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M.Phil./Ph.D./URS-EE-Oct.-2017

**SUBJECT: Chemistry** 



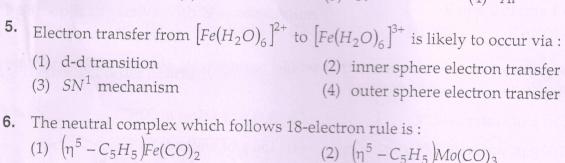
		Sr. No. 10057
Time: 11/4 Hours	Max. Marks: 100	Total Questions: 100
Roll No. (in figures)	(in words)	
Name	Father's Name	
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(Signature of the Candidate)		(Signature of the Invigilator)

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- 2. The candidates must return the question booklet 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.
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1.	The ground states of high spin octahedral and tetrahedral Co(II) complexes are respectively:
	(1) ${}^4T_{2g}$ and ${}^4A_2$ (2) ${}^4T_{1g}$ and ${}^4A_2$ (3) ${}^3T_{1g}$ and ${}^4A_2$ (4) ${}^4T_{1g}$ and ${}^3T_1$
2.	A true statement about base hydrolysis of $\left[C_0(NH_3)_5Cl\right]^{2+}$ :
	<ul> <li>(1) It is first order reaction</li> <li>(2) The rate determining step involves the dissociation of chloride in [Co(NH<sub>3</sub>)<sub>4</sub>(NH<sub>2</sub>)Cl]<sup>+</sup></li> <li>(3) The rate is independent of the concentration of the base</li> <li>(4) The rate determining step involves the abstraction of a proton from [Co(NH<sub>3</sub>)<sub>5</sub>Cl]<sup>2+</sup></li> </ul>
3.	10 2 12
	(1) $B_{12}H_{12}^{2-}$ (2) $B_{12}H_{12}$ (3) $B_{12}H_{12}^{2+}$ (4) $B_{12}H_{12}^{4-}$
4.	Which of the following is the strongest oxidizing agent?
	(1) $In^{3+}$ (2) $Ga^{3+}$ (3) $Ti^{3+}$ (4) $Al^{3+}$



(3)  $(\eta^5 - C_5 H_5) Co$  (4)  $(\eta^5 - C_5 H_5) Re(\eta^5 - C_6 H_6)$ 

7. The degree of hydration is expected to the maximum for:
(1)  $Mg^{2+}$  (2)  $Na^{+}$  (3)  $Ba^{2+}$  (4)  $K^{+}$ 

**8.** For this system in equilibrium  $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$  the number of components (C), phases (P) and degree of freedom (F), respectively are:

(1) 1, 3, 2 (2) 2, 2, 2 (3) 2, 0, 3 (4) 2, 3,

9. The compound having highest melting point:

(1) LiCl
(2) LiF
(3) LiBr
(4) LiI

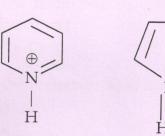
	10.	The pH of a $1.0 \times$ is:	$10^{-3} \mu$	solution of a w	reak a	acid $HA$ is 4.0.	The di	ssociation cons	stant k
		(1) $1.0 \times 10^{-3}$	(2)	$1.0 \times 10^{-4}$	(3)	$1.0 \times 10^{-5}$	(4)	$1.0 \times 10^{-6}$	
	11.	If $k_{sp}$ is the solub: (1) $(k_{sp}/108)^{1/5}$	ility pı (2)	coduct of a Span $(k_{sp}/72)^{1/5}$	ringly (3)	y soluble salt . $(k_{sp})^{1/5}$	$A_3X_2$ , (4)	then its solubil $(k_{sp})^{1/2}$	ity is :
1	12.	The radioactive is (1) ${}_{1}^{2}D$					(4)	<sup>13</sup> <sub>6</sub> C	
1	3.	The Bronsted acid	ity of	boron hydrides	follo	ows the trend :			
		(1) $B_2H_6 > B_4H_1$ (2) $B_5H_9 > B_4H_1$ (3) $B_2H_6 = B_4H_1$ (4) $B_{10}H_{14} > B_5H_2$	$0 > B_2$ $0 > B_3$	$AH_6 > B_{10}H_{14}$ $AH_9 = B_{10}H_{14}$					
1		The free energy ch from 1 atm to 2 atm (1) -RT ln 2	m is:			eal gas which RT ln 2			rmally
1	5.	Among the follow to bring its temper	ing, th	ne system that to 80°C is:	woul	d require leas	t amou	nt of thermal e	energy
		(1) 200 g of water	at 40°	С	(2)	300 g of water	r at 30°0	C	
		(3) 100 g of water	at 20°0	C	(4)	150 g of water	at 50°0	C	
1		The point group sy (1) $C_{2v}$		ry of p-dichloro D <sub>2h</sub>			(4)	C <sub>2h</sub>	
1	7.	A certain buffer so is $10^{-10}$ . The pH of	lution	contains equal	cond	centrations of	$A^-$ and	HA. The kb fo	or A-
		(1) 7	(2)		(3)	4	(4) 1	14	
1	(	The spontaneity of change (G) of the c	ell:				of emf	(E) and free e	nergy
		(1) $\Delta G = +ve_x E = -$ (3) $\Delta G = -ve_x E = -$				$\Delta G = 0, E = 0$ $\Delta G = -ve, E = 0$	– ve		
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- **19.** An aqueous solution is prepared by mixing equal volume of 0.1 M KCl and 0.1 M KI. To this solution a drop of 0.01 M *AgNO*<sub>3</sub> solution is added. Which of the following is correct?
  - (1) A precipitate forms which is primarily *AgI*
  - (2) A precipitate forms which is primarily AgCl
  - (3) A precipitate forms which is primarily AgI and AgCl
  - (4) There will be no precipitation as there is no common ions between potassium and silver salts
- **20.** An example of a colligative property is :
  - (1) Vapour pressure

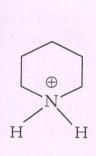
(2) Freezing point

(3) Osmotic pressure

- (4) All
- 21. R-(-)-2-Bromooctane on reaction with aqueous KOH mainly gives 2-octanol that is:
  - (1) optically active with 'R' configuration
  - (2) a racemic mixture
  - (3) optically active with 'S' configuration
  - (4) a meso compound
- **22.** The correct order of acidity among:







(1) (i) < (ii) < (iii) < (iv)

(2) (iv) < (iii) < (i) < (ii)

CH<sub>3</sub>

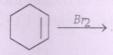
(3) (ii) < (i) < (iii) < (iv)

- (4) (ii) < (iv) < (i) < (iii)
- **23.** At room temperature, the number of singlet resonance observed in the  ${}^{1}H$  spectrum of  $Me_{3}CC(O)NMe_{2}$  is :
  - (1) 3
- (2) 4
- (3) 5
- (4) 2

24.	cycloheptatrienone is due to:	etching frequency (1650 cm <sup>-1</sup> ) in 2, 4, 6
	(1) conjugation effect	(2) steric effect
	(3) field effect	(4) electronic effect
25.	Conversion of PhNH <sub>2</sub> to PhCN can be of	done by:
	(1) reaction with <i>NaCN</i> in the presence	of Ni catalyst
	(2) reaction with CHCl <sub>3</sub> and NaOH	
	(3) diazotization followed by the reacti	on with CuCN
	(4) reaction with ethylformate followed	l by the reaction with NaCN
26.	The major product formed in the react and t-butanol is:	tion of anisole with Lithium, liquid ammonia
	(1) 1-methoxycyclohexa-1, 3-diene	(2) 2-methoxycyclohexa-1, 3-diene
	(3) 1-methoxycyclohexa-1, 4-diene	(4) 3-methoxycyclohexa-1, 4-diene
27.		$n \rightarrow \pi^*$ transition at the lowest wavelength? (3) $CH_3COC_2H_5$ (4) $C_6H_5COC_6H_5$
28.	<ul> <li>Aniline can be distinguished from meth</li> <li>(1) p-toluene sulphonyl chloride/KOH</li> <li>(2) Sn/HCl</li> <li>(3) Acetyl chloride</li> <li>(4) (i) NaNO<sub>2</sub> / HCl 0 – 5°C</li> <li>(ii) alkaline β-napthol</li> </ul>	[HONDERN HONDERN HONDE
29.	$SN^1$ reaction on optically active substration (1) retention in configuration (3) racemic product	tes mainly give :  (2) inversion in configuration  (4) no product
30.	Which among the following is solvolyse	d at the faster rate ?
	(1) $C_6H_5CH_2Cl$ (3) $CH_2 = CH - CH_2Cl$	(2) $Me_3C - Cl$ (4) $(C_6H_5)_3C - Cl$
		(±) (C6115)3C - C1
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- 31. When benzene sulphonic acid and p-nitrophenol are treated with NaHCO<sub>3</sub> the gases released, respectively are:
  - (1)  $SO_2$ ,  $NO_2$
- (2) SO2, NO
- (3)  $CO_2$ ,  $CO_2$  (4)  $SO_2$ ,  $CO_2$
- **32.** Which of the following pairs give positive Tollen's test?
  - (1) Glucose, Sucrose

- (2) Glucose, Fructose
- (3) Hexanal, Acetophenone
- (4) Fructose, Sucrose
- **33.** What configuration are found in the product(s) of the reaction?



(1) 1s, 2s only

(2) 1R, 2s only

(3) 1R, 2R only

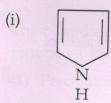
- (4) equal mixture of 1R, 2R and 1s, 2s
- **34.** The compound which shows  $L \leftarrow M$  charge transfer is:

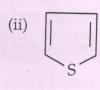
- (1) HgO (2)  $K_2Cr_2O_7$  (3)  $Ni(CO)_4$  (4)  $\left[Ni(H_2O)_6\right]^{2+}$
- 35. Among the following complexes, which would show the strong Jahn-Teller distortion?
- (1)  $\left[Cr(H_2O)_6\right]^{2+}$  (2)  $\left[Ti(H_2O)_6\right]^{3+}$  (3)  $\left[Co(H_2O)_6\right]^{2+}$  (4)  $\left[Fe(H_2O)_6\right]^{2+}$
- The homogeneous catalyst used in the hydroformylation or hydrocarbonylation is based on:
  - (1) Co
- (2) Cr
- (3) Ti
- (4) V
- The correct order of the soft character (as per HSAB principle) of the central metal ion is:
  - (1)  $[CrCl_4]^- < [Cr(bipy)_3]^- < [CrO_4]^{2-} < [Cr(CO)_5]^{2-}$
  - (2)  $[CrCl_4]^- < [CrO_4]^{2-} < [Cr(CO)_5]^{2-} < [Cr(bipy)_3]$
  - (3)  $\left[ CrO_{4} \right]^{2-} < \left[ CrCl_{4} \right]^{2-} < \left[ Cr(bipy)_{2} \right] < \left[ Cr(CO)_{5} \right]^{2-}$
  - (4)  $[CrO_4]^{2-} < [Cr(CO)_5]^{2-} < [CrCl_4]^{2-} < [Cr(bipy)_3]$

38.	Lewis acidity of $BMe_3$ , $BPh_3$ and $BCl_3$ wrt pyridine follows the order:			
	$(1)  BCl_3 > BPh_3 > BMe_3$	$(2)  BMe_3 > BPh_3 > BCl_3$		
	$(3) BPh_3 > BCl_3 > BMe_3$	$(4) BCl_3 > BMe_3 > BPh_3$		
39.	A disaccharide that will not give Bened (1) maltose (2) lactose			
40.		btain individual amounts of $Cu^{2+}$ and $Cd^{++}$ ir and $CCl^{2+}$ ) is achieved by measuring their:		
	(1) half wave potentials	(2) migration current		
	(3) decomposition potentials	(4) diffusion current		
41.	$Mg^{2+}$ is prefered in photosynthesis by	chlorophyll because:		
	(1) It has strong spin orbit coupling	(2) It has weak spin orbit coupling		
	(3) It is a heavy metal	(4) It is high reactive metal		
42.	and C is -2. The possible formula of the	C. The oxidation number of A is +2, of B is +5 e compound is:  (3) $A_3(BC_4)_2$ (4) $A_3(B_4C)_2$		
43.	Which among the followings is microw	rave inactive?		
	(1) NO (2) Br <sub>2</sub>	(3) CO (4) C <sub>2</sub> H <sub>4</sub>		
44.	Which of the following species does no	t obey Huckel Rule ?		
	(1) cyclopentadienyl anion	(2) cyclopentadienyl cation		
	(3) cyclopropane cation	(4) Tropylium cation		
45.	Write the increasing order of relative ba (1) amine > imine > nitrile (3) nitrile > amine > imine	(2) imine > nitrile > amine		
46.	Which among the following has highes (1) $(CH_3)_3 PO$ (2) $Br_3 PO$			
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- The oxide of chlorine, which is a mixed anhydride? 47.
  - (1) Cl<sub>2</sub>O
- (2) ClO<sub>2</sub>
- (3) Cl<sub>2</sub>O<sub>3</sub>
- (4)  $Cl_2O_7$
- Which reagent is used for the conversion of benzyl to benilic acid?
  - (1) Conc. HCl
- (2) Conc. KOH
  - (3)  $TiCl_{4}$
- (4)  $KMnO_4$
- 49. Which in the correct order of vapour pressure of 0.1 M aqueous solution of FeCl<sub>3</sub>, NaCl, CaCl2 and Glucose?
  - (1) Glucose > NaCl >  $CaCl_2$  >  $FeCl_3$  (2) NaCl >  $CaCl_2$  >  $FeCl_3$  > Glucose

  - (3)  $NaCl > Glucose > CaCl_2 > FeCl_3$  (4)  $FeCl_3 > CaCl_2 > NaCl > Glucose$
- Phenol associates in benzene to form dimer. The Van't Hoff's factor is 0.54. What is 50. the degree of association?
  - (1) 0.46
- (2) 0.54
- (3) 0.88
- (4) 0.92
- The decreasing order of the reactivity towards electrophiles:

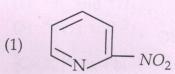


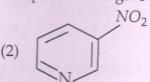


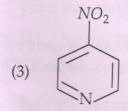


- (1) (iii) > (ii) > (i)

- (2) (i) > (ii) > (iii) > (i) > (ii) > (i) > (ii) > (ii) > (ii) > (iii)
- Pyridine undergoes nitration at elevated temperature to give:





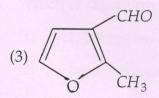


NO2 (4)NO2

- **53.** Which of the following will not undergo HVZ reaction?
  - (1) Acetic acid

- (2) Propanoic acid
- (3) 2-methyl propanoic acid
- (4) 2,2-diemthyl propanoic acid
- **54.** In the Lassaignes's test, the blood red colouration is due to the formation of:
  - (1)  $Fe(CN)_2$
- (2) NaCNS
- (3)  $Fe(CNS)_3$
- (4) NH<sub>4</sub>CNS
- **55.** Conversion of  $C_6H_5CN \rightarrow C_6H_5COCH_3$  can be achieved most easily with:
  - (1)  $CH_3MgBr$  followed by hydrolysis
  - (2)  $I_2$  / NaOH;  $CH_3I$
  - (3)  $LiAlH_4$  followed by the reaction  $CH_3I$
  - (4) dil  $H_2SO_4 + CH_2N_2$
- **56.** Cyclohexyl benzyl ether when reacted with hydrogen in the presence of 10% palladium on charcoal generates a mixture of :
  - (1) cyclohexanol and benzyl alcohol
- (2) cyclohexane and toluene
- (3) cyclohexanol and toluene
- (4) cyclohexane and bnenzyl alcohol
- **57.** The reaction of 2-methyl furan with DMF-POCl<sub>3</sub> would given :

(2) OHC O CH<sub>3</sub>



- (4) CHO
- **58.** The separation of trivalent ions  $Lu^{3+}$ ,  $Yb^{3+}$ ,  $Dy^{3+}$ ,  $Eu^{3+}$  can be effectively done by a cation exchange resin using ammonium o-hydroxy iso-butyrate as a element. The order of separation of ions would be:
  - (1)  $Lu^{3+}$ ,  $Yb^{3+}$ ,  $Dy^{3+}$ ,  $Eu^{3+}$
- (2)  $Eu^{3+}$ ,  $Lu^{3+}$ ,  $Dy^{3+}$ ,  $Yb^{3+}$
- (3)  $Yb^{3+}$ ,  $Dy^{3+}$ ,  $Eu^{3+}$ ,  $Lu^{3+}$
- (4)  $Dy^{3+}$ ,  $Yb^{3+}$ ,  $Eu^{3+}$ ,  $Lu^{3+}$

**59.** The symmetry elements present in  $BF_3$  are :

	(1) $C_3$ , $3C_2$ , $S_2$ , $\sigma_v$ (3) $C_3$ , $\sigma_v$ , $\sigma_h$ , $3C_2$	(2) $C_3$ , $\sigma_h$ , $\sigma_v$ , $i$ (4) $C_3$ , $3C_2$ , $\sigma_x$ , $\sigma_h$
60.	The compressibility factor of Vander W (1) 1/3 (2) 3/8	Vaals gas at critical state is: (3) 8/27 (4) 3
61.	observed in the spectroscopy of:	split the 3d orbitals. Their separation may be
	(1) NMR (3) IR	(2) ESR (4) Electronic absorption
62.	Movement of nuclei is negligible dur called:	ring time taken by an electronic transition is
	<ul><li>(1) Franck Condon Principle</li><li>(3) Born-Oppenheimer approximation</li></ul>	(2) Lambert Beer Law (4) None
63.	The number of ESR peak(s) expected for (1) 1 (2) 2	or $^{14}N$ is (are): (3) 3 (4) 4
64.	The platinised platinum electrodes are remme which of the following effect?	used for conducting measurements in order to
	(1) Precipation effect	(2) Solubility effect
	(3) Polarisation effect	(4) Redox effect
65.	The ground state term of $Sm^{3+}$ and $Eu^{2}$	2+ respectively are:
	(1) ${}^{7}F_{0}$ and ${}^{6}H_{5/2}$	(2) ${}^{6}H_{5/2}$ and ${}^{7}F_{0}$
	(3) ${}^2F_{5/2}$ and ${}^5I_4$	(4) ${}^{7}F_{6}$ and ${}^{2}H_{7/2}$
66.		ontrolled treatment of this complex with water exes of composition $[Co(H_2O)_4Cl_2]$ . Identify the action complexes:
	(1) $D_{4h}(C_{2v} \text{ and } C_{2h})$	(2) $D_{4h}(C_{2v} \text{ and } C_{4h})$
		(4) $T_d(C_{2v} \text{ and } C_{4h})$
67.	Kelvin's thermodynamics scale of temperature of tem	erature is based on :
	가 있는 것 같은 것 같	(3) Amagat's Law (4) Carnot's principle
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Calculate the work of expansion when 2 moles of an ideal gas expands isothermally and reversibly from 10 L to 20 L at 300 K: (4) -413.25 cal (2) 413.25 cal (3) -826.5 cal (1) 826.5 cal Which of the following is strongest reducing agent? (3)  $PbCl_2$  (4)  $SnCl_4$ (2) SnCl<sub>2</sub> (1) GeCl2 **70.** The total pressure for the reaction  $C(s) + CO_2(g) \rightleftharpoons 2CO(g)$  under the equilibrium condition is 15 atms. The value of Kp is: (3) 20 (4) 25 (1) 16 (2) 2**71.** When the particle is in its lowest energy state, the average momentum  $(\langle p_x \rangle)$  of the particle is: (2)  $\langle p_x \rangle = \frac{h}{2}$ (1)  $\langle p_x \rangle = 0$ (4)  $\langle p_x \rangle = \frac{h}{2\pi a}$ (3)  $\langle p_x \rangle = \frac{h}{2a}$ **72.** Which of the following statement is *not* true for haemoglobin? (1) The binding with oxygen is weaker in comparison with myoglobin (2) Iron is 5-coordinated (3) Iron is coplanar with prorphyrin ring in the absence of oxygen (4) The oxidation state of iron is +273. How many minutes are required to deliver  $3.21 \times 10^6$  coulombs using a current of 500 amperes used in the production of chlorine? (2)  $10 \times 10^3$  (3) 6420 (4) 107(1) 8.3 **74.** A solution containing  $H^+$  and  $D^+$  ions is in equilibrium with a mixture of  $H_2$  and D<sub>2</sub> gases at 25°C. If the partial pressure of both gases are 1.0 atm, find the ratio of (Given :  $E_{D^+/D_2}^{\circ} = -0.003 \text{ V}$ )  $[D^{+}]/[H^{+}]$ :

(3) 0.11

(4) 1.0

(2) 1.12

(1) 1.23

**75.** What will be the emf for a given cell?

$$Pt \mid H_2(g, P_1) \mid H^+(aq) \mid H_2(g, P_2) \mid Pt$$

 $(1) \quad \frac{RT}{F} \ln \frac{P_1}{P_2}$ 

(2)  $\frac{RT}{F} \ln \frac{P_2}{P_1}$ 

(3)  $\frac{RT}{2F} \ln \frac{P_1}{P_2}$ 

(4) None of these

76. How much ethyl alcohol must be added to 1.0 L of water so that solution will not freeze at -4°F ( $K_f = 1.86$ °C/m)

- (1) < 20 g
- (2)  $< 10.75 \,\mathrm{g}$  (3)  $< 494.5 \,\mathrm{g}$  (4)  $> 494.5 \,\mathrm{g}$

77. When mercuric iodide is added to the aqueous solution of KI, then:

- (1) freezing point is raised
- (2) freezing point is lowered
- (3) freezing point does not change
- (4) boiling point does not change

In the spinel structure, oxides ions are ccp whereas 1/8th of tetrahedral voids are occupied by  $A^{2+}$  and 1/2 of octahedral voids are occupied by  $B^{3+}$ . The general formula of the compound is:

- (1)  $A_2B_2O_4$

- (2)  $AB_2O_4$  (3)  $A_2B_4O_2$  (4)  $A_4B_2O_2$

79. On adding AgNO3 solution into KI solution, a negatively charged colloidal sol is obtained when they are in:

- (1)  $50 \text{ mL of } 0.1 \text{ M } AgNO_3 + 50 \text{ mL of } 0.01 \text{ M } KI$
- (2)  $50 \text{ mL of } 0.1 \text{ M } AgNO_3 + 50 \text{ mL of } 0.1 \text{ M } KI$
- (3)  $50 \text{ mL of } 0.2 \text{ M} \text{ } AgNO_3 + 50 \text{ mL of } 0.1 \text{ M} \text{ KI}$
- (4) 50 mL of 0.1 M AgNO<sub>3</sub> + 50 mL of 0.2 M KI

$$CH_3$$
 Ph  $CH_3$   $H_2SO_4 \rightarrow (A)$ ,  $H_2SO_4 \rightarrow (B)$  OH

Product (A) and (B) respectively are:

81. On which position the attack of nitronium ion would be most rapid, when the compound undergoes nitration with  $HNO_3/H_2SO_4$ 

O A B C D 
$$OCH_3$$
 (1) A (2) B (3) C (4) D

- 82. Which of the following pair gives same phenyl osazone?
  - (1) D-glucose and D-allose
  - (2) D-glucose and D-alfrose
  - (3) D-glucose and D-mannose
  - (4) D-glucose and D-talose

83. Stereoisomers of aldoheptose is (a) and stereoisomers of ketoheptose is (b). Ratio of a/b is:

- $(1) \frac{1}{2}$
- (2)  $\frac{2}{1}$
- (3)  $\frac{4}{1}$
- $(4) \frac{1}{4}$

**84.** The IUPAC name of the following compound is:

- (1) 4-Bromo-3-Cyano phenol
- (2) 2-Bromo-5-hydroxybenzonitrile
- (3) 2-Cyano-4-hydroxy bromobenzene
- (4) 6-Bromo-3-hydroxybenzonitrile
- 85. Which is correct matching of List-I and List-II?

#### List-I

## (Quantity measured and variable controlled

#### List-II

(Name of method)

controlled

1/R Vs. Volume of titrant

- (A) Amperometeric titrations
- (ii) i Vs. Volume of titrant, ε
- (B) Potentiometric titrations
- (iii) E Vs. Volume of titrant, i = 0
- (C) Conductometric titrations

- (1) (i) B, (ii) C, (iii) A
- (2) (i) A, (ii) B, (iii) C
- (3) (i) C, (ii) A, (iii) B
- (4) (i) C, (ii) B, (iii) A

- **86.** Cyctochrom is:
  - (1) oxygen storage protein
- (2) redox protein
- (3) Cu containing protein
- (4) Mo containing protein

87.	Which of the following enzyme causes breakdown of proteins to peptides?
	(1) Lipase (2) Amylase (3) Proteases (4) Peptidases
88.	Which of the following will have higher isoelectric point?
	(1) Glycine (2) Lysine
	(3) Aspartic acid (4) Glutamic acid
89.	The ion channels those permit transport of $Na^+$ and $K^+$ ions, are constructed from :
	(1) globular proteins (2) helical protiens
	(3) pleated proteins (4) None of these
90.	Sulphur is not a constituent of:
	(1) Cysteine (2) Methionine (3) Ferredoxin (4) Pyridoxine
91.	Molecule having non polar as well as polar bonds but the molecule as a whole is polar:
	(1) $(SCN)_2$ (2) $Cl_2O_8$ (3) $B_2Cl_4$ (4) $I_2Cl_6$
92.	Among the following compounds which on heating do not produce $N_2$ ?
	(1) $NH_4Cl + CaO$ (2) $(NH_4)_2Cr_2O_7$ (3) $Ba(N_3)_2$ (4) $NH_4Cl + NaNO_2$
93.	Non-metal 'M' forms $MCl_3$ , $M_2O_5$ and $Mg_3M_2$ but does not form $MI_5$ . The incorrect statement regarding non-metal is :
	(1) 'M' can form multiple bonds
	(2) Atomicity of 'M' is 4
	(3) 'M' is second period element
	(4) The range of oxidation number for M is $+5$ to $-3$
94.	Which of the following order is correct?
	(1) $K^+ < Ca^{++} < P^{3-} < S^{2-}$ : ionic size
	(2) $Na^+(aq) > K^+(aq) > Rb^+(aq) > Cs^+(aq)$ : electrical conductance
	(3) $Al^{3+}(aq) > Mg^{2+}(aq) > Na^{+}(aq)$ : hydrate size
	(4) $I^-(aq) < Br^-(aq) < Cl^-(aq) < F^-(aq)$ : ionic mobility

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95. 
$$CH_3 - C - CH_2 - CH_2 - C - CH_3 \xrightarrow{(NH_4)_2 CO_3} (A) \xrightarrow{CCl_3 CO_2 Na} (B)$$
 (major)

Product (B) of above reaction is:

$$(1) \qquad (2) \qquad (3) \qquad (4) \qquad (4) \qquad (C) \qquad (1) \qquad (1) \qquad (1) \qquad (2) \qquad (1) \qquad (2) \qquad (3) \qquad (4) \qquad (4) \qquad (5) \qquad (5) \qquad (6) \qquad (7) \qquad (8) \qquad (1) \qquad (1)$$

96. 
$$R$$
 $C = N$  where  $X = CH_3COO^-$ ,  $Cl - CH_2COO^-$ ,  $PhSO_3^-$ 

(i) (ii) (iii)

Rate of reaction toward Beckmann rearrangement:

$$(1)$$
  $(i) > (ii) > (iii)$ 

$$(2)$$
  $(ii) > (i) > (iii)$ 

$$(3)$$
  $(iii) > (ii) > (i)$ 

$$(4)$$
  $(iii) > (i) > (ii)$ 

97. Which of the following reaction, does not give chlorobenzen as a product?

$$(1) \qquad \qquad \stackrel{CHCl_3,OH^{\Theta}}{\longrightarrow}$$

(2) 
$$CHBrCl_2,OH^{\Theta}$$

(3) 
$$CHBr_2Cl,OH^{\Theta}$$

$$(4) \qquad \qquad CHFClBr,OH^{\Theta} \rightarrow$$

98. 
$$Ph - C - CHN_2 \xrightarrow{Ag_2O} A$$
, Product 'A' is:

(1) Ph<sup>14</sup>CH<sub>2</sub>COOH

(2) PhCH<sub>2</sub><sup>14</sup>COOH

(3) Ph<sup>14</sup>COOH

(4) PhCOOH

99. 
$$\underbrace{\begin{array}{c} (i) \ HCl \\ (ii) \ SOCl_2 \end{array}}_{O} (A) \xrightarrow{AlCl_3 \atop C_6H_6} (B) \xrightarrow{KOH / MeOH} (C)$$

Compound 'C' is:

$$(1) Ph-CH_2-C-$$

$$(3) Ph-C \longrightarrow$$

(2) 
$$PhCH = CH - C - CH_3$$

$$\begin{array}{c|c}
O \\
| \\
(4) Ph - C - CH = CH - CH_3
\end{array}$$

- 100. Which of the following benzene ring substituents is deactivating but ortho-para directing?

  - (1) -N = 0 (2)  $-OCH_3$
- (3)  $-COCH_3$
- $(4) NO_2$

Total No. of Printed Pages: 17

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

M.Phil./Ph.D./URS-EE-Oct.-2017

SUBJECT: Chemistry

В

10054

		Sr. No
Time: 11/4 Hours	Max. Marks: 100	Total Questions: 100
Roll No. (in figures)	(in words)	
Name	Father's Name	
Mother's Name	Date of Examination_	
(Signature of the Candidate)	_	(Signature of the Invigilator)

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

- 1. All questions are compulsory.
- 2. The candidates *must return* the question booklet 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. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing within two hours after the test is over. No such complaint(s) will be entertained thereafter.
- 4. 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 booklet itself. Answers *must not* be ticked in the question booklet.
- 5. 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.
- 6. Use only Black or Blue Ball Point Pen of good quality in the OMR Answer-Sheet.
- 7. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.

M.Phil./Ph.D./URS-EE-Oct.-2017/(Chemistry)/(B)

1.	If $k_{sp}$ is the solubility product of a Sparingly soluble salt $A_3X_2$ , then its solubility (1) $(k_{sp}/108)^{1/5}$ (2) $(k_{sp}/72)^{1/5}$ (3) $(k_{sp})^{1/5}$ (4) $(k_{sp})^{1/2}$	is:
2.	The radioactive isotope used to locate brain tumors is:	
	(1) ${}_{1}^{2}D$ (2) ${}_{7}^{15}N$ (3) ${}_{53}^{113}I$ (4) ${}_{6}^{13}C$	
3.	The Bronsted acidity of boron hydrides follows the trend:	
	(1) $B_2H_6 > B_4H_{10} > B_5H_9 > B_{10}H_{14}$	
	(2) $B_5H_9 > B_4H_{10} > B_2H_6 > B_{10}H_{14}$	
	(3) $B_2H_6 = B_4H_{10} > B_5H_9 = B_{10}H_{14}$	
	$(4)  B_{10}H_{14} > B_5H_9 > B_4H_{10} > B_2H_6$	
4.	. The free energy change ( $\Delta G$ ) of 1 mole of ideal gas which is compressed isotherm from 1 atm to 2 atm is :	nally
	(1) $-RT \ln 2$ (2) $RT$ (3) $RT \ln 2$ (4) $-RT$	
5.	. Among the following, the system that would require least amount of thermal en to bring its temperature to 80°C is :	ergy
	(1) 200 g of water at 40°C (2) 300 g of water at 30°C	
	(3) 100 g of water at 20°C (4) 150 g of water at 50°C	
6.	(4) C	
	(1) $C_{2v}$ (2) $D_{2h}$ (3) $D_3$ (4) $C_{2h}$	4 -
7.	Matrix, 그는 그리고 있는 그리고 있는데 그리고 있는데 있는데 있는데 지원하다 하다고 있는데 그리고 있는데 그리고 있는데 그리고 있는데 그리고 있는데 되었다. 그리고 있는데 그리고 있	r A
	is $10^{-10}$ . The pH of solution is:  (1) 7 (2) 10 (3) 4 (4) 14	
8.	- the sign of emf (F) and free er	ıergy
	(1) $\Delta G = +ve$ , $E = -ve$ (2) $\Delta G = 0$ , $E = 0$	
	(1) $\Delta G = +ve$ , $E = +ve$ (2) $\Delta G = -ve$ , $E = -ve$	
	(0) 43 (0)2	

- An aqueous solution is prepared by mixing equal volume of 0.1 M KCl and 0.1 M KI. To this solution a drop of 0.01 M AgNO<sub>3</sub> solution is added. Which of the following is correct?
  - (1) A precipitate forms which is primarily AgI
  - (2) A precipitate forms which is primarily AgCl
  - (3) A precipitate forms which is primarily AgI and AgCl
  - (4) There will be no precipitation as there is no common ions between potassium and silver salts
- **10.** An example of a colligative property is:
  - (1) Vapour pressure

(2) Freezing point

(3) Osmotic pressure

- (4) All
- 11. Molecule having non polar as well as polar bonds but the molecule as a whole is polar:
  - (1)  $(SCN)_2$
- (2)  $Cl_2O_8$  (3)  $B_2Cl_4$
- (4)  $I_2Cl_6$
- **12.** Among the following compounds which on heating do not produce  $N_2$ ?

  - (1)  $NH_4Cl + CaO$  (2)  $(NH_4)_2Cr_2O_7$  (3)  $Ba(N_3)_2$
- (4)  $NH_4Cl + NaNO_2$
- 13. Non-metal 'M' forms  $MCl_3$ ,  $M_2O_5$  and  $Mg_3M_2$  but does not form  $MI_5$ . The incorrect statement regarding non-metal is:
  - (1) 'M' can form multiple bonds
  - (2) Atomicity of 'M' is 4
  - (3) 'M' is second period element
  - (4) The range of oxidation number for M is +5 to -3
- **14.** Which of the following order is correct?
  - (1)  $K^+ < Ca^{++} < P^{3-} < S^{2-}$ : ionic size
  - (2)  $Na^+(aq) > K^+(aq) > Rb^+(aq) > Cs^+(aq)$ : electrical conductance
  - (3)  $Al^{3+}(aq) > Mg^{2+}(aq) > Na^{+}(aq)$ : hydrate size
  - (4)  $I^{-}(aq) < Br^{-}(aq) < Cl^{-}(aq) < F^{-}(aq)$ : ionic mobility

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15. 
$$CH_3 - C - CH_2 - CH_2 - C - CH_3 \xrightarrow{(NH_4)_2 CO_3} (A) \xrightarrow{CCl_3 CO_2 Na} (B)$$
 (major)

Product (B) of above reactions

Product (B) of above reaction is:

$$(1) \bigcap_{N}^{Cl} (2) \bigcap_{N}^{Cl} (3) \bigcap_{N}^{Cl} (4) \bigcap_{N}^{Cl}$$

16.

R
$$C = N$$
where  $X = CH_3COO^-$ ,  $Cl - CH_2COO^-$ ,  $PhSO_3^-$ 
(i)
(ii)
(iii)
te of reaction toward Beckmann rearrangement.

Rate of reaction toward Beckmann rearrangement:

(1) 
$$(i) > (ii) > (iii)$$

(2) 
$$(ii) > (i) > (iii)$$

(3) 
$$(iii) > (ii) > (i)$$

$$(4)$$
  $(iii) > (i) > (ii)$ 

Which of the following reaction, does not give chlorobenzen as a product?

$$(1) \qquad \qquad \underbrace{CHCl_3,OH^{\Theta}}$$

(2) 
$$CHBrCl_2,OH^{\Theta}$$

$$(3) \qquad \underbrace{CHBr_2Cl,OH^{\Theta}}$$

$$(4) \qquad \boxed{\qquad \qquad CHFClBr,OH^{\Theta}}$$

18.  $Ph - C - CHN_2 \xrightarrow{Ag_2O} A$ , Product 'A' is:

(1) 
$$Ph^{14}CH_2COOH$$

19. 
$$\underbrace{\begin{array}{c} (i) \text{ HCl} \\ (ii) \text{ SOCl}_2 \end{array}}_{(ii) \text{ SOCl}_2} (A) \xrightarrow{AlCl_3}_{C_6H_6} (B) \xrightarrow{KOH / MeOH}_{(C)}$$

Compound 'C' is:

$$\begin{array}{ccc}
O & & & & & & & & & & & \\
O & & & & & & & & & & & \\
O & & & & & & & & & & \\
O & & & & & & & & & & \\
O & & & & & & & & & & \\
O & & & & & & & & & \\
O & & & & & & & & & \\
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O & & & & & & & & \\
O & & & & & & & \\
O & & & & & & & \\
O & \\
O & \\$$

(2) 
$$PhCH = CH - C - CH_3$$

$$(3) Ph-C \longrightarrow$$

(2) 
$$PhCH = CH - C - CH_3$$
  
O  
(4)  $Ph - C - CH = CH - CH_3$ 

Which of the following benzene ring substituents is deactivating but ortho-para directing? (2)  $-OCH_3$  (3)  $-COCH_3$  (4)  $-NO_2$ 

$$(1) - N = O$$

(2) 
$$-OCH_3$$

$$(4) - NO_2$$

**21.** When the particle is in its lowest energy state, the average momentum ( $\langle p_x \rangle$ ) of the particle is:

$$(1) < p_x > = 0$$

$$(2) < p_x > = \frac{h}{a}$$

$$(3) < p_x > = \frac{h}{2a}$$

$$(4) < p_x > = \frac{h}{2\pi a}$$

- Which of the following statement is *not* true for haemoglobin? 22.
  - (1) The binding with oxygen is weaker in comparison with myoglobin
  - (2) Iron is 5-coordinated
  - (3) Iron is coplanar with prorphyrin ring in the absence of oxygen
  - (4) The oxidation state of iron is +2
- How many minutes are required to deliver  $3.21 \times 10^6$  coulombs using a current of 500 amperes used in the production of chlorine?

(2) 
$$10 \times 10^3$$

- A solution containing  $H^+$  and  $D^+$  ions is in equilibrium with a mixture of  $H_2$  and  $D_2$  gases at 25°C. If the partial pressure of both gases are 1.0 atm, find the ratio of (Given:  $E_{D^+/D_2}^{\circ} = -0.003 \text{ V}$ )  $[D^{+}]/[H^{+}]$ :
  - (1) 1.23
- (2) 1.12
- (3) 0.11
- (4) 1.0

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What will be the emf for a given cell?

 $Pt \mid H_2(g, P_1) \mid H^+(aq) \parallel H_2(g, P_2) \mid Pt$ 

 $(1) \quad \frac{RT}{F} \ln \frac{P_1}{P_2}$ 

(2)  $\frac{RT}{F} \ln \frac{P_2}{P_1}$ 

 $(3) \quad \frac{RT}{2F} \ln \frac{P_1}{P_2}$ 

- (4) None of these
- How much ethyl alcohol must be added to 1.0 L of water so that solution will not freeze at -4°F ( $K_f = 1.86$ °C/m)
  - (1) < 20 g
- (2) < 10.75 g (3) < 494.5 g
- (4) > 494.5 g
- When mercuric iodide is added to the aqueous solution of KI, then:
  - (1) freezing point is raised
  - (2) freezing point is lowered
  - (3) freezing point does not change
  - (4) boiling point does not change
- In the spinel structure, oxides ions are ccp whereas 1/8th of tetrahedral voids are 28. occupied by  $A^{2+}$  and 1/2 of octahedral voids are occupied by  $B^{3+}$ . The general formula of the compound is:
  - (1)  $A_2B_2O_4$
- (2)  $AB_2O_4$
- (3)  $A_2B_4O_2$  (4)  $A_4B_2O_2$
- On adding AgNO3 solution into KI solution, a negatively charged colloidal sol is obtained when they are in:
  - (1)  $50 \text{ mL of } 0.1 \text{ M } AgNO_3 + 50 \text{ mL of } 0.01 \text{ M } KI$
  - (2)  $50 \text{ mL of } 0.1 \text{ M } AgNO_3 + 50 \text{ mL of } 0.1 \text{ M } KI$
  - (3)  $50 \text{ mL of } 0.2 \text{ M} \text{ } AgNO_3 + 50 \text{ mL of } 0.1 \text{ M} \text{ KI}$
  - (4) 50 mL of 0.1 M  $AgNO_3 + 50$  mL of 0.2 M KI

30. 
$$CH_3$$
 Ph  $CH_3$ 

$$H_2SO_4 \rightarrow (A),$$

$$N$$
OH
OH

Product (A) and (B) respectively are:

**31.** The decreasing order of the reactivity towards electrophiles:

(i) 
$$(ii)$$
  $(iii)$   $($ 

32. Pyridine undergoes nitration at elevated temperature to give:

(1) 
$$NO_2$$
 (2)  $NO_2$  (3)  $NO_2$  (4)  $NO_2$ 

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- 33. Which of the following will not undergo HVZ reaction?
  - (1) Acetic acid

- (2) Propanoic acid
- (3) 2-methyl propanoic acid
- (4) 2,2-diemthyl propanoic acid
- In the Lassaignes's test, the blood red colouration is due to the formation of:
  - (1)  $Fe(CN)_2$
- (2) NaCNS
- (3)  $Fe(CNS)_3$
- (4) NH<sub>4</sub>CNS
- **35.** Conversion of  $C_6H_5CN \rightarrow C_6H_5COCH_3$  can be achieved most easily with :
  - (1) CH<sub>3</sub>MgBr followed by hydrolysis
  - (2)  $I_2$  / NaOH;  $CH_3I$
  - (3)  $LiAlH_4$  followed by the reaction  $CH_3I$
  - (4) dil  $H_2SO_4 + CH_2N_2$
- 36. Cyclohexyl benzyl ether when reacted with hydrogen in the presence of 10% palladium on charcoal generates a mixture of:
  - (1) cyclohexanol and benzyl alcohol
- (2) cyclohexane and toluene
- (3) cyclohexanol and toluene
- (4) cyclohexane and bnenzyl alcohol
- The reaction of 2-methyl furan with DMF-POCl<sub>3</sub> would given:

OHC

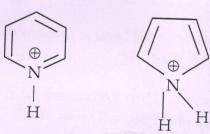
- The separation of trivalent ions  $Lu^{3+}$ ,  $Yb^{3+}$ ,  $Dy^{3+}$ ,  $Eu^{3+}$  can be effectively done by a 38. cation exchange resin using ammonium o-hydroxy iso-butyrate as a element. The order of separation of ions would be:
  - (1)  $Lu^{3+}$ ,  $Yb^{3+}$ ,  $Dy^{3+}$ ,  $Eu^{3+}$
- (2)  $Eu^{3+}$ ,  $Lu^{3+}$ ,  $Dy^{3+}$ ,  $Yb^{3+}$
- (3)  $Yb^{3+}$ ,  $Dy^{3+}$ ,  $Eu^{3+}$ ,  $Lu^{3+}$
- (4)  $Dy^{3+}$ ,  $Yb^{3+}$ ,  $Eu^{3+}$ ,  $Lu^{3+}$

**39.** The symmetry elements present in  $BF_3$  are:

(1) $C_3$ , $3C_2$ , $S_2$ , $\sigma_v$	$(2)  C_3,  \sigma_h,  \sigma_v,  \iota$
(3) $C_2$ , $\sigma_n$ , $\sigma_h$ , $3C_2$	(4) $C_3$ , $3C_2$ , $\sigma_x$ , $\sigma_h$
:1:11:4x factor of Vander	Waals gas at critical state is:
$(1) 1/3 \qquad (2) 3/8$	(5) 5, -
(1) 1/0	o-nitrophenol are treated with NaHCO <sub>3</sub> the gases
41. When benzene sulphonic acid and p	
released, respectively are: (1) $SO_2$ , $NO_2$ (2) $SO_2$ , $NO_2$	(3) $CO_2$ , $CO_2$ (4) $SO_2$ , $CO_2$
(1) $SO_2, NO_2$ (2) $SO_2/11$	T 11 to toot 2
<b>42.</b> Which of the following pairs give po	ositive Toller's test:
(1) Glucose, Sucrose	(2) Glucose, Fructose
	(4) Fructose, Sucrose
(3) Hexanal, Acetophenone	
43. What configuration are found in the	product(s) of the reaction ?
43. William corange	$Br_2 \rightarrow$
The state of the second st	
	an an arrive
(1) 1s, 2s only	(2) 1R, 2s only
	(4) equal mixture of 1R, 2R and 1s, 2s
(3) 1R, 2R only	A leave transfer is:
<b>44.</b> The compound which shows $L \leftarrow 1$	M charge transfer is .
$(2)  K_{\sigma} C r_{\sigma} Q_{\sigma}$	(3) $Ni(CO)_4$ (4) $[Ni(H_2O)_6]^{2+}$
45. Among the following complex	es, which would show the strong Jahn-Teller
distortion?	
$[-(-, -)]^{2+}$ (2) $[T_i(H_{-}O)]$	$[Co(H_2O)_6]^{2+}$ (4) $[Fe(H_2O)_6]^{2+}$
(1) $[Cr(H_2O)_6]$ (2) $[II(II_2O)_6]$	is a subspiration is
46. The homogeneous catalyst used	in the hydroformylation or hydrocarbonylation is
based on:	
(0) C	$(3) Ti \qquad (4) V$
. (-)	
M. Phil./Ph.D./URS-EE-Oct2017/(Chem	nistry)/(B)

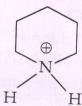
(2)  $C_3$ ,  $\sigma_h$ ,  $\sigma_v$ , i

- The correct order of the soft character (as per HSAB principle) of the central metal ion
  - (1)  $[CrCl_4]^- < [Cr(bipy)_3] < [CrO_4]^{2-} < [Cr(CO)_5]^{2-}$
  - (2)  $[CrCl_4]^- < [CrO_4]^{2-} < [Cr(CO)_5]^{2-} < [Cr(bipy)_3]$
  - (3)  $[CrO_4]^{2-} < [CrCl_4]^{2-} < [Cr(bipy)_2] < [Cr(CO)_5]^{2-}$
  - (4)  $[CrO_4]^{2-} < [Cr(CO)_5]^{2-} < [CrCl_4]^{2-} < [Cr(bipy)_3]$
- **48.** Lewis acidity of  $BMe_3$ ,  $BPh_3$  and  $BCl_3$  wrt pyridine follows the order:
  - (1)  $BCl_3 > BPh_3 > BMe_3$
- (2)  $BMe_3 > BPh_3 > BCl_3$
- (3)  $BPh_3 > BCl_3 > BMe_3$
- (4)  $BCl_3 > BMe_3 > BPh_3$
- 49. A disaccharide that will not give Benedict's test and will not form osazone is:
  - (1) maltose
- (2) lactose
- (3) cellobiose
- **50.** Polarographic method of analysis to obtain individual amounts of  $Cu^{2+}$  and  $Cd^{++}$  in a given mixture of the two ions ( $Cu^{2+}$  and  $CCl^{2+}$ ) is achieved by measuring their:
  - (1) half wave potentials
- (2) migration current
- (3) decomposition potentials
- (4) diffusion current
- **51.** R-(-)-2-Bromooctane on reaction with aqueous KOH mainly gives 2-octanol that is:
  - (1) optically active with 'R' configuration
  - (2) a racemic mixture
  - (3) optically active with 'S' configuration
  - (4) a meso compound
- The correct order of acidity among: 52.





 $CH_3$ H



(1) (i) < (ii) < (iii) < (iv)

(2) (iv) < (iii) < (i) < (ii)

(3) (ii) < (i) < (iii) < (iv)

(4) (ii) < (iv) < (i) < (iii)

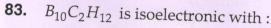
10			on oh	served in the <sup>1</sup> H spectrum
53.	At room temperatu	re, the number of sin	nglet resonance ob	served in the <sup>1</sup> H spectrum
	of $Me_3CC(O)NMe_2$	(0) 1	(3) 5	(4) 2
54.	The exceptionally cycloheptatrienone	low carbonyl stre is due to:		(1650 cm <sup>-1</sup> ) in 2, 4, 6-
	(1) conjugation eff		<ul><li>(2) steric effect</li><li>(4) electronic eff</li></ul>	fect
	(3) field effect			
55.	Conversion of Phl	$\mathrm{NH}_2$ to $\mathrm{PhCN}$ can be	done by:	
	(1) reaction with	NaCN in the presenc	ge of Ni Catalyst	
	(2) reaction with	CHCl <sub>3</sub> and NaOH	· · · · · · · · · · · · · · · · · · ·	
	(3) diazotization	followed by the read	ction with Cuciv	with NaCN
		11 -16 mate follow	red by the reaction	ish Lithium liquid ammonia
56	. The major produ	act formed in the re	action of anisole v	vith Lithium, liquid ammonia
	and t-butanol is:		(2) 2-methoxy	rcyclohexa-1, 3-diene
		vclohexa-1, 3-diene vclohexa-1, 4-diene	(4) 3-methoxy	vcyclohexa-1, 4-diene
5	7. Which of the fol	lowing molecules hat $(2)$ $CH_3COC_6F$	-5	on at the lowest wavelength? $_2H_5$ (4) $C_6H_5COC_6H_5$
	(1) There	listinguished from n	nethyl amine by its	reaction with:
	<ul> <li>(1) p-toluene s</li> <li>(2) Sn/HCl</li> <li>(3) Acetyl chlo</li> <li>(4) (i) NaNO</li> <li>(ii) alkalir</li> </ul>	oride 2 / HCl 0 – 5°C le β-napthol		
	59. $SN^1$ reaction of (1) retention if (3) racemic p	on optically active sun configuration roduct	ibstrates mainly gr (2) inversio (4) no prod	
<b>N</b>	Phil./Ph.D./URS-	EE-Oct2017/(Chem	istry)/(B)	

60. Which among the following is solvolysed at the faster rate?  (1) $C_6H_5CH_2Cl$ (2) $Me_3C-Cl$ (3) $CH_2 = CH - CH_2Cl$ (4) $(C_6H_5)_3C-Cl$
<ul> <li>61. Mg<sup>2+</sup> is prefered in photosynthesis by chlorophyll because:</li> <li>(1) It has strong spin orbit coupling</li> <li>(2) It has weak spin orbit coupling</li> <li>(3) It is a heavy metal</li> <li>(4) It is high reactive metal</li> </ul>
A compound contains atoms A, B and C. The oxidation number of A is +2, of B is +5 and C is -2. The possible formula of the compound is:  (1) $ABC_2$ (2) $B_2(AC_3)_2$ (3) $A_3(BC_4)_2$ (4) $A_3(B_4C)_2$
<b>63.</b> Which among the followings is microwave inactive?
(1) NO (2) $Br_2$ (3) CO (4) $C$ $T$
(1) cyclopentadienyl anion (2) cyclopentadienyl cation (3) cyclopropane cation (4) Tropylium cation
(1) amine > imine > nitrile (2) imine > nitrile > amine (3) nitrile > amine > imine (4) nitrile < imine < amine
66. Which among the following has highest P-O stretching frequency? (1) $(CH_3)_3 PO$ (2) $Br_3 PO$ (3) $Cl_3 PO$ (4) $F_3 PO$
67. The oxide of chlorine, which is a mixed anhydride?
(1) $(2)$ $(3)$
$(3) Cl_2O_3$ (4) $Cl_2O_3$
(1) Conc. HCl (2) Conc. KOH (3) TiCl <sub>4</sub> (4) KMnO
NaCl, CaCl <sub>2</sub> and Glucose?
(1) Glucose > $NaCl$ > $CaCl_2$ > $FeCl_3$ (2) $NaCl$ > $CaCl_3$ = $Tack_3$
(3) $NaCl > Glucose > CaCl_2 > FeCl_3 > Glucose$ (4) $FeCl_3 > CaCl_2 > NaCl > Glucose$
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P. T. O.

70.	Phenol associates in benzene to form de the degree of association?	limer	. The Van't Ho	ff's factor is 0.54. What is
	(1) 0.46 (2) 0.54	(3)	0.88	(4) 0.92
71.	The strong field in $[Fe(CN)_6]^{3-}$ will spobserved in the spectroscopy of:  (1) NMR  (3) IR	(2) (4)	ESR Electronic abso	orption
72.	Movement of nuclei is negligible dur called:  (1) Franck Condon Principle  (3) Born-Oppenheimer approximation	(2)	Lambert Beer I	
73.	The number of ESR peak(s) expected for (1) 1 (2) 2	or <sup>14</sup> I (3)	<i>N</i> is (are):	(4) 4
74.	The platinised platinum electrodes are remme which of the following effect?  (1) Precipation effect  (3) Polarisation effect	(2)	for conducting Solubility effect Redox effect	
75.	(1) ${}^{7}F_{0}$ and ${}^{6}H_{5/2}$	(2)	espectively are: $^6H_{5/2}$ and $^7F_{6}$ and $^2H_{7/2}$	0
76.	$[CoCl_4]^{2-}$ is a blue coloured complex of gives two light coloured pink complex point groups of $[CoCl_4]^{2-}$ and two ison	olexes meric	of composition complexes:	on $[CO(H_2O)_4CI_2]$ . Identifi
	(1) $D_{4h}(C_{2v} \text{ and } C_{2h})$ (3) $T_d(C_{2v} \text{ and } D_{4h})$		$D_{4h}(C_{2v} \text{ and } C_4)$ $T_d(C_{2v} \text{ and } C_4)$	
77.	Kelvin's thermodynamics scale of temp (1) Charle's Law (2) Joule's Law	perat (3)	ure is based on Amagat's Law	: v (4) Carnot's principle
78.	. Calculate the work of expansion when and reversibly from 10 L to 20 L at 300 (1) 826.5 cal (2) 413.25 cal	) K :	noles of an idea -826.5 cal	al gas expands isothermall  (4) -413.25 cal

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79	Which of the following is strongest reducing agent?	
	(1) $GeCl_2$ (2) $SnCl_2$ (3) $PbCl_2$ (4) $SnCl_4$	
80.	condition is 15 atms. The value of Kp is: $2CO(g) \rightleftharpoons 2CO(g)$ under the equilibrium	m
	(1) 16 (2) 2 (3) 20 (4) 25	
81.	respectively:	re
	(1) ${}^4T_{2g}$ and ${}^4A_2$ (2) ${}^4T_{1g}$ and ${}^4A_2$ (3) ${}^3T_{1g}$ and ${}^4A_2$ (4) ${}^4T_{1g}$ and ${}^3T_1$	
82.	A true statement about base hydrolysis of $\left[Co(NH_3)_5Cl\right]^{2+}$ :	
	(1) It is first order reaction	
	(2) The rate determining step involves the dissociation of chloride in $\left[Co(NH_3)_4(NH_2)Cl\right]^+$	1
	(3) The rate is independent of the concentration of the base	
	(4) The rate determining step involves the abstraction of a proton from $[Co(NH_2)Cl]^{2+}$	



- (1)  $B_{12}H_{12}^{2-}$
- (2)  $B_{12}H_{12}$
- (3)  $B_{12}H_{12}^{2+}$  (4)  $B_{12}H_{12}^{4-}$
- **84.** Which of the following is the strongest oxidizing agent?
  - (1)  $In^{3+}$
- (2)  $Ga^{3+}$
- (3)  $Ti^{3+}$
- **85.** Electron transfer from  $\left[Fe(H_2O)_6\right]^{2+}$  to  $\left[Fe(H_2O)_6\right]^{3+}$  is likely to occur via :
  - (1) d-d transition

(2) inner sphere electron transfer

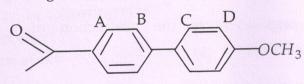
(3)  $SN^1$  mechanism

- (4) outer sphere electron transfer
- The neutral complex which follows 18-electron rule is:
  - (1)  $(\eta^5 C_5 H_5) Fe(CO)_2$
- (2)  $(\eta^5 C_5 H_5) Mo(CO)_3$
- (3)  $(\eta^5 C_5 H_5) C_0$

(4)  $(\eta^5 - C_5 H_5) \text{Re} (\eta^5 - C_6 H_6)$ 

- The degree of hydration is expected to the maximum for:
  - (1)  $Mg^{2+}$  (2)  $Na^{+}$
- (3)  $Ba^{2+}$
- (4)  $K^{+}$
- **88.** For this system in equilibrium  $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$  the number of components (C), phases (P) and degree of freedom (F), respectively are:
  - (1) 1, 3, 2
- (2) 2, 2, 2
- (3) 2, 0, 3
- (4) 2, 3, 1
- 89. The compound having highest melting point:
  - (1) LiCl
- (2) LiF
- (3) LiBr
- (4) LiI
- **90.** The pH of a  $1.0 \times 10^{-3} \mu$  solution of a weak acid HA is 4.0. The dissociation constant  $k_a$  is:
  - (1)  $1.0 \times 10^{-3}$  (2)  $1.0 \times 10^{-4}$  (3)  $1.0 \times 10^{-5}$  (4)  $1.0 \times 10^{-6}$

- 91. On which position the attack of nitronium ion would be most rapid, when the compound undergoes nitration with  $HNO_3/H_2SO_4$



- (1) A
- (2) B
- (3) C
- (4) D
- 92. Which of the following pair gives same phenyl osazone?
  - (1) D-glucose and D-allose
  - (2) D-glucose and D-alfrose
  - (3) D-glucose and D-mannose
  - (4) D-glucose and D-talose
- Stereoisomers of aldoheptose is (a) and stereoisomers of ketoheptose is (b). Ratio of a/b is:
- (2)  $\frac{2}{1}$
- (3)  $\frac{4}{1}$
- $(4) \frac{1}{4}$

96.

# **94.** The IUPAC name of the following compound is:

- (1) 4-Bromo-3-Cyano phenol
- (2) 2-Bromo-5-hydroxybenzonitrile
- (3) 2-Cyano-4-hydroxy bromobenzene
- (4) 6-Bromo-3-hydroxybenzonitrile

## 95. Which is correct matching of List-I and List-II?

of List-II?				
List-I	Lieta			
(Quantity measured and var controlled	iable (Name of method)			
(i) 1/R Vs. Volume of titrant	(A) Amperometeric titrations			
(ii) i Vs. Volume of titrant, $\epsilon$ (iii) E Vs. Volume of titrant, $i = 0$	(B) Potentiometric titrations			
(1) (i) $-B$ , (ii) $-C$ , (iii) $-A$	(C) Conductometric titrations			
(3) $(i) - C$ , $(ii) - A$ , $(iii) - B$	(2) (i) – A, (ii) – B, (iii) – C (4) (i) – C, (ii) – B, (iii) – A			
Cyctochrom is:				
(1) oxygen storage protein	(2) redox protein			
(3) Cu – containing protein	(4) Mo containing protein			

5		functions to pentid	es?
	Which of the following enzyme causes b (1) Lipase (2) Amylase		lases
98.	Which of the following will have higher	isoelectric point?  (2) Lysine	
	<ul><li>(1) Glycine</li><li>(3) Aspartic acid</li></ul>	(4) Glutamic acid	d from:
99.	The ion channels those permit transpor	t of $Na^+$ and $K^+$ ions, are cons (2) helical protiens	structea from
	<ul><li>(1) globular proteins</li><li>(3) pleated proteins</li></ul>	(4) None of these	
100	is a constituent of:	(3) Ferredoxin (4) Pyrio	doxine

Total No. of Printed Pages: 17

(Signature of the Invigilator)

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

### M.Phil./Ph.D./URS-EE-Oct.-2017

SUBJECT: Chemistry

C		10055 Sr. No.
Time : 11/4 Hours	Max. Marks: 100	Total Questions: 100
Roll No. (in figures)	(in words)	
Name	Father's Name	
Mother's Name	Date of Examination	

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

1. All questions are compulsory.

(Signature of the Candidate)

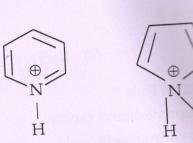
- 2. The candidates *must return* the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means/misbehaviour will be registered against him/her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
- 3. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing within two hours after the test is over. No such complaint(s) will be entertained thereafter.
- 4. 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 booklet itself. Answers *must not* be ticked in the question booklet.
- 5. 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.
- 6. Use only Black or Blue Ball Point Pen of good quality in the OMR Answer-Sheet.
- 7. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.

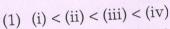
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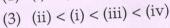
SEAL

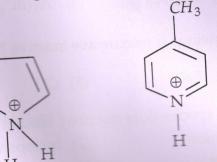
1.	Mg <sup>2+</sup> is prefered in photosynthesis by ch	ılor	rophyll because:
	(1) It has strong spin orbit coupling (	(2)	It has weak spin orbit coupling
	(3) It is a heavy metal	(4)	It is high reactive metal
2.	A compound contains atoms A, B and C, and C is $-2$ . The possible formula of the c (1) $ABC_2$ (2) $B_2(AC_3)_2$	om	The oxidation number of A is +2, of B is +5 in a pound is: $A_3(BC_4)_2 \qquad (4)  A_3(B_4C)_2$
3.	Which among the followings is microway	ve i	inactive?
	(1) NO (2) Br <sub>2</sub>	(3)	$CO$ (4) $C_2H_4$
4.	(-) -) 1	(2)	ey Huckel Rule ? cyclopentadienyl cation Tropylium cation
5.	(1) amine > imine > nitrile	(2)	ty of the amine, imine and nitrile : imine > nitrile > amine nitrile < imine < amine
6.		P-C (3)	O stretching frequency? $Cl_3PO$ (4) $F_3PO$
7.	The oxide of chlorine, which is a mixed a	nh	nydride?
	(1) $Cl_2O$ (2) $ClO_2$	(3)	$Cl_2O_3$ (4) $Cl_2O_7$
8.	Which reagent is used for the conversion (1) Conc. <i>HCl</i> (2) Conc. <i>KOH</i>		
9.	Which in the correct order of vapour p $NaCl$ , $CaCl_2$ and $Glucose$ ?  (1) $Glucose > NaCl > CaCl_2 > FeCl_3$ (3) $NaCl > Glucose > CaCl_2 > FeCl_3$	(2)	
10.	the degree of association?		er. The Van't Hoff's factor is 0.54. What is 0.88 (4) 0.92
D1	(1) 0.46 (2) 0.54		P.T.O

- 11. R-(-)-2-Bromooctane on reaction with aqueous KOH mainly gives 2-octanol that is:
  - (1) optically active with 'R' configuration
  - (2) a racemic mixture
  - (3) optically active with 'S' configuration
  - (4) a meso compound
  - The correct order of acidity among:









(2) (iv) < (iii) < (i) < (ii)

(4) (ii) < (iv) < (i) < (iii)

13. At room temperature, the number of singlet resonance observed in the <sup>1</sup>H spectrum of  $Me_3CC(O)NMe_2$  is:

(2) 4

(3) 5

H

The exceptionally low carbonyl stretching frequency (1650 cm<sup>-1</sup>) in 2, 4, 6cycloheptatrienone is due to:

(1) conjugation effect

(2) steric effect

(3) field effect

(4) electronic effect

- **15.** Conversion of *PhNH*<sub>2</sub> to *PhCN* can be done by :
  - (1) reaction with NaCN in the presence of Ni catalyst
  - (2) reaction with CHCl<sub>3</sub> and NaOH
  - (3) diazotization followed by the reaction with CuCN
  - (4) reaction with ethylformate followed by the reaction with NaCN
- The major product formed in the reaction of anisole with Lithium, liquid ammonia and t-butanol is:

(1) 1-methoxycyclohexa-1, 3-diene

(2) 2-methoxycyclohexa-1, 3-diene

(3) 1-methoxycyclohexa-1, 4-diene

(4) 3-methoxycyclohexa-1, 4-diene

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17.	(1) $HCHO$ (2) $CH_3COC_6H_5$ (3) $CH_3COC_2H_5$ (4) $C_6H_5COC_6H_5$
18.	<ul> <li>Aniline can be distinguished from methyl amine by its reaction with:</li> <li>(1) p-toluene sulphonyl chloride/KOH</li> <li>(2) Sn/HCl</li> <li>(3) Acetyl chloride</li> <li>(4) (i) NaNO<sub>2</sub>/HCl 0 – 5°C</li> <li>(ii) alkaline β-napthol</li> </ul>
19.	$SN^1$ reaction on optically active substrates mainly give :  (1) retention in configuration  (2) inversion in configuration  (3) racemic product  (4) no product
20.	Which among the following is solvolysed at the faster rate?
	(1) $C_6H_5CH_2Cl$ (2) $Me_3C-Cl$
	(3) $CH_2 = CH - CH_2Cl$ (4) $(C_6H_5)_3C - Cl$
21.	The ground states of high spin octahedral and tetrahedral Co(II) complexes are respectively: (1) ${}^4T_{2g}$ and ${}^4A_2$ (2) ${}^4T_{1g}$ and ${}^4A_2$ (3) ${}^3T_{1g}$ and ${}^4A_2$ (4) ${}^4T_{1g}$ and ${}^3T_1$
22.	A true statement about base hydrolysis of $[Co(NH_3)_5Cl]^{2+}$ :  (1) It is first order reaction  (2) The rate determining step involves the dissociation of chloride in $[Co(NH_3)_4(NH_2)Cl]^+$ (3) The rate is independent of the concentration of the base  (4) The rate determining step involves the abstraction of a proton from $[Co(NH_3)_5Cl]^{2+}$
23.	$B_{10}C_2H_{12}$ is isoelectronic with: (1) $B_{12}H_{12}^{2-}$ (2) $B_{12}H_{12}$ (3) $B_{12}H_{12}^{2+}$ (4) $B_{12}H_{12}^{4-}$
24.	Which of the following is the strongest oxidizing agent? (1) $In^{3+}$ (2) $Ga^{3+}$ (3) $Ti^{3+}$ (4) $Al^{3+}$
и. Pł	nil./Ph.D./URS-EE-Oct2017/(Chemistry)/(C)

17. Which of the following molecules have  $n \to \pi^*$  transition at the lowest wavelength?

4	<b>25.</b> Electron transfer from $[Fe(H_2O)_6]^{2+}$ to $[Fe(H_2O)_6]^{3+}$ is likely to occur via:
	<b>25.</b> Electron transfer from $[Fe(H_2O)_6]$ to $[Fe(H_2O)_6]$ (2) inner sphere electron transfer
	(1) d-d transition (2) Inter sp  (3) $SN^1$ mechanism (4) outer sphere electron transfer
	1.1 Callerys 18-electron rule is:
	26. The neutral complex which follows to creation (2) $(\eta^5 - C_5H_5)Mo(CO)_3$ (1) $(\eta^5 - C_5H_5)Fe(CO)_2$ (2) $(\eta^5 - C_5H_5)Re(\eta^5 - C_6H_6)$
	(1) $(\eta^5 - C_5 H_5) Fe(CO)_2$ (3) $(\eta^5 - C_5 H_5) Co$ (4) $(\eta^5 - C_5 H_5) Re(\eta^5 - C_6 H_6)$
	Chardration is expected to the maximum for:
	$I^{*}I^{*}I^{*}I^{*}I^{*}I^{*}I^{*}I^{*}$
	$C_{\alpha}(s) \Rightarrow C_{\alpha}(s) + C_{\alpha}(s)$ the final states
	components (C), phases (1) and (3) $2,0,3$ (4) $2,3,1$
	(1) 1/0/-
	29. The compound having highest melting point:  (1) LiCl (2) LiF (3) LiBr (4) LiI
	(1) LiCl (2) LiP (2) and (2) LiP (30. The pH of a $1.0 \times 10^{-3} \mu$ solution of a weak acid HA is 4.0. The dissociation constant
	30. The pH of a $1.0 \times 10^{-4}$ $\mu$ solution $k_a$ is:
	30. The pirot a flower $k_a$ is:  (1) $1.0 \times 10^{-3}$ (2) $1.0 \times 10^{-4}$ (3) $1.0 \times 10^{-5}$ (4) $1.0 \times 10^{-6}$ (7) $1.0 \times 10^{-6}$
	(1) $1.0 \times 10^{-3}$ (2) $1.0 \times 10^{-3}$ (3) $1.0 \times 10^{-3}$ (4) $1.0 \times 10^{-3}$ (5) $1.0 \times 10^{-3}$ (7) $1.0 \times 10^{-3}$ (8) $1.0 \times 10^{-3}$ (9) $1.0 \times 10^{-3}$ (1) $1.0 \times 10^{-3}$ (1) $1.0 \times 10^{-3}$ (1) $1.0 \times 10^{-3}$ (2) $1.0 \times 10^{-3}$ (2) $1.0 \times 10^{-3}$ (2) $1.0 \times 10^{-3}$ (3) $1.0 \times 10^{-3}$ (3) $1.0 \times 10^{-3}$ (4) $1.0 \times 10^{-3}$ (5) $1.0 \times 10^{-3}$ (7) $1.0 \times 10^{-3}$ (8) $1.0 \times 10^{-3}$ (9) $1.0 \times 10^{-3}$ (1) $1.0 \times 10^{-3}$ (1) $1.0 \times 10^{-3}$ (2) $1.0 \times 10^{-3}$ (3) $1.0 \times 10^{-3}$ (1) $1.0 \times 10^{-3}$ (2) $1.0 \times 10^{-3}$ (3) $1.0 \times 10^{-3}$ (1) $1.0 \times 10^{-3}$ (1) $1.0 \times 10^{-3}$ (2) $1.0 \times 10^{-3}$ (3) $1.0 \times 10^{-3}$ (1) $1.0 \times 10^{-3}$ (2) $1.0 \times 10^{-3}$ (3) $1.0 \times 10^{-3}$ (1) $1.0 \times 10^{-3}$ (2) $1.0 \times 10^{-3}$ (2) $1.0 \times 10^{-3}$ (3) $1.0 \times 10^{-3}$ (2) $1.0 \times 10^{-3}$ (2) $1.0 \times 10^{-3}$ (3) $1.0 \times 10^{-3}$ (3) $1.0 \times 10^{-3}$ (4) $1.0 \times 10^{-3}$ (5) $1.0 \times 10^{-3}$ (7) $1.0 \times 10^{-3}$ (8) $1.0 \times 10^{-3}$ (8) $1.0 \times 10^{-3}$ (8) $1.0 \times 10^{-3}$ (9) $1.0 \times 10^{-3}$ (1)
	polar: (3) $B_2Cl_4$ (4) $I_2Cl_6$
	1. which on heating do not produce $N_2$ ?
	32. Among the following compounds which of fleating (4) $NH_4Cl + NaNO_2$ (1) $NH_4Cl + CaO$ (2) $(NH_4)_2Cr_2O_7$ (3) $Ba(N_3)_2$ (4) $NH_4Cl + NaNO_2$
	(1) $NH_4Cl + CuO$ (2) (2) (2) (2) (3) (1) $NH_4Cl + CuO$ (2) (2) (2) (3) (1) $NH_4Cl + CuO$ (2) (4) (2) (4) (2) (4) (4) (4) (4) (4) (4) (4) (4) (4) (4
	incorrect statement regularions
	(1) 'M' can form multiple bonds
	(2) Atomicity of 'M' is 4
1	(3) 'M' is second period element
	(4) The range of oxidation number for M is +5 to -3
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- **34.** Which of the following order is correct?
  - (1)  $K^+ < Ca^{++} < P^{3-} < S^{2-}$ : ionic size
  - (2)  $Na^+(aq) > K^+(aq) > Rb^+(aq) > Cs^+(aq)$ : electrical conductance
  - (3)  $Al^{3+}(aq) > Mg^{2+}(aq) > Na^{+}(aq)$ : hydrate size
  - (4)  $I^{-}(aq) < Br^{-}(aq) < Cl^{-}(aq) < F^{-}(aq)$ : ionic mobility

35. 
$$CH_3 - C - CH_2 - CH_2 - C - CH_3 \xrightarrow{(NH_4)_2 CO_3} (A) \xrightarrow{CCl_3 CO_2 Na} (B)$$
 (major)

Product (B) of above reaction is:

$$(1) \quad \bigcirc \bigvee_{N}^{Cl} \qquad (2) \quad \bigcirc \bigvee_{N}^{Cl} \qquad (3) \quad \bigcirc \bigvee_{N}^{Cl} \qquad (4) \quad \bigcirc \bigvee_{N}^{Cl}$$

36.

R 
$$C = N$$
 where  $X = CH_3COO^-$ ,  $Cl - CH_2COO^-$ ,  $PhSO_3^-$  (i) (ii) (iii)

Rate of reaction toward Beckmann rearrangement:

(1) (i) > (ii) > (iii)

(2) (ii) > (i) > (iii)

(3) (iii) > (ii) > (i)

- (4) (iii) > (i) > (ii)
- **37.** Which of the following reaction, does not give chlorobenzen as a product?
  - $(1) \qquad \underbrace{CHCl_3,OH^{\Theta}}_{}$
- (2)  $CHBrCl_2,OH^{\Theta}$
- (3)  $CHBr_2Cl_1OH^{\Theta}$
- (4) CHFClBr,OH<sup>©</sup>

38. 
$$Ph - C - CHN_2 \xrightarrow{Ag_2O} A$$
, Product 'A' is:

(1) Ph<sup>14</sup>CH<sub>2</sub>COOH

(2) PhCH<sub>2</sub><sup>14</sup>COOH

(3) Ph<sup>14</sup>COOH

(4) PhCOOH

39. 
$$(3) Ph COOTI$$

$$(i) HCl \longrightarrow (A) \xrightarrow{AlCl_3} (B) \xrightarrow{KOH/MeOH} (C)$$

$$(ii) SOCl_2 \longrightarrow (GH_6)$$

Compound 'C' is:

(1) 
$$Ph-CH_2-C$$

(2) 
$$PhCH = CH - C - CH_3$$

$$(3) Ph-C-$$

(2) 
$$PhCH = CH - C - CH_3$$
  
O  
(4)  $Ph - C - CH = CH - CH_3$ 

- 40. Which of the following benzene ring substituents is deactivating but ortho-para  $(4) - NO_2$ (3) -COCH<sub>3</sub>directing?
- $(2) OCH_3$
- The strong field in  $[Fe(CN)_6]^{3-}$  will split the 3d orbitals. Their separation may be observed in the spectroscopy of:
  - (1) NMR

(2) ESR

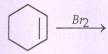
- (4) Electronic absorption
- Movement of nuclei is negligible during time taken by an electronic transition is 42. called:
  - (1) Franck Condon Principle
- (2) Lambert Beer Law
- (3) Born-Oppenheimer approximation (4) None
- The number of ESR peak(s) expected for  $^{14}$  N is (are): 43.
  - (1) 1
- (3) 3
- (4) 4

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4	<b>44.</b> The platinised platinum electrodes are used for cremme which of the following effect?	onducting managements in 1
	remme which of the following effect?	officing measurements in order to
	(1) Precipation effect (2) Solui	bility effect
	(3) Polarisation effect (4) Redo	
4	<b>45.</b> The ground state term of $Sm^{3+}$ and $Eu^{2+}$ respecti	velv are ·
	(1) 7 5 1 6	$r_2$ and $r_0$
	(2) 2 5	and ${}^{2}H_{7/2}$
40	<b>46.</b> $[CoCl_4]^{2-}$ is a blue coloured complex controlled to	
	gives two light coloured pink complexes of compoint groups of $[CoCl_4]^{2-}$ and two isomeric complexes	
	(1) D (C 10)	$C_{2v}$ and $C_{4h}$ )
	(3) $T_d(C_{2v} \text{ and } D_{4h})$ (4) $T_d(C_{2v})$	$c_{2}$ and $C_{4h}$ )
47	47. Kelvin's thermodynamics scale of temperature is ba (1) Charle's Law (2) Joule's Law (3) Amaga	ased on: at's Law (4) Carnot's principle
48.	<b>48.</b> Calculate the work of expansion when 2 moles of and reversibly from 10 L to 20 L at 300 K:	an ideal gas expands isothermally
	(1) 826.5 cal (2) 413.25 cal (3) -826.5	cal (4) –413.25 cal
49.	<b>49.</b> Which of the following is strongest reducing agent?	(4) SnCl <sub>4</sub>
50.	<b>50.</b> The total pressure for the reaction $C(s) + CO_2(g) \rightleftharpoons$ condition is 15 atms. The value of Kp is:	
	(1) 16 (2) 2 (3) 20	(4) 25
51.	51. When benzene sulphonic acid and p-nitrophenol are released, respectively are:	e treated with NaHCO <sub>3</sub> the gases
	(1) $SO_2$ , $NO_2$ (2) $SO_2$ , $NO$ (3) $CO_2$ , $CO_2$	$O_2$ (4) $SO_2$ , $CO_2$

- **52.** Which of the following pairs give positive Tollen's test?
  - (1) Glucose, Sucrose

- (2) Glucose, Fructose
- (3) Hexanal, Acetophenone
- (4) Fructose, Sucrose
- What configuration are found in the product(s) of the reaction?



(1) 1s, 2s only

(2) 1R, 2s only

(3) 1R, 2R only

- (4) equal mixture of 1R, 2R and 1s, 2s
- The compound which shows  $L \leftarrow M$  charge transfer is:
  - (1) HgO
- (2)  $K_2Cr_2O_7$  (3)  $Ni(CO)_4$
- (4)  $\left[Ni(H_2O)_6\right]^{2+}$
- Among the following complexes, which would show the strong Jahn-Teller distortion?
- (1)  $\left[ Cr(H_2O)_6 \right]^{2+}$  (2)  $\left[ Ti(H_2O)_6 \right]^{3+}$  (3)  $\left[ Co(H_2O)_6 \right]^{2+}$  (4)  $\left[ Fe(H_2O)_6 \right]^{2+}$
- The homogeneous catalyst used in the hydroformylation or hydrocarbonylation is based on:
  - (1) Co
- (2) Cr
- (3) Ti
- (4) V
- The correct order of the soft character (as per HSAB principle) of the central metal ion is:
  - (1)  $[CrCl_4]^- < [Cr(bipy)_3] < [CrO_4]^{2-} < [Cr(CO)_5]^{2-}$
  - (2)  $[CrCl_4]^7 < [CrO_4]^{2-} < [Cr(CO)_5]^{2-} < [Cr(bipy)_3]$
  - (3)  $\left[ CrO_4 \right]^{2-} < \left[ CrCl_4 \right]^{2-} < \left[ Cr(bipy)_2 \right] < \left[ Cr(CO)_5 \right]^{2-}$
  - (4)  $\left[ CrO_4 \right]^{2-} < \left[ Cr(CO)_5 \right]^{2-} < \left[ CrCl_4 \right]^{2-} < \left[ Cr(bipy)_3 \right]$
- Lewis acidity of  $BMe_3$ ,  $BPh_3$  and  $BCl_3$  wrt pyridine follows the order:
  - (1)  $BCl_3 > BPh_3 > BMe_3$

- (2)  $BMe_3 > BPh_3 > BCl_3$
- (3)  $BPh_3 > BCl_3 > BMe_3$
- (4)  $BCl_3 > BMe_3 > BPh_3$

	59 Adisant .	1 .1			9
	A disacchario	de that will not give	e Benedict's test a	nd will not form osazone is	18
	(1) maltose	(2) lactose	(3) cello	biose (4) sucrose	
		10115	Sis to obtain indiv $(Cu^{2+} \text{ and } CCl^{2+})$	idual amounts of $Cu^{2+}$ and is achieved by measuring t	Cd <sup>++</sup> in
	(1) half wave	potentials		ation current	
	(3) decompos	sition potentials		sion current	
6	<b>1.</b> When the par particle is:	ticle is in its lowest		average momentum ( $< p_x >$	of the
	$(1) < p_x > = 0$		$(2) < p_x >$	$\Rightarrow = \frac{h}{a}$	
	$(3) < p_x > = \frac{h}{2a}$	7	$(4) < p_x >$	$=\frac{h}{2\pi a}$	
62	. Which of the fo	ollowing statement	is <i>not</i> true for hae	emoglobin ?	
				on with myoglobin	
	(2) Iron is 5-coo				
	(3) Iron is copla	anar with prorphyr	in ring in the abse	ence of oxygen	
		on state of iron is +2			
63.	How many min 500 amperes use	utes are required d in the production	to deliver 3.21 × n of chlorine ?	10 <sup>6</sup> coulombs using a curre	ent of
	(1) 8.3	(2) $10 \times 10^3$	(3) 6420	(4) 107	
64.	A solution contains $D_2$ gases at 25°C $[D^+]/[H^+]$ :	ining $H^+$ and $D^+$ . If the partial pre	source of both gas	rium with a mixture of $H_2$ ses are 1.0 atm, find the rat $_{/D_2} = -0.003 \text{ V}$	and io of
	(1) 1.23	(2) 1.12	(3) 0.11	(4) 1.0	

(4) 1.0

65. What will be the emf for a given cell?

 $Pt \mid H_2(g, P_1) \mid H^+(aq) \parallel H_2(g, P_2) \mid Pt$ 

 $(1) \quad \frac{RT}{F} \ln \frac{P_1}{P_2}$ 

 $(2) \quad \frac{RT}{F} \ln \frac{P_2}{P_1}$ 

 $(3) \quad \frac{RT}{2F} \ln \frac{P_1}{P_2}$ 

- (4) None of these
- **66.** How much ethyl alcohol must be added to 1.0 L of water so that solution will not freeze at -4°F ( $K_f = 1.86$ °C/m)
  - (1) < 20 g
- (2) < 10.75 g
- (3) < 494.5 g
- (4) > 494.5 g
- 67. When mercuric iodide is added to the aqueous solution of KI, then:
  - (1) freezing point is raised
- (2) freezing point is lowered
- (3) freezing point does not change
- (4) boiling point does not change
- **68.** In the spinel structure, oxides ions are ccp whereas 1/8th of tetrahedral voids are occupied by  $A^{2+}$  and 1/2 of octahedral voids are occupied by  $B^{3+}$ . The general formula of the compound is :
  - (1)  $A_2B_2O_4$
- (2)  $AB_2O_4$
- (3)  $A_2B_4O_2$
- $(4) A_4 B_2 O_2$
- **69.** On adding  $AgNO_3$  solution into KI solution, a negatively charged colloidal sol is obtained when they are in :
  - (1) 50 mL of 0.1 M  $AgNO_3 + 50$  mL of 0.01 M KI
  - (2) 50 mL of 0.1 M  $AgNO_3 + 50$  mL of 0.1 M KI
  - (3)  $50 \text{ mL of } 0.2 \text{ M} \text{ } AgNO_3 + 50 \text{ mL of } 0.1 \text{ M} \text{ } KI$
  - (4) 50 mL of 0.1 M  $AgNO_3 + 50$  mL of 0.2 M KI

70. 
$$CH_3$$
 Ph  $CH_3$   $H_2SO_4$   $(A)$   $H_2SO_4$   $(B)$  OH

Product (A) and (B) respectively are:

(1) 
$$Ph-C-NHCH_3$$
,  $Ph-C-NHCH_3$  (2)  $CH_3-C-NHPh$ ,  $CH_3-C-NHPh$ 

(3) 
$$Ph-C-NHCH_3$$
,  $CH_3-C-NHPh$  (4)  $CH_3-C-NHPh$ ,  $Ph-C-NHCH_3$ 

71. On which position the attack of nitronium ion would be most rapid, when the compound undergoes nitration with  $HNO_3/H_2SO_4$ 

$$O \longrightarrow A \longrightarrow B \longrightarrow O \subset D$$

$$O \longrightarrow A \longrightarrow B \longrightarrow O \subset D$$

$$O \longrightarrow O \subset H_3$$

Which of the following pair gives same phenyl osazone?

- (1) D-glucose and D-allose
- (2) D-glucose and D-alfrose
- (3) D-glucose and D-mannose
- (4) D-glucose and D-talose

73. Stereoisomers of aldoheptose is (a) and stereoisomers of ketoheptose is (b). Ratio of

- (1)  $\frac{1}{2}$

## **74.** The IUPAC name of the following compound is:

- (1) 4-Bromo-3-Cyano phenol
- (2) 2-Bromo-5-hydroxybenzonitrile
- (3) 2-Cyano-4-hydroxy bromobenzene
- (4) 6-Bromo-3-hydroxybenzonitrile

### 75. Which is correct matching of List-I and List-II?

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T	i	-	1	
	.1	5	ι	-

(Quantity measured and variable controlled

- (i) 1/R Vs. Volume of titrant
- (ii) i Vs. Volume of titrant, ε
- (iii) E Vs. Volume of titrant, i = 0
- (1) (i) B, (ii) C, (iii) A
- (3) (i) C, (ii) A, (iii) B
- (-)
- **76.** Cyctochrom is:
  - (1) oxygen storage protein
  - (3) Cu containing protein

#### List-II

(Name of method)

- (A) Amperometeric titrations
- (B) Potentiometric titrations
- (C) Conductometric titrations
- (2) (i) A, (ii) B, (iii) C
- (4) (i) C, (ii) B, (iii) A
- (2) redox protein
- (4) Mo containing protein

P. T. O.

77. Which of the following enzyme causes breakdown of proteins to peptides?  (1) Lipase (2) Amylase (3) Proteases (4) Pentidases
78. Which of the following will have higher isoelectric point?
(1) Grycine
(2) Lysine (3) Aspartic acid
(4) Glutamic acid
<ul> <li>79. The ion channels those permit transport of Na<sup>+</sup> and K<sup>+</sup> ions, are constructed from:</li> <li>(1) globular proteins</li> <li>(2) helical protiens</li> <li>(3) pleated proteins</li> <li>(4) None of these</li> </ul>
<b>80.</b> Sulphur is not a constituent of :
(1) Cysteine (2) Methionine (3) Ferredoxin (4) Pyridoxine
81. If $k_{sp}$ is the solubility product of a Sparingly soluble salt $A_3X_2$ , then its solubility is:  (1) $(k_{sp}/108)^{1/5}$ (2) $(k_{sp}/72)^{1/5}$ (3) $(k_{sp})^{1/5}$ (4) $(k_{sp})^{1/2}$
The radioactive isotope used to locate brain tumors is:  (1) ${}_{1}^{2}D$ (2) ${}_{7}^{15}N$ (3) ${}_{53}^{113}I$ (4) ${}_{6}^{13}C$
83. The Bronsted acidity of boron hydrides follows the trend:
(1) $B_2H_6 > B_4H_{10} > B_5H_9 > B_{10}H_{14}$ (2) $B_5H_9 > B_4H_{10} > B_5H_9 > B_4H_{10}$
$B_2 H_6 = B_4 H_{10} > B_5 H_9 = B_{10} H_{14} $ (4) $B_{10} H_{14} > B_5 H_0 > B_1 H_0 > B_2 H_0$
84. The free energy change ( $\Delta G$ ) of 1 mole of ideal gas which is compressed isothermally
(1) $-RT \ln 2$ (2) $RT$ (3) $RT \ln 2$ (4) $-RT$
85. Among the following, the system that would require least amount of thermal energy to bring its temperature to 80°C is:
(1) 200 g of water at 40°C (2) 300 g of water at 30°C
(3) 100 g of water at 20°C (4) 150 g of water at 50°C
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- **86.** The point group symmetry of p-dichlorobenzene is:
  - (1)  $C_{2v}$
- (2)  $D_{2h}$
- (3)  $D_3$
- (4)  $C_{2h}$
- **87.** A certain buffer solution contains equal concentrations of  $A^-$  and HA. The kb for  $A^-$  is  $10^{-10}$ . The pH of solution is :
  - (1) 7
- (2) 10
- (3) 4
- (4) 14
- **88.** The spontaneity of a reaction can be judged from the sign of emf (E) and free energy change (G) of the cell:
  - (1)  $\Delta G = +ve$ , E = -ve

(2)  $\Delta G = 0, E = 0$ 

(3)  $\Delta G = -ve$ , E = +ve

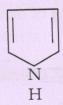
- (4)  $\Delta G = -ve$ , E = -ve
- **89.** An aqueous solution is prepared by mixing equal volume of 0.1 M KCl and 0.1 M KI. To this solution a drop of 0.01 M  $AgNO_3$  solution is added. Which of the following is correct?
  - (1) A precipitate forms which is primarily AgI
  - (2) A precipitate forms which is primarily AgCl
  - (3) A precipitate forms which is primarily AgI and AgCl
  - (4) There will be no precipitation as there is no common ions between potassium and silver salts
- **90.** An example of a colligative property is:
  - (1) Vapour pressure

(2) Freezing point

(3) Osmotic pressure

- (4) All
- **91.** The decreasing order of the reactivity towards electrophiles:





(ii)

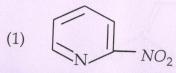


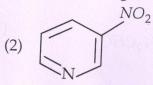
(iii

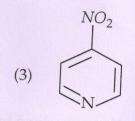


- (1) (iii) > (ii) > (i)
- (2) (i) > (ii) > (iii)
- (3) (iii) > (i) > (ii)
- (4) (ii) > (i) > (iii)

**92.** Pyridine undergoes nitration at elevated temperature to give :







$$(4) \qquad NO_2 \qquad NO_2$$

93. Which of the following will not undergo HVZ reaction?

(1) Acetic acid

- (2) Propanoic acid
- (3) 2-methyl propanoic acid
- (4) 2,2-diemthyl propanoic acid

**94.** In the Lassaignes's test, the blood red colouration is due to the formation of:

- (1) Fe(CN)<sub>2</sub>
- (2) NaCNS
- (3)  $Fe(CNS)_3$
- (4) NH<sub>4</sub>CNS

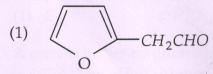
**95.** Conversion of  $C_6H_5CN \rightarrow C_6H_5COCH_3$  can be achieved most easily with :

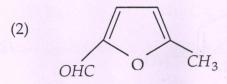
- (1)  $CH_3MgBr$  followed by hydrolysis
- (2)  $I_2 / NaOH; CH_3I$
- (3)  $LiAlH_4$  followed by the reaction  $CH_3I$
- (4) dil  $H_2SO_4 + CH_2N_2$

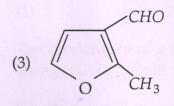
**96.** Cyclohexyl benzyl ether when reacted with hydrogen in the presence of 10% palladium on charcoal generates a mixture of :

- (1) cyclohexanol and benzyl alcohol
- (2) cyclohexane and toluene
- (3) cyclohexanol and toluene
- (4) cyclohexane and bnenzyl alcohol

**97.** The reaction of 2-methyl furan with DMF-POCl<sub>3</sub> would given:







- **98.** The separation of trivalent ions  $Lu^{3+}$ ,  $Yb^{3+}$ ,  $Dy^{3+}$ ,  $Eu^{3+}$  can be effectively done by a cation exchange resin using ammonium o-hydroxy iso-butyrate as a element. The order of separation of ions would be:
  - (1)  $Lu^{3+}$ ,  $Yb^{3+}$ ,  $Dy^{3+}$ ,  $Eu^{3+}$
- (2)  $Eu^{3+}$ ,  $Lu^{3+}$ ,  $Dy^{3+}$ ,  $Yb^{3+}$
- (3)  $Yb^{3+}$ ,  $Dy^{3+}$ ,  $Eu^{3+}$ ,  $Lu^{3+}$
- (4)  $Dy^{3+}$ ,  $Yb^{3+}$ ,  $Eu^{3+}$ ,  $Lu^{3+}$
- **99.** The symmetry elements present in  $BF_3$  are :
  - (1)  $C_3$ ,  $3C_2$ ,  $S_2$ ,  $\sigma_v$

(2)  $C_3$ ,  $\sigma_h$ ,  $\sigma_v$ , i

(3)  $C_3$ ,  $\sigma_v$ ,  $\sigma_h$ ,  $3C_2$ 

- (4)  $C_3$ ,  $3C_2$ ,  $\sigma_x$ ,  $\sigma_h$
- **100.** The compressibility factor of Vander Waals gas at critical state is:
  - (1) 1/3
- (2) 3/8
- (3) 8/27
- (4) 3

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

### M.Phil./Ph.D./URS-EE-Oct.-2017

**SUBJECT: Chemistry** 

D		100 <b>56</b> Sr. No.
Time: 11/4 Hours	Max. Marks: 100	Total Questions: 100
Roll No. (in figures)	(in words)	
Name	Father's Name	
Mother's Name	Date of Examination_	
(Signature of the Candidate)		(Signature of the Invigilator)

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

- 1. All questions are compulsory.
- 2. The candidates must return the question booklet 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. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing within two hours after the test is over. No such complaint(s) will be entertained thereafter.
- 4. 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 booklet itself. Answers must not be ticked in the question booklet.
- 5. 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.
- 6. Use only Black or Blue Ball Point Pen of good quality in the OMR Answer-Sheet.
- 7. Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained 30 minutes after starting of the examination.

M.Phil./Ph.D./URS-EE-Oct.-2017/(Chemistry)/(D)

EAL

- 1. When the particle is in its lowest energy state, the average momentum  $(\langle p_x \rangle)$  of the particle is:
  - (1)  $\langle p_x \rangle = 0$

(2)  $\langle p_x \rangle = \frac{h}{3}$ 

(3)  $\langle p_x \rangle = \frac{h}{2a}$ 

- (4)  $\langle p_x \rangle = \frac{h}{2\pi a}$
- **2.** Which of the following statement is *not* true for haemoglobin?
  - (1) The binding with oxygen is weaker in comparison with myoglobin
  - (2) Iron is 5-coordinated
  - (3) Iron is coplanar with prorphyrin ring in the absence of oxygen
  - (4) The oxidation state of iron is +2
- 3. How many minutes are required to deliver  $3.21 \times 10^6$  coulombs using a current of 500 amperes used in the production of chlorine?
  - (1) 8.3
- (2)  $10 \times 10^3$
- (3) 6420
- (4) 107
- **4.** A solution containing  $H^+$  and  $D^+$  ions is in equilibrium with a mixture of  $H_2$  and D<sub>2</sub> gases at 25°C. If the partial pressure of both gases are 1.0 atm, find the ratio of (Given:  $E_{D^+/D_2}^{\circ} = -0.003 \text{ V}$ )  $[D^+]/[H^+]$ :
  - (1) 1.23
- (2) 1.12
- (3) 0.11
- (4) 1.0

5. What will be the emf for a given cell?

 $Pt \mid H_2(g, P_1) \mid H^+(aq) \parallel H_2(g, P_2) \mid Pt$ 

(1)  $\frac{RT}{F} \ln \frac{P_1}{P_2}$ 

(2)  $\frac{RT}{F} \ln \frac{P_2}{P_1}$ 

(3)  $\frac{RT}{2F} \ln \frac{P_1}{P_2}$ 

- (4) None of these
- How much ethyl alcohol must be added to 1.0 L of water so that solution will not freeze at -4°F ( $K_f = 1.86$ °C/m)
  - (1) < 20 g
- (2)  $< 10.75 \,\mathrm{g}$  (3)  $< 494.5 \,\mathrm{g}$  (4)  $> 494.5 \,\mathrm{g}$

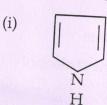
- 7. When mercuric iodide is added to the aqueous solution of KI, then:
  - (1) freezing point is raised
  - (2) freezing point is lowered
  - (3) freezing point does not change
  - (4) boiling point does not change
- 8. In the spinel structure, oxides ions are ccp whereas 1/8th of tetrahedral words are occupied by  $A^{2+}$  and 1/2 of octahedral voids are occupied by  $B^{3+}$ . The general formula of the compound is:
  - $(1) A_2 B_2 O_4$
- (2)  $AB_2O_4$
- (3)  $A_2B_4O_2$  (4)  $A_4B_2O_2$
- 9. On adding AgNO3 solution into KI solution, a negatively charged colloidal sol is obtained when they are in:
  - (1) 50 mL of 0.1 M  $AgNO_3 + 50$  mL of 0.01 M KI
  - (2) 50 mL of 0.1 M  $AgNO_3 + 50$  mL of 0.1 M KI
  - (3)  $50 \text{ mL of } 0.2 \text{ M} \text{ } AgNO_3 + 50 \text{ mL of } 0.1 \text{ M} \text{ KI}$
  - (4) 50 mL of 0.1 M  $AgNO_3 + 50$  mL of 0.2 M KI

10. 
$$CH_3$$
 Ph  $CH_3$   $H_2SO_4$   $(A)$   $H_2SO_4$   $(B)$ 

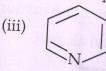
Product (A) and (B) respectively are:

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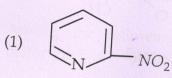
The decreasing order of the reactivity towards electrophiles:

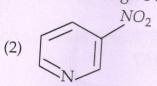


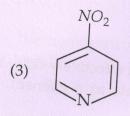




- (1) (iii) > (ii) > (i)
- (2) (i) > (ii) > (iii) > (i) > (ii) > (ii)
- (4) (ii) > (i) > (iii)
- Pyridine undergoes nitration at elevated temperature to give :







$$(4) \qquad \bigvee_{NO_2}^{NO_2}$$

- Which of the following will not undergo HVZ reaction?
  - (1) Acetic acid

- (2) Propanoic acid
- (3) 2-methyl propanoic acid
- (4) 2,2-diemthyl propanoic acid
- In the Lassaignes's test, the blood red colouration is due to the formation of: 14.
  - (1)  $Fe(CN)_2$
- (2) NaCNS
- (3)  $Fe(CNS)_3$
- (4)  $NH_4CNS$
- Conversion of  $C_6H_5CN \rightarrow C_6H_5COCH_3$  can be achieved most easily with : 15.
  - (1)  $CH_3MgBr$  followed by hydrolysis
  - (2)  $I_2 / NaOH; CH_3I$
  - (3)  $LiAlH_4$  followed by the reaction  $CH_3I$
  - (4) dil  $H_2SO_4 + CH_2N_2$

- 16. Cyclohexyl benzyl ether when reacted with hydrogen in the presence of 10% palladium on charcoal generates a mixture of:
  - (1) cyclohexanol and benzyl alcohol
- (2) cyclohexane and toluene
- (3) cyclohexanol and toluene
- (4) cyclohexane and bnenzyl alcohol
- The reaction of 2-methyl furan with DMF-POCl<sub>3</sub> would given:

OHC

CHO

- The separation of trivalent ions  $Lu^{3+}$ ,  $Yb^{3+}$ ,  $Dy^{3+}$ ,  $Eu^{3+}$  can be effectively done by a cation exchange resin using ammonium o-hydroxy iso-butyrate as a element. The order of separation of ions would be:
  - (1)  $Lu^{3+}$ ,  $Yb^{3+}$ ,  $Dy^{3+}$ ,  $Eu^{3+}$
- (2)  $Eu^{3+}$ ,  $Lu^{3+}$ ,  $Dy^{3+}$ ,  $Yb^{3+}$
- (3)  $Yb^{3+}$ ,  $Dy^{3+}$ ,  $Eu^{3+}$ ,  $Lu^{3+}$
- (4)  $Dy^{3+}$ ,  $Yb^{3+}$ ,  $Eu^{3+}$ ,  $Lu^{3+}$
- **19.** The symmetry elements present in  $BF_3$  are :
  - (1)  $C_3$ ,  $3C_2$ ,  $S_2$ ,  $\sigma_n$

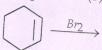
(2)  $C_3$ ,  $\sigma_h$ ,  $\sigma_n$ , i

(3)  $C_3$ ,  $\sigma_v$ ,  $\sigma_h$ ,  $3C_2$ 

- (4)  $C_3$ ,  $3C_2$ ,  $\sigma_r$ ,  $\sigma_h$
- 20. The compressibility factor of Vander Waals gas at critical state is:
  - (1) 1/3
- (2) 3/8
- (3) 8/27
- (4) 3
- 21. When benzene sulphonic acid and p-nitrophenol are treated with NaHCO<sub>3</sub> the gases released, respectively are:
  - (1)  $SO_2$ ,  $NO_2$
- (2)  $SO_2$ , NO
- (3)  $CO_2$ ,  $CO_2$  (4)  $SO_2$ ,  $CO_2$
- **22.** Which of the following pairs give positive Tollen's test?
  - (1) Glucose, Sucrose

- (2) Glucose, Fructose
- (3) Hexanal, Acetophenone
- (4) Fructose, Sucrose

23.	What configuration	
	What configuration are found in the product(s)	of the contract of the contrac
	product(s)	of the reaction?



- (1) 1s, 2s only
- (3) 1R, 2R only

- (2) 1R, 2s only
- (4) equal mixture of 1R, 2R and 1s, 2s

#### The compound which shows $L \leftarrow M$ charge transfer is : 24.

- (1) HgO

- (2)  $K_2Cr_2O_7$  (3)  $Ni(CO)_4$  (4)  $[Ni(H_2O)_6]^{2+}$

# Among the following complexes, which would show the strong Jahn-Teller (1) $\left[Cr(H_2O)_6\right]^{2+}$ (2) $\left[Ti(H_2O)_6\right]^{3+}$ (3) $\left[Co(H_2O)_6\right]^{2+}$ (4) $\left[Fe(H_2O)_6\right]^{2+}$

- The homogeneous catalyst used in the hydroformylation or hydrocarbonylation is 26. (1) Co
  - (2) Cr
- (3) Ti
- (4) V

(1) 
$$[CrCl_4]^- < [Cr(bipy)_3]_- < [CrO_4]^{2-} < [Cr(CO)_5]^{2-}$$

(2) 
$$[CrCl_4]^- < [CrO_4]^{2-} < [Cr(CO)_5]^{2-} < [Cr(bipy)_3]$$

(3) 
$$[CrO_4]^{2-} < [CrCl_4]^{2-} < [Cr(bipy)_2] < [Cr(CO)_5]^{2-}$$

(4) 
$$[CrO_4]^{2-} < [Cr(CO)_5]^{2-} < [CrCl_4]^{2-} < [Cr(bipy)_3]$$

**28.** Lewis acidity of 
$$BMe_3$$
,  $BPh_3$  and  $BCl_3$  wrt pyridine follows the order:

- (1)  $BCl_3 > BPh_3 > BMe_3$
- (2)  $BMe_3 > BPh_3 > BCl_3$
- (3)  $BPh_3 > BCl_3 > BMe_3$
- (4)  $BCl_3 > BMe_3 > BPh_3$

- (2) lactose
- (3) cellobiose
- (4) sucrose

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M.

	<ul> <li>30. Polarographic method of analysis to a given mixture of the two ions (Cu<sup>2+</sup></li> <li>(1) half wave potentials</li> </ul>	obtain individual a and <i>CCl</i> <sup>2+</sup> ) is achi	mounts of $Cu^{2+}$ and $Cd^{++}$ in
	(3) decomposition potentials	(2) migration cu	irrent
	31. If $k_{sp}$ is the solubility product of a Span (1) $(k_{sp}/108)^{1/5}$ (2) $(k_{sp}/72)^{1/5}$		
	(1) ${}_{1}^{2}D$ (2) ${}_{7}^{15}N$	train tumors is: $(3) \frac{113}{53}I$	$(4) \frac{13}{6}C$
3	33. The Bronsted acidity of boron hydrides  (1) $B_2H_6 > B_4H_{10} > B_5H_9 > B_{10}H_{14}$	follows the trend :	25. Approximately 25. Approxim
	(2) $B_5H_9 > B_4H_{10} > B_2H_6 > B_{10}H_{14}$		and to the second second
rae i	(3) $B_2H_6 = B_4H_{10} > B_5H_9 = B_{10}H_{14}$ (4) $B_{10}H_{14} > B_5H_9 > B_4H_{10} > B_2H_6$		
34	<ul> <li>The free energy change (ΔG) of 1 mole of from 1 atm to 2 atm is:</li> <li>(1) -RT ln 2</li> <li>(2) RT</li> </ul>	ideal gas which is	compressed isothermally
35.		3) RT ln 2	(4) -RT
	(1) 200 g of water at 40°C (2)	) 300 g of water at	30°C
36.	The point group symmetry of p-dichlorobe $(1) C_{2n} \qquad (2) D$	D	to resolution of the post
37.	A certain buffer solution contains equal cor is $10^{-10}$ . The pH of solution is:	$D_3$ (4)	4) $C_{2h}$ and $HA$ . The kb for $A^{-1}$
	(1) 7 (2) 10 (3)	1	) 14
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The spontaneity of a reaction can be judged from the sign of emf (E) and free energy

(2) 
$$\Delta G = 0, E = 0$$

(3) 
$$\Delta G = -ve, E = +ve$$

(4) 
$$\Delta G = -ve, \varepsilon E - ve$$

**39.** An aqueous solution is prepared by mixing equal volume of 0.1 M KCl and 0.1 M KI. To this solution a drop of 0.01 M AgNO<sub>3</sub> solution is added. Which of the following is

(1) A precipitate forms which is primarily *AgI* 

(2) A precipitate forms which is primarily AgCl

(3) A precipitate forms which is primarily AgI and AgCl

(4) There will be no precipitation as there is no common ions between potassium and

40. An example of a colligative property is:

(1) Vapour pressure

(2) Freezing point

(3) Osmotic pressure

Molecule having non polar as well as polar bonds but the molecule as a whole is (4) All (2) Cl<sub>2</sub>O<sub>8</sub>

- (3)  $B_2Cl_4$

Among the following compounds which on heating do not produce  $N_2$  ? (1)  $NH_4Cl + CaO$  (2)  $(NH_4)_2Cr_2O_7$  (3)  $Ba(N_3)_2$ 

Non-metal 'M' forms  $MCl_3$  ,  $M_2O_5$  and  $Mg_3M_2$  but does not form  $MI_5$  . The (1) 'M' can form multiple bonds

(2) Atomicity of 'M' is 4

(3) 'M' is second period element

(4) The range of oxidation number for M is +5 to -3

**44.** Which of the following order is correct?

- (1)  $K^+ < Ca^{++} < P^{3-} < S^{2-}$ : ionic size
- (2)  $Na^+(aq) > K^+(aq) > Rb^+(aq) > Cs^+(aq)$ : electrical conductance
- (3)  $Al^{3+}(aq) > Mg^{2+}(aq) > Na^{+}(aq)$ : hydrate size
- (4)  $I^{-}(aq) < Br^{-}(aq) < Cl^{-}(aq) < F^{-}(aq)$ : ionic mobility

**45.** 
$$CH_3 - C - CH_2 - CH_2 - C - CH_3 \xrightarrow{(NH_4)_2 CO_3} (A) \xrightarrow{CCl_3 CO_2 Na} (B)$$
 (major)

Product (B) of above reaction is:

$$(1) \bigcap_{N} Cl \qquad (2) \bigcap_{N} (3) \bigcap_{N} (4) \bigcap_{N} Cl$$

46. 
$$R$$
 $C = N$  where  $X = CH_3COO^-$ ,  $Cl - CH_2COO^-$ ,  $PhSO_3^-$ 

(i) (ii) (iii)

Rate of reaction toward Beckmann rearrangement:

(1) (i) > (ii) > (iii)

(2) (ii) > (i) > (iii)

(3) (iii) > (ii) > (i)

(4) (iii) > (i) > (ii)

**47.** Which of the following reaction, does not give chlorobenzen as a product?

- (1)  $CHCl_3,OH^{\Theta}$
- (2)  $CHBrCl_2,OH^{\Theta}$
- $(3) \qquad CHBr_2Cl,OH^{\Theta} \rightarrow$
- $(4) \qquad \boxed{\qquad \qquad CHFClBr,OH^{\Theta}}$

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48. 
$$Ph - C - CHN_2 \xrightarrow{Ag_2O} A$$
, Product 'A' is:

(1)  $Ph^{14}CH_2COOH$ 

(2) *PhCH*<sub>2</sub><sup>14</sup>*COOH* 

(3) *Ph*<sup>14</sup>*COOH* 

(4) PhCOOH

49. 
$$(4) \ PhCOOH$$

$$(i) \ HCl \ (ii) \ SOCl_2 \ (A) \xrightarrow{AlCl_3 \ C_6H_6} (B) \xrightarrow{KOH/MeOH} (C)$$

Compound 'C' is:

$$(1) Ph-CH_2-C-$$

(2) 
$$PhCH = CH - C - CH_3$$

$$(3) Ph-C \longrightarrow$$

(2) 
$$PhCH = CH - C - CH_3$$
  
O  
(4)  $Ph - C - CH = CH - CH_3$ 

- 50. Which of the following benzene ring substituents is deactivating but ortho-para (2)  $-OCH_3$  (3)  $-COCH_3$  (4)  $-NO_2$

- The strong field in  $[Fe(CN)_6]^{3-}$  will split the 3d orbitals. Their separation may be (1) NMR
  - (2) ESR

(3) IR

- (4) Electronic absorption
- 52. Movement of nuclei is negligible during time taken by an electronic transition is
  - (1) Franck Condon Principle
- (2) Lambert Beer Law
- (3) Born-Oppenheimer approximation (4) None
- 53. The number of ESR peak(s) expected for  $^{14}N$  is (are):
  - (2) 2
- (3) 3
- (4) 4

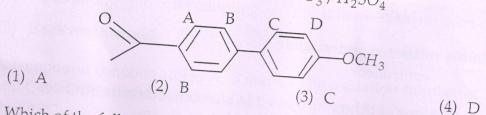
54.

	remme which of the following effect?	
	(1) Precipation effect	(2) Solubility effect
	(3) Polarisation effect	(4) Redox effect
55.	The ground state term of $Sm^{3+}$ and $Eu^{2}$	2+ respectively are:
	(1) ${}^{7}F_{0}$ and ${}^{6}H_{5/2}$	(2) ${}^{6}H_{5/2}$ and ${}^{7}F_{0}$
	(3) ${}^2F_{5/2}$ and ${}^5I_4$	(4) ${}^{7}F_{6}$ and ${}^{2}H_{7/2}$
56.		ontrolled treatment of this complex with water exes of composition $[Co(H_2O)_4Cl_2]$ . Identify thereic complexes:
	(1) $D_{4h}(C_{2v} \text{ and } C_{2h})$	(2) $D_{4h}(C_{2v} \text{ and } C_{4h})$
	(3) $T_d(C_{2v} \text{ and } D_{4h})$	(4) $T_d(C_{2v} \text{ and } C_{4h})$
57.	Kelvin's thermodynamics scale of temporal	erature is based on:
	(1) Charle's Law	(2) Joule's Law
	(3) Amagat's Law	(4) Carnot's principle
58.	Calculate the work of expansion when and reversibly from 10 L to 20 L at 300 H	2 moles of an ideal gas expands isothermally C:
	(1) 826.5 cal (2) 413.25 cal	(3) -826.5 cal (4) -413.25 cal
59.	Which of the following is strongest redu	acing agent ?
	(1) $GeCl_2$ (2) $SnCl_2$	(3) PbCl2   (4) SnCl4
60.	The total pressure for the reaction $C(s)$ condition is 15 atms. The value of Kp is	$+CO_2(g) \rightleftharpoons 2CO(g)$ under the equilibrium:
	(1) 16 (2) 2	(3) 20 (4) 25

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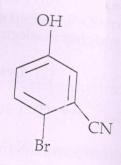
The platinised platinum electrodes are used for conducting measurements in order to

61. On which position the attack of nitronium ion would be most rapid, when the compound undergoes nitration with  $HNO_3/H_2SO_4$ 



- **62.** Which of the following pair gives same phenyl osazone?
  - (1) D-glucose and D-allose
  - (2) D-glucose and D-alfrose
  - (3) D-glucose and D-mannose
  - (4) D-glucose and D-talose
- Stereoisomers of aldoheptose is (a) and stereoisomers of ketoheptose is (b). Ratio of (1)

- **64.** The IUPAC name of the following compound is:



- (1) 4-Bromo-3-Cyano phenol
- (2) 2-Bromo-5-hydroxybenzonitrile
- (3) 2-Cyano-4-hydroxy bromobenzene
- (4) 6-Bromo-3-hydroxybenzonitrile

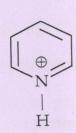
#### **65.** Which is correct matching of List-I and List-II?

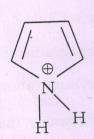
#### List-II List-I (Name of method) (Quantity measured and variable controlled (A) Amperometeric titrations 1/R Vs. Volume of titrant (i) (B) Potentiometric titrations (ii) i Vs. Volume of titrant, ε (C) Conductometric titrations (iii) E Vs. Volume of titrant, i = 0 (1) (i) - B, (ii) - C, (iii) - A (2) (i) - A, (ii) - B, (iii) - C(4) (i) - C, (ii) - B, (iii) - A(3) (i) -C, (ii) -A, (iii) -B**66.** Cyctochrom is: (1) oxygen storage protein (2) redox protein (4) Mo containing protein (3) Cu – containing protein 67. Which of the following enzyme causes breakdown of proteins to peptides? (1) Lipase (2) Amylase (4) Peptidases (3) Proteases **68.** Which of the following will have higher isoelectric point? (2) Lysine (1) Glycine (4) Glutamic acid (3) Aspartic acid **69.** The ion channels those permit transport of $Na^+$ and $K^+$ ions, are constructed from : (2) helical protiens (1) globular proteins (4) None of these (3) pleated proteins **70.** Sulphur is not a constituent of: (2) Methionine (3) Ferredoxin (4) Pyridoxine (1) Cysteine

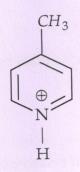
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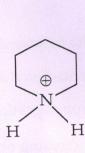
<b>71.</b> $Mg^{2+}$ is prefered in photosynthesis by chlorophyll because:	1,
(1) If has strong oning 1:	
(3) It is a heavy metal	
72. A compound contains atoms A. P. and C. T.	
72. A compound contains atoms A, B and C. The oxidation number of A is +2, of B is and C is -2. The possible formula of the compound is:  (1) $ABC_2$ (2) $B_2(AC_3)_2$ (3) $A_3(BC_4)_2$ (4) $A_3(B_4C)_2$	+5
<b>73.</b> Which among the followings is microwave inactive?	
(1) NO (2) $Br_2$ (3) CO (4) $CH$	
74. Which of the following species does not obey Huckel Rule?	
(1) cyclopentadienyl anion (2) cyclopentadienyl cation	
(3) Cyclopropane cation (4) Tropylium cation	
<b>75.</b> Write the increasing order of relative basicity of the amine, imine and nitrile:	
(1) amine > imine > nitrile (2) imine > nitrile > amine	
(3) nitrile > amine > imine (4) nitrile < imine < amine	
76. Which among the following has highest P-O stretching frequency? (1) $(CH_3)_3 PO$ (2) $Br_3 PO$ (3) $Cl_3 PO$ (4) $F_3 PO$	
77. The oxide of chlorine, which is a mixed anhydride?	
(1) $Cl_2O$ (2) $ClO_2$ (3) $Cl_2O_3$ (4) $Cl_2O_7$	
78. Which reagent is used for the conversion of benzyl to benilic acid?	
(1) Conc $HCI$ (2) $C$	
79. Which in the correct order of vapour pressure of 0.1 M aqueous solution of FeCl <sub>3</sub> , NaCl, CaCl <sub>2</sub> and Glucose?	
(1) Glucose > NaCl > C Cl	
(3) $NaCl > Glucose$	
Phil./Ph.D./URS-EE-Oct2017/(Chemistry)/(D)  (4) $FeCl_3 > CaCl_2 > NaCl > Glucose$	
P. T. O.	

- **80.** Phenol associates in benzene to form dimer. The Van't Hoff's factor is 0.54. What is the degree of association?
  - (1) 0.46
- (2) 0.54
- (3) 0.88
- (4) 0.92
- **81.** R-(-)-2-Bromooctane on reaction with aqueous KOH mainly gives 2-octanol that is:
  - (1) optically active with 'R' configuration
  - (2) a racemic mixture
  - (3) optically active with 'S' configuration
  - (4) a meso compound
- **82.** The correct order of acidity among:









- (1) (i) < (ii) < (iii) < (iv)
- (3) (ii) < (i) < (iii) < (iv)

- (2) (iv) < (iii) < (i) < (ii)
- (4) (ii) < (iv) < (i) < (iii)
- **83.** At room temperature, the number of singlet resonance observed in the  ${}^{1}H$  spectrum of  $Me_{3}CC(O)NMe_{2}$  is :
  - (1) 3
- (2) 4
- (3) 5
- (4) 2
- **84.** The exceptionally low carbonyl stretching frequency (1650 cm<sup>-1</sup>) in 2, 4, 6-cycloheptatrienone is due to :
  - (1) conjugation effect

(2) steric effect

(3) field effect

- (4) electronic effect
- **85.** Conversion of  $PhNH_2$  to PhCN can be done by :
  - (1) reaction with NaCN in the presence of Ni catalyst
  - (2) reaction with CHCl<sub>3</sub> and NaOH
  - (3) diazotization followed by the reaction with *CuCN*
  - (4) reaction with ethylformate followed by the reaction with NaCN

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86.	The major product formed and t-butanol is:	in the	reaction	of	anisole	with	Lithium,	liquid	ammonia

- (1) 1-methoxycyclohexa-1, 3-diene
- (2) 2-methoxycyclohexa-1, 3-diene
- (3) 1-methoxycyclohexa-1, 4-diene
- (4) 3-methoxycyclohexa-1, 4-diene

## **87.** Which of the following molecules have $n \to \pi^*$ transition at the lowest wavelength?

- (1) *HCHO*

- (2)  $CH_3COC_6H_5$  (3)  $CH_3COC_2H_5$  (4)  $C_6H_5COC_6H_5$

- (1) p-toluene sulphonyl chloride/KOH
- (2) Sn/HCl
- (3) Acetyl chloride
- (4) (i)  $NaNO_2 / HCl \ 0 5^{\circ}C$ 
  - (ii) alkaline β-napthol

**89.** 
$$SN^1$$
 reaction on optically active substrates mainly give :

- (1) retention in configuration
- (2) inversion in configuration

(3) racemic product

(4) no product

### Which among the following is solvolysed at the faster rate?

(1)  $C_6H_5CH_2Cl$ 

(2)  $Me_3C - Cl$ 

(3)  $CH_2 = CH - CH_2Cl$ 

(4)  $(C_6H_5)_3C-Cl$ 

(1) 
$${}^4T_{2g}$$
 and  ${}^4A_2$  (2)  ${}^4T_{1g}$  and  ${}^4A_2$  (3)  ${}^3T_{1g}$  and  ${}^4A_2$  (4)  ${}^4T_{1g}$  and  ${}^3T_1$ 

#### 92. A true statement about base h9ydrolysis of $\left[Co(NH_3)_5 Cl\right]^{2+}$ :

- (1) It is first order reaction
- (2) The rate determining step involves the dissociation of chloride in  $\left[Co(NH_3)_4(NH_2)Cl\right]^+$
- (3) The rate is independent of the concentration of the base
- (4) The rate determining step involves the abstraction of a proton from  $\left[Co(NH_3)_5Cl\right]^{2+}$

93. B <sub>10</sub> C <sub>2</sub>	$H_{12}$ is isoe	lectronic with	
------------------------------------	------------------	----------------	--

(1)  $B_{12}H_{12}^{2-}$ 

(2)  $B_{12}H_{12}$ 

(3)  $B_{12}H_{12}^{2+}$  (4)  $B_{12}H_{12}^{4-}$ 

## **94.** Which of the following is the strongest oxidizing agent?

(1)  $In^{3+}$ 

(2)  $Ga^{3+}$ 

(3)  $Ti^{3+}$ 

(4)  $Al^{3+}$ 

# Electron transfer from $\left[Fe(H_2O)_6\right]^{2+}$ to $\left[Fe(H_2O)_6\right]^{3+}$ is likely to occur via:

(1) d-d transition

(2) inner sphere electron transfer

(3)  $SN^1$  mechanism

(4) outer sphere electron transfer

(1)  $(\eta^5 - C_5 H_5) Fe(CO)_2$ 

(2)  $(\eta^5 - C_5 H_5) Mo(CO)_3$ 

(3)  $(\eta^5 - C_5 H_5) C_0$ 

(4)  $(\eta^5 - C_5 H_5) \text{Re} (\eta^5 - C_6 H_6)$ 

## The degree of hydration is expected to the maximum for:

(1)  $Mg^{2+}$ 

(2) Na<sup>+</sup>

(3)  $Ba^{2+}$ 

(4)  $K^{+}$ 

### For this system in equilibrium $CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$ the number of components (C), phases (P) and degree of freedom (F), respectively are:

(1) 1, 3, 2

(2) 2, 2, 2

(3) 2, 0, 3

### The compound having highest melting point:

(1) LiCl

(2) LiF

(4) LiI

### The pH of a $1.0 \times 10^{-3} \mu$ solution of a weak acid HA is 4.0. The dissociation constant (2) $1.0 \times 10^{-4}$ (3) $1.0 \times 10^{-5}$ (4) $1.0 \times 10^{-6}$ $k_a$ is:

(1)  $1.0 \times 10^{-3}$ 

====														
	2		2	31.	3	46.	4	61.	. 4	76.	4	91.	1	=
2.	2	17.	3	32.	2	47.	2	62.	1	77.	2	92.	1	
3.	1	18.	3	33.	4	48.	2	63.	3	78.	3	93.	2	
4.	3	19.	1	34.	3	49.	4	64.	3	79.	4	94.	3	
5.	4	20.	3	35.	1	50.	4	65.	2	80.	3	95.	1	
6.	4	21.	2	36.	1	51.	3	66.	3	81.	4	96.	3	
7.	1	22.	2	37.	3	52.	2	67.	1	82.	3	97.	4	
8.	4	23.	1	38.	1	53.	4	68.	3	83.	1	98.	2	
9.	2	24.	1	39.	4.	54.	3	69.	1	84.	2	99.	3	
10.	3	25.	3	40.	4.	55.	1	70.	3	85.	3	100.	1.	
11.	1	26.	3	41.	2	56.	2	71.	1	86.	2			
12.	3	27.	4	42.	3	57.	2	72.	3	87.	3			
13.	4	28.	4	43.	4	58.	1	73.	3	88.	-2			
14.	3	29.	3	44.	2	59.	3	74.	2	89.	2			
15.	4	30.	4	45.	4	60.	2	75.	3	90.	4			

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SET : B

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3.	4 .	18.	2	33. 4	48. 1	63. 4	78. 3	93. 1
4.	3	19.	3	34. 3	49. 4	64. 2	79. 1	94. 2
5.	4	20.	1	35. 1	50. 4	65. 4	80.3	95. 3
6.	2	21.	1	36. 2	51. 2	66. 4	81. 2	96. 2
7.	3	22.	3	37. 2	52. 2	67. 2	82. 2	97. 3
8.	3	23.	3	38. 1	53. 1	68. 2	83. 1	98. 2
9.	1	24.	2	39. 3	54. 1	69. 4	84. 3	99. 2
10.	3	25.	3	40.2	55. 3	70. 4	85. 4	100. 4
11.	1	26.	4	41. 3	56. 3	71. 4	86. 4	
12.	1	27. 2	2	42. 2	57. 4	72. 1	87. 1	
13.	2	28. 3	3	43. 4	58. 4	73. 3	88. 4	
14.	3	29. 4	1	44. 3	59. 3	74. 3	89. 2	
15.	1	30. 3	3	45. 1	60. 4	75. 2	90. 3	

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SET : C

1.	2	16.	3	31. 1	46. 3	61. 1	76. 2	91. 3
2.	3	17.	4	32. 1	47. 1	62. 3	77. 3	92. 2
3.	4	18.	4	33. 2	48. 3	63. 3	78. 2	93. 4
4.	2	19.	3	34. 3	49. 1	64. 2	79. 2	94. 3
5.	4	20.	4	35. 1	50. 3	65. 3	80. 4	95. 1
6.	4	21.	2	36. 3	51. 3	66. 4	81. 1	96. 2
7.	2	22.	2	37. 4	52. 2	67. 2	82. 3	97. 2
8.	2	23.	1	38. 2	53. 4	68. 3	83. 4	98. 1
9.	4	24.	3	39. 3	54. 3	69. 4	84. 3	99. 3
10.	4	25.	4	40.1	55. 1	70. 3	85. 4	100. 2
11.	2	26.	4	41. 4	56. 1	71. 4	86. 2	
12.	2	27.	1	42. 1	57. 3	72. 3	87. 3	
13.	1	28.	4	43. 3	58. 1	73. 1	88. 3	
14.	1	29.	2	44. 3	59. 4	74. 2	89. 1	
15.	3	30.	3	45. 2	60. 4	75. 3	90. 3	

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2.	3	17.	2	32. 3	47.	4	62. 3	77. 2	92. 2
3.	3	18.	1	33. 4	48.	2	63. 1	78. 2	93. 1
4.	2	19.	3	34. 3	49.	3	64. 2	79. 4	94. 3
5.	3	20.	2	35. 4	50.	1	65. 3	80. 4	95. 4
6.	4	21.	3	36. 2	51.	4	66. 2	81. 2	96. 4
7.	2	22.	2	37. 3	52.	1	67. 3	82. 2	97. 1
8.	3	23.	4	38. 3	53.	3	68. 2	83. 1	98. 4
9.	4	24.	3	39. 1	54.	3	69. 2	84. 1	99. 2
10.	3	25.	1	40. 3	55.	2	70. 4	85. 3	100. 3
11.	3	26.	1	41. 1	56.	3	71. 2	86. 3	
12.	2	27.	3	42. 1	57.	1	72. 3	87. 4	
13.	4	28.	1	43. 2	58.	3	73. 4	88. 4	
14.	3	29.	4	44. 3	59.	1	74. 2	89. 3	
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