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B. Sc. (Bio-Tech) 5th Semester (N.S.) Examination – February, 2022

BIO-INFORMATICS

Paper : BT-501

Time : Three hours] *[Maximum Marks : 40*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Question No. 1 is *compulsory*. Answer any *four* other questions, *one* from each Unit.

1. Answer in brief the following : $2 \times 5 = 10$

(a) What do you understand by homology in bioinformatics ?

(b) Expand :

(i) PDB

(ii) EMBL

(c) What is the nature of data generated by Restriction digestion ?

(d) Differentiate between rooted and unrooted phylogenetic tree.

(e) Enlist any *two* Gene identification tool.

UNIT – I

2. What are the basic features of biological databases ? Enlist and explain sequence and structure database with suitable examples. 7.5

3. Differentiate between primary and secondary biological database. 7.5

UNIT – II

4. *Write short notes on any two :* 4 + 3.5 = 7.5

(a) SWISSPROT

(b) PDB

(c) TREMBL

5. Describe in brief the technique of Microarray and the nature of data generated by them. 7.5

UNIT – III

6. Write short notes on any *two* : 4 + 3.5 = 7.5

(a) BLAST

(b) Multiple Sequence Alignment

7. What do you understand by substitution matrices ? Differentiate between PAM and BLOSSUM. 7.5

UNIT – IV

8. Explain the basic architecture of Entrez at NCBI. 7.5

9. Explain the methods of patterns and repeat finding during genome annotation. 7.5

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B. Sc. (Bio-Tech) 5th Semester (N.S.) Examination – February, 2022

RE-COMBINANT DNA TECHNOLOGY

Paper : BT-502

Time : Three hours] *[Maximum Marks : 40*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

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

1. Write short note on the following : $1 \times 8 = 8$

(a) Ti plasmid

(b) Polyethylene glycol

(c) Liposome fusion

(d) Random mutagenesis

(e) Phage display

(f) Chimeric proteins

(g) Immune modulators

(h) Microlaser

UNIT – I

2. Write detailed account on :

   (a) Episomes 3

   (b) Ultrasonication 3

   (c) Microprojectile 2

3. What do you mean by gene recombination ? Discuss in detail the methods of genetic recombination. 8

UNIT – II

4. What do you mean by protein engineering ? Discuss in detail various methods of protein Engineering. 8

5. Write a detailed description on :

   (a) PCR based site directed mutagenesis 4

   (b) Primer extension method of site-directed mutagenesis 4

UNIT – III

6. Define genetic engineering. Discuss in detail the therapeutic products produced by the genetic engineering technology. 8

7. Discuss in detail :

(a) Yeast to study eukaryotic gene function 4

(b) Embryonic stem cells for the production of transgenic mouse 4

UNIT – IV

8. Write a note on :

(a) Use of plant viruses as episomal expression vectors 4

(b) Gene targeting in plants 4

9. Discuss in detail different strategies for gene transfer to plant cells. 8

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B. Sc. (Bio-tech.) 5th Semester (N.S.) Examination – February, 2022

IMMUNOLOGY

Paper : BT-503

Time : Three hours] *[Maximum Marks : 40*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting *one* question from each Unit. Question No. 1 is *compulsory*. All questions carry equal marks.

1. Write the short notes on the following : 8

(a) Suppressor T-cell

(b) Genome

(c) Antibody Engineering

(d) Plasma cell

(e) SCID several conjugation Immuno deficiency

(f) Infectious agents

(g) Any *two* vaccines for COVID-19

(h) Immunofluorescence

UNIT – I

2. What is the immune system ? Describe the various cells and organs related to the human immune system. 8

3. Write the short notes on any *two* : 8

(a) Humoral immune response

(b) T-lymphocytes

(c) Basic structure and functions of antibodies

UNIT – II

4. Explain the somatic-variation models' Hypotheses contended to explain antibody diversity in detail. 8

5. Write the short notes on any *two* : 8

(a) Immunological memory

(b) Clonal selection theory

(c) Allotypes & Idiotypes

UNIT – III

6. Write the short notes on any *two* : 8

(a) Pathogen defence strategies

(b) Immunity to repeated infections

(c) Exogenous Antigens : The Endocytic Pathway

7. What is the MHC ? Differences between the class I and class II MHC molecule. 8

UNIT – IV

8. What is the vaccine ? Describe various types of the vaccine in detail. 8

9. Write the short notes on any *two* : 8

   (a) Passive and Active immunization

   (b) Adjuvant

   (c) Properties and functions of Cytokines

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B. Sc. (Bio-Tech) 5th Semester (N.S.) Examination – February, 2022

GENOMIC & PROTEOMICS

Paper : BT-504

Time : Three hours] *[Maximum Marks : 40*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

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

1. Write short note on the following : $1 \times 8 = 8$

(a) Peptide mass fingerprint

(b) Repetitive sequences

(c) Isoelectric point

(d) Pyrosequencing

(e) DNA polymerase

(f) Short-range interactions

(g) EcoCyc

(h) Genome Browser

UNIT – I

2. What is DNA sequencing ? Discuss in detail the principle and procedure of Sanger's method of DNA sequencing and its advantages and disadvantages over other methods of DNA sequencing. 8

3. What is the principle of shotgun sequencing ? Describe in detail steps involved in shotgun sequencing method of genome sequencing and its advantages and disadvantages. 8

UNIT – II

4. Discuss in detail : $4 \times 2 = 8$

(a) VISTA

(b) NCBI

5. Write a detailed description on : $4 \times 2 = 8$

(a) TAIR

(b) SGD

UNIT – III

6. Write detailed account on :

(a) Sedimentation analysis and gel filtration 4

(b) Native PAGE 4

7. How do proteins interact ? Explain in detail different physical interactions that determine the property of proteins. 8

UNIT – IV

8. Define proteomics. Discuss in detail the principle and procedure of 2D-PAGE for the analysis of proteins. 8

9. What is the principle of Mass spectrometry ? Give a detailed description on mass spectrometry methods for protein identification. 8

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B. Sc. Bio-Technology 5th Semester (N. S.) Examination – February, 2022

PHYSICAL CHEMISTRY

Paper : BT-505

Time : Three Hours] *[Maximum Marks : 40*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting at least *one* question from each Section. Question Number 1 is *compulsory*.

1. (a) Define Laplacian operator. 1

(b) What do you understand by a normalized wave function ? 1

(c) Define Doppler-broadening. 1

(d) Define selection rules. 1

(e) What is the direction of dipole moment ? 1

(f) Define photoelectric effect. 1

(g) What are eigen functions ? 1

(h) Define polarizability. 1

SECTION – A

2. (a) Explain the following : $2 \times 2 = 4$

(i) Photoelectric effect

(ii) Heat capacity of solids

(b) Applying de-Broglie relationship, derive Schrodinger wave equation. 4

3. (a) When are the two eigen functions said to be : $2 \times 2 = 4$

(i) Mutually orthogonal

(ii) Orthonormal

(b) State and derive plancks radiation law. How can it be verified experimentally ? 4

SECTION – B

4. (a) What is dipole moment ? What are its units ? How is it determined by refraction method ? 4

   (b) Derive Clausius-Mosotti equation. 4

5. (a) Briefly explain Gouy's method for the measurement of magnetic susceptibility. 4

   (b) A molecule of *HCl* has dipole moment 1.38 D. Calculate the percentage ionic character of *HCl* bond. Bond length is 1.20 Å. 4

SECTION – C

6. (a) Discuss rotational spectrum of the diatomic molecule. 4

   (b) What is signal to noise ratio ? Discuss the means and methods to minimize it. 4

7. (a) Write short notes on : $2 \times 2 = 4$

   (i) Zero point energy

   (ii) Relative intensities of rotational spectral lines

   (b) Write expressions for the wave number of rotational levels of a non-rigid rotator. Explain why molecule behaves as a non-rigid rotator. 4

P. T. O.

SECTION – D

8. (a) Why a diatomic molecule should be considered as an anharmonic oscillator ? Write Moarse equation for the energy of the vibrational levels of an anharmonic oscillator. 4

(b) Explain quantum theory of Raman effect. 4

9. (a) What do you understand by degrees of freedom of motion of a molecule ? Briefly explain the different types of degrees of freedom possessed by linear or non-linear molecules. 4

(b) Calculate the force constant for bond in *HBr* when its fundamental vibrational frequency is $9.667 \times 10^{12} s^{-1}$. 4

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B. Sc. Bio-Technology 5th Semester (N. S.) Examination – February, 2022

INORGANIC CHEMISTRY

Paper : BT-507/BIN-506

Time : Three Hours] *[Maximum Marks : 40*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting at least *one* question from each Section. Question Number **1** is *compulsory*.

1. (a) What are labile complexes ? 1

(b) Which has larger value Δ_0 or Δ_t ? 1

(c) Out of Cl^- and NH_3 which has more trans effect ? 1

(d) What is Curie's point ? 1

Max. PL. on graph for thermodynamic complexes

(f) Define spectrochemical series. 1

(g) What are term symbols ? 1

(h) State spin multiplicity rule. 1

SECTION – A

(a) Give comparative account of valence bond theory and crystal field theory. 4

(b) What are limitation of valence bond theory ? Explain. 4

(a) Explain why N_1^{2+} forms tetrahedral complex with CO whereas square planar with CN^-. 4

(b) Calculate the number of unpaired electrons in $[Fe(CN)_6]^{3-}$ and $[Fe(H_2O)_6]^{3+}$. 4

SECTION – B

a) What is log β ? How is it related to the stability of metal complexes ? Explain with example. 4

(b) How does nature of ligand affect the stability of the complexes ? 4

5. (a) Discuss the mechanism of substitution reactions in square planar complexes. 4

(b) What is trans effect ? Explain the theories for it. 4

SECTION – C

6. (a) Discuss briefly the Gouy's method for measuring magnetic susceptibility. 4

(b) Explain spin and orbital contribution to magnetic moments. Give example. 4

7. (a) Calculate the magnetic moments (spin only) for the following ions : 4

(i) N_1^{2+}

(ii) $[Fe(H_2O)_6]^{+}$

(iii) $[Cr(CN)_6]^{3-}$

(b) Explain what you understand by quenching of orbital angular momentum. 4

SECTION – D

8. (a) What are two important limitations of Orgel energy level diagrams ? 4

   (b) Derive various term states for d^2 configuration. 4

9. (a) Explain selection rules for d-d transition in transition metal complexes. 4

   (b) Calculate the number of microstates for p^3 and d^2 configurations. 4

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B. Sc. Bio-Technology 5th Semester (N. S.) Examination – February, 2022

ORGANIC CHEMISTRY

Paper : BT-506/BIN-507

Time : Three Hours] *[Maximum Marks : 40*

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt *five* questions in all, selecting at least ***one*** question from each Section. Question Number 1 is ***compulsory.***

1. (a) Assign whether $^{14}_{7}N$ and $^{19}_{9}F$ are spin active nuclei or not.

   (b) How many PMR signal do you expect from acetaldehyde ?

   (c) Name any reagent whose test is used to distinguish Glucose and Fructose. Tollen's R.

P. T. O.

(d) Define inversion of sugar.

(e) What do you mean by anomers ?

(f) Name the most commonly used reference compound in PMR spectroscopy.

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

(h) Who discovered Grignard reagent ? When was it discovered ? $1 \times 8 = 8$

SECTION – A

2. (a) Write short note on the following : 4

(i) Shielding and deshielding of proton

(ii) Coupling constant

(b) Discuss the main factors affecting chemical shift. 4

3. (a) Explain the following : 4

(i) Spin active nuclei

(ii) Peak area of signal

(b) Give a detailed account of rules for splitting of proton signal. 4

SECTION – B

4. (a) A compound having molecular formula $C_2H_3Br_3$ exhibit two PMR signal : 4

$$\delta = 4.2(2H, d)\ \delta = 5.8(1H, t)$$

What is the structure of compound ?

(b) Propose structural formula for compounds with the following molecular formula which give rise to only one PMR signal : 4

(i) C_5H_{12}

(ii) C_2H_6O

(iii) $C_2H_4Br_2$

(iv) C_8H_{18}

5. (a) Describe the NMR of Acetophenone. 4

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

SECTION – C

6. (a) Explain the mechanism of Osazone formation. 4

(b) Convert : 4

(i) Glucose into Fructose

(ii) Fructose into Glucose

7. (a) Illustrate with example the detailed steps of Killiani Fischer synthesis. 4

(b) Write Haworth projection formulae of the following : 4

(i) α-D-Glucopyranose

(ii) β-D-Fructofuranose

SECTION – D

8. (a) Complete the following reactions : 4

(i) $CH_3MgBr + CH_3COOH \rightarrow ?$

(ii) $CH_3MgBr + HCN \rightarrow ?$

(iii) $CH_3Li + CO_2 \rightarrow ?$

(iv) $CH_3MgBr + C_2H_5OH \rightarrow ?$

(b) Write short note on reformat Sky reaction. 4

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

(b) Draw the Haworth formula structure of the following : 4

(i) Sucrose

(ii) Maltose