KN-1630

Seat No._____

M. Sc. (Sem. I) Examination

November / December - 2017

Chemistry : CHN - 402

(Organic Chemistry)

Time : 3 Hours] [Total Marks : 70

Instructions :

(1) All questions are compulsory.

(2) The medium of answer is English only.

1 (a) Answer any two of the following : **10**

(1) Define Huckel's rule for determining whether a molecule is aromatic. Give at least four examples.

(2) Explain the types of bonding in fulerenes.

(3) Differentiate alternant and non-alternant compounds with suitable examples.

(b) Answer any one of the following : **4**

(1) Give a detailed account of rotaxanes.

(2) Write short note on Aromaticity of Annulin.

2 (a) Answer any two of the following : 10

(1) Write a note on : Effect of confirmation on reactivity.

(2) What is resolution ? Give any three methods of resolution of racemates.

(3) What is the difference between Stereospecific and Stereoselective reactions ? Explain with suitable examples.

(b) Answer any one of the following : 4

(1) Discuss optical activity of allenes giving illustrations.

(2) Explain chirality due to helth shape.

3 (a) Answer any two of the following : 10

(1) Discuss the stability and reactivity of carbaniones.

(2) What is neighbouring group participation ? Discuss its mechanism in the presence of different neighbouring groups.

(3) Give Hammet equation and explain the terms involved in it. Show that Hammet equation is linear free energy relationship.

(b) Answer any one of the following : 4

(1) Give application of NMR spectroscopy in detection of carbocations.

(2) Discuss the Resonance and field effect of structure on reactivity.

4 (a) Answer any two of the following : **10**

(1) Give an account of SET mechanism.

(2) Discuss effect of the leaving group on nucleophilic substitution.

(3) Give an acount on SN^1 mechanism.

(b) Answer any one of the following : **4**

(1) Write note on : Ambient nucleophiles.

(2) Discuss the methods for determining reaction mechanism.

5 Answer any seven of the following : **14**

(1) What are ambidientate substrate ?

(2) Cyclopentadiene is highly acidic in nature, why ?

(3) Give one example each define enantiomers and diastereoisomers.

(4) Discuss stereochemistry of amines.

(5) Discuss limitation of Huckel's rule.

(6) Comment on bonding in fullerness.

(7) Explain sigmatropic Rearrangement.

(8) What is Teft equation ? Explain it.

(9) What is cross conjugation ? Give at least two examples.

(10) Can you detect the carbocation with the help of NMR ?

KP-1639

KP-1639 Seat No._____

M. Sc. (Sem. I) Examination

November/December – 2017

CHN-403 : Physical Chemistry : Paper-III

Time : 3 Hours] [Total Marks : 70

Instructions : (1) Each question carries 14 marks.

(2) Figures to the right indicates marks of the question.

1 (a) Answer the following : (any two) **10**

(1) Describe briefly the various postulates of wave mechanics.

(2) Set up and solve the Schrondinger wave equation for : one-dimensional simple harmonic oscillator.

(3) Mention the perturbation theory.

(b) Answer the following : (any one) **14**

(1) Discuss : Variation theorem.

(2) Short note about "The rigid rotor".

2 (a) Answer the following : (any two) 10

(1) Discuss the eigen functions for angular momentum.

(2) Short note on "Russell-Saunders terms and coupling schemes".

(3) Write a note on Huckel theory of conjugated systems.

(b) Answer the following : (any one) 4

(i) Explain : Pauli exclusion principle.

(ii) Apply the Huckel-Molecular orbital theory to the following :

(1) Ethylene

(2) 1, 3 - Butadiene.

3 (a) Answer the following : (any two) 10

(i) Explain the term partial molar free energy. "Derive the Gibbs-Duhem equation".

(ii) Define fugacity : Discuss the methods used to determine its value.

(iii) Discuss about "EMF method" for determine of activity and activity coefficient.

(b) Answer the following : (any one) 4

(i) From the plot of α Vs P for CO, the area under the curve between 0 and 100 atm pressure was found to be 0.0875 atm^2. Calculate the fugacity of CO at 100 atm and 0°C.

(ii) Calculate the volume of an ideal solution at 25°C that contains exactly 10 mole of ethanol and 6 mole of water. The molar volumes of ethanol and water being 58.7 cm^3 and 18.1 cm^3 respectively. If the partial molar volumes of ethanol water are 57.6 and 16.5 cm^3 respectively, what would be the change in volume when 10 mol of ethanol is mixed with 6 mole of water ?

4 (a) Answer the following : (any two) **10**

(i) Give an account of Thermodynamics probability.

(ii) What is partition function ? Derive an equation for rotational partition function.

(iii) Mention and prove Prigogine's principle of minimum entropy production.

(b) Answer the following : (any one) **4**

(i) Calculate the rotational partition function for hydrogen molecule at 300°k. Moment of interia of hydrogen molecule is

$4.59 \times 10^{-4}\ kg.m^2$, symmetry number = 2.

(ii) Explain : grand canonical and micro-canonical ensembles.

5 Attempt any seven of the following : 14

(i) Define : Laplacian operator.

(ii) What are electron spin and antisymmetry ?

(iii) Explain : electron density.

(iv) Explain entropy. What are its units ?

(v) Calculate the ionic strength of the following solutions :

(1) 0.1M $BaCl_2$ (2) 0.1M Na_3PO_4

(vi) Define the term phase and degree of freedom with examples.

(vii) What is meant by activity ? How it is related to pressure and fugacity ?

(viii) Any one sentence of "Second law of thermodynamics."

(ix) Define the term probability.

(x) Using stirling approximation and the value of 6!. Compare this value without stirling approximation, comment on the result.

KR-1648-49-50 Seat No._____

M. Sc. (Sem. I) Examination

November / December - 2017

Chemistry : CHN - 404 (A), (B) & (C)

1. CHN - 404 (A) : Group Theory, Spectroscopy & Diffraction Methods - IV

2. CHN - 404 (B) : Mathematics for Chemists - V (Elective Subject)

3. CHN - 404 (C) : Biology for Chemists - V

Time : 2 Hours] [Total Marks : 50

1. CHN - 404 (A) : Group Theory, Spectroscopy & Diffraction Methods - IV

Instructions :

(1) Each question carries **equal** marks.

(2) All questions are **compulsory**.

1 Answer any **two** of the following : 2×5=10

(1) Discuss the point groups of molecules containing $C_n \perp nC_2$ axis of rotation.

(2) Explain the Laws of Group theory with illustration of C_2h point group.

(3) Obtain the symmetrical properties of S and P orbitals for C_{2V} point group and fill up the below table :

C_2V	E	$C_2(z)$	σ_{xz}	σ_{yz}
S				
P_x				
P_y				
P_z				

2 Answer any **two** of the following : **2×5=10**

(1) Derive the Bragg's law equation.

(2) What is Miller indices ? Draw the planes diagrams for Miller indices (1 0 0), (0 1 0), (1 1 0) and (1 1 1)

(3) Write a short note on Ramchandran plot.

3 Answer any **two** of the following : **2×5=10**

(1) What is an electro magnetic radiation ? Discus the principle associated with vibrational spectroscopy.

(2) Explain stokes line and anti stokes line in Raman spectroscopy.

(3) Explain the selection rules for Vibrational - Rotational spectra.

4 Answer any **two** of the following : **2×5=10**

(1) Discuss the applications of Mossbauer spectroscopy.

(2) Mossbauer's contribution in gamma radiation absorption spectroscopy.

(3) Discuss the Mossbauer spectra of ferric chloride compound.

5 Answer any **five** of the following : 5×2=10

(1) Whether the carbon dioxide molecule contains C_7 axis or not ? If yes, show in Structural Formula.

(2) Explain the point group of allene.

(3) Write an equation for chemical isomer shift (δ) and explain in short the terms included.

(4) What is Doppler effect in Mossbauer spectroscopy ?

(5) A certain crystal has lattice parameters of 4.24, 10 and 3.66 $\mathring{A}$ on x, y, and z axis respectively. Determine the Miller indices of plane having intercepts of 2.12, 10 and 1.83 $\mathring{A}$ on the x, y and z axis.

(6) What is the distance between the two adjacent planes if the first order reflection from X-rays of wavelength 2.30 $\mathring{A}$ occurs at $27^{\circ}\ 8'$ ($\sin 27^{\circ}\ 8' = 0.4715$)

(7) What can you predict about hydrogen bond with the help of Infrared spectroscopy ?

(8) Which factors are affecting to the value of ΔV ?

2. CHN - 404 (B) : Mathematics for Chemists - V
(Elective Subject)

Instructions : (1) All questions are compulsory.

(2) Figures to the right side indicate the marks of question.

1 (a) For vectors $\bar{a} = -7i + 4j + \frac{1}{2}k$ and $\bar{b} = 6i - 5j - k$, find $\bar{a} \cdot \bar{b}$, $\bar{a} \times \bar{b}$, $|\bar{a} \times \bar{b}|$, $\bar{b} \times \bar{a}$ and the angle between $\bar{a}$ and $\bar{b}$. 5

(b) Verify : $div(curl\ f) = 0$ for a vector function $f = \left(x^2yz\right)\bar{i} + \left(xy^2z\right)\bar{j} + \left(xyz^2\right)\bar{k}$. 5

OR

1 (a) Using divergence theorem of Gauss's, Evaluate $\iint_s (xdydz + ydzdx + zdxdy)$, where s is the surface of the ellipsoid $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2} = 1$ over xy-plane. 5

(b) If $f = grad\left(x^3 + y^3 + z^3 - 3xyz\right)$, then prove that $grad(div\ f) = 6\bar{i} + 6\bar{j} + 6\bar{k}$ and $div \cdot (curl\ f) = 0$. 5

2 (a) Find the eigenvalues and corresponding any one eigenspaces for the matrix 5

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & -3 & 3 \end{bmatrix}.$$

(b) Find the matrix that diagonalizes $A = \begin{bmatrix} 2 & 6 \\ 0 & -1 \end{bmatrix}$. 5

OR

2 (a) Express the matrix $B = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ as the sum of a symmetric and a skew-symmetric matrix. 5

(b) Verify that the matrix $B = \begin{bmatrix} 1 & 1-i & 2 \\ 1+i & 3 & i \\ 2 & -i & 0 \end{bmatrix}$ is a Hermitian or skew-Hermitian matrix. 5

3 Attempt any **two** : 10

(a) If $f(x, y) = \dfrac{xy^2}{\sqrt{x^2 + y^2}}$; $(x, y) \neq (0, 0)$

$= 0$; $(x, y) = (0, 0)$

Prove that $f_x(0, 0)$; $f_y(0, 0)$ exists and f is continuous and differentiable at $(0, 0)$.

(b) If $f(x, y) = \sqrt{x^2 - xy}$ then prove that

$x^2 f_{xx} + 2xy\, f_{xy} + y^2 f_{yy} = 0$

(c) Prove that the maximum value of $x^2y^2z^2$, where $x^2 + y^2 + z^2 = c^2$ is $\frac{c^6}{27}$.

4 Attempt any **two** : 10

(a) Determine the equation of the curve which satisfies the equation $xy\frac{dy}{dx} = x^2 - 1$, and which passes through the point $(1, 2)$.

(b) Solve the differential equation :

$$xy^3dy = \left(x^4 + y^4\right)dx.$$

(c) Determine the power series solution of the differential equation $3xy'' + 4y' - y = 0$ using the Frobenius method.

5 Attempt any **two** : 10

(a) Five coins are tossed simultaneously. Determine the probabilities of having 0, 1, 2, 3, 4 and 5 heads upwards, and draw a histogram depicting the results.

(b) Find the value of $n \in N$, if $\binom{n}{6} : \binom{n-3}{3} = 91 : 4$.

(c) In a particular street, 80% of the houses have telephones. If two houses selected at random are visited, calculate the probabilities that (i) they both have a telephone and (ii) one has a telephone but the other does not have telephone.

3. CHN - 404 (C) : *Biology for Chemists - V*

Instructions : (1) All questions carry equal marks.
(2) Each question is compulsory.

1 Give answer of any **two** : **10**

(1) Explain the structure and function of eukaryotic cell.

(2) Write note on origin of life and rise of living organisms.

(3) Describe briefly catabolism and anabolism during metabolic process.

2 Give answer of any **two** : **10**

(1) Write note on structure and function of polysaccharides.

(2) Describe on Kreb cycle.

(3) Write a note on role of sugars in biological recognition.

3 Give answer of any **two** : **10**

(1) Write note on structure and function of fatty acids.

(2) Give the properties of lipid aggregate micelles.

(3) Describe tertiary and quaternary structure of protein-folding.

4 Give answer of any **two** : **10**

(1) Explain briefly degradation of amino acid.

(2) Describe the purine and pyrimidine bases of Nucleic acids.

(3) Give the overview of replication of DNA.

5 Write any **five** : 10

(1) Give the characteristics of Prokaryotic cell.

(2) Write the role of Ascorbic acid in metabolism.

(3) What is Bile acid?

(4) What is tryptophan releasing hormone (TRH)?

(5) What are essential fatty acids?

(6) Define the terms Nucleoside and Nucleotide.

(7) Why ATP is biological energy currency?

(8) What is Glycogen?

KS-1642

Seat No._____

M. Sc. (Physics) (Sem. I) Examination

November / December - 2017

CPH - 403 : Computer

Time : 3 Hours] [Total Marks : 70

Instructions :

(1) All five questions carry equal marks.
(2) Figures on R.H.S. indicate individual marks of the question.
(3) The symbols have their usual meanings.

1 (a) Answer the following question : (Any One) 10

1. Design at least five slides to present Isaac Newton for 'the personal interview. (Explain points only and no need to consider actual (or true) information)
2. Write' note on MS power point.

(b) Attempt any one of following : 4

a) Create three slides to present your self including your education and family background.(Do not give correct information)

b) Write down steps to include picture in your presentation.

2 a) Answer the following question : (Any One) 10

(i) a. Explain any three options of File menu.

b. Explain two different methods to copy some text in same document.

(ii) Explain, how can you insert page number. How many different options are available to place page number into page. (Explain any five options) Explain Header and footer with suitable example.

(b) Attempt any one' of following : 4

(i) Discuss spelling and grammar checking for word file and also discuss about the clipart,

(ii) Write short note on formatting of the text in document.

3 (a) Answer the following question : (Any One) 10

(i) What is MS Excel? Write down detail note on it.

(ii) Explain in detail about mathematical calculation of compound interest of Rs.5000 for 5 years with interest rate of 9% in MS-Excel.

(b) Attempt any one of following 4

1. Explain Graph in MS excel. Write down steps to draw the graph for below given voltagps and.currents.

Voltage (Volts)	Current(mA)
11V	11mA
22V	22mA
33V	33mA
44V	44mA
55V	55mA

2. Explain steps to find summation of below given numbers in MS EXCEL. 35, 54, 38, 77, 45, 67, 78, 75, 96.

4 (a) Answer the following question: (Any One) **10**

(1) Explain LAN, MAN, WAN in details.

(2) a. Explain difference between internet and intranet.

b. Explain ISP.

(b) Attempt. any one of following : **4**

(i) Write down steps to E-mail one file ABC.PPTX from location C:\ABCD\ABC.PPTX.

(ii) Write note on computer virus.

5 Answer the following : (any seven out of ten) **14**

1. Functions MS Excel. must begin with

A. An ( ) sign B. An'Equal Sign

C. A Plus Sign D. A > Sign

2. What is the intersection of a column and a row on a worksheet called ?

A. Column B. Value

C. Address D. Cell

3. Which of the following is not valid version of MS Office ?

A) Office XP B) Office Vista

C) Office 2007 D) None of above

4. Mostly _____ is used in wirelets. LAN.

a) time division multiplexing

b) orthogonal frequency division multiplexing

c) space division multiplexing

d) none of the mentioned

5. Which short cut key inserts a new slide in current presentation ?

A) Ctrl+N B) Ctrl+M

C) Ctr1+S D) All of above

6. Which of the following method can insert a new slide in current presentation ?
   A) Right click on the Slide panel and choose New Slide
   B) From Insert menu choose New Slide.
   C) Click on New Slide button on toolbar
   D) All of above

7 You cannot-close MS Word application by
   A) Choosing File menu then Exit submenu
   B) Press Alt+F4
   C) Click X button on title bar
   D) From File menu choose Close submenu

8 Statistical calculations and preparation of 'tables and graphs can be done using :
   A) Adobe Photoshop
   B) Excel
   C) Notepad
   D) Power Point

9. Which of the following is not a font style' ?
   A) Bold B) Italics
   C) Regular D) Superscript

10. From which menu you can access Picture, Test Box, Chart etc. in MS Powerpoint ?
   A) File B) Ed. it
   C) Insert D) View

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KP-1640 Seat No. _____

M. Sc. (Part - I) (Sem. I) Examination

November / December - 2017

Botany : CBO-403

(Cell Biology & Genetics)

Time : 3 Hours] [Total Marks : 70

Instructions : (1) The question paper consists of two sections, each has three questions.

(2) All questions are compulsory. In each section first two questions carry 14 marks and last question carry 7 marks.

(3) There is no overall choice. However, an internal choice has been provided in each question.

(4) Write answer of each section in separate answer sheet.

(5) Illustrate your answers with necessary diagrams, if required.

SECTION - I

1 Answer the following : (any **two**) 14

(1) Describe the ultra structure of chromosomes.

(2) Explain in detail : mitosis with diagrams.

(3) Mention the functions of cell membrane (any seven).

2 Answer the following : (any **three**) 14

(1) Write a short note on: mitochondrial genome (mt DNA).

(2) Give in short: gene interactions.

(3) Explain in detail : application of male sterility in plants.

(4) Describe the effect of porky mutation in Yeast.

(5) Explain non-chromosomal genes in Chlamydomonas.

3 Answer the following : (any **four**) 7

(1) Draw a labeled diagram : sandwich model of plasma membrane. 2

(2) Explain in very short : lampbrush chromosome. 2

(3) State the definition of synepsis. 1

(4) What do you mean by extra-chromosomal inheritance? 2

(5) Explain the word: cytoplasmic male sterility (CMS). 2

(6) Define: epistasis. 1

SECTION - II

1 Answer the following : (any **two**) 14

(1) Discuss in detail: genetic mapping.

(2) Explain the example of kernal color in man as metric characters.

(3) Describe the regulation of mitotic cell cycle in eukaryotes.

2 Answer the following : (any **three**) 14

(1) Describe the principle of segregation.

(2) Give a brief account on genetic drift.

(3) What are the factors affecting natural selection?

(4) What are the seven traits which taken by Mendel in his experiments.

(5) Describe in detail : Hardy-Weinberg equilibrium.

3 Answer the following : (any **four**) 7

(1) Mention any two examples of chemical mutagens. 2

(2) Explain the word : AC-DS system. 2

(3) What do you mean by transposable elements? 1

(4) Discuss in brief : law of dominance. 2

(5) Explain the word : gene frequency. 2

(6) State any one importance of population genetics. 1
