii) H_3O^+}$	
	(2) $Ph$ $Me$ + $PhMgBr \xrightarrow{i) Et_2O}$ $ii) H_3O^+$	
	(3) $Ph$ + PhCH <sub>2</sub> MgBr $\xrightarrow{i) Et_2O}$ $ii) H_3O^+$	
	(4) $ O_{\text{Oet}} + 2 \text{ PhMgBr} \xrightarrow{i) \text{ Et}_2\text{O}}                                   $	

Question No.	Questions
110.	
78.	Which compound is not a carboxylic acid?
	0
34 7	(1) CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> C - OH (2)
	(1) CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> C OH (2) HO
	ОН
	0
	(3) OH (4) M
79.	Which of the following is most reactive in electrophilic aromatic
	substitution?
51 02	
	$(1)  \binom{N}{S} \qquad (2)  \binom{N}{N} $
	$(3)  \binom{N}{N} \qquad (4)  \boxed{0}$
	(9) III
80.	The IUPAC name of the compound shown below is:
	$\mathrm{C}\ell$ $\mathrm{CH_3}$
	$CH_3 - CH - C = CHCH_3$
	(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
81.	The organic chloro compound, which shows complete stereochemica
	inversion during a SN <sup>2</sup> reaction is:
	(1) $CH_3C\ell$ (2) $(C_2H_5)_2CHC\ell$
	(3) $(CH_3)_3 CC\ell$ (4) $(CH_3)_3 CHC\ell$
82.	What intermolecular force is most responsible for molecular iodine $I_2$ being a solid at room temperature?
	(1) Dipole-dipole (2) Ionic-bonding
1	(3) Ion-dipole (4) London dispersion force

Question No.	Questio	ons
83.	The process of separation of enantiome as:	rs from a racemic mixture is known
	(1) Racemic modification (2) I	Resolution
	(3) Inversion (4) S	Specific rotation
84.	Which one of the following is aromatic	compound?
	(1) (2)	
	(3) (4)	
85.	The conversion of cis-isomers to transsomers is known as:	s-isomers or trans-isomers to cis-
s # 19		Signial indonestion
		Diaxial interaction Stereomutation
86.	Which of the following statements reg	
	(1) It is cyclic	aranig cyclopropene is wrong :
2	(2) It does not exhibit continuous del	ocalization
	(3) It obeys Huckel's rule	oddization
	(4) It is aromatic	
87.	Which of the following is the most stable carbocation?	
	(1) $C_6H_5\overset{+}{C}H_2$ (2)	
	(3) $C_6 H_5 \overset{+}{C} H C_6 H_5$ (4) (	$C_6H_5CH_2\overset{+}{C}H_2$
88.	Which of the following is an electroph	ile?
	(1) $H_2O$ (2) $A$	$A\ell C\ell_3$
		C <sub>2</sub> H <sub>5</sub> NH <sub>2</sub>

Question No.	Questions
89.	The most reactive nucleophile among the following is:
	(1) $C_6H_5\bar{O}$ (2) $(CH_3)_3C\bar{O}$
5 3 40 5	(1) $C_6H_5\bar{O}$ (2) $(CH_3)_3C\bar{O}$ (3) $CH_3\bar{O}$ (4) $(CH_3)_2C\bar{H}\bar{O}$
90.	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) Synthon
	(3) Synthetic equivalent (4) Protecting group
91.	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
92.	What is meant by a reaction going in 94% enantiomeric excess?
	(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.

Question No.	Questions
140.	
93.	Which reaction condition are not appropriate for the following transformation?
	$\stackrel{\circ}{\cup} \longrightarrow \bigcirc$
# 1	(1) $\operatorname{Zn}\left(\operatorname{Hg}\right) / \operatorname{HC}\ell$ (2) $\operatorname{NH}_{2}\operatorname{NH}_{2} / \operatorname{NaOH}$
	(3) $\text{LiA}\ell\text{H}_4$ / $\text{Et}_2\text{O}$ (4) $\text{HS CH}_2\text{CH}_2\text{CH}_2\text{SH}$ / $\text{H}^+$ , then $\text{H}_2$ / $\text{Ni}$
94.	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?
	$_{\text{MeO}}$ + $_{\text{OMe}}$ $\xrightarrow{\Delta}$ $_{\text{MeO}}$ $\xrightarrow{O}$ $\xrightarrow{O}$ $\xrightarrow{O}$ $\xrightarrow{O}$ $\xrightarrow{O}$ $\xrightarrow{O}$ $\xrightarrow{O}$ $\xrightarrow{O}$
	(1) (i) NaBH <sub>4</sub> / MeOH; (ii) H <sub>3</sub> O <sup>+</sup> (2) (i) NaBH <sub>4</sub> / THF; (ii) NaOH / H <sub>2</sub> O (3) (i) LiA $\ell$ H <sub>4</sub> / Et <sub>2</sub> O; (ii) H <sub>3</sub> O <sup>+</sup> (4) (i) LiA $\ell$ H <sub>4</sub> / Et <sub>2</sub> O; (ii) NaOH / H <sub>2</sub> O
95.	The following transformation is feasible by:
	Me H H Me Me Me Trans Cis
*	(1) Thermal disrotatory process
	(2) Photochemical disrotatory process
	(3) Thermal conrotatory process
487	(4) Photo chemical conrotatory process

uestion	Questions
No.	
96.	Which compound is most basic?
	$(1)  \begin{array}{ c c } \hline \\ N \end{array} \qquad \qquad (2)  \begin{array}{ c c } \hline \\ N \\ H \end{array}$
	$(3)  \bigvee_{H}^{N} \qquad \qquad (4)  \bigvee_{H}^{N} \qquad \qquad $
97.	Which one of the following gas is responsible for maximum contribution in green house effect?
	(1) CFC (2) O <sub>2</sub> (3) CO <sub>2</sub> (4) CH <sub>4</sub>
98.	The <sup>13</sup> C chemical shifts normally range between:
	(1) $\delta = 0.200 \text{ ppm}$ (2) $\delta = 100.200 \text{ ppm}$ (3) $\delta = 50.100 \text{ ppm}$ (4) $\delta = 200.250 \text{ ppm}$
99.	What is meant by a drug's 'specification'?  (1) The molecular dimensions of the molecule
	<ul> <li>(2) The physical properties of a drug</li> <li>(3) The purity tests and purity standards required for a drug</li> <li>(4) The functional groups on a drug that are important to its activity</li> </ul>
100.	The order of aromaticity of furan, thiophene and pyrrole is as:
	<ul><li>(1) Thiophene &gt; furan &gt; pyrrole</li><li>(2) Furan &gt; Pyrrole &gt; thiophene</li></ul>
	(3) Thiophene > Pyrrole > furan
	(4) Pyrrole > thiophene > furan

Question No.	Questions
1.	The reaction
	$_{1}^{2}D + _{4}^{7}T \longrightarrow _{2}^{4}He + _{0}^{1}n$ is an example of:
	(1) nuclear fission (2) nuclear fusion
	(3) artificial radioactivity (4) radioactive disintegration
2.	The inert pair effect is predominant in:
	(1) Si (2) Ge
	(3) Sn (4) Pb
3.	There is no S-S bond in:
	(1) $S_2O_4^{2-}$ (2) $S_2O_5^{2-}$ (3) $S_2O_3^{2-}$ (4) $S_2O_7^{2-}$
	(3) $S_2O_3^{2-}$ (4) $S_2O_7^{2-}$
4.	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
5.	Which of the following is paramagnetic?
	(1) Cu <sup>2+</sup> (2) Ag <sup>+</sup>
8	(3) Zn <sup>2+</sup> (4) Au <sup>+</sup>
6.	KMnO <sub>4</sub> on heating gives:
	(1) $K_2MnO_4$ , $Mn_2O_3$ (2) $K_2MnO_4$ , $MnO_1O_2$
*	(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>

Question No.	Questions	
7.	Which of the following is an organometallic compound?	
* 6 1	(1) Lithium methoxide (2) Lithium acetate	
	(3) Lithium dimethylamide (4) Methyl lithium	
8.	The IUPAC name of $[Pt(NH_3)_4NO_2C\ell]$ SO <sub>4</sub> 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 $[Mn(H_2O)_6]^{2+}$ ion is:	
	(1) diamagnetism (2) paramagnetism	
	(3) ferromagnetism (4) antiferromagnetism	
10.	Which of the following organometallic compound does not obey EAN rule?	
	(1) $CO(CO)_3 (\pi - C_3 H_5)$ (2) $(C_2 H_5) Cr(CO)_3 (\pi - C_2 H_5)$	
H N	(3) $[Mn(CO)_5 (C_2H_5)^+$ (4) $Co (C_6H_6)_2$	
11.	Which of the following definitions of an asymmetric reaction is the mos accurate?	
	(1) A reaction that involves a chiral reagent.	
1. E.	(2) A reaction that creates a new chiral centre in the product.	
3	(3) A reaction which creates a new chiral centre with selectivity for one enantiomer/diastereoisomer over another.	
1 2	(4) A reaction that is carried out on an asymmetric starting material	
F		

uestion	Questions
No.	. 9
12.	What is meant by a reaction going in 94% enantiomeric excess?
	(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.
13.	Which reaction condition are not appropriate for the following transformation?
	$\bigcirc \longrightarrow \bigcirc$
	(1) $\operatorname{Zn}\left(\operatorname{Hg}\right)/\operatorname{HC}\ell$ (2) $\operatorname{NH}_{2}\operatorname{NH}_{2}/\operatorname{NaOH}$
	(1) $\operatorname{Zn}(\operatorname{Hg}) / \operatorname{HC}\ell$ (2) $\operatorname{NH}_2 \operatorname{NH}_2 / \operatorname{NaOH}$ (3) $\operatorname{LiA}\ell \operatorname{H}_4 / \operatorname{Et}_2 \operatorname{O}$ (4) $\operatorname{HS} \operatorname{CH}_2 \operatorname{CH}_2 \operatorname{CH}_2 \operatorname{H} / \operatorname{H}^+$ , then $\operatorname{H}_2 / \operatorname{Ni}$
14.	4-Hydroxymethyl cyclohexanone can be synthesized from a Diels-Alde adduct in the following reactions. Which combination of reagents appropriate for the second step?
	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
	MeO + OMe MeO O
	(1) (i) $NaBH_4/MeOH$ ; (ii) $H_3O^+$ (2) (i) $NaBH_4/THF$ ; (ii) $NaOH/H_2O$
	(3) (i) $\text{LiA}\ell\text{H}_4$ / $\text{Et}_2\text{O}$ ; (ii) $\text{H}_3\text{O}^+$ (4) (i) $\text{LiA}\ell\text{H}_4$ / $\text{Et}_2\text{O}$ ; (ii) NaOH / $\text{H}_2\text{O}$

Question No.	Questions
15.	The following transformation is feasible by:
	Me H H Me Me Me Trans Cis
	<ol> <li>Thermal disrotatory process</li> <li>Photochemical disrotatory process</li> <li>Thermal conrotatory process</li> <li>Photo chemical conrotatory process</li> </ol>
16.	Which compound is most basic?
	$(1)  \bigcirc \\ N \qquad \qquad (2)  \bigcirc \\ H \qquad \qquad $
	(3) $\bigvee_{H}^{N}$ (4) $\bigvee_{H}^{N}$
17.	Which one of the following gas is responsible for maximum contribution
	in green house effect?
	(1) CFC (2) O <sub>2</sub>
	(3) CO <sub>2</sub> (4) CH <sub>4</sub>
18.	The <sup>13</sup> C chemical shifts normally range between:
	(1) $\delta = 0.200 \text{ ppm}$ (2) $\delta = 100.200 \text{ ppm}$
	(3) $\delta = 50-100 \text{ ppm}$ (4) $\delta = 200-250 \text{ ppm}$
19.	What is meant by a drug's "specification"?
	(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

Question No.	Questions
20.	The order of aromaticity of furan, thiophene and pyrrole is as:
	(1) Thiophene > furan > pyrrole
	(2) Furan > Pyrrole > thiophene
	(3) Thiophene > Pyrrole > furan
	(4) Pyrrole > thiophene > furan
21.	Which one of the following is most abundant of all the hydrocarbons pollutants in the atmoshphere?
	(1) Methane (2) HCH
	(3) Benzene (4) Propane
22.	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
23.	How many signals does the unsaturated ketone
	(CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> C(O) CH = CH <sub>2</sub> have in <sup>1</sup> H NMR and <sup>13</sup> C NMR spectra?
	(1) Five <sup>1</sup> H signals and six <sup>13</sup> C signals
10 100	(2) Five <sup>1</sup> H signals and seven <sup>13</sup> C signals
	(3) Six <sup>1</sup> H signals and seven <sup>13</sup> C signals
123	(4) Six <sup>1</sup> H signals and six <sup>13</sup> C signals

Question No.	Questions
24.	A single strong absorption near 1800 cm <sup>-1</sup> in IR spectroscopy indicates the presence of:
	(1) Thioketones (2) Sulphoxide
E Sec	(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.
7 - 2	(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 KMnO <sub>4</sub> 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) $Ph$ + MeMgBr $\frac{i) Et_2O}{ii) H_3O^+}$
	(2) $Ph$ $Me$ + $PhMgBr \xrightarrow{i) Et_2O}$ $ii) H_3O^+$
	(3) $Ph H + PhCH_2MgBr \xrightarrow{i) Et_2O} ii) H_3O^+$
	(4) $O$ OEt + 2 PhMgBr $i)$ Et <sub>2</sub> O $ii)$ H <sub>3</sub> O <sup>+</sup>

Question No.	Questions
28.	Which compound is not a carboxylic acid?
	(1) CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> C - OH (2) HO
	OH
	(3) OH (4) O
29.	Which of the following is most reactive in electrophilic aromatic
20.	substitution?
	$(1)   \qquad \qquad (2)   \qquad $
	$(3) \bigvee_{H}^{N} \qquad (4) \bigvee_{O}^{N}$
30.	The IUPAC name of the compound shown below is:
	$C\ell  CH_3$ $CH_3 - CH - C = CHCH_3$
	(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
31.	The specific conductance of a solution is $0.176 \Omega^{-1} \mathrm{cm}^{-1}$ . If the cell constant is $0.255 \mathrm{cm}^{-1}$ , the conductance ( $\Omega^{-1}$ ) of that solution is :
	(1) 1.449 (2) 0.690
-	(3) 0.045 (4) 0.431

Question No.	Questions
32.	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> ) ( $\overline{M}_n$ ) of the sample is :
	(1) 13,000 (2) 15,000
	(3) 14,000 (4) 16,000
33.	Two phases ( $\alpha$ and $\beta$ ) of a species are in equilibrium. The correct relations observed among the variables, T, p and $\mu$ are :
	(1) $T_{\alpha} = T_{\beta}$ , $p_{\alpha} \neq p_{\beta}$ , $\mu_{\alpha} = \mu_{\beta}$ (2) $T_{\alpha} \neq T_{\beta}$ , $p_{\alpha} = p_{\beta}$ , $\mu_{\alpha} = \mu_{\beta}$
and a Eq.	(3) $T_{\alpha} = T_{\beta}$ , $p_{\alpha} = p_{\beta}$ , $\mu_{\alpha} = \mu_{\beta}$ (4) $T_{\alpha} = T_{\beta}$ , $p_{\alpha} = p_{\beta}$ , $\mu_{\alpha} \neq \mu_{\beta}$
34.	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 ( $V_{FCC}$ and $V_{BCC}$ ) is:
	$(1)  V_{BCC}: V_{FCC} \qquad (2)  2V_{BCC}: V_{FCC}$
	(3) $V_{BCC}: 2V_{FCC}$ (4) $V_{BCC}: \frac{1}{2}V_{FCC}$
35.	One molecular orbital of a polar molecule AB has the form $C_A \Psi_A + C_B \Psi_B$ , where $\Psi_A$ and $\Psi_B$ , 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 $\Psi_A$ and $\Psi_B$ , a possible set of $C_A$ and $C_B$ is:
	(1) $C_A = 0.95, C_B = 0.32$ (2) $C_A = 0.32, C_B = 0.95$
	(3) $C_A = -0.32$ , $C_B = 0.95$ (4) $C_A = 0.32$ , $C_B = -0.95$
36.	The first order rate constant for a unimolecular gas phase reaction $A \rightarrow \text{products that follows Lindemann mechanism is } 2.0 \text{ s}^{-1} \text{ at p}_A = 1 \text{ atm}$ and $4.0 \text{ s}^{-1} \text{ at p}_A = 2 \text{ atm}$ . The rate constant for the activation step is :
	(1) $1.0 \text{ atm}^{-1} \text{ s}^{-1}$ (2) $4.0 \text{ atm}^{-1} \text{ s}^{-1}$
12	

uestion No.	Questions
37.	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. $\Delta G$ for this process is :
80	(1) $300R \ln 2$ (2) $600R \ln 2$
	(3) $-600R \ln 2$ (4) $300 \ln 2$
38.	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:
4 4	(1) 0 (2) 1
1	(3) 2 (4) 3
39.	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:
	(1) $\frac{h^2}{8 \text{ m}} \left(\frac{2}{a^2}\right)$ , 1 (2) $\frac{h^2}{8 \text{ m}} \left(\frac{17}{4 a^2}\right)$ , 2
	(3) $\frac{h^2}{8 \text{ m}} \left(\frac{5}{4 \text{ a}^2}\right)$ , 1 (4) $\frac{h^2}{8 \text{ m}} \left(\frac{5}{\text{a}^2}\right)$ , 2
40.	For the chemical reaction in aqueous solution,
	$CH_2C\ell COO^- + OH^- \rightarrow CH_2OHCOO^- + C\ell^-$
	the correct statement is:
	(1) increase of pressure increases the rate constant
	(2) increase of dielectric constant increases the rate constant
3	(3) increase of ionic strength decreases the rate constant
	(4) the entropy of activation is positive
41.	The isomer shift in Mossbaurs in iron complexes changes with increase i S-electrons density:
	(1) increases (2) decreases
	(3) no change (4) none of these

Question No.	Questions
42.	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) $\operatorname{Ru}_{3}\left(\operatorname{CO}\right)_{12}$ (4) $\operatorname{Co}_{2}\left(\operatorname{CO}\right)_{8}$
43.	$H_2Os_6$ (CO) <sub>18</sub> 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 He <sup>+</sup> , in its ground state is approximately:
	(1) $-54.4 \mathrm{eV}$ (2) $-27.2 \mathrm{eV}$
	(1) $-54.4 \mathrm{eV}$ (2) $-27.2 \mathrm{eV}$ (3) $-13.6 \mathrm{eV}$ (4) $-108.8 \mathrm{eV}$
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
20 a	(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 $8 \times 10^{-3}$ 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 $(1.0 \text{ bar L} = 100 \text{ J})$ :
	200 L mol-1 and the molar volume in the liquid form is negligible, the

Question No.	Questions
47.	A system consists of gaseous $H_2$ , $O_2$ , $H_2O$ and $CO_2$ where the amount of $CO_2$ is specified and the equilibrium constant for the reactions $2H_2(g) + O_2(g) \rightleftharpoons 2H_2O(g)$ is known. The number of degrees of freedom of the system is:
	(1) 2 (2) 3
	(3) 4 (4) 5
48.	The vibrational frequency and anharmonicity constant of an alkali halide are 300 cm <sup>-1</sup> and 0.0025 respectively. The positions (in cm <sup>-1</sup> ) of its fundamental mode and first overtone are respectively:
	(1) 300,600 (2) 298.5,595.5
	(3) 301.5, 604.5 (4) 290, 580
49.	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) $C_v$
50.	The translational, rotational and vibrational partition functions for a molecule are $f_{\text{translational}} \cong 10^{10} \text{ m}^{-1}$ , $f_{\text{rotation}} = f_{\text{vibration}} \cong 1$ , $(k_BT/H) = 10^{13}$ are room temperature, $N_A = 6 \times 10^{23}$ , using the approximate data given above the frequency factor (A) for a reaction of the type :
8	atom + diatomic molecule → non-linear transition state → 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) $6 \times 10^{13}$

Question No.	Questions
51.	Wilkinson's catalyst is used for:
	(1) hydrogenation of alkenes (2) hydrogenation of alkynes
	(3) hydrogenationof alkanes (4) hydrogenation of unsaturated oils
52.	An aqueous solution contains Hg <sup>+</sup> , Pb <sup>2+</sup> and Cd <sup>2+</sup> . The addition of 6N HC precipitates :
	(1) $\operatorname{Hg}_{2}\operatorname{C}\ell_{2}$ only (2) $\operatorname{PbC}\ell_{2}$ only
	(3) $\operatorname{Hg}_{2}\operatorname{C}\ell_{2} + \operatorname{PbC}\ell_{2}$ (4) $\operatorname{PbC}\ell_{2} + \operatorname{HgC}\ell_{2}$
53.	Which one among the following pairs cannot be separated by $H_2S$ in di $HC\ell$ ?
	(1) $Bi^{3+}$ , $Sn^{4+}$ (2) $A\ell^{3+}$ , $Hg^{2+}$
	(3) $Zn^{2+}$ , $Sn^{4+}$ (4) $Ni^{2+}$ , $Cu^{2+}$
54.	Oxymyoglobin contains:
	(1) O <sub>2</sub> at trans position to histidine chain
	(2) O <sub>2</sub> in the hole of porphyrin
	(3) O <sub>2</sub> bonded by coordinated bond to Mg (II)
	(4) does not contain O <sub>2</sub>
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) $NO_3^-$ to $NH_4$ (2) $N_2$ to $NH_4^+$
	(3) $NH_4^+$ to $NO_3^-$ (4) $NO_3^-$ to $N_2$

Question No.	Questions
58.	How many fundamental vibrations are possible in SO <sub>2</sub> molecule?  (1) Two  (2) Three
	(3) Four (4) Six
59.	The EPR spectrum of NO <sub>2</sub> 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 [Ni(H <sub>2</sub> O) <sub>6</sub> ] <sup>2+</sup> 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

Question No.	Questions
63.	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) $27 \text{ kcal mol}^{-1}$ (2) $110 \text{ kcal mol}^{-1}$
	(3) $55 \text{ kcal mol}^{-1}$ (4) $5.5 \text{ kcal mol}^{-1}$
64.	A carnot takes up 90 J of heat from the source kept at 300 K. The correct statement among the following is:
	(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
65.	The correct statement about the difference of second and first excited state energies ( $\Delta E$ ) of a particle in 1-D, 2-D square and 3-D cubic boxes with same length for each, is:
	(1) $\Delta E (1 - D box) = \Delta E (2 - D box) = DE (3 - D box)$
	(2) $\Delta E (1 - D box) > \Delta E (2 - D box) > DE (3 - D box)$
	(3) $\Delta E (1 - D box) > \Delta E (2 - D box) = DE (3 - D box)$
	(4) $\Delta E (1 - D box) < \Delta E (2 - D box) < DE (3 - D box)$
66.	According to Eyring transition state theory for a bimolecular reaction, the activated complex has:
	(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.

Question No.	Questions
	The molecule with the smallest rotational constant (in the microwave spectrum) among the following is:  (1) $N = CH$ (2) $HC = CC\ell$ (3) $C\ell C = CF$ (4) $B = CC\ell$
68.	The electronic transition energy from $\pi_1 \to \pi_2$ in propenyl radical is 4.8 eV. Within the frame work of Huckel theory, the transitions energy from $\pi_1 \to \pi_3$ 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 <sub>1</sub> and E <sub>2</sub> with degeneracy of 2 and 3, respectively. Number of microstates, with 3
	molecules in energy level $E_1$ and one in energy level $E_2$ (2) 12 (3) 96 (4) 192
70.	molecules in energy level $E_1$ and one in energy level $E_2$ (2) 12  (4) 192

Question No.	Questions
72.	The simultaneous eigen functions of angular momentum operators L2 and Lz are:
	<ul> <li>(1) all of 2s, 2p<sub>x</sub>, 2p<sub>y</sub> and 2p<sub>z</sub> orbitals</li> <li>(2) only 2s, 2p<sub>x</sub>, and 2p<sub>y</sub> orbitals</li> <li>(3) only 2s and 2p<sub>z</sub> orbitals</li> <li>(4) only 2p<sub>z</sub> orbital</li> </ul>
73.	The single-particle partition function (f) for a certain system has the form f = A Ve <sup>BT</sup> . The average energy per particle will then be (k is the Boltzman constant):  (1) BkT (2) BkT <sup>2</sup> (3) kT/B (4) kT/B <sup>2</sup>
74.	Which of the following statements in INCORRECT?
	(1) A Slater determinant is an antisymmetrized wave function
1 702	(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
75.	(4) A Slater determinant obeys the Pauli exclusion principle  1 poise is equal to :
75.	,
75.	1 poise is equal to:
75. 76.	1 poise is equal to:  (1) 10 N sm <sup>-2</sup> (2) 100 N sm <sup>-2</sup> (3) 1/100 N sm <sup>-2</sup> (4) 1/10 N sm <sup>-2</sup>
	1 poise is equal to : $(1)  10 \text{ N sm}^{-2} \qquad (2)  100 \text{ N sm}^{-2}$ $(3)  1/100 \text{ N sm}^{-2} \qquad (4)  1/10 \text{ N sm}^{-2}$ Find the probability of the link in polymers where average values of links
	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) $1/10 \text{ N sm}^{-2}$ Find the probability of the link in polymers where average values of links are :
	1 poise is equal to:  (1) 10 N sm <sup>-2</sup> (2) 100 N sm <sup>-2</sup> (3) 1/100 N sm <sup>-2</sup> (4) 1/10 N sm <sup>-2</sup> 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
76.	1 poise is equal to:  (1) 10 N sm <sup>-2</sup> (2) 100 N sm <sup>-2</sup> (3) 1/100 N sm <sup>-2</sup> (4) 1/10 N sm <sup>-2</sup> 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

uestion No.	Questions		
78.	Which of the following reacts by the E1 mechanism?		
	(1) $CH_3CH_2CH_2CH_2Br$ (2) $(CH_3)_2CHCH_2Br$ $Br$		
	(3) (CH <sub>3</sub> ) <sub>3</sub> CBr (4) CH <sub>3</sub> CH <sub>2</sub> CH-CH <sub>3</sub>		
79.	Nicotine alkaloid belong to:		
	(1) Phenylethylamine group (2) Indoe group		
	(3) Pyrrolidine-Pyridine group (4) Iso quinoline group		
80.	The protein in which prosthetic group is carbohydrate are known as:		
	(1) Chromoprotein (2) Lipoprotein		
13	(3) Nucleoprotein (4) Mucoprotein		
81.	Which atom requires the least amount of energy to form its cation?		
	(1) Na (2) Rb		
2 2 2	(3) Al (4) Mg		
82.	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		
83.	According to VSEPR theory, the geometry of ICl2 ion is:		
	(1) trigonal planar (2) square planar		
	(3) angular (4) linear		

Question No.	Questions		
84.	During the change of NO+ to NO, the electron is added in a:		
	(1) σ-orbital (2) π-orbital		
	(3) $\sigma^*$ -orbital (4) $\pi^*$ -orbital		
85.	The molecular orbital configuration of $B_2$ molecule is:		
	(1) KK $(\sigma 2s)^2 (\sigma 2p2)^2 (\sigma^* 2s)^2$ (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 $(\sigma 2s)^2 (\sigma^* 2s)^2 (\pi 2px)^2$		
86.	Which of the following is not a hard acid?		
	(1) Na <sup>+</sup> (2) Mg <sup>2+</sup>		
	(3) Pd <sup>2+</sup> (4) Ti <sup>4+</sup>		
87.	CH <sub>3</sub> 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 SO <sub>2</sub> of the following, NaC <sub>4</sub> , NaBr, NaF and NaI:		
	(1) $NaI > NaBr > NaC\ell > NaF$ (2) $NaI > NaBr < NaC\ell > NaF$		
	(3) $NaI < NaBr < NaC\ell < NaF$ (4) $NaI < NaBr > NaC\ell < NaF$		
89.	Which is not emitted by a radioactive substance?		
	(1) α-rays (2) β-rays		
4 3 10	(3) positron (4) proton		
90.	In a nuclear reaction		
	$_{3}^{7}\text{Li} + Z \longrightarrow _{4}^{7}\text{Be} + _{0}^{1}\text{n}$		
	the bombarding projectile Z is:		
	(1) α-particle (2) denterium		

Question	Questions		
No.			
91.	The organic chloro compound, which shows complete stereochemical inversion during a SN <sup>2</sup> reaction is:		
	(1) $CH_3C\ell$ (2) $(C_2H_5)_2CHC\ell$		
	(3) $(CH_3)_3 CC\ell$ (4) $(CH_3)_2 CHC\ell$		
92.	What intermolecular force is most responsible for molecular iodine, I, being a solid at room temperature?		
	(1) Dipole-dipole (2) Ionic-bonding		
	(3) Ion-dipole (4) London dispersion force		
93.	The process of separation of enantiomers from a racemic mixture is known as:		
	(1) Racemic modification (2) Resolution		
0 4	(3) Inversion (4) Specific rotation		
94.	Which one of the following is aromatic compound?		
7	(1) (2) \( \frac{1}{4} \)		
	(3) \( \sum_{+} \) (4) \( \sum_{-} \)		
95.	The conversion of cis-isomers to trans-isomers or trans-isomers to cis- isomers is known as:		
	(1) Conformations (2) Diaxial interaction		
- 1	(3) Conformational analysis (4) Stereomutation		
96.	Which of the following statements regarding cyclopropene is wrong?		
100000000	(1) It is cyclic		
	(2) It does not exhibit continuous delocalization		
	(3) It obeys Huckel's rule		
	(4) It is aromatic		

Question No.	Questions			
97.	Which of the following is the most stable carbocation?			
	(1) $C_6 H_5 \overset{+}{C} H_2$ (2) $C H_3 \overset{+}{C} H_2$			
	(3) $C_6H_5^{\dagger}CHC_6H_5$ (4) $C_6H_5CH_2^{\dagger}CH_2$			
98.	Which of the following is an electrophile?			
	(1) $H_2O$ (2) $A\ell C\ell_3$			
	(3) $NH_3$ (4) $C_2H_5NH_2$			
99.	The most reactive nucleophile among the following is:			
.7-15.	(1) $C_6H_5O$ (2) $(CH_3)_3CO$			
	(1) $C_6H_5\bar{O}$ (2) $(CH_3)_3C\bar{O}$ (3) $CH_3\bar{O}$ (4) $(CH_3)_2CH\bar{O}$			
100.	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) Synthon			
	(3) Synthetic equivalent (4) Protecting group			
28				
a				
	boch			

Question No.	Questions
1.	The temperature-dependence of the vapour pressure of solid A car
	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
2.	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
3.	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) $27 \text{ kcal mol}^{-1}$ (2) $110 \text{ kcal mol}^{-1}$
	(3) $55 \text{ kcal mol}^{-1}$ (4) $5.5 \text{ kcal mol}^{-1}$
4.	A carnot takes up 90 J of heat from the source kept at 300 K. The correct statement among the following is :
	(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

Question	Questions
No.	
5.	The correct statement about the difference of second and first excited state energies ( $\Delta E$ ) of a particle in 1-D, 2-D square and 3-D cubic boxes with same length for each, is:
	(1) $\Delta E (1 - D box) = \Delta E (2 - D box) = DE (3 - D box)$
	(2) $\Delta E (1 - D box) > \Delta E (2 - D box) > DE (3 - D box)$
	(3) $\Delta E (1 - D box) > \Delta E (2 - D box) = DE (3 - D box)$
	(4) $\Delta E (1 - D box) < \Delta E (2 - D box) < DE (3 - D box)$
6.	According to Eyring transition state theory for a bimolecular reaction, the activated complex has:
	(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.
7.	
7.	The molecule with the smallest rotational constant (in the microwave
7.	The molecule with the smallest rotational constant (in the microwav spectrum) among the following is:
7.	The molecule with the smallest rotational constant (in the microwav spectrum) among the following is:  (1) $N \equiv CH$ (2) $HC \equiv CC\ell$ (3) $C\ell C \equiv CF$ (4) $B \equiv CC\ell$ The electronic transition energy from $\pi_1 \rightarrow \pi_2$ in propenyl radical in the microwav spectrum.
	The molecule with the smallest rotational constant (in the microwave spectrum) among the following is: $(1)  N \equiv CH \qquad \qquad (2)  HC \equiv CC\ell$ $(3)  C\ell C \equiv CF \qquad \qquad (4)  B \equiv CC\ell$ The electronic transition energy from $\pi_1 \to \pi_2$ in propenyl radical in 4.8 eV. Within the frame work of Huckel theory, the transitions energy

Question No.		6	uest	ions
9.	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
10.	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°. The wavelength of X-ray used is close to:			
0 *	(1)	11 nm	(2)	18 nm
	(3)	25 nm	(4)	32 nm
11.	Will	kinson's catalyst is used for	:	
	(1)	hydrogenation of alkenes	(2)	hydrogenation of alkynes
	(3)	hydrogenationof alkanes	(4)	hydrogenation of unsaturated oils
12.		aqueous solution contains F cipitates :	Ig+, P	$^{\circ}b^{2+}$ and $\mathrm{Cd}^{2+}.$ The addition of 6N HC $\ell$
	(1)	$\mathrm{Hg_2C}\ell_2$ only	(2)	$\operatorname{PbC}\ell_2$ only
		$\mathrm{Hg_2C\ell_2} + \mathrm{PbC\ell_2}$	(4)	$\mathrm{PbC}\ell_2^{}+\mathrm{HgC}\ell_2^{}$
13.	Wh		g pai	rs cannot be separated by H <sub>2</sub> S in di
	(1)	Bi <sup>3+</sup> , Sn <sup>4+</sup>	(2)	$A\ell^{3+}, Hg^{2+}$
	(3)	Zn <sup>2+</sup> , Sn <sup>4+</sup>	(4)	Ni <sup>2+</sup> , Cu <sup>2+</sup>
14.	Oxy	ymyoglobin contains:		
	(1)	O2 at trans position to his	tidin	e chain
	(2)	O <sub>2</sub> in the hole of porphyri	n	
	(3)	O <sub>2</sub> bonded by coordinated		d to Mg (II)
	(4)	does not contain O <sub>2</sub>		

Question No.		Quest	ions
15.	Heme is a porphyrii	n complex of:	
	(1) Fe (II)	(2)	Fe (III)
	(3) Mg (II)	(4)	Zn (II)
16.	The metal present is	n chlorophyll is :	
13,000	(1) Mg (II)	(2)	Ca (II)
	(3) Zn (II)	(4)	Fe (II)
17.	During biological ni	trogen fixations	nitrifying bacteria convert:
	(1) $NO_3^-$ to $NH_4$	(2)	N <sub>2</sub> to NH <sub>4</sub>
	(3) $NH_4^+$ to $NO_3^-$	(4)	$NO_3^-$ to $N_2$
18.	How many fundame	ental vibrations a	re possible in SO <sub>2</sub> molecule?
	(1) Two	(2)	Three
	(3) Four	(4)	Six
19.	The EPR spectrum	of NO <sub>2</sub> will show	
	(1) One peak	(2)	Two peaks
	(3) Three peaks	(4)	Four peaks
20.	How many bands a complex ion?	re obtained in t	he electronic spectra of [Ni(H <sub>2</sub> O) <sub>6</sub> ] <sup>2+</sup>
	(1) Two	(2)	Three
	(3) One	(4)	Four
21.	Which atom require	es the least amou	ant of energy to form its cation?
	(1) Na	(2)	Rb
vir.,	(3) Al	(4)	Mg

Question No.	Questions
22.	When an electron is added to a gaseous atom:
	(1) its size decreases
4.	(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 $IC\ell_2^-$ 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 <sub>2</sub> molecule is:
	(1) KK $(\sigma 2s)^2 (\sigma 2p2)^2 (\sigma^* 2s)^2$ (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 <sup>+</sup> (2) Mg <sup>2+</sup>
	(3) Pd <sup>2+</sup> (4) Ti <sup>4+</sup>
27.	CH <sub>3</sub> OH is:
	(1) soft-soft (2) hard-hard
	(3) soft-hard (4) hard-soft

Question No.	Questions		
28.	Arrange the order of increasing solubilities of alkali metal halides in liquid $SO_2$ of the following, NaC $\ell$ , NaBr, NaF and NaI :		
	(1) $NaI > NaBr > NaC\ell > NaF$ (2) $NaI > NaBr < NaC\ell > NaF$		
	(3) $NaI < NaBr < NaC\ell < NaF$ (4) $NaI < NaBr > NaC\ell < NaF$		
29.	Which is not emitted by a radioactive substance?		
0	(1) α-rays (2) β-rays		
* =	(3) positron (4) proton		
30.	In a nuclear reaction		
1.2	${}_{3}^{7}\text{Li} + Z \longrightarrow {}_{4}^{7}\text{Be} + {}_{0}^{1}\text{n}$		
	the bombarding projectile Z is:		
	(1) α-particle (2) denterium		
	(3) neutron (4) proton		
31.	Which of the following definitions of an asymmetric reaction is the most accurate?		
	(1) A reaction that involves a chiral reagent.		
- 1	(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		
32.	What is meant by a reaction going in 94% enantiomeric excess?		
	(1) The product contains 94% of one enantiomer and 6% of the other enantiomer.		
1 8	(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.		

Question No.	Questions
33.	Which reaction condition are not appropriate for the following transformation?
	(1) $\operatorname{Zn}\left(\operatorname{Hg}\right) / \operatorname{HC}\ell$ (2) $\operatorname{NH}_{2}\operatorname{NH}_{2} / \operatorname{NaOH}$
	(3) $\text{LiA}\ell\text{H}_4$ / $\text{Et}_2\text{O}$ (4) $\text{HS CH}_2\text{CH}_2\text{CH}_2\text{SH}$ / $\text{H}^+$ , then $\text{H}_2$ / $\text{Ni}$
34.	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?
	+ $O$
1 (A) (A) (B)	(1) (i) NaBH <sub>4</sub> /MeOH; (ii) H <sub>3</sub> O <sup>+</sup>
	(2) (i) NaBH <sub>4</sub> / THF; (ii) NaOH / H <sub>2</sub> O (3) (i) LiA $\ell$ H <sub>4</sub> / Et <sub>2</sub> O; (ii) H <sub>3</sub> O <sup>+</sup>
	(4) (i) $\text{LiA}\ell\text{H}_4$ / $\text{Et}_2\text{O}$ ; (ii) NaOH / $\text{H}_2\text{O}$
35.	The following transformation is feasible by:
	Me II II Me Me Me
	I H IVIC IVIC
	Trans Cis
	(1) Thermal disrotatory process (2) Photochemical disrotatory process
	(2) Photochemical disrotatory process (3) Thermal conrotatory process
*	(4) Photo chemical conrotatory process

Question No.	Questions		
36.	Which compound is most basic?		
	(1) $\left(\begin{array}{c} \\ \\ \\ \end{array}\right)$ (2) $\left(\begin{array}{c} \\ \\ \\ \end{array}\right)$		
	(3) $\bigvee_{H}^{N}$ (4) $\bigvee_{H}^{N}$		
37.	Which one of the following gas is responsible for maximum contribution in green house effect?		
	(1) CFC (2) O <sub>2</sub>		
	(3) CO <sub>2</sub> (4) CH <sub>4</sub>		
38.	The <sup>13</sup> C chemical shifts normally range between:		
	(1) $\delta = 0.200 \text{ ppm}$ (2) $\delta = 100.200 \text{ ppm}$		
	(3) $\delta = 50-100 \text{ ppm}$ (4) $\delta = 200-250 \text{ ppm}$		
39.	What is meant by a drug's "specification"?		
1	(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		
40.	The order of aromaticity of furan, thiophene and pyrrole is as:		
	(1) Thiophene > furan > pyrrole		
31 g +1	(2) Furan > Pyrrole > thiophene		
	(3) Thiophene > Pyrrole > furan		
- 1 - 1	(4) Pyrrole > thiophene > furan		

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 :
	$(1)  \sigma_{\rm g}^2 + \sigma_{\rm u}^2 \qquad (2)  \sigma_{\rm g}^2$
	(3) $\sigma_{\rm g}^2 - \sigma_{\rm u}^2$ (4) $\sigma_{\rm g}^2 + \frac{1}{2} \sigma_{\rm u}^2$
42.	The simultaneous eigen functions of angular momentum operators L2 and Lz are:
	<ul> <li>(1) all of 2s, 2p<sub>x</sub>, 2p<sub>y</sub> and 2p<sub>z</sub> orbitals</li> <li>(2) only 2s, 2p<sub>x</sub>, and 2p<sub>y</sub> orbitals</li> <li>(3) only 2s and 2p<sub>z</sub> orbitals</li> <li>(4) only 2p<sub>z</sub> orbital</li> </ul>
43.	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 Boltzman constant):  (1) BkT  (2) BkT <sup>2</sup>
	(1) BkT (2) BkT <sup>2</sup> (3) kT/B (4) kT/B <sup>2</sup>
44.	Which of the following statements in 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) $10 \text{ N sm}^{-2}$ (2) $100 \text{ N sm}^{-2}$
	(3) $1/100 \text{ N sm}^{-2}$ (4) $1/10 \text{ N sm}^{-2}$

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) $(CH_3)_3O^+$ (2) $(CH_3)_3B$
	(3) (CH <sub>3</sub> ) <sub>3</sub> CH (4) (CH <sub>3</sub> ) <sub>3</sub> N
48.	Which of the following reacts by the E1 mechanism?
	(1) $CH_3CH_2CH_2CH_2Br$ (2) $(CH_3)_2CHCH_2Br$ Br
	(3) (CH <sub>3</sub> ) <sub>3</sub> CBr (4) CH <sub>3</sub> CH <sub>2</sub> CH-CH <sub>3</sub>
49.	Nicotine alkaloid belong to:
	(1) Phenylethylamine group (2) Indoe 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) $\operatorname{Ru}_{3}(\operatorname{CO})_{12}$ (4) $\operatorname{Co}_{2}(\operatorname{CO})_{8}$
53.	$H_2Os_6 (CO)_{18}$ 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) $-54.4 \mathrm{eV}$ (2) $-27.2 \mathrm{eV}$
	(3) $-13.6 \mathrm{eV}$ (4) $-108.8 \mathrm{eV}$
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) $640 \text{ kJ mol}^{-1}$ (2) $100 \text{ kJ mol}^{-1}$
	(3) 80 kJ mol <sup>-1</sup> (4) 64 kJ mol <sup>-1</sup>

Question	Questions
No.	
57.	A system consists of gaseous $H_2$ , $O_2$ , $H_2O$ and $CO_2$ where the amount of $CO_2$ is specified and the equilibrium constant for the reactions $2H_2(g) + O_2(g) \rightleftharpoons 2H_2O(g)$ is known. The number of degrees of freedom of the system is:
	(1) 2 (2) 3
150	(3) 4 (4) 5
58.	The vibrational frequency and anharmonicity constant of an alkali halide are 300 cm <sup>-1</sup> and 0.0025 respectively. The positions (in cm <sup>-1</sup> ) of its fundamental mode and first overtone are respectively:
	(1) 300,600 (2) 298.5,595.5
	(3) 301.5, 604.5 (4) 290, 580
59.	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) $C_v$
	(3) $C_P + \pi V \alpha$ (4) $C_V$
60.	The translational, rotational and vibrational partition functions for a molecule are $f_{translational} \cong 10^{10} \text{ m}^{-1}$ , $f_{rotation} = f_{vibration} \cong 1$ , $(k_BT/H) = 10^{13}$ 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) $6 \times 10^{13}$

Question No.	Questions
61.	Which one of the following is most abundant of all the hydrocarbons pollutants in the atmoshphere?
	(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
	$(CH_3)_2$ CHCH <sub>2</sub> C(O) CH = CH <sub>2</sub> have in <sup>1</sup> H NMR and <sup>13</sup> C NMR spectra ?
	(1) Five <sup>1</sup> H signals and six <sup>13</sup> C signals
	(2) Five <sup>1</sup> H signals and seven <sup>13</sup> C signals
	(3) Six <sup>1</sup> H signals and seven <sup>18</sup> C signals
	(4) Six <sup>1</sup> H signals and six <sup>13</sup> C signals
64.	A single strong absorption near 1800 cm <sup>-1</sup> 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 $\mathrm{KMnO_4}$ 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) $Ph$ + MeMgBr $i) Et_2O$ $ii) H_3O^+$
8 3	(2) $Ph$ $Me$ + $PhMgBr \xrightarrow{i) Et_2O}$ $ii) H_3O^+$
	(3) $Ph H + PhCH_2MgE_r \xrightarrow{i) Et_2O}$ $ii) H_3O^+$
	(4) $O_{\text{Et}} + 2 \text{ PhMgBr} \xrightarrow{i) \text{ Et}_2\text{O}} ii) \text{ H}_3\text{O}^+$
68.	Which compound is not a carboxylic acid?
	(1) CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> C – OH (2) HO
	(3) OH (4) OH

Question	Qu	estions
No.		Sant .
69.	Which of the following is mos substitution?	t reactive in electrophilic aromatic
	(1) $\langle S \rangle$	2) N
	$(3)  \stackrel{N}{\underset{H}{\bigvee}} $	4) (0)
70.	The IUPAC name of the compoun	d shown below is :
	$C\ell$ $CH_3$ $CH_3-CH-C=CHCH$	
	(1) 3-Methyl-4-chloropent-2-ene	(2) 4-chloro-3-methyl pent-2-ene
= = 11	(3) 2-chloro-3-methyl pent-3-ene	e (4) 3-Methyl-2-chloro pent-3-ene
71.	The organic chloro compound, inversion during a SN <sup>2</sup> reaction is	which shows complete stereochemical
	(1) CH <sub>3</sub> Cℓ (	2) $(C_2H_6)_2$ CHC $\ell$
	(3) (CH <sub>3</sub> ) <sub>3</sub> CC $\ell$ (	4) $(CH_3)_2 CHC\ell$
72.	What intermolecular force is marked $I_2$ being a solid at room temperat	ost responsible for molecular iodine, ure?
4	(1) Dipole-dipole (	2) Ionic-bonding
	(3) Ion-dipole (	4) London dispersion force
73.	The process of separation of enant	iomers from a racemic mixture is known
		2) Resolution
		4) Specific rotation

Question No.	Questions
74.	Which one of the following is aromatic compound?
	(1) (2) +
	(3) \(  \)
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
200	(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) $C_6H_5\overset{+}{C}H_2$ (2) $CH_3\overset{+}{C}H_2$
	t
	(3) $C_6H_5CHC_6H_5$ (4) $C_6H_5CH_2CH_2$
78.	(3) $C_6H_5CHC_6H_5$ (4) $C_6H_5CH_2CH_2$ Which of the following is an electrophile?
78.	., 83 63
78.	Which of the following is an electrophile?
78. 79.	Which of the following is an electrophile? (1) $H_2O$ (2) $A\ell C\ell_3$
	Which of the following is an electrophile? $ (1)  H_2O \qquad \qquad (2)  A\ell C\ell_3 $ $ (3)  NH_3 \qquad \qquad (4)  C_2H_5NH_2 $

Question No.	Questions
80.	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) Synthon
	(3) Synthetic equivalent (4) Protecting group
81.	The reaction
	$_{1}^{2}D + _{4}^{7}T \longrightarrow _{2}^{4}He + _{0}^{1}n$ is an example of:
	(1) nuclear fission (2) nuclear fusion
	(3) artificial radioactivity (4) radioactive disintegration
82.	The inert pair effect is predominant in:
	(1) Si (2) Ge
	(3) Sn (4) Pb
83.	There is no S-S bond in:
	(1) $S_2O_4^{2-}$ (2) $S_2O_5^{2-}$
	(1) $S_2O_4^{2-}$ (2) $S_2O_5^{2-}$ (3) $S_2O_3^{2-}$ (4) $S_2O_7^{2-}$
84.	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
85.	Which of the following is paramagnetic?
	(1) Cu <sup>2+</sup> (2) Ag <sup>+</sup>
	(3) Zn <sup>2+</sup> (4) Au <sup>+</sup>

Question No.	Questions
86.	$\mathrm{KMnO_4}$ on heating gives :
	(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>
1	(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>
87.	Which of the following is an organometallic compound?
	(1) Lithium methoxide (2) Lithium acetate
	(3) Lithium dimethylamide (4) Methyl lithium
88.	The IUPAC name of $[Pt(NH_3)_4NO_2C\ell]$ SO <sub>4</sub> is :
	(1) chloronitrotetraammine platinum (IV) sulphate
	(2) tetraamminechloronitro platinum (IV) sulphate
	(3) nitrochlorotetraammine platinum (IV) sulphate
	(4) platinum (IV) tetraamminenitrochloro sulphate
89.	The type of magnetism exhibited by $[Mn(H_2O)_6]^{2+}$ ion is:
1.1.	(1) diamagnetism (2) paramagnetism
	(3) ferromagnetism (4) antiferromagnetism
90.	Which of the following organometallic compound does not obey EAN rule?
	(1) $CO(CO)_3 (\pi - C_3H_5)$ (2) $(C_2H_5) Cr(CO)_3 (\pi - C_2H_5)$
	(3) $[Mn(CO)_5 (C_2H_5)^+$ (4) $Co (C_6H_6)_2$
91.	The specific conductance of a solution is $0.176 \Omega^{-1} \mathrm{cm}^{-1}$ . If the cell constant is $0.255 \mathrm{cm}^{-1}$ , the conductance ( $\Omega^{-1}$ ) of that solution is :
1.0	(1) 1.449 (2) 0.690
	(3) 0.045 (4) 0.431

Question No.	Questions
92.	A polydisperse polymer sample has ten molecules of molar mass $20,000~{\rm g~mol^{-1}}$ and fifteen molecules of molar mass $10,000~{\rm g~mol^{-1}}$ . The number-average molar mass $({\rm gmol^{-1}})$ $(\overline{\rm M}_{\rm n})$ of the sample is :
	(1) 13,000 (2) 15,000
	(3) 14,000 (4) 16,000
93.	Two phases ( $\alpha$ and $\beta$ ) of a species are in equilibrium. The correct relations observed among the variables, T, p and $\mu$ are :
	(1) $T_{\alpha} = T_{\beta}$ , $p_{\alpha} \neq p_{\beta}$ , $\mu_{\alpha} = \mu_{\beta}$ (2) $T_{\alpha} \neq T_{\beta}$ , $p_{\alpha} = p_{\beta}$ , $\mu_{\alpha} = \mu_{\beta}$
	(3) $T_{\alpha} = T_{\beta}$ , $p_{\alpha} = p_{\beta}$ , $\mu_{\alpha} = \mu_{\beta}$ (4) $T_{\alpha} = T_{\beta}$ , $p_{\alpha} = p_{\beta}$ , $\mu_{\alpha} \neq \mu_{\beta}$
94.	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 ( $V_{FCC}$ and $V_{BCC}$ ) is:
	$(1)  V_{BCC}: V_{FCC} \qquad (2)  2V_{BCC}: V_{FCC}$
	(3) $V_{BCC}: 2V_{FCC}$ (4) $V_{BCC}: \frac{1}{2}V_{FCC}$
95.	One molecular orbital of a polar molecule AB has the form $C_A \Psi_A + C_B \Psi_B$ , where $\Psi_A$ and $\Psi_B$ , 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 $\Psi_A$ and $\Psi_B$ , a possible set of $C_A$ and $C_B$ is:
	(1) $C_A = 0.95$ , $C_B = 0.32$ (2) $C_A = 0.32$ , $C_B = 0.95$
	(3) $C_A = -0.32$ , $C_B = 0.95$ (4) $C_A = 0.32$ , $C_B = -0.95$
96.	The first order rate constant for a unimolecular gas phase reaction $A \rightarrow \text{products that follows Lindemann mechanism is } 2.0 \text{ s}^{-1} \text{ at p}_A = 1 \text{ atm}$ and $4.0 \text{ s}^{-1} \text{ at p}_A = 2 \text{ atm}$ . The rate constant for the activation step is :
	(1) $1.0 \text{ atm}^{-1} \text{ s}^{-1}$ (2) $4.0 \text{ atm}^{-1} \text{ s}^{-1}$

Question No.	Questions
97.	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. $\Delta G$ for this process is :
	(1) 300R ln2 (2) 600R ln2
	(3) $-600R \ln 2$ (4) $300 \ln 2$
98.	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
	(1) 0 (2) 1
	(3) 2 (4) 3
99.	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:
	(1) $\frac{h^2}{8  \text{m}} \left(\frac{2}{a^2}\right)$ , 1 (2) $\frac{h^2}{8  \text{m}} \left(\frac{17}{4  a^2}\right)$ , 2
	(3) $\frac{h^2}{8  \text{m}} \left( \frac{5}{4  \text{a}^2} \right)$ , 1 (4) $\frac{h^2}{8  \text{m}} \left( \frac{5}{\text{a}^2} \right)$ , 2
100.	For the chemical reaction in aqueous solution,
	$CH_2C\ell COO^- + OH^- \rightarrow CH_2OHCOO^- + C\ell^-$
	the correct statement is:
	(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

Question No.	Questions
1.	Which one of the following is most abundant of all the hydrocarbons pollutants in the atmoshphere?
74	(1) Methane (2) HCH
	(3) Benzene (4) Propane
2.	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
3.	How many signals does the unsaturated ketone
	(CH <sub>3</sub> ) <sub>2</sub> CHCH <sub>2</sub> C(O) CH = CH <sub>2</sub> have in <sup>1</sup> H NMR and <sup>13</sup> C NMR spectra?
241	(1) Five <sup>1</sup> H signals and six <sup>13</sup> C signals
	(2) Five <sup>1</sup> H signals and seven <sup>13</sup> C signals
9.5	(3) Six <sup>1</sup> H signals and seven <sup>13</sup> C signals
	(4) Six <sup>1</sup> H signals and six <sup>13</sup> C signals
4.	A single strong absorption near 1800 cm <sup>-1</sup> in IR spectroscopy indicates the presence of :
	(1) Thioketones (2) Sulphoxide
	(3) Acid halide (4) Azo compounds
5.	Which of the following statements is true?
· v	(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
6.	Oxidative cleavage of pent-2-yne with alkaline KMnO <sub>4</sub> 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) $Ph$ + MeMgBr $i)$ Et <sub>2</sub> O $ii)$ H <sub>3</sub> O <sup>+</sup>
	(2) $Ph$ $Me$ + $PhMgBr$ $\xrightarrow{i)Et_2O}$ $ii)H_3O^+$
	(3) $Ph H + PhCH_2MgB_1 \xrightarrow{i) Et_2O} ii) H_3O^+$
	(4) $O_{\text{Et}} + 2 \text{ PhMgBr} \xrightarrow{i) \text{Et}_2\text{O}} ii) \text{H}_3\text{O}^+$
8.	Which compound is not a carboxylic acid?
	O O
	(1) CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> C – OH (2) HO
	(3) OH (4) OH

Question No.	Questions
9.	Which of the following is most reactive in electrophilic aromatic substitution?
	$(1)  \begin{array}{c} \swarrow \\ S \end{array} \qquad \qquad (2)  \begin{array}{c} \swarrow \\ N \end{array}$
	(3) $\langle N \rangle$ (4) $\langle O \rangle$
10.	The IUPAC name of the compound shown below is:
66.65 66.65	$C\ell$ $CH_3$ $CH_3 - CH - C = CHCH_3$
- 1	(1) 3-Methyl-4-chloropent-2-ene (2) 4-chloro-3-methyl pent-2-ene
9 6	(3) 2-chloro-3-methyl pent-3-ene (4) 3-Methyl-2-chloro pent-3-ene
11.	The specific conductance of a solution is $0.176 \Omega^{-1} \text{ cm}^{-1}$ . If the cell constant is $0.255 \text{ cm}^{-1}$ , the conductance ( $\Omega^{-1}$ ) of that solution is :
	(1) 1.449 (2) 0.690
	(3) 0.045 (4) 0.431
12.	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
# 5	number-average molar mass (gmol <sup>-1</sup> ) ( $\overline{M}_n$ ) of the sample is :
	(1) 13,000 (2) 15,000
	(3) 14,000 (4) 16,000
13.	Two phases ( $\alpha$ and $\beta$ ) of a species are in equilibrium. The correct relations observed among the variables, T, p and $\mu$ are :
8 (	(1) $T_{\alpha} = T_{\beta}$ , $p_{\alpha} \neq p_{\beta}$ , $\mu_{\alpha} = \mu_{\beta}$ (2) $T_{\alpha} \neq T_{\beta}$ , $p_{\alpha} = p_{\beta}$ , $\mu_{\alpha} = \mu_{\beta}$
4 4 2	(3) $T_{\alpha} = T_{\beta}$ , $p_{\alpha} = p_{\beta}$ , $\mu_{\alpha} = \mu_{\beta}$ (4) $T_{\alpha} = T_{\beta}$ , $p_{\alpha} = p_{\beta}$ , $\mu_{\alpha} \neq \mu_{\beta}$

Question No.	Questions
14.	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 ( $V_{FCC}$ and $V_{BCC}$ ) is:
	$(1)  V_{BCC}: V_{FCC} \qquad (2)  2V_{BCC}: V_{FCC}$
	(3) $V_{BCC}: 2V_{FCC}$ (4) $V_{BCC}: \frac{1}{2}V_{FCC}$
15.	One molecular orbital of a polar molecule AB has the form $C_A \Psi_A + C_B \Psi_B$ , where $\Psi_A$ and $\Psi_B$ , 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 $\Psi_A$ and $\Psi_B$ , a possible set of $C_A$ and $C_B$ is:
27	(1) $C_A = 0.95, C_B = 0.32$ (2) $C_A = 0.32, C_B = 0.95$
	(3) $C_A = -0.32$ , $C_B = 0.95$ (4) $C_A = 0.32$ , $C_B = -0.95$
16.	The first order rate constant for a unimolecular gas phase reaction $A \rightarrow \text{products that follows Lindemann mechanism is } 2.0 \text{ s}^{-1} \text{ at p}_A = 1 \text{ atm}$ and $4.0 \text{ s}^{-1} \text{ at p}_A = 2 \text{ atm}$ . The rate constant for the activation step is :
	(1) $1.0 \text{ atm}^{-1} \text{ s}^{-1}$ (2) $4.0 \text{ atm}^{-1} \text{ s}^{-1}$
10.00	(3) $2.0 \text{ atm}^{-1} \text{ s}^{-1}$ (4) $8.0 \text{ atm}^{-1} \text{ s}^{-1}$
17.	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. $\Delta G$ for this process is :
	(1) 300R ln2 (2) 600R ln2
	(3) $-600R \ln 2$ (4) $300 \ln 2$
18.	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:
	(1) 0 (2) 1
	(3) 2 (4) 3

Question No.	Questions
19.	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:
	(1) $\frac{h^2}{8 \text{ m}} \left(\frac{2}{a^2}\right)$ , 1 (2) $\frac{h^2}{8 \text{ m}} \left(\frac{17}{4 a^2}\right)$ , 2
	(3) $\frac{h^2}{8 \text{ m}} \left(\frac{5}{4 \text{ a}^2}\right)$ , 1 (4) $\frac{h^2}{8 \text{ m}} \left(\frac{5}{\text{a}^2}\right)$ , 2
20.	For the chemical reaction in aqueous solution,
	$CH_2C\ell COO^- + OH^- \rightarrow CH_2OHCOO^- + C\ell^-$
	the correct statement is:
	(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
21.	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
22.	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) $Ru_3 (CO)_{12}$ (4) $Co_2 (CO)_8$
23.	$H_2Os_6 (CO)_{18}$ is a cluster:
* 1 N 1 2 2	(1) closo (2) nido
	(3) Arachno (4) none of these

Question No.	Q	ues	tions
24.	The ionization energy of hy approximately 13.6 eV. The pote approximately:	dro	gen atom in its ground state is ll energy of He <sup>+</sup> , in its ground state is
	(1) -54.4  eV	(2)	$-27.2\mathrm{eV}$
	(3) -13.6 eV	(4)	-108.8 eV
25.	sample of 1.0 cm path length. Th	e pe	ses by 50% when it passes through a ercentage of transmission of the light ut of 3.0 cm path length would be:
	(1) 50.0	(2)	25.0
19 28 - 83	(3) 16.67	(4)	12.5
26.	For the liquid === vapour ed	quili	brium of a substance $\frac{dP}{dT}$ at 1 bar
	and 400 K is 8 × 10 <sup>-3</sup> bar K <sup>-1</sup> . If 200 L mol <sup>-1</sup> and the molar volu molar enthalpy of vapourisation	me	molar volume in the vapour form is in the liquid form is negligible, the $1.0 \text{ bar L} = 100 \text{ J}$ :
			100 kJ mol <sup>-1</sup>
	(0)	(4)	
27.	A system consists of gaseous $H_2$ , $CO_2$ is specified and the equ	$O_2$	H <sub>2</sub> O and CO <sub>2</sub> where the amount of
	$2H_2(g) + O_2(g) \rightleftharpoons 2H_2O(g)$ is known of the system is:	10W	n. The number of degrees of freedom
	$2H_2(g) + O_2(g) \rightleftharpoons 2H_2O(g)$ is kr of the system is:	iowi	n. The number of degrees of freedom
	$2H_2(g) + O_2(g) \rightleftharpoons 2H_2O(g)$ is known of the system is: $(1)  2$	10001 (2) (4)	a. The number of degrees of freedom  3
28.	2H <sub>2</sub> (g) + O <sub>2</sub> (g) ⇒ 2H <sub>2</sub> O (g) is kr of the system is: (1) 2 (3) 4 The vibrational frequency and an	(2) (4) har	The number of degrees of freedom  3  5  monicity constant of an alkali halide vely. The positions (in cm <sup>-1</sup> ) of its
28.	2H <sub>2</sub> (g) + O <sub>2</sub> (g) ⇒ 2H <sub>2</sub> O (g) is known of the system is:  (1) 2  (3) 4  The vibrational frequency and an are 300 cm <sup>-1</sup> and 0.0025 respectively.	(2) (4) har	The number of degrees of freedom  3  5  monicity constant of an alkali halide vely. The positions (in cm <sup>-1</sup> ) of its

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 $f_{translational} \cong 10^{10}$ m <sup>-1</sup> , $f_{rotation} = f_{vibration} \cong 1$ , $(k_BT/H) = 10^{13}$ 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
W 4	$^{2}_{1}D + ^{7}_{4}T \longrightarrow ^{4}_{2}He + ^{1}_{0}n$ is an example of:
	(1) nuclear fission (2) nuclear fusion
35 ± 25 ¥ 8	(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:
₩ - <del>0</del>	(1) $S_2O_4^{2-}$ (2) $S_2O_5^{2-}$ (3) $S_2O_3^{2-}$ (4) $S_2O_7^{2-}$
8 (e. *	(3) $S_2O_3^{2-}$ (4) $S_2O_7^{2-}$

Question No.	Questions
34.	Polyphosphates are used as water softening agents because they:
y Section	(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) Cu <sup>2+</sup> (2) Ag <sup>+</sup>
	(3) Zn <sup>2+</sup> (4) Au <sup>+</sup>
36.	KMnO <sub>4</sub> on heating gives:
	(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>
, 12° °	(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>
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 $[Pt(NH_3)_4NO_2C\ell]$ SO <sub>4</sub> is :
a *a	(1) chloronitrotetraammine platinum (IV) sulphate
	(2) tetraamminechloronitro platinum (IV) sulphate
	(3) nitrochlorotetraammine platinum (IV) sulphate
	(4) platinum (IV) tetraamminenitrochloro sulphate

Question No.	Questions
39.	The type of magnetism exhibited by $[Mn(H_2O)_6]^{2+}$ ion is:
	(1) diamagnetism (2) paramagnetism
	(3) ferromagnetism (4) antiferromagnetism
40.	Which of the following organometallic compound does not obey EAN rule?
1901	(1) $CO(CO)_3 (\pi - C_3 H_5)$ (2) $(C_2 H_5) Cr(CO)_3 (\pi - C_2 H_5)$
	(3) $[Mn(CO)_5 (C_2H_5)^+$ (4) $Co (C_6H_6)_2$
41.	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
42.	What is meant by a reaction going in 94% enantiomeric excess?
	(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.

Question No.	Questions
43.	Which reaction condition are not appropriate for the following transformation?
	(1) $\operatorname{Zn}\left(\operatorname{Hg}\right)/\operatorname{HC}\ell$ (2) $\operatorname{NH}_{2}\operatorname{NH}_{2}/\operatorname{NaOH}$
	(3) $\text{LiA}\ell\text{H}_4$ / $\text{Et}_2\text{O}$ (4) HS $\text{CH}_2\text{CH}_2\text{CH}_2\text{SH}$ / $\text{H}^+$ , then $\text{H}_2$ / Ni
44.	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?
	$\begin{array}{c c} & & O \\ & & & \\$
	(1) (i) $NaBH_4/MeOH$ ; (ii) $H_3O^+$ (2) (i) $NaBH_4/THF$ ; (ii) $NaOH/H_2O$ (3) (i) $LiA\ell H_4/Et_2O$ ; (ii) $H_3O^+$ (4) (i) $LiA\ell H_4/Et_2O$ ; (ii) $NaOH/H_2O$
45.	The following transformation is feasible by:
	Me H H Me Me Me
	Trans Cis
	(1) Thermal disrotatory process
	(2) Photochemical disrotatory process
	(3) Thermal conrotatory process (4) Photo chemical conrotatory process

Question No.	Questions
46.	Which compound is most basic?
	_pound is most basic :
	$(1) \qquad (2) \qquad \begin{bmatrix} 1 \\ N \end{bmatrix}$
eran er an ar	
	$(3)  \bigvee_{H} \qquad \qquad (4)  \bigvee_{H} \qquad \qquad (4)$
47.	Which one of the following gas is responsible for maximum contribution in green house effect?
	(1) CFC (2) O <sub>2</sub>
1 *	(3) CO <sub>2</sub> (4) CH <sub>4</sub>
48.	The <sup>13</sup> C chemical shifts normally range between:
	(1) $\delta = 0.200 \text{ ppm}$ (2) $\delta = 100.200 \text{ ppm}$
	(3) $\delta = 50\text{-}100 \text{ ppm}$ (4) $\delta = 200\text{-}250 \text{ ppm}$
49.	What is meant by a drug's "specification"?
	(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
50.	The order of aromaticity of furan, thiophene and pyrrole is as:
	(1) Thiophene > furan > pyrrole
	(2) Furan > Pyrrole > thiophene
	(3) Thiophene > Pyrrole > furan
	(4) Pyrrole > thiophene > furan

Question No.	Questions
51.	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:
	$(1)  \sigma_{\rm g}^2 + \sigma_{\rm u}^2 \qquad (2)  \sigma_{\rm g}^2$
	(3) $\sigma_{\rm g}^2 - \sigma_{\rm u}^2$ (4) $\sigma_{\rm g}^2 + \frac{1}{2} \sigma_{\rm u}^2$
52.	The simultaneous eigen functions of angular momentum operators L2 and Lz 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 <sub>z</sub> orbitals (4) only 2p <sub>z</sub> orbital
53.	The single-particle partition function (f) for a certain system has the form f=A Ve <sup>BT</sup> . The average energy per particle will then be (k is the Boltzman constant):  (1) BkT  (2) BkT <sup>2</sup>
8,1	(3) $kT/B$ (4) $kT/B^2$
54.	
	Which of the following statements in INCORRECT?
	Which of the following statements in INCORRECT?  (1) A Slater determinant is an antisymmetrized wave function
	(1) A Slater determinant is an antisymmetrized wave function
	(1) A Slater determinant is an antisymmetrized wave function (2) Electronic wavefunction should be represented by Slater
	<ul> <li>(1) A Slater determinant is an antisymmetrized wave function</li> <li>(2) Electronic wavefunction should be represented by Slater determinants</li> </ul>
55.	<ol> <li>A Slater determinant is an antisymmetrized wave function</li> <li>Electronic wavefunction should be represented by Slater determinants</li> <li>A Slater determinant always corresponds to a particular spin state</li> </ol>
	<ol> <li>A Slater determinant is an antisymmetrized wave function</li> <li>Electronic wavefunction should be represented by Slater determinants</li> <li>A Slater determinant always corresponds to a particular spin state</li> <li>A Slater determinant obeys the Pauli exclusion principle</li> </ol>

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?					
3 10	(1) $(CH_3)_3 O^+$ (2) $(CH_3)_3 B$ (3) $(CH_2)_3 CH$ (4) $(CH_3)_3 N$					
	., 33					
58.	Which of the following reacts by the E1 mechanism?					
	(1) $CH_3CH_2CH_2CH_2Br$ (2) $(CH_3)_2CHCH_2Br$ Br					
	(3) $(CH_3)_3 CBr$ (4) $CH_3 CH_2 CH - CH_3$					
59.	Nicotine alkaloid belong to:					
	(1) Phenylethylamine group (2) Indoe group					
a	(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 SN <sup>2</sup> reaction is:					
	(1) $CH_3C\ell$ (2) $(C_2H_5)_2CHC\ell$					
	(3) $(CH_3)_3 CC\ell$ (4) $(CH_3)_2 CHC\ell$					
62.	What intermolecular force is most responsible for molecular iodine, $I_2$ being a solid at room temperature?					
	(1) Dipole-dipole (2) Ionic-bonding					
	(3) Ion-dipole (4) London dispersion force					

Question No.		Q	ues	tions			
63.	The as:	The process of separation of enantiomers from a racemic mixture is known as:					
- 'z	(1) (3)	Racemic modification Inversion	(2) (4)	Resolution Specific rotation			
64.	Whi	ch one of the following is arc	ma	tic compound ?			
	(1)		(2)	$\Box$			
	(3)		(4)				
65.	The	conversion of cis-isomers to	o tra	ans-isomers or trans-isomers to cis-			
	(1)	Conformations	(2)	Diaxial interaction			
	(3)	Conformational analysis	(4)	Stereomutation			
66.	Which of the following statements regarding cyclopropene is wrong?						
	(1)	It is cyclic					
	(2)	It does not exhibit continuo	us d	elocalization			
	(3)	It obeys Huckel's rule					
	(4)	It is aromatic					
67.	Whi	ch of the following is the mos	st st	able carbocation ?			
	(1)	$\mathrm{C_6H_5} \overset{+}{\mathrm{C}}\mathrm{H_2}$	(2)	$\mathrm{CH_3} \overset{+}{\mathrm{C}} \mathrm{H_2}$			
	(3)	$\mathrm{C_6H_5} \mathrm{\overset{+}{C}HC_6H_5}$	(4)	$C_6H_5CH_2\overset{+}{C}H_2$			
68.	Whi	ch of the following is an elec	trop	hile?			
	(1)	H <sub>2</sub> O	(2)	$A\ell C\ell_{q}$			
	(3)			C <sub>2</sub> H <sub>5</sub> NH <sub>2</sub>			

Question No.	Questions
69.	The most reactive nucleophile among the following is:
	(1) $C_6H_5\bar{O}$ (2) $(CH_3)_3C\bar{O}$
	(3) $CH_3^{\circ}O$ (4) $(CH_3)_2CH^{\circ}O$
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) Synthon
	(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 (3) 400 K (4) 500 K
72.	<ul> <li>In Kohlrausch law Λ<sub>m</sub> = Λ<sup>0</sup><sub>m</sub> − k √c, Λ<sup>0</sup><sub>m</sub> and k</li> <li>(1) depend only on stoichiometry</li> <li>(2) depend only on specific identity of the electrolyte</li> <li>(3) are independent of specific identity of the electrolyte</li> <li>(4) are mainly dependent on specific identity of the electrolyte and stoichiometry, respectively</li> </ul>
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) $27 \text{ kcal mol}^{-1}$ (2) $110 \text{ kcal mol}^{-1}$
	(3) $55 \text{ kcal mol}^{-1}$ (4) $5.5 \text{ kcal mol}^{-1}$

Question No.	Questions
74.	A carnot takes up 90 J of heat from the source kept at 300 K. The correct statement among the following is :
	(1) It transfers 60 J of heat to the sink at 200 K
200	(2) It transfers 50 J of heat to the sink at 200 K
0 T	(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
75.	The correct statement about the difference of second and first excited state energies ( $\Delta E$ ) of a particle in 1-D, 2-D square and 3-D cubic boxes with same length for each, is:
	(1) $\Delta E (1 - D box) = \Delta E (2 - D box) = DE (3 - D box)$
	(2) $\Delta E (1 - D box) > \Delta E (2 - D box) > DE (3 - D box)$
, n	(3) $\Delta E (1 - D box) > \Delta E (2 - D box) = DE (3 - D box)$
1 2	(4) $\Delta E (1 - D box) < \Delta E (2 - D box) < DE (3 - D box)$
76.	According to Eyring transition state theory for a bimolecular reaction, the activated complex has:
	(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.
77.	The molecule with the smallest rotational constant (in the microwave spectrum) among the following is:
	(1) $N \equiv CH$ (2) $HC \equiv CC\ell$
	(3) $C\ell C \equiv CF$ (4) $B \equiv CC\ell$

Question No.		policies (Ma	Ques	stions
78.	7.0	e electronic transiti eV. Within the fram m $\pi_1 \to \pi_3$ would be:	on energy in a work of H	from $\pi_1 \to \pi_2$ in propenyl radical is Huckel theory, the transitions energy
	(1)	2.4 eV	(2)	4.8 eV
	(3)	14.4 eV	(4)	9.6 eV
79.	WIL	n degeneracy of 2 an	d 3, respect	distributed in energy levels $E_1$ and $E_2$ ively. Number of microstates, with 3 e in energy level $E_2$ , is :
	(1)	4	(2)	12
n in	(3)	96	(4)	192
	from to:	n (2, 1, 0) plane of sil	ver is 30°. T	order diffraction angle of X-ray beam The wavelength of X-ray used is close 18 nm
	(3)	25 nm	(4)	32 nm
81.	Wil	kinson's catalyst is u	sed for :	
	(1)	hydrogenation of all	kenes (2)	hydrogenation of alkynes
	(3)	hydrogenationof alk	anes (4)	hydrogenation of unsaturated oils
82.	An a	aqueous solution con cipitates :	tains Hg+, P	$^{\prime}b^{2+}$ and $Cd^{2+}$ . The addition of $6N$ $HC\ell$
	(1)	$\mathrm{Hg_2C}\ell_2$ only	(2)	$PbC\ell_{2}$ only
	(3)	$Hg_2C\ell_2 + PbC\ell_2$		$PbC\ell_{2} + HgC\ell_{2}$
83.	Whi	ich one among the fo	llowing pair	rs cannot be separated by H <sub>2</sub> S in dil
	(1)	Bi <sup>3+</sup> , Sn <sup>4+</sup>	(2)	$\mathrm{A}\ell^{3+}$ , $\mathrm{Hg}^{2+}$
a .	(3)	Zn <sup>2+</sup> , Sn <sup>4+</sup>	(4)	Ni <sup>2+</sup> , Cu <sup>2+</sup>
		*		

Question No.	Questions						
84.	Oxymyoglobin contains:						
	(1) O <sub>2</sub> at trans position to histidine chain						
En ''	(2) O <sub>2</sub> in the hole of porphyrin						
	(3) O <sub>2</sub> bonded by coordinated bond to Mg (II)						
	(4) does not contain O <sub>2</sub>						
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:						
n .	(1) $NO_3^-$ to $NH_4$ (2) $N_2$ to $NH_4^+$						
, e e	(3) $NH_4^+$ to $NO_3^-$ (4) $NO_3^-$ to $N_2$						
88.	How many fundamental vibrations are possible in SO <sub>2</sub> molecule?						
	(1) Two (2) Three						
	(3) Four (4) Six						
89.	The EPR spectrum of NO <sub>2</sub> 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 <sub>2</sub> O) <sub>6</sub> ] <sup>2+</sup> 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 $IC\ell_2^-$ 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) σ-orbital (2) π-orbital					
	(3) $\sigma^*$ -orbital (4) $\pi^*$ -orbital					
95.	The molecular orbital configuration of B <sub>2</sub> molecule is:					
	(1) KK $(\sigma 2s)^2 (\sigma 2p2)^2 (\sigma^* 2s)^2$ (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 <sup>+</sup> (2) Mg <sup>2+</sup>					
	(3) Pd <sup>2+</sup> (4) Ti <sup>4+</sup>					
97.	CH <sub>3</sub> OH is:					
	(1) soft-soft (2) hard-hard					
	(3) soft-hard (4) hard-soft					

99. V	Arrange the order of increasing solubilities of alkali metal halides in liq $SO_2$ of the following, $NaC\ell$ , $NaBr$ , $NaF$ and $NaI$ :  (1) $NaI > NaBr > NaC\ell > NaF$ (2) $NaI > NaBr < NaC\ell > Na$ (3) $NaI < NaBr < NaC\ell < NaF$ (4) $NaI < NaBr > NaC\ell < Na$ Which is not emitted by a radioactive substance?	F
99. V	Which is not emitted by a radioactive substance?	.r 
(	(0)	
	<ul> <li>(1) α-rays</li> <li>(2) β-rays</li> <li>(3) positron</li> <li>(4) proton</li> </ul>	2 2 10
	In a nuclear reaction	
	$^{7}_{3}\text{Li} + Z \longrightarrow ^{7}_{4}\text{Be} + ^{1}_{0}\text{n}$ the bombarding projectile Z is:  (1) $\alpha$ -particle (2) denterium (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	3.4
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/
17	4	3	3	3.1
18	2	1	2	1/
19	2	4	3	1
20	4	3	2	2/
21	1	1	2	2 0
22	3	2	2	3 /
23	1	4	4	2 /
24	1	3	4	4/
25	1	1	3	4/
26	1	2	3	4/
27	3	3	3	2 /
28	2	3	1	2/
29	. 3	3	4	3 /
30	2	2	1	2/
31	2	2	3	2 /
32	3	3	4	4 ~
33	2	3	3	4-
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 ′
39	3	1	4	2 /
40	2	2	3	4-
41	1	2	3	3 /
42	4	3	3	4/
43	3	2	2	3/
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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51	2	1	2	3 🗸
52	3	3	3	3 /
53	3	1	2	2 /
54	2	1	4	3/
55	2	1	4	1 /
56	3	1	4	3 /
57	3	3	2	41
58	1	2	2	3/
59	1	3	3	3.
60	2	2	2	4/
61	3	1	1	1 ~
62	3	4	2	4 /
63	2	3	4	2 ./
64	3	1	3	3 ′
65	1	3	1	4 /
66	3	4	2	4/
67	4	3	3	3 /
68	3	4	3	2 /
69	3	3	3	3 1
70	4	2	2	4/
71	1	3	1	1 /
72	2	3	4	4 /
73	. 4	2	2	3 /
74	3	3	3	1/
75	1	1	4	3 /
76	2	3	4	4 /
77	3	4	3	3 ^
78	3	3	2	4 /
79	3	3	3	3 /
80	2	4	4	2/
81	1	2	2	1 -
82	4	2	4	3 /
83	2	4	4	1
84	3	4	3	1-
85	4	3	1	1/
86	4	3	3	1
87	3	3	4	3 /
88	2	1	2	2/
89	3	4	2	3 /
90	4	1	4	2/
91	3	1	2	2 /
92	4	4	3	2 ~
93	3	2	3	4 /
94	3	3	2	4/
95	3	4	2	3 /
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