CE-2121 Seat No. _____

M. Sc. (Sem.-II) Examination

April - 2024

Inorganic Chemistry : CHNN-501

Time : 2.30 Hours] [Total Marks : 70

1 Answer any **two** : 17

(1) Explain the orgel diagram of d^1-d^9 and d^2-d^8 with example.

(2) Explain 'Charge transfer spectra with appropriate example.

(3) Discuss the Tanabe-Sugano diagram for d^3 complex.

2 Answer any **two** : 18

(1) Explain the use of IR spectra for bonding and structure of carbonyl compounds.

(2) Write a note on 'Metal carbonyl clusters'.

(3) Give the structure of complexes and calculate EAN. $NiCO_4$, $CrCO_6$, $Mn_2(CO)_{10}$, $Fe_2(CO)_9$

3 Answer any **two** : 17

(1) Give classification and nomenclature of Boranes.

(2) Write a note on "Metallo-Carboranes".

(3) Give the preparation of B_2H_6, B_4H_{10}, B_5H_9, $B_{10}H_{14}$.

4 Answer any two : 18

(1) Write a note on "Hetropoly Blues".

(2) Explain the Molybdenum poly acids and salts.

(3) Explain Keggin's theory.

CE-2122 Seat No._____

M. Sc. (Sem.-II) Examination

April - 2024

Chemistry : CHNN-502

(Organic Chemistry) (New Course)

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

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

(i) Discuss the unimolecular aliphatic electrophilic substitution reaction with mechanism and factors affecting reactivity in SE reaction.

(ii) Explain the arenium ion mechanism with evidence and nitration process.

(iii) Write a note on Vilsmeier-Haack reaction.

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

(i) Write a note on Sommelet-Hauser rearrangements.

(ii) Explain stereochemical aspects of addition reaction of BH_3 (HydroBoration).

(iii) Discuss mechanism and application of the sharpless asymmetric epoxidation.

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

(i) Explain in detail : Knoevenagel reaction.

(ii) Discuss the mechanism of metal hydride reduction of saturated and unsaturated carbonyl compounds.

(iii) Discuss the mechanism and orientation of pyrolytic elimination.

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

(i) Give brief account on the electrocyclic and cyclo addition reactions using PMO approach.

(ii) Discuss the correlation diagram of the conversion of cyclohexadine into 1,3,5 - hexatriene through conrotatory and disrotatory motion.

(iii) Write a note on : Cope rearrangement.

CE-2123

Seat No._____

M. Sc. (Sem.-II) Examination

April - 2024

Chemistry : CHNN-503

(Physical Chemistry) (New Course)

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

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

(1) Derive Debye-Smoluchowski equation for diffusion control rate constant.

(2) Discuss oscillatory reactions.

(3) Mention the kinetics of ionic reactions : Describe the influence of solvent on such reactions.

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

(1) For the reaction $H_2O \rightarrow H^+ + OH^-$, the equilibrium relaxes in 40μs at 298 K and Pk_w=14. Calculate the rate constant for forward and backward reaction.

(2) The rate constant at 300 K for a reaction is 1.3×10^{-3} sec^{-1} and its frequency factor is 2.785×10^{6} sec^{-1}. Determine its entropy and enthalpy of activation.

2 (a) Answer any **two** of the following : **12**

(1) Explain the pressure across curved surface and derive Laplase equation.

(2) What are surfactants ? Classify them.

(3) Derive Kelvin equation for vapor pressure of droplets of liquids.

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

(1) The volume of N_2 (V_m) measured at S.T.P. required to cover a sample of silica gel with a unimolecular layer is 0.129 m^3 per kg of the gel. Calculate the surface area per kg of the gel if each N_2 molecule occupies 1.62×10^{-19} m^2.

(2) In the study of adsorption of N_2 gas on Fe-Al_2O_3 at 77 K, the area occupied by a molecule of N_2 is 16.2 $A^{o\,2}$. If the specific area of Al_2O_3 is 12.46 $meter^2$ gm^{-1}. Calculate the value of V_m in BET sotherm.

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

(1) Discuss osmotic pressure method for molecular mass determination of polymers.

(2) What are electrically conducting polymers ? Describe polyacetylene as electrically conducting polymer.

(3) Discuss mechanism of polymerization reaction.

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

(1) The diffusion coefficient of insulin in water is 1.5×10^{-10} m^2 s^{-1} at 25°C. If the coefficient of viscosity of water at this temperature is 0.00089 ps (Pascal second), calcualte the radius of the insulin molecule.

(2) The intrinsic viscosity of a solution of polymer is 25°C is 180 cm^3gm^{-1}. Calculate the approximate concentration of this polymer solution in water which gives a relative viscosity of 1.4.

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

(1) Explain shortly the current potential relation at a semi conductor/electrode interface. What is the effect of light on it?

(2) Discuss the limitations of Gouy-Chapman theory and explain Stern's theory of electrical double layer.

(3) Describe the quantum aspects of charge transfer at electrode-solution interface.

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

(1) A 5.0×10^{-4} M solution of $BaCl_2$ in 0.1 M (CH_3) NCl was found to give the half wave potential of -1.94 volt versus SCE and the average diffusion current of 4.0 μA. The dropping rate was 24 drops per minutes; the mass of 20 drops collected was 0.075 gm. Calculate the diffusion coefficient of Ba^{2+} ion.

(2) To measure the over potential on the surface of shining platinum, the hydrogen electrode and a saturated calomel electrodes are kept in a solution of 3pH and 1 ma/cm^2 current density, the emf of the cell is recorded. The emf of the cell is 0.660V. Calculate the over potential of hydrogen electrode. $E^0_{calomel}$ =0.244 V

CE-2124 Seat No._____

M. Sc. (Sem.-II) Examination

April - 2024

Chemistry : CHNN504

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

Instructions :

(1) All questions are compulsory.

(2) The medium of answers is English only.

1 Answer the following questions : (any **two**) 17

(1) Write a note on Russell-Saunders coupling approximation with vector representation.

(2) Explain spectra of alkali metal atoms.

(3) What is Franck-Condon principle ? Explain with suitable examples.

(4) Explain diffuse spectrum in detail.

2 Answer the following questions : (any **two**) 18

(1) Write a note on vibrational and vibrational rotation Raman spectra.

(2) Discuss the classical theory of Raman effect with proper derivation.

(3) Write a note on resonance Raman spectroscopy.

(4) Explain coherent Anti-stokes Raman spectroscopy.

3 Answer the following questions : (any **two**) 17

(1) Explain linear, symmetric rotor spherical rotor and asymetric rotor molecules.

(2) Explain the chemical analysis by microwave spectroscopy.

(3) Write as note on isotopic effect in rotational spectra.

(4) What is stark effect ? Explain it in diatomic, linear and symmetric rotor molecules.

4 Answer the following questions : (any **two**) 18

(1) Write a note on 19_F and 31_P NMR spectroscopy.

(2) What is first and second order spectra ? Explain splitting patterns in ABX and AMX spin system.

(3) Explain : NMR chemical shift.

(4) Write importance and applications of FT-NMR.

CE-2125-2126 Seat No. _____

M. Sc. (Sem.-II) Examination

April - 2024

Chemistry

CHNN-505 (A) : Inorganic Chemistry
(Organ Transition Metal Chemistry) (New Course)
SE-CHNN-505 (B) : Inorganic Chemistry
(Bioinorganic & Supramolecular Chemistry)
(New Course) (Elective)

Time : 2 Hours] [Total Marks : 35

CHNN-505 (A) : Inorganic Chemistry
(Organ Transition Metal Chemistry) (New Course)

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

(1) What is alkyls an aryls of transition metals?

(2) What is organocopper compounds? Explain the organocopper in organic synthesis.

(3) Explain the classification of carbon complex.

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

(1) What is Fischer carbine complexes? Explain Nucleophilic reactions on the ligand.

(2) Explain the Ziegler-natta polymerization of olefins or Ziegler-natta catalyst.

(3) Explain the stoichiometric reaction for catalysis.

SE-CHNN-505 (B) : Inorganic Chemistry (Bioinorganic & Supramolecular Chemistry) (New Course) (Elective)

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

(1) Write a short note on coenzyme vitamin B-12.

(2) Briefly discuss the role of bacterial siderophores.

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

(4) Explain the role of Ferritir and Transferrin in living organism and also, explain in structure of Ferritin.

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

(1) Discuss the structure of carbonic anhydrase compare the role of zinc in carbonic-anhydrase and carboxy peptidase.

(2) What type of diseases is caused by copper and Iron overload?

(3) Explain the transportation and regulation of calcium in living cell.

(4) What are supramolecular device? Give their classification and significance.

CE-2141

Seat No. _____

M. Sc. (Sem.-II) Examination

April - 2024

Physics : MSPHY-201-CC

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

(New Course)

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

Instructions :

(1) The symbols used have their usual meaning.

(2) Figure on the right indicates marks of sub question.

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

(1) Prove and describe Quotient rule with appropriate example.

(2) Define scalar, vector and tensor. Explain covariant, contravariant, and compound second rank tensor.

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

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

(2) Explain Levi-civita symbol with example.

(3) Write notes on Isotropic tensor.

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

(1) Define dual tensor and Pseudo tensor.

(2) Explain in short Christoffel symbols.

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

(1) Explain group representation for operators.

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

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

(1) Explain Isomorphism and homomorphism with suitable examples.

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

(3) Derive and explain Orthogonality theorem.

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

(1) What is Identity element ?

(2) Explain dihedral group.

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

(1) Explain Unions and determine how structures and unions differ in terms of their storage technique.

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

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

(1) Discuss copying and comparing structure variables.

(2) Write the program to add five numbers 12, 23, 5 and 8 using pointer.

(3) Write rules of Pointer operations.

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

(1) What is slack byte ?

(2) What is pointer variable ?

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

(1) Discuss an error handling during I/O operations.

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

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

(1) Write a short note on program design.

(2) Describe program coding.

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

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

(1) What is the use of '*fopen()*' function ?

(2) What is command line argument ?

CE-2142 Seat No._____

M. Sc. (Sem.-II) Examination

April - 2024

Physics : MSPHY-202CC

(Statistical Mechanics-I & Computer-I)

(New Course)

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

Instructions :

(1) Symbols have usual meaning.

(2) Figures on RHS indicate marks.

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

(1) Explain the density matrix and derive the expression of 'F' for single system.

(2) Discuss the density distribution in detail and obtain necessary expression.

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

(1) Describe the principle of conservation of extension in phase.

(2) Explain mean value over time and show that "the mean value over the ensemble is equal to the mean value over time".

(3) Describe canonical ensemble in quantum mechanics with proper expressions.

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

(1) Write down two condition for stationary ensemble.

(2) Obtain the ensemble average of 'G' in the grand canonical ensemble.

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

(1) Discuss the property Emissivity for photon gas radiation and obtain Stefan's law.

(2) Explain Bose-Einstein condensation and obtain the formula $N_0 = N\left[1-\left\{\frac{T}{Tb}\right\}^{3/2}\right]$.

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

(1) Derive the expressions for Fermi energy and Fermi momentum.

(2) Derive operation for the compressibility of fermi gas.

(3) Write note on white dwarfs.

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

(1) Write zero point energy equation and obtain the ground state pressure of the system.

(2) How electron gas is to be treated as a separate gas ? Explain with proper example.

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

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

(2) Describe calculator and different mathematical applications of it. Also draw displays of programmer calculator and scientific calculator.

(b) Attempt any two : 8

(1) Write note on Notepad in windows. Explain different menus for Notepad with description.

(2) Explain "MS Power Point" in detail.

(3) How one can create presentation using templates? Discuss it briefly.

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

(1) What do you mean by control panel?

(2) Define animation and quiting power point.

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

(1) What is starting word in microsoft word ? Explain in detail the justification of Text, line spacing and setting tabs in MS-word.

(2) Describe Clip Art. How one can create drawing (with tool bar) ? Explain auto correct and auto text with diagram.

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

(1) Explain word wrapping in detail.

(2) How one can make margin settings and columns ? Explain with examples.

(3) Write short note on

(i) Change case and

(ii) Bullets and Numbering

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

(1) Define Autotext.

(2) Write down any two short keys with understanding for what they use.

CE-2143 Seat No._____

M. Sc. (Sem.-II) Examination

April - 2024

Physics : MSPHY203CC

(Quantum Mechanics-II & Solid State Mechanics-II)

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

Instruction : Symbols used have usual meaning.

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

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

(2) What is WKB approximation ? Discuss about asymptotic solution of the one dimensional Schrodinger equation using WKB method.

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

(1) Explain exchange interaction.

(2) Discuss perturbation and obtain basic equations of perturbation.

(3) Explain variational method.

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

(1) What is difference between degenerate and non-degenerate level?

(2) What is the basis for WKB method?

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

(1) Obtain general solution of time dependent Schrodinger equation and explain propagator.

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

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

(1) Explain selection rules.

(2) Using property of propagator explain retarded Green's function.

(3) Explain perturbative solution for transition amplitude.

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

(1) What is first order transition?

(2) Write Fermi golden rule formula.

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

(1) Explain Wigner-Seitz method for energy bands with necessary equation.

(2) Discuss quantization of orbits in a magnetic field.

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

(1) Write short note on construction of fermi surfaces.

(2) Write short note on electron orbit, hole orbit, and open orbit.

(3) Write short note on Magnetic Breakdown.

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

(1) Give the methods for calculation of energy bands.

(2) The total volume enclosed by the Fermi surface depends on what ?

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

(1) Derive Langevin Diamagnetic Equation for susceptibility.

(2) Describe Quenching of the orbital angular momentum with necessary equation.

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

(1) Describe Van Vleck paramagnetism.

(2) Write short note on Adiabatic Demagnetization.

(3) Irons contains 10^{29} atoms/m^3, the magnetic moment of each beingb 1.8×10^{-23} A-m^2. Treating iron as paramagnetic (no alignment of dipoles) find its magnetic susceptibility at 300 degree k.

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

(1) Define Bohr magnetron.

(2) (a) The magnetic susceptibility is negative in case of _____.

(b) The unit of intensity of magnetic field is _____.

CE-2144

Seat No. _____

M. Sc. (Sem.-II) Examination

April - 2024

Physics : MSPHY204CC

(Electronics-2) (New Course)

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

Instructions :

(1) Figures on R.H.S. indicate individual marks.

(2) The symbols have their usual meanings.

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

(1) Explain inverting OP-AMP amplifier with feedback.

(2) Discuss an OP-AMP as Differentiator and Schmitt trigger.

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

(1) Draw the circuit diagram of a bridge amplifier using OP-AMP. Explain its function.

(2) Explain frequency response and stability in an OP-AMP.

(3) Discuss open-loop OP-AMP configurations.

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

(1) Write two electrical characteristics of an ideal OP-AMP.

(2) Draw Block diagram of a typical OP-AMP.

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

(1) Draw the circuit diagram of J-K Flip-Flop and explain it.

(2) Draw the circuit diagram of 4-bit asynchronous counter and explain it with its waveforms.

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

(1) Discuss D-type Flip-Flop.

(2) Explain weighted-resistor type digital to analog converter.

(3) Explain 5-Bit Synchronous counter with series carry.

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

(1) Draw the circuit diagram of SR Flip-Flop using NAND gates.

(2) List the name of different types of shift register.

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

(1) What is bus ? Explain functions of Address bus, Data bus and Control bus.

(2) Write a note on prime (system or main) memory.

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

(1) Discuss operating system.

(2) Explain Tri-State Devices.

(3) What is a decoder ? Discuss 2 to 4 decoder and 3 to 8 decoders.

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

(1) Give full forms of ROM and R/WM.

(2) What is a Buffer ?

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

(1) Discuss the 8085 progamming model.

(2) Discuss followirg instructions of the 8085 MPU with relevant examples.

(i) Data transfer operations

(ii) Arithmetic operations

(iii) Logical operations

(iv) Branching operations

(v) Machine operations

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

(1) Write a program to do the following :

(a) Load the number 30H in register B and 39H in register C.

(b) Subtract 39H from 30H.

(c) Display the answer at PORT 1.

(2) Assume register B holds 93H and accumulator holds 15H. Illustrate the results of the instructions ORA B, XRA B, and CMA.

(3) Write instructions to load 2050H in the register pair HL using LXI and MVI opcodes and explain the difference between the two instructions.

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

(1) List the flags used by the Jump instructions in 8085 microprocessor.

(2) What is indexing ?

CE-2145-2146 Seat No._____

M. Sc. (Sem.-II) Examination

April - 2024

Physics : MSPHY201ES & MSPHY-202ES

MSPHY201ES : Applications of Computer in Physics

MSPHY-202ES : Synthesis of Material

(Elective Course)

Time : Hours] [Total Marks : 35

MSPHY201ES : Applications of Computer in Physics

Instructions :

(1) Symbols used have usual meaning.

(2) Figure on R.H.S indicate marks of the questions.

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

(1) Explain Interfaces.

(2) Explain Functions and programs.

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

(1) Give two examples of differential equations.

(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) Explain Redrawing and combining plots.

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

(1) Write note on elementary graphics.

(2) Explain Nlist with example.

(3) Explain parametric plots.

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

(1) Explain limit in trigonometric functions.

(2) Define optimization.

(3) Define Transferring algebraic expression.

(4) List out arithmetic functions.

(5) Define symbolic computation.

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

(1) Write program to solve $2x^2+4x=6$ in mathematica

(2) Which function we will use for combining the list?

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

(4) Define 3D plot.

(5) Write the mathematica program for any sum.

(6) Give one table syntax.

(7) Which function we will use for adding list elements?

MSPHY-202ES : Synthesis of Material (Elective Course)

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

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

(ii) Describe Pulse Laser Deposition (PLD) technique.

(b) Answer any **two** out of three : 6

(i) Discuss CVD technique for preparation of thin film.

(ii) Write major disadvantages of ceramic method.

(iii) Explain Vacuum evaporation method for thin film preparation.

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

(i) Explain Stockbarger method for the crystal growth.

(ii) Explain Flux Method.

(b) Answer any **two** out of three : 6

(i) Write short note on sol gel method.

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

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

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

(i) What is 'sputtering'?

(ii) Write the difference between Czochralski and Stockbarger methods.

(iii) What are the uses of XRD and EDAX?

(iv) Write principle of Sol - gel method.

(v) Define pyrolysis and photolysis.

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

(i) For the reaction of the solids the necessary heat is around -5°, to -1° C. True/False.

(ii) Write full form of CVD.

(iii) Wite full form of XRD.

(iv) The meaning of Photolysis

(A) X-Ray (B) IR or UV light

(C) A and B both (D) None of these

(v) Czochralski method for crystal growth of melt from -

(A) Same composition

(B) Different composition

(C) Mixed composition

(D) None of these

(vi) The crystalline characteristics can be analyzed by -

(A) SEM (B) XRD

(C) EDEX (D) TEM

(vii) The stoichiometry of the crystal is decided by _____ (XRD/EDAX)

(viii) Full form of EDAX.

CE-2127 Seat No. _____

M. Sc. (Sem.-II) Examination

April - 2024

Botany : BOC-201

(Biology and Diversity-II)

(Bryophytes and 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) Illustrate your answers with necessary diagram, if required.

1 (a) Answer the following **one** out of **two** : **8**

(1) Vegetative propagation in Hepaticopsida, Anthocerotopsida and Bryopsida.

(2) Write note on salient features of the Jungermaniales and Bryales.

(b) Answer the following **one** out of **two** : **7**

(1) Economic and ecological importance of Bryophytes.

(2) Algal origin of Bryophytes.

(c) Answer the following **three** out of **five** : **3**

(1) Calyptra develop from :

(A) Wall of venter

(B) Base of Archegonium

(C) Base of Antheradium

(D) Base of Sporophytes

(2) Name two liverwort in which seta is altogether absent.

(3) Define with suitable example : Protandrous.

(4) Give any two ecological importance of bryophytes with examples.

(5) Most bryophytes are autotrophic but a few are more or less saprophytic, growing upon organic matter – true or false statement.

2 (a) Answer the following **one** out of **two** : **8**

(1) Theory of sterilization.

(2) Morphological and anatomical study of thallus and reproductive structures of Anthoceros.

(b) Answer the following **one** out of **two** : **6**

(1) Sexual reproduction and sporcphytes of *Sphagnum*.

(2) Comparative reproductive structures of *Riccia* and *Plagiochasma*.

(c) Answer the following **three** out of **five** : **3**

(1) In which species of *Sphagnum* retort cells are present in the main axis ?

(2) Arrange the following bryophytes in order of their progressive sterilization : *Riccia, Pogonatum, Pellia, Anthoceros, Marchantia, Porella*.

(3) Write the systematic position of Polytrichum.

(4) The columella of Anthoceros sporophyte corresponds to the vascular tissue of higher plants – True or False statement.

(5) The mature sporophyte of *Plagiochasma* has _____ parts, viz _____ and _____.

3 (a) Answer the following **one** out of **two** : 8

(1) "Heterospory leads to the seed habit". Comment upon the statement.

(2) Give the classification and general account of Lycopsida.

(b) Answer the following **one** out of **two** : 7

(1) Apogamy

(2) Classification, distribution and anatomical structure and reproduction in Pteropsida.

(c) Answer the following **three** out of **five** : 3

(1) Heterospory has evolved only in living forms and was not known in fossil plants – True or false statement.

(2) Name the process which resulted in the development of monopodial branches from equal dichotomies.

(3) According to the Telome theory, all leaves in plants are _____ in nature.

(4) In the presence of GA3, IAA and tryptophan stimulates _____ to produce apogamous sporophytes even at very low concentration of carbohydrates.

(5) Which elementary process do you think are responsible for the development of sporophylls in Pteropsida ?

4 (a) Answer the following **one** out of **two** : 8

(1) With the help of labelled diagrams describe different types of stealer system found in pteridophytes.

(2) Comparative study of reproductive structure of *Marsilea* and *Osmunda*.

(b) Answer the following **one** out of **two** : 6

(1) Describe spore producing and sex organ in *Psilotum*.

(2) Comparative study of thallus structure in various species Lycopodium and Isoetes.

(c) Answer the following **three** out of **five** : 3

(1) According to extra-stelar origin, the pith originated as a result of transformation of tracheary elements of the central xylem core into parenchyma - True or False statement.

(2) Define : Glossopodium.

(3) In Lycopodium the gametophyte is _____ and _____ and it is subterranean or partially exposed.

(4) In *Osmunda* the tapetum develops from the _____ layer of the _____.

(5) Marsilea sporocarp can be included in which three categories ?

CE-2128 Seat No. _____

M. Sc. (Sem.-II) Examination

April - 2024

Botany : BOC-202

(Plant Anatomy and Reproduction)

(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-questions.

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

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

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

(1) Histogen theory of apical meristem.

(2) Heart wood and sap wood with growth rings.

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

(1) Transfusion tissue.

(2) Lateral root development and root hairs.

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

(1) The role of wood parenchyma.

(2) Define : Meristem.

(3) Who proposed apical cell theory ?

(4) Give the name of types of laticifer tissue.

(5) Resin ducts are found in _____ plant.

2 Answer the following as per Instruction : 17

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

(1) Secondary growth in *Mirabilis* stem.

(2) Anatomy of *Helianthus* leaf.

(b) Expain in brief : (any **one**) (6)

(1) Cambium activity in *Dracaena* stem.

(2) Systematic plant anatomy with reference of stomata.

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

(1) Give the name of nodal types.

(2) Role of cambium ring.

(3) Broad medullary rays are present in _____ stem.

(4) Write the function of stinging hair.

(5) Water storage tissue is the characteristic of _____ leaf.

3 Answer the following as per Instruction : 18

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

(1) Structure of anther wall.

(2) Structure of ovule.

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

(1) Preparation of pollen grains.

(2) Microsporogenesis.

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

(1) Write the function of tapetum.

(2) Defire : Megasporogenesis.

(3) Give the name of ovule types.

(4) What is melissopalynology ?

(5) Give the name of pollen grain wall layers.

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

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

(1) Types of endosperm.

(2) Structure of typical embryo sac.

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

(1) Polymbryony.

(2) *In vitro* pollen germination.

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

(1) What is double fertilization ?

(2) Define : Embryogenesis.

(3) Function of synergid cells.

(4) What is germ pore ?

(5) Write the types of embryo sac development.

CE-2129 Seat No. _____

M. Sc. (Sem.-II) Examination

April - 2024

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 notes : (any **one**) **7**
(1) Monosaccharaides.
(2) Triglycerides.

(c) Answer the following questions : (any **three**) **3**
(1) Drow structure of Fructose.
(2) Give name of triose sugar.
(3) Drow structure of amino acid.
(4) Define monosaccharide.
(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) Law of thermodynamics.
(2) Application in plant sciences of isotopes.

(b) Write short note : (any **one**) 7
(1) Free radicals.
(2) Buffer

(c) Asnwer 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 thermodynamic.

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 followirg 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?

CE-2130 Seat No._____

M. Sc. (Theory) (Sem.-II) Examination

April - 2024

Botany : BOC-204

(Research Methodology, Biostatistics, IPR & Biosafety)

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) Types of scientific research.
(2) Method of data collection.

(b) Write short note : (any **one**) 7
(1) Experimental design of research.
(2) Characteristics of scientific research.

(c) Answer the following questions in short : (any **three**) **3**
(1) What is research?
(2) What is data collection?
(3) Define : Thesis.
(4) What is hypothesis?
(5) What is data processing?

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

(1) Selection criteria of scientific journals for research publication.

(2) Writing research proposal.

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

(1) Publication processes.

(2) Impact factor.

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

(1) What is poster paper?

(2) Define : Flyers.

(3) Define : Citation.

(4) What is a review process?

(5) What is I10-Index?

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

(1) Theory of probability.

(2) Dispersion measures.

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

(1) Regression.

(2) Rank test.

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

(1) What is Co-relation?

(2) What is chi-square?

(3) Define : Sign test.

(4) What is biostatistics?

(5) What is variance?

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

(1) Types of patents.

(2) Level of biosafety.

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

(1) Intangible property.

(2) Biological hazards.

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

(any **three**)

(1) What is biosafety?

(2) Give the full form of IPR.

(3) Function of WTO.

(4) Define : Tangible property.

(5) What is biotechnology?

CE-2131-2132-2133 Seat No._____

M. Sc. (Sem.-II) Examination

April - 2024

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

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

(3) Botany : BOE-201 Plant Tissue Culture (New Course)

Time : Hours] [Total Marks : 35

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

Instructions :

(1) The numbers to the right of the each question shows the marks of that question.

(2) Illustrate your answer with neat and labeled diagram if required.

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

(1) Case Study of the river Ganga.

(2) Plankton and Benthic Communities.

(b) Write short notes on any **one** : 6

(1) Concept of Nutrient Limitation.

(2) Primary Productivity.

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

(1) General Characteristics of Water.

(2) Ground Water Pollution.

(b) Write short notes on any **one** : 6

(1) Sustainability Principles of water management.

(2) Waste Water Treatment.

3 Answer in short (any **seven**) : 7

(1) Definition : Hydrology.

(2) Define : Eutrophication.

(3) Explain : Microbial loop.

(4) Definition : Benthic Communities.

(5) Define : Trophic cascades.

(6) Explain : Waste Water.

(7) Explain : Ground water recharge.

(8) Definition : Pollution.

(9) Explain : Water Quality Standards.

(10) Defne : Aquifers.

(2) Botany : BOE-203 Bioinformatics

(New Course)

Instructions :

(1) All questions are compulsory.

(2) Figures to the right indicate marks of sub-questions.

(3) Illustrate your answers with net and labeled diagram if required.

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

(1) Application of bioinformatics.

(2) Various biological database.

(b) Write short note : (any **one**) 6
(1) Programming algorithms.
(2) Pathway database.

2 (a) Describe : (any **one**) 8
(1) Gene structure in Prokaryotes.
(2) RNA secondary structure prediction.
(b) Write short note : (any **one**) 6
(1) Introduction to chemi-informatics.
(2) Signal sites predictions.

3 Answer the following questions in short (any **seven**) : 7
(1) Define : Database.
(2) What is bioinformatics?
(3) What is sequence analysis?
(4) What is data mining?
(5) What is scoring matrices?
(6) Define : Microarray.
(7) What is gene predication?
(8) Who is the founder of bioinformatics?
(9) What is chemi-informatics?
(10) Define : Gene discovery.

(3) Botany : BOE-201
Plant Tissue Culture (New Course)

Instructions :
(1) This question paper consists total three questions.
(2) All questions are compulsory and carrying 14, 14, and 7 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 required.

1 Answer the following as per instructions : 14

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

(1) Protoplast isolation and fusion.

(2) Micropropogation.

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

(1) Somatic Hybridization.

(2) Plant cell and tissue culture it's scope and applications.

2 Answer the following as per instructions : 14

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

(1) Clonal propagation.

(2) Pathogen and Herbicide resistant plant production.

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

(1) Production of Antibodies and vaccines.

(2) Germplasm storage and Cryopreservation.

3 Give short answers: (any **seven**) 7

(1) What is callus?

(2) Autoclave is used for which purpose in tissue culture?

(3) What is cellular differentiation?

(4) Give the full name of ESTs.

(5) What is totipotency?

(6) How bioplastic is beneficial for nature?

(7) Halophytes having salt stress. (true or false)

(8) What is molecular farming?

(9) Artificially encapsulated somatic embryos are called as _____

(10) Is corona virus act as a pathogen ? (yes or no)
