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## (MPH/PHD/URS-EE-2020)

### LEMICTOV

Code	CUEINII2 I KA	Sr. No. 1001
Time: 11/4 Hours	Total Questions: 100	Max. Marks : 100
Roll No.	(in figure)	WHAT. WHATES: 100
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one full mark. Cut	ting, erasing, overwriting and	more than one answer

Use only Black or Blue BALL POINT PEN of good quality in the OMR Answer-7. Sheet.

BEFORE ANSWERING THE QUESTIONS, THE CANDIDATES SHOULD 8. ENSURE THAT THEY HAVE BEEN SUPPLIED CORRECT AND COMPLETE BOOK-LET. COMPLAINTS, IF ANY, REGARDING MISPRINTING ETC. WILL NOT BE ENTERTAINED 30 MINUTES AFTER STARTING OF THE

Question No.	A sudden large jump between the values of second and third ionisation energies of elements would be associated with which of the following electronic configurations?	
1.		
-	(1) $1s^2 2s^2 2p^6 3s^1$ (2) $1s^2 2s^2 2p^6 3s^2 3p^1$	
1	(3) $1s^2 2s^2 2p^6 3s^1 3p^2$ (4) $1s^2 2s^2 2p^6 3s^2$	
2.	Among the following groupings which represents the collection of isoelectronic species?	
	(1) $NO^+$ , $C_2^{2-}$ , $O_2$ , $CO$ (2) $N_2$ , $C_2^{2-}$ , $NO$ , $CO$	
- 1	(3) CO, $N_2$ , CN <sup>-</sup> , $C_2^{2-}$ (4) NO, CN <sup>-</sup> , $N_2$ , $O_2^{-}$	
3.	In the Molecular orbital diagram for $O_2^+$ ion the highest occupied orbital is:  (1) $\sigma$ MO orbital (2) $\pi$ MO orbital (3) $\pi^*$ MO orbital (4) $\sigma^*$ MO orbital	
1 <b>4.</b> .10	The correct order of hybridization of the central atom in the following species, NH <sub>3</sub> , [PtCl <sub>4</sub> ] <sup>2-</sup> , PCl <sub>5</sub> , and BCl <sub>3</sub> , is respectively:  (1) dsp <sup>2</sup> , dsp <sup>3</sup> , sp <sup>2</sup> , sp <sup>3</sup> (2) sp <sup>3</sup> , dsp <sup>2</sup> , dsp <sup>3</sup> , sp <sup>2</sup> (3) dsp <sup>2</sup> , sp <sup>2</sup> , sp <sup>3</sup> , dsp <sup>3</sup> (4) dsp <sup>2</sup> , sp <sup>3</sup> , sp <sup>2</sup> , dsp <sup>3</sup>	
5.	Which of the following structure is most expected for the molecule XeOF <sub>4</sub> ?  (1) Tetrahedral  (2) Square Pyramid  (3) Square planar  (4) Octahedral	

Question No.	Questions
6.	Among the following, which is the weakest Lewis base?  (1) CH <sub>3</sub> (2) NH <sub>2</sub> (3) OH- (4) F-
7.	CH <sub>3</sub> HgOH is classified as:  (1) Soft - Hard  (2) Soft - Soft  (3) Hard - Hard  (4) Hard - Soft
8.	<ul> <li>[Co (NH<sub>3</sub>)<sub>4</sub> (NO<sub>2</sub>)<sub>2</sub>] Cl exhibits:</li> <li>(1) Linkage isomerism, ionisation isomerism and optical isomerism.</li> <li>(2) Linkage isomerism, ionisation isomerism and geometrical isomerism.</li> <li>(3) Ionisation isomerism, geometrical isomerism and optical isomerism.</li> <li>(4) Linkage isomerism, geometrical isomerism and optical isomerism.</li> </ul>
9.	Which one of the following shows maximum value of paramagnetic behaviour?  (1) [Sc (CN) <sub>6</sub> ] <sup>3-</sup> (2) [Co (CN) <sub>6</sub> ] <sup>3-</sup> (3) [Fe (CN) <sub>6</sub> ] <sup>3-</sup> (4) [Cr (CN) <sub>6</sub> ] <sup>3-</sup>

Question No.	Questions		
10.	In which of the following pairs are both the ions coloured in aqueous solution?		
7 18	(1) Ni <sup>2+</sup> , Ti <sup>3+</sup> (2) Sc <sup>3+</sup> , Ti <sup>3+</sup>		
	(3) Sc <sup>3+</sup> , Co <sup>2+</sup> (4) Ni <sup>2+</sup> , Cu <sup>+</sup>		
11.	Stainless steel does not rust because:		
	(1) Chromium and nickel combine with iron		
	(2) Chromium forms an oxide layer and protects iron from rusting		
÷, ;	(3) Nickel present in it, does not rust		
	(4) Iron forms a hard chemical compound with chromium present in it		
12.	The pair whose both species are used in antacid medicinal preparations is:		
	(1) NaHCO <sub>3</sub> and Mg (OH) <sub>2</sub> (2) Na <sub>2</sub> CO <sub>3</sub> and Ca (HCO <sub>3</sub> ) <sub>2</sub>		
	(3) Ca(HCO <sub>3</sub> ) <sub>2</sub> and Mg (OH) <sub>2</sub> (4) Ca(OH) <sub>2</sub> and Na HCO <sub>3</sub>		
13.	Artificial gem used for cutting glass is:		
44 .	(1) graphite (2) diamond		
	(3) SiC (4) CaCN <sub>2</sub>		
14.	Phosgene can be obtained when:		
	(1) White phosphorus reacts with alkali.		
	(2) Calcium phosphide reacts with water.		
	(3) Chloroform reacts with air.		
	(4) Bone comes in contact with water.		
	(4) Bone comes in contact with water.		

Question No.	Questions
15.	The structural formula of hypophosphorous acid is:
	(1) H OH OH
	(3) HO HO OH OH
16.	In which of these processes platinum is used as a catalyst?  (1) Production of synthetic rubber  (2) Hardening of oils  (3) Oxidation of ammonia to form HNO <sub>3</sub> (4) Synthesis of methanol
17.	In Zeigler - Natta polymerisation of ethylene, the active species is:  (1) AlCl <sub>3</sub> (2) Et <sub>3</sub> Al  (3) Ti <sup>III</sup> (4) TiCl <sub>4</sub>
e gate ( )	Which of the following is not an example of organometallic compound?  (1) Trimethylboron  (2) Trimethylaluminium  (3) Trimethoxytitanium chloride  (4) Tetracarbonylnickel

Question No.	Questions
19.	The nuclear reaction : $^{63}$ Cu + $^{4}$ He $\rightarrow ^{87}_{17}$ Cl + 14 $^{1}$ H + 16 $^{1}_{0}$ n is referred to as :
- washing as	(1) Spallation reaction (2) Fusion reaction (3) Fission reaction (4) Chain reaction
20.	The nucleus resulting from $_{92}U^{238}$ after successive emission of two $\alpha$ an four $\beta$ -particles is :
6347	(1) $_{90}$ Th <sup>230</sup> (2) $_{94}$ Pu <sup>230</sup> (3) $_{88}$ Ra <sup>230</sup> (4) $_{92}$ U <sup>230</sup>
21.	The metal species present in Nitrogenase is: (1) Zinc (2) Molybdenum
22.	(3) Tungsten (4) Lead  Which of the following compounds will show quadrupole splitting in Mossbauer spectroscopy?
	(1) $K_4$ Fe (CN) <sub>6</sub> (2) FeCl <sub>3</sub> (3) Fe <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> (4) FeSO <sub>4</sub>
23.	The most widely used standard reference substance in ESR is:  (1) 1, 1 -diphenyl -2-Picryl - hydrazyl free radical  (2) 1, 1 -diphenyl -2-Picryl - hydroxyl free radical  (3) TMS
	(4) None of these

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24.	In DTA, the differential temperature Vs temperature or time curve is highly sensitive to:  (1) Heating rate  (2) Sample size  (3) Sample packing  (4) All of these
25.	Radio metric titrations have been applied for:  (1) Determination of the composition of compound  (2) Investigation of co-precipitation  (3) Determination of the specific activity of radioactive preparations  (4) All of these
26.	Cytochromes in biological systems are involved in:  (1) Proton transfer  (2) Oxygen transfer  (3) Electron transfer  (4) Metal transfer
27.	In Ferrocene which metal orbital interact more effectively with ligand group orbital?  (1) $3d_z^2$ (2) $3d_{xy} 3d_{x^2-y^2}$ (3) $4P_x 4P_y$ (4) $3d_{xz}$ , $3d_{yz}$
28.	The Electroanalytical technique in which the potential of the working electrode is stepped and the resulting current is monitored as a function of time is:  (1) Coulometry (2) Chronopotentiometry (3) Chronoamperometry (4) Pulse polarography

Question No.	" Andrew of the second	Questions	
29.	Lithium drugs are used in	n treatment of:	
	(1) Dental caries	(2) Psychiatric disorder	
	(3) Malaria	(4) Arthritis	
30.	Which alkylating agent is of the cancers?	s used as Anticancer Drug in treatme	nt of most
M 1 .06	(1) Melphan	(2) Cyclophosphamide	
- Same	(3) Chlorambucil	(4) None of these	
7.20 3	CI P CI CI CI CI (1) two (3) one	CI CI P F CI CI P F (2) three (4) four	
32.	Auxochrome when attached towards longer wavelength  (1) Bonding  (3) Inductive effect	ed to chromophore absorption band h due to increase in: (2) Conjugation (4) None of these	is shifted
33.	deshielding the protons als		elding and
	(1) Inductive effect	(2) Space effect	
	(3) H-bonding	(4) All of above	

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34.	Ionic equivalent conductance value for Ca <sup>2+</sup> is 0.0119 S m <sup>2</sup> mol <sup>-1</sup> and for Cl <sup>-</sup> is 0.0076 S m <sup>2</sup> mol <sup>-1</sup> . The correct expected molar conductivity at infinite dilution for CaCl <sub>2</sub> is:  (1) 0.0195 S m <sup>2</sup> mol <sup>-1</sup> (2) 0.0271 S m <sup>2</sup> mol <sup>-1</sup> (3) 0.0542 S m <sup>2</sup> mol <sup>-1</sup> (4) 0.01355 S m <sup>2</sup> mol <sup>-1</sup>
35.	A binary mixture of A <sub>2</sub> and B <sub>2</sub> will show negative deviation from Raoult's law when:  (1) A-A and B-B interactions are stronger than A-B  (2) A-A and B-B interactions are weaker than A-B  (3) Both A-A and B-B interactions are equal to A-B  (4) Either A-A or B-B interactions is equal to A-B
36.	The molar masses of monodisperse and polydisperse polymers oberespectively the conditions: $ (M_n = \text{Number average molecular weight and } M_w = \text{Weight average molecular weight} ). $ $ (1)  M_n > M_w \text{ and } < M_w $ $ (2)  M_n = M_w \text{ and } M_n < M_w $ $ (3)  M_n < M_w \text{ and } M_n < M_w $ $ (4)  M_n = M_w \text{ and } M_n = M_w $
37.	CH <sub>3</sub> COOC <sub>2</sub> H <sub>5</sub> (aq) + H <sub>3</sub> O <sup>+</sup> (ℓ) → CH <sub>3</sub> COOH(aq) + C <sub>2</sub> H <sub>5</sub> OH(aq). What type reaction is this?  (1) Unimolecular (elementary)  (2) Pseudo first order  (3) Zero order  (4) Second order

Question No.	Questions
38.	Micelle formation is accompanied by the:  (1) decrease in overall entropy due to ordering of solvent near hydrophobic ends.  (2) increase in overall entropy mostly due to increase in solvent entropy.  (3) increase in overall entropy, mostly due to increase in solute entropy.  (4) increase in overall entropy and decrease in enthalpy.
39.	The rotational partition function is expected to be smallest for the molecule, among the following:
7, */abresant. 2	(1) H <sub>2</sub> (2) Li <sub>2</sub> (3) N <sub>2</sub> (4) F <sub>2</sub>
40.	The temperature derivative of electrochemical cell potential E at constant pressure, $\left(\frac{\partial E}{\partial T}\right)_{\!p}$ , is given by :
relevant diper on	(1) $\frac{\Delta S}{nF}$ (2) $\frac{\Delta S}{nF}$ (3) $\frac{\Delta S}{nFT}$ (4) $-\frac{\Delta S}{nFT}$
41.	The number of rotational degrees of freedom of CO, is:
	(1) one (2) two (3) three (4) four

Question No.	Questions	
42.	When crystals of sodium chloride are heated in the presence of sodium vapor, they turn yellow. This is due to the formation of:  (1) Schottky defects (2) Frenkel defects (3) F-centres (4) H-centres	
43.	Of the following inequalities, the criterion/criteria for spontaneity of a chemical reaction is/are: $(i) (\Delta G)_{T,P} < 0 (ii) (\Delta U)_{S,V} > 0 (iii) (\Delta S)_{U,V} > 0$ (1) (i) only (2) (ii) only (3) (i) and (ii) (4) (i) and (iii)	
44.	The concentration of a reactant decreases linearly with time. What is the order of the reaction?  (1) 1st order  (2) Fractional order  (3) 2nd order  (4) Zero order	
45.	The absorbance of solution having 20% transmittance is: (1) 0.301 (2) 0.699 (3) 1.301 (4) 1.699	
46.	Electrolysis of an aqueous solution of 1.0 M NaOH results in:  (1) Na at the cathode and O <sub>2</sub> at the anode.  (2) H <sub>2</sub> at the cathode and O <sub>2</sub> at the anode.  (3) Na and H <sub>2</sub> at the cathode and O <sub>2</sub> at the anode.  (4) O <sub>2</sub> at the cathode and H <sub>2</sub> at the anode.	

Question No.	Questions	
47.	The rate constant of decomposition of a compound is represented by	
	in $K = 5.0 - \frac{12000}{T}$	
	The value of E <sub>A</sub> (in Kcal mol-1) for this compound at 300 K is:	
	(1) 24 (2) 12 (3) 240 (4) 120	
48.	For a reaction $2A \rightarrow Product$ the initial concentration of A is 0.1 M and the rate constant is $2 \times 10^{-3} dm^3 mol^{-1} s^{-1}$ . The half life period of the reaction is:  (1) 5 sec (2) 50 sec (3) 500 sec (4) 5000 sec	
49.	The number of degenerate spatial orbitals of a hydrogen-like atom with principal quantum number n=6 is:  (1) 12 (2) 6  (3) 72 (4) 36	
50.	If the atoms/ions in the crystal are taken to be hard spheres touching each other in the unit cell, then the fraction of volume occupied in the body centered cubic structure is:  (1) $\sqrt{3}\pi$ (2) $\frac{\sqrt{2}}{6}\pi$ (3) $\frac{\pi}{6}$ (4) $\frac{\sqrt{3}}{8}\pi$	

Questions Question No. The plot of the rate constant vs. ionic strength of the reaction A2+ + B-51. follows the line as shown in the figure :  $\sqrt{I}$ (2) II (1) I (4) IV (3) III Reaction between A and B is carried out for different initial concentrations 52. and the corresponding half-life times are measured. The data are listed in the table: 11/25 [B<sub>o</sub>] M Entry [A<sub>o</sub>] M 60 10 500 60 20 500

The rate can be represented as:

3

(1) k[A][B]

(2)  $k[A]^2$ 

(3)  $k[A]^2[B]$ 

(4) k[A] [B]<sup>2</sup>

500

500

60

30

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20

	Questions
53.	The separation of the (123) planes of an orthorhombic unit cell is 3.12 nm.  The separation of (246) and (369) planes are, respectively:  (1) 1.56 nm and 1.04 nm  (2) 1.04 nm and 1.56 nm  (3) 3.12 nm and 1.50 nm  (4) 1.04 nm and 3.12 nm
54.	The predicted electromotive force (emf) of the electrochemical cell Fe(s) / Fo <sup>2+</sup> (aq) (0.01M) $\ $ Cd <sup>2+</sup> (aq) (0.01M)/Cd(s) (E° (Fc <sup>2+</sup> /Fc) = -0.447V and E° Cd <sup>2</sup> /Cd = -0.403V)
	(1) -0.850V (2) +0.044V (3) +0.0850V (4) -0.044V
55.	For a particle of mass m in a 1-D box of length 2L, the energy of level corresponding to n=8 is:  (1) $\frac{h^2}{8ml^2}$ (2) $\frac{h^2}{32ml^2}$
SW)	(3) $\frac{4h^2}{ml^2}$ (4) $\frac{2h^2}{ml^2}$
<b>56.</b>	A thermodynamic equation that relates chemical potential to the composition of a mixture is known as:
is. Polit	A thermodynamic equation that relates chemical potential to the

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57.	One mole of monoatomic gas is transformed from 300K and 2 atm to 600K and 4 atm. The entropy change for the process is:
	(1) $\frac{3}{2}$ R $\ln 2$ (2) $\frac{1}{2}$ R $\ln 2$
*	(3) $\frac{7}{2}$ R $\ln 2$ (4) $\frac{5}{2}$ R $\ln 2$
58.	The electrical double layer model that consist of both the fixed layer and diffused layer among the following is:
	(1) Helmholtz (2) Gouy (3) Stern (4) Debye Huckel
59.	If e <sup>ax</sup> is an eigen function and d <sup>a</sup> /dx <sup>a</sup> is an operator then the eigen value will be:
	(1) a <sup>n</sup> (2) a (3) n (4) n <sup>a</sup>
60.	The Gibbs energy for the decomposition of Al <sub>2</sub> O <sub>3</sub> at 500°C is as follows:
	$\frac{2}{3}\text{Al}_2\text{O}_3 \rightarrow \frac{4}{3}\text{Al} + \text{O}_2$ , $\Delta_r G = +966 \text{ kJ mol}^{-1}$ The potential difference needed for electrolytic reduction of $\text{Al}_2\text{O}_3$ at 500°C
	is at least: (1) 2.5 V (2) 5.0 V
	(3) 4.5 V (4) 3.0 V

Question No.	Questions
61.	The equilibrium constants $k_{p_1}$ and $k_{p_2}$ for the reactions $X \rightleftharpoons 2Y$ and $Z \rightleftharpoons P+Q$ , respectively are in the ratio of 1:9. If the degree of dissociation of X and Z be equal then the ratio of total pressure at these equilibria is:
	(1) 1:36 (2) 1:1 (3) 1:3 (4) 1:9
62.	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:
a estados.	(1) 4 (2) 12 (3) 96 (4) 192
63.	One mole of an ideal gas undergoes a cyclic process (ABCDA) starting from point A through 4 reversible steps as shown in the figure. Total work done in the process is:
	(3) $R(T_1 + T_2) ln \frac{V_2}{V_1}$ (4) $R(T_1 - T_2) ln \frac{V_2}{V_1}$

No.	Questions
64.	If the specific conductance of an electrolyte solution is 0.2 ohm <sup>-1</sup> cm <sup>-1</sup> and cell constant is 0.25, the conductance of the solution is:  (1) 1.25 ohm <sup>-1</sup> (2) 1.0 ohm <sup>-1</sup> (3) 0.8 ohm <sup>-1</sup> (4) 2.0 ohm <sup>-1</sup>
65.	The slope and intercept obtained from (1/Rate) against (1/substrate concentration) of an enzyme catalyzed reaction are 300 and 2 $\times$ 10 <sup>5</sup> , respectively. The Michaelis-Menten constant of the enzyme in this reaction is:  (1) $5 \times 10^6 \mathrm{M}$ (2) $5 \times 10^{-6} \mathrm{M}$ (3) $1.5 \times 10^3 \mathrm{M}$ (4) $1.5 \times 10^{-3} \mathrm{M}$
66.	Given;  A. Fe (OH) <sub>2</sub> (s) + 2e <sup>-</sup> → Fe(s) + 2OH – (aq); E <sub>o</sub> = -0.877V  B. Al <sup>3+</sup> (aq) + 3e <sup>-</sup> → Al(s); E <sub>o</sub> =-1.66V  C. AgBr(aq) + e <sup>-</sup> → Ag(s) +Br (aq); E <sub>o</sub> =0.071V  The overall reaction for the cells in the direction of spontaneous change would be  1. Cell with A and B: Fe reduced  Cell with A and C: Fe reduced  2. Cell with A and B: Fe reduced  Cell with A and B: Fe oxidized  3. Cell with A and B: Fe oxidized  Cell with A and C: Fe oxidized  4. Cell with A and B: Fe oxidized

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uestion No.	Questions
67.	IUPAC name of the following compound is:
	and the second of the second o
± +:	
4	
	H COOE
The same	(1) Pethyl (S)-3-methyl-4-ovoqyolohou 2 august 1
ij,	Military construction of the second control
	(2) (R)-4-ethoxycarbonyl-2-methyl-4-oxocyclohex-2-enone
	(3) ethyl (R)-3-methyl-4-oxocyclohex-2-enecarboxylate
The author probability	(4) (S)-4-ethoxycarbonyl-2-methyl-4-oxocyclohex-2-enone
68.	Compound given below may be named as:
	To the state of th
	(2) Committee de la committe de la c
	(1) (2R, 3Z)-7-phenylhept-3-en-2-ol
8 3	(2) (2R, 3E)-7-phenylhept-3-en-2-ol
	guit the quid be quite in the but to the A difference of blue A difference and the second of the sec
	(3) (2S, 3E)-7-phenylhept-3-en-2-ol
	(4) (2S, 3Z)-7-phenylhept-3-en-2-ol
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uestion No.	Questions
69.	Enantiomer of the following structure is:
	H, OH CH <sub>3</sub>
	(1) H <sub>2</sub> N CH <sub>3</sub> (2) H <sub>2</sub> N H
	(3) H <sub>2</sub> N H (4) H <sub>2</sub> N CH <sub>3</sub>
70.	HO OH  Hacking SH
	Consider compound A and choose the correct answer:
- 3	HO OH
	(1) A could be optically active and its diastereomer is HS CH <sub>3</sub> CH <sub>3</sub>
	HO HO OH
	(2) A could be optically active and its enantiomer is HS GH <sub>3</sub> C

A-abo3

uestion No.	Questions
	(3) A could be optically inactive and its diastereomer is HS "CH,
	(4) A could be optically inactive and its enantiomer is HS 7 "CH3
71.	HO Cholesterol 1 200 200 200 200 200 200 200 200 200 2
	Number of Optical isomers in Cholesterol would be: (1) 128 (2) 512 (3) 64 (4) 256
72.	Among the following structures, the number of aromatic compound(s is:
. ( <del></del>	
	(1) 3 (2) 4 (3) 5 (4) 6

Question No.	Questions
73.	Number of sp <sup>8</sup> and sp hybridized carbon atoms present in benzyne is:  (1) 3 and 1 (2) 6 and 0 (4) 4 and 0
74.	CH <sub>3</sub> , CH <sub>5</sub> , CH <sub>3</sub> CH <sub>2</sub> , CH <sub>3</sub> CHCH <sub>3</sub> Number of carbonium ions in the above list is:  (1) 4 (2) 3  (3) 2 (4) 1
75.	In the chlorination of 1-chlorobutane under free radical conditions, the most abundant compound formed is:  (1) 1,1-dichlorobutane  (2) 1,2-dichlorobutane  (3) 1,3-dichlorobutane  (4) 1,4-dichlorobutane
76.	Repeated Hofmann Elimination reaction will often remove a nitroger atom from an amine molecule.  Hofmann Elimination  Which of the following compounds is likely product in this case?  (2)
	(3) 🔀

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Question No.	Questions
77.	Major product of the following reaction is :
	CI 1. CH <sub>3</sub> MgBr, dry ether, 0°C 1. aq. acid
	(1) (2) (2)
	(3) OH (4) Q
78.	A LDA/THF 1-BuO/A-BuOH B
	Major product A and B are respectively:
	(1) 0 0 0 0 0 0
# A	(3) C) (4) C) C)
79.	Identify A in the following reaction sequence:
	O O A B 1. LIAIH. O OH + CH3CH2OH
	(1) ) (2) ) oh
	(3) COH (4) HCN

uestion No.	Questions
80.	COOH Sodalime Heat Finc Heat Financi HCI (gae)
* .T &	Products A, B and C respectively are:
,	(1) COOH COOC, HE OH
	(2) OH OH OH
	(3) OH COOH COOC <sub>2</sub> H <sub>6</sub> OH OH
	(4) OH COOC <sub>2</sub> H <sub>6</sub> OH
81.	→ → → ?
	Major product obtained in this reaction is:
	(1) Br (2) Br (2)
	(3) H <sub>2</sub> C=CH <sub>2</sub> (4) Br (4)
82.	A CH <sub>3</sub> OH Br CH <sub>3</sub> OH B
	Products A and B respectively are:
	$(1) \bigcirc - \bigcirc - \bigcirc (2) \bigcirc \times \cdot \bigcirc -$
	(3) (4) (5) Code-A
MPH/P	HD/URS-EE-2020 (Inorganic Chemistry) Code-A

Question No.	Questions
83.	Which combination of reagents is wrong for disconnections (a)-(d) in the following?  (1) (2) (3) (4) (4)
84.	Stereoselective reduction of the dione A with a chiral reducing agent provides the corresponding diol B in 100% diastereoselectivity and 90% ee favoring R, R configuration.
	The composition of the product is:  (1)  (1)  (2)  (3)  (4)  (4)  (5)  (6)  (7)  (8)  (9)  (9)  (1)
	(2) OH HQ OH 95% and 5%
	(3) BON and HO OH

Question No.	Questions	1.4
85.	An a-amino acid, L-proline, can be used as a catalytic chiral auxilia a stereoselective aldol reaction.  Ph	ary for
	Which of (1)-(4) is not involved in the above transformation?	
insga	(1) N CO <sub>2</sub> H (2) N CO <sub>2</sub> H	
3. nt 5	(3) OH N CO₂H (4) PH H	
86.	Which of adducts (1)-(4) is the main product of the following Diel reaction?  CH <sub>3</sub> Me CO <sub>2</sub> Me (1)  CO <sub>2</sub> Me (2)  Me CO <sub>2</sub> Me (3)  Me CO <sub>2</sub> Me (4)  Me CO <sub>2</sub> Me Me CO <sub>2</sub> Me Me Me CO <sub>2</sub> Me	s-Aider

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Questions
The following involves two pericyclic reactions. Which combination indicates correctly the types of reaction involved?
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
(1) [4+2] cycloaddition + [2+2] cycloreversion (2) cheletropic reaction + [4+2] cycloaddition
<ul> <li>(2) cheletropic reaction + [4+2] cycloaddition</li> <li>(3) [4+2] cycloaddition + [4+1] cycloreversion</li> <li>(4) [4+2] cycloaddition + cheletropic reaction</li> </ul>
Which of the following equations shows an unlikely result?  (1) $H_2SO_4$ $NO_2$
(2) (CH <sub>3</sub> CO) <sub>2</sub> O COCH <sub>3</sub>
(3) $\bigcirc$ CI + $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$ $\bigcirc$
$(4)  \bigoplus_{\substack{\Theta \\ N}}  \frac{HNO_{3}}{H_{2}SO_{4}}  \bigoplus_{\substack{\Theta \\ N}}  $

Question No.	Questions
89.	Which of the following statements regarding the reducing ability of a sugar is wrong?
	(1) The aldehyde group of a saccharide is responsible for its reducing properties.
	(2) Ketoses are not reducing sugars because they are not aldehydes.
· · · · · · · · · · · · · · · · · · ·	(3) D-Glucose in predominantly in a cyclic hemiacetal form but it is a
1	reducing sugar through the acyclic form with which the hemiacetal
1	is in equilibrium.
	(4) A methyl glucoside is not a reducing sugar.
90.	Which of the following is not an important secondary structural feature
	in large peptides and proteins?
	(1) the $\alpha$ -helix
	(2) the β-turn
	(3) chair conformations
	(4) the β-pleated sheet
91.	Which of the following statements is wrong?
•	(1) UV absorption is attributable to electronic transitions.
	(2) UV spectra provide information about valence electrons.
	(3) IR absorption is attributable to transitions between rotational energy levels of whole molecules.
	(4) NMR spectrometers use radiofrequency electromagnetic radiation.

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Question No.	Questions				
92.	Which of the following statements regarding mass spectrometry is false?				
	(1) The base peak of a simple ketone is usually attributable to an acylium ion.				
	(2) The molecular ion of carbonyl compounds with a -C-H readily undergoes elimination of an alkene to give a relatively stable enol				
14	radical cation.				
	(3) The molecular ion peak of some alcohols is very weak because it readily loses an alkyl radical to give a relatively stable oxonium (hydroxycarbenium) ion.				
	(4) Structurally isomeric alkanes cannot be distinguished by low resolution mass spectrometry.				
93.	Neopentyl chloride, (CH <sub>3</sub> ) <sub>3</sub> CCH <sub>2</sub> Cl, reacts with the strong base sodium amide to form a new compound. This compound has a molecular ion at m/z = 70 amu and displays two 'H NMR singlets at δ 0.20 & 1.05 ppm (integration ratio = 2:3). What is a plausible structure for this compound?  (1) 2-methyl-2-butene (2) 1,1-dimethylcyclopropane  (3) methylcyclobutane (4) cyclopentane				
94.	Combustion analysis of an organic compound shows it to be 64.3% carbon. It displays a molecular ion at $m/z = 112$ amu in the mass spectrum. Which of the following is a plausible molecular formula for this compound?				
	(1) $C_8H_{16}$ (2) $C_7H_{12}O$				
	(3) $C_6H_8O_2$ (4) $C_5H_4O_3$				

No.	Questions				
95.					
96.	Which of the following is the principal factor which causes the properties of nanomaterials to differ significantly from other materials?  (1) Size distribution  (2) Specific surface feature  (3) Quantum size effects  (4) All the above				
97.	is an excellent 'green' solvent as well as a greenhouse gas?  (1) Methane (2) CFCs (3) Carbon monoxide (4) Carbon dioxide				
98.	<ul> <li>Which of the following statements is not true regrading the binding site of a receptor?</li> <li>(1) The binding site is normally a hollow or cleft in the surface of a receptor.</li> <li>(2) The binding site is normally hydrophobic in nature.</li> <li>(3) The binding site contains amino acids which are important to the binding process and a catalytic mechanism.</li> <li>(4) Chemical messengers fit into binding sites and bind to functional groups within the binding site.</li> </ul>				

No.	Questions				
99.	Th	nere is a lot of inte oment, why is this	rest in the a	rea of supramolecular catalysis at t	
	(1)	There is actually	very little i	nterest in this area, due to the fact th supramolecular catalyst.	
	(2)	It would be usefu	ul for cutting ice decrease	g down on the amount of solvent in the costs. This is of particular significan	
	(3)		ery efficient	and stereoselective catalysis of ofte	
	(4)	It is thought the replacing catalyt increasing efficie	ic metals in	olecular catalyst would be capable reactions, thereby reducing cost whi	
100	The	e term used to mea	sure a produ	ct or person's environmental impact	
100.	- 110		· · · · · · · · · · · · · · · · · · ·		
100.	(1) (3)	Handprint Footprint	(2)	CO <sub>2</sub> print Hazardous potential	
100.	(1)	Handprint Footprint	(2) (4) (4)	CO <sub>2</sub> print	
100.	(1)	Handprint Footprint	(2) (4) (4)	CO <sub>2</sub> print Hazardous potential	
100.	(1)	Handprint Footprint	(2) (4) (4) (4) (4)	CO <sub>2</sub> print Hazardous potential	
	(1)	Handprint Footprint	(2) (4) (4)	CO <sub>2</sub> print Hazardous potential	

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

(MPH/PHD/URS-EE-2020)

# CHEMISTRY

10002 Sr. No.

Code	B

Time: 1% Hours Roll No.	Total Questi	ons: 100 Max. Marks: 100 (in words)
All'	(in figure)	(III West)
Name:		Father's Name:
Mother's Name:	1	Date of Examination:

(Signature of the candidate)

(Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/ INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

All questions are compulsory.

The candidates must return the Question book-let as well as OMR 2. answer-sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.

Keeping in view the transparency of the examination system, carbonless OMR 3. Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by

the candidate.

Question Booklet along with answer key of all the A,B,C and D code will be got uploaded on the university website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examination in writing/through E-Mail within 24 hours of uploading the same on the University Website. Thereafter, no complaint in any case, will be considered.

The candidate MUST NOT do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question book-let itself. Answers

MUST NOT be ticked in the Question book-let.

There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.

Use only Black or Blue BALL POINT PEN of good quality in the OMR Answer-

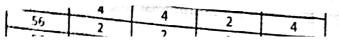
Sheet.

BEFORE ANSWERING THE QUESTIONS, THE CANDIDATES SHOULD ENSURE THAT THEY HAVE BEEN SUPPLIED CORRECT AND COMPLETE BOOK-LET. COMPLAINTS, IF ANY, REGARDING MISPRINTING ETC. WILL NOT BE ENTERTAINED 30 MINUTES AFTER STARTING OF THE To be gened for Disp EXAMINATION.

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Question No.	Questions Code-B
1.	Cholesterol  Number of Optical isomers in Cholesterol would be:
	(1) 128 (2) 512 (3) 64 (4) 256
2.	Among the following structures, the number of aromatic compound(s) is:
	(1) 3 (2) 4 (3) 5 (4) 6
3.	Number of sp <sup>2</sup> and sp hybridized carbon atoms present in benzyne is:  (1) 3 and 1  (2) 6 and 0

O/URS-EE-2020 (Inorganic Chemistry) Code-B (1)



Question No.	Questions
4.	CH3. CH8. CH3CH2, CH3CHCH3
	Number of carbonium ions in the above list is:
	(1) 4 (2) 3
	(3) 2 (4) 1
5.	In the chlorination of 1-chlorobutane under free radical conditions, the
	most abundant compound formed is:
	(1) 1,1-dichlorobutane (2) 1,2-dichlorobutane
	(3) 1,3-dichlorobutane (4) 1,4-dichlorobutane
5.	Repeated Hofmann Elimination reaction will often remove a nitrogen
3	atom from an amine molecule.
	Hofmann Elimination
W	Which of the following compounds is likely product in this case?
(1	) X (2) X
(3)	) X> (4) X
4 4	

luestion No.	Questions
7.	Major product of the following reaction is:
	CI 1. CH <sub>3</sub> MgBr, dry ether, 0°C 1. aq. acid
	(1) 1 (2) 5.
, , ,	(3) OH (4) C
8.	A LDATHF 1-Buon-Buoh B
	Major product A and B are respectively:
	(1) 0 . 0 (2) 0 . 0
	(3) C) (4) C) C
9.	Identify A in the following reaction sequence:
	A = 1, LIMIL - OH + CH, CH2OH
	(1) (2)
San San	(3) COH (4) HCN

uestion No.	Questions
10.	COOH  Sodstime A  Heat  Tinc  Heat  Ethanol  HCI (ges)  C
	Products A, B and C respectively are:
	(1) COOM, COOCHE
	(3) OH COOH COOC <sub>2</sub> H <sub>6</sub>
	(4) COOH OH COOC, H, OH
11.	The plot of the rate constant vs. ionic strength of the reaction A <sup>2+</sup> +
	follows the line as shown in the figure:
	¥ 0 111
	¥
	VI VI
	$\sqrt{I}$
	(1) I (2) II
	(2) III (4) IV

uestion No.	Questions						
12,	Reaction between A and B is carried out for different initial concentrations and the corresponding half-life times are measured. The data are listed in the table:						
		Entry	[A <sub>o</sub> ] M	[B <sub>o</sub> ] M	t1/25-1		
		1	500	10	60		
		2	500	20	60		
	interest in the	3	10	500	60		
167	-	4	20	500	30	Gures Y	
	The rate can b	e repre	sented as :				
	(1) k[A] [B]		(2)	) k[A] <sup>2</sup>			
	(3) k[A] <sup>2</sup> [B]	ta.	(4	) k[A] [B] <sup>2</sup>	AND S		
13.	The separation					it cell is 3.12 nm	
	(1) 1.56 nm a	nd 1.04	nm (2	) 1.04 nm	and 1.56 nr	n	
	(3) 3.12 nm a	nd 1.50	) nm (4	) 1.04 nm	and 3.12 nr	n	
	The predicted	electro	motive force	e (emf) of t	he electroch	nemical cell	
14.		Fe(s) / Fe <sup>2+</sup> (aq) (0.01M)    Cd <sup>2+</sup> (aq) (0.01M)/Ud(s)					
14.	Fe(s) / Fe <sup>2+</sup> (aq	(0.011	M)   Cd2+(aq	(0.01M)/C	d(s)		
14.	Fe(s) / Fe <sup>2+</sup> (aq (E° $_{(Fe^{2+}/Fe)}$ =-0.4				d(s)		
14.			nd E° <sub>Cd²/Cd</sub> =				

Question	
No.	Questions
15.	For a particle of mass m in a 1-D box of length 2L, the energy of level
	corresponding to n=8 is:
	(1) $\frac{h^2}{8ml^2}$ (2) $\frac{h^2}{32ml^2}$
	(3) $\frac{4h^2}{ml^2}$ (4) $\frac{2h^2}{ml^2}$
16.	A thermodynamic equation that relates chemical potential to the
	composition of a mixture is known as:
	(1) Gibbs Helmholtz equation
	(2) Gibbs-Duhem equation
	(3) Joule-Thomson equation
	(4) Debye Huckel equation
17.	One mole of monoatomic gas is transformed from 300K and 2 atm to 600K and 4 atm. The entropy change for the process is:
. 6 v /	(1) $\frac{3}{2}$ R $\ln 2$ (2) $\frac{1}{2}$ R $\ln 2$
	(3) $\frac{7}{2}$ R $\ln 2$ (4) $\frac{5}{2}$ R $\ln 2$
18.	The electrical double layer model that consist of both the fixed layer and
	diffused layer among the following is:
	(1) Helmholtz (2) Gouy
	(3) Stern (4) Debye Huckel
, , , , .	

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Question No.	Wilestions
19.	If e°x is an eigen function and d°/dx° is an operator then the eigen value
	will be:
	(1) $a^n$ (2) $\alpha$
	$(3)  n \qquad \qquad (4)  n^{\alpha}$
20.	The Gibbs energy for the decomposition of Al <sub>2</sub> O <sub>3</sub> at 500°C is as follows
	$\frac{2}{3}\text{Al}_2\text{O}_3 \rightarrow \frac{4}{3}\text{Al} + \text{O}_2, \ \Delta_r G = +966 \text{ kJ mol}^{-1}$
	The potential difference needed for electrolytic reduction of Al <sub>2</sub> O <sub>3</sub> at 500°C
- 1	is at least:
	(0) FOY
	(1) 2.5 V (2) 5.0 V (3) 4.5 V (4) 3.0 V
21.	How many signals are present in both isomers in NQR spectroscopy?
	igni, in the second of the control o
	$CI \longrightarrow_{P} CI$ $CI \longrightarrow_{P} F$
*	
	Cl
, 1	(1) two (2) three
3	(3) one (4) four
	(0) 0110
22.	Auxochrome when attached to chromophore absorption band is shifted
	towards longer wavelength due to increase in:
	(1) Bonding (2) Conjugation
	(3) Inductive effect (4) None of these

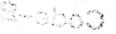
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Questic No.	Questions
23.	
24.	Ionic equivalent conductance value for Ca <sup>2+</sup> is 0.0119 S m <sup>2</sup> mol <sup>-1</sup> and for Cl <sup>-</sup> is 0.0076 S m <sup>2</sup> mol <sup>-1</sup> . The correct expected molar conductivity at infinite dilution for CaCl <sub>2</sub> is:  (1) 0.0195 S m <sup>2</sup> mol <sup>-1</sup> (2) 0.0271 S m <sup>2</sup> mol <sup>-1</sup> (3) 0.0542 S m <sup>2</sup> mol <sup>-1</sup> (4) 0.01355 S m <sup>2</sup> mol <sup>-1</sup>
25.	A binary mixture of A <sub>2</sub> and B <sub>2</sub> will show negative deviation from Raoult's law when:  (1) A-A and B-B interactions are stronger than A-B  (2) A-A and B-B interactions are weaker than A-B  (3) Both A-A and B-B interactions are equal to A-B  (4) Either A-A or B-B interactions is equal to A-B
26.	The molar masses of monodisperse and polydisperse polymers obey respectively the conditions: $ (M_n = \text{Number average molecular weight and } M_w = \text{Weight average molecular weight} ). $ $ (1)  M_n > M_w \text{ and } < M_w $ $ (2)  M_n = M_w \text{ and } M_n < M_w $ $ (3)  M_n < M_w \text{ and } M_n < M_w $ $ (4)  M_n = M_w \text{ and } M_n = M_w $

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Na	Questions
27.	CH <sub>3</sub> COOC <sub>2</sub> H <sub>a</sub> (aq) + H <sub>3</sub> O' (t) CH <sub>3</sub> COOH(aq)+C <sub>4</sub> H <sub>6</sub> OH(aq). What type of reaction is this?  (1) Unimolecular (elementary)  (2) Pseudo first order  (3) Zero order  (4) Second order
28.	Micelle formation is accompanied by the:  (1) decrease in overall entropy due to ordering of solvent near hydrophobic ends.  (2) increase in overall entropy mostly due to increase in solvent entropy.  (3) increase in overall entropy mostly due to increase in solute entropy.  (4) increase in overall entropy and decrease in enthalpy.
29.	The rotational partition function is expected to be smallest for the molecule, among the following:  (1) H <sub>2</sub> (2) Li <sub>2</sub> (3) N <sub>2</sub> (4) F <sub>2</sub>
30.	The temperature derivative of electrochemical cell potential E at constant pressure, $\left(\frac{\partial E}{\partial T}\right)_{P}$ , is given by:  (1) $-\frac{\Delta S}{nF}$ (2) $\frac{\Delta S}{nF}$ (3) $\frac{\Delta S}{nFT}$ (4) $-\frac{\Delta S}{nFT}$
,	$(3)  \frac{\Delta S}{nFT} \qquad \qquad (4)  -\frac{\Delta S}{nFT}$

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Questi No.	Questions
31	Stainless steel does not rust because:
	(1) Chromium and nickel combine with iron
	(2) Chromium forms an oxide layer and protects iron from rusting
	(3) Nickel present in it, does not rust
	(4) Iron forms a hard chemical compound with chromium present in it
32.	The pair whose both species are used in antacid medicinal preparations is:
	(1) NaHCO <sub>3</sub> and Mg (OH) <sub>2</sub> (2) Na <sub>2</sub> CO <sub>3</sub> and Ca (HCO <sub>3</sub> ) <sub>2</sub> (3) Ca(HCO <sub>3</sub> ) <sub>2</sub> and Mg (OH) <sub>2</sub> (4) Ca(OH) <sub>2</sub> and Na HCO <sub>3</sub>
33.	Artificial gem used for cutting glass is:  (1) graphite (2) diamond (3) SiC (4) CaCN <sub>2</sub>
34.	Phosgene can be obtained when:
	(1) White phosphorus reacts with alkali.
18 I	(2) Calcium phosphide reacts with water.
	(3) Chloroform reacts with air.
	(4) Bone comes in contact with water.

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Question No.	Questions
35.	The structural formula of hypophosphorous acid is:
r	
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
	(1) $H$ $OH$ $OH$ $OH$
	O II P
	(3) HO H OH OH
36.	In which of these processes platinum is used as a catalyst?
	(1) Production of synthetic rubber
	(2) Hardening of oils
	(3) Oxidation of ammonia to form HNO
. /	(4) Synthesis of methanol
37.	In Zeigler - Natta polymerisation of ethylene, the active species is:
	(1) AlCl <sub>3</sub> (2) Et <sub>3</sub> Al
	(3) Ti <sup>III</sup> (4) TiCl <sub>4</sub>
38.	Which of the following is not an example of organometallic compound?
	(1) Trimethylboron
1	(2) Trimethylaluminium
4-	(3) Trimethoxytitanium chloride
, ,	(4) Tetracarbonylnickel

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(11)

Question No.	
43.	Neopentyl chloride, (CH <sub>3</sub> ) <sub>3</sub> CCH <sub>2</sub> Cl, reacts with the strong base sodium amide to form a new compound. This compound has a molecular ion at m/z = 70 amu and displays two 'H NMR singlets at δ 0.20 & 1.05 ppm (integration ratio = 2:3). What is a plausible structure for this compound?  (1) 2-methyl-2-butene (2) 1,1-dimethylcyclopropane (3) methylcyclobutane (4) cyclopentane
44.	Combustion analysis of an organic compound shows it to be 64.3% carbon. It displays a molecular ion at $m/z = 112$ amu in the mass spectrum. Which of the following is a plausible molecular formula for this compound?  (1) $C_8H_{16}$ (2) $C_7H_{12}O$ (3) $C_6H_8O_2$ (4) $C_5H_4O_3$
45.	The <sup>1</sup> H NMR spectrum of a diluted solution of a mixture of acetone and dichloromethane in CDCl <sub>3</sub> exhibits two singlets of 1:1 intensity. Molar ratio of acetone to dichloromethane in the solution is  (1) 3:1  (2) 1:3  (3) 1:1  (4) 1:2
46.	Which of the following is the principal factor which causes the properties of nanomaterials to differ significantly from other materials?  (1) Size distribution  (2) Specific surface feature  (3) Quantum size effects  (4) All the above
47.	is an excellent 'green' solvent as well as a greenhouse gas?  (1) Methane (2) CFCs (3) Carbon monoxide (4) Carbon dioxide

MPH/PHD/URS-EE-2020 (Inorganic Chemistry) Code-B
(13)

uestion No.	Questions
48.	<ul> <li>Which of the following statements is not true regrading the binding site of a receptor?</li> <li>(1) The binding site is normally a hollow or cleft in the surface of a receptor.</li> <li>(2) The binding site is normally hydrophobic in nature.</li> <li>(3) The binding site contains amino acids which are important to the binding process and a catalytic mechanism.</li> <li>(4) Chemical messengers fit into binding sites and bind to functional groups within the binding site.</li> </ul>
49.	<ul> <li>There is a lot of interest in the area of supramolecular catalysis at the moment, why is this?</li> <li>(1) There is actually very little interest in this area, due to the fact that it is very difficult to make a supramolecular catalyst.</li> <li>(2) It would be useful for cutting down on the amount of solvent in the reaction and hence decrease costs. This is of particular significance to large scale industrial processes.</li> <li>(3) It would allow very efficient and stereoselective catalysis of often very difficult reactions.</li> <li>(4) It is thought that a supramolecular catalyst would be capable of replacing catalytic metals in reactions, thereby reducing cost while increasing efficiency.</li> </ul>
50.	The term used to measure a product or person's environmental impact is  (1) Handprint (2) CO <sub>2</sub> print  (3) Footprint (4) Hazardous potential

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(14)

Question No.	Questions
51.	The equilibrium constants $k_{P1}$ and $k_{P2}$ for the reactions $X \Longrightarrow 2Y$ and $Z \Longrightarrow P + Q$ , respectively are in the ratio of 1:9. If the degree of dissociation of X and Z be equal then the ratio of total pressure at these equilibria is:  (1) 1:36 (2) 1:1 (3) 1:3 (4) 1:9
52.	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 <sub>1</sub> and one in energy level E <sub>2</sub> is:  (1) 4 (2) 12  (3) 96 (4) 192
53.	One mole of an ideal gas undergoes a cyclic process (ABCDA) starting from point A through 4 reversible steps as shown in the figure. Total work done in the process is:  (1) $R(T_1 - T_2) \frac{V_2}{V_1}$ (2) $R(T_1 + T_2) \frac{V_2}{V_1}$ (3) $R(T_1 + T_2) \ln \frac{V_2}{V_1}$ (4) $R(T_1 - T_2) \ln \frac{V_2}{V_1}$

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	Questions
54.	If the specific conductance of an electrolyte solution is 0.2 ohm <sup>-1</sup> cm <sup>-1</sup> and cell constant is 0.25, the conductance of the solution is:  (1) 1.25 ohm <sup>-1</sup> (2) 1.0 ohm <sup>-1</sup> (3) 0.8 ohm <sup>-1</sup> (4) 2.0 ohm <sup>-1</sup>
55.	The slope and intercept obtained from (1/Rate) against (1/substrate concentration) of an enzyme catalyzed reaction are 300 and $2 \times 10^5$ respectively. The Michaelis-Menten constant of the enzyme in this reaction is:  (1) $5 \times 10^6$ M  (2) $5 \times 10^{-6}$ M  (3) $1.5 \times 10^3$ M  (4) $1.5 \times 10^{-3}$ M
56.	Given;
	A. Fe (OH) (s) + 2e <sup>-</sup> > Fo(a) + 9OII ( ) 7
	A. Fe (OH) <sub>2</sub> (s) + 2e <sup>-</sup> $\rightarrow$ Fe(s) + 2OH – (aq); E <sub>0</sub> = -0.877V B. Al <sup>3+</sup> (aq) + 3e <sup>-</sup> $\rightarrow$ Al(s); E <sub>0</sub> =-1.66V
	1
	C. AgBr(aq) + $e^- \rightarrow Ag(s) + Br(aq) \cdot E = 0.0717$
	C. $AgBr(aq) + e^- \rightarrow Ag(s) + Br^-(aq)$ ; $E_0=0.071V$ The overall reaction for the cells in the direction of spontaneous change would be
	C. AgBr(aq) + e <sup>-</sup> $\rightarrow$ Ag(s) +Br <sup>-</sup> (aq) ; E <sub>0</sub> =0.071V The overall reaction for the cells in the direction of spontaneous change would be <sup>-</sup>
	C. AgBr(aq) + $e^- \rightarrow$ Ag(s) +Br <sup>-</sup> (aq) ; E <sub>0</sub> =0.071V The overall reaction for the cells in the direction of spontaneous change would be
	<ul> <li>C. AgBr(aq) + e<sup>-</sup> → Ag(s) +Br<sup>-</sup>(aq); E<sub>0</sub>=0.071V</li> <li>The overall reaction for the cells in the direction of spontaneous change would be<sup>-</sup></li> <li>Cell with A and B: Fe reduced</li> </ul>
	<ul> <li>C. AgBr(aq) + e<sup>-</sup> → Ag(s) +Br<sup>-</sup>(aq); E<sub>0</sub>=0.071V</li> <li>The overall reaction for the cells in the direction of spontaneous change would be<sup>-</sup></li> <li>Cell with A and B: Fe reduced</li> <li>Cell with A and C: Fe reduced</li> </ul>
	<ul> <li>C. AgBr(aq) + e<sup>-</sup> → Ag(s) +Br<sup>-</sup>(aq); E<sub>0</sub>=0.071V</li> <li>The overall reaction for the cells in the direction of spontaneous change would be<sup>-</sup></li> <li>1. Cell with A and B: Fe reduced</li> <li>Cell with A and C: Fe reduced</li> <li>2. Cell with A and B: Fe reduced</li> <li>Cell with A and C: Fe oxidized</li> <li>3. Cell with A and B: Fe oxidized</li> </ul>
	<ul> <li>C. AgBr(aq) + e<sup>-</sup> → Ag(s) +Br<sup>-</sup>(aq); E<sub>0</sub>=0.071V</li> <li>The overall reaction for the cells in the direction of spontaneous change would be<sup>-</sup></li> <li>1. Cell with A and B: Fe reduced</li> <li>Cell with A and C: Fe reduced</li> <li>2. Cell with A and B: Fe reduced</li> <li>Cell with A and C: Fe oxidized</li> </ul>
	<ul> <li>C. AgBr(aq) + e<sup>-</sup> → Ag(s) +Br<sup>-</sup>(aq); E<sub>0</sub>=0.071V</li> <li>The overall reaction for the cells in the direction of spontaneous change would be<sup>-</sup></li> <li>1. Cell with A and B: Fe reduced</li> <li>Cell with A and C: Fe reduced</li> <li>2. Cell with A and B: Fe reduced</li> <li>Cell with A and C: Fe oxidized</li> <li>3. Cell with A and B: Fe oxidized</li> </ul>
	<ul> <li>C. AgBr(aq) + e<sup>-</sup> → Ag(s) +Br<sup>-</sup>(aq); E<sub>0</sub>=0.071V The overall reaction for the cells in the direction of spontaneous change would be.  1. Cell with A and B: Fe reduced Cell with A and C: Fe reduced 2. Cell with A and B: Fe reduced Cell with A and C: Fe oxidized 3. Cell with A and B: Fe oxidized Cell with A and C: Fe oxidized</li> </ul>

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Question	
No.	Questions
57.	H' COOE!  (1) Pethyl (S)-3-methyl-4-oxocyclohex-2-enecarboxylate  (2) (R)-4-ethoxycarbonyl-2-methyl-4-oxocyclohex-2-enone  (3) ethyl (R)-3-methyl-4-oxocyclohex-2-enecarboxylate  (4) (S)-4-ethoxycarbonyl-2-methyl-4-oxocyclohex-2-enone
58.	Compound given below may be named as:  OH  (1) (2R, 3Z)-7-phenylhept-3-en-2-ol  (2) (2R, 3E)-7-phenylhept-3-en-2-ol  (3) (2S, 3E)-7-phenylhept-3-en-2-ol  (4) (2S, 3Z)-7-phenylhept-3-en-2-ol
59.	Enantiomer of the following structure is:  H, OH, CH <sub>3</sub> H, OH, CH <sub>3</sub> (1)  H, OH, CH <sub>3</sub> NH <sub>2</sub> H, OH, CH <sub>3</sub> H,

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(17)

uestio No.	
777	Questions
	но Тон
60.	Hacur 8H
	Сн <sub>ь</sub>
	Consider compound A and choose the correct answer:
	H h
N. 4:	но 🗓
	(1) A could be optically active and its diastereomer is
· 6	H <sub>3</sub> C H <sub>3</sub> C
The second	но
	но
	(2) A could be optically active and its enantiomer is
11.	H <sub>3</sub> C
	но
3.	(3) A could be optically inactive and its diastereomer is
	ns / CH <sub>2</sub>
- :-	H <sub>a</sub> C
7	но он
	4) A could be optically inactive and its enantiomer is HS TOCH.
	H <sub>2</sub> C
l.	$\mathcal{N}$
M	lajor product obtained in this reaction is:
	Br.
(1	(2) Br
(3)	H <sub>2</sub> C=CH <sub>2</sub> (4) Br 0
Ji. •a	

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(18)

Question	
No.	Questions
62,	A CH3OH By CH3OH B
	Products A and B respectively are:
	(3)
63.	Which combination of reagents is wrong for disconnections (a)-(d) in the
	following?
	Ph: (c) (d)
	(1) $\bigcirc + c_1$ (2) $\bigcirc + c_2$
	(3) Ph OEt + Br (4) Ph + Bridg
64.	Stereoselective reduction of the dione A with a chiral reducing agent
	provides the corresponding diol B in 100% diastereoselectivity and 90%
	ee favoring R, R configuration.
	HO OH
	A B
	The composition of the product is:
	(1) HO DH HO DH HO DH HO DH ON DH ON DH
	HO OH HO OH
	(3) (4) (4) and (10) of the option of the op
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No.	Questions Questions			
65.	An a-amino acid, L-proline, can be used as a catalytic chiral auxiliary for a stereoselective aldol reaction.			
	Ph H + 1. L-proline, H <sub>2</sub> O Ph OH  L-Proline = N CO <sub>2</sub> H			
, "	L-Proline = (N CO₂H			
	Which of (1)-(4) is not involved in the above transformation?			
	(1) H CO <sub>2</sub> H (2) Ph H			
	(3) OH N CO2H (4) PH H			
66.	Which of adducts (1)-(4) is the main product of the following Diels-Alder reaction?			
	CH <sub>3</sub> CH <sub>3</sub> CH <sub>3</sub> CH <sub>3</sub>			
	(1) $\stackrel{\text{Me}}{\longleftarrow}_{\text{CO}_2\text{Me}}$ (2) $\stackrel{\text{Me}}{\longleftarrow}_{\text{CO}_2\text{Me}}$			
	$(3) \qquad \bigvee_{Me}^{Me} CO_{2}Me$ $(4) \qquad \bigvee_{CO_{2}Me}^{CO_{2}Me}$			

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luestion No.	Questions
67.	The following involves two pericyclic reactions. Which combination indicates correctly the types of reaction involved?
	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
	(1) [4+2] cycloaddition + [2+2] cycloreversion
	(2) cheletropic reaction + [4+2] cycloaddition
	(3) [4+2] cycloaddition + [4+1] cycloreversion
	(4) [4+2] cycloaddition + cheletropic reaction
68.	Which of the following equations shows an unlikely result?
	$(1)  \bigcap_{N} \frac{H_{2}SO_{4}}{H_{2}SO_{4}}  \bigcap_{N} NO_{2}$
- j	(2) $\prod_{H} \frac{(CH_3CO)_2O}{COCH_3}$
	$(3) \bigcirc_{N}^{-} C_{I}^{+} \stackrel{N}{\bigcirc} \longrightarrow \bigcirc_{N}^{-} \bigcirc_{N}^{-}$
	(4) (a) HNO <sub>3</sub> (b) (b) (c) (d) (d) (d) (d) (d) (d) (d) (d) (d) (d

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1			430,000	The state of the
55		3	2	4
56	4	4	2	4
57		2	2	3

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Question No.	Questions
69.	Which of the following statements regarding the reducing ability of a sugar is wrong?
	(1) The aldehyde group of a saccharide is responsible for its reducing properties.
	(2) Ketoses are not reducing sugars because they are not aldehydes.
	(3) D-Glucose in predominantly in a cyclic hemiacetal form but it is a reducing sugar through the acyclic form with which the hemiacetal is in equilibrium.
	(4) A methyl glucoside is not a reducing sugar.
70.	Which of the following is not an important secondary structural feature
	in large peptides and proteins?
5 × 5	(1) the α-helix
4 1 L	(2) the β-turn
	(3) chair conformations
	(4) the β-pleated sheet
71.	The number of rotational degrees of freedom of CO, is:
	(1) one (2) two
F = 1 = 1 = 1 = 1 = 1 = 1 = 1 = 1 = 1 =	(3) three (4) four
72.	When crystals of sodium chloride are heated in the presence of sodium
1	vapor, they turn yellow. This is due to the formation of:
	(1) Schottky defects (2) Frenkel defects

MPH/PHD/URS-EE-2020 (Inorganic Chemistry) Code-B
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uestion No.	Questions			
73.	Of the following inequalities, the criterion/criteria for spontaneity of a chemical reaction is/are:			
	(i) $(\Delta G)_{T,P} < 0$ (ii) $(\Delta U)_{S,V} > 0$ (iii) $(\Delta S)_{U,V} > 0$			
	(1) (i) only (2) (ii) only			
-	(3) (i) and (ii) (4) (i) and (iii)			
74.	The concentration of a reactant decreases linearly with time. What is the order of the reaction?			
	(1) 1st order (2) Fractional order			
1,	(3) 2nd order (4) Zero order			
75.	The absorbance of solution having 20% transmittance is:			
	(1) 0.301 (2) 0.699			
	(3) 1.301 (4) 1.699			
76.	Electrolysis of an aqueous solution of 1.0 M NaOH results in:			
7.0	(1) Na at the cathode and O <sub>2</sub> at the anode.			
	(2) H <sub>2</sub> at the cathode and O <sub>2</sub> at the anode.			
	(3) Na and H <sub>2</sub> at the cathode and O <sub>2</sub> at the anode.			
	(4) $O_2$ at the cathode and $H_2$ at the anode.			
	HD/URS-EE-2020 (Inorganic Chamiltonia			

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Question No.	Questions			
77.	The rate constant of decomposition of a compound is represented by			
	in $K = 5.0 - \frac{12000}{T}$			
-	The value of $E_{A}$ (in Kcal mol <sup>-1</sup> ) for this compound at 300 K is:			
	(1) 24 (2) 12			
	(3) 240 (4) 120			
78.	For a reaction $2A \rightarrow Product$ the initial concentration of A is 0.1 M and the rate constant is $2 \times 10^{-3} dm^3 mol^{-1} s^{-1}$ . The half life period of the reaction is:			
	(1) 5 sec (2) 50 sec			
	(3) 500 sec (4) 5000 sec			
79.	The number of degenerate spatial orbitals of a hydrogen-like atom with principal quantum number $n=6$ is:			
	(1) 12 (2) 6			
	(3) 72 (4) 36			
80.	If the atoms/ions in the crystal are taken to be hard spheres touching each other in the unit cell, then the fraction of volume occupied in the body centered cubic structure is:			
	(1) $\sqrt{3} \pi$ (2) $\frac{\sqrt{2}}{6} \pi$ (3) $\frac{\pi}{6}$ (4) $\frac{\sqrt{3}}{8} \pi$			
	$(3)  \frac{\pi}{6} \qquad \qquad (4)  \frac{\sqrt{3}}{8}\pi$			

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Question No.	Questions
81.	The metal species present in Nitrogenase is:  (1) Zinc (2) Molybdenum (3) Tungsten (4) Lead
82.	Which of the following compounds will show quadrupole splitting in Mossbauer spectroscopy?  (1) K <sub>4</sub> Fe (CN) <sub>6</sub> (2) FeCl <sub>3</sub> (3) Fe <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> (4) FeSO <sub>4</sub>
83.	The most widely used standard reference substance in ESR is:  (1) 1, 1 -diphenyl -2-Picryl - hydrazyl free radical  (2) 1, 1 -diphenyl -2-Picryl - hydroxyl free radical  (3) TMS  (4) None of these
84.	In DTA, the differential temperature Vs temperature or time curve is highly sensitive to:  (1) Heating rate (2) Sample size (3) Sample packing (4) All of these
85.	Radio metric titrations have been applied for:  (1) Determination of the composition of compound  (2) Investigation of co-precipitation  (3) Determination of the specific activity of radioactive preparations  (4) All of these

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Question No.	Questions			
86.	Cytochromes in biological systems are involved in:			
	(1) Proton transfer (2) Oxygen transfer			
	(3) Electron transfer (4) Metal transfer			
87.	In Ferrocene which metal orbital interact more effectively with ligan			
	group orbital?			
	(1) $3d_{z}^{2}$ (2) $3d_{xy} 3d_{x^{2}-y^{2}}$ (3) $4P_{z}4P_{y}$ (4) $3d_{xz}$ , $3d_{yz}$			
	(3) $4P_x 4P_y$ (4) $3d_{xx}$ , $3d_{yz}$			
88.	The Electroanalytical technique in which the potential of the working			
	electrode is stepped and the resulting current is monitored as a function of time is:  (1) Coulometry  (2) Chronopotentiometry  (3) Chronoamperometry  (4) Pulse polarography			
	electrode is stepped and the resulting current is monitored as a function of time is:  (1) Coulometry  (2) Chronopotentiometry  (3) Chronoamperometry  (4) Pulse polarography			
89.	electrode is stepped and the resulting current is monitored as a function of time is:  (1) Coulometry (2) Chronopotentiometry (3) Chronoamperometry (4) Pulse polarography  Lithium drugs are used in treatment of:  (2) Psychiatric disorder			
89.	electrode is stepped and the resulting current is monitored as a function of time is:  (1) Coulometry (2) Chronopotentiometry  (3) Chronoamperometry (4) Pulse polarography  Lithium drugs are used in treatment of:			
89.	electrode is stepped and the resulting current is monitored as a function of time is:  (1) Coulometry (2) Chronopotentiometry  (3) Chronoamperometry (4) Pulse polarography  Lithium drugs are used in treatment of:  (1) Dental caries (2) Psychiatric disorder  (3) Malaria (4) Arthritis			
89. 90.	electrode is stepped and the resulting current is monitored as a function of time is:  (1) Coulometry (2) Chronopotentiometry (3) Chronoamperometry (4) Pulse polarography  Lithium drugs are used in treatment of:  (1) Dental caries (2) Psychiatric disorder (3) Malaria (4) Arthritis			
90.	electrode is stepped and the resulting current is monitored as a function of time is:  (1) Coulometry (2) Chronopotentiometry  (3) Chronoamperometry (4) Pulse polarography  Lithium drugs are used in treatment of:  (1) Dental caries (2) Psychiatric disorder  (3) Malaria (4) Arthritis  Which alkylating agent is used as Anticancer Drug in treatment of most			

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Question No.	Questions
91.	A sudden large jump between the values of second and third ionisation energies of elements would be associated with which of the following electronic configurations?  (1) 1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>1</sup> (2) 1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>2</sup> 3p <sup>1</sup> (3) 1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>1</sup> 3p <sup>2</sup> (4) 1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>2</sup>
92.	Among the following groupings which represents the collection of isoelectronic species?
	(1) NO <sup>+</sup> , C <sub>2</sub> <sup>2-</sup> , O <sub>2</sub> , CO (2) N <sub>2</sub> , C <sub>2</sub> <sup>2-</sup> , NO, CO (3) CO, N <sub>2</sub> , CN <sup>-</sup> , C <sub>2</sub> <sup>2-</sup> (4) NO, CN <sup>-</sup> , N <sub>2</sub> , O <sub>2</sub> <sup>-</sup>
93.	In the Molecular orbital diagram for $O_2^+$ ion the highest occupied orbital is:  (1) $\sigma$ MO orbital  (2) $\pi$ MO orbital  (3) $\pi^+$ MO orbital  (4) $\sigma^+$ MO orbital
	The correct order of hybridization of the central atom in the following species, NH <sub>3</sub> , [PtCl <sub>4</sub> ] <sup>2-</sup> , PCl <sub>5</sub> , and BCl <sub>3</sub> , is respectively:  (1) dsp <sup>2</sup> , dsp <sup>3</sup> , sp <sup>2</sup> , sp <sup>3</sup> (2) sp <sup>3</sup> , dsp <sup>2</sup> , dsp <sup>3</sup> , sp <sup>2</sup> (3) dsp <sup>2</sup> , sp <sup>2</sup> , sp <sup>3</sup> , dsp <sup>3</sup> (4) dsp <sup>2</sup> , sp <sup>3</sup> , sp <sup>2</sup> , dsp <sup>3</sup>
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Question No.	Questions			
95.	Which of the following structure is most expected for the molecule XeOF <sub>4</sub> ?			
	(1) Tetrahedral (2) Square Pyramid (3) Square planar (4) Octahedral			
96.	Among the following, which is the weakest Lewis base?			
12	(1) CH <sub>3</sub> (2) NH <sub>2</sub> (3) OH- (4) F-			
97.	CH <sub>3</sub> HgOH is classified as:			
21. 21.50	<ul> <li>(1) Soft - Hard</li> <li>(2) Soft - Soft</li> <li>(3) Hard - Hard</li> <li>(4) Hard - Soft</li> </ul>			
98.	<ul> <li>[Co (NH<sub>3</sub>)<sub>4</sub> (NO<sub>2</sub>)<sub>2</sub>] Cl exhibits:</li> <li>(1) Linkage isomerism, ionisation isomerism and optical isomerism.</li> <li>(2) Linkage isomerism, ionisation isomerism and geometrical isomerism.</li> <li>(3) Ionisation isomerism, geometrical isomerism and optical isomerism.</li> <li>(4) Linkage isomerism, geometrical isomerism and optical isomerism.</li> </ul>			

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Question No.	Questions o.				
99.	Which one of the following shows maximum value of paramagnetic				
	behaviour ?  (1) $[Sc(CN)_6]^{3-}$ (2) $[Co(CN)_6]^{3-}$				
	(3) $[Fe(CN)_6]^{3-}$ (4) $[Cr(CN)_6]^{3-}$				
100.	In which of the following pairs are both the ions coloured in aqueous solution?  (1) Ni <sup>2+</sup> , Ti <sup>3+</sup> (2) Sc <sup>3+</sup> , Ti <sup>3+</sup> (3) Sc <sup>3+</sup> , Co <sup>2+</sup> (4) Ni <sup>2+</sup> , Cu <sup>+</sup>	.s			
	•				

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## SET-"X"

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

(MPH/PHD/URS-EE-2020)

## **CHEMISTRY**

Sr. No. 10007

Time: 14 Hours	<b>Total Quest</b>	ions: 100	Max. Marks: 100
Roll No.	(in figure)		(in words)
Name:		_ Father's Name:	
Mother's Name:	1	_ Date of Examina	tion :

(Signature of the candidate)

(Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. All questions are compulsory.

2. The candidates must return the Question book-let as well as OMR answer-sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.

3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by

the candidate.

4. Question Booklet along with answer key of all the A,B,C and D code will be got uploaded on the university website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examination in writing/through E-Mail within 24 hours of uploading the same on the University Website. Thereafter, no complaint in any case, will be considered.

5. The candidate MUST NOT do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question book-let itself. Answers

MUST NOT be ticked in the Question book-let.

6. There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.

7. Use only Black or Blue BALL POINT PEN of good quality in the OMR Answer-

Sheet.

8. BEFORE ANSWERING THE QUESTIONS, THE CANDIDATES SHOULD ENSURE THAT THEY HAVE BEEN SUPPLIED CORRECT AND COMPLETE BOOK-LET. COMPLAINTS, IF ANY, REGARDING MISPRINTING ETC. WILL NOT BE ENTERTAINED 30 MINUTES AFTER STARTING OF THE EXAMINATION.

Question No.	Questions		
1.	The number of rotational degrees of freedom of CO <sub>2</sub> is:		
	(1) one (2) two		
	(3) three (4) four		
2.	When crystals of sodium chloride are heated in the presence of sodium		
	vapor, they turn yellow. This is due to the formation of:		
	(1) Schottky defects (2) Frenkel defects		
	(3) F-centres (4) H-centres		
3.	Of the following inequalities, the criterion/criteria for spontaneity of a chemical reaction is/are:  (i) (ΔG) <sub>T,P</sub> < 0 (ii) (ΔU) <sub>S,V</sub> > 0 (iii) (ΔS) <sub>U,V</sub> > 0		
	(1) (i) only (2) (ii) only		
	(3) (i) and (ii) (4) (i) and (iii)		
4.	The concentration of a reactant decreases linearly with time. What is the order of the reaction?		
0.8	(1) 1st order (2) Fractional order		
	(3) 2nd order (4) Zero order		
5.	The absorbance of solution having 20% transmittance is:		
	(1) 0.301 (2) 0.699		
	(3) 1.301 (4) 1.699		

Question No.	Q	uestio	ns
6.	Electrolysis of an aqueous s	solution	of 1.0 M NaOH results in :
STATE OF THE PROPERTY OF THE P	(1) Na at the cathode and	O <sub>2</sub> at tl	ne anode.
	(2) H <sub>2</sub> at the cathode and	O <sub>2</sub> at th	e anode.
	(3) Na and H <sub>2</sub> at the catho	ode and	O <sub>2</sub> at the anode.
	(4) O <sub>2</sub> at the cathode and	H <sub>2</sub> at th	ne anode.
7.	The rate constant of decom	position	of a compound is represented by
	in $K = 5.0 - \frac{12000}{T}$		
	The value of E <sub>A</sub> (in Kcal mo	ol <sup>-1</sup> ) for	this compound at 300 K is:
	(1) 24	(2)	12
	(3) 240	(4)	120
8.			nitial concentration of A is 0.1 M and s-1. The half life period of the reaction
	(1) 5 sec	(2)	50 sec
	(3) 500 sec	(4)	5000 sec
9.	The number of degenerate	spatial	orbitals of a hydrogen-like atom with
	principal quantum number	r n=6 is	
TO COLOMBIA CONTRACTOR		(2)	
AND	(1) 12	(2)	6

Question No.	Questions		
10.	If the atoms/ions in the crystal are taken to be hard spheres touching each other in the unit cell, then the fraction of volume occupied in the body centered cubic structure is:		
	(1) $\sqrt{3} \pi$ (2) $\frac{\sqrt{2}}{6} \pi$		
	(3) $\frac{\pi}{6}$ (4) $\frac{\sqrt{3}}{8}\pi$		
11.	The metal species present in Nitrogenase is:		
	(1) Zinc (2) Molybdenum		
	(3) Tungsten (4) Lead		
12.	Which of the following compounds will show quadrupole splitting in Mossbauer spectroscopy?		
2 2 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	(1) K <sub>4</sub> Fe (CN) <sub>6</sub> (2) FeCl <sub>3</sub>		
	(3) $\operatorname{Fe}_{2}(\operatorname{SO}_{4})_{3}$ (4) $\operatorname{FeSO}_{4}$		
13.	The most widely used standard reference substance in ESR is:		
	(1) 1,.1 -diphenyl -2-Picryl - hydrazyl free radical		
	(2) 1, 1 -diphenyl -2-Picryl - hydroxyl free radical		
	(3) TMS		
	(4) None of these		

Question No.	Questions		
14.	In DTA, the differential temperature Vs temperature or time curve is highly sensitive to:		
	(1) Heating rate (2) Sample size		
	(3) Sample packing (4) All of these		
15.	Radio metric titrations have been applied for:		
	(1) Determination of the composition of compound		
	(2) Investigation of co-precipitation		
	(3) Determination of the specific activity of radioactive preparations		
	(4) All of these		
16.	Cytochromes in biological systems are involved in :		
	(1) Proton transfer (2) Oxygen transfer		
	(3) Electron transfer (4) Metal transfer		
17.	In Ferrocene which metal orbital interact more effectively with ligand group orbital?		
	(1) $3d_{xy}^2$ (2) $3d_{xy}^3 3d_{x^2-y^2}$		
	(3) $4P_x 4P_y$ (4) $3d_{xz}$ , $3d_{yz}$		
18.	The Electroanalytical technique in which the potential of the workin electrode is stepped and the resulting current is monitored as a function		
	of time is:		
	(1) Coulometry (2) Chronopotentiometry		
	(3) Chronoamperometry (4) Pulse polarography		

Question No.	Questio	ons	
19.	Lithium drugs are used in treatment of:		
	(1) Dental caries (2)	Psychiatric disorder	
	(3) Malaria (4)	Arthritis	
20.	Which alkylating agent is used as of the cancers?	Anticancer Drug in treatment of most	
	(1) Melphan (2)	Cyclophosphamide	
Popular a constraint of the co	(3) Chlorambucil (4)	None of these	
21.	energies of elements would be as electronic configurations?	values of second and third ionisation ssociated with which of the following $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$	
	(3) $1s^2 2s^2 2p^6 3s^1 3p^2$ (4)	1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>2</sup>	
22.	Among the following groupings which represents the collection of isoelectronic species?		
	(1) $NO^+$ , $C_2^{2-}$ , $O_2$ , $CO$ (2)	N <sub>2</sub> , C <sub>2</sub> -, NO, CO	
	(3) CO, $N_2$ , CN-, $C_2^{2-}$ (4)	NO, CN-, N <sub>2</sub> , O <sub>2</sub>	
23.	In the Molecular orbital diagram is:	for O <sub>2</sub> ion the highest occupied orbital	
	(1) $\sigma$ MO orbital (2)	$\pi$ MO orbital	
	(3) $\pi^*$ MO orbital (4)	$\sigma^*$ MO orbital	

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Question No.	Questions		
24.	The correct order of hybridization of the central atom in the following species, NH <sub>3</sub> , [PtCl <sub>4</sub> ] <sup>2-</sup> , PCl <sub>5</sub> , and BCl <sub>3</sub> , is respectively:  (1) dsp <sup>2</sup> , dsp <sup>3</sup> , sp <sup>2</sup> , sp <sup>3</sup> (2) sp <sup>3</sup> , dsp <sup>2</sup> , dsp <sup>3</sup> , sp <sup>2</sup>		
TOTAL	(3) dsp <sup>2</sup> , sp <sup>2</sup> , sp <sup>3</sup> , dsp <sup>3</sup> (4) dsp <sup>2</sup> , sp <sup>3</sup> , sp <sup>2</sup> , dsp <sup>3</sup>		
25.	Which of the following structure is most expected for the molecule XeOF <sub>4</sub> ?		
	(1) Tetrahedral (2) Square Pyramid		
2 4	(3) Square planar (4) Octahedral		
26.	Among the following, which is the weakest Lewis base?		
talas p <sup>MB</sup> et.	(1) CH <sub>3</sub> (2) NH <sub>2</sub>		
	(3) OH- (4) F-		
27.	CH <sub>3</sub> HgOH is classified as:		
	(1) Soft - Hard (2) Soft - Soft		
	(3) Hard - Hard (4) Hard - Soft		
28.	[Co (NH <sub>3</sub> ) <sub>4</sub> (NO <sub>2</sub> ) <sub>2</sub> ] Cl exhibits:		
	(1) Linkage isomerism, ionisation isomerism and optical isomerism.		
K y z Šam	(2) Linkage isomerism, ionisation isomerism and geometrical		
	isomerism.		
	(3) Ionisation isomerism, geometrical isomerism and optical isomerism.		
	(4) Linkage isomerism, geometrical isomerism and optica isomerism.		

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(6)

Question No.	Questions
29.	Which one of the following shows maximum value of paramagnetic behaviour?
	(1) $[Sc(CN)_6]^{3-}$ (2) $[Co(CN)_6]^{3-}$
	(3) $[Fe(CN)_6]^{3-}$ (4) $[Cr(CN)_6]^{3-}$
30.	In which of the following pairs are both the ions coloured in aqueous solution?
	(1) Ni <sup>2+</sup> , Ti <sup>3+</sup> (2) Sc <sup>3+</sup> , Ti <sup>3+</sup>
	(3) Sc <sup>3+</sup> , Co <sup>2+</sup> (4) Ni <sup>2+</sup> , Cu <sup>+</sup>
31.	=\@_HBr_>?
	Major product obtained in this reaction is:
	(1) Br (2) Br
	(3) H <sub>2</sub> C=CH <sub>2</sub> (4) Br
32.	A CH <sub>3</sub> OH Br NaOCH <sub>3</sub> B
	Products A and B respectively are:
	(1) (2) (2) (2)
	(3) \( \rightarrow\), \( \rightarrow\)

Question No.	Questions
33.	Which combination of reagents is wrong for disconnections (a)—(d) in the following?  (1) (2) + Cl  (3) (4) (4) (5) (7)
	(3) Ph OEt + Br (4) Ph + BrMg
34.	Stereoselective reduction of the dione A with a chiral reducing agent provides the corresponding diol B in 100% diastereoselectivity and 90% ee favoring R, R configuration.  The composition of the product is:  (1)  HO OH  BO OH  HO OH  (2)  And  HO OH  H
	(3) and (10%)  HO OH HO OH  (4) and (10%)

Question No.	Questions
35.	An a-amino acid, L-proline, can be used as a catalytic chiral auxiliary for a stereoselective aldol reaction.
	Ph + H 1. L-proline, H <sub>2</sub> O Ph OH  L-Proline = N CO <sub>2</sub> H
	Which of (1)-(4) is not involved in the above transformation?
	(1) N CO <sub>2</sub> H (2) Ph H
	(3) OH CO <sub>2</sub> H (4) PH H
36.	Which of adducts (1)-(4) is the main product of the following Diels-Alder reaction?
	COOMe A
	Me Me CO <sub>2</sub> Me CO <sub>2</sub> Me
	(1) (2) "CO <sub>2</sub> Me Me Me
	(3) MeCO <sub>2</sub> Me (4) MeCO <sub>2</sub> Me MeCO <sub>2</sub> Me Me
	T CO2Me

Question No.	Questions
37.	The following involves two pericyclic reactions. Which combination indicates correctly the types of reaction involved?  Ph P
	(3) [4+2] cycloaddition + [4+1] cycloreversion (4) [4+2] cycloaddition + cheletropic reaction
38.	Which of the following equations shows an unlikely result?  (1) HNO3. H2SO4 NO2  (2) HCCOCH3
	$(3) \qquad \begin{array}{c} \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$

Question No.	Questions
39.	Which of the following statements regarding the reducing ability of a sugar is wrong?
	(1) The aldehyde group of a saccharide is responsible for its reducing properties.
	(2) Ketoses are not reducing sugars because they are not aldehydes.
	(3) D-Glucose in predominantly in a cyclic hemiacetal form but it is a
TANK DISTRICT	reducing sugar through the acyclic form with which the hemiacetal
	is in equilibrium.
And the state of t	(4) A methyl glucoside is not a reducing sugar.
40.	Which of the following is not an important secondary structural feature in large peptides and proteins?
	(1) the α-helix
	(2) the β-turn
	(3) chair conformations
	(4) the β-pleated sheet
41.	The equilibrium constants $k_{p_1}$ and $k_{p_2}$ for the reactions $X \rightleftharpoons 2Y$ and $Z \rightleftharpoons P + Q$ , respectively are in the ratio of 1:9. If the degree of dissociation of X and Z be equal then the ratio of total pressure at these equilibria
	is:
	(1) 1:36 (2) 1:1
	(3) 1:3 (4) 1:9

question No.	Questions
42.	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
43.	One mole of an ideal gas undergoes a cyclic process (ABCDA) starting from point A through 4 reversible steps as shown in the figure. Total work done in the process is:
	T <sub>1</sub> Temperature T <sub>2</sub>
	(1) $R(T_1 - T_2) \frac{V_2}{V_1}$ (2) $R(T_1 + T_2) \frac{V_2}{V_1}$
	$V_2$
	(3) $R(T_1 + T_2) ln \frac{z}{V_1}$ (4) $R(T_1 - T_2) ln \frac{z}{V_1}$
44.	(3) $R(T_1 + T_2) \ln \frac{1}{V_1}$ (4) $R(T_1 - T_2) \ln \frac{1}{V_1}$ If the specific conductance of an electrolyte solution is 0.2 ohm <sup>-1</sup> cm <sup>-1</sup> and cell constant is 0.25, the conductance of the solution is :
44.	If the specific conductance of an electrolyte solution is 0.2 ohm <sup>-1</sup> cm <sup>-1</sup> and

Question No.	The slope and intercept obtained from (1/Rate) against (1/substrate concentration) of an enzyme catalyzed reaction are 300 and $2 \times 10^5$ , respectively. The Michaelis-Menten constant of the enzyme in this reaction is:	
45.		
	(1) $5 \times 10^6 \mathrm{M}$ (2) $5 \times 10^{-6} \mathrm{M}$ (3) $1.5 \times 10^3 \mathrm{M}$ (4) $1.5 \times 10^{-3} \mathrm{M}$	
46.	Given;	
	A. Fe $(OH)_2$ (s) + 2e <sup>-</sup> $\rightarrow$ Fe(s) + 2OH – (aq); $E_0 = -0.877V$	
	B. Al <sup>3+</sup> (aq) + 3e <sup>-</sup> $\rightarrow$ Al(s); E <sub>0</sub> =-1.66V	
	C. AgBr(aq) + $e^- \rightarrow$ Ag(s) +Br <sup>-</sup> (aq) ; E <sub>0</sub> =0.071V	
	The overall reaction for the cells in the direction of spontaneous change	
	would be	
	1. Cell with A and B: Fe reduced	
	Cell with A and C: Fe reduced	
20 CM	2. Cell with A and B: Fe reduced	
	Cell with A and C : Fe oxidized	
	3. Cell with A and B: Fe oxidized	
	Cell with A and C: Fe oxidized	
	4. Cell with A and B: Fe oxidized	
	Cell with A and C : Fe reduced	

Question No.		
47.	IUPAC name of the following compound is:	
	H° COOE1	
	(1) Pethyl (S)-3-methyl-4-oxocyclohex-2-enecarboxylate	
	(2) (R)-4-ethoxycarbonyl-2-methyl-4-oxocyclohex-2-enone	
and the same of th	(3) ethyl (R)-3-methyl-4-oxocyclohex-2-enecarboxylate	
aminan digitat do vincia	(4) (S)-4-ethoxycarbonyl-2-methyl-4-oxocyclohex-2-enone	
48.	Compound given below may be named as:	
	OH Ph	
	(1) (2R, 3Z)-7-phenylhept-3-en-2-ol	
	(2) (2R, 3E)-7-phenylhept-3-en-2-ol	
	(3) (2S, 3E)-7-phenylhept-3-en-2-ol	
	(4) (2S, 3Z)-7-phenylhept-3-en-2-ol	
	(1) (3), 23) Zaphanalbana Penistrat	

Questions	
Enantiomer of the following structure is:	
H <sub>2</sub> OH <sub>2</sub> CH <sub>3</sub>	
(1) CH <sub>3</sub> (2) H <sub>2</sub> N H.	
(3) H <sub>2</sub> N H (4) H <sub>2</sub> N H	
Hacm, SIH	
Consider compound A and choose the correct answer:	
но он	
(1) A could be optically active and its diastereomer is HS CH <sub>3</sub>	
но но он	
(2) A could be optically active and its enantiomer is HS CH <sub>3</sub> C	

Question No.	Questions	
	HOUND	
	(3) A could be optically inactive and its diastereomer is HS CH3	
and the second s	но 1 он	
	(4) A could be optically inactive and its enantiomer is HS T CH <sub>3</sub>	
51.	How many signals are present in both isomers in NQR spectroscopy?	
	(1) two (2) three (3) one (4) four	
52.	Auxochrome when attached to chromophore absorption band is shifted towards longer wavelength due to increase in :	
	(1) Bonding (2) Conjugation	
	(3) Inductive effect (4) None of these	
53.	The quantitative shifting in PMR signals in addition to shielding and deshielding the protons also depends upon the :	
	(1) Inductive effect (2) Space effect	
	(3) H-bonding (4) All of above	

Question No.	Questions	
54.	Ionic equivalent conductance value for Ca <sup>2+</sup> is 0.0119 S m <sup>2</sup> mol <sup>-1</sup> and for Cl <sup>-</sup> is 0.0076 S m <sup>2</sup> mol <sup>-1</sup> . The correct expected molar conductivity at infinite dilution for CaCl <sub>2</sub> is:  (1) 0.0195 S m <sup>2</sup> mol <sup>-1</sup> (2) 0.0271 S m <sup>2</sup> mol <sup>-1</sup> (3) 0.0542 S m <sup>2</sup> mol <sup>-1</sup> (4) 0.01355 S m <sup>2</sup> mol <sup>-1</sup>	
55.	A binary mixture of A <sub>2</sub> and B <sub>2</sub> will show negative deviation from Raoult's law when:  (1) A-A and B-B interactions are stronger than A-B  (2) A-A and B-B interactions are weaker than A-B  (3) Both A-A and B-B interactions are equal to A-B  (4) Either A-A or B-B interactions is equal to A-B	
56.	The molar masses of monodisperse and polydisperse polymers obey respectively the conditions: $ (M_n = Number \ average \ molecular \ weight \ and \ M_w = Weight \ average \ molecular \ weight). $ $ (1)  M_n > M_w \ and < M_w \qquad (2)  M_n = M_w \ and \ M_n < M_w $ $ (3)  M_n < M_w \ and \ M_n < M_w \ and \ M_n = M_w \ and \ M_n = M_w $	
57.	CH <sub>3</sub> COOC <sub>2</sub> H <sub>5</sub> (aq) + H <sub>3</sub> O <sup>+</sup> (ℓ) → CH <sub>3</sub> COOH(aq)+C <sub>2</sub> H <sub>5</sub> OH(aq). What type of reaction is this?  (1) Unimolecular (elementary)  (2) Pseudo first order  (3) Zero order  (4) Second order	

Question Questions No.		
58.	<ul> <li>Micelle formation is accompanied by the:</li> <li>(1) decrease in overall entropy due to ordering of solvent near hydrophobic ends.</li> <li>(2) increase in overall entropy mostly due to increase in solvent entropy.</li> <li>(3) increase in overall entropy mostly due to increase in solute entropy.</li> <li>(4) increase in overall entropy and decrease in enthalpy.</li> </ul>	
59.	The rotational partition function is expected to be smallest for the molecule, among the following:  (1) $H_2$ (2) $Li_2$ (3) $N_2$ (4) $F_2$	
60.	The temperature derivative of electrochemical cell potential E at constant pressure, $\left(\frac{\partial E}{\partial T}\right)_P$ , is given by:  (1) $-\frac{\Delta S}{nF}$ (2) $\frac{\Delta S}{nF}$ (3) $\frac{\Delta S}{nFT}$ (4) $-\frac{\Delta S}{nFT}$	
61.	Cholesterol  Number of Optical isomers in Cholesterol would be:  (1) 128 (2) 512  (3) 64 (4) 256	

uestion No.	Questi	ions
62.	Among the following structures, is:	the number of aromatic compound(s)
		2) 4 4) 6
63.	(1) 3 and 1	d carbon atoms present in benzyne is: 2) 6 and 0 4) 4 and 0
64.		ne above list is: (2) 3 (4) 1
65.	most abundant compound form  (1) 1,1-dichlorobutane	

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uestion No.	440040	
66.	Repeated Hofmann Elimination reaction will often remove a nitrogen	
SCHOOL OF THE STATE OF THE STAT	atom from an amine molecule.	
	N— Hofmann Elimination	
2000000	Which of the following compounds is likely product in this case?	
	(1) (2) (2)	
	(3) (4) (2)	
67.	Major product of the following reaction is:	
	1. CH <sub>3</sub> MgBr, dry ether, 0°C	
	1. aq. acid	
	(1) 1 (2) \( \frac{1}{2} \)	
	(3) OH (4) Q	
68.	A LDA/THF 1-BuO/A-BuOH B	
	Major product A and B are respectively:	
	(1) & & (2) & &	
er evenha sa	2 2 2	
100   100   200   200	(3) (4) (Q) (Q)	

uestion No.	Questions
69.	Identify A in the following reaction sequence:  A B 1. LIANH4 OH + CH3CH2OH
	(1) (2) J
	(3) C <sub>OH</sub> (4) HCN
70.	GOOH  Soxialime  Heat  Zinc Heat  Heat  Heat  Heat  House  Heat  H
	Products A, B and C respectively are:  (1) ONA COOK, COOK, HG OH
	(3) OH COOH COOC <sub>2</sub> H <sub>5</sub> OH  COOH OH COOC <sub>2</sub> H <sub>5</sub> OH  (4) OH
71.	<ul> <li>Which of the following statements is wrong?</li> <li>(1) UV absorption is attributable to electronic transitions.</li> <li>(2) UV spectra provide information about valence electrons.</li> <li>(3) IR absorption is attributable to transitions between rotational energy levels of whole molecules.</li> <li>(4) NMR spectrometers use radiofrequency electromagnetic radiation.</li> </ul>

<ul> <li>Which of the following statements regarding mass spectrometry false?</li> <li>(1) The base peak of a simple ketone is usually attributable to an acylinion.</li> <li>(2) The molecular ion of carbonyl compounds with a -C-H read undergoes elimination of an alkene to give a relatively stable en radical cation.</li> <li>(3) The molecular ion peak of some alcohols is very weak because readily loses an alkyl radical to give a relatively stable oxome (hydroxycarbenium) ion.</li> <li>(4) Structurally isomeric alkanes cannot be distinguished by resolution mass spectrometry.</li> </ul>	
resolution mass spectrometry.  Neopentyl chloride, (CH <sub>3</sub> ) <sub>3</sub> CCH <sub>2</sub> Cl, reacts with the strong base sodium amide to form a new compound. This compound has a molecular ion at m/z = 70 amu and displays two <sup>1</sup> H NMR singlets at δ 0.20 & 1.05 ppm (integration ratio = 2:3). What is a plausible structure for this compound?  (1) 2-methyl-2-butene (2) 1,1-dimethylcyclopropane (3) methylcyclobutane (4) cyclopentane	
Combustion analysis of an organic compound shows it to be 64.3% carbon. It displays a molecular ion at $m/z = 112$ amu in the mass spectrum. Which of the following is a plausible molecular formula for this compound?  (1) $C_8H_{16}$ (2) $C_7H_{12}O$	
The state of the s	

Question No.	Questions
75.	The <sup>1</sup> H NMR spectrum of a diluted solution of a mixture of acetone and dichloromethane in CDCl <sub>3</sub> exhibits two singlets of 1:1 intensity. Molar ratio of acetone to dichloromethane in the solution is
	(1) 3:1 (2) 1:3
9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	(3) 1:1 (4) 1:2
76.	Which of the following is the principal factor which causes the properties of nanomaterials to differ significantly from other materials?
	(1) Size distribution (2) Specific surface feature
	(3) Quantum size effects (4) All the above
77.	is an excellent 'green' solvent as well as a greenhouse gas?
	(1) Methane (2) CFCs
	(3) Carbon monoxide (4) Carbon dioxide
78.	Which of the following statements is not true regrading the binding site of a receptor?
	(1) The binding site is normally a hollow or cleft in the surface of a receptor.
	(2) The binding site is normally hydrophobic in nature.
	(3) The binding site contains amino acids which are important to the binding process and a catalytic mechanism.
	(4) Chemical messengers fit into binding sites and bind to functiona
	groups within the binding site.
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Question No.	Questions				
No. 79.	<ul> <li>There is a lot of interest in the area of supramolecular catalysis at the moment, why is this?</li> <li>(1) There is actually very little interest in this area, due to the fact that it is very difficult to make a supramolecular catalyst.</li> <li>(2) It would be useful for cutting down on the amount of solvent in the reaction and hence decrease costs. This is of particular significance to large scale industrial processes.</li> <li>(3) It would allow very efficient and stereoselective catalysis of often very difficult reactions.</li> <li>(4) It is thought that a supramolecular catalyst would be capable of replacing catalytic metals in reactions, thereby reducing cost while increasing efficiency.</li> </ul>				
80.	The term used to measure a product or person's environmental impact is  (1) Handprint (2) CO <sub>2</sub> print  (3) Footprint (4) Hazardous potential				
81.	Stainless steel does not rust because:  (1) Chromium and nickel combine with iron  (2) Chromium forms an oxide layer and protects iron from rusting  (3) Nickel present in it, does not rust  (4) Iron forms a hard chemical compound with chromium present in it				

uestion No.	Questions				
82.	The pair whose both species are used in antacid medicinal preparations is:				
	<ul> <li>(1) NaHCO<sub>3</sub> and Mg (OH)<sub>2</sub> (2) Na<sub>2</sub> CO<sub>3</sub> and Ca (HCO<sub>3</sub>)<sub>2</sub></li> <li>(3) Ca(HCO<sub>3</sub>)<sub>2</sub> and Mg (OH)<sub>2</sub> (4) Ca(OH)<sub>2</sub> and Na HCO<sub>3</sub></li> </ul>				
83.	Artificial gem used for cutting glass is:  (1) graphite (2) diamond  (3) SiC (4) CaCN <sub>2</sub>				
84.	Phosgene can be obtained when:  (1) White phosphorus reacts with alkali.  (2) Calcium phosphide reacts with water.  (3) Chloroform reacts with air.  (4) Bone comes in contact with water.				
85.	The structural formula of hypophosphorous acid is:  (1) HOHOHOHOHOHOHOHOHOHOHOHOHOHOHOHOHOHOHO				

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Question No.	Questions					
86.	In which of these processes platinum is used as a catalyst?					
	(1) Production of synthetic rubber					
	(2) Hardening of oils					
	(3) Oxidation of ammonia to form HNO <sub>3</sub>					
	(4) Synthesis of methanol					
87.	In Zeigler - Natta polymerisation of ethylene, the active species is:					
	(1) AlCl <sub>3</sub> (2) Et <sub>3</sub> Al					
	(3) Ti <sup>III</sup> (4) TiCl <sub>4</sub>					
88.	Which of the following is not an example of organometallic compound?  (1) Trimethylboron  (2) Trimethylaluminium  (3) Trimethoxytitanium chloride  (4) Tetracarbonylnickel					
89.						
	The nuclear reaction:					
	$^{53}_{29}\text{Cu} + {}^{4}_{2}\text{He} \rightarrow {}^{87}_{17}\text{Cl} + 14  {}^{1}_{1}\text{H} + 16  {}^{1}_{0}\text{n is referred to as}$ :					
	$^{53}_{29}\text{Cu} + {}^{4}_{2}\text{He} \rightarrow {}^{37}_{17}\text{Cl} + 14  {}^{1}_{1}\text{H} + 16  {}^{1}_{0}\text{n}  \text{is referred to as} :$					
90.	$^{53}_{29}\text{Cu} + ^{4}_{2}\text{He} \rightarrow ^{37}_{17}\text{Cl} + 14  ^{1}_{1}\text{H} + 16  ^{1}_{0}\text{n} \text{ is referred to as}:$ (1) Spallation reaction (2) Fusion reaction (3) Fission reaction (4) Chain reaction					
90.	$^{63}_{29}$ Cu + $^{4}_{2}$ He $\rightarrow ^{87}_{17}$ Cl + 14 $^{1}_{1}$ H + 16 $^{1}_{0}$ n is referred to as :  (1) Spallation reaction (2) Fusion reaction  (3) Fission reaction (4) Chain reaction  The nucleus resulting from $^{92}$ U <sup>238</sup> after successive emission of two a and four $\beta$ -particles is :					
90.	(1) Spallation reaction (2) Fusion reaction (3) Fission reaction (4) Chain reaction  The nucleus resulting from 92U <sup>238</sup> after successive emission of two a and					

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uestion No.		and the contrast part of the state of the contrast of the cont	Questio	ns	nous dinamentalismentalismentalismentalismentalismentalismentalismentalismentalismentalismentalismentalismenta		
91.	The plot of the rate constant vs. ionic strength of the reaction A <sup>2+</sup> + B <sup>-</sup>						
	follows the line	e as show	n in the fig	gure:			
				and the same			
		and the same of th		And the second second	î.		
		A STATE OF THE STA	A STATE OF THE PARTY OF THE PAR	- Contraction of			
		26	THE PROPERTY OF THE PARTY OF TH	Control of the Contro			
		80 0			100		
	A 2						
				The state of the s	IV		
71 <sup>2</sup> T. 2 <sub>0</sub>							
		- Commission Parketon			Her Source Constitutes		
	(1) I		(2)	II			
	(3) III		(4)	IV			
				7 . 0 7.4	reaching and the second	1	
92.						al concentration	
	and the corre	sponding	half-life ti	mes are me	easured. Th	e data are liste	
	in the table:						
		Entry	A <sub>0</sub> ] M	(B <sub>o</sub> ) M	t <sub>1/2</sub> 5 <sup>-2</sup>		
3			500	10	60		
		2	500	20	60		
			10	500	60		
	Rivertice best	4	20	500			
	The rate can	be repres	ented as:		* * * * * * * * * * * * * * * * * * *		
	(1) k[A] [B]	2 *	(2	$k[A]^2$			
	(3) k[A] <sup>2</sup> [B]		(4	) k[A] [B] <sup>2</sup>			
	1 (2) 16 15-41 1111						

uestion No.	Questions
93.	The separation of the (123) planes of an orthorhombic unit cell is 3.12 nm.  The separation of (246) and (369) planes are, respectively:  (1) 1.56 nm and 1.04 nm  (2) 1.04 nm and 1.56 nm  (3) 3.12 nm and 1.50 nm  (4) 1.04 nm and 3.12 nm
94.	The predicted electromotive force (emf) of the electrochemical cell Fe(s) / Fe <sup>2+</sup> (aq) (0.01M) $\parallel$ Cd <sup>2+</sup> (aq) (0.01M)/Cd(s) (E° (Fe <sup>2+</sup> /Fe) = -0.447V and E° Cd <sup>2</sup> /Cd = -0.403V)
>	(1) -0.850V (2) +0.044V (3) +0.0850V (4) -0.044V
95.	For a particle of mass m in a 1-D box of length 2L, the energy of level corresponding to n=8 is:  (1) $\frac{h^2}{8ml^2}$ (2) $\frac{h^2}{32ml^2}$
	(3) $\frac{4h^2}{ml^2}$ (4) $\frac{2h^2}{ml^2}$
96.	A thermodynamic equation that relates chemical potential to the composition of a mixture is known as:  (1) Gibbs Helmholtz equation  (2) Gibbs-Duhem equation  (3) Joule-Thomson equation

Question No.	Questions				
97.	One mole of monoatomic gas is transformed from 300K and 2 atm to 600K and 4 atm. The entropy change for the process is:				
- 12 A	(1) $\frac{3}{2}$ R $\ln 2$ (2) $\frac{1}{2}$ R $\ln 2$				
	(3) $\frac{7}{2}$ R ln 2 (4) $\frac{5}{2}$ R ln 2				
98.	The electrical double layer model that consist of both the fixed layer and diffused layer among the following is:  (1) Helmholtz (2) Gouy (3) Stern (4) Debye Huckel				
99.	If $e^{ax}$ is an eigen function and $d^n/dx^n$ is an operator then the eigen value will be:				
	$\begin{array}{cccccccccccccccccccccccccccccccccccc$				
100.	The Gibbs energy for the decomposition of $Al_2O_3$ at 500°C is as follows: $\frac{2}{3}Al_2O_3 \rightarrow \frac{4}{3}Al + O_2, \ \Delta_r G = +966 \text{ kJ mol}^{-1}$ The potential difference needed for electrolytic reduction of $Al_2O_3$ at 500°C is at least:  (1) 2.5 V (2) 5.0 V (3) 4.5 V (4) 3.0 V				
1,3134	Chamistay) Code C				

## SET-"X"

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

(MPH/PHD/URS-EE-2020)

## **CHEMISTRY**

sr. No. 10004

Code	D
Time: 1	14 Hours

Total Questions: 100 Max. Marks: 100

Roll No	(in figure)	(in words)
Name :	×	_ Father's Name:
Mother's Name:		Date of Examination:
(Signature of the candidate)		(Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. All questions are compulsory.

2. The candidates must return the Question book-let as well as OMR answer-sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.

3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by

the candidate.

4. Question Booklet along with answer key of all the A,B,C and D code will be got uploaded on the university website after the conduct of Entrance Examination. In case there is any discrepancy in the Question Booklet/Answer Key, the same may be brought to the notice of the Controller of Examination in writing/through E-Mail within 24 hours of uploading the same on the University Website. Thereafter, no complaint in any case, will be considered.

5. The candidate MUST NOT do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question book-let itself. Answers

MUST NOT be ticked in the Question book-let.

6. There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.

7. Use only Black or Blue BALL POINT PEN of good quality in the OMR Answer-

Sheet.

BEFORE ANSWERING THE QUESTIONS, THE CANDIDATES SHOULD ENSURE THAT THEY HAVE BEEN SUPPLIED CORRECT AND COMPLETE BOOK-LET. COMPLAINTS, IF ANY, REGARDING MISPRINTING ETC. WILL NOT BE ENTERTAINED 30 MINUTES AFTER STARTING OF THE EXAMINATION.

Komal

Question No.	Questions
1.	Stainless steel does not rust because:
# # # # # # # # # # # # # # # # # # #	<ul><li>(1) Chromium and nickel combine with iron</li><li>(2) Chromium forms an oxide layer and protects iron from rusting</li></ul>
	(3) Nickel present in it, does not rust
7. E 7	(4) Iron forms a hard chemical compound with chromium present in it
2.	The pair whose both species are used in antacid medicinal preparations is:
. 3	(1) NaHCO <sub>3</sub> and Mg (OH) <sub>2</sub> (2) Na <sub>2</sub> CO <sub>3</sub> and Ca (HCO <sub>3</sub> ) <sub>2</sub>
	(3) Ca(HCO <sub>3</sub> ) <sub>2</sub> and Mg (OH) <sub>2</sub> (4) Ca(OH) <sub>2</sub> and Na HCO <sub>3</sub>
3.	Artificial gem used for cutting glass is:
	(1) graphite (2) diamond (3) SiC · (4) CaCN <sub>2</sub>
4.	Phosgene can be obtained when:
- 1	(1) White phosphorus reacts with alkali.
	<ul><li>(2) Calcium phosphide reacts with water.</li><li>(3) Chloroform reacts with air.</li></ul>
	(4) Bone comes in contact with water.

Question No.	Questions				
5.	The structural formula of hypophosphorous acid is:				
	$(1) \qquad \begin{array}{c} O \\ H \end{array} \qquad (2) \qquad \begin{array}{c} O \\ II \\ P \\ OH \end{array}$				
	(3) HO H (4) HO OH				
6.	In which of these processes platinum is used as a catalyst?  (1) Production of synthetic rubber  (2) Hardening of oils  (3) Oxidation of ammonia to form HNO <sub>3</sub> (4) Synthesis of methanol				
7.	In Zeigler - Natta polymerisation of ethylene, the active species is : (1) $AlCl_3$ (2) $Et_3Al$ (3) $Ti^{III}$ (4) $TiCl_4$				
8.	Which of the following is not an example of organometallic compound?  (1) Trimethylboron  (2) Trimethylaluminium				
	(3) Trimethoxytitanium chloride (4) Tetracarbonylnickel				

Question No.	Questions  The nuclear reaction: $^{63}_{29}$ Cu + $^{4}_{2}$ He $\rightarrow ^{37}_{17}$ Cl + 14 $^{1}_{1}$ H + 16 $^{1}_{0}$ n is referred to as:  (1) Spallation reaction  (2) Fusion reaction  (3) Fission reaction  (4) Chain reaction				
9.					
10.	The nucleus resulting from $_{92}$ U <sup>238</sup> after successive emission of two $\alpha$ and four $\beta$ -particles is : (1) $_{90}$ Th <sup>230</sup> (2) $_{94}$ Pu <sup>230</sup> (3) $_{88}$ Ra <sup>230</sup> (4) $_{92}$ U <sup>230</sup>				
11.	<ul> <li>Which of the following statements is wrong?</li> <li>(1) UV absorption is attributable to electronic transitions.</li> <li>(2) UV spectra provide information about valence electrons.</li> <li>(3) IR absorption is attributable to transitions between rotational energy levels of whole molecules.</li> <li>(4) NMR spectrometers use radiofrequency electromagnetic radiation.</li> </ul>				
12.	<ul> <li>Which of the following statements regarding mass spectrometry is false?</li> <li>(1) The base peak of a simple ketone is usually attributable to an acylium ion.</li> <li>(2) The molecular ion of carbonyl compounds with a -C-H readily undergoes elimination of an alkene to give a relatively stable enol radical cation.</li> <li>(3) The molecular ion peak of some alcohols is very weak because it readily loses an alkyl radical to give a relatively stable oxonium (hydroxycarbenium) ion.</li> <li>(4) Structurally isomeric alkanes cannot be distinguished by low resolution mass spectrometry.</li> </ul>				

Question No.	Questions				
13.	Neopentyl chloride, (CH <sub>3</sub> ) <sub>3</sub> CCH <sub>2</sub> Cl, reacts with the strong base sodium amide to form a new compound. This compound has a molecular ion at m/z = 70 amu and displays two <sup>1</sup> H NMR singlets at δ 0.20 & 1.05 ppm (integration ratio = 2:3). What is a plausible structure for this compound?  (1) 2-methyl-2-butene (2) 1,1-dimethylcyclopropane  (3) methylcyclobutane (4) cyclopentane				
14.	Combustion analysis of an organic compound shows it to be 64.3% carbon. It displays a molecular ion at $m/z = 112$ amu in the mass spectrum. Which of the following is a plausible molecular formula for this compound?				
	(1) $C_8H_{16}$ (2) $C_7H_{12}O$				
	(3) $C_6H_8O_2$ (4) $C_5H_4O_3$				
15.	The <sup>1</sup> H NMR spectrum of a diluted solution of a mixture of acetone and dichloromethane in CDCl <sub>3</sub> exhibits two singlets of 1:1 intensity. Molar ratio of acetone to dichloromethane in the solution is				
	(2) 1:3				
	(3) 1:1 (4) 1:2				
16.	Which of the following is the principal factor which causes the properties of nanomaterials to differ significantly from other materials?				
	(1) Size distribution (2) Specific surface feature				
	(3) Quantum size effects (4) All the above				

Question No.	Questions
17.	is an excellent 'green' solvent as well as a greenhouse gas?
	(1) Methane (2) CFCs
5 7	(3) Carbon monoxide (4) Carbon dioxide
18.	Which of the following statements is not true regrading the binding site of a receptor?
	(1) The binding site is normally a hollow or cleft in the surface of a
SIS SE	receptor.
	(2) The binding site is normally hydrophobic in nature.
	(3) The binding site contains amino acids which are important to the
	binding process and a catalytic mechanism.
	(4) Chemical messengers fit into binding sites and bind to functional groups within the binding site.
19.	There is a lot of interest in the area of supramolecular catalysis at the moment, why is this?
	(1) There is actually very little interest in this area, due to the fact that it is very difficult to make a supramolecular catalyst.
	(2) It would be useful for cutting down on the amount of solvent in the reaction and hence decrease costs. This is of particular significance to large scale industrial processes.
	(3) It would allow very efficient and stereoselective catalysis of often very difficult reactions.
	(4) It is thought that a supramolecular catalyst would be capable of replacing catalytic metals in reactions, thereby reducing cost while increasing efficiency.

uestion No.		Questions			
20.	The term used to measure a product or person's environmental impact is				
	(1) Handprint	(2) CO <sub>2</sub> print			
	(3) Footprint	(4) Hazardous potential			
	~~~				
21.					
	Cholesterol				
	Number of Optical isome	ers in Cholesterol would be :			
	(1) 128	(2) 512			
	(3) 64	<b>(4)</b> 256			
22.	Among the following st	ructures, the number of aromatic compound(s			
	is:				
	<b>6</b>				
	0000				
v <sup>2</sup> /2 o	Animor des fallowips, so				
	(1) 3	(2) 4			
	(3) 5	(4) 6			

Question No.	Questions
23.	Number of sp <sup>2</sup> and sp hybridized carbon atoms present in benzyne is:
. 14	(1) 3 and 1 (2) 6 and 0
	(3) 4 and 2 (4) 4 and 0
24.	⊕ ⊕ ⊕ ⊕ ⊕ ⊕ ⊕ CH <sub>3</sub> , CH <sub>3</sub> CHCH <sub>3</sub>
	Number of carbonium ions in the above list is:
S of the second	(1) 4 (2) 3
	(3) 2 (4) 1
25.	In the chlorination of 1-chlorobutane under free radical conditions, the most abundant compound formed is:  (1) 1,1-dichlorobutane  (2) 1,2-dichlorobutane  (3) 1,3-dichlorobutane  (4) 1,4-dichlorobutane
26.	Repeated Hofmann Elimination reaction will often remove a nitrogen atom from an amine molecule.
	N— Hofmann Elimination
	Which of the following compounds is likely product in this case?
	(1) (2) (2)
7 April 10 A	(3) (4) (2)

Major product of the following reaction is:
CI 1. CH <sub>3</sub> MgBr, dry ether, 0°C 1. aq. acid
(1) (2)
(3) OH (4) (4)
A LDA/THF 25°C Br
Major product A and B are respectively:
(1) 6.6 (2) 6.6
(3) (4) (1) (2)
Identify A in the following reaction sequence:
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$
(1) (2) OH
(3) COH (4) HCN

Question No.		Questions	
	Sodalime Heat	- A	
30.	COOH Zinc Heat Ethanol HCi (gas)	— B — c	
	Products A, B and C respe	ectively are:	
	(1) ONa COOH COOC <sub>2</sub> H <sub>5</sub>	success lowers	
e same	(2) OH OH OH	y years ye way to discuss of the second of t	
	(3) OH COOH COOC <sub>2</sub> H <sub>5</sub>		
	$(4) \qquad \begin{array}{c} COOH \ OH \\ \end{array} \qquad \begin{array}{c} COOC_2H_5 \\ OH \end{array}$		
31.	The plot of the rate cons	tant vs. ionic st	rength of the reaction A <sup>2+</sup> + E
	follows the line as shown	in the figure:	
	<u> </u>		W
	80 0		
		- Jī	
	(1) I	(2) II	
	(3) III	(4) IV	

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(9)

No.			Questi	ons	3 S	
32.	Reaction between A and B is carried out for different initial concentration					
	and the corresponding half-life times are measured. The data are listed					
	the table:			/ /		100 arc 1150cc
, .		Entry	[A <sub>0</sub> ] M	[B <sub>o</sub> ] M	t <sub>1/2</sub> s <sup>-1</sup>	
			500	10	60	
		2	500	20	60	
		3	10	500	60	
	fu-linkling compa	4	20	500	30	
	The separation	n of (246		planes are,	respectivel	у:
	(1) 1.56 nm a				nd 1.56 nm	
	(1) 1.56 nm a				nd 1.56 nm and 3.12 nm	4, 0 1 1
34.	(1) 1.56 nm a	and 1.50	nm (4)	1.04 nm a	nd 3.12 nm	mical cell
34.	(1) 1.56 nm a (3) 3.12 nm a	and 1.50	nm (4)	1.04 nm a	e electroche	mical cell
34.	(1) 1.56 nm a (3) 3.12 nm a The predicted	electron () (0.01M	nm (4) notive force (1)    Cd <sup>2+</sup> (aq)	1.04 nm a (emf) of th (0.01M)/Cd	e electroche	mical cell
34.	(1) 1.56 nm a (3) 3.12 nm a The predicted Fe(s) / Fe <sup>2+</sup> (aq	electron () (0.01M)	nm (4)  notive force  (aq) $Cd^{2+}(aq)$ $Cd^{2-}(aq)$	1.04 nm a (emf) of th (0.01M)/Cd	e electroche	mical cell
34.	(1) 1.56 nm a (3) 3.12 nm a  The predicted  Fe(s) / Fe <sup>2+</sup> (ac)  (E° $_{(Fe^{2+}/Fe)}$ =-0.4	electron () (0.01M) (447V and	nm (4) notive force  (2) Cd <sup>2+</sup> (aq)  (2)	1.04 nm a (emf) of th (0.01M)/Cd 0.403V) +0.044V	e electroche	mical cell

uestion No.	Questions
35.	For a particle of mass m in a 1-D box of length 2L, the energy of level corresponding to n=8 is:
8 .	(1) $\frac{h^2}{8ml^2}$ (2) $\frac{h^2}{32ml^2}$
	(3) $\frac{4h^2}{ml^2}$ (4) $\frac{2h^2}{ml^2}$
36.	A thermodynamic equation that relates chemical potential to the composition of a mixture is known as:  (1) Gibbs Helmholtz equation  (2) Gibbs-Duhem equation  (3) Joule-Thomson equation  (4) Debye Huckel equation
37.	One mole of monoatomic gas is transformed from 300K and 2 atm to 600K and 4 atm. The entropy change for the process is:
	(1) $\frac{3}{2}$ R ln 2 (2) $\frac{1}{2}$ R ln 2
	(3) $\frac{7}{2}$ R ln 2 (4) $\frac{5}{2}$ R ln 2
38.	The electrical double layer model that consist of both the fixed layer an diffused layer among the following is:  (1) Helmholtz  (2) Gouy
	(3) Stern (4) Debye Huckel

uestion No.	Questions
39.	If eax is an eigen function and dn/dxn is an operator then the eigen value
	will be:
0 to 1	(1) $\alpha^n$ (2) $\alpha$
	(3) $n$ (4) $n^{\alpha}$
40.	The Gibbs energy for the decomposition of Al <sub>2</sub> O <sub>3</sub> at 500°C is as follows:
	$\frac{2}{3}\text{Al}_2\text{O}_3 \rightarrow \frac{4}{3}\text{Al} + \text{O}_2, \ \Delta_{\text{r}}G = +966 \text{ kJ mol}^{-1}$
	[발발 기계 기계 위치] 선택하게 기계하고 하는 경기 사용
	The potential difference needed for electrolytic reduction of Al <sub>2</sub> O <sub>3</sub> at 500°C
	is at least:
	(1) 2.5 V (2) 5.0 V
	(3) 4.5 V (4) 3.0 V
41.	How many signals are present in both isomers in NQR spectroscopy?
	All
	CI D CI D F
	CI CI
	(1) two (2) three
	(3) one (4) four
42.	Auxochrome when attached to chromophore absorption band is shifte
	towards longer wavelength due to increase in:
	(1) Bonding (2) Conjugation
	(3) Inductive effect (4) None of these

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uestion No.	Questions
43.	The quantitative shifting in PMR signals in addition to shielding and deshielding the protons also depends upon the:  (1) Inductive effect (2) Space effect (3) H-bonding (4) All of above
44.	Ionic equivalent conductance value for $Ca^{2+}$ is 0.0119 S $m^2$ mol <sup>-1</sup> and for $Cl^-$ is 0.0076 S $m^2$ mol <sup>-1</sup> . The correct expected molar conductivity at infinite dilution for $CaCl_2$ is :  (1) 0.0195 S $m^2$ mol <sup>-1</sup> (2) 0.0271 S $m^2$ mol <sup>-1</sup> (3) 0.0542 S $m^2$ mol <sup>-1</sup> (4) 0.01355 S $m^2$ mol <sup>-1</sup>
45.	A binary mixture of A <sub>2</sub> and B <sub>2</sub> will show negative deviation from Raoult's law when:  (1) A-A and B-B interactions are stronger than A-B  (2) A-A and B-B interactions are weaker than A-B  (3) Both A-A and B-B interactions are equal to A-B  (4) Either A-A or B-B interactions is equal to A-B
46.	The molar masses of monodisperse and polydisperse polymers obey respectively the conditions: $ (M_n = \text{Number average molecular weight and } M_w = \text{Weight average molecular weight} ). $ $ (1)  M_n > M_w \text{ and } < M_w $ $ (2)  M_n = M_w \text{ and } M_n < M_w $ $ (3)  M_n < M_w \text{ and } M_n < M_w $ $ (4)  M_n = M_w \text{ and } M_n = M_w $

Question No.	Questions				
47.	$\mathrm{CH_3COOC_2H_5}$ (aq) + $\mathrm{H_3O^+}$ ( $\ell$ ) $^{\rightarrow}$ $\mathrm{CH_3COOH}$ (aq)+ $\mathrm{C_2H_5OH}$ (aq). What type of reaction is this ?				
	(1) Unimolecular (elementary)				
	(2) Pseudo first order				
2 200 * * * * * * * * * * * * * * * * *	(3) Zero order				
	(4) Second order				
48.	Micelle formation is accompanied by the:				
0,000	(1) decrease in overall entropy due to ordering of solvent near				
	hydrophobic ends.				
	(2) increase in overall entropy mostly due to increase in solvent entropy.				
	(3) increase in overall entropy mostly due to increase in solute entropy.				
	(4) increase in overall entropy and decrease in enthalpy.				
49.	The rotational partition function is expected to be smallest for the molecule, among the following:				
0 4	(1) H <sub>2</sub> (2) Li <sub>2</sub>				
A STATE OF THE STA	(3) N <sub>2</sub> (4) F <sub>2</sub>				
50.	The temperature derivative of electrochemical cell potential E at constant				
	(4) Large $\partial \mathbf{E}$ a charge $\mathbb{N}$ expresses a single constant $\mathbf{E}$				
	pressure, $\left(\overline{\partial T}\right)_{p}$ , is given by :				
	$\Delta S$				
	$(1)  -\frac{1}{nF} \qquad (2)  \frac{1}{nF}$				
	$\Delta S$ $\Delta S$				
	$nFT$ $(4)$ $-\frac{1}{nFT}$				

Question No.	Questions
51.	The metal species present in Nitrogenase is:  (1) Zinc (2) Molybdenum  (3) Tungsten (4) Lead
52.	Which of the following compounds will show quadrupole splitting in Mossbauer spectroscopy?
	(1) $K_4$ Fe (CN) <sub>6</sub> (2) FeCl <sub>3</sub>
	(3) $\operatorname{Fe}_{2}(\operatorname{SO}_{4})_{3}$ (4) $\operatorname{FeSO}_{4}$
53.	The most widely used standard reference substance in ESR is:  (1) 1, 1 -diphenyl -2-Picryl - hydrazyl free radical  (2) 1, 1 -diphenyl -2-Picryl - hydroxyl free radical  (3) TMS  (4) None of these
54.	In DTA, the differential temperature Vs temperature or time curve is highly sensitive to:  (1) Heating rate  (2) Sample size  (3) Sample packing  (4) All of these
55.	Radio metric titrations have been applied for:  (1) Determination of the composition of compound  (2) Investigation of co-precipitation  (3) Determination of the specific activity of radioactive preparations  (4) All of these

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Question No.	Que	estio	ns		
56.	Cytochromes in biological systems are involved in:				
1	(1) Proton transfer	(2)	Oxygen transfer		
	(3) Electron transfer	(4)	Metal transfer		
57.	In Ferrocene which metal or group orbital?	bital	interact more effectively with ligand		
	(1) 3d <sub>z</sub> <sup>2</sup>	(2)	$3d_{xy} 3d_{x^2-y^2}$		
	$(3)  4P_{x}4P_{y}$		$3d_{xz}$ , $3d_{yz}$		
58.			n which the potential of the working ing current is monitored as a function		
0.00	(1) Coulometry	(2)	Chronopotentiometry		
	(3) Chronoamperometry	(4)	Pulse polarography		
59.	Lithium drugs are used in tr	eatm	ent of:		
	(1) Dental caries	(2)	Psychiatric disorder		
	(3) Malaria	(4)	Arthritis		
60.	askord and a first second, and second in the second		Arthritis  Anticancer Drug in treatment of most		
60.	Which alkylating agent is use		Speriment magnetic in the Million of the period of Million of the State of the Stat		
60.	Which alkylating agent is use of the cancers?	ed as	Anticancer Drug in treatment of most  Cyclophosphamide		
61.	Which alkylating agent is use of the cancers?  (1) Melphan	(2)	Anticancer Drug in treatment of most Cyclophosphamide None of these		
	Which alkylating agent is use of the cancers?  (1) Melphan  (3) Chlorambucil	(2) (4)	Anticancer Drug in treatment of most Cyclophosphamide None of these		

uestion No.	Questions
62.	When crystals of sodium chloride are heated in the presence of sodium vapor, they turn yellow. This is due to the formation of:  (1) Schottky defects (2) Frenkel defects (3) F-centres (4) H-centres
63.	Of the following inequalities, the criterion/criteria for spontaneity of a chemical reaction is/are: $ (i) (\Delta G)_{T,P} < 0 (ii) (\Delta U)_{S,V} > 0 (iii) (\Delta S)_{U,V} > 0 $ (1) (i) only (2) (ii) only (3) (i) and (ii) (4) (i) and (iii)
64.	The concentration of a reactant decreases linearly with time. What is the order of the reaction?  (1) 1st order (2) Fractional order (3) 2nd order (4) Zero order
65.	The absorbance of solution having 20% transmittance is:  (1) 0.301 (2) 0.699  (3) 1.301 (4) 1.699
66.	Electrolysis of an aqueous solution of 1.0 M NaOH results in:  (1) Na at the cathode and O <sub>2</sub> at the anode.  (2) H <sub>2</sub> at the cathode and O <sub>2</sub> at the anode.  (3) Na and H <sub>2</sub> at the cathode and O <sub>2</sub> at the anode.  (4) O <sub>2</sub> at the cathode and H <sub>2</sub> at the anode.

Question No.		Questio	ons	
67.	The rate constant of d	ecomposition	n of a compound is represented by	
	in $K = 5.0 - \frac{12000}{T}$			
	The value of E <sub>A</sub> (in Kc	al mol <sup>-1</sup> ) for	this compound at 300 K is:	
	(1) 24	(2)	12	
	(3) 240	(4)	120	
68.			initial concentration of A is 0.1 M as -1 s-1. The half life period of the reacti	
	(1) 5 sec	(2)	50 sec	
	(3) 500 sec	(4)	5000 sec	
69.	The number of degene		orbitals of a hydrogen-like atom wi	th
	(1) 12	(2)	6	
	(3) 72	(4)	36	
70.			re taken to be hard spheres touchi	
	body centered cubic st		garan di pagaman di mangan kalandar. Salah B <b>anda</b> salah di pagamangan di kalandar da	
	$(1)$ $\sqrt{3} \pi$	(2)	$\frac{\sqrt{2}}{2}\pi$	
j.	The st		6	
	$(3)  \frac{\pi}{6}$	(4)	$\frac{\sqrt{3}}{8}\pi$	

Question No.	Questions
71.	The equilibrium constants $k_{p_1}$ and $k_{p_2}$ for the reactions $X \Longrightarrow 2Y$ and $Z \Longrightarrow P+Q$ , respectively are in the ratio of 1:9. If the degree of dissociation of X and Z be equal then the ratio of total pressure at these equilibria
, w	is:
E UJ PAR PARAMETER DE	(1)     1:36       (2)     1:1       (3)     1:3       (4)     1:9
72.	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:
7.4	(1) 4 (2) 12
	(3) 96 (4) 192
73.	One mole of an ideal gas undergoes a cyclic process (ABCDA) starting from point A through 4 reversible steps as shown in the figure. Total work done in the process is:
	T <sub>1</sub> Temperature T <sub>2</sub>
X	(1) $R(T_1 - T_2) \frac{V_2}{V_1}$ (2) $R(T_1 + T_2) \frac{V_2}{V_1}$
	(3) $R(T_1 + T_2) \ln \frac{V_2}{V_1}$ (4) $R(T_1 - T_2) \ln \frac{V_2}{V_1}$

Question No.	Questions
74.	If the specific conductance of an electrolyte solution is 0.2 ohm <sup>-1</sup> cm <sup>-1</sup> and cell constant is 0.25, the conductance of the solution is:  (1) 1.25 ohm <sup>-1</sup> (2) 1.0 ohm <sup>-1</sup> (3) 0.8 ohm <sup>-1</sup> (4) 2.0 ohm <sup>-1</sup>
75.	The slope and intercept obtained from (1/Rate) against (1/substrate concentration) of an enzyme catalyzed reaction are 300 and $2 \times 10^5$ , respectively. The Michaelis-Menten constant of the enzyme in this reaction is:  (1) $5 \times 10^6$ M  (2) $5 \times 10^{-6}$ M  (3) $1.5 \times 10^3$ M  (4) $1.5 \times 10^{-3}$ M
76.	Given;
	A. Fe (OH) <sub>2</sub> (s) + 2e <sup>-</sup> $\rightarrow$ Fe(s) + 2OH – (aq); E <sub>o</sub> = -0.877V B. Al <sup>3+</sup> (aq) + 3e <sup>-</sup> $\rightarrow$ Al(s); E <sub>o</sub> =-1.66V C. AgBr(aq) + e <sup>-</sup> $\rightarrow$ Ag(s) +Br <sup>-</sup> (aq); E <sub>o</sub> =0.071V The overall reaction for the cells in the direction of spontaneous change would be  1. Cell with A and B: Fe reduced
	Cell with A and C: Fe reduced  2. Cell with A and B: Fe reduced Cell with A and C: Fe oxidized  3. Cell with A and B: Fe oxidized Cell with A and C: Fe oxidized  4. Cell with A and B: Fe oxidized Cell with A and C: Fe reduced

uestion No.	Questions
77.	IUPAC name of the following compound is:
	Ĭ
(***)	
	H. COOE
	(1) Pethyl (S)-3-methyl-4-oxocyclohex-2-enecarboxylate
0 v si	1 1 0 - 41 - 1 4
	(3) ethyl (R)-3-methyl-4-oxocyclohex-2-enecarboxylate
	(4) (S)-4-ethoxycarbonyl-2-methyl-4-oxocyclohex-2-enone
78.	Compound given below may be named as:
	(OH Probable Co.)
	(1) (2R, 3Z)-7-phenylhept-3-en-2-ol
	(2) (2R, 3E)-7-phenylhept-3-en-2-ol
Lam to	
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	A NOTE CONTROL BY A CAPACITY INSCITATION INSCITATION AND INSCI
	(4) (2S, 3Z)-7-phenylhept-3-en-2-ol

Question No.	Questions
79.	Enantiomer of the following structure is:
	н он
	CH <sub>3</sub>
	H <sub>2</sub> N H
	H, OH CH <sub>3</sub>
	(1) $H_2$ $H_2$ $H_3$ $H_4$ $H_4$ $H_4$ $H_4$ $H_4$ $H_5$ $H_4$ $H_5$ $H_4$ $H_5$
	H, OH
ş.	(3) $H_2N$ $H$ (4) $H_2N$ $H$
	O Burdons
	но
80.	H <sub>3</sub> C''' CH <sub>3</sub>
	Consider compound A and choose the correct answer:
	но
	(1) A could be optically active and its diastereomer is HS CH <sub>3</sub>
	H₃Ĉ
100 mg	но Но
	(2) A could be optically active and its enantiomer is HS CH <sub>3</sub> CH <sub>3</sub>
•	

Question No.	Questions
	(3) A could be optically inactive and its diastereomer is HS CH <sub>3</sub> H <sub>3</sub> C  (4) A could be optically inactive and its enantiomer is HS CH <sub>3</sub> H <sub>3</sub> C
81.	A sudden large jump between the values of second and third ionisation energies of elements would be associated with which of the following electronic configurations?  (1) 1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>1</sup> (2) 1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>2</sup> 3p <sup>1</sup> (3) 1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>1</sup> 3p <sup>2</sup> (4) 1s <sup>2</sup> 2s <sup>2</sup> 2p <sup>6</sup> 3s <sup>2</sup>
82.	Among the following groupings which represents the collection of isoelectronic species?  (1) $NO^+$ , $C_2^{2-}$ , $O_2$ , $CO$ (2) $N_2$ , $C_2^{2-}$ , $NO$ , $CO$ (3) $CO$ , $N_2$ , $CN^-$ , $C_2^{2-}$ (4) $NO$ , $CN^-$ , $N_2$ , $O_2^-$
83.	In the Molecular orbital diagram for $O_2^*$ ion the highest occupied orbital is:  (1) $\sigma$ MO orbital (2) $\pi$ MO orbital  (3) $\pi^*$ MO orbital (4) $\sigma^*$ MO orbital

Question No.	Questions
84.	The correct order of hybridization of the central atom in the following species, $NH_3$ , $[PtCl_4]^{2-}$ , $PCl_5$ , and $BCl_3$ , is respectively:  (1) $dsp^2$ , $dsp^3$ , $sp^2$ , $sp^3$ (2) $sp^3$ , $dsp^2$ , $dsp^3$ , $sp^2$ (3) $dsp^2$ , $sp^2$ , $sp^3$ , $dsp^3$ (4) $dsp^2$ , $sp^3$ , $sp^2$ , $dsp^3$
85.	Which of the following structure is most expected for the molecule XeOF <sub>4</sub> ?  (1) Tetrahedral (2) Square Pyramid  (3) Square planar (4) Octahedral
86.	Among the following, which is the weakest Lewis base?  (1) $CH_3^-$ (2) $NH_2^-$ (3) $OH^-$ (4) $F^-$
87.	CH <sub>3</sub> HgOH is classified as:  (1) Soft - Hard  (2) Soft - Soft  (3) Hard - Hard  (4) Hard - Soft
88.	<ul> <li>[Co (NH<sub>3</sub>)<sub>4</sub> (NO<sub>2</sub>)<sub>2</sub>] Cl exhibits:</li> <li>(1) Linkage isomerism, ionisation isomerism and optical isomerism.</li> <li>(2) Linkage isomerism, ionisation isomerism and geometrical isomerism.</li> <li>(3) Ionisation isomerism, geometrical isomerism and optical isomerism.</li> <li>(4) Linkage isomerism, geometrical isomerism and optical isomerism.</li> </ul>

uestion No.	Questions
89.	Which one of the following shows maximum value of paramagnetic behaviour?  (1) $[Sc(CN)_6]^{3-}$ (2) $[Co(CN)_6]^{3-}$ (3) $[Fe(CN)_6]^{3-}$ (4) $[Cr(CN)_6]^{3-}$
90.	In which of the following pairs are both the ions coloured in aqueous solution?  (1) Ni <sup>2+</sup> , Ti <sup>3+</sup> (2) Sc <sup>3+</sup> , Ti <sup>3+</sup>
	(3) Sc <sup>3+</sup> , Co <sup>2+</sup> (4) Ni <sup>2+</sup> , Cu <sup>+</sup>
91.	Major product obtained in this reaction is:
	(1) Br (2) Br (3) H <sub>2</sub> C=CH <sub>2</sub> (4)
92.	A CH <sub>3</sub> OH Br CH <sub>3</sub> OH B
	Products A and B respectively are:  (1)

Question No.	Questions
93.	Which combination of reagents is wrong for disconnections (a)-(d) in the
	following?
	Ph: (a) (b) (d)
	(1)
	(3) Ph OE1 + Br (4) Ph + BrMg
94.	Stereoselective reduction of the dione A with a chiral reducing agent
	provides the corresponding diol B in 100% diastereoselectivity and 90%
	ee favoring R, R configuration.
	010
	В
	The composition of the product is:
52.7.	(1) HO OH HO OH
	но рн но он
	(2) and (1)
	95% 5%
	но он но он
	(3) So% and C10%
	(4) HO OH HO OH
	95% 5%

Question No.	Questions
95.	An a-amino acid, L-proline, can be used as a catalytic chiral auxiliary for a stereoselective aldol reaction.  Ph + + + + + + + + + + + + + + + + + + +
	Which of (1)-(4) is not involved in the above transformation?
	(1) $\frac{1}{1}$
	(3) OH O OH O Ph H
96.	Which of adducts (1)-(4) is the main product of the following Diels-Alder reaction?
	Me CO <sub>2</sub> Me Me CO <sub>2</sub> Me
1	(1) (2) (2) (CO <sub>2</sub> Me Me

Question No.	Questions
97.	The following involves two pericyclic reactions. Which combination indicates correctly the types of reaction involved?
	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
	(1) [4+2] cycloaddition + [2+2] cycloreversion
a 2 m	(2) cheletropic reaction + [4+2] cycloaddition
	(3) [4+2] cycloaddition + [4+1] cycloreversion
	(4) [4+2] cycloaddition + cheletropic reaction
98.	Which of the following equations shows an unlikely result?
	(1) $H_2SO_4$ $N_{NO_2}$
	(2) $\left(\begin{array}{c} \left(\text{CH}_3\text{CO}\right)_2\text{O} \\ \text{H} \end{array}\right)$ $\left(\begin{array}{c} \left(\text{CH}_3\text{CO}\right)_2\text{O} \\ \text{H} \end{array}\right)$ $\left(\begin{array}{c} \left(\text{CH}_3\text{CO}\right)_2\text{O} \\ \text{H} \end{array}\right)$
	$(3)  \bigcirc _{N} = (3)  \bigcirc _{N} = (3) $
	NO <sub>2</sub>
	$(4) \qquad \begin{array}{c} \begin{array}{c} HNO_{3} \\ \hline H_{2}SO_{4} \end{array} \end{array} \qquad \begin{array}{c} \begin{array}{c} \\ \\ \\ \end{array} $
	8

Question No.	Questions					
99.	Which of the following statements regarding the reducing ability of a sugar is wrong?  (1) The aldehyde group of a saccharide is responsible for its reducing					
	properties.  (2) Ketoses are not reducing sugars because they are not aldehydes.					
	<ul> <li>(3) D-Glucose in predominantly in a cyclic hemiacetal form but it is a reducing sugar through the acyclic form with which the hemiacetal is in equilibrium.</li> <li>(4) A methyl glucoside is not a reducing sugar.</li> </ul>					
100.	<ul> <li>Which of the following is not an important secondary structural feature in large peptides and proteins?</li> <li>(1) the α-helix</li> <li>(2) the β-turn</li> <li>(3) chair conformations</li> <li>(4) the β-pleated sheet</li> </ul>					
M.Co.co.	- Wilbinds of size following in and see, for ordered reven visite all or real follows:  In the particular word properties:  (1) Ohe main list					

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