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AS-3611

Seat No. _____

M. Sc. (Sem. II) Examination

April - 2023

Chemistry : CHNN-501-(I) : Paper - I

(Inorganic Chemistry)

(New Course)

Time : **3** Hours] [Total Marks : **70**

Instruction : All questions carry equal marks.

1 Answer any two of the following questions : **18**

(1) Discuss the electronic spectra of $[Cr(H_2O)_6]^{3+}$.

(2) Explain selection rule and charge Transfer spectra of ML_4 and ML_6 complexes.

(3) Discuss the Orgel diagram of Mn(II) an Ni(II).

2 Answer any two of the following questions : **17**

(1) Explain the method of preparation and chemical properties of $[Ni(CO)_4]$.

(2) Write a short note on the structure and bonding in metal nitrosyl complexes.

(3) Describe the structure $[Ni(CO)_4]$ and $[Co_2(CO)_8]$ complexes.

3 Answer any two of the following questions : **18**

(1) Discuss the structure of dinuclear metal clusters.

(2) Discuss the boron hydrides and the stereo chemistry of higher boranes.

(3) Discuss the metal clusters and its types.

4 Answer any two of the following questions : 17

(1) Explain the classification of organometallic compounds.

(2) Give brief report on Isopoly and heteropoly acids and salts. Explain the Kegging's theory.

(3) Discuss the structure and bonding of organometallic compounds of Al and Mg.

AS-3612

Seat No. _____

M. Sc. (Sem. II) Examination

April - 2023

Chemistry : CHNN-502

(Organic Chemistry)

(New Course)

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

1 Answer any two of the following : **18**

(1) Discuss the bimolecular aliphatic electrophilic substitution with mechanism.

(2) Explain in detail - the orientation and reactivity in monosubstituted benzene derivatives.

(3) Write a note on Diazonium coupling reaction.

2 Answer any two of the following : **17**

(1) Write a short note : Smiles rearrangement.

(2) Explain stereochemical aspects of addition reaction of alkene.

(3) Discuss the Michael addition reaction with mechanism.

3 Answer any two of the following : **18**

(1) Discuss the mechanism and stereochemical aspects of reduction by $LiAlH_4$.

(2) Explain in detail : Perkin reaction.

(3) Discuss the stereoselectivity, stereospecificity and regioselectivity of E_2 reaction.

4 Answer any two of the following : 17

(1) Discuss the conrotation and disrotation process for 4n and 4n+2 systems with suitable examples.

(2) Discuss suprafacial and antaratacial cycloaddition reaction.

(3) Write a short note : Ene reaction.

AS-3613 Seat No. _____

M. Sc. (Sem. II) Examination

April - 2023

Chemistry : Paper - CHNN - 503

(Physical Chem.) (New Course)

Time : $2\frac{1}{2}$ Hours] [Total Marks : 70

1 (A) Answer any **two** of the following : 12

(1) Discuss kinetics of enzyme reaction.

(2) Explain RRKM theories of unimolecular reaction.

(3) Discuss general features of fast reactions.

(B) Answer any **one** of the following : 6

(1) The rate constant for the first order decomposition of ethylene oxide in to CH_4 and CO follows the equation :

$$\log_{10} K\left(in\ \sec^{-1}\right) = 14.34 - \left(1.25 \times 10^4 K\right)/T.$$

Calculate

(a) The activation energy of the reaction.

(b) The rate constant at 700 K and

(c) The frequency factor, A.

(2) On the top of certain mountain the atmospheric pressure is 503 mm Hg and pure water boils at 360 K. A climber finds that it takes 3×10^2 minutes to boil an egg as against 3 minutes at 370 K.

(a) What is the relation between rate of boiling the egg and time?

(b) What is the ratio of the rate constant

$$\frac{K_{370}}{K_{360}} \ ?$$

(c) What is the activation energy for the reaction that occurs when egg is boiled. Given that the pre-exponential factor remains constant.

2 Answer any **two** of the following : 17

(1) Discuss Electro Kinetics Phenomenon.

(2) Explain counter ion binding to micelles.

(3) Discuss micro emulsion and reverse micelles.

3 (A) Answer any **two** of the following : 12

(1) Explain liquid crystal polymers.

(2) Discuss osmometry method for molecular mass determination of polymers.

(3) Explain chain configuration of macromolecule.

(B) Answer any **one** of the following : **6**

(1) The intrinsic viscosity of myosin is $217\ cm^3.g^{-1}$. Calculate the approximate concentration of myosin in water which would have a relative viscosity of 1.5.

(2) A protein sample consists of an equimolar mixture of haemoglobin ($M_m = 15.5\ kg.mole^{-1}$) ribonuclease ($M = 13.7\ kg.mole^{-1}$) and myoglobin ($M = 17.2\ kg.mole^{-1}$). Calculate $\bar{M}_n$ and $\bar{M}_w$. Which is greater?

4 (A) Answer any two of the following : **12**

(1) Explain Guoy - Chapman model.

(2) Derive Butler - Volmer equation.

(3) Discuss effect of light at semiconductor solution interface.

(B) Answer any one of the following : **5**

(1) In an alkali chloride cell, a saturated solution of 6 N NaCl is electrolyte at 25°C. Using a steel cathode which of the two ions H^+ or Na^+ will be discharged first?

$$\left[pH = 7.0,\ E^0_{H_2/H^+} = 0.0\ V,\ E^0_{Na/Na^+} = 2.71\ V \right.$$
$$\left. \text{Hydrogen over voltage } \eta = 0.35\ V \right]$$

(2) The standard reduction potential E^0 of zinc is –0.726 V and its hydrogen over voltage is 0.75 V. Calculate the maximum permissible final activity of a solution of zinc ions, if the concentration of zinc is to be reduced to 1.0×10^{-5} gm ion/litre by electrodecomposition without the evolution of hydrogen at the cathode.

AS-3614 Seat No. _____

M. Sc. (Sem.-II) Examination

April - 2023

CCNN504 : Spectroscopy Part-II

(New Course)

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) All questions are compulsory.

(2) The medium of answer is English only.

1 Answer any **two** of the following: **17**

(i) Write a note on - Diffuse spectrum.

(ii) Explain Frank-Condon principle with appropriate examples.

(iii) Discuss the spectra of transition metal complexes.

(iv) Explain the charge-transfer spectra.

2 Answer any **two** of the following: **18**

(i) Explain Resonance Raman Spectroscopy.

(ii) Discuss the classical theory of Raman effect.

(iii) Explain the selection rules for Raman spectroscopy.

(iv) Write a note on coherent Anti-stokes Raman spectroscopy (CARS).

3 Answer any **two** of the following: 17

(i) Discuss the isotopic effect in rotational spectra.

(ii) Explain the stark effect in diatomic, linear and symmetric rotor molecules.

(iii) Discuss the effect of isotopic sub-situation on the transition frequencies.

(iv) Explain the chemical analysis by Microwave spectroscopy.

4 Answer any **two** of the following: 15

(i) Write importance of FT-NMR and its applications in medical diagnostics.

(ii) Discuss the factors affecting the chemical shift in 13C-NMR.

(iii) Give an account on 19_F NMR with applications.

(iv) Define first order and second order spectra. Discuss splitting patterns in AMX spin system.

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AS-3615-3616

Seat No. _____

M. Sc. (Sem. II) Examination

April - 2023

Chemistry

(1) CHNN-505 : Organotransition Metal Chemistry (New Elective Course)

(2) SE-CHNN-505 : Inorganic Chemistry (Bioinorganic and Supramoleculaz Chemistry) (New Course) (Elective Course)

Time : $1\frac{1}{2}$ Hours] [Total Marks : **35**

(1) CHNN-505 : Organotransition Metal Chemistry (New Elective Course)

Instruction : All questions are compulsory.

1 Answer any **two** : **18**

(1) Write a note on organo copper addition reactions.

(2) Discuss classification and types of organotransition metal compound.

(3) Write a note on homogeneous catalytic hydrogenation.

2 Answer any **two** : **17**

(1) Write a note on organo copper reagent.

(2) Write a note on metal carbene and metal carbyne complexes.

(3) Explain transition metals compounds with bonds to hydrogen.

(2) SE-CHNN-505 : Inorganic Chemistry
(Bioinorganic and Supramoleculaz Chemistry)
(New Course) (Elective Course)

1 Answer any **Two** : **18**

(1) Discuss the role of Ferritin and Transferrin in living organism and also, explain in structure of Ferritin.

(2) Briefly discuss the role of bacterial siderophores.

(3) How does carboxypeptidase work.

(4) Explain Biomineralization phenomenon.

2 Answer any **Two** : **17**

(1) Explain the structure of carbonic anhydrase and compare the role of Zinc in carbonic - anhydrase and Carboxy Peptidase.

(2) What is Xanthine Oxidase ? Write its catalytic activity with mechanism.

(3) What are supra molecular device ? Give their classification and Significance.

(4) What type of diseases are caused by Copper and Iron overload.

AS-3653

Seat No. _____

M. Sc. (Sem. II) Examination

April - 2023

Physics : MSPHY201CC

(Mathematical Physics - II & Programming in C-II)

Time : $2\frac{1}{2}$ Hours] [Total Marks : 70

Instructions : (1) Figures on right hand side indicate individual marks.

(2) The symbols have their usual meanings.

1 (a) Attempt any one : **8**

(1) Prove and describe Quotien rule with appropriate examples.

(2) Define Scalar, Vector and Tensor. Explain covariant, contravariant and compound second rank tensor.

(b) Attempt any two : **8**

(1) Explain Levi-civita symbol with example.

(2) Prove Kronecker delta is mixed tensor of a rank two.

(3) Show that the covariant derivative of a covariant vector is given by

$$V_{i,j} = \frac{\partial V_i}{\partial q^j} - V_k \Gamma^K_{ij}.$$

(c) Attempt any one : **2**

(1) Define Dual tensor and Pseudo tensor.

(2) Explain Christoffel symbols.

2 (a) Attempt any one : 7

(1) What is group theory ? Explain all group properties with a proper illustrations.

(2) Prove Schur's lemma-1 and lemma-2.

(b) Attempt : (any two) 8

(1) Explain Isomorphism and homomorphism with suitable examples.

(2) Explain special unitary groups SU(2) and SU(3).

(3) By considering the symmetry transformations on the coordinates x_i, construct the irreducible representation of D_4.

(c) Attempt any one : 2

(1) Explain dihedral group.

(2) Define Lie group and Lie algebra.

3 (a) Attempt any one : 8

(1) Write the program to add, subtract and multiply two numbers using pointers and print the addresses of all the variables.

(2) Define structure named as sem-3 with four structure elements paper1, paper2, paper3 and paper4. Write a program to scan the data for three students and print all together on the monitor screen.

(b) Answer any two : 8

(1) Write a program to copy one structure element into another.

(2) Write the program to add five numbers 10, 20, 30, 40 and 50 using pointer variable.

(3) Write the program to multiply four numbers 11, 22, 5 and 7 using pointer.

(c) Attempt any one : 2

(1) Explain arrays of structures.

(2) Explain copying and comparing structure.

4 (a) Attempt any one : 7

(1) A file named SEM-3 contains series of integer numbers. Code a program to read these numbers and then write all odd numbers to a file to be called ODD and all even numbers to a file to be called EVEN.

(2) Explain at least five common programming errors in development of C program.

(b) Attempt any two : 8

(1) Write a program to print 10 to 1 in to file name reverse_no.txt.

(2) Write short note on program design.

(3) Explain getc() and putc() functions with appropriate examples.

(c) Attempt any one : 2

(1) What is command line argument ?

(2) What is fseek function ? Write its form.

AS-3654

Seat No. _____

M. Sc. (Sem. II) Examination

April - 2023

MS - PHY - 202 - CC : Physics
Statistical Mechanics - 1 & Computer - 1

(New Course)

Time : $2\frac{1}{2}$ Hours] [Total Marks : 70

Instructions :

(1) Symbols used have usual meaning.

(2) Figures on RHS indicate marks.

1 (a) Attempt any **one** : 8

(1) Describe the microcanonical ensemble and canonical ensemble in quantum mechanics.

(2) State and explain Ergodic hypothesis for mean value over time and mean value over an ensemble.

(b) Attempt any **two** : 8

(1) Obtain the relation

$$\frac{\partial \rho}{\partial t} = -\sum_{i=1}^{f}\left[\frac{\partial}{\partial q_i}(\rho, \dot{q}_i) + \frac{\partial}{\partial p_i}(\rho, \dot{p}_i)\right]$$ for

Liouville's theorem.

(2) Obtain the quantum mechanical analogue $(i\hbar\dot{\rho})$ of Liouville's theorem.

(3) Write down equation of mean value of the quantity $C_n^*(t)\,C_m(t)$ over all the system in the ensemble and discuss it to derive $\sum_n |C_n(t)|^2 = 1$.

(c) Attempt any one : 2

(1) Obtain the condition $i\hbar\rho_{mn} = \rho_0\left[H_{mn} - H_{mn}\right] = 0$.

(2) (i) Write down Liouville's equation in the form of partied differentiation.

(ii) Write down the equation of the Poisson bracket.

2 (a) Attempt any **one** : 7

(1) What is black body radiation ? Derive the formula of Entropy of the thermal photons for radiation pressure.

(2) Discuss white dwarfs in detail. Derive the equation of ground state energy of the fermigas, i.e. $E_0 = \frac{V}{\pi^2\hbar^3}\cdot m^4c^5 f\left(x_f\right)$.

(b) Attempt any **two** : 8

(1) Write note on Fermi gas in metals.

(2) What is black body emissivity ? Derive an expression for Stefen's law.

(3) Discuss the Einsteins derivation of Plank's law in detail and determine various coefficient of Einstein's.

(c) Attempt any one : 2

(1) Explain Rayleigh - Jeans law and wins law for radiation density.

(2) Explain what is population inversion? Write the full name of 'MASER' and 'LASER'.

3 (a) Attempt any **one** : 8

(1) What is MS-PowerPoint ? Explain it detail. How one can create a presentation in different ways?

(2) Explain basic features and simple commands of operating system-windows. Write its applications.

(b) Attempt any **two** : 8

(1) Draw a four slide of information regarding your college and activity run in your college. (No need to put real info)

(2) Explain disk clean up and Disk defragmentation.

(3) Explain creating presentation using templates.

(c) Attempt any one : 2

(1) Define creating Blank Presentation.

(2) Define control panel.

4 (a) Attempt any **one** : 7

(1) Explain character formatting and style in MS-Word. Also describe Margin setting in MS-Word.

(2) What is word wrapping? Explain it detail. What do you mean by adding or deleting tools?

(b) Attempt any **two** : 8

(1) Explain in detail : (i) Change case and (ii) Butlet and Numbering.

(2) Explain formating of the text in document. How you can check spelling and grammar?

(3) Describe Borders and shading for MS-Word.

(c) Attempt any one : 2

(1) What is 'CELL' in document?

(2) Explain copying text and moving text.

AS-3655

Seat No. _____

M. Sc. (Sem. II) Examination

April - 2023

Physics - MSPHY-203CC

(Quantum Mechanics-2 and Solid State Physics-2)

(New Course)

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) All questions carry equal marks.
(2) Nos. on RHS indicate marks of sub question.

1 (a) Attempt any **one** : **8**

(1) Define degenerate levels and explain removal of degeneracy.

(2) Discuss perturbation and obtain basic equations of perturbation, also obtain equation for first order correction to energy.

(b) Attempt any **two** : **8**

(i) Find WKB solution of radial wave equation.

(ii) Write a note on exchange interaction.

(iii) Discuss the variation method and prove that if lower energy is E_0 then $W \geq E_0$.

(c) Attempt any **one** : **2**

(i) What is Stark effect ?

(ii) What is basis of WKB method?

2 (a) Attempt any **one** : 7

(i) Discuss propagator in detail.

(ii) Explain transitions, sudden approximation with alteration of Hamiltonian.

(b) Attempt any **two** : 8

(i) Describe closely spaced levels.

(ii) Write short note on selection rule.

(iii) Obtain general solution of time dependent Schrodinger equation.

(c) Attempt any **one** : 2

(i) State Fermi golden rule/formula.

(ii) Define retarded green's function.

3 (a) Attempt any **one** : 8

(i) Explain reduced and periodic zone scheme.

(ii) Describe De Haas-van Alphen effect.

(b) Attempt any **two** : 8

(i) Calculate energy band using Pseudopotential method.

(ii) Explain the construction of Fermi surfaces.

(iii) Explain Tight binding method for energy band in short.

(c) Attempt any **one** : 2

(i) What is magnetic breakdown?

(ii) What is Hole orbit ?

4 (a) Attempt any **one** : 7

(i) Discuss quantum theory of paramagnetism.

(ii) Explain quenching of the orbital angular momentum.

(b) Attempt any **two** : 8

(i) What are rare earth ions ? Discuss it.

(ii) Explain the Hund's rules.

(iii) Describe crystal field splitting.

(c) Attempt any one: 2

(i) Define paramagnetic susceptibility.

(ii) Define spectroscopic splitting factor.

AS-3656 Seat No. _____

M. Sc. (Sem.-II) Examination

April - 2023

MSPHY-204 CC : Physics

(Electronics-II)

(New Course)

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) Symbols have their usual meaning.
(2) Figures on R.H.C. indicate marks.

1 (a) Answer the following: (any **one**) **8**

(1) Discuss an OP-AMP as Bootstrap sweep generator and Bridge amplifier.

(2) Discuss the following OP-AMP parameters I_{basi}, I_{DS}, V_{DS}, CMRR and slew rate.

(b) Answer the following: (any **two**) **8**

(1) Discuss an OP-AMP use of Differentiator.

(2) Discuss application of OP-AMP as summing amplifier.

(3) Explain effect of OFFSET in an OP-AMP.

(c) Answer the following: (any **one**) **2**

(1) What is power supply voltage rejection ratio?

(2) Define hysteresis in Schmitt Trigger.

2 (a) Answer the following: (any **one**) 7

(1) Draw the circuit diagram of Master slave Flip flop and explain it.

(2) What is shift register? Explain how serial data converted into parallel data.

(b) Answer the following: (any **two**) 8

(1) Explain how to JK flip flop converted into a T type flip flop with truth table.

(2) Explain operation of D to A converter.

(3) Explain R-2R ladder digital to analog converter.

(c) Answer the following: (any **one**) 2

(1) Write two basic applications of counters.

(2) What is the difference between storage and shift register.

3 (a) Answer the following: (any **one**) 8

(1) Discuss internal data operations and 8085 registers.

(2) What is internal architecture of microprocessor? Draw and explain the logical block diagram of 8085 microprocessor.

(b) Answer the following: (any **two**) 8

(1) Write note on 'Demultiplexing multiplexed A/D bus.'

(2) Calculate number of memory chips required to design 8 Kbyte memory if chip size is 1024×1.

(3) What is microprocessor? Explain it as a programmable machine.

(c) Answer the following: (any **one**) **2**

(1) What is bus? State its different types.

(2) What is difference between compiler and interpreter?

4 (a) Answer the following: (any **one**) **7**

(1) Discuss different programming techniques looping, counting and indexing.

(2) Write illustrative program for addition of two hexadecimal numbers using ADD and ADI instruction.

(b) Answer the following: (any **two**) **8**

(1) Explain logic operation Rotate right with and without carry.

(2) Write a program to load the accumulator with content of M. Address 8501. Transfer this to register B.

(3) Explain instructions for different Arithmetic operations.

(c) Answer the following: (any **one**) **2**

(1) Give the difference between RLC and RAL instructions.

(2) Give the meaning of ADI 56H.

AS-3657-3658 Seat No._____

M. Sc. (Sem.-II) Examination

April - 2023

Physics

(1) MSPHY201ES : Applications of Computer in Physics (New Course) (Elective Course)

(2) MSPHY-202ES - Synthesis of Material

Time : $1\frac{1}{2}$ Hours] [Total Marks : **35**

(1) MSPHY201ES : Applications of Computer in Physics (New Course) (Elective Course)

1 (a) Attempt any **One** : **6**

(1) Discuss algebraic calculations.

(2) Explain Functions and programs.

(b) Attempt any **Two** : **6**

(1) Write program in mathematica for any one recurrence relation.

(2) Write program in mathematica for any one differential equation.

(3) Write program for LogIntegrals to obtain 2Dplot.

2 (a) Attempt any **One** : **6**

(1) Explain type of lists.

(2) Write note on file operation.

(b) Attempt any **Two** : 6

(1) Write note on elementary graphics.

(2) Explain Nlist with example.

(3) Write note on list plots.

3 (a) Attempt any **Three** : 6

(1) What is geometric construction ?

(2) Give name of two power series.

(3) Explain limit in trigonometric functions.

(4) Define optimization.

(5) What is Barchart ?

(b) Attempt any **Five** : 5

(1) Write program to solve $2x^2+3x=5$ in mathematica.

(2) Write the program to obtain values of π up to ten digit.

(3) Write the program to plot Sin[x] verses x with range 0 to 6 π.

(4) Define 3D plot.

(5) Write the name of other software package useful in physics computation.

(6) What is Nlist plot ?

(7) Write the mathemetica program for any sum.

(2) MSPHY-202ES - Synthesis of Material

1 (a) Answer any one out of two : 6

(i) Discuss general principle of ceramic method. Also describe experimental procedure to prepare samples using a solid state reaction method.

(ii) Explain heat treatment, analysis and kinetics of solid state reaction. List disadvantages of solid state reaction.

(b) Answer any two out of three: 6

(i) Draw diagram and explain in brief for Pulse Laser Deposition (PLD) technique.

(ii) Write major disadvantages of ceramic method.

(iii) Discuss 'Chemical Vapour Deposition (CVD) technique' for synthesis of thin film.

2 (a) Answer any one out of two : 6

(i) Describe Czochralski method for the growth of single crystals.

(ii) Explain sol gel method and write its advantages.

(b) Answer any two out of three : 6

(i) Write short note on Bridgemen method for the crystal growth.

(ii) Write short note on Flux Method.

(iii) Describe Vapour Phase Transport Method for growth of single crystals.

3 (a) Answer any three out of five : 6

(i) What is Kirkendall effect?

(ii) What do you understand by epitaxial Growth?

(iii) Define pyrolysis and photolysis.

(iv) Define Topotactic.

(v) What is reagent?

(b) Answer any five out of eight objective questions: 5

(i) Czochralski method for crystal growth of melt from

(A) Different composition

(B) Same composition

(C) Mixed Composition

(D) None of these

(ii) In solid state reactions the factors are important

(A) The thermodynamic factor

(B) Kinetic factor

(C) (A) and (B) both

(D) None of these

(iii) The meaning of pyrolysis:

(A) Melting (B) Solidifying

(C) Heating (D) Cooling

(iv) The meaning of Photolysis:

(A) IR or UV light

(B) X-Ray

(C) (A) and (B) both

(D) None of these

(v) The Kinetic factor determines:

(A) The occurrence of reaction

(B) Rate of reaction

(C) Both (A) and (B)

(D) None of these

(vi) The reaction at interface is clearly seen with difference in colour and explained by Marker is known as:

(A) Raman effect

(B) Kirkendall effect

(C) Skin effect

(D) All these

(vii) The chemical compositions can be analyzed by:

(A) SEM (B) XRD

(C) EDEX (D) TEM

(viii) What is PLD ?

(A) Pulsed Liquid Dissipation

(B) Pulsed Laser Deposition

(C) Plumb Large Deposition

(D) None of these

AS-3646

Seat No. _____

M. Sc. (Sem. II) Examination

April - 2023

Botany : BOC-201

(Biology & Diversity - II Bryophytes & Pteridophytes)

(New Course)

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) This question paper consists total four questions.

(2) All questions are compulsory and carrying 18, 17, 18 and 17 marks respectively.

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

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

1 Answer the following as per **Instruction :** **18**

(a) Explain in detail : (any one) **8**

(1) Describe : Origin of Bryophytes from Pteridophytes.

(2) Write in short : Economic importance of Bryophytes.

(b) Explain in brief : (any one) **7**

(1) Explain in short : Vegetative reproduction in Bryophytes.

(2) Write in short : Algal origin of Bryophytes.

(c) Give short answers : (any three) 3

(1) Which phase is dominant in Bryophytes ?

(2) Nostoc colonies are recorded inside the thallus of _____.

(3) Which group of plants is considered as amphibious of plant group ?

(4) Member of anthocerotopsida are commonly known as _____.

(5) In liverworts the rhizoids are _____ cellular.

2 Answer the following as per **Instruction :** 17

(a) Explain in detail : (any one) 8

(1) Describe the theory of "Progressive sterilization" of the potentially sporogenous tissue in Bryophytes.

(2) Write the structure of mature sporophyte in Anthoceros.

(b) Explain in brief : (any one) 6

(1) Describe in detail : Mature sporophyte of Polytrichum.

(2) Explain in short : Sexual reproductive organ in Plagiochasma

(c) Give short answers : (any three) 3

(1) Intercalary meristematic tissue occurs in the sporophyte of _____.

(2) Sporophyte of riccia consists of only _____.

(3) Sphagnum is commonly known as _____.

(4) Psudoelaters are found in _____.

(5) Write the function of elasters.

3 Answer the following as per **Instructions :** 18

(a) Explain in detail : (any one) 8

(1) Explain Heterospory with the help of sellaginela.

(2) Describe : Telome theory.

(b) Explain in brief : (any one) 7

(1) Economic importance of Pteridophytes.

(2) Describe : Apogamy.

(c) Give short answers : (any three) 3

(1) Apospory was first demonstrated by _____.

(2) Define : Eusporangiate.

(3) Seed habit, considered an important step in evolution, is present in _____.

(4) The formation of gametophyte directly from the sporophyte without the formation of spores is called _____.

(5) _____ is the vascular cryptogames.

4 Answer the following as per **Instruction :** 17

(a) Explain in detail : (any one) 8

(1) Describe : Marsilea sporocarp.

(2) Write the internal structure of Psilotum stem with labelled diagram.

(b) Explain in brief : (any one) 6

(1) Explain in short : Protostele

(2) Describe : Lycopodium cone.

(c) Give short answers - any three : 3

(1) Name the spore producing organs in Psilotum.

(2) Quilwort is the common name of _____.

(3) The sporangia in Osmunda do not form _____.

(4) The most primitive type of stele is _____.

(5) Club moss is the common name of _____.

AS-3647

Seat No. _____

M. Sc. (Sem. II) Examination

April - 2023

Botany : BOC-202

(Plant Development & Reproduction)

(New Coruse)

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) All questions are compulsory.
(2) Figures to the right indicate marks of sub-questions.
(3) Illustrate your answers with neat and labelled diagram if required.

1 (a) Describe : (any one) **8**
(1) Apical cell theory.
(2) Korper-kappe theory.

(b) Write short note : (any one) **7**
(1) Growth rings.
(2) Classification of meristems.

(c) Answer the following questions in short : (any three) **3**
(1) What is laticifers tissue ?
(2) What is sap wood ?
(3) Define : Secretory duct.
(4) Give the function of Phloem.
(5) Give the function of transfusion tissue.

2 (a) Describe : (any one) 8

(1) Anomalous secondary growth in *Bougainvillea* stem.

(2) Anatomy of structural variability in *Aloe* leaf.

(b) Write short note : (anyone) 6

(1) Nodal anatomy.

(2) Seasonal changes in cambium activity.

(c) Answer the following questions in short : (any three) 3

(1) What kind of anomaly is seen in *Aristolochia* stem ?

(2) What is leaf trace ?

(3) Give the function of cambium.

(4) What is secondary growth ?

(5) Mention the types of stomata in monocot.

3 (a) Describe : (any one) 8

(1) Structure of ovule and its development.

(2) Microsporogensis.

(b) Write short note : (any one) 7

(1) Megasporogensis.

(2) Internal structure of anther.

(c) Answer the following questions in short : (any three) 3

(1) What is sporogenous tissue ?

(2) Role of tapetum.

(3) Mention the name of cell from which male gametes are found ?

(4) Define : Palynology.

(5) The exine of pollen is made up of _____.

4 (a) Describe : (any one) **8**

(1) Types of embryo sac development.

(2) Double fertilization.

(b) Write short note : (any one) **6**

(1) Structure of endosperm.

(2) Polyembryony in plants.

(c) Answer the following questions in short : (any three) **3**

(1) Give the example of tetrasporic embryo sac.

(2) What is *in-vitro* pollen germination ?

(3) Mention the function of endosperm.

(4) Define : Embryogensis.

(5) Which kind of fertilization is observed in angiosperms ?

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Seat No. _____

M. Sc. (Sem. II) Examination

April - 2023

Botany : BOC-203

(Biochemistry, Biophysics & Instrumentation)

(New Course)

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) All questions are compulsory.
(2) Figures to the right indicate marks of sub-questions.
(3) Illustrate your answers with neat and labelled diagram if required.

1 (a) Describe in brief : (any one) **8**
(1) Structure of Starch.
(2) Classification of amino acid.

(b) Write short note : (any one) **7**
(1) Monosaccharaides.
(2) Triglycerides.

(c) Answer the following questions : (any three) **3**
(1) Drown structure of Fructose.
(2) Give name of triose sugar.
(3) Drown structure of amino acid.
(4) Define monosacchraride.
(5) Name the simplest amino acid.

2 (a) Describe in brief : (any one) 8

(1) Classification of enzymes.

(2) Classification of proteins.

(b) Write short note : (any one) 6

(1) Fat soluble vitamins.

(2) Coenzymes.

(c) Answer the following questions : (any three) 3

(1) The naturally occurring proteins consist of _____.

(2) Which vitamins provide the cofactor for pyruvate dehydrogenase ?

(3) Which vitamins are essential for fatty acid synthesis ?

(4) The enzymes are sensitive to _____.

(5) Define an enzyme.

3 (a) Describe in brief : (any one) 8

(1) Laws of thermodynamics

(2) Applications in plant sciences of isotopes.

(b) Write short notes : (any one) 7

(1) Free radicals.

(2) Buffer

(c) Answer the following questions : (any three) 3

(1) pH of neutral salt is _____.

(2) Define Buffer solution.

(3) Define redox potential.

(4) What are three uses of isotopes ?

(5) The law of conservation of energy is first/ second/third law of thermodynamics.

4 (a) Describe in brief : (any one) **8**

(1) Application of colorimetry.

(2) Structure and function of ultra-centrifugation.

(b) Write short note : (any one) **6**

(1) ESR spectroscopy.

(2) Principles of thin layer chromatography.

(c) Answer the following questions : (any three) **3**

(1) Which technique separates charged particles using electric field ?

(2) What does the electrophoresis apparatus consist of ?

(3) The chroma plate or thin layer chromatography plate is made up of _____.

(4) Which gel is used in thin layer chromatography ?

(5) What is the principle of ESR spectroscopy ?

AS-3649

Seat No. _____

M. Sc. (Sem.-II) Examination

April - 2023

BOC-204 : Botany

(Research Methology, Biostatistics, IPR and Bio-safety)

(New Course)

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions :

(1) The question paper consists four questions, each has three sub-questions, A, B and C.

(2) All questions are compulsory. In each section 1st and 3rd questions carry 18 marks and 2nd and 4th carry 17 marks.

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

(4) Write the answer of each question in separate answer sheet.

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

1 Answer the following: **18**

(a) Long answer question: (**one** out of two) each 8 marks

(1) Methods of data collection.

(2) Characteristics of scientific research.

(b) Short answer question: (one out of two) each of 7 marks

(1) Experimental design

(2) Basics of research methodology.

(c) Do as directed: (Three out of five)

(1) Explain the word: research.

(2) Field-work based research is classified as:

(A) Empirical (B) Historical

(C) Biographical

(3) Mention the types of scientific research: (any two)

(4) Observation is not the method of research (True or False)

(5) The first step of research is:

(A) Selection of a problem

(B) Identifying a problem

(C) Searching a problem

2 Answer the following: **17**

(a) Long answer question: (One out of two) each of 8 marks

(1) Writing the research proposal

(2) Criteria of scientific communications.

(b) Short answer question: (one out of two) each of 6 marks.

(1) Power point presentation.

(2) Criteria of scientific journal for publication.

(c) Do as directed: (Three out of five)

(1) Mention the full form of: ISBN

(2) Technical report is otherwise called:
(A) Summary (B) Thesis
(C) Synopsis

(3) To judge the depth of any research by acknowledgement (True or False)

(4) Which of the following index is a measure of the publication published?
(A) U-Index (B) B-Index
(C) H-Index

(5) Write the name of scientific journals (any two)

3 Answer the following: **18**

(a) Long answer question: (one out of two): Each of 8 marks.
(1) Binomial distribution
(2) Give the comparison of parametric and non-parametric statistic.

(b) Short answer question (One out of two): each of 7 marks
(1) Standard deviation.
(2) Multiplication theorem of probability.

(c) Do as directed: (three out of five)
(1) Mention the formula of Chi-square.
(2) In biostatistics, group of individuals taken for study is called:
(A) Group (B) Block
(C) Population
(3) Write the scope of biostatistics (any two)
(4) Mutual exclusive events that do not occur at the same time (True or False)

(5) It is a non-parametric version of the independent samples of t-test:

(A) Rank test

(B) Mann-Whitney U Test

(C) F-max test

4 Answer the following: 17

(a) Long answer question: (one out of two) each of 8 marks

(1) Assessment of biological hazards.

(2) Levels of bio-safety.

(b) Short answer question: (one out of two): each of 6 marks

(1) Types of patents.

(2) Intellectual Property Right

(c) Do as directed: (Three out of five)

(1) Explain the word: Tangible property.

(2) Write the full form of: TRIPs.

(3) The desire to maintain a safe laboratory environment for all begins with:

(A) Permission (B) Preservation

(C) Prevention

(4) Food and drinks are allowed in the laboratory (True or False)

(5) Where is headquarter of WTO?

(A) Tokyo (B) Geneva

(C) New York

AS-3650-3651-3652 Seat No. _____

M. Sc. (Sem. II) Examination

April - 2023

Botany

(1) BOE-202 : River Ecology & Water Management (New Course)

(2) BOE-203 : Bioinformatics (New Course)

(3) Plant Tissue Culture (New Course)

ıe : 2 Hours] [Total Marks : 35

1) BOE-202 : River Ecology & Water Management (New Course)

tructions : (1) This question paper consists of total three questions.

(2) All questions are compulsory and carrying 14, 14 and 07 marks respectively.

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

(4) Illustrate your answers with necessary diagrams if needed.

Answer the following as per Instruction : **14**

(A) Explain in detail : (any one) **8**

(1) Sabarmati river case study.

(2) Integrated river basin management.

(B) Explain in brief : (any one) 6

(1) Primary productivity.

(2) Eutrophication.

Answer the following as per Instruction : 14

(A) Explain in detail : (any one) 8

(1) Waste water treatment.

(2) Ground water pollution.

(B) Explain in brief : (any one) 6

(1) General characteristics of water.

(2) Ground water recharge.

Very short answer questions : (any seven) 7

(1) River Ganga starts from _____ place.

(2) What is hydrology ?

(3) Give the full name of RCC.

(4) What is ecosystem ?

(5) What is trophic cascade ?

(6) Give the names of the types of surface water.

(7) Ground water pollutants are _____.

(8) What is aquifer water ?

(9) Drinking water pH lies within _____ range.

(10) Give the full name of BOD.

(2) BOE-203 : Bioinformatics
(New Course)

tructions : (1) All questions are compulsory.
(2) Figures to the right indicate marks of sub-questions.
(3) Illustrate your answers with neat and labeled diagram if required.

(A) Describe (Any One) : **8**

(1) Tools for sequence alignment.

(2) Database in bioinformatics.

(B) Write short note : (Any One) **6**

(1) Programming algorithms.

(2) Protein sequence.

(A) Describe : (Any One) **8**

(1) Gene structure in Eukaryotes.

(2) Evaluation of gene prediction methods.

(B) Write short notes (Any One) : **6**

(1) RNA secondary structure prediction.

(2) Introduction to chemi-informatics.

Answer the following questions in short (any Seven) : **7**

(1) Define : Bioinformatics.

(2) What is Database ?

(3) Give the function of protein sequence.

(4) What is medical - informatics ?

(5) What is data mining ?

(6) Define : Gene predication.

(7) What is data analysis ?

(8) Who is the founder of bioinformatics ?

(9) What is chemi - informatics ?

(10) Define : Primary database.

(3) Plant Tissue Culture (New Course)

(A) Answer the following- Long answer question : (One out of two) 8

1. Write note on organization of tissue culture laboratory.
2. Describe various types of Micropropagation.

(B) Answer the following- Short notes : (One out of two) 6

1. Write note on somatic hybridization.
2. Discuss about the various applications of tissue culture.

(A) Answer the following - Long answer question (One out of two) 8

1. Write a note on transgenic plant for crop protection.
2. Write note on artificial seed production.

(B) Answer the, following- Short notes : (One out of two) 6

1. Describe briefly about Cryopreservation.
2. Write note on molecular farming for vaccine production.

Answer following Very short answer question : 7
(Seven out of Ten)

1) What is totipotency?
2) Name the rooting hormones.
3) what is somatic hybridization?
4) what is meristem culture?
5) What is hardening.
6) What is clonal propagation?
7) Define molecular farming?
8) What is the name of substance use for coating artificial seed?
9) Cryopreservation of tissue is done at what temperature?
10) Name two transgenic plant.

A-3617 Seat No._____

M. Sc. (Sem.-II) Examination

April - 2023

MBCC-201 : Microbiology

(Biochemistry) (New Course)

Time : Hours] [Total Marks : 70

SECTION - I

1 Attempt any **two** out of Three: **14**

(a) Explain all 4 types of bonds in detail.

(b) Describe structure and function of ATP.

(c) Write a note on pH and buffer and their importance in biological reactions.

2 Attempt any **two** out of Three: **14**

(a) Describe structure, function and importance of monosaccharides.

(b) Explain Oxidative phosphorylation and photophosphorylation.

(c) Give a note on Catabolism of fatty acids and β - Oxidation of fatty acids.

3 Attempt any **seven** out of Ten: **7**

(1) Which interaction is responsible for aggression of protein in dilute solution?

(2) What is Van der Waal interactions?

(3) What is the role of hydrophobic interaction in biological systems?

(4) What is the energy currency of our body?

(5) Enlist the chemical bonds of biological system.

(6) Differentiate: D and L sugars.
(7) Define the term: Glycogenesis.
(8) What is the function of sphingolipids in human body?
(9) Give the full form of TCA cycle and ATP.
(10) Differentiate: Saturated and Unsaturated fatty acids.

SECTION - II

4 Attempt any **two** out of Three: **14**
(a) Describe structure and classification of amino acid with hydrophobic side chains.
(b) Explain function and conformation of proteins.
(c) Describe Interrelationship between metabolism of lipid and protein.

5 Attempt any **two** out of Three: **14**
(a) Describe role of cofactors and prosthetic groups in enzymes.
(b) Explain enzyme regulation in detail.
(c) Write a note on enzyme nomenclature and Apo-enzymes.

6 Attempt any **seven** out of Ten: **7**
(1) Enlist any two positively charged amino acids.
(2) Draw the structure of Tryptophan amino acid.
(3) Define the term: Deamination.
(4) What are essential amino acids?
(5) What is Renaturation of protein.
(6) Define the term: Coenzyme.
(7) What is competitive inhibition of enzymes.
(8) Enlist any two fat soluble vitamins.
(9) What is the active site of enzyme?
(10) Deficiency of which vitamin causes excessive bleeding during injury?

AS-3684 Seat No. _____

M. Sc. (Sem. II) Examination

April - 2023

Mathematics : MSM1202

(Algebra - I)

Time : $2\frac{1}{2}$ Hours] [Total Marks : **70**

Instructions : (1) All questions are compulsory.

(2) Standard notations and conventions are followed.

1 (a) Prove that Symmetric groups S_3 and S_4 are solvable while $S_n (n \geq 5)$ is not solvable. **6**

(b) State and prove Cayley's theorem. **6**

(c) Define $Z(G)$. Let G be a group of order p^n, where p is a prime number and n is a positive integer then show that $o(Z(G)) > 1$. **5**

OR

1 (a) Let G be a non-abelian group of order p^3, where p is prime number. Determine $o(Z(G))$ and number of conjugate classes of G. **6**

(b) Prove that a group G is solvable if and only if $G^{(n)}=\{e\}$ for some positive integer n. 6

(c) Define $N(a)$ and Prove that suppose $a \in G$ has only two conjugates in G then show that $N(a)$ is a normal subgroup of G. 5

2 (a) State and Prove Sylow's Second theorem. 6

(b) Show that there is no simple group G of order 216. 6

(c) Show that every group of order p^2, p a prime, is either cyclic or is isomorphic to direct product of two cyclic groups, each of order p. 5

OR

2 (a) If G is a group of order, where p and q are prime numbers with $p < q$ such that $p \nmid (q-1)$, show that G is cyclic. 6

(b) Let G be group of order 231. Show that 11-Sylow subgroup of G is contained in the centre of G. 6

(c) Let G be a finite abelian group. Then prove that G is isomorphic to direct product of its Sylow groups. 5

3 (a) Prove that $Z\left[\sqrt{2}\right]=\left\{a+\sqrt{2}a \,/\, a,b \in Z\right\}$ is an Euclidean domain. 6

(b) (i) Let a, b be two non-zero elements of a Euclidean domain R. If b is not a unit in R then $d(a) < d(ab)$. 6

(ii) Show by an example that it is possible to find two elements a, b in a Euclidean domain such that $d(a) = d(b)$ but a, b are not associates.

(c) Prove that in a Principal Ideal Domain an element is prime if and only if it is irreducible. 6

OR

3 (a) If D_1 and D_2 be two isomorphic integral domain then show that their respective field of quotients F_1 and F_2 are also isomorphic. 6

(b) Show that an element x in a Euclidean domain is a unit if and only if $d(x) = d(1)$. 6

(c) Let R be Principal Ideal Domain prove that any two nonzero elements a, b in a R have a least common multiple. 6

4 (a) Prove that any two nonzero elements in a UFD have an LCM. 6

(b) If R is a UFD then any $f(x)$ in $R[x]$ is an irreducible element of $R[x]$ iff either f is an irreducible element of R or f is an irreducible primitive polynomial of $R[x]$. 6

(c) Prove that the ring 6

$$Z\left[\sqrt{-5}\right]=\left\{a+b\sqrt{-5}\,/\,a,b\in Z\right\}$$ is not UFD.

OR

4 (a) (i) Prove that for any prime number p the polynomial $1+x+x^2+\ldots x^{p-1}+x^p$ is irreducible over the field of rational numbers. 6

(ii) Prove that x^4+1 is not reducible over Z_p for any prime p.

(b) If R is a UFD, then show that $R[x]$ is a UFD. 6

(c) Prove that x^3-x+1 is not reducible over Q. 6
