B.Sc. 5th Semester (New Scheme)
Examination, December–2022
BIO-TECHNOLOGY
Paper–BT-501
Bio-Informatics

Time allowed : 3 hours] *[Maximum marks : 40*

Note : ***Question No. 1 is compulsory****, and attempt* ***four*** *more questions by selecting* ***one*** *question from each unit given. All questions carry equal marks.*

1. Write short note on the following :

(a) UNIGENE

(b) Homology

(c) TOF

(d) pdb files

(e) Sequence Assembly

(f) Substitution Matrices

(g) Data submission

(h) SRS

Unit–I

2. (a) Explain the history of Bioinformatics.

(b) What is GENBANK ?

3. (a) What is ENTREZ ? Explain its role in detail.

(b) What is EMBL ?

Unit–II

4. (a) What is SWISS-PROT ? Explain its important features in detail.

   (b) Explain the technique of Restriction Digestion in detail.

5. Write short note on :

   (a) TrEMBL

   (b) PCR

Unit–III

6. (a) Explain Open Reading Frames in detail.

   (b) What is Pairwise alignment ? Explain with suitable example.

7. (a) Write short note on BLAST.

   (b) What is Phylogenetic Analysis ?

Unit–IV

8. (a) What is similarity searching using FASTA ?

   (b) Explain pattern and repeat finding in genome annotation

9. Write short notes on :

   (a) Entrez

   (b) Gene identification tool

B.Sc. 5th Semester (New Scheme)

Examination, December–2022

BIO-TECHNOLOGY

Paper–BT-502

Re-Combinant DNA Technology

Time allowed : 3 hours] *[Maximum marks : 40*

*Note : **Question No. 1 is compulsory** and attempt **four** more questions by selecting **one** question from each unit given. All questions carry equal marks.*

1. Write the short notes on the following : 8×1

(a) Expression vector

(b) Ultrasonication

(c) Recombinant proteins

(d) Physical agents for Mutations

(e) Immune modulator

(f) Yeast

(g) Pluripotent stem cells

(h) Golden rice

Unit–I

2. What are the differences between Conjugation, Transformation and Transduction ? 8

3. Write the short notes on any **two** : 4×2

(a) Plasmid

(b) Electroporation

(c) Transduction

Unit–II

4. What is PCR ? Describe the procedure and applications of PCR in detail. 8

5. Write the short notes on any **two** :
   (a) Site-directed mutation
   (b) Phage display tech
   (c) Colony hybridization

Unit–III

6. What are embryonic stem cells ? Describe their applications in biotechnology. 8

7. Write the short notes on any **two** : 4×2
   (a) Transgenic animal
   (b) Production of vaccine
   (c) Production of hormone

Unit–IV

8. Explain the various methods of direct DNA transfer in plant cells. 8

9. Write the short notes on any **two** : 4×2
   (a) Ti & Pi Plasmids
   (b) Viruses as plant vector
   (c) A. rhizogenes

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B.Sc. 5th Semester (New Scheme)

Examination, December–2022

BIO-TECHNOLOGY

Paper–BT-503

Immunology

Time allowed : 3 hours] *[Maximum marks : 40*

Note : ***Question No. 1 is compulsory*** *and attempt* ***four*** *more questions by selecting* ***one*** *question from each unit given. All questions carry equal marks.*

1. Write the short notes on the following : 8
   (a) Memory cells
   (b) DiGeorge's syndrome
   (c) Suppressor T-cells
   (d) Allotypes
   (e) Autoimmunity
   (f) Immuno-compromised
   (g) Name of COVID-19 vaccines
   (h) Adjuvant

Unit–I

2. What is Immune Response ? What are the similarities and differences between primary and secondary immune responses ? 8

3. Write the short notes on any **two** : 8
   (a) Antibody Class switching
   (b) Primary organs related immune-system
   (c) Basic structure of immunoglobulin

Unit–II

4. What is antibody diversity ? Explain the germ-line models contended to explain antibody diversity in detail. 8

5. Write short notes on : 8
   (a) Immunoglobulin gene
   (b) Clonal selection theory

Unit–III

6. Write short notes on any **two** : 8
   (a) Pathogen defense strategies
   (b) HIV/AIDS
   (c) Exogenous Antigens : The Endocytic Pathway

7. What is the MHC ? Schematic diagrams of class I and class II MHC molecule. 8

Unit–IV

8. What is immuno-diagnosis ? Describe the procedure, requirements and applications of RIA & ELISA in detail. 8

9. Write short notes on any **two** : 8
   (a) Recombinant vaccine
   (b) Cytokines
   (c) Passive immunization

B.Sc. 5th Semester (New Scheme)
Examination, December–2022
BIO-TECHNOLOGY
Paper–BT-504
Genomic and Proteomics

Time allowed : 3 hours] *[Maximum marks : 40*

Note : *Question paper has nine questions in all.* ***Question No. 1 is compulsory****. The compulsory question is of 10 marks. Students should attempt* ***four*** *other questions selecting* ***one*** *question from each unit.*

1. Write short note on the following : 10×1=10

(i) Pyrosequencing
(ii) BLAST
(iii) VISTA
(iv) Web-Based Genome Browsers
(v) Short Range Interactions in Proteins
(vi) Native PAGE
(vii) Proteomics
(viii) 2D-PAGE
(ix) PROTEIN IDENTIFICATION Methods
(x) Genomics

Unit–I

2. What do you understand by manual DNA sequencing ? Describe the different manual DNA sequencing methods. 7½

3. Describe the following :
   (i) Shotgun & Hierarchical methods of genome sequencing 3½
   (ii) Genome sequence assembly software's 4

Unit–II

4. What do you understand by Web based servers and software-ENSEMBL and UCSC. 7½

5. (i) What is NCBI ? Describe the uses of NCBI.
   (ii) Describe the selected Model Organismal Genomes and Databases. 4½

Unit–III

6. What are the chemical properties of proteins ? Discuss the different physical interactions that determine the property of proteins. 7½

7. Describe the Sedimentation analysis and SDS-PAGE methods for determination the size of proteins. 7½

Unit–IV

8. What do you understand by sample preparation solubilization, reduction and resolution of proteins ? Why proteomic analysis is important ? 7½

9. Describe the following :
   (a) De Novo sequencing of proteins 4
   (b) Mass spectrometry based methods for protein identification 3½

B.Sc. 5th Semester (New Scheme) Examination,

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BIO-TECHNOLOGY

Paper–BT-505

Physical Chemistry

Time allowed : 3 hours] *[Maximum marks : 40*

Note : *Attempt **five** questions in all, selecting **one** question from each section. **Question number 1 is compulsory.***

1. (a) What do you mean by ∇^2 ? What does it represent ?

(b) What is zero point energy ?

(c) How light can be made plane polarized ?

(d) What is meso form ?

(e) Which type of molecules show pure rotational spectrum ?

(f) How does the spacing between the energy of rotational energy level related to J ?

(g) Which of these are IR active ?

CO, NO, H_2, N_2

(h) What is Raman Shift ? $8\times1=8$

Section–A

2. (a) Explain the role of operators in quantum mechanics with suitable examples. 4

(b) Determine the wave function and energy expression when particle move in one-dimensional box. 4

3. (a) Define Planck's radiation law and derive its expression. 4

(b) Derive an expression for eigen function for a particle having mass 'm' moving in one dimension box of length 'a'. 4

Section–B

4. (a) What is dipole moment ? What are its units ? Explain one method for its determination. 5

(b) What is optical activity and specific rotation ? What is the cause of it ? Explain. 3

5. (a) What is magnetic permeability ? Differentiate between diamagnetic, paramagnetic and ferromagnetic substance. 5

(b) Discuss and derive Clausius-Mosotti equation. 3

Section–C

6. (a) What do you understand by electro-magnetic radiation ? Give their important characteristics. 4

(b) What is Born-Oppenheimer approximation ? What is its use in molecular spectroscopy ? 4

7. (a) Derive an expression for the wave number of rotational level of a non-rigid rotator. 4

(b) Discuss rotational spectrum of diatomic molecules with example. 4

Section–D

8. (a) Describe anharmonic oscillator. How does it differ from harmonic oscillator ? 3

(b) What are P, Q, R branches of vibrational rotation spectra ? What are selection rules for vibrational-rotational spectra ? 5

9. (a) What is Raman spectrum ? Name and explain different types of lines present in it and reason for observing these lines ? 5

(b) Explain why Anti-Stokes lines are less intense than Stoke's line in Raman spectroscopy ? 3

B.Sc. 5th Semester (New Scheme) Examination,

December–2022

BIO-TECHNOLOGY

Paper–BT-507/BIN-506

Inorganic Chemistry

Time allowed : 3 hours] *[Maximum marks : 40*

Note : *Attempt **five** questions in all, selecting **one** question from each section. **Q. No. 1 is compulsory.***

1. (a) What are inner orbital complexes ?

(b) Which of these two complexes, $(CoF_6)^{3-}$ and $[Co(NH_3)_6]^{3+}$ will have higher CFSE ?

(c) Name the methods used for determination of magnetic susceptibility.

(d) What is Bohr magneton ?

(e) What are inert complexes ?

(f) What is general relation between overall stability constant and stepwise stability constant ?

(g) What are term symbols ?

(h) What are Orgel diagrams ?

Section–A

2. (a) Calculate CFSE for d^5 low spin octahedral and d^7 high spin octahedral. 4

(b) Distinguish between VB approach and CF approach. 4

3. (a) What do you understand by CFSE ? 4

(b) How do Δ_0 and Δ_t differ from each other ? 4

Section–B

4. (a) Discuss the mechanism of nucleophilic substitution reaction in square planar complexes. 4

(b) Define trans effect. Arrange ligands in order of their increasing trans effect. 4

5. (a) Show stereochemistry of substitution in following reaction

(i) $PtC\ell_4^{2-} \xrightarrow{NH_3} \xrightarrow{NO_2^-}$

(ii) $PtC\ell_4^{2-} \xrightarrow{NO_2^-} \xrightarrow{NH_3}$ 6

(b) What are inert complexes ? Distinugish them from labile complexes. 2

Section–C

6. (a) What do you understand by magnetic susceptibility ? How does it vary with magnetic field and temperature ? 4

(b) Calculate spin only magnetic moment in case of Fe^{3+} and Ni^{2+}. 4

7. (a) Briefly explain Gouy's Method of determining magnetic susceptibility. 4

(b) Calculate magnetic moment of Cr^{3+} ion by spin only formula. 4

Section–D

8. (a) Write briefly about L–S coupling. 4

(b) Discuss Orgel diagram for a d^1 and d^9 ion in octahedral field. 4

9. (a) What are selection rules for electronic spectra ? 5

(b) What is meant by spectrochemical series. 3

B.Sc. 5th Semester (New Scheme) Examination,

December–2022

BIO-TECHNOLOGY

Paper–BT-506/BIN-507

Organic Chemistry

Time allowed : 3 hours] *[Maximum marks : 40*

Note : *Attempt **five** questions in all. **Question No. 1** is **compulsory**. **One** question from each section.*

1. (a) How many PMR signal do you expect from Ethanol ?

   (b) Define coupling constant.

   (c) What is meant by resonance in PMR spectroscopy ?

   (d) To which frequency region do the electromagnetic radiation used in NMR spectroscopy belong to ?

   (e) How do epimers and anomers differ ?

   (f) Define inversion of sugar.

   (g) Write the reaction to prepare primary alcohol from Grignard reagent.

   (h) Who discovered Grignard Reagent ? When was it discovered ? 1×8

Section–A

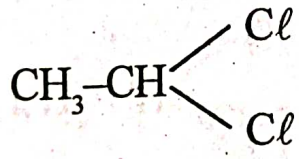
2. (a) Explain the following :
   (i) Spin-spin coupling
   (ii) Equivalent and Non-Equivalent Proton
   (iii) Shielding and Deshielding of proton 6

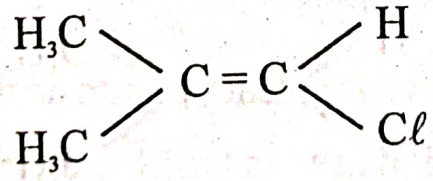
   (b) Write short note on chemical shift. 2

3. (a) Discuss the Main factor affecting the chemical shift. 4

   (b) How many signal will you expect from each of the following compounds

   (i) $CH_3–O–CH_2–CH_3$

   (ii) 

   (iii) 

   (iv) $CH_3–CH_2–CH_2–COOH$ 4

Section–B

4. (a) Discuss the PMR spectra of the following compound :
   (i) Isopropyl bromide
   (ii) P–Nitrotoluene 4

(b) A compund having Molecular Formula $C_{10}H_{14}$ gave the following PMR data :

(i) δ 0.89 (9H, S)

(ii) δ 7.28 (5H, S)

Assign the structural Formula to compound and explain it. 4

5. (a) Propose the structural formula for the following compounds which give only one PMR signal

(i) C_5H_{12}

(ii) C_8H_{18}

(iii) C_2H_6O

(iv) $C_2H_4Br_2$ 4

(b) How can NMR spectroscopy be employed in differentiating Ethane, Ethene and Ethyne ? 4

Section–C

6. (a) Write short note on Ruff degradation. 4

(b) Explain the Mechanism of osazone formation. 4

7. (a) Write short note on : 4

(i) Killiani Fischer synthesis

(ii) Mutarotation

[P.T.O.

(b) Convert : 4

(i) Glucose into Fructose

(ii) Fructose into Glucose

Section–D

8. (a) Write short note on Reformatsky Reaction. 4

(b) Complete the following reaction : 4

(i) $CH_3MgBr + CO_2 \longrightarrow ?$

(ii) $CH_3Li + CO_2 \longrightarrow ?$

(iii) $CH_3–MgBr + CH_3CN \longrightarrow ?$

(iv) $CH_3MgBr + CH_3CH_2OH \longrightarrow ?$

9. (a) Write Haworth Formula of Maltose and Sucrose. 4

(b) What are polysaccharides ? Name the major polysaccharide. Draw the structure of one of them. 4