Q.No. 7 Obtain a relation between heat of reaction, ΔH, measured emf and temperature coefficient of emf of the reaction.

Q.No. 8 Derive Gibbs-Duhem equation.

Q.No. 9 Explain why H_3PO_3 is dibasic while H_3PO_4 is a tri basic acid.

Q.No. 10 Show that multiple extractions are more efficient in extracting a solute from an organic solvent into aqueous phase.

Q.No.3 Write down the mechanism of reaction involved in ninhydrin test of proteins/ peptides

Q.No. 4 Explain the biological signification of Ca^{2+} and Mg^{2+} essential element

Q.No. 5 Draw labeled orgel diagrame of $[Ti F_4]$ and $[Ti F_6]^{3-}$. Write electronic transition that corresponds to 10Dg.

Q.No. 6 Calculate the coefficients of sp^2 – hybrid orbitals .

67.	Which of the following is the reason that pH of about 6 to 10 is maintained in the Mohr method of titration? a. In more acidic solution, the chromate ion (indicator) concentration is too low near the equivalence point b. In more alkaline solutions, silver oxide precipitates c. Solubility of silver chloride is less than silver chromate in pH of 6-10 d. Both A and B	68.	50% of a solute from an aqueous solution is extracted to ether when volume of both the phases is equal. What would be the percent extraction when the volume of the organic phase is doubled? a. 100 b. 90.9 c. 66.6 d. 24.9
69.	Which of the following is not the source of method error? a. Slight solubility of precipitate b. Impurities in reagents c. Incomplete reactions d. Effervescence and "bumping" during sample dissolution	70.	Which of the following statement is NOT true about the Beer-Bouguer-Lambert law (Commonly called Beer's law) for the absorption of monochromatic radiation by a sample? a. Power of the transmitted radiation decreases exponentially as the thickness of the absorbing medium and concentration of the sample increases arithmetically b. Infinite concentration of the sample and thickness of the absorbing medium are required to absorb all the radiation c. Absorbance by the sample is directly proportional to the thickness of the absorbing medium and concentration of the sample d. None of the above

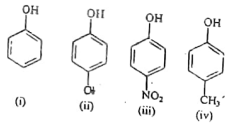
Q.No. 1 Discuss the relative basicities of pyridine, piperidine and pyrrole.

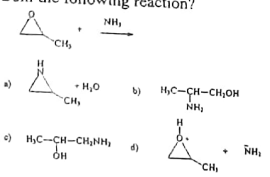
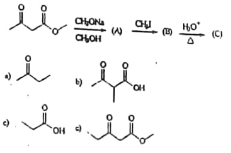
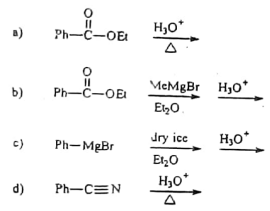
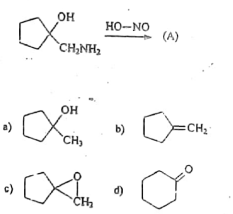
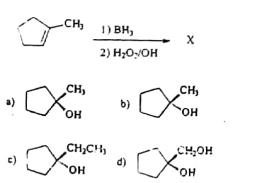
Q.No.2 What is meant by mutarotation? Write down mechanism of mutarotation in D-(+)-glucose

41.	The Complexes $[Co(NH_3)_5 NO_2]Cl_2$ and $[Co(NH_3)_6 ONO]Cl_2$ are the a. Linkage isomers b. Coordination isomers c. Ionization isomers d. Double salt	42.	The correct IUPAC nomenclature for the complex $(Ph_3P)_3$ RhCl is a. Tris (triphenyl phosphine) rhodium chloride b. Chloro tris (triphenyl phosphine) rhodium (I) c. Tris (triphenyl phosphine) chloride rhodium (iii) d. Tris (triphenyl phosphine) rhodium (i) chloride
43.	The Ground term for Mn^{2+} ion is a. ^2S b. ^6S c. ^2D d. ^4F	44.	The CFSE for low spin octahedral d^7 configuration is a. $0.8\ \Delta_0$ b. $1.2\ \Delta_0$ c. $0.4\ \Delta_0$ d. 0
45.	The complex $[Ni(DMGH)_2]$ where DMGH = dimethyl gloximato used in analytical determination of nickel exhibits the geometry a. Square planal b. Trigonal bipyramidal c. Tetrahedeal d. Octahedeal	46.	The biologically significant organometallic complex also a vitamin known as coenzyme B_{12} possesses a. Plastocyanin b. Corrin ring c. Porphyrin ring d. None of the above
47.	The correct binding constant of hemoglobin for oxygen is represented best in equation a. $r = kp^{2.8}/1+kp^{2.8}$ b. $r = kp/1+kp$ c. $r = kp^4/1 + kp^4$ d. $r = kp^{0.5}/1+kp^{0.5}$	48.	Ethylene is bonded to $PtCl_3$ in zeise salt $K[Pt\ Cl_3(C_2H_4)]$ a. η^6 – hexahepto ligand b. η^5 – pentahapto ligand c. η^2 – dihapto ligand d. η^3 – trihapto ligand
49.	At seveso, Italy the disaster in July 1976, was due to a. DDT b. BHC c. TCDD d. Toxaphene	50.	COD removal efficiency is 90% in case of a. UASB Technology b. ASBR Technology c. AMBR Technology d. EGSB reactor
51.	The bond order for superoxide ion is a. 2 b. 2.5 c. 1 d. 1.5	52.	Heats of Hydration for Li^+, Na^+, K^+, Rb^+ and Cs^+ follow the order a. $Li^+ > Na^+ > K^+ > Rb^+ > Cs^+$ b. $Cs^+ > Rb^+ > K^+ > Na^+ > Li^+$ c. $Na^+ > K^+ > Rb^+ > Li^+ > Cs^+$ d. $K^+ > Na^+ > Li^+ > Rb^+ > Cs^+$

31	The wave function of an electron of hydrogen atom in the lowest energy state is proportional to e^{-r/a_o} (where a_o is constant and r is the distance from the nucleus), the probability of finding the electron inside a region of volume 1.00 pm^3 located at the nucleus is a. Zero b. Infinity c. 1.00 pm^3 d. Indeterminate	32	Spectroscopic transitions are changes in populations of quantized energy levels of system involving a. The absorption and emission of radiation b. The absorption and the scattering of electromagnetic radiation c. The emission and the scattering of electromagnetic radiation d. The absorption, the emission and the scattering of electromagnetic radiation
33	A linear rotor is a rigid rotor with a. Three equal moment of inertia b. Two equal moment of inertia c. One moment of inertia equal to zero d. One moment of inertia not equal to zero	34	A Hamiltonian operator is a. The sum of kinetic and potential energy operators b. The sum of position and potential energy operators c. The sum of momentum and kinetic energy operators d. The sum of position and kinetic energy operators
35	Given that the standard potential of the Cu^{2+}/Cu and Cu^{+}/Cu couples are + 0.340 V and + 0.522 V, respectively. The standard potential of the Cu^{2+}/Cu^{+} couple is a. + 0.182 V b. + 0.158 V c. + 0.862 V d. – 0.182 V	36	The expression used to establish criteria for spontaneous change is a. (ds)u,v ≥ o and $\Delta S_{tot} > o$ b. (ds)u,v ≥ o and $\Delta S_{tot} < o$ c. (ds)s,v ≤ o and $\Delta S_{tot} > o$ d. (ds)u,v ≥ o, (ds)s,v ≤ o and $\Delta S_{tot} > o$
37	When a sample of argon, for which r =5/3 at 100 kPa expands reversibly and isothermally to twice its initial volume the final pressure is a. 32 kPa b. 50 kPa c. 200 kPa d. 132 kPa	38	The vapour pressure of 0.500 M aqueous KNO_3 solution at 100 °C is 99.95 kPa, so the activity of water in the solution at this temperature is (1 atm=101.325 kPa) a. 0.4998 b. 0.9864 c. 0.5050 d. 0.500
39	The temperature at which the vapour pressure of a liquid is equal to the external pressure is called the a. Boiling temperature b. Normal boiling point c. Standard boiling point d. Critical temperature	40	The critical pressure, critical volume and critical temperature of methane are 45.6 atm, 98.7 $cm^3\ mol^{-1}$ and 190.6 K, respectively. The radius of the molecule is a. 0.24×10^{-12} m b. 0.24×10^{-15} m c. 0.24×10^{-10} m d. 0.24×10^{-9} m

19.	Glycerol on heating with anhaydrous $ZnCl_2$ gives: a. Ethylene oxide b. Acetaldehyde c. Ethanol d. 1,4-Dioxane	20.	Which one of the following is most basic? a. m-Nitroaniline b. o-Nitroaniline c. p-Nitroaniline d. 2,4-Dinitroaniline
21.	For a zero-order reaction A ⟶ Products, t ½ is proportional to a. [A] b. $\frac{1}{[A]}$ c. $[A_o]^2$ d. $\frac{1}{[A_o]^2}$	22.	If for a reaction the plot of ln k versus 1/T gives a straight line, then a. E_a = - (slope) x R b. E_a = (slope) x R c. E_a = - (slope) /R d. E_a = R/(slope)
23.	What is the value of J_{max} for a rigid diatomic molecule for which at 300 K, the rotational constant is 1.566 cm^{-1} a. 8 b. 7 c. 9 d. 6	24.	Raman effect is a. Absorption of light b. Emission of light c. Elastic scattering of light d. Inelastic scattering of light
25.	A microscope using suitable photons is employed to locate an electron in an atom within a distance of 0.1 A^0. what is the uncertainty involued in the measurement of its velocity? (Mass of electron = 9.1×10^{-31} kg, Plank's constant = 6.626×10^{-34} Js) a. $0.579 \times 10^7\ ms^{-1}$ b. $5.79 \times 10^7\ ms^{-1}$ c. $0.579 \times 10^7\ cms^{-1}$ d. $5.79 \times 10^7\ cms^{-1}$	26.	The energy of an electromagnetic radiation of wave length 253.7 nm is: (Plank's constant = 6.626×10^{-34} Js) a. 471.9 k J b. 270.2 k J c. 471.9 J d. 270.2 J
27.	Which of the following functions are eigen function of the operator d^2/dx^2: a. k^{x^2} b. e^{ax^3} c. e^{ikx} d. x sin x	28	A particle of mass 'm' is constrained to move in an infinite one-dimensional box of width 'l'. In units of $\left(\frac{h^2}{m\,l^2}\right)$, the energy change involved in the transition n=4 ⟶ n=3 is a. 1/8 b. 7/8 c. 1 d. 1/2
29	If $\phi(\emptyset) = N \exp(im\emptyset)$, $0 \le \emptyset \le 2\pi$, then the normalization constant is equal to a. π b. $(\pi)^{1/2}$ c. $(1/\pi)^{1/2}$ d. $(1/2\pi)^{1/2}$	30	A particle of mass 'm' is confined in a one-dimensional box of length 'l' the probability of finding the particle in the region $o \le x \le L/2$ is a. ½ b. 1 c. 3/2 d. 5/2

1.	β-D-Glucopyranose in the chair form is most widely occurring form of glucose in nature. It has the following characteristics except a. Forms a six membered ring b. Carbon 6 is above the plane of the chair c. All-OH groups are equatorial d. The anomeric carbon has a hydroxyl that is below the plan of the chair	2.	Which of the following aldehydes will give the ^{1}HNMR data given below after reacting with Tollent's regent δ 1.01 (doublet, 6H), 2.16 (multiplet, 1H), 2.19 (doublet, 2H) 11.0 (singlet, 1H) a)  b)  c)  d) 
3.	Which of the following solvent is preferably used for SN2 reactions? a. Polar solvents b. Polar aprotic solvents c. Polar protic solvents d. Non-polar solvents	4.	Alizarin is a. an azo dye b. an anthraquinone dye c. a tripheny dmethane dye d. a phthalein dye
5.	The correct order of acidity of the following compounds is  (i) (ii) (iii) (iv) a. iv < iii < ii < i b. iv < i < iii < ii c. iv < ii < i < iii d. iv < i < ii < iii	6.	The range of visible region in the electromagnetic radiation a. 100 – 200 nm b. 200 – 400 nm c. 400 – 800 nm d. 100 – 300 nm
7.	A strong absorption at 1710 cm^{-1} in IR spectrum of acetone corresponds to which of the following bond stretching a. Aliphatic C – H b. C – C c. C = O d. None	8.	Which of the following is not an aromatic compound a)  b)  c)  d) 
9.	Ethylacetoacetete is synthesized by a. Claisen condensation b. Wurtz reaction c. Sandmeyer's reaction d. Rosendmund's reduction	10	Which of the following compound will have zero dipole moment a. Cis-1, 2-Dibromo ethylene b. 1,1-Dibromo ethylene c. Trans-1,2-Dibromo ethylene d. All of these

11.	Which of the following compounds will react with ammoniacal silver nitrate a. 1-Butene b. 1-Butyne c. 2-Butene d. 2-Butyne	12.	Optical isomerism is shown by a. n-Butyl chloride b. sec-Butyl chloride c. tert-Butyl chloride d. isobutyl chloride
13.	What is the major product(s) obtained from the following reaction? 	14.	What is the major end product (c) expected from the following synthetic sequence? 
15.	Which of the following reaction will not yield benzoic acid as the major product? 	16.	Major product (A) of the following reaction is: 
17.	What is X ? 	18.	Methyl ketones can be distinguished from ordinary ketones by a. Schiff's test b. Fehling test c. Tollen's test d. Iodoform test

DEPARTMENT OF CHEMISTRY
A.M.U., ALIGARH

M.Sc. Chemistry Admission Test 2012-2013

Time: 2 hours M.M. : 200

Question Booklet

Name of the Candidate :

Roll No. of the Candidate :

Examination Centre :

Date & Time of Examination :

faul

Signature of the Candidate **Signature of Invigilator**

Instructions to Candidate:

1. This booklet contains two sections. Section A contains 70 objective type questions each of 2 marks and Section B contains 10 short answer type questions each of 6 marks.
2. Candidate should chose the most appropriate answer out of four options given with each question in Section A and mark it on OMR sheet using ball point pen in the space given below the question.
3. **Negative Marking:** Incorrect answers shall result in a negative score of 25 per cent of the marks allotted to the question.
4. Candidate should write the answer of each question in Section B using ball point pen in the space provided below the question.
5. Any rough work if required can be done in the blank space available in the question booklet.
6. Symbols have their usual meaning.
7. Candidate should return the OMR sheet and question booklet.

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	INO	ORG	PHY	ANA	TOTAL
Marks Obtained					
Sign. of Examiner					

...the nature of the wave function of sp-hybrid orbitals. Derive the angle between the ... orbitals.

...the van Deemter equation. Plot HETP against the velocity of carrier gas and explain, briefly, ... contribution of each term of van Deemter equation.

g) on the bonding and uses of organotin compounds.

4. Discuss the general approach for the synthesis of azo dyes.

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DEPARTMENT OF CHEMISTRY
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MCH17

M.Sc. Chemistry Admission Test 2017 – 2018

Time: 2 hours M.M. : 200

Question Booklet **SERIES - B**

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Roll No. of the Candidate : 7265000

Examination Centre : S.T.S School (Minto Circle)

Room Number : 35

Date & Time of Examination : 07/06/2017 8:00 AM

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5. Any rough work if required can be done in the blank space available in the question booklet.
6. Symbols have their usual meaning
7. Candidate will have to return the **hall ticket** and **OMR sheet** to the invigilator before leaving his/her seat. They can take carbon less copy of OMR sheets with them.

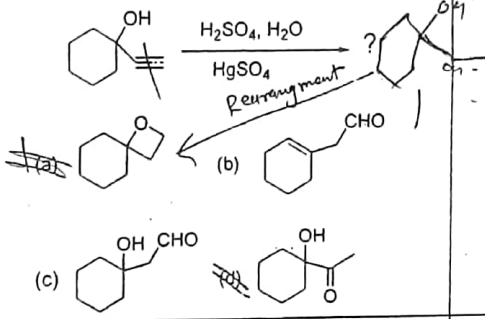
7. During a reaction, formation of silver mirror inside tube is due to:

(a) Silver nitrate
(b) Silver ions
(c) Silver atoms
(d) Silver compounds

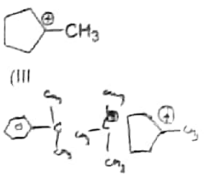
8. Which statement about pentanoic acid (A) is incorrect?

(a) The reaction between (A) and PCl_5 gives pentanoyl chloride
(b) Treatment of (A) with ethanol yields ethyl pentanoate
(c) (A) Can be prepared by reacting $n\text{-}C_5H_{11}MgBr$ in Et_2O with solid CO_2, followed by treatment with acid
(d) (A) reacts with KOH to give a salt.

9. The sole product of the following reaction is



10. Increasing stability order of the following carbocations is:



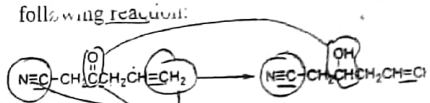
(a) I < III < II
(b) II < I < III
(c) II < III < I
(d) III < II < I

11. Primary alcohol can be prepared from

by

(a) Direct hydration
(b) Hydroboration –oxidation
(c) Mercuration-demerceuration
(d) All the above

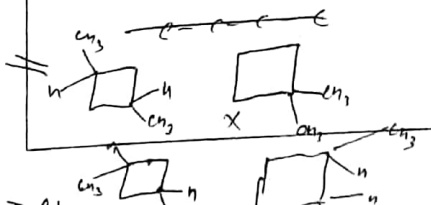
12. Which of these reagents could accomplish th following reaction:



(a) $NaBH_4$
(b) $LiAlH_4$
(c) 1 mole H_2, low pressure
(d) H_3O^+

13. Among following dimethylcyclobutanes, which one can exhibit optical activity?

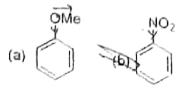
(a) *cis*-1,2-dimethylcyclobutane
(b) *trans*-1,2-dimethylcyclobutane
(c) *cis*-1.3-dimethylcyclobutane
(d) *trans*-1,3-dimethylcyclobutane



14. Which one of the following statements FALSE for IR Spectroscopy

(a) Higher the stretching frequiency if m starained the alicyclic ring contain carbonyl group.
(b) Electron withdrawing substituents decre the frequency of carbonyl group.
(c) Electron releasing substituents decrease frequency of carbonyl group.
(d) Conjugation decreases the carbo stretching frequency.

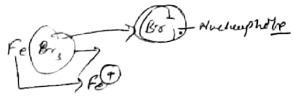
15. The most reactive substrate towards Br_2 in presence of $FeBr_3$ is:

(a) 

(b)

(c) 

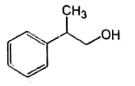
(d) 

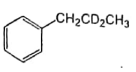


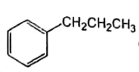
16. The following proton NMR spectral data of an organic compound:

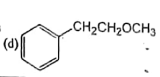
δ 7.2 (5H, singlet)
δ 2.3 (2H, triplet)
δ 1.3 (2H, multiplet)
δ 0.9 (3H, triplet)

indicates that the compound is –

(a) 

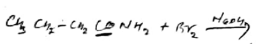
(b) 

(c) 

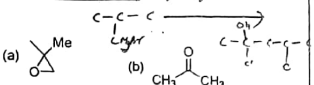
(d) 

17. When butamide is heated with Br_2 in alkali it gives:

(a) $CH_3CH_2CH_2Br$
(b) $CH_3CH_2NH_2$
(c) $CH_3CH_2CH_2COOH$
(d) $CH_3CH_2CH_2NH_2$



18. Which of the following compound will react with isopropyl magnesium bromide to give 2,4-demethyl pentan-2-ol on hydrolysis:



(a) 

(b) 

(c) $CH_3CH_2\overset{O}{\overset{\|}{C}}H$ (d) $CH_3\overset{O}{\overset{\|}{C}}OCH_3$

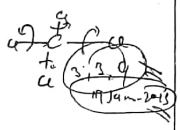
19. A particle of mass 'm' confined in a one dimensional box of length L. The probability of finding the particle in the region

$0 \le x \le L/2$ is

(a) 0
(b) 1
(c) 1/2
(d) 1/4

20. The number of translational, rotational and vibrational degrees of freedom in CCl_4 molecule are respectively

(a) 3,2,10
(b) 3,3,9
(c) 1,1,13
(d) 3,10,2



21. The degree of ionization of HF in 0.1 m aqueous solution is : (Freezing point of the solution = -0.197 ^{0}C and K_f for water = 1.86 ^{0}C)

(a) 3%
(b) 6%
(c) 9%
(d) 12%

22. Compound A decomposes to form B and C, the reaction is first-order. At 25 ^{0}C the rate constant for the reaction is 0.450 sec^{-1}. The half life of A at 25 ^{0}C is

(a) 0.77 sec
(b) 1.54 sec
(c) 3.08 sec
(d) 4.62 sec

23. What is the potential of a half-cell consisting of zinc electrode in 0.01 M $ZnSO_4$ solution at 25 ^{0}C ? (E^0 = 0.763 V)

(a) 0.8221 V
(b) -0.8221 V
(c) 0.7039 V
(d) -0.7039 V

24. A gas would show maximum deviations from ideal gas behaviour at

(a) 150 ^{0}C, 2 atm
(b) 0 ^{0}C, 2 atm
(c) -100 ^{0}C, 2atm
(d) -100 ^{0}C, 4 atm

25. The mathematical relation for the first-law of thermodynamics is

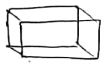
(a) $\Delta E = q - w$
(b) $\Delta E = 0$ for a cyclic process
(c) $\Delta E = q$ for an isochoric process
(d) All of these

26. The value of commutator [x, d/dx] is

(a) x
(b) d/dx
(c) -1
(d) +1

27. For a one dimensional box of length a, in stationary state n=2 the approximate probability of finding the particle in the central one third region will be

(a) 0.4
(b) 0.2
(c) 0.3
(d) 0.1



28. The J=4←3 transition for a diatomic molecul occurs at 0.50 cm^{-1}. Assuming a rigid rotator th wavenumber for the J = 7← 6 transition is

(a) 0.88 cm^{-1}
(b) 0.28 cm^{-1}
(c) 0.75 cm^{-1}
(d) 1.0 cm^{-1}

29. The mobility of chloride ion in water at 25 ^{0}C is 7.91 x 10^{-4} cm^2 S^{-1} V^{-1}, How much time will it take for the ion to travel between two electrodes separated by 4.0 cm if the electric field is 20 V cm^{-1}.

(a) 2.5 min
(b) 1.4 min
(c) 4.2 min
(d) 84.28 min

30. The Joule-Thomson expansion of a real g occurs with

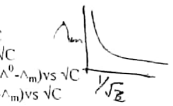
(a) $\Delta U = 0$ & $\Delta H \neq 0$
(b) $\Delta U \neq 0$ & $\Delta H = 0$
(c) $\Delta U = 0$ & $\Delta H = 0$
(d) $\Delta U \neq 0$ & $\Delta H \neq 0$

31. For propanoic acid, value of Ka is 1.34 x 10^{-5} M at 25 ^{0}C. The pH for 0.01 M solution of the acid will be

(a) 3.44
(b) 12
(c) 4.44
(d) 2

32. For weak electrolyte, straight line is obtained graph of:

(a) Λ_m vs $\sqrt{C}$
(b) Λ_m vs $1/\sqrt{C}$
(c) $\Lambda_m^2/\Lambda^0(\Lambda^0-\Lambda_m)$ vs $\sqrt{C}$
(d) $\Lambda_m^2/(\Lambda^0-\Lambda_m)$ vs $\sqrt{C}$



33. The unit of Michaelis Menton constant, K_m of enzyme catalysis is:

(a) Mol L^{-1}
(b) Mol^{-1} L^{-1}
(c) Mol^2 L^{-1}
(d) Mol L^{-2}

34. A non-ideal mixture of component A and shows positive deviation from Raoult's law. implies that

(a) Dissolution is endothermic
(b) Dissolution is exothermic
(c) $\Delta H_{mix} = 0$
(d) Both A and B

35. The following system is in equilibrium
$CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$
The number of component (C), Phases (P), and Degree of freedom (F), respectively are:

(a) 2,2,2
(b) 1,3,0
(c) 3,3,2
(d) 2,3,1

36. A particular chemical reaction has a negative ΔH and a negative ΔS. Which statement is correct.

(a) The reaction is spontaneous at all temperatures
(b) The reaction is non spontaneous at all temperatures
(c) The reaction becomes spontaneous as temperature increases
(d) The reaction becomes spontaneous as temperature decreases

37. If the half life of a reaction is independent of concentration, the reaction can be

I. First order
II. Second order
III. Third order

(a) I & II only
(b) II & III only
(c) I only
(d) II only

38. The unit of rate constant for a zero order reaction is

(a) s^{-1}
(b) $L\ mol^{-1}s^{-1}$
(c) s
(d) $mol\ L^{-1}s^{-1}$

39. Which one of the following is used as visual indicator in the Mohr precipitation titration

(a) Silver ions
(b) Chloride ions
(c) Thiocyanate ion
(d) Chromate ion

40. A sample of a copper (II) sulphate solution gives absorbance of 0.46 in a 1.0 cm cell. Using the same cell a 0.055M solution of copper (II) suphate gives an absorbance of 0.34. The concentration of copper (II) solution in the given samples is:

(a) 0.074 M
(b) 0.35 M
(c) 0.041 M
(d) 8.60×10^{-3} M

41. Multiple flow paths of the solute contributes to which term of the Van Deemter equation

(a) Coefficient of longitudinal diffusion
(b) Longitudinal diffusion
(c) Eddy diffusion
(d) Mass transfer coefficient

42. If the stationary phase is of non-polar nature and mobile phase is polar, this type of chromatography is

(a) Normal phase chromatography
(b) Reverse phase chromatography
(c) Gradient elution chromatography
(d) Gel permeation chromatography

43. An acid HA (K_a =1.0 x 10^{-4}) has a distribution coefficient of 10.0 between an organic solvent and water. The distribution ratio of acid HA (organic/water) at pH 3.0 would be:

(a) 10.00
(b) 9.09
(c) 11.11
(d) 5.00

44. Which one of the following is used to cross link the polyglucose chain for obtaining the packing material for GFC:

(a) Styrene
(b) Divinylbenzene
(c) N,N'-methylenebisacrylamide
(d) Epichlorohydrin

45. 50.0 mL of a solution which is 0.01 M in Ca^{2+} and buffered at pH 10 is titrated with 0.01 M EDTA solution. The value of K_{eff} for the reaction:

$Ca^{2+} + Y^{4-} \rightleftharpoons CaY^{2-}$

is 1.8×10^{10}. The concentration of Ca^{2+} at the equivalence point is:

(a) 5.27×10^{-7} M
(b) 2.77×10^{-13} M
(c) 5.27×10^{-10} M
(d) 2.77×10^{-6} M

46. Which one of the following is used as indicator in the titration of silver ion with a standard solution of thiocyanate ion?

(a) Fe^{3+}
(b) CrO_4^{2-}
(c) Fluorescein
(d) Methyl orange

47. The transmittance of a solution was found to be 10% when measured at 455 nm in a 1.00 cm cell. The absorbance of this solution at 455 nm in a cell with path length of 2.0 mm would be:

(a) 0.1
(b) 0.2
(c) 2.0
(d) 0.5

48. In a chromatographic analysis of lemon oil, peak for limonene has a retention time of 10.0 min with a baseline width of 0.70 min. Y-Terpinene elutes at 10.9 min with a baseline width of 0.80 min. The resolution between the two peaks is:

(a) 1.20
(b) 1.10
(c) 1.06
(d) 1.30

49. Which of the following statements is incorrect regarding HSAB concept?

(a) hard – hard interactions are electrostatic
(b) soft-soft interactions are covalent
(c) AgI_2^- is stable while AgF_2^- is unstable
(d) $[Co(NH_3)_5F]^{2+}$ is unstable while $[Co(NH_3)_5I]^{2+}$ is stable

50. Among Pr^{3+}, Sm^{3+}, Dy^{3+} and Yb^{3+} ions, which one would be eluted first in ion exchange chromatography.

(a) Pr^{3+}
(b) Sm^{3+}
(c) Dy^{3+}
(d) Yb^{3+}

51. The cross linking unit used in designing of Silicones is

(a) Me_2SiCl_2
(b) $MeSiCl_3$
(c) Me_3SiCl
(d) Me_4Si

52. Which of the following pairs involves ligand to metal charge transfer (LMCT)

(a) $[Fe(CN)_6]^{4-}$ and $[MnO_4]^-$
(b) $[Fe(CN)_6]^{3-}$ and $[MnO_4]^-$
(c) $[MnO_4]^-$ and $[IrBr_6]^{2-}$
(d) $[Cr(CO)_6]$ and $[MnO_4]^-$

53. Correct order of Lewis acid character of boron trihalides is

(a) $BF_3 > BCl_3 > BBr_3$
(b) $BF_3 > BBr_3 > BCl_3$
(c) $BCl_3 > BF_3 > BBr_3$
(d) $BBr_3 > BCl_3 > BF_3$

54. Which one of the following complexes is optically active:

(a) $[Co(NH_3)_4Cl_2]$
(b) $[Co(NH_3)_2Cl_4]$
(c) *cis*-$[Co(en)_2Cl_2]$
(d) *trans*-$[Co(en)_2Cl_2]$

55. Ionic radii of high spin Fe^{2+} in hemoglobin is

(a) 78 (pm)
(b) 61 (pm)
(c) 69 (pm)
(d) 65 (pm)

56. Na^+/K^+ ATPASE Transports

(a) $3Na^+$ out of cell and $2K^+$ into the cell
(b) $3Na^+$ out of cell and $3K^+$ into the cell
(c) $2Na^+$ out of cell and $3K^+$ into the cell
(d) $3Na^+$ out of cell and $5K^+$ into the cell

57. The complex will show maximum crystal field splitting is

(a) $[Co(H_2O)_6]^{2+}$
(b) $[Co(H_2O)_6]^{3+}$
(c) $[Rh(H_2O)_6]^{3+}$
(d) $[Fe(H_2O)_6]^{2+}$

58. Coloured nature of $[Ti(H_2O)_6]^{3+}$ is due to

(a) H_2O ligands
(b) Charge Transfer
(c) Intramolecular Vibrations
(d) $^2T_2g \rightarrow {}^2Eg$ transition

59. High spin d^6 complex is

(a) $[Co(H_2O)_6]^{2+}$
(b) $[CoF_6]^{3-}$
(c) $[Fe(CN)_6]^{3-}$
(d) $[Ni(NH_3)_6]^{2+}$

60. Four units of hemoglobin are held together by

(a) Covalent bonds
(b) Salt bridge only
(c) Hydrogen bond only
(d) Hydrogen bond and salt bridge both

61. False statement about crystal field theory is

(a) It considers ligand as point charge
(b) It does not consider covalent bonding between metal and ligand orbitals
(c) It gives accurate explanation about charge transfer bond
(d) It considers repulsion between metal and ligand electrons

62. Decreasing order of energy of term symbols is

(a) $^1S > {}^1D > {}^1G > {}^3P > {}^3F$
(b) $^1G > {}^1D > {}^1S > {}^3P > {}^3F$
(c) $^1S > {}^1D > {}^1G > {}^3F > {}^3P$
(d) $^3P > {}^3F > {}^1S > {}^1D > {}^1G$

63. A substance behaves like simple paramagnetic above Neil Temperature but magnetic moment decreases below it. The substance can be

(a) Ferromagnetic
(b) Diamagnetic
(c) Super magnetic
(d) Anti ferromagnetic

64. The electronic transition

$$t_2g^3eg^2 \xrightarrow{h\nu} t_2g^2eg^3$$

is

(a) Laport forbidden
(b) Spin forbidden
(c) Laport and spin forbidden both
(d) Charge transfer

65. Which one of the following has C—C bond length largest

(a) $[Cl_3PtC_2H_4]^-$
(b) $[Cl_3PtC_2Me_4]^-$
(c) $[Cl_3PtC_2(CN)_4]^-$
(d) $[Cl_3PtC_2(CN)_2H_2]^-$

66. Correct relationship for magnetic susceptibility is

(a) $B = H + 4\pi I$
(b) $B = H - 4\pi I$
(c) $B = H + 4\pi 2I$
(d) $B/H = I - 4\pi I$

67. A strong field octahedral complex has CFSE of $-18Dq+3P$. This is a case of

(a) d^6 configuration
(b) d^4 configuration
(c) d^5 configuration
(d) d^7 configuration

68. Trouton's Constant for a normal liquid is

(a) 25
(b) 21.5
(c) 80
(d) 78

69. Sanger's reagent is

(a) 2,4-Dinitroflourobenzene
(b) Phenylisothiocyanate
(c) 2,4-Dinitrophenyl hydrazine
(d) Ninhydrin

70. Which one of the following is a natural dye

(a) Methyl orange
(b) Alizarin
(c) Malachite green
(d) Martius yellow

Section B

1. 30 mL of an aqueous solution of 0.20 M butyric acid is shaken with 20 mL ether. After the layers are separated it is determined by titration that, 0.4 moles of butyric acid remains in the aqueous layer. Calculate the distribution ratio and the percent extraction.

2. Explain Dewar and coworkers theory of bonding in phosphazene complexes

3. How myoglobine binds with O_2? Prove the relation

$$f = \frac{KP^n}{1 + KP^n}$$

4. Show crystal field splitting picture of $[Ni(CN)_4]^{2-}$ and $[Ni(NH_3)_4\ Cl_2]$ and label the orbitals.

5. (a) Nucleophilic substitution occurs readily in alkyl halides, whereas in alcohols it occurs in presence of strong acids as catalysts. Explain.

   (b) What is the difference between epimers and anomers? Explain with examples.

6. Pyridine, being aromatic like benzene, can undergo nucleophilic substitution easily while benzene cannot. Explain.

7. Indicate what ^1H NMR spectra would you expect from the following compounds:
   (i) n-Propylbenzene
   (ii) n-Butane
   (iii) neo-pentane

8. Calculate the coefficients of sp^2-hybrid orbitals.

9. Normalize the wave function:

   $\Psi = N \exp(i\phi)$ where $0 \leq \phi \leq 2\pi$

10. The force constant of $^1H^{19}F$ molecule is 970 N/m. Calculate the fundamental vibrational frequency and zero-point energy.

Chemistry

A.M.U. ALIGARH

M.Sc. Chemistry Admission Test 2011-2012

Time: 2 hours M.M. : 200

Question Booklet

Name of the Candidate :

Roll No. of the Candidate :

Examination Centre :

Date & Time of Examination :

Signature of the Candidate

Signature of Invigilator

Instructions to Candidate:

1. This booklet contains two sections. Section A contains 70 objective type questions each of 2 marks and Section B contains 10 short answer type questions each of 6 marks.
2. Candidate should chose the most appropriate answer out of four options given with each question in Section A and mark it on OMR sheet using HB pencil or ball point pen in the space given below the question.
3. Negative Marking: Incorrect answers shall result in a negative score of 25 per cent of the marks allotted to the question.
4. Candidate should write the answer of each question in Section B using ball point pen in the space provided below the question.
5. Any rough work if required can be done in the blank space available in the question booklet.
6. Symbols have their usual meaning.
7. Candidate should return the hall ticket, OMR sheet and question booklet.

For Office use

	INO	ORG	PHY	ANA	TOTAL
Marks Obtained					
Sign. of Examiner					

[illegible] and Mo[illegible] [isomers] can be produced by

(a) $[Co(NH_3)_5Cl]$ [illegible]
(b) $[Co(NH_3)_4Cl_2]$ [illegible]
(c) $[Co(en)_2Cl_2]$ [illegible]
(d) $[Co(en)_2Cl_2]Br$

14. The number of isomers produced by square planer complex of the type [Mabcd] can be given as

(a) 2
(b) 3
(c) 6
(d) None

15. Which one of the following molecules has three-[centre] two electron (3C-2e) σ bonding ?

(a) XeF_2
(b) XeF_4
(c) XeF_6
(d) B_2H_6

16. Which one of the following statement about ψ^2 is not true?

(a) ψ^2 is proportional to electron density
(b) ψ^2 may be positive, negative or imaginary
(c) If ψ^2 is high the probability of finding the electron is high
(d) $\psi\psi^*$ is used for ψ^2 to avoid imaginary value.

17. Which one of the following expression corresponds to the Roschow electronegativitiy scale?

(a) [illegible] 3.15
(b) [illegible] 0.359 [illegible] + 0.744
(c) [illegible] 3.59 [illegible] + 0.744
(d) [illegible] 3.59 [illegible] + 0.744

18. Aufbau rules for electronic configuration of elements is not violated in

(a) Main group elements
(b) d-block elements
(c) Lanthenides
(d) Actinides

19. Select correct order of electronegativity of elements

(a) Si [illegible] P [illegible] C [illegible] N
(b) Si [illegible] P [illegible] C [illegible] N
(c) Si [illegible] P [illegible] C [illegible] N
(d) Si < P [illegible] C [illegible] N

20. The compound having maximum Lattice energy is

(a) LiF
(b) NaF
(c) KF
(d) CsF

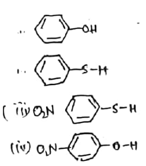
21. [Sa]ponification of oils and fats with potash gives

(a) hard soap
(b) soft soap
(c) transparent soap
(d) detergent

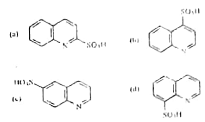
22. In which case of the following formation of Grignard reagent will be most difficult

(a) [illegible]
(b) $CH_2=CH-CH_2-Cl$
(c) $CH_3-CH=CH-Cl$
(d) $CH_3-CH(CH_3)-Cl$

23. Which of the following is most acidic ?



24. Which of the following is the major product when quinoline is treated with $H_2SO_4.SO_3$ at 100 °C



25. Strong oxidation of glucose with nitric acid gives

(a) Gluconic acid
(b) Oxalic acid
(c) Glucaric acid
(d) Formic acid

26. In Sheehan method for the synthesis of polypeptides from amino acid, the aminogroup is protected by

(a) benzyloxycarbonyl group
(b) sulphonyl group
(c) phthalyl group
(d) t-butoxy azidoformate group

27. [illegible] is expected to give in its [1]HNMR spectrum

(a) three signals as doublet, singlet and singlet
(b) two signals both as singlets
(c) two signals as singlet and quartet
(d) four signals, 3 as singlets 1 as quartet

28. Which of the following acids decraboxylates on heating ?

(a) Succinic acid
(b) Malonic acid
(c) Phthalic acid
(d) Maleic acid

29. The following reaction:

[illegible] $C_2H_5C(=O)-O^-Na^+$

is fastest when Y is

(a) Cl
(b) NH_2
(c) OC_2H_5
(d) $OCOC_2H_5$

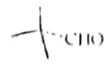
30. When ethanol is heated with concentrated H_2SO_4, a gas is produced. Which of the following compounds is formed when this gas is treated with Br_2 in CCl_4 ?

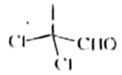
(a) 1-Bromo-2-chloroethane
(b) 1,2-Dibromoethane
(c) 1,1,2,2-Tetrabromoethane
(d) Bromoethane

32. β-Hyroxycarbonyl compound is obtained by the action of NaOH on

(a) 

(b) 

(c) 

(d) 

... called as

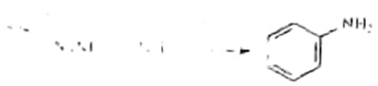
(a) Fries rearrangement
(b) Claisen rearrangement
(c) Curtius rearrangement
(d) Hofmann rearrangement

On nitration of aniline with a mixture of nitric acid and sulphuric acid, the major product is

(a) o-Nitroaniline
(b) m-Nitroaniline
(c) p-Nitroaniline
(d) None of these

34. The reaction which is used to prepare a β-ketoester from ethyl acetate is known as
(a) Michel addition
(b) Cannizzaro reaction
(c) Claisen-Schmidt reaction
(d) Clasisen condensation

The following reaction fallow



(a) S_N1 mechanism
(b) S_N2 mechanism
(c) Elimination - addition mechanism
(d) S_E mechanism

36. How many isomeric aromatic hydrocarbons are possible for C_8H_{10}.

(a) 3
(b) 4
(c) 5
(d) 6

The combustion of one mole of propane produces how many moles of H_2O ?

(a) 2
(b) 3
(c) 4
(d) 8

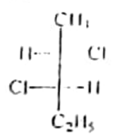
38. Enantiomers have

(a) different physical properties
(b) identical biological properties
(c) identical chemical properties
(d) different chemical properties

39 Hydroboration oxidation of 2-butyne with BH_3-H_2O_2 and alkali provides

(a) Butanal
(b) Butanone
(c) 2-Butanol
(d) 1-Butanol

40. The R/S notation to chiral carbon C-2 and C-3 in the following structure will be



(a) 2S3S
(b) 2R3R
(c) 2S3R
(d) 2R3S

[illegible] maximum in

[illegible] $\rightarrow CaO(s) + CO_2(g)$
[illegible] $\rightarrow CO_2(s)$
[illegible] $\rightarrow 2NH_3(g)$
[illegible] $\rightarrow 2HI(g)$

[illegible] is the energy associated with

(a) one molecule
(b) one photon
(c) Avogadro number of photons
(d) Faraday number of photons

52. What function of [A], plotted against time, will give a straight line for a second-order reaction?

(a) [A]
(b) $[A]^2$
(c) log [A]
(d) $\frac{1}{[A]}$

54. The following graph

Represents the variation of compressibility factor, Z, versus P for three real gases A, B and C. Identify the incorrect answer:

(a) For the gas A, a = 0 and its dependence on P is linear at all pressure.
(b) For the gas B, b = 0 and its dependence on P is linear at all pressure.
(c) For the gas C, neighter a nor b is zero. By knowing the minima and point of intersection, with Z=1, a and b can be calculated.
(d) At high pressure, the slope is positive for all real gases.

55. Water carrying impurities is purified by addition of potash alum. Al^{3+} of the potash alum causes:

(a) peptisation of negatively charged turbidity
(b) coagulation of negatively charged turbidity
(c) peptisation of positively charged turbidity
(d) coagulation of positively charge turbidity.

56. Lyophilic sols are:

(a) irreversible sols
(b) they are prepared from inorganic compounds
(c) coagulated by adding electrolytes
(d) self – stabilizing

11-9

[illegible] the incorrect statement about the determinate errors?

(a) Determinate errors have definitive value
(b) Determinate errors have an assignable cause
(c) Determinate errors are of the same sign and magnitude
(d) Precision is mainly affected by the systematic errors.

66. When 50.0 ml of an aqueous solution of ~~$FeCl_3$ (1 × 10^{-2} M) in concentrated HCl~~ is shaken with 50.0 ml of ether, 99.0% of the iron is extracted. What is the distribution ratio?

(a) 9.9
(b) 10.0
(c) 99.0
(d) 11.9

67. The cells used in UV Spectrophotometer are made up of

(a) glass
(b) quartz
(c) polystyrene
(d) rock salt

68. A certain solution absorbs 90% of the incident radiation in 1.0 cm cell at 510 nm. What is the absorbance of this solution?

(a) 0.90
(b) 0.10
(c) 1.0
(d) 0.8

69. The abundance of tropospheric O_3 as one of the green house gases is

(a) 0.03 ppm
(b) 0.47 ppb
(c) 1.74 ppm
(d) 0.26 ppm

70. The numerical value in decimal numbering system of the following binary number 1101 will be

(a) 13
(b) 22
(c) 101
(d) 110