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## (MPH/PHD/URS-EE-2019) **CHEMISTRY**

Code	
	No.

10005 Sr. No.

	•	SET-"X"
Total Questi	ons:100	Max. Marks: 100
(in figure)		(in words)
	Father's Name:	
·	Date of Examinat	ion:
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(Signature of the candidate)

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Question No.	Questions
1.	Which one of the following high spin complexes has the largest CSFE Crystal field stabilization energy
	(1) $[Cr(H_2O)_6]^{2+}$ (2) $[Mn(H_2O)_6]^{2+}$
· .	(3) $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ (4) $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$
2.	The number of 3c, 2e BHB and B-B bonds present in $\mathrm{B_4H_{10}}$ respectively are
	(1) 2, 4 (2) 3, 2
	(3) 4, 1
3.	The most unstable species among the following is  (1) Ti(C <sub>2</sub> H <sub>5</sub> ) <sub>4</sub> (2) Ti(CH <sub>2</sub> Ph) <sub>4</sub> (3) Pb(CH <sub>3</sub> ) <sub>4</sub> (4) Pb(C <sub>2</sub> H <sub>5</sub> ) <sub>4</sub> The acid catalyzed hydrolysis of trans-[Co(en) <sub>2</sub> AX) <sup>n+</sup> can give cis-product
	also due to the formation of  (1) Square pyramidal intermediate  (2) Trigonal bipyramidal intermediate  (3) Pentagonal bipyramidal intermediate  (4) Face capped octahedral intermediate
5.	Total number of lines expected in <sup>31</sup> P NMR spectrum of HPF <sub>2</sub> is (I = 1/2 for both <sup>19</sup> F and <sup>31</sup> P)  (1) Six (2) Four (3) Five (4) Three
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Question No.	Questions
6.	The number of faces, vertices and edges in IF, polyhedron are, respectively
	(1) 15, 7 and 15 (2) 10, 7 and 15
	(3) 10, 8 and 12 (4) 12, 6 and 9
7.	The light pink colour of $[Co(H_2O)_6]^{2+}$ and the deep blue colour of $[CoC\ell_4]^{-2}$ are due to
	(1) MLCT transition in the first and d-d transition in the second
	(2) LMCT transitions in both
	(3) d-d transitions in both
	(4) d-d transition in the first and MLCT transition in the second
8.	In $[Mo_2(S_2)_6]^{2-}$ cluster the number of bridging S atoms and coordination number of Mo respectively, are
Lauria Tasia	(1) 2 and 8 (2) 2 and 6
	(3) 1 and 8 (4) 1 and 6
9.	The number of possible isomers of $[Ru(PPh_3)_2(acac)_2]$ (acac = acetylacetonate) is
	(1) 2 (2) 5 5 10 10 10 10 10 10 10 10 10 10 10 10 10
	(3) 4
10.	Which ones among CO <sub>3</sub> <sup>2-</sup> , XeO <sub>3</sub> , SO <sub>3</sub> , PO <sub>3</sub> <sup>3-</sup> and NO <sub>3</sub> <sup>-</sup> have planar structure?
	(1) $CO_3^{2-}$ , $PO_3^{3-}$ and $XeO_3$ (2) $CO_3^{2-}$ , $XeO_3$ and $NO_3^{-}$
	(3) $SO_3$ , $PO_3^{3-}$ and $NO_3^{-}$ (4) $CO_3^{2-}$ , $SO_3$ and $NO_3^{-}$

(2)

Question No.			
11.	The molecule $(OC)_5M = CPh(OCH_3)$ obeys 18 electron rule. The two 'M' satisfying the condition are		
-	(1) Cr, Re <sup>+</sup> (2) Mo, V		
	(3) V, Re <sup>+</sup> (4) Cr, V		
12.	The number of lines exhibited by a high resolution EPR spectrum of the species $[Cu(ethylenediamine)_2]^{2+}$ is [Nuclear spin (I) of copper is 3/2 and of N = 1]		
ě	(1) 12 (2) 15		
10 10 1	(3) 20 (4) 36		
13.	Complexes of general formula, fac-[Mo(CO) <sub>3</sub> (phosphine) <sub>3</sub> ] have the C–O stretching bands as given below:		
	Phosphine: $PF_3$ (i); $PC\ell_3$ (ii); $P(C\ell)Ph_2$ (iii); $PMe_3$ (iv)		
	v(CO): in cm <sup>-1</sup> : 2090 (a); 2040 (b); 1977 (c); 1945 (d)		
	The correct combination of the phosphine and the stretching frequency is,		
14	(1) (i-a) (ii-b) (iii-c) (iv-d) (2) (i-b) (ii-a) (iii-d) (iv-c)		
	(3) (i-d) (ii-c) (iii-b) (iv-a) (4) (i-c) (ii-d) (iii-a) (iv-b)		
14.	Which one of the following will $NOT$ undergo oxidative addition by methyl iodide?		
	(1) [Rh(CO <sub>2</sub> )I <sub>2</sub> ] (2) [η <sup>δ</sup> -CpRh(CO) <sub>2</sub> ]		
1	2 2		

Question No.	Questions	y" ·
15.	C <sub>60</sub> has	
	(1) 14 pentagon rings and 18 Hexagon rings	
	(2) 12 pentagon rings and 20 Hexagon rings	•
	(3) 12 pentagon rings and 18 Hexagon rings	
	(4) 14 pentagon rings and 20 Hexagon rings	
16.	In 'carbon-dating' application of radioisotopes, <sup>14</sup> C emits	
	(1) Positron (2) $\gamma$ particle	
	(3) β particle (4) α particle	
17.	The product of the reaction of propene, CO and $H_2$ in the present $Co_2(CO)_8$ as catalyst is	nce oi
,	(1) butanoic acid (2) butanal	
,	(3) 2-butanone (4) methylpropanoate	
18.	Reductive elimination step in hydrogenation of alkenes by Wilk catalyst results in (neglecting solvent in coordination sphere of Rh)	cinson )
. + "	(1) T-shaped $[Rh(PPh_3)_2 CI]$ (2) Trigonal-planar $[Rh(PPh_3)_2 C\ell]$	
	(3) T-shaped $[Rh(H)(PPh_3)_2]$ (4) Trigonal-planar $[Rh(H)(PPh_3)_2]$	
19.	The correct statement with respect to the bonding of the ligands, and $Mc_3P$ with the metal ions $Be^{2+}$ and $Pd^{2+}$ is,	
	(1) the ligands bind equally strong with both the metal ions as the dicationic	
	(2) the ligands bind equally strong with both the metal ions as bo ligands are pyramidal	De La
	(3) the binding is stronger for Me <sub>3</sub> N with Be <sup>2+</sup> and Me <sub>3</sub> P with Pd <sup>2+</sup>	+ 1
	(4) the binding is stronger for Me <sub>3</sub> N with Pd <sup>2+</sup> and Me <sub>3</sub> P with Be <sup>2-</sup>	+

Question No.	Questions		
20.	In the iodometric titration of sodium thiosulfate (Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> ) with acidic dichromate solution, 25 mL of 0.1 M dichromate requires 50 mL of 'x' M thiosulfate. The value of 'x' is		
	(1) 0.6 (2) 0.3		
	(3) 0.1 (4) 0.4		
21.	The room temperature magnetic moment ( $\mu_{eff}$ in BM) for a monomeric Cu(II) complex is greater than 1.73. This may be explained using the expression		
,	(1) $\mu_{\text{eff}} = \mu_{\text{s}} (1 - \alpha \lambda / \Delta)$ (2) $\mu_{\text{eff}} = [n (n + 2)]^{\frac{1}{2}}$		
-	(3) $\mu_{\text{eff}} = [4s (s+1) + L (L+1)]^{\frac{1}{2}}$ (4) $\mu_{\text{eff}} = g [J (J+1)]^{\frac{1}{2}}$		
22.	The numbers of P–S and P–P bonds in the compound $P_4S_3$ are, respectively,		
	(1) 3 and 6 (2) 4 and 3		
	(3) 6 and 3 (4) 6 and 2		
23.	In the absence of bound globin chain, heme group on exposure to $\mathrm{O}_2$ gives the iron-oxgen species		
	(1) Fe(III) –O– Fe(III) (2) Fe(III) –O–O		
Par a series	(3) Fe(III) –O–O– Fe(III) (4) Fe(IV) –O–		
24.	The complex [Cr(bipyridyl) <sub>3</sub> ] <sup>2+</sup> , shows a red phosphorescence due to transition		
	(1) ${}^{4}\Gamma_{1g} \leftarrow {}^{4}A_{2g}$ (2) ${}^{2}E_{g} \leftarrow {}^{4}A_{2g}$		
	(1) ${}^{4}\Gamma_{1g} \leftarrow {}^{4}A_{2g}$ (2) ${}^{2}E_{g} \leftarrow {}^{4}A_{2g}$ (3) ${}^{4}\Gamma_{2g} \leftarrow {}^{4}A_{2g}$ (4) ${}^{4}A_{2g} \leftarrow {}^{2}E_{g}$		
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Question No.	Questions
30.	Among the complexes (i) $K_4[(Cr(CN)_6], (ii) K_4[(Fe(CN)_6], (iii) K_3[(Co(CN)_6], and (iv) K_4[(Mn(CN)_6], Jahn Teller distortion is expected in$
	(1) i, ii and iii (2) ii, iii and iv
	(3) i and iv (4) ii and iii
31.	The complex $[Fe(Phen)_2(NCS)_2](Phen-1, 10$ -phnanthroline) shows spin crossover behaviour. CFSE and $\mu_{eff}$ at 250 and 150 K, respectively will be:
	(1) $0.4  \Delta_0$ , $4.90  \mathrm{BM}$ and $2.4  \Delta_0$ , $0.00  \mathrm{BM}$
1	(2) $2.4  \Delta_0$ , 2.90 BM and $0.4  \Delta_0$ , 1.77 BM
	(3) $2.4  \Delta_0$ , $0.00  \mathrm{BM}$ and $0.4  \Delta_0$ , $4.90  \mathrm{BM}$
	(4) $1-2 \Delta_0$ , 4.90 BM and $2.4 \Delta_0$ , 0.00 BM
32.	$[\mathrm{Ni^{II}L_6}]^{\mathrm{n+orn-}}$ show absorption bands at 8500, 15400 and 26000 cm <sup>-1</sup> whereas $[\mathrm{Ni^{II}L'_6}]^{\mathrm{n+orn-}}$ at 10750, 17500 and 28200 cm <sup>-1</sup> , L and L' are respectively
	(1) OH- and $N_3$ - (2) C $\ell$ - and I-
	(3) NCS- and RCOO- (4) $H_2O$ and $NH_3$
33.	The rate of exchange of $\mathrm{OH_2}$ present in the coordination sphere by $^{18}\mathrm{OH_2}$ of
	i. $[Cu(H_2O)_6]^{2+}$ ; ii) $[Mn(H_2O)_6]^{2+}$ ; iii) $[Fe(H_2O)_6]^{2+}$ ; iv) $[Ni(H_2O)_6]^{2+}$ , follows the order
	(1) $i) > iv) > iii) > ii) (2) i) > iii) > iv$
	(3) $ii) > iii) > iv) > i$ (4) $iii) > i) > iv) > ii)$

Question	Questions
No.	t relume to the reaction
34.	On addition of an inert gas at constant volume to the reaction
3	$N_2 + 3H_2 \longrightarrow 2NH_3$ at equilibrium
	(1) The reaction remains unaffected
F	(2) Forward reaction is favoured
	(3) The reaction halts
· ·	(4) Backward reaction is favoured
35.	The transition zone for Raman spectra is
	(1) Between vibrational and rotational levels
	(2) Between electronic levels
	(3) Between magnetic levels of nuclei
	(4) Between magnetic levels of unpaired electrons
36.	Polarisation of the electron cloud by the cation forms
	(1) Ionic bond (2) Covalent bond
H Y	(3) Coordinate bond (4) Metallic bond
37.	Activation energy of a chemical reaction can be determined by
	(1) determining the rate constant at standard temperature
	(2) determining the rate constants at two temperatures
	(3) determining probability of collision
	(4) using catalyst

(8)

Question No.	Questions		
38.	Due to Frenkel defect, the density of the ionic solids		
	(1) increases (2) decreases		
	(3) does not change (4) none of the above		
39.	What is the simplest formula of a solid whose cubic unit cell has the atom A at each corner, the atom B at each face centre and a C atom at the body centre		
	(1) $AB_2C$ (2) $A_2BC$		
-	(3) AB <sub>3</sub> C (4) ABC <sub>3</sub>		
40.	Which of the following thermodynamic function is called as the arrow of "time"		
	(1) Enthalpy (2) Gibbs free energy		
	(3) Entropy (4) Helmholtz free energy		
41.	For a potentiometric titration in the curve of emf (E) v/s volume (V) of the titrant added, the equivalence point is indicated by		
-	(1) $ dE/dV  = 0$ , $ d^2E/dV^2  = 0$ (2) $ dE/dV  = 0$ , $ d^2E/dV^2  > 0$		
	(3) $ dE/dV  > 0$ , $ d^2E/dV^2  = 0$ (4) $ dE/dV  > 0$ , $ d^2E/dV^2  > 0$		
42.	If the concentration (c) is increased to 4 times its original value (c), the change in molar conductivity for strong electrolytes is (where b is kohlrausch's constant) -		
	(1) 0 (2) $b\sqrt{c}$		
	$(3)  2b\sqrt{c} \qquad \qquad (4)  4b\sqrt{c}$		

Question No.	Questions		
No.	( leating gero no	nt energy)	
43.	The energy levels of the harmonic oscillator (neglecting zero point energy are $\varepsilon_v = \text{nhv}$ for $n = 0, 1, 2 \dots$ Assuming $hv = k_B T/3$ ; the partition function		
Ŷ.	1 1S		
* .	(1) e (2) $e^{1/3} (e^{1/3} - 1)$		
5	(3) $1/3e$ (4) $3e/(3e^3-1)$		
44.	The ground state of hydrogen atom is -13.598 eV. The except of kinetic energy <t> and potential energy, <v>, in units of eV</v></t>	•	
	(1) $\langle T \rangle = 13.598, \langle V \rangle = -27.196$ (2) $\langle T \rangle = -27.196, \langle V \rangle$	/ - 10.000	
	(3) $ = -6.799,  = -6.799$ (4) $ = 6.799, $	= - 20.331	
45.	The correct expression for the product ((M <sub>n</sub> ).(M <sub>w</sub> )) [where M <sub>n</sub> and M <sub>w</sub> are the number average and weight average molar masses, respectively, of a polymer] is		
	(1) $N^{-1} \sum_{i} N_{i} M_{i}$ (2) $N^{-1} \sum_{i} N_{i} M_{i}^{2}$		
	(3) $N/\sum_{i} N_{i} M_{i}$ (4) $N/\sum_{i} N_{i} M_{i}^{2}$		
46.	Match the following columns:		
* p :	Column-1 Column-2		
	A. Energy of the ground state of He+ 1. $-6.0$	4 ev	
	B. Potential energy of 1st orbit of H- atom 2. $-27$ .	2 ev	
20	C. Kinetic energy of II excited state of He+ 3. 8.68	* 10 <sup>-18</sup> J	
1 4	D. Ionisation potential of He+ 4. $-54$ .	plant in the	
	Codes.		
-1.	A B C D		
	(1) 1 2 3 4		
	(2) 4 3 2 1	(	
y	(3) 4 2 1 3	9.	
i i	(4) 2 3 1 4		
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Question No.	Questions		
47.	The protecting power of lyophilic colloidal sol is expressed in terms of		
	(1) Critical miscelle concentration (2) Oxidation number		
	(3) Coagulation value (4) Gold number		
48.	Which one of the following is an example for homogenous catalysis?		
	(1) Hydrogenation of oil		
	(2) Manufacture of ammonia by Haber's process		
,-	(3) Manufacture of sulphuric acid by Contact process		
	(4) Hydrolysis of sucrose in presence of dilute hydrochloric acid		
49.	The energy of a hydrogen atom in a state is ( $-hcR_H/25$ ), where $R_H = Rydberg$ Constant). The degeneracy of the state will be -		
	(1) $25^1$ (2) $25^2$		
	(3) $25^3$ (4) $25^4$		
50.	The value of the commutator [x, p <sup>2</sup> <sub>x</sub> ] is		
	(1) $2i + p_x$		
	(3) $2ixp_x$ (4) $h i p_x/\pi$		
51.	The number of the lines in the ESR spectrum of CD <sub>3</sub> is (the spin of D is 1)		
	(1) 1 (2) 3		
	(3) 4		
52.	Colligative properties are used for the determination of		
	(1) molar mass (2) equivalent weight		
	(3) arrangement of molecules (4) melting and boiling point		

Question	Questions		
No.			
53.	Which of the following does not contain a C <sub>3</sub> axis?		
	(1) $POC\ell_3$ (2) $NH_4^+$		
,	(3) $H_3O^+$ (4) $C\ell F_3$		
54.	Franck Condon principle is related to		
	(1) time required for electronic transition to occur		
	(2) absorption of light		
	(3) time of electronic transition and change in internuclear distance		
	(4) symmetry of molecules		
55.	Which pairing of molecule and point group is correct?		
	(1) $\mathrm{BC}\ell_{3}$ , $\mathrm{C}_{3v}$ (2) $\mathrm{SiC}\ell_{4}$ , $\mathrm{D}_{4h}$		
	(3) $H_2S$ , $C_{2v}$ (4) $SF_4$ , $C_{4v}$		
56.	The symmetric stretching mode of the SiF <sub>4</sub> molecule:		
	(1) IR active		
	(2) IR inactive		
· ·	(3) generates a change in molecular dipole moment		
	(4) gives rise to a strong absorption in IR spectrum		
57.	Match the following columns:		
,	LIST-1 LIST-2		
	1. Sol A. Liquid dispersed in solid		
, 2 17	2. Gel B. gas dispersed in liquid		
	3. Emulsion C. Solid dispersed in liquid		
	4. Foam D. liquid dispersed in liquid		
	Codes		
	(1) 1-A 2-B 3-C 4-D		
	(2) 1–B 2–C 3–D 4–A		
	(3) 1–C 2–A 3–D 4–B		
	(4) 1-B 2-D 3-A 4-C		

Question No.	Questions				
58.	A heat engine operates between the boiling point of water and a room temperature of 25°C. The efficiency of the engine is largest, if water is allowed to boil at a pressure of –				
	(1) 1 atm.	(2)	10 atms		
	(3) 25 atms	(4)	1.01 * 10 <sup>6</sup> Nm <sup>-2</sup>		
59.	Monomer of Orlon is				
,	(1) $CH_2 = CH - OCH_3$	(2)	$CF_2 = CF_2$		
	(3) $CH_2 = CH - CN$	(4)	$CH_2 = CH - C\ell$		
60.	Chloroprene is obtained by the a	ıddi	tion of HC $\ell$ to		
1	(1) ethylene	(2)	acetylene		
9	(3) vinylacetylene	(4)	phenylacetylene		
61.	The normality of 2.3 M H <sub>2</sub> SO <sub>4</sub> so	luti	on is		
	(1) 2.3 N	(2)	4.6 N		
	(3) 6.9 N	(4)	7.9 N		
62.	Crystal cannot posses				
	(1) 1 fold axis of symmetry	(2)	3 fold axis of symmetry		
	(3) 5 fold axis of symmetry	(4)	6 fold axis of symmetry		
63.	Number of sigma bonds in P <sub>4</sub> O <sub>10</sub>	is	er Massing niet was		
	(1) 6	(2)	7		
	(3) 17	(4)	16		

(13)

No.	Questions
64.	2 mol of an ideal gas at $27^{\circ}$ C is expanded reversibly from 2 lit. To 20 l Find entropy change (R = 2 cal / mol K)
r	(1) 92.1 (2) 0
÷	(3) 4 (4) 9.2
65.	An adiabatic process is
	(1) isoenthalpic (2) isoentropic
·,	(3) isochoric (4) isobaric
66.	At a certain temperature, the following observations were made for the reaction
	$A \longrightarrow Products$ Time [A]
	(From the start)
	2 minutes 5*10 <sup>-3</sup> 5 minutes 4*10 <sup>-3</sup>
	8 minutes 3*10 <sup>-3</sup>
	11 minutes 2*10 <sup>-3</sup>
	The order of the reaction is
, t	(1) 1
	(3) 3 (4) Zero

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Question No.	Questions	
67.	How many stereoisomers does have 2, 3-dichloropentane?	
	(1) 2 (2) 4	
	(3) 3 (4) 5	
68.	Which statement about benzene is incorrect?	
	(1) The C <sub>6</sub> ring is planar	
	(2) The C–Cπ–bonding is delocalised.	
	(3) The reactivity of the benzene reflects the presence of carbon-carbon double bond.	
	(4) Each C atom is sp <sup>2</sup> hybridized.	
69.	Which of the following is not a Huckel (4n + 2) aromatic system?	
	(1) [18]–Annulene ( $C_{18}H_{18}$ ) (2) Cyclooctatetraene ( $C_8H_8$ )	
	(3) Benzene $(C_6H_6)$ (4) Cyclopentadienyl anion $(C_5H_5)$	
,	Çℓ	
70.	The IUPAC name of Br is:	
	(1) 1-bromo-3-chlorocyclohexene	
e e la dire	(2) 2-bromo-6-chlorocyclohex-1-ene	
	(3) 6-bromo-2-chlorocyclohexene	
	(4) 3-bromo-1-chlorocyclohexene	
71.	Which of the following is a correct name for the following compound?	
do of	$\frac{C\ell}{H_3C}$ C = $C < \frac{CH_2CH_3}{I}$	
	(1) cis-2-chloro-3-iodo-2-pentene	
	(2) trans-2-chloro-3-ido-2-pentene	
	(3) trans-3-iodo-4chloro-3-pentene	
	(4) cis-3-iodo-4-chloro-3-pentene	

Question No.	Questions
72.	Keto-enol tautomerism is observed in :
	O O O $  $ $  $ $  $ $  $ $  $ $  $ $  $
1	O O II II II (3) CH <sub>3</sub> CH <sub>2</sub> C-OH (4) C <sub>6</sub> H <sub>5</sub> -C-H
73.	Which of the following gases is mainly responsible for acid rain?
	(1) NO <sub>2</sub> and CO <sub>2</sub> (2) CO <sub>2</sub> and SO <sub>2</sub>
	(3) SO <sub>2</sub> and NO <sub>2</sub> (4) None of these
74.	Which of the following compound displays two singlets at $\delta_{2.3}$ and 7.1 ppm.
,	(1) 1, 2-dimethylbenzene (2) 1, 3-dimethyl benzene
	(3) 1, 4-dimethyl benzene (4) methyl benzene
75.	A single strong and sharp absorption near 1650 cm <sup>-1</sup> in IR spectra indicates the presence of
	(1) Acid chlorides (2) Amides
	(3) Anhydrides (4) Aldehydes
76.	The proteins in which prosthetic group is carbohydrate are known as
	(1) Lipo-protein (2) Mucoprotein
	(3) Chromoprotein (4) Nucleoprotein

Question				
No.	Questions			
77.	Match the List I and List II and select the correct answer using code given below:			
	List I			
·	1 Nerol A Lemon grass oil			
v	2 Citral B Geraniol			
	3 Pinol C Amyrin			
, ,	4 Lupeol D α-pinene			
	Correct answer is:			
	(1) 1–C, 2–B, 3–A, 4–D (2) 1–B, 2–A, 3–D, 4–C			
	(3) 1–D, 2–C, 3–A, 4–D (4) 1–A, 2–D, 3–B, 4–D			
78.	Hydrolysis product of sucrose is:			
	(1) Fructose (2) Glucose + Galactose			
	(3) Glucose (4) Glucose + Fructose			
79.	The mass spectrum of primary amides shows a moderate molecular ion and an Intense peak at $m/z = 44$ due to :			
	(1) Loss of an alkyl radical (2) Loss of HCN			
	(3) Loss of CO (4) Loss of methyl radical			
80.	Which one of the following is bacteriostatic drug?			
	(1) Chloramphenicol (2) Penicillin			
	(3) Streptomycin (4) Phenacetin			
81.	Heating 1, 4-dicarbonyl compounds in the presence of phosphorus pentoxide (P <sub>2</sub> O <sub>5</sub> ) gives:			
Language La	(1) Pyrrole (2) Furan			
	(3) Thiophene (4) Quinoline			
82.	The Acetylation of thiophene occurs at:			
	(1) C <sub>3</sub> -position (2) C <sub>4</sub> -position			
	(3) C <sub>2</sub> -position (4) both at C <sub>2</sub> and C <sub>4</sub> -positions			

Question No.	Questions		
83.	Pyridine is basic in nature having		
. P	(1) $pKa = 5.21$ (2) $pKa = -0.27$		
. *	(3) $pKa = 5.81$ (4) $pKa = -0.35$		
84.	Least stable carbocation among the following is		
	(1) $(CH_3)_3C^+$ (2) $(CH_3)_2CH^+$		
	(3) CH <sub>3</sub> CH <sub>2</sub> <sup>+</sup> (4) CH <sub>3</sub> <sup>+</sup>		
85.	Due to the presence of an unpaired electron, free radicals are		
	(1) Anions (2) Cations		
	(3) Chemically reactive (4) Chemically inreactive		
86.	Benzoyl peroxide undergoes hamolytic cleavage to produce		
	(1) Phenyl radical (2) Methyl radical		
	(3) Phenyl chloride (4) Methyl chloride		
87.	SN¹ mechanism for the hydrolysis of an alkyl halide involves the formation of intermediate		
• •	(1) Free radical (2) Carbanion		
	(3) Carbocation (4) None of these		
88.	Which of the following is <u>NOT</u> polar protic solvent?		
	(1) $H_2O$ (2) $C_2H_5OH$		
	(3) Fumaric acid (4) Acetone		
89.	A new carbon-carbon bond formation is possible in		
p stast in	(1) Clemmensen reduction (2) Wurtz reduction		
, see	(3) Friedel-Craft alkylation (4) Oppenauer oxidation		

Question			
No.	Questions		
90.	Give the name of		
	Give the name of reaction given below:		
	$ \begin{array}{c} O \\ C \\ C$		
-	(1) Perkin reaction (2) Pechmann condensation		
	(3) Benzoin condensation (4) Claisen-Schmidt reaction		
91.	What is meant by a reaction going in 94% enantiomeric excess?		
	(1) The product contains 94% of one enantiomer and 6% of other enantiomer		
	(2) The product contains an enantiomer which is 94% pure		
	(3) The product contains 94% of one enantiomer and 6% of the products		
e e	(4) The product contains 97% of one enantiomer and 3% of other enantiomer		
92.	Which of the following functional group is <u>not</u> reduced by sodium borohydride (NaBH <sub>4</sub> )		
	(1) $\searrow$ C=O (2) $\stackrel{-C-C\ell}{\underset{O}{\sqcup}}$		
1.	(3) -C-H    (4) -C-OH    O		
93.	The given reaction is the example of:		
	//\lambda + = → \bigsim \bigsim		
1	(1) 2+4 cycloaddition (2) 2+2 cycloaddition (3) 2+2+2 cycloaddition (4) 2S+2S cycloaddition		
94.	A photo chemical reaction is:  (1) catalysed by light (2) Initiated by light (3) accompanied with the emission of light (4) used to convert heat energy into light		
	(2) accompanied with the (4) used to convert		

	Question No.	
	INO.	Questions
· [	95.	Which of the following
		Which of the following solvents is unacceptable on large scale?  (1) Dimethoxy others
		(2) Xylene
-	96.	(4) Heptane
	90.	For the reaction given below, which reaction condition are not suitable
		O
· I.		
		$\bigcup \longrightarrow \bigcup$
- 1		(1) $\text{LiA}\ell H_4/\epsilon t_2 O$ (2) $H_2 N N H_2/N a O H$
	- 1	(3) $\operatorname{Zn}(\operatorname{Hg})/\operatorname{HC}\ell$ (4) $\operatorname{HSCH_2CH_2CH_2SH}/\operatorname{H^+}, \operatorname{H_2}/\operatorname{Ni}$
	97.	Which of the following statements is <u>not</u> correct?
		(1) The molecule to be synthesised is a target molecule
		(2) Synthetic equivalent is a real chemical compound resulting from
		disconnection
	, ,	3) Regioselective reaction does not produce one of several possib
		structural isomers
1	10	4) Synthon is an idealised fragment (usually cation or anion) resulting
		from a disconnection.
00	) TI	ow many oxygen atoms lined up in a row would fit in a one nanomateria
98	·	oace?
	- 1 -	(9)
	(1	/ None
r	(3)	Deven (*)
99.	Th	e role of catalyst in chemical reaction is
500	(1)	- 11 1' - Line on owar
	1 ` `	Alters the amount of products
	(2)	Increases $\Delta H$ of Forward reaction
	(3)	Decreases of ΔH of Forward reaction
	(4)	
100.	Sec	ondary pollutant is
TOO.		(2)
	(1)	(4) Aerosor
	(3)	PAN
		Code-A (20)
DITE	ZEE-201	9-Chemistry-Code-A (20)
DIOIN		

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## (MPH/PHD/URS-EE-2019) CHEMISTRY

Sr. No. 10002

Code B

Time: 11/4 Hours

Total Questions: 100

Max. Marks: 100

(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 / misbehaviour 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 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-

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.

SEAL STATE

No.	CHOROLD
1	Which of the following is a correct name for the following compound?
	$C\ell \setminus C = C \setminus CH_1CH_3$
	(1) cis-2-chloro-3-iodo-2-pentene
	(2) trans-2-chloro-3-ido-2-pentene
	(3) trans-3-iodo-4chloro-3-pentene
	(4) cis-3-iodo-4-chloro-3-pentene
2.	Keto-enol tautomerism is observed in :
	O O O O O O O O O O O O O O O O O O O
	0 0 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII
33.	Which of the following gases is mainly responsible for acid rain?
8	(1) $NO_2$ and $CO_2$ (2) $CO_2$ and $SO_2$ (3) $SO_3$ and $NO_3$ (4) None of these
4.	Which of the following compound displays two singlets at $\delta_{2,3}$ and
	7.1 ppm.
	1, 4-dimethyl benzene (4)
5.	A single strong and sharp absorption near 1650 cm $^{\text{-1}}$ in IR spectra indicates the presence of
	(1) Acid chlorides (2) Amides
	(3) Anhydrides (4) Aldehydes

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Questic No.	Questions			
1.	Which of the following is a correct name for the following compound?			
	$\frac{C\ell}{H_1C} = C \frac{CH_2CH_3}{I}$			
	(1) cis-2-chloro-3-iodo-2-pentene			
	(2) trans-2-chloro-3-ido-2-pentene			
	(3) trans-3-iodo-4chloro-3-pentene			
	(4) cis-3-iodo-4-chloro-3-pentene			
2.	Keto-enol tautomerism is observed in:			
×	O O O O (1) $C_6H_5$ - $C$ - $CH_2$ - $C$ - $CH_3$ (2) $C_6H_5$ - $C$ - $C_6H_5$			
	O O O II I			
3.	Which of the following gases is mainly responsible for acid rain?			
	(1) $NO_2$ and $CO_2$ (2) $CO_2$ and $SO_2$ (3) $SO_2$ and $NO_2$ (4) None of these			
4.	Which of the following compound displays two singlets at $\delta_{2.3}$ and 7.1 ppm.			
	(1) 1, 2-dimethylbenzene (2) 1, 3-dimethyl benzene			
	(3) 1, 4-dimethyl benzene (4) methyl benzene			
5.	A single strong and sharp absorption near 1650 cm <sup>-1</sup> in IR spectra indicates the presence of			
	1) Acid chlorides (2) Amides			
	3) Anhydrides (4) Aldehydes			

10000	Questions Questions
6	The proteins in which prosthetic group is carbohydrate are known as
	(1) Lipo-protein (2) Mucoprotein
	(3) Chromoprotein (4) Nucleoprotein
7.	Match the List I and List II and select the correct answer using codes given below:
	List I List II
1	1 Nerol A Lemon grass oil
	2 Citral B Geraniol
	3 Pinol C Amyrin
	4 Lupeol D α-pinene
	Correct answer is:
	(1) 1–C, 2–B, 3–A, 4–D (2) 1–B, 2–A, 3–D, 4–C
	(3) 1–D, 2–C, 3–A, 4–D (4) 1–A, 2–D, 3–B, 4–D
8.	Hydrolysis product of sucrose is:
	(1) Fructose (2) Glucose + Galactose
	(3) Glucose (4) Glucose + Fructose
9.	The mass spectrum of primary amides shows a moderate molecular ion and an Intense peak at $m/z = 44$ due to :
	(1) Loss of an alkyl radical (2) Loss of HCN
	(3) Loss of CO (4) Loss of methyl radical
10.	Which one of the following is bacteriostatic drug?
direit.	(1) Chloramphenicol (2) Penicillin
	(3) Streptomycin (4) Phenacetin
11.	The number of the lines in the ESR spectrum of CD <sub>3</sub> is (the spin of D is 1)
	(1) 1 (2) 3 (3) 4 (4) 7

(2)

Question No.	Questions			
12.	Colligative properties are used for the determination of			
B = 12	(1) molar mass (2) equivalent weight			
	(3) arrangement of molecules (4) melting and boiling point			
13.	Which of the following does not contain a C <sub>3</sub> axis?			
	(1) POCℓ <sub>3</sub> (2) NH <sub>4</sub> <sup>+</sup>			
0	(3) $H_3O^+$ (4) $C\ell F_3$			
14.	Franck Condon principle is related to			
	(1) time required for electronic transition to occur			
*	(2) absorption of light			
- 2	(3) time of electronic transition and change in internuclear distance.			
	(4) symmetry of molecules			
15.	Which pairing of molecule and point group is correct?			
	(1) $BC\ell_3$ , $C_{3v}$ (2) $SiC\ell_4$ , $D_{4h}$ (3) $H_2S$ , $C_{2v}$ (4) $SF_4$ , $C_{4v}$			
10	* **			
16.	The symmetric stretching mode of the SiF <sub>4</sub> molecule:  (1) IR active			
	(2) IR inactive			
4.5	(3) generates a change in molecular dipole moment			
	(4) gives rise to a strong absorption in IR spectrum			
17.	Match the following columns:			
	LIST-1 LIST-2			
	1. Sol A. Liquid dispersed in solid			
	2. Gel B. gas dispersed in liquid			
Mg .	3. Emulsion C. Solid dispersed in liquid			
	4. Foam D. liquid dispersed in liquid			
	Codes			
of 200	(1) 1–A 2–B 3–C 4–D			
	(2) 1–B 2–C 3–D 4–A			
	(3) 1–C 2–A 3–D 4–B			
	(4) 1–B 2–D 3–A 4–C			

	of water and a room
18.	A heat engine operates between the boiling point of water is temperature of 25°C. The efficiency of the engine is largest, if water is allowed to boil at a pressure of—
	(1) .1 atm. (2) 10 atms
	(3) 25 atms (4) $1.01 * 10^6 \mathrm{Nm}^{-2}$
19.	Monomer of Orlon is
	(1) $CH_2 = CH - OCH_3$ (2) $CF_2 = CF_2$
	(3) $CH_2 = CH - CN$ (4) $CH_2 = CH - C\ell$
20.	Chloroprene is obtained by the addition of $HC\ell$ to
	(1) ethylene (2) acetylene
	(3) vinylacetylene (4) phenylacetylene
21.	The complex $[Fe(Phen)_2(NCS)_2](Phen-1, 10$ -phnanthroline) shows spin crossover behaviour. CFSE and $\mu_{eff}$ at 250 and 150 K, respectively will be:
	(1) 0.4 $\Delta_0$ , 4.90 BM and 2.4 $\Delta_0$ , 0.00 BM
	(2) $2.4 \Delta_0$ , $2.90 \text{ BM and } 0.4 \Delta_0$ , $1.77 \text{ BM}$
34	(3) 2.4 Δ <sub>0</sub> , 0.00 BM and 0.4 Δ <sub>0</sub> , 4.90 BM
18 18 15 14	(4) 1-2 $\Delta_0$ , 4.90 BM and 2.4 $\Delta_0$ , 0.00 BM.
22.	$[Ni^{II}L_{e}]^{\text{Intern-show absorption bands at 8500, 15400 and 26000 cm}^{-1}$ whereas $[Ni^{II}L_{e}]^{\text{Intern-at 10750, 17500 and 28200 cm}^{-1}$ , L and L' are respectively
	(1) OH- and N <sub>3</sub> - (2) Ct- and I-
	(3) NCS-and RCOO- (4) H <sub>2</sub> O and NH <sub>3</sub>

Question No.	Questions
23.	The rate of exchange of $\mathrm{OH_2}$ present in the coordination sphere by $^{18}\mathrm{OH}$ of
80	i. $[Cu(H_2O)_6]^{2+}$ ; ii) $[Mn(H_2O)_6]^{2+}$ ; iii) $[Fe(H_2O)_6]^{2+}$ ; iv) $[Ni(H_2O)_6]^{2+}$ , follows the order
	(1) $i > iv > iii > ii$ (2) $i > iii > iv$
	(3) $ii) > iii) > iv) > i)   (4) iii) > iv) > ii)$
24.	On addition of an inert gas at constant volume to the reaction
· ·	$N_2 + 3H_2 = 2NH_3$ at equilibrium
	(1) The reaction remains unaffected
	(2) Forward reaction is favoured
	(3) The reaction halts
	(4) Backward reaction is favoured
25.	The transition zone for Raman spectra is
	(1) Between vibrational and rotational levels
.*	(2) Between electronic levels
	(3) Between magnetic levels of nuclei
	(4) Between magnetic levels of unpaired electrons
26.	Polarisation of the electron cloud by the cation forms
	(1) Ionic bond (2) Covalent bond
	(3) Coordinate bond (4) Metallic bond

Question No.	Questions	-	No.
27.	Activation energy of a chemical reaction can be determined by		32.
	(1) determining the rate constant at standard temperature		
	(2) determining the rate constants at two temperatures		
57	(3) determining probability of collision		
	(4) using catalyst		33.
28.	Due to Frenkel defect, the density of the ionic solids		9,
	(I) increases (2) decreases		
	(3) does not change (4) none of the above		*
29.	What is the simplest formula of a solid whose cubic unit cell has the atom A at each corner, the atom B at each face centre and a C atom at the body centre	Al la	
	(1) $AB_2C$ (2) $A_2BC$		
	(3) AB <sub>3</sub> C (4) ABC <sub>3</sub>		34.
30.	ollowing thermodynan		
	(1) Enthalpy (2) Gibbs free energy	10.00	70
	(3) Entropy (4) Helmholtz free energy	11.1	.00
31.	The molecule $(OC)_5M = CPh(OCH_3)$ obeys 18 electron rule. The two 'M' satisfying the condition are		
	(2)	4.	
	(3) V, Re <sup>+</sup> (4) Cr, V		

Question No.	Questions				
32.	The number of lines exhibited by a high resolution EPR spectrum of the species $[Cu(ethylenediamine)_2]^{2+}$ is [Nuclear spin (I) of copper is 3/2 and of N = 1]				
	(1) 12 (2) 15				
24	(3) 20 (4) 36				
33.	Complexes of general formula, fac- $[Mo(CO)_3$ (phosphine), have the C-O stretching bands as given below:				
	$Phosphine: PF_3 (i); PC\ell_3 (ii); P(C\ell)Ph_2 (iii); PMe_3 (iv)$				
	v(CO): in cm <sup>-1</sup> : 2090 (a); 2040 (b); 1977 (c); 1945 (d)				
	The correct combination of the phosphine and the stretching frequency is,				
	(1) (i-a) (ii-b) (iii-c) (iv-d) (2) (i-b) (ii-a) (iii-d) (iv-c)				
	(3) (i-d) (ii-c) (iii-b) (iv-a) (4) (i-c) (ii-d) (iii-a) (iv-b)				
34.	Which one of the following will $NOT$ undergo oxidative addition by methyl iodide ?				
	(1) $[Rh(CO_2)I_2]$ (2) $[\eta^5-CpRh(CO)_2]$				
	(3) $[Ir(PPh_3)_2(CO)C\ell]$ (4) $[\eta^5-Cp_2Ti(Me)C\ell]$				
35.	C <sub>60</sub> has				
	(1) 14 pentagon rings and 18 Hexagon rings				
	(2) 12 pentagon rings and 20 Hexagon rings				
	(3) 12 pentagon rings and 18 Hexagon rings				
	(4) 14 pentagon rings and 20 Hexagon rings				

(7)

Question No.	Questions		
36.	In 'carbon-dating' application of radioisotopes, 14C emits		
= 1-	(1) Positron (2) y particle		
	(3) β particle (4) α particle		
37.	The product of the reaction of propene, CO and H <sub>2</sub> in the presence of Co <sub>2</sub> (CO) <sub>8</sub> as catalyst is		
	(1) butanoic acid (2) butanal		
1 1	(3) 2-butanone (4) methylpropanoate		
38.	Reductive elimination step in hydrogenation of alkenes by Wilkinson catalyst results in (neglecting solvent in coordination sphere of Rh)		
	(1) T-shaped $[Rh(PPh_3)_2 CI]$ (2) Trigonal-planar $[Rh(PPh_3)_2 C\ell]$		
_	(3) T-shaped $[Rh(H)(PPh_3)_2]$ (4) Trigonal-planar $[Rh(H)(PPh_3)_2]$		
39.	The correct statement with respect to the bonding of the ligands, $Mc_3N$ and $Mc_3P$ with the metal ions $Be^{2+}$ and $Pd^{2+}$ is,		
	(1) the ligands bind equally strong with both the metal ions as they are dicationic		
***	(2) the ligands bind equally strong with both the metal ions as both the ligands are pyramidal		
	(3) the binding is stronger for Me <sub>3</sub> N with Be <sup>2+</sup> and Me <sub>3</sub> P with Pd <sup>2+</sup>		
	(4) the binding is stronger for Me <sub>3</sub> N with Pd <sup>2+</sup> and Me <sub>3</sub> P with Be <sup>2+</sup>		
40.	In the iodometric titration of sodium thiosulfate $(Na_2S_2O_3)$ with acidic dichromate solution, 25 mL of 0.1 M dichromate requires 50 mL of 'x' M thiosulfate. The value of 'x' is		
	(1) 0.6 (2) 0.3		
	(3) 0.1 (4) 0.4		

Question	Questions			
No.	ing in 94% enantiomeric excess?			
41.	<ul> <li>What is meant by a reaction going in 94% enantiomeric excess?</li> <li>(1) The product contains 94% of one enantiomer and 6% of other enantiomer</li> <li>(2) The product contains an enantiomer which is 94% pure</li> <li>(3) The product contains 94% of one enantiomer and 6% of the products</li> <li>(4) The product contains 94% of one enantiomer and 9% of other</li> </ul>			
	(3) The product contains 94% of one enantiomer and 3% of other			
	<ul> <li>(3) The product contains 94% of one enantiomer and 3% of other</li> <li>(4) The product contains 97% of one enantiomer and 3% of other enantiomer</li> </ul>			
42.	which of the following functional group is not reduced by sodium borohydride (NaBH <sub>4</sub> )			
6	(1) $C = O$ (2) $C = C = C = C = C = C = C = C = C = C $			
	(3) -C-H   (4) -C-OH     O			
43.	The given reaction is the example of:			
40.	$         + = \rightarrow \langle     \rangle$			
9.	(1) 2+4 cycloaddition			
	(2) 2+2 cycloaddition			
	(3) 2+2+2 cycloaddition			
	(4) 2S + 2S cycloaddition			
44.	A photo chemical reaction is:  (1) catalysed by light (2) Initiated by light (3) accompanied with the emission of light (4) used to convert hear energy into light			
45.	Which of the following solvents is unacceptable on large scale?			
20.	(1) Dimethoxy ethane (2) Xylene			
	(3) Diethyl ether (4) Heptane			

Question No.	n Questions			
46.	For the reaction given below, which reaction condition are not suitable?			
40.	O			
	$\bigcirc$ $\longrightarrow$ $\bigcirc$			
	(1) $\text{LiA}\ell\text{H}_4/\text{st}_2\text{O}$ (2) $\text{H}_2\text{N NH}_2/\text{NaOH}$			
	(3) $\operatorname{Zn}(\operatorname{Hg})/\operatorname{HC}\ell$ (4) $\operatorname{HSCH_2CH_2CH_2SH}/\operatorname{H^+}, \operatorname{H_2}/\operatorname{Ni}$			
47.	Which of the following statements is <u>not</u> correct?			
	(1) The molecule to be synthesised is a target molecule			
	(2) Synthetic equivalent is a real chemical compound resulting from disconnection			
	(3) Regioselective reaction does not produce one of several possible structural isomers			
	(4) Synthon is an idealised fragment (usually cation or anion) resulting from a disconnection.			
48.	How many oxygen atoms lined up in a row would fit in a one nanomateria			
	space /			
	space? (1) Seventy (2) One			
a **	The state of the s			
49.	(1) Seventy (2) One			
49.	(1) Seventy (2) One (3) Seven (4) None  The role of catalyst in chemical reaction is (1) Lowers the activation energy			
49.	(1) Seventy (2) One (3) Seven (4) None  The role of catalyst in chemical reaction is (1) Lowers the activation energy (2) Alters the amount of products			
49.	<ol> <li>Seventy (2) One</li> <li>Seven (4) None</li> <li>The role of catalyst in chemical reaction is</li> <li>Lowers the activation energy</li> <li>Alters the amount of products</li> <li>Increases ΔH of Forward reaction</li> </ol>			
49.	(1) Seventy (2) One (3) Seven (4) None  The role of catalyst in chemical reaction is (1) Lowers the activation energy (2) Alters the amount of products			
<b>49. 50.</b>	<ol> <li>Seventy (2) One</li> <li>Seven (4) None</li> <li>The role of catalyst in chemical reaction is</li> <li>Lowers the activation energy</li> <li>Alters the amount of products</li> <li>Increases ΔH of Forward reaction</li> <li>Decreases of ΔH of Forward reaction</li> </ol>			
,	<ul> <li>(1) Seventy (2) One</li> <li>(3) Seven (4) None</li> <li>The role of catalyst in chemical reaction is</li> <li>(1) Lowers the activation energy</li> <li>(2) Alters the amount of products</li> <li>(3) Increases ΔH of Forward reaction</li> </ul>			
,	<ul> <li>(1) Seventy</li> <li>(2) One</li> <li>(3) Seven</li> <li>(4) None</li> <li>The role of catalyst in chemical reaction is</li> <li>(1) Lowers the activation energy</li> <li>(2) Alters the amount of products</li> <li>(3) Increases ΔH of Forward reaction</li> <li>(4) Decreases of ΔH of Forward reaction</li> <li>Secondary pollutant is</li> <li>(1) SO<sub>2</sub></li> <li>(2) CO</li> <li>(3) PAN</li> <li>(4) Aerosol</li> </ul>			
,	<ul> <li>(1) Seventy</li> <li>(2) One</li> <li>(3) Seven</li> <li>(4) None</li> <li>The role of catalyst in chemical reaction is</li> <li>(1) Lowers the activation energy</li> <li>(2) Alters the amount of products</li> <li>(3) Increases ΔH of Forward reaction</li> <li>(4) Decreases of ΔH of Forward reaction</li> <li>Secondary pollutant is</li> <li>(1) SO<sub>2</sub></li> <li>(2) CO</li> </ul>			
50.	<ul> <li>(1) Seventy</li> <li>(2) One</li> <li>(3) Seven</li> <li>(4) None</li> <li>The role of catalyst in chemical reaction is</li> <li>(1) Lowers the activation energy</li> <li>(2) Alters the amount of products</li> <li>(3) Increases ΔH of Forward reaction</li> <li>(4) Decreases of ΔH of Forward reaction</li> <li>Secondary pollutant is</li> <li>(1) SO<sub>2</sub></li> <li>(2) CO</li> <li>(3) PAN</li> <li>(4) Aerosol</li> </ul>			

(10)

Question	Questions
No.	Questions
52.	Crystal cannot posses
	(1) 1 fold axis of symmetry
, - 7	(2) 3 fold axis of symmetry
	(3) 5 fold axis of symmetry
	(4) 6 fold axis of symmetry
53.	Number of sigma bonds in P <sub>4</sub> O <sub>10</sub> is
	(1) 6 (2) 7
	(3) 17 (4) 16
54.	2 mol of an ideal gas at $27^{\circ}$ C is expanded reversibly from 2 lit. To 20 lit. Find entropy change (R = 2 cal / mol K)
	(1) 92.1
	(2) 0
	(3) 4
	(4) 9.2
55.	An adiabatic process is
	(1) isoenthalpic
8	(2) isoentropic
8. 1	
i s	(3) isochoric
	<ul><li>(3) isochoric</li><li>(4) isobaric</li></ul>

Question No.		Questions			
56.	At a certain temperature, the reaction  A	[A]  5*10-3  4*10-3  3*10-3  2*10-3	rvations were	made for	r the
	(3) 3	(4) Zero		- *, <sub>U</sub>	
	How many stereoisomers does 1 (1) 2 (3) 3	(2) 4 (4) 5	propentane?		
	<ul> <li>Which statement about benzend</li> <li>(1) The C<sub>6</sub> ring is planar</li> <li>(2) The C-Cπ-bonding is deloc</li> <li>(3) The reactivity of the benzendouble bond.</li> <li>(4) Each C atom is sp² hybridiz</li> </ul>	alised. ne reflects the	presence of ca	rbon-carl	oon

Question No.	Questions					
59.	Which of the following is not a Huckel (4n + 2) aromatic system?					
*	(1) [18]–Annulene ( $C_{18}H_{18}$ ) (2) Cyclooctatetraene ( $C_8H_8$ )					
	(3) Benzene $(C_6H_6)$ (4) Cyclopentadienyl anion $(C_5H_5)$					
	Çℓ					
60.	The IUPAC name of Br is:					
	(1) 1-bromo-3-chlorocyclohexene					
	(2) 2-bromo-6-chlorocyclohex-1-ene					
	(3) 6-bromo-2-chlorocyclohexene					
	(4) 3-bromo-1-chlorocyclohexene					
61.	Heating 1, 4-dicarbonyl compounds in the presence of phosphorus pentoxide ( $P_2O_5$ ) gives					
-	(1) Pyrrole (2) Furan					
	(3) Thiophene (4) Quinoline					
62.	The Acetylation of thiophene occurs at:					
	(1) $C_3$ -position (2) $C_4$ -position					
	(3) $C_2$ -position (4) both at $C_2$ and $C_4$ -positions					
63.	Pyridine is basic in nature having					
	(1) $pKa = 5.21$ (2) $pKa = -0.27$					
	(3) $pKa = 5.81$ (4) $pKa = -0.35$					
64.	Least stable carbocation among the following is					
	(1) $(CH_3)_3C^+$ (2) $(CH_3)_2CH^+$					
	(3) CH <sub>3</sub> CH <sub>2</sub> <sup>+</sup> (4) CH <sub>3</sub> <sup>+</sup>					

Due to the presence of ar (1) Anions (3) Chemically reactive Benzoyl peroxide underg	(2) (4)	electron, free radicals are Cations Chemically inreactive	
<ul><li>(1) Anions</li><li>(3) Chemically reactive</li></ul>	(2)	Cations	
	(4)	Chamically inreactive	
Benzoyl peroxide underg		Chemicany in cast	- •
	oes hamoly	tic cleavage to produce	
(1) Phenyl radical	(2)	Methyl radical	(352)
(3) Phenyl chloride	(4)	Methyl chloride	
SN <sup>1</sup> mechanism for the hy of intermediate	drolysis of	an alkyl halide involves the forr	nation
(1) Free radical	(2)	Carbanion	
(3) Carbocation	(4)	None of these	(9) 8
Which of the following is	NOT polar	protic solvent?	7.00
(1) H <sub>2</sub> O	(2)	C <sub>2</sub> H <sub>5</sub> OH	
(3) Fumaric acid	(4)	Acetone	
A new carbon-carbon bon	d formatio	n is possible in	
(1) Clemmensen reducti	ion (2)	Wurtz reduction	
(3) Friedel-Craft alkylat	tion (4)	Oppenauer oxidation	
Give the name of reaction	n given bel	ow:	
O O O O O O O O O O O O O O O O O O O	CH <sub>3</sub> COC	$\stackrel{O}{\longrightarrow} \bigcirc \stackrel{\text{CH}=\text{CH-C-OH}}{\longrightarrow}$	
(1) Perkin reaction	(2)	Pechmann condensation	,
	n (4)	Claisen-Schmidt reaction	
	(3) Phenyl chloride  SN¹ mechanism for the hy of intermediate  (1) Free radical  (3) Carbocation  Which of the following is  (1) H₂O  (3) Fumaric acid  A new carbon-carbon bon  (1) Clemmensen reduction  (3) Friedel-Craft alkylate  Give the name of reaction  O  O  CH₃-C  CH₃-C  CH₃-C  (1) Perkin reaction	(3) Phenyl chloride (4)  SN¹ mechanism for the hydrolysis of a of intermediate  (1) Free radical (2)  (3) Carbocation (4)  Which of the following is NOT polar  (1) H₂O (2)  (3) Fumaric acid (4)  A new carbon-carbon bond formation  (1) Clemmensen reduction (2)  (3) Friedel-Craft alkylation (4)  Give the name of reaction given below the name of reaction given below the company of	(3) Phenyl chloride (4) Methyl chloride  SN¹ mechanism for the hydrolysis of an alkyl halide involves the form of intermediate  (1) Free radical (2) Carbanion  (3) Carbocation (4) None of these  Which of the following is NOT polar protic solvent?  (1) H₂O (2) C₂H₃OH  (3) Fumaric acid (4) Acetone  A new carbon-carbon bond formation is possible in  (1) Clemmensen reduction (2) Wurtz reduction  (3) Friedel-Craft alkylation (4) Oppenauer oxidation  Give the name of reaction given below:  O O CH₃COO Na CH=CH-C-OH  CH=CH-C-OH  (1) Perkin reaction (2) Pechmann condensation

Question No.	Questions
71.	For a potentiometric titration in the curve of emf (E) v/s volume (V) of the titrant added, the equivalence point is indicated by
	(1) $ dE/dV  = 0$ , $ d^2E/dV^2  = 0$ (2) $ dE/dV  = 0$ , $ d^2E/dV^2  > 0$
	(3) $ dE/dV  > 0$ , $ d^2E/dV^2  = 0$ (4) $ dE/dV  > 0$ , $ d^2E/dV^2  > 0$
72.	If the concentration (c) is increased to 4 times its original value (c), the change in molar conductivity for strong electrolytes is (where b is kohlrausch's constant).
10	(1) 0 (2) b√c
	(3) $2b\sqrt{c}$ (4) $4b\sqrt{c}$
73.	The energy levels of the harmonic oscillator (neglecting zero point energy) are $\varepsilon_v = nhv$ for $n = 0, 1, 2 \dots$ Assuming $hv = k_B T/3$ ; the partition function is
1	(1) $e^{1/3} (e^{1/3} - 1)$
	(3) $1/3e$ (4) $3e/(3e^3-1)$
74.	The ground state of hydrogen atom is $-13.598$ eV. The exception values of kinetic energy $<$ T $>$ and potential energy, $<$ V $>$ , in units of eV, are
	(1) $<$ T>= 13.598, $<$ V>= -27.196 (2) $<$ T>= -27.196, $<$ V>= 13.598
	(3) $=-6.799$ , $=-6.799$ (4) $=6.799$ , $=-20.397$
75.	The correct expression for the product $((M_n).(M_w))$ [where $M_n$ and $M_w$ are the number average and weight average molar masses, respectively, of a polymer] is
	(1) $N^{-1} \sum_{i} N_{i} M_{i}$ (2) $N^{-1} \sum_{i} N_{i} M_{i}^{2}$
	(3) $N/\sum_{i}N_{i}M_{i}$ (4) $N/\sum_{i}N_{i}M_{i}^{2}$

(15)

	1) SP <sub>1</sub> (S) SP <sub>2</sub>	
.67	he energy of a hydrogen atom in a state is (–h sonstant). The degeneracy of the state will b	$_{1}^{1}$ (25), where $R_{H} = R_{y}$ dber
	Hydrolysis of sucrose in presence of dilu	hydrochloric acid
	3) Manufacture of sulphuric acid by Conta	rocess
	Manufacture of ammonia by Haber's pro	S
	Io fo notenagorbyH (1	
.87	Tot elqmsxe as si gaiwollot eat to eno doidy	gogenous catalysis?
		•
	, w	д илшрет
		lation number
.77	The protecting power of lyophilic colloidal so	to amret ni beaserqxe
22	ъ 1 E 2 (ф.	
22	8 1 2 4 (F	
	2 2 5 4 (2) 2 1 2 4 (8) 4 1 8 2 (4)	
	\$ I Z \$ \$ (E) F I E Z (F)	
	4) Z 3 I 4 Z) 4 3 Z I Z) 1 3 3 4 Z) 1 3 4 B C D	
	7) Z 3 I 4 Z) 4 3 Z I Z) 1 3 4 Y B C D Codes.	
	Codes. A B C D (2) 4 3 2 1 (3) 4 2 1 3 (4) 2 3 1 4	ν <sub>θ</sub> φ.φ.δ —
	C. Kinetic energy of II excited state of He+ Codes. A B C D (1) 1 2 3 4 (2) 4 3 2 1 (3) 4 2 1 3 (4) 2 3 1 4	8.68 * 10-18 J
	B. Potential energy of lat orbit of H- atom C. Kinetic energy of II excited state of He+ Codes. A B C D (1) I Z 3 4 (2) 4 3 Z I (3) 4 2 I 3 (4) 2 3 I 4	227.2 ev 3. 8.68 * 10-18 J 454.4 ev
	A. Energy of the ground state of He+  B. Potential energy of Ist orbit of H- atom C. Kinetic energy of II excited state of He+ Codes.  A. B. C. D.  Codes.  A. B. C. D.  A. B.	7. — 6.04 ev 2. 77.2 ev 3. 8.68 * 10-18 J 4. — 54.4 ev
	Column–1  A. Energy of the ground state of He+  C. Kinetic energy of Ist orbit of H– atom  C. Codes.  A. B. C. D  (1) I. Z. 3. 4  (2) 4. 3. Z. I  (3) 4. Z. I. 3  (4) Z. 3. I. 4	V9 2.72 — .2 S. 83 * 10-18 J. 49 V. 45 J. 46 J.
.9 <i>T</i>	A. Energy of the ground state of He+  B. Potential energy of Ist orbit of H- atom C. Kinetic energy of II excited state of He+ Codes.  A. B. C. D.  Codes.  A. B. C. D.  A. B.	7. — 6.04 ev 2. 72.2 ev 3. 8.68 * 10-18 J 4. — 54.4 ev

Questi No.	on Questions
80.	The value of the commutator [x, p²x] is
	$(1) 2i \qquad (2) 2ihp_x$
	(3) $2ixp_x$ (4) $h i p_x/\pi$
81.	The room temperature magnetic moment ( $\mu_{eff}$ in BM) for a monomeric Cu(II) complex is greater than 1.73. This may be explained using the expression
	(1) $\mu_{\text{eff}} = \mu_{\text{e}} (1 - \alpha \lambda / \Delta)$ (2) $\mu_{\text{eff}} = [n (n + 2)]^{\frac{1}{2}}$
	(3) $\mu_{\text{eff}} = [4s (s+1) + L (L+1)]^{\frac{1}{2}}$ (4) $\mu_{\text{eff}} = g [J (J+1)]^{\frac{1}{2}}$
82.	The numbers of P-S and P-P bonds in the compound P <sub>4</sub> S <sub>3</sub> are, respectively,
	(1) 3 and 6 (2) 4 and 3
	(3) 6 and 3 (4) 6 and 2
83.	In the absence of bound globin chain, heme group on exposure to O <sub>2</sub> gives the iron-oxgen species
	(1) Fe(III) –O– Fe(III) (2) Fe(III) –O–O-
	(3) Fe(III) -O-O-Fe(III) (4) Fe(IV) -O-
84.	The complex [Cr(bipyridyl) <sub>3</sub> ] <sup>2+</sup> , shows a red phosphorescence due to transition
	(1) ${}^{4}T_{1g} \leftarrow {}^{4}A_{2g}$ (2) ${}^{2}E_{g} \leftarrow {}^{4}A_{2g}$
85.	Consider the following reactions in N <sub>2</sub> O <sub>4</sub>
	i. $NOC\ell + Sn$ ii. $NOC\ell + AgNO_3$
	iii. $NOC\ell + BrF_3$ iv. $NOC\ell + SbC\ell_5$
-	Reactions which will give [NO] <sup>+</sup> as a major product are:
	(1) i and ii (2) iii and iv
	(3) i and iv (4) ii and iv

Question No.	Questions
110.	
86.	The number of 3c–2e bonds present in $A\ell(BH_4)_3$ is
	(1) four (2) three
	(3) six (4) zero
87.	The role of copper salt as co-catalyst in Wacker process is
	(1) Oxidation of Pd(0) by Cu(II) (2) Oxidation of Pd(0) by Cu(I)
	(3) Oxidation of Pd(II) by Cu(I) (4) Oxidation of Pd(II) by Cu(II)
88.	For the oxidation state/s of sulphur atoms in S <sub>2</sub> O, consider the following;
	i) $-2$ and $+4$ ii) $0$ and $+2$
	iii) $+4$ and 0 iv) $+2$ and $+2$
	The correct answer is/are
	(1) i and ii (2) i and iii
	(3) ii and iv (4) iii and iv
89.	The geometries of $[C\ell F_4]^+$ and $[IF_4]^-$ respectively are
	(1) Tetrahedral and tetrahedral
4	(2) Tetrahedral and trigonal bipyramidal
	(3) Tetrahedral and Square planar
	(4) Tetrahedral and Octahedral
90.	Among the complexes (i) $K_4[(Cr(CN)_6], (ii) K_4[(Fe(CN)_6], (iii) K_3[(Co(CN)_6], and (iv) K_4[(Mn(CN)_6], Jahn Teller distortion is expected in$
	(1) i, ii and iii (2) ii, iii and iv
	(3) i and iv (4) ii and iii

Question No.	Questions
91. ,.	Which one of the following high spin complexes has the largest CSFE Crystal field stabilization energy
	(1) $[Cr(H_2O)_6]^{2+}$ (2) $[Mn(H_2O)_6]^{2+}$
a t	(3) $[Fe(H_2O)_6]^{2+}$ (4) $[Co(H_2O)_6]^{2+}$
92.	The number of 3c, 2e BHB and B-B bonds present in $\mathrm{B_4H_{10}}$ respectively are
	(1) 2, 4 (2) 3, 2
	(3) 4, 1 (4) 4, 0
93.	The most unstable species among the following is
	(1) $\operatorname{Ti}(C_2H_5)_4$ (2) $\operatorname{Ti}(CH_2Ph)_4$
* 7	(3) $Pb(CH_3)_4$ (4) $Pb(C_2H_5)_4$
94.	The acid catalyzed hydrolysis of trans-[Co(en) <sub>2</sub> AX) <sup>n+</sup> can give cis-product also due to the formation of
	(1) Square pyramidal intermediate
* **	(2) Trigonal bipyramidal intermediate
	(3) Pentagonal bipyramidal intermediate
-	(4) Face capped octahedral intermediate
95.	Total number of lines expected in $^{31}P$ NMR spectrum of HPF $_2$ is (I = $1/2$ for both $^{19}F$ and $^{31}P$ )
	(1) Six (2) Four
	(3) Five (4) Three

Question	Questions
No.	questions
96.	The number of faces, vertices and edges in IF, polyhedron are, respectively
	(1) 15, 7 and 15 (2) 10, 7 and 15
	(3) 10, 8 and 12 (4) 12, 6 and 9
97.	The light pink colour of $[{\rm Co(H_2O)_6}]^{2+}$ and the deep blue colour of $[{\rm CoC}\ell_4]^{-2}$ are due to
	(1) MLCT transition in the first and d-d transition in the second
	(2) LMCT transitions in both
	(3) d-d transitions in both
	(4) d-d transition in the first and MLCT transition in the second
98.	In $[Mo_2(S_2)_6]^{2-}$ cluster the number of bridging S atoms and coordination number of Mo respectively, are
	(1) 2 and 8 (2) 2 and 6
	(3) 1 and 8 (4) 1 and 6
99.	The number of possible isomers of [Ru(PPh <sub>3</sub> ) <sub>2</sub> (acac) <sub>2</sub> ] (acac = acetylacetonate) is
	(1) 2 (2) 5
	(3) 4 (4) 3
100.	Which ones among CO <sub>3</sub> <sup>2-</sup> , XeO <sub>3</sub> , SO <sub>3</sub> , PO <sub>3</sub> <sup>3-</sup> and NO <sub>3</sub> <sup>-</sup> have planar structure?
	(1) $CO_3^{2-}$ , $PO_3^{3-}$ and $XeO_3$ (2) $CO_3^{2-}$ , $XeO_3$ and $NO_3^{-}$
	(3) $SO_3$ , $PO_3^{3-}$ and $NO_3^{-}$ (4) $CO_3^{2-}$ , $SO_3$ and $NO_3^{-}$

(20)

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## (MPH/PHD/URS-EE-2019) CHEMISTRY

Time: 11/4 Hours	Total Quest		Max. Marks: 100
Roll No	(in figure)		(in words)
Name :		Father's Nam	ne:
Mother's Name:		Date of Exam	ination:
(Signature of the candidate)		(Sign	ature of the Invigilator)

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Question No.	Questions
1.	For a potentiometric titration in the curve of emf (E) v/s volume (V) of the titrant added, the equivalence point is indicated by
	(1) $ dE/dV  = 0$ , $ d^2E/dV^2  = 0$ (2) $ dE/dV  = 0$ , $ d^2E/dV^2  > 0$
	(3) $ dE/dV  > 0$ , $ d^2E/dV^2  = 0$ (4) $ dE/dV  > 0$ , $ d^2E/dV^2  > 0$
2.	If the concentration (c) is increased to 4 times its original value (c), the change in molar conductivity for strong electrolytes is (where b is kohlrausch's constant).
	(1) 0 (2) b√c
	(3) $2b\sqrt{c}$ (4) $4b\sqrt{c}$
3.	The energy levels of the harmonic oscillator (neglecting zero point energy) are $\varepsilon_v = nhv$ for $n = 0, 1, 2 \dots$ Assuming $hv = k_B T/3$ ; the partition function is
	(1) e (2) $e^{1/3} (e^{1/3} - 1)$
	(3) 1/3e (4) 3e/(3e <sup>3</sup> - 1)
4.	The ground state of hydrogen atom is $-13.598$ eV. The exception values of kinetic energy $<$ T $>$ and potential energy, $<$ V $>$ , in units of eV, are
	(1) $=13.598$ , $=-27.196$ (2) $=-27.196$ , $=13.598$
	(3) $<$ T>=-6.799, $<$ V>=-6.799 (4) $<$ T>=6.799, $<$ V>=-20.397
5.	The correct expression for the product $((M_n).(M_w))$ [where $M_n$ and $M_w$ are the number average and weight average molar masses, respectively, of a polymer] is
	(1) $N^{-1} \sum_{i} N_{i} M_{i}$ (2) $N^{-1} \sum_{i} N_{i} M_{i}^{2}$
	(3) $N/\sum_{i} N_{i} M_{i}$ (4) $N/\sum_{i} N_{i} M_{i}^{2}$

Question No.		Questions								
6.	Ma	tch tl	he foll	owin	g colun	ins:				
				Col	umn-1				Co	lumn-2
	A.	Ene	ergy o	f the	ground	state of	He+		1.	$-6.04  \mathrm{ev}$
	B.	Pot	ential	enei	gy of Is	st orbit o	f H– a	tom	2.	– 27.2 ev
	C.	Kin	etic e	nerg	y of II e	xcited st	ate of	He+	3.	$8.68 * 10^{-18} J$
	D.	Ion	isatio	n pot	ential o	f He+			4.	$-54.4 \mathrm{ev}$
к:	Cod	les.								
		Α	В	C	D					
	(1)	1	2	3	4					
	(2)	4	3	2	1					
	(3)	4	2	1	3					
	(4)	2	3	1	4					
7.	The	prot	ecting	pow	er of ly	ophilic co	lloida	l sol is	expres	ssed in terms of
	(1)	Crit	tical n	iscel	le conce	entration	(2)	Oxi	dation	number
	(3)	Coa	gulati	on va	lue		(4)	Gol	d numb	er
8.	Whi	ich o	ne of t	he fo	llowing	is an exa	mple	for ho	nogeno	us catalysis?
	(1)	Hyd	lrogen	ation	of oil					34
	(2)	Mar	ufact	ure o	fammo	nia by H	aber's	proces	38	*
	(3)	Mar	nufact	ure o	f sulph	uric acid	by Cor	ntact p	rocess	
	(4)	Hyd	rolysi	s of s	ucrose	in preser	ce of	dilute	hydrocl	nloric acid
9.	The Con	ener stant	gy of a t). The	hydr dege	ogen at	om in a st of the st	ate is	(–hcR <sub>r</sub> ll be	/25), wl	nere R <sub>H</sub> = Rydberg
	(1)	25¹				(2)	25 <sup>2</sup>			
	(3)	25³				(4)	254			4

Question No.	Questions					
10.	The value of the commutator [x, p <sup>2</sup> <sub>x</sub> ] is					
	(1)	2i	(2)	2 i h p <sub>x</sub>		
	(3)	$2ixp_x$	(4)	h i p <sub>x</sub> /π		
11.	Cu(	room temperature magne II) complex is greater tha ression	etic m	oment (µ <sub>eff</sub> in BM) for a monomeric 3. This may be explained using the		
	(1)	$\mu_{\rm eff} = \mu_{\rm m} (1 - \alpha \lambda / \Delta)$	4			
	(2)	$\mu_{\text{eff}} = \mu_{\text{H}} (1 - \alpha \lambda / \Delta)$ $\mu_{\text{eff}} = [n (n + 2)]^{4}$		'		
	(3)	$\mu_{\text{eff}} = [4s (s + 1) + L (L + 1)]$	]%	±2		
	(4)	$\mu_{\text{eff}} = g [J (J + 1)]^{\frac{1}{2}}$		# # # # # # # # # # # # # # # # # # #		
12.	The	numbers of P-S and P-P bo	nds i	n the compound P <sub>4</sub> S <sub>3</sub> are, respectively,		
	(1)	3 and 6	(2)	4 and 3		
	(3)	6 and 3	(4)	6 and 2		
13.		he absence of bound globin iron-oxgen species	chain	, heme group on exposure to $O_2$ gives		
	(1)	Fe(III) -O- Fe(III)	(2)	Fe(III) -O-O-		
	(3)	Fe(III) –O–O– Fe(III)	(4)	Fe(IV) -O-		
14.		complex [Cr(bipyridyl) <sub>3</sub> ] sition	²+, sh	ows a red phosphorescence due to		
	(1)	$^{4}T_{1g} \leftarrow ^{4}A_{2g}$ $^{4}T_{2g} \leftarrow ^{4}A_{2g}$	(2)	${}^{2}E_{g} \leftarrow {}^{4}A_{2g}$ ${}^{4}A_{2g} \leftarrow {}^{2}E_{g}$		
**	(3)	<sup>4</sup> T <sub>2g</sub> ← <sup>4</sup> A <sub>2g</sub>	(4)	$^{4}A_{2g} \leftarrow {}^{2}E_{g}$		

(3)

Question No.	Questions					
15.	Con	sider the following reactions in	N	$^{\prime}_{2}\mathrm{O}_{4}$		
	i.	NOCℓ+Sn ii.		$NOC\ell + AgNO_3$		
	iii.	$NOC\ell + BrF_3$ iv.		$NOC\ell + SbC\ell_5$		
	Rea	ctions which will give [NO]+ as	a	major product are :		
	(1)	i and ii (2)		iii and iv		
	(3)	i and iv (4)	)	ii and iv		
16.	The	number of 3c–2e bonds presen	t i	$n A \ell (BH_4)_3$ is		
	(1)	four (2)		three		
	(3)	six (4)	)	zero		
17.	The	role of copper salt as co-cataly	st	in Wacker process is		
	(1)	Oxidation of Pd(0) by Cu(II)		(2) Oxidation of Pd(0) by Cu(I)		
	(3)	Oxidation of Pd(II) by Cu(I)		(4) Oxidation of Pd(II) by Cu(II)		
18.	For	the oxidation state/s of sulphu	r	atoms in $S_2O$ , consider the following;		
	i)	-2 and +4 ii)	)	0 and + 2		
	iii)	+ 4 and 0 iv	)	+ 2 and + 2		
	The	e correct answer is/are				
	(1)	i and ii (2	2)	i and iii		
	(3)	ii and iv (4	l)	iii and iv		
19.	The	geometries of $[C\ell F_4]^+$ and $[IF]$	<u>]</u> -	respectively are		
	(1)	Tetrahedral and tetrahedral		÷ ·		
	(2)	Tetrahedral and trigonal bipy	ra	amidal		
	(3)	Tetrahedral and Square plan	ar			
V	(4)	Tetrahedral and Octahedral				

Question No.	Questions				
20.	Among the complexes (i) $K_4[(Cr(CN)_6], (ii) K_4[(Fe(CN)_6], (iii) K_3[(Co(CN)_6], and (iv) K_4[(Mn(CN)_6], Jahn Teller distortion is expected in$				
	(1) i, ii and iii (2) ii, iii and iv				
	(3) i and iv (4) ii and iii				
21.	Which one of the following high spin complexes has the largest CSFE Crystal field stabilization energy				
	(1) $[Cr(H_2O)_6]^{2+}$ (2) $[Mn(H_2O)_6]^{2+}$				
,	(3) $[Fe(H_2O)_6]^{2+}$ (4) $[Co(H_2O)_6]^{2+}$				
22.	The number of 3c, 2e BHB and B-B bonds present in $B_4H_{10}$ respectively are				
	(1) 2, 4 (2) 3, 2				
	(3) 4, 1 (4) 4, 0				
23.	The most unstable species among the following is				
	(1) Ti(C <sub>2</sub> H <sub>5</sub> ) <sub>4</sub> (2) Ti(CH <sub>2</sub> Ph) <sub>4</sub>				
1.0	(3) Pb(CH <sub>3</sub> ) <sub>4</sub> (4) Pb(C <sub>2</sub> H <sub>5</sub> ) <sub>4</sub>				
24.	The acid catalyzed hydrolysis of trans-[Co(en) <sub>2</sub> AX) <sup>n+</sup> can give cis-product also due to the formation of				
	(1) Square pyramidal intermediate				
	(2) Trigonal bipyramidal intermediate				
	(3) Pentagonal bipyramidal intermediate				
	(4) Face capped octahedral intermediate				
Duname					

Question No.	Questions					
25.	Total number of lines expected in $^{31}P$ NMR spectrum of HPF $_2$ is (I = 1/2 for both $^{19}F$ and $^{31}P$ )					
	(1) Six (2) Four					
	(3) Five (4) Three					
26.	The number of faces, vertices and edges in ${\rm IF}_7$ polyhedron are, respectively					
	(1) 15, 7 and 15 (2) 10, 7 and 15					
	(3) 10, 8 and 12 (4) 12, 6 and 9					
27.	The light pink colour of $[Co(H_2O)_6]^{2+}$ and the deep blue colour of $[CoC\ell_4]^{-2}$ are due to					
	(1) MLCT transition in the first and d-d transition in the second					
	(2) LMCT transitions in both					
	(3) d-d transitions in both					
	(4) d-d transition in the first and MLCT transition in the second					
28.	In [Mo <sub>2</sub> (S <sub>2</sub> ) <sub>6</sub> ] <sup>2-</sup> cluster the number of bridging S atoms and coordination number of Mo respectively, are					
	(1) 2 and 8 (2) 2 and 6					
	(3) 1 and 8 (4) 1 and 6					
29.	The number of possible isomers of $[Ru(PPh_3)_2(acac)_2]$ (acac = acetylacetonate) is					
	(1) 2 (2) 5					
	(3) 4 (4) 3					

(6)

39. Which ones among CO <sub>3</sub> <sup>2</sup> , XeO <sub>3</sub> , SO <sub>3</sub> , PO <sub>3</sub> <sup>3</sup> and NO <sub>3</sub> - 4 and NO <sub>3</sub> - (1) CO <sub>3</sub> <sup>2</sup> , PO <sub>3</sub> <sup>3</sup> and NO <sub>5</sub> - (4) CO <sub>3</sub> <sup>2</sup> , SO <sub>3</sub> and NO <sub>3</sub> - (1) The product contains 94% of one enantiomer and 6% of other enantiomer  (1) The product contains 94% of one enantiomer and 6% of the product contains 94% of one enantiomer and 6% of the product contains 97% of one enantiomer and 3% of other enantiomer  (2) The product contains 97% of one enantiomer and 3% of other enantiomer  (3) The product contains 97% of one enantiomer and 3% of other enantiomer  (4) C−O  (5) C−C (1) C−C (2) C−C (3) C−C (4) C−C (4	Question No.	Questions
(1) (2) (3) (4) (4) (4) (5) (5) (7) (7) (7) (8) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7	30	Which ones among CO <sub>3</sub> <sup>2-</sup> , XeO <sub>3</sub> , SO <sub>3</sub> , PO <sub>3</sub> <sup>3-</sup> and NO <sub>3</sub> - have planar structure?
(3) (3) (4) (4) (4) (5) (5) (6) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7		CO <sub>3</sub> -, PO <sub>3</sub> - and XeO <sub>3</sub>
(1) (2) (3) (4) (4) (4) (5) (5) (6) (7) (7) (7) (7) (7) (7) (7) (7) (7) (7		SO <sub>3</sub> , PO <sub>3</sub> - and NO <sub>3</sub> -
(3) (4) (4) (5) (6) (7) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9	31.	13
(4) (5) (7) (8) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9		
(1) >C=O  (3) -C-H  (4) -C-OH	32.	Which of the following functional group is not reduced by sodium borohydride (NaBH $_{\! 4})$
(3) $-C-H$ (4) $-C-OH$ $0$ $0$ $0$ The given reaction is the example of:		7 (2)
The given reaction is the example of: $///////////////////////////////////$		-C-H 0
<ul> <li>IM + = →</li> <li>(1) 2 + 4 cycloaddition</li> <li>(2) 2 + 2 cycloaddition</li> <li>(3) 2 + 2 + 2 cycloaddition</li> <li>(4) 2S + 2S cycloaddition</li> <li>(5) 2 + 2 + 2 cycloaddition</li> <li>(6) 2S + 2S cycloaddition</li> <li>(7) 2S + 2S cycloaddition</li> <li>(8) accompanied with the emergy into emission of light</li> </ul>	33.	The given reaction is the example of :
(1) 2+4 cycloaddition (2) 2+2 cycloaddition (3) 2+2+2 cycloaddition (4) 2S+2S cycloaddition A photo chemical reaction is: (1) catalysed by light (3) accompanied with the emission of light energy into		
(2) 2+2 cycloaddition (3) 2+2+2 cycloaddition (4) 2S+2S cycloaddition A photo chemical reaction is: (1) catalysed by light (3) accompanied with the emission of light energy into		
(3) 2+2+2 cycloaddition  (4) 2S+2S cycloaddition  A photo chemical reaction is:  (1) catalysed by light (3) accompanied with the emergy into emission of light		
A photo chemical reaction is:  (1) catalysed by light (3) accompanied with the emission of light emission of light		
(1) catalysed by light (2) Initiated by (3) accompanied with the emission of light energy into	3	(1) ES STORMATION
accompanied with the (4) used to emission of light		(2)
		accompanied with the (4)

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Question No.	Questions				
	Which of the following solvents is unacceptable on large scale?				
35.				nacceptable on range	
	(1)	Dimethoxy ethane	(2)	Xylene	
	(3)	Diethyl ether	(4)	Heptane	
36.	For	the reaction given below	v, which	reaction condition are not suitable	
		Ö			
		$\bigcup \longrightarrow \bigcup$	]		
	(1)	LiAlH4/et2O	(2)	$H_2N NH_2 / NaOH$	
	(3)	Zn (Hg) / HC $\ell$	(4)	$HSCH_2CH_2CH_2SH / H^+, H_2 / Ni$	
37.	Wh	ich of the following state	ments is	s not correct?	
	(1)	The molecule to be synt	thesised	is a target molecule	
	(2) Synthetic equivalent is a real chemical compound resulting				
	(3) Regioselective reaction does not produce one of several				
		structural isomers	<b>c</b>		
	(4)	from a disconnection.	iragmer	nt (usually cation or anion) resulting	
38.	Hov		ed up in a	row would fit in a one nanomaterial	
	(1)	Seventy	(2)	One	
	(3)	Seven	(4)	None	
39.		role of catalyst in chemic	cal react	ion is	
	(1) Lowers the activation energy				
	(2)	Alters the amount of pr			
	(3)	Increases ΔH of Forward		n ·	
17	(4)	Decreases of $\Delta H$ of Forw	vard read	ction	
40.	Sec	ondary pollutant is			
	(1)	$SO_2$	(2)	co .	
	(3)	PAN	(4)	Aerosol	

Question No.	Questions						
41.	The normality of 2.3 M H <sub>2</sub> SO <sub>4</sub> solution is						
	(1)	2.3 N	(2)	4.6 N			
	(3)	6.9 N	(4)	7.9 N			
42.	Cry	stal cannot posses					
	(1)	1 fold axis of symmetry		2 M			
	(2)	3 fold axis of symmetry		#5			
	(3)	5 fold axis of symmetry					
	(4)	6 fold axis of symmetry		5 <b>.</b>			
43.	Nu	mber of sigma bonds in P40	) <sub>10</sub> is	ė ,i			
	(1)	6	(2)	7.			
	(3)	17	(4)	16			
44.	2 mol of an ideal gas at 27°C is expanded reversibly from 2 lit. To 2 Find entropy change (R = 2 cal / mol K)						
	(1)	92.1	(2)	0			
1	(3)	4	(4)	9.2			
45.	An adiabatic process is						
	(1)	isoenthalpic	(2)	isoentropic			
	(3)	isochoric	(4)	isobaric			

(9)

Question No.	Questions				
46.	At a certain temperature, the following observations were made for the reaction				
	$A \longrightarrow Products$				
	Time [A]				
	(From the start)				
	2 minutes 5*10 <sup>-3</sup>				
L	5 minutes 4*10-3				
	8 minutes 3*10 <sup>-3</sup>				
-	11 minutes 2*10 <sup>-3</sup>				
	The order of the reaction is				
	(1) 1 (2) 2				
	(3) 3 (4) Zero				
47.	How many stereoisomers does have 2, 3-dichloropentane?				
1	(1) 2 (2) 4				
	(3) 3 (4) 5				
48.	Which statement about benzene is incorrect?				
115	(1) The C <sub>6</sub> ring is planar				
	(2) The C-Cπ-bonding is delocalised.				
	(3) The reactivity of the benzene reflects the presence of carbon-carbon double bond.				
	(4) Each C atom is sp <sup>2</sup> hybridized.				

Question No.	Questions				
49.	Which of the following is not a Huckel (4n + 2) aromatic system?				
	(1) [18]-Annulene (C <sub>18</sub> H <sub>18</sub> ) (2) Cyclooctatetraene (C <sub>8</sub> H <sub>8</sub> )				
	(3) Benzene $(C_6H_6)$ (4) Cyclopentadienyl anion $(C_5H_5^-)$				
	Ce				
50	The IUPAC name of Br is:				
	(1) 1-bromo-3-chlorocyclohexene				
	(2) 2-bromo-6-chlorocyclohex-1-ene				
	(3) 6-bromo-2-chlorocyclohexene				
	(4) 3-bromo-1-chlorocyclohexene				
51.	The complex $[Fe(Phen)_2(NCS)_2](Phen-1, 10$ -phnanthroline) shows spin crossover behaviour. CFSE and $\mu_{eff}$ at 250 and 150 K, respectively will be:				
ē	(1) $0.4  \Delta_0$ , $4.90  \text{BM}$ and $2.4  \Delta_0$ , $0.00  \text{BM}$				
	(2) $2.4 \Delta_0$ , 2.90 BM and $0.4 \Delta_0$ , 1.77 BM				
	(3) $2.4  \Delta_0$ , 0.00 BM and 0.4 $\Delta_0$ , 4.90 BM				
	(4) $1-2 \Delta_0$ , 4.90 BM and $2.4 \Delta_0$ , 0.00 BM				
52.	[Ni <sup>II</sup> $L_6$ ] <sup>n+or n-</sup> show absorption bands at 8500, 15400 and 26000 cm <sup>-1</sup> whereas [Ni <sup>II</sup> $L_6$ ] <sup>n+or n-</sup> at 10750, 17500 and 28200 cm <sup>-1</sup> , L and L' are respectively				
	(1) OH- and N <sub>3</sub> -				
	(2) Cℓ- and I-				
	(3) NCS- and RCOO-				
	(4) H <sub>2</sub> O and NH <sub>3</sub>				

Question	Questions						
No.							
53.	The rate of exchange of $\mathrm{OH_2}$ present in the coordination sphere by $^{18}\mathrm{OH_2}$ of						
	i. $[Cu(H_2O)_6]^{2+}$ ; ii) $[Mn(H_2O)_6]^{2+}$ ; iii) $[Fe(H_2O)_6]^{2+}$ ; iv) $[Ni(H_2O)_6]^{2+}$ , follows the order						
	(1) $i > iv > iii > iii > iii > iv > iv)$						
	(3) $ii) > iii) > iv) > i)    (4) iii) > iv) > ii)$						
54.	On addition of an inert gas at constant volume to the reaction						
	$N_2 + 3H_2 \Longrightarrow 2NH_3$ at equilibrium						
	(1) The reaction remains unaffected						
	(2) Forward reaction is favoured						
	(3) The reaction halts						
	(4) Backward reaction is favoured						
55.	The transition zone for Raman spectra is						
	(1) Between vibrational and rotational levels						
	(2) Between electronic levels						
	(3) Between magnetic levels of nuclei						
	(4) Between magnetic levels of unpaired electrons						
56.	Polarisation of the electron cloud by the cation forms						
	(1) Ionic bond (2) Covalent bond						
	(3) Coordinate bond (4) Metallic bond						

(12)

Question No.	Questions				
57.	Activation energy of a chemical reaction can be determined by				
	(1) determining the rate constant at standard temperature				
	(2) determining the rate constants at two temperatures				
	(3) determining probability of collision				
	(4) using catalyst				
58.	Due to Frenkel defect, the density of the ionic solids				
	(1) increases (2) decreases				
	(3) does not change (4) none of the above				
59.	What is the simplest formula of a solid whose cubic unit cell has the atom A at each corner, the atom B at each face centre and a C atom at the body centre				
	(1) AB <sub>2</sub> C (2) A <sub>2</sub> BC				
	(3) AB <sub>3</sub> C (4) ABC <sub>3</sub>				
60.	Which of the following thermodynamic function is called as the arrow of "time"				
	(1) Enthalpy				
	(2) Gibbs free energy				
.,,	(3) Entropy				
	(4) Helmholtz free energy				
DADam					

uestion No.	Questions					
61.	Which of the following is a correct name for the following compound?					
	$\frac{C\ell}{H,C}$ $C = C < \frac{CH_2CH_3}{I}$					
	(1) cis-2-chloro-3-iodo-2-pentene					
	(2) trans-2-chloro-3-ido-2-pentene					
	(3) trans-3-iodo-4chloro-3-pentene					
	(4) cis-3-iodo-4-chloro-3-pentene					
62.	Keto-enol tautomerism is observed in:					
	0 0					
	(1) C <sub>6</sub> H <sub>5</sub> -C-CH <sub>2</sub> -C-CH, (2) C <sub>6</sub> H <sub>5</sub> -C-C <sub>6</sub> H,					
	9					
	O O II II II (3) CH,CH,C-OH (4) C,H,-C-H					
63.	Which of the following gases is mainly responsible for acid rain?					
	(1) $NO_2$ and $CO_2$ (2) $CO_2$ and $SO_2$					
	(3) SO <sub>2</sub> and NO <sub>2</sub> (4) None of these					
64.	Which of the following compound displays two singlets at $\delta_{2.3}$ and 7.1 ppm.					
	(1) 1, 2-dimethylbenzene (2) 1, 3-dimethyl benzene					
	(3) 1, 4-dimethyl benzene (4) methyl benzene					
65.	A single strong and sharp absorption near 1650 cm <sup>-1</sup> in IR spectra indicate the presence of					
F-1	(1) Acid chlorides (2) Amides					
	(3) Anhydrides (4) Aldehydes					
66.	The proteins in which prosthetic group is carbohydrate are known as					
. 4.	(1) Lipo-protein (2) Mucoprotein					
	(3) Chromoprotein (4) Nucleoprotein					
	(14)					
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Question						
No.	Questions					
67.	Match the List Land List II and calcut the same of					
61.	giver	Match the List I and List II and select the correct answer using codes given below:				
		List I	List	t II		
	1	Nerol	Α	Lemon grass oil		
	2	Citral	В	Geraniol		
	3	Pinol	C	Amyrin		
	4	Lupeol	D	α-pinene		
	Corr	ect answer is :				
	(1)	1-C, 2-B, 3-A, 4-D	(2)	1-B, 2-A, 3-D, 4-C		
	(3)	1-D, 2-C, 3-A, 4-D	(4)	1–A, 2–D, 3–B, 4–D		
68.	Hydi	Hydrolysis product of sucrose is:				
	(1)	Fructose	(2)	Glucose + Galactose		
5.00	(3)	Glucose	(4)	Glucose + Fructose		
69.	The mass spectrum of primary amides shows a moderate molecular ion					
	and an Intense peak at $m/z = 44$ due to :					
	(1)	Loss of an alkyl radical	(2)	Loss of HCN		
	(3)	Loss of CO	(4)	Loss of methyl radical		
70.	Whi	ch one of the following is ba	cteri	ostatic drug ?		
	(1)	Chloramphenicol	(2)	Penicillin		
	(3)	Streptomycin	(4)	Phenacetin		
71.	Hea	ting 1, 4-dicarbonyl com	poun	ds in the presence of phosphorus		
	pent	oxide (P <sub>2</sub> O <sub>5</sub> ) gives :		_		
	(1)	Pyrrole	(2)	Furan ·		
	(3)	Thiophene	(4)	Quinoline		
72.	The	Acetylation of thiophene o				
	(1)	3 -		C <sub>4</sub> -position		
ş	(3)	C <sub>2</sub> -position	(4)	both at C <sub>2</sub> and C <sub>4</sub> -positions		

Question No.	Questions				
73.					
	(1) $pKa = 5.2$	21	(2)	pKa = -0.27 pKa = -0.35	
	(3) $pKa = 5.8$	31	(4)	pKa = -0.35	
74.	Least stable c	arbocation among	the t	following is	
	(1) $(CH_3)_3C^+$		(2)	$(CH_3)_2CH^+$	
170	(3) CH <sub>3</sub> CH <sub>2</sub> <sup>+</sup>		(4)	CH <sub>3</sub> <sup>+</sup>	
75.	Due to the pro	esence of an unpa	aired	electron, free radicals are	
<u>-</u>	(1) Anions		(2)	Cations	
	(3) Chemica	lly reactive	(4)	Chemically inreactive	
76.	Benzoyl peroxide undergoes hamolytic cleavage to produce				
	(1) Phenyl ra	adical	(2)	Methyl radical	
	(3) Phenyl cl	nloride	(4)	Methyl chloride	
77.	SN <sup>1</sup> mechanism for the hydrolysis of an alkyl halide involves the formation of intermediate				
	(1) Free radi	cal	(2)	Carbanion	
	(3) Carbocat	ion	(4)	None of these	
78.	Which of the following is NOT polar protic solvent?				
12	(1) H <sub>2</sub> O		(2)	$C_2H_5OH$	
	(3) Fumaric	acid	(4)	Acetone	
79.	A new carbon-	carbon bond forn	ation	n is possible in	
	(1) Clemmen	sen reduction	(2)	Wurtz reduction	
	(3) Friedel-C	raft alkylation	(4)	Oppenauer oxidation	
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Question No.	Questions
80.	Give the name of reaction given below:
	$ \begin{array}{c} O \\ C \\ C$
	(1) Perkin reaction (2) Pechmann condensation (3) Benzoin condensation (4) Claisen-Schmidt reaction
81.	The molecule $(OC)_5M = CPh(OCH_3)$ obeys 18 electron rule. The two 'M' satisfying the condition are
	(1) Cr, Re <sup>+</sup> (2) Mo, V
	(3) V, Re <sup>+</sup> (4) Cr, V
82.	The number of lines exhibited by a high resolution EPR spectrum of the species $[Cu(ethylenediamine)_2]^{2+}$ is [Nuclear spin (I) of copper is 3/2 and of N = 1]
	(1) 12 (2) 15 (3) 20 (4) 36
83.	Complexes of general formula, fac- $[Mo(CO)_3$ (phosphine) <sub>3</sub> ] have the C–O stretching bands as given below:
	Phosphine : $PF_3$ (i); $PC\ell_3$ (ii); $P(C\ell)Ph_2$ (iii); $PMe_3$ (iv)
	v(CO): in cm <sup>-1</sup> : 2090 (a); 2040 (b); 1977 (c); 1945 (d)
je s	The correct combination of the phosphine and the stretching frequency is,
	(1) (i-a) (ii-b) (iii-c) (iv-d) (2) (i-b) (ii-a) (iii-d) (iv-c)
	(3) (i-d) (ii-c) (iii-b) (iv-a) (4) (i-c) (ii-d) (iii-a) (iv-b)

(17)

Question No.	Questions				
84.	Which one of the following will NOT undergo oxidative addition by methyl iodide?				
	(1) $[Rh(CO_2)I_2]$ (2) $[\eta^5-CpRh(CO)_2]$ (3) $[Ir(PPh_3)_2 (CO)C\ell]$ (4) $[\eta^5-Cp_2Ti(Me)C\ell]$				
85.	C <sub>60</sub> has (1) 14 pentagon rings and 18 Hexagon rings (2) 12 pentagon rings and 20 Hexagon rings (3) 12 pentagon rings and 18 Hexagon rings (4) 14 pentagon rings and 20 Hexagon rings				
86.	In 'carbon-dating' application of radioisotopes, <sup>14</sup> C emits  (1) Positron (2) γ particle (3) β particle (4) α particle				
87.	The product of the reaction of propene, CO and H <sub>2</sub> in the presence of Co <sub>2</sub> (CO) <sub>8</sub> as catalyst is  (1) butanoic acid  (2) butanal  (3) 2-butanone  (4) methylpropanoate				
88.	Reductive elimination step in hydrogenation of alkenes by Wilkinson catalyst results in (neglecting solvent in coordination sphere of Rh)  (1) T-shaped [Rh(PPh <sub>3</sub> ) <sub>2</sub> CI] (2) Trigonal-planar [Rh(PPh <sub>3</sub> ) <sub>2</sub> Cl]  (3) T-shaped [Rh(H)(PPh <sub>3</sub> ) <sub>2</sub> ] (4) Trigonal-planar [Rh(H)(PPh <sub>3</sub> ) <sub>2</sub> ]				
89.	<ul> <li>The correct statement with respect to the bonding of the ligands, Mc<sub>3</sub>N and Mc<sub>3</sub>P with the metal ions Be<sup>2+</sup> and Pd<sup>2+</sup> is,</li> <li>(1) the ligands bind equally strong with both the metal ions as they are dicationic</li> <li>(2) the ligands bind equally strong with both the metal ions as both the ligands are pyramidal</li> <li>(3) the binding is stronger for Me<sub>3</sub>N with Be<sup>2+</sup> and Me<sub>3</sub>P with Pd<sup>2+</sup></li> <li>(4) the binding is stronger for Me<sub>3</sub>N with Pd<sup>2+</sup> and Me<sub>3</sub>P with Be<sup>2+</sup></li> </ul>				

Question No.	Questions				
90,	In the iodometric titration of sodium thiosulfate (Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> ) with acidic dichromate solution, 25 mL of 0.1 M dichromate requires 50 mL of 'x' M thiosulfate. The value of 'x' is				
	(1) 0.6 (2) 0.3 (3) 0.1 (4) 0.4				
91.	The number of the lines in the ESR spectrum of CD <sub>3</sub> is (the spin of D is 1)				
	(1) 1 (2) 3 (3) 4 (4) 7				
92.	Colligative properties are used for the determination of				
	(1) molar mass (2) equivalent weight				
	(3) arrangement of molecules (4) melting and boiling point				
93.	Which of the following does not contain a $C_3$ axis?				
	(1) $POC\ell_3$ (2) $NH_4^+$				
	(3) $H_3O^+$ (4) $C\ell F_3$				
94.	Franck Condon principle is related to				
	(1) time required for electronic transition to occur				
	(2) absorption of light				
	(3) time of electronic transition and change in internuclear distance				
-	(4) symmetry of molecules				
95.	Which pairing of molecule and point group is correct?				
	(1) $BC\ell_3$ , $C_{3v}$ (2) $SiC\ell_4$ , $D_{4h}$				
	(3) $H_2S$ , $C_{2v}$ (4) $SF_4$ , $C_{4v}$				
96.	The symmetric stretching mode of the SiF <sub>4</sub> molecule:				
	(1) IR active				
	(2) IR inactive				
	(3) generates a change in molecular dipole moment				
	(4) gives rise to a strong absorption in IR spectrum				

(19)

No.	Questions					
97.	Match the following columns:					
	LIST-1 LIST-2			LIST-2		
	1.	Sol			A.	Liquid dispersed in solid
	2.	Gel			В.	gas dispersed in liquid
	3.	Emulsi	on		C.	1 1 1 1 1 1
7.	4.	Foam			D.	
	Cod				2.	
	(1)	1-A	2-B	3-C	4-D	
	(2)	1-B	2–C	3-D	4–A	
	(3)	1-C	2-A	3-D	4-B	
	(4)	1-B	2-D	3–A	4-C	
98.	A h	eat engi	ne ope	rates b	etween t	he boiling point of water and a room
	tem	peratur	e of 25°	C. The	efficienc	y of the engine is largest, if water is
		wed to b	10 m			
	(1)	1 atm.			(2)	10 atms
					. ,	10 atms
	(3)	25 atm	3		(4)	1.01 * 10 <sup>6</sup> Nm <sup>-2</sup>
99.		25 atm		is	(4)	
99.		nomer of	Orlon		all:	
99.	Mor	nomer of	Orlon	$H_3$	(2)	1.01 * 10 <sup>6</sup> Nm <sup>-2</sup>
99.	Mor (1) (3)	omer of $CH_2 = C$ $CH_2 = C$	Orlon CH-OCI CH – Cl	H <sub>3</sub>	(2)	$1.01 * 10^6 \text{ Nm}^{-2}$ $CF_2 = CF_2$
	Mor (1) (3)	omer of $CH_2 = C$ $CH_2 = C$	Orlon : CH-OCI CH – Cl	H <sub>3</sub>	(2)	$1.01 \star 10^6 \mathrm{Nm^{-2}}$ $\mathrm{CF_2} = \mathrm{CF_2}$ $\mathrm{CH_2} = \mathrm{CH} - \mathrm{C}\ell$ lition of $\mathrm{HC}\ell$ to

(20)

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

## (MPH/PHD/URS-EE-2019) CHEMISTRY

Code

Sr. No. 10012

SET-"X"

Time: 11/4 Hours Total Ques		ions: 100	Max. Marks: 100	
Roll No.	(in figure)			_ (in words)
Name:		Father's Name:		
Mother's Name:		Date of Examina	tion:	

(Signature of the candidate)

(Signature of the Invigilator)

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- 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 / misbehaviour 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.
- 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 <u>BALL POINT PEN</u> 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.

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Question No.	Questions
1.	The molecule $(OC)_5M = CPh(OCH_5)$ obeys 18 electron rule. The two 'M satisfying the condition are
	(1) Cr, Re <sup>+</sup> (2) Mo, V
	(3) V, Re <sup>+</sup> (4) Cr, V
2.	The number of lines exhibited by a high resolution EPR spectrum of the species $[Cu(ethylenediamine)_2]^{2+}$ is [Nuclear spin (I) of copper is 3/2 and of N = 1]
	(1) 12 (2) 15
	(3) 20 (4) 36
	Phosphine : $PF_3$ (i); $PC\ell_3$ (ii); $P(C\ell)Ph_2$ (iii); $PMe_3$ (iv) $v(CO)$ : in cm <sup>-1</sup> : 2090 (a); 2040 (b); 1977 (c); 1945 (d)
	The correct combination of the phosphine and the stretching frequency is,
4	(1) (i-a) (ii-b) (iii-c) (iv-d) (2) (i-b) (ii-a) (iii-d) (iv-c)
	(3) (i-d) (ii-c) (iii-b) (iv-a) (4) (i-c) (ii-d) (iii-a) (iv-b)
4.	Which one of the following will $NOT$ undergo oxidative addition by methyl iodide ?
	(1) $[Rh(CO_2)I_2]$ (2) $[\eta^5-CpRh(CO)_2]$
	(3) $[Ir(PPh_3)_2(CO)C\ell]$ (4) $[\eta^5-Cp_2Ti(Me)C\ell]$
	the state of the s

(1)

Question No.	Questions						
5.	C <sub>60</sub> has						
	(1) 14 pentagon rings and 18 Hexagon rings						
	(2) 12 pentagon rings and 20 Hexagon rings						
	(3) 12 pentagon rings and 18 Hexagon rings						
	(4) 14 pentagon rings and 20 Hexagon rings						
6.	In 'carbon-dating' application of radioisotopes, 14C emits						
	(1) Positron (2) γ particle						
11	(3) β particle (4) α particle						
7.	The product of the reaction of propene, CO and H <sub>2</sub> in the presence of						
	Co <sub>2</sub> (CO) <sub>8</sub> as catalyst is						
+1	(1) butanoic acid (2) butanal						
-	(3) 2-butanone (4) methylpropanoate						
8.	Reductive elimination step in hydrogenation of alkenes by Wilkinson catalyst results in (neglecting solvent in coordination sphere of Rh)						
	(1) T-shaped [Rh(PPh <sub>3</sub> ) <sub>2</sub> CI] (2) Trigonal-planar [Rh(PPh <sub>3</sub> ) <sub>2</sub> Cℓ]						
2	(3) T-shaped $[Rh(H)(PPh_3)_2]$ (4) Trigonal-planar $[Rh(H)(PPh_3)_2]$						
9.	The correct statement with respect to the bonding of the ligands, Mc <sub>3</sub> N and Mc <sub>3</sub> P with the metal ions Be <sup>2+</sup> and Pd <sup>2+</sup> is,						
4400	(1) the ligands bind equally strong with both the metal ions as they are dicationic						
a	(2) the ligands bind equally strong with both the metal ions as both the ligands are pyramidal						
	(3) the binding is stronger for Me <sub>3</sub> N with Be <sup>2+</sup> and Me <sub>3</sub> P with Pd <sup>2+</sup>						

Question				
No.	Questions			
	· · ·			
10.	In the iodometric titration of sodium thiosulfate (Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> ) with acidic			
	dichromate solution, 25 mL of 0.1 M dichromate requires 50 mL of 'x' M			
	thiosulfate. The value of 'x' is			
	(1) 0.6 (2) 0.3			
	(3) 0.1 (4) 0.4			
11.	What is meant by a reaction going in 94% enantiomeric excess?			
	(1) The product contains 94% of one enantiomer and 6% of other enantiomer			
	(2) The product contains an enantiomer which is 94% pure			
	(3) The product contains 94% of one enantiomer and 6% of the products			
	(4) The product contains 97% of one enantiomer and 3% of other			
	enantiomer			
12.	Which of the following functional group is not reduced by sodium			
	borohydride (NaBH <sub>4</sub> )			
	(1) $\searrow$ C=O (2) $-$ C $-$ C $\ell$			
	Ö			
	(3) -C-H (4) -C-OH			
14				
13.	The given reaction is the example of:			
10.				
	$///// + = \rightarrow \langle - \rangle$			
	(1) 2+4 cycloaddition (2) 2+2 cycloaddition			
	(3) 2+2+2 cycloaddition (4) 2S+2S cycloaddition			
14.	A photo chemical reaction is:			
	(1) catalysed by light (2) Initiated by light			
	(3) accompanied with the (4) used to convert heat			
v	emission of light energy into light			
*				

Question No.	Questions
-	
15.	Which of the following solvents is unacceptable on large scale?
6	(1) Dimethoxy ethane (2) Xylene
	(3) Diethyl ether (4) Heptane
16.	For the reaction given below, which reaction condition are not suitable
	O O
	$\bigcap \longrightarrow \bigcap$
1 1981	(1) $\text{LiA}\ell\text{H}_4/\text{st}_2\text{O}$ (2) $\text{H}_2\text{N NH}_2/\text{NaOH}$
	(3) $\operatorname{Zn}(\operatorname{Hg})/\operatorname{HC}\ell$ (4) $\operatorname{HSCH_2CH_2CH_2SH'H^+, H_2/Ni}$
17.	Which of the following statements is <u>not</u> correct?
	(1) The molecule to be synthesised is a target molecule
	(2) Synthetic equivalent is a real chemical compound resulting from
	disconnection
38	(3) Regioselective reaction does not produce one of several possible
- 1	structural isomers
٠.	(4) Synthon is an idealised fragment (usually cation or anion) resulting
	from a disconnection.
18.	How many oxygen atoms lined up in a row would fit in a one nanomateria
	space :
	(1) Seventy (2) One
	(3) Seven (4) None
19.	The role of catalyst in chemical reaction is
-	(1) Lowers the activation energy
	(2) Alters the amount of products
	(3) Increases ΔH of Forward reaction
_	(A) D
	(4) Decreases of ΔH of Forward reaction
20.	(4) Decreases of ΔH of Forward reaction  Secondary pollutant is
20.	

Question No.	Questions							
21.	Which of the following is a correct name for the following compound?							
/	$\frac{C\ell}{H_1C}C = C < \frac{CH_2CH_3}{I}$							
	(1) cis-2-chloro-3-iodo-2-pentene							
	(2) trans-2-chloro-3-ido-2-pentene							
2 11	(3) trans-3-iodo-4chloro-3-pentene							
	(4) cis-3-iodo-4-chloro-3-pentene							
22.	Keto-enol tautomerism is observed in:							
	O O O O O O O O O O O O O O O O O O O							
	Ĭ							
	(3) CH,CH,C-OH (4) C,H,-C-H							
23.	Which of the following gases is mainly responsible for acid rain?							
	(1) NO <sub>2</sub> and CO <sub>2</sub> (2) CO <sub>2</sub> and SO <sub>2</sub>							
	(3) SO <sub>2</sub> and NO <sub>2</sub> (4) None of these							
24.	Which of the following compound displays two singlets at $\delta_{2.3}$ and 7.1 ppm.							
	(1) 1, 2-dimethylbenzene (2) 1, 3-dimethyl benzene							
	(3) 1, 4-dimethyl benzene (4) methyl benzene							
25.	A single strong and sharp absorption near 1650 cm <sup>-1</sup> in IR spectra indicates the presence of							
	(1) Acid chlorides (2) Amides							
	(3) Anhydrides (4) Aldehydes							

Question			Ques	tions			
No.							
26.	The as	e proteins in which prostl	netic	group is carbohydrate are known			
	(1)	Lipo-protein	(2)	Mucoprotein			
	(3)	Chromoprotein	(4)	Nucleoprotein			
27.	Match the List I and List II and select the correct answer using code given below:						
		List I	Lis	t II			
	1.	Nerol	Α	Lemon grass oil			
	2	Citral	В	Geraniol			
	3	Pinol	C	Amyrin			
	4	Lupeol	D	α-pinene			
	Correct answer is:						
	(1)	1-C, 2-B, 3-A, 4-D	(2)	1–B, 2–A, 3–D, 4–C			
	(3)	1–D, 2–C, 3–A, 4–D	(4)	1–A, 2–D, 3–B, 4–D			
28.	Hyd	drolysis product of sucrose i	8:				
9	(1)	Fructose	(2)	Glucose + Galactose			
	(3)	Glucose	(4)	Glucose + Fructose			
29.	The mass spectrum of primary amides shows a moderate molecular ion and an Intense peak at $m/z = 44$ due to :						
	(1)	Loss of an alkyl radical	(2)	Loss of HCN			
	(3)	Loss of CO	(4)	Loss of methyl radical			
30.	Which one of the following is bacteriostatic drug?						
/	(1)	Chloramphenicol					
	(2)	Penicillin					
	(3)	Streptomycin					
	(4)	Phenacetin					
- 45 - 2 - 1		2.					

Question No.	Questions
31.	The number of the lines in the ESR spectrum of CD <sub>3</sub> is (the spin of D is 1)
/	(1) 1 (2) 3
	(3) 4 (4) 7
32.	Colligative properties are used for the determination of
4	(1) molar mass
	(2) equivalent weight
	(3) arrangement of molecules
	(4) melting and boiling point
33.	Which of the following does not contain a C <sub>3</sub> axis?
	(1) POCl <sub>3</sub> (2) NH <sub>4</sub> <sup>+</sup>
1 - 4	(3) $H_3O^+$ (4) $C\ell F_3$
34.	Franck Condon principle is related to
	(1) time required for electronic transition to occur
201	(2) absorption of light
	(3) time of electronic transition and change in internuclear distance
	(4) symmetry of molecules
35.	Which pairing of molecule and point group is correct?
	(1) $BC\ell_3$ , $C_{3v}$ (2) $SiC\ell_4$ , $D_{4h}$
* #	(3) $H_2S$ , $C_{2v}$ (4) $SF_4$ , $C_{4v}$
36.	The symmetric stretching mode of the SiF <sub>4</sub> molecule:
	(1) IR active
	(2) IR inactive
	(3) generates a change in molecular dipole moment
	(4) gives rise to a strong absorption in IR spectrum
li i	

Question No.	Questions				
37.	Match the following columns:				
	LIST-1 LIST-2				
	1. Sol A. Liquid dispersed in solid				
	2. Gel B. gas dispersed in liquid				
	3. Emulsion C. Solid dispersed in liquid				
1	4. Foam D. liquid dispersed in liquid				
4	Codes				
143	(1) 1–A 2–B 3–C 4–D				
*	(2) 1–B 2–C 3–D 4–A				
	(3) 1-C 2-A 3-D 4-B				
	(4) 1–B 2–D 3–A 4–C				
38.	A heat engine operates between the boiling point of water and a room temperature of 25°C. The efficiency of the engine is largest, if water is allowed to boil at a pressure of—  (1) 1 atm.  (2) 10 atms  (3) 25 atms  (4) 1.01 * 10 <sup>6</sup> Nm <sup>-2</sup>				
39.	Monomer of Orlon is				
	(1) $CH_2 = CH - OCH_3$ (2) $CF_2 = CF_2$				
	(3) $CH_2 = CH - CN$ (4) $CH_2 = CH - C\ell$				
40.	Chloroprene is obtained by the addition of $HC\ell$ to				
	(1) ethylene (2) acetylene				
	(3) vinylacetylene (4) phenylacetylene				

(8)

Question No.	Questions
41.	The complex $[Fe(Phen)_2(NCS)_2](Phen-1, 10$ -phnanthroline) shows spin crossover behaviour. CFSE and $\mu_{eff}$ at 250 and 150 K, respectively will be:
	(1) $0.4  \Delta_0$ , $4.90  \text{BM}$ and $2.4  \Delta_0$ , $0.00  \text{BM}$
1	(2) $2.4  \Delta_0$ , $2.90  \text{BM}$ and $0.4  \Delta_0$ , $1.77  \text{BM}$
	(3) $2.4  \Delta_0$ , 0.00 BM and $0.4  \Delta_0$ , 4.90 BM
	(4) $1-2 \Delta_0$ , 4.90 BM and $2.4 \Delta_0$ , 0.00 BM
42.	$[\mathrm{Ni^{II}}\ \mathrm{L_6}]^{\mathrm{n+or}\mathrm{n-}}$ show absorption bands at 8500, 15400 and 26000 cm $^{-1}$ whereas $[\mathrm{Ni^{II}}\ \mathrm{L'_6}]^{\mathrm{n+or}\mathrm{n-}}$ at 10750, 17500 and 28200 cm $^{-1}$ , L and L' are respectively
	(1) OH- and $N_3$ - (2) $C\ell$ - and $I$ -
	(3) NCS- and RCOO- (4) H <sub>2</sub> O and NH <sub>3</sub>
43.	The rate of exchange of $\mathrm{OH_2}$ present in the coordination sphere by $^{18}\mathrm{OH_2}$ of
	i. $[Cu(H_2O)_6]^{2+}$ ; ii) $[Mn(H_2O)_6]^{2+}$ ; iii) $[Fe(H_2O)_6]^{2+}$ ; iv) $[Ni(H_2O)_6]^{2+}$ , follows the order
	(1) $i > iv > iii > iii > iii > iv$
	(3) $ii) > iii) > iv) > i)   (4) iii) > iv) > ii)$
44.	On addition of an inert gas at constant volume to the reaction
	$N_2 + 3H_2 \rightleftharpoons 2NH_3$ at equilibrium
	(1) The reaction remains unaffected
	(2) Forward reaction is favoured
	(3) The reaction halts
	(4) Backward reaction is favoured

Question No.	Questions				
45.	The transition zone for Raman spectra is				
	(1) Between vibrational and rotational levels				
	(2) Between electronic levels				
	(3) Between magnetic levels of nuclei				
	(4) Between magnetic levels of unpaired electrons				
46.	Polarisation of the electron cloud by the cation forms				
	(1) Ionic bond (2) Covalent bond				
	(3) Coordinate bond (4) Metallic bond				
47.	Activation energy of a chemical reaction can be determined by				
	(1) determining the rate constant at standard temperature				
	(2) determining the rate constants at two temperatures				
	(3) determining probability of collision				
	(4) using catalyst				
48.	Due to Frenkel defect, the density of the ionic solids				
	(1) increases (2) decreases				
	(3) does not change (4) none of the above				
49.	What is the simplest formula of a solid whose cubic unit cell has the atom A at each corner, the atom B at each face centre and a C atom at the body centre				
8	(1) AB <sub>2</sub> C (2) A <sub>2</sub> BC				
	(3) AB <sub>3</sub> C (4) ABC <sub>3</sub>				

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(10)

Question No.	Questions				
50.	Which of the following thermodynamic function is called as the arrow o "time"				
	(1) Enthalpy (2) Gibbs free energy				
	(3) Entropy (4) Helmholtz free energy				
51.	The room temperature magnetic moment ( $\mu_{eff}$ in BM) for a monomeric Cu(II) complex is greater than 1.73. This may be explained using the expression				
	(1) $\mu_{\text{eff}} = \mu_{s} (1 - \alpha \lambda / \Delta)$ (2) $\mu_{\text{eff}} = [n (n + 2)]^{\nu_{s}}$				
	(3) $\mu_{\text{eff}} = [4s (s + 1) + L (L + 1)]^{\frac{1}{2}}$ (4) $\mu_{\text{eff}} = g [J (J + 1)]^{\frac{1}{2}}$				
52.	The numbers of P-S and P-P bonds in the compound $P_4S_3$ are, respectively,				
	(1) 3 and 6 (2) 4 and 3				
	(3) 6 and 3 (4) 6 and 2				
53.	In the absence of bound globin chain, heme group on exposure to ${\rm O}_2$ gives the iron-oxgen species				
	(1) $Fe(III) - O - Fe(III)$ (2) $Fe(III) - O - O$				
	(3) Fe(III) -O-O-Fe(III) (4) Fe(IV) -O-				
54.	The complex [Cr(bipyridyl) <sub>3</sub> ] <sup>2+</sup> , shows a red phosphorescence due to transition				
	(1) ${}^{4}T_{1g} \leftarrow {}^{4}A_{2g}$ (2) ${}^{2}E_{g} \leftarrow {}^{4}A_{2g}$ (3) ${}^{4}T_{2g} \leftarrow {}^{4}A_{2g}$ (4) ${}^{4}A_{2g} \leftarrow {}^{2}E_{g}$				
	(1) ${}^{4}T_{1g} \leftarrow {}^{4}A_{2g}$ (2) ${}^{2}E_{g} \leftarrow {}^{4}A_{2g}$ (3) ${}^{4}T_{2g} \leftarrow {}^{4}A_{2g}$ (4) ${}^{4}A_{2g} \leftarrow {}^{2}E_{g}$				

Questio	n				
No.	Questions				
55.	Consider the Ciliary				
55,	Consider the following reactions in N <sub>2</sub> O <sub>4</sub>				
	i. $NOC\ell + Sn$ ii. $NOC\ell + AgNO_3$				
	iii. $NOC\ell + BrF_3$ iv. $NOC\ell + SbC\ell_5$				
	Reactions which will give [NO] <sup>+</sup> as a major product are:				
	(1) i and ii (2) iii and iv				
	(3) i and iv (4) ii and iv				
56.	The number of 3c=2e bonds present in $A\ell(BH_4)_3$ is				
	(1) four (2) three				
	(3) six (4) zero				
57.	The role of copper salt as co-catalyst in Wacker process is				
	(1) Oxidation of Pd(0) by Cu(II) (2) Oxidation of Pd(0) by Cu(I)				
la la	(3) Oxidation of Pd(II) by Cu(I) (4) Oxidation of Pd(II) by Cu(II)				
58.	For the oxidation state/s of sulphur atoms in S2O, consider the following				
	i) $-2$ and $+4$ ii) $0$ and $+2$				
	iii) $+4$ and 0 iv) $+2$ and $+2$				
1	The correct answer is/are				
	(1) i and ii (2) i and iii				
59.	The geometries of $[C\ell F_4]^+$ and $[IF_4]^-$ respectively are				
	(1) Tetrahedral and tetrahedral				
- 1	(2) Tetrahedral and trigonal bipyramidal				
	(3) Tetrahedral and Square planar				
	(4) Tetrahedral and Octahedral				

(12)

Question No.						
60.	Among the complexes (i) $K_4[(Cr(CN)_6], (ii) K_4[(Fe(CN)_6], (iii) K_3[(Co(CN)_6], and (iv) K_4[(Mn(CN)_6], Jahn Teller distortion is expected in$					
	(1) i, ii and iii (2) ii, iii and iv					
	(3) i and iv (4) ii and iii					
61.	For a potentiometric titration in the curve of emf (E) v/s volume (V) the titrant added, the equivalence point is indicated by					
	(1) $ dE/dV  = 0$ , $ d^2E/dV^2  = 0$ (2) $ dE/dV  = 0$ , $ d^2E/dV^2  > 0$					
	(3) $ dE/dV  > 0$ , $ d^2E/dV^2  = 0$ (4) $ dE/dV  > 0$ , $ d^2E/dV^2  > 0$					
62.	If the concentration (c) is increased to 4 times its original value (c), the change in molar conductivity for strong electrolytes is (where b is kohlrausch's constant).					
	(1) 0 (2) b√c					
	(3) $2b\sqrt{c}$ (4) $4b\sqrt{c}$					
63.	The energy levels of the harmonic oscillator (neglecting zero point energy) are $\epsilon_{\nu} = nh\nu$ for $n=0,1,2$ . Assuming $h\nu = k_{B}T/3$ ; the partition function is					
-2	(1) e (2) $e^{1/3} (e^{1/3} - 1)$					
	(3) $1/3e$ (4) $3e/(3e^3-1)$					
64.	The ground state of hydrogen atom is $-13.598$ eV. The exception values of kinetic energy <t> and potential energy, <v>, in units of eV, are</v></t>					
	(1) $\langle T \rangle = 13.598, \langle V \rangle = -27.196$					
	(2) $<$ T>=-27.196, $<$ V>= 13.598					
** .	(3) $<$ T>=-6.799, $<$ V>=-6.799					
	(4) $\langle T \rangle = 6.799, \langle V \rangle = -20.397$					

Question No.	Questions
65.	The correct expression for the product $((M_n).(M_w))$ [where $M_n$ and $M_w$ are the number average and weight average molar masses, respectively, of a polymer] is
	(1) $N^{-1} \sum_{i} N_{i} M_{i}$ (2) $N^{-1} \sum_{i} N_{i} M_{i}^{2}$
	(1) $N^{-1} \sum_{i} N_{i} M_{i}$ (2) $N^{-1} \sum_{i} N_{i} M_{i}^{2}$ (3) $N / \sum_{i} N_{i} M_{i}$ (4) $N / \sum_{i} N_{i} M_{i}^{2}$
66.	Match the following columns:
	Column-1 Column-2
	A. Energy of the ground state of He+ $16.04$ ev
*	B. Potential energy of 1st orbit of H- atom 2. $-27.2$ ev
	C. Kinetic energy of II excited state of He+ 3. $8.68 * 10^{-18} \text{ J}$
	D. Ionisation potential of He+ 4. $-54.4$ ev
	Codes.
	A B C D
	(1) 1 2 3 4
1 gr 4	(2) 4 3 2 1
	(3) 4 2 1 3
	(4) 2 3 1 4
67.	The protecting power of lyophilic colloidal sol is expressed in terms of
	(1) Critical miscelle concentration (2) Oxidation number
	(3) Coagulation value (4) Gold number
68.	Which one of the following is an example for homogenous catalysis?
	(1) Hydrogenation of oil
	(2) Manufacture of ammonia by Haber's process
	(3) Manufacture of sulphuric acid by Contact process
	(4) Hydrolysis of sucrose in presence of dilute hydrochloric acid

(14)

Question No.	Questions
69.	The energy of a hydrogen atom in a state is ( $-hcR_H/25$ ), where $R_H = Rydberg$ Constant). The degeneracy of the state will be -
	(1) $25^1$ (2) $25^2$
	(3) 25 <sup>3</sup> (4) 25 <sup>4</sup>
70.	The value of the commutator [x, p <sup>2</sup> <sub>x</sub> ] is
. /	(1) $2i$ (2) $2ihp_x$
-	(3) $2ixp_x$ (4) $hip_x/\pi$
71.	The normality of 2.3 M H <sub>2</sub> SO <sub>4</sub> solution is
	(1) 2.3 N (2) 4.6 N
	(3) 6.9 N (4) 7.9 N
72.	Crystal cannot posses
	(1) 1 fold axis of symmetry (2) 3 fold axis of symmetry
2,	(3) 5 fold axis of symmetry (4) 6 fold axis of symmetry
73.	Number of sigma bonds in P <sub>4</sub> O <sub>10</sub> is
	(1) 6 (2) 7
*	(3) 17 (4) 16
74.	2 mol of an ideal gas at $27^{\circ}\text{C}$ is expanded reversibly from 2 lit. To 20 lit. Find entropy change (R = 2 cal / mol K)
	1) 92.1 (2) 0
	3) 4 (4) 9.2
T 2 -	

Question		0	
No.		Questions	*
75.	An adiabatic process is		124
	(1) isoenthalpic	(2) isoentropic	
	(3) isochoric	(4) isobaric	
76.	At a certain temperature, the reaction	following observation	ons were made for the
	A → Products	(8)	
0.			
	Time (From the start)	[A]	
# F			
	2 minutes	5*10 <sup>-3</sup>	
00 V2	5 minutes	4*10-3	
	8 minutes	3*10-3	
s'	11 minutes	2*10-3	a lateral de la
	The order of the reaction is		
	(1) 1	(2) 2	
	(3) 3	(4) Zero	
77.	How many stereoisomers does	have 2, 3-dichlorop	entane?
	(1) 2	(2) 4	Transfer
	(3) 3	(4) 5	

Question No.	Questions
78.	Which statement about benzene is incorrect?
	(1) The C <sub>6</sub> ring is planar
	(2) The C-C $\pi$ -bonding is delocalised.
	(3) The reactivity of the benzene reflects the presence of carbon-carbon double bond.
	(4) Each C atom is sp <sup>2</sup> hybridized.
79.	Which of the following is not a Huckel (4n + 2) aromatic system?
	(1) [18]-Annulene ( $C_{18}H_{18}$ ) (2) Cyclooctatetraene ( $C_{8}H_{8}$ )
x = 1	(3) Benzene $(C_6H_6)$ (4) Cyclopentadienyl anion $(C_5H_5^-)$
00	The IUPAC name of $\bigcap_{Br}^{C\ell}$ is:
80.	
	(1) 1-bromo-3-chlorocyclohexene
	(2) 2-bromo-6-chlorocyclohex-1-ene
	(3) 6-bromo-2-chlorocyclohexene
	(4) 3-bromo-1-chlorocyclohexene
81.	Which one of the following high spin complexes has the largest CSFE Crystal field stabilization energy
	(1) $[Cr(H_2O)_6]^{2+}$ (2) $[Mn(H_2O)_6]^{2+}$
14	(3) $[Fe(H_2O)_6]^{2+}$ (4) $[Co(H_2O)_6]^{2+}$
82.	The number of 3c, 2e BHB and B-B bonds present in B <sub>4</sub> H <sub>10</sub> respectively
	are
	(1) 2, 4 (2) 3, 2
	(3) 4, 1 (4) 4, 0

Question No.	Questions					
83.	The most unstable species among the following is					
	(1) $\operatorname{Ti}(C_2H_5)_4$ (2) $\operatorname{Ti}(CH_2Ph)_4$					
1.75	(3) $Pb(CH_3)_4$ (4) $Pb(C_2H_5)_4$					
84.	The acid catalyzed hydrolysis of trans-[Co(en) <sub>2</sub> AX) <sup>n+</sup> can give cis-product also due to the formation of					
	(1) Square pyramidal intermediate					
	(2) Trigonal bipyramidal intermediate					
4 1	(3) Pentagonal bipyramidal intermediate					
	(4) Face capped octahedral intermediate					
85.	Total number of lines expected in $^{31}P$ NMR spectrum of HPF <sub>2</sub> is (I = $1/2$ for both $^{19}F$ and $^{31}P$ )					
	(1) Six (2) Four					
	(3) Five (4) Three					
86.	The number of faces, vertices and edges in IF, polyhedron are, respectively					
to)	(1) 15, 7 and 15 (2) 10, 7 and 15					
1	(3) 10, 8 and 12 (4) 12, 6 and 9					
87.	The light pink colour of $[Co(H_2O)_6]^{2+}$ and the deep blue colour of $[CoC\ell_4]^{-2}$ are due to					
4	(1) MLCT transition in the first and d-d transition in the second					
	(2) LMCT transitions in both					
	(3) d-d transitions in both					
	(4) d-d transition in the first and MLCT transition in the second					

Question No.	Questions				
88.					
	(1) 2 and 8	(2) 2 and 6			
μ) IΛ	(3) 1 and 8	(4) 1 and 6			
89.	The number of personate of the contract of the	ssible isomers	of [Ru(PPh <sub>3</sub> ) <sub>2</sub> (ac	ac) <sub>2</sub> ]	
	(1) 2	(2) 5	: [c] (come!\$] .(6).		
	(3) 4	(4) 3			
90.	Which ones among CO structure?	P-, XeO <sub>3</sub> , SO <sub>3</sub> , PO <sub>3</sub>	and NO <sub>3</sub> - have plant	anar	
	(1) CO <sub>3</sub> <sup>2</sup> -, PO <sub>3</sub> <sup>3</sup> - and XeO	(2) CO <sub>3</sub> <sup>2-</sup> , Xo	${\rm eO_3}$ and ${\rm NO_3}^-$		
	(3) SO <sub>3</sub> , PO <sub>3</sub> and NO <sub>3</sub>	(4) CO <sub>3</sub> <sup>2-</sup> , SO	O <sub>3</sub> and NO <sub>3</sub> -		
91.	Heating 1, 4-dicarbony pentoxide (P <sub>2</sub> O <sub>5</sub> ) gives:	compounds in the	presence of phosph	orus	
	(1) Pyrrole	(2) Furan	1 A.	50.0	
	(3) Thiophene	(4) Quinolin	е ,		
00	The Acetylation of thiophene occurs at :				
92.	The Acetylation of thioph	ene occurs at :			
92.	The Acetylation of thioph (1) $C_3$ -position	ene occurs at :  (2) $C_4$ -posit	on		
92.		(2) C <sub>4</sub> -posit	on $\mathrm{C_2}$ and $\mathrm{C_4}$ –positions		
93.	(1) C <sub>3</sub> -position	(2) $C_4$ -position (4) both at (	THE PROPERTY OF THE PARTY OF TH		
	<ul> <li>(1) C<sub>3</sub>-position</li> <li>(3) C<sub>2</sub>-position</li> </ul>	(2) $C_4$ -position (4) both at (	C <sub>2</sub> and C <sub>4</sub> -positions		
	<ul> <li>(1) C<sub>3</sub>-position</li> <li>(3) C<sub>2</sub>-position</li> <li>Pyridine is basic in nature</li> </ul>	(2) C <sub>4</sub> -posit (4) both at (	$ m C_2$ and $ m C_4$ –positions		
	<ul> <li>(1) C<sub>3</sub>-position</li> <li>(3) C<sub>2</sub>-position</li> <li>Pyridine is basic in nature</li> <li>(1) pKa = 5.21</li> </ul>	(2) C <sub>4</sub> -position (4) both at C having (2) pKa = - (4) pKa = - (4)	2 <sub>2</sub> and C <sub>4</sub> -positions 0.27 0.35		
93.	<ul> <li>(1) C<sub>3</sub>-position</li> <li>(3) C<sub>2</sub>-position</li> <li>Pyridine is basic in nature</li> <li>(1) pKa = 5.21</li> <li>(3) pKa = 5.81</li> </ul>	(2) C <sub>4</sub> -position (4) both at C having (2) pKa = - (4) pKa = - (4)	2 and C <sub>4</sub> -positions 0.27 0.35		

Question No.	Questions						
95.	Due to the presence of an unpaired electron, free radicals are						
e 1	10000000	Anions	(2)	Cations			
	(3)	Chemically reactive	(4)	Chemically inreactive			
96.	Benzoyl peroxide undergoes hamolytic cleavage to produce						
9		Phenyl radical	(2)				
* t	(3)	Phenyl chloride		Methyl chloride			
97.	$\mathrm{SN^{1}}$ mechanism for the hydrolysis of an alkyl halide involves the formation of intermediate						
	(1)	Free radical	(2)	Carbanion			
8	(3)	Carbocation	(4)	None of these			
98.	Which of the following is NOT polar protic solvent?						
		H <sub>2</sub> O	(2)	C <sub>2</sub> H <sub>5</sub> OH			
	(3) I	rumaric acid	(4)	Acetone			
99.	A new carbon-carbon bond formation is possible in						
A .		Clemmensen reduction	(2)	Wurtz reduction			
	100000	riedel-Craft alkylation	(4)	Oppenauer oxidation			
100.	Give the name of reaction given below:						
	(	O O O CH C-H + CH <sub>3</sub> -C O CH	,COO	$\stackrel{\bullet}{\longrightarrow} \bigcirc \stackrel{\circ}{\longleftrightarrow} $			
		erkin reaction enzoin condensation	(2) (4)	Pechmann condensation Claisen-Schmidt reaction			
ID/URS-E	E-2019-	Chemistry-Code-D (2	0)				

Question No.	Code-A	Code-B	Code-C	Code-D
1	4	2	3	1
2	3	1	2	4
3	1	3	2	1
4	2	3	1	4
5	1	2	2	2
6	2	2	3	3
7	3	2	4	2
8	1	4	4	2
9	4	1	1	3
10	4	1	4	2
11	1	4	1	4
12	4	1	3	4
13	1	4	1	1
14	4	3	4	2
15	2	3	2	2
16	3	2	3	1
17	2	3	1	2
18	2	3	1	2
19	3	3	1	1
20	2	3	2	1
21	1	1	1	3
22	3	1	2	
23	1	2	1	1
24	4	1	2	3
25	2	1	1	3
26	3	2	2	2
27	1	2	2	2
28	1	2	1	2
29	4	2	1	4
30	3	2	4	1
31	1	1	4	1
32	4	1	4	4
33	2	1	4	1
34	1	1	1	4
35	1	4	2	3
36	2		3	3
27	2	3	1	2
20	2	2	3	3
30	3	2	3	3
10	3	3	1	3
40	3	2	3	3
41	3	4	2	1
42	2	4	3	4
43	2	1	4	2
44	1	2	4	1
45	2	3	2	1
46	3	1	4	2
47	4	3	2	2
48	4	3	3	2
49	1	1	2	3
50	4	3	1	3
51	4	2	1	3
52	1	-	1	1

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Question No.	Answer Key of I	Code-B	Code-C	THE REAL PROPERTY AND ADDRESS OF THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAMED IN COLUMN T
53	4	4	2	Code-D
54	3	4	1	1
55	3	2	1	4
56	2	4	2	2
57	3	2	2	3
58	3	3	2	1
59	3	2	3	1
60	3	1	3	4
61	2	2	3	3
62	3	2	2	3
63	4	1	1	2
64	4	1	3	2
65	2	4	3	1
66	4	3	2	2
67	2	1	2	3
68	2	3	2	4
69	2	4	4	4
70	4	3	1	1
71	2	1	1	4
72	2	3	2	2
73	1	2	3	3
74	3	2	1	4
75	3	1	4	4
76	2	2	3	2
77	2	3	1	4
78		4	3	2
79	4	4	4	3
80	1	- 1	3	2
81	1	4	1	4
82	2	1	1	4
83	3	3	4	3
84	1	1	1	1
85	4	4	4	2
86	3	2	2	1
87	1	3	3	2
88	3	1	2	3
89	4	1	2	1
90	3	4	3	1
91	1	3	2	1
92	4	4	4	2
93	4	3	1	2
91	1	1	4	1
05	2	2	3	1
96	3	1	3	4
07	1	2	2	3
00	3	3	3	1
98	3	1	3	3
99	1	4.	2	4
100	3	4	3	3

J. J. Og