[4819] - 1001

F.Y. B.Sc.

BIOTECHNOLOGY

Bb - 101 : Fundamentals of Chemistry

(2013 Pattern)

Time :3 Hours]   *[Max. Marks :80*

Instructions to the candidates:

   1)   *Neat diagram must be drawn whenever necessary.*

   2)   *Figures to the right indicate full marks.*

   3)   *All questions carry equal marks.*

   4)   *Use of logarithmic table and calculator is allowed.*

   5)   *All questions are compulsory.*

Q1) Answer the following.   **[8 × 2 = 16]**

   a)   Distinguish between order and molecularity.

   b)   Derive the relation between kinetic energy and absolute temperature for n moles of the gas.

   c)   Define,

       i)   Ebullioscopic constant

       ii)   Molarity

   d)   State and explain gibbs phase rule.

   e)   What are alcohols? How they are classified?

   f)   State the Octate rule and Fajans rule.

   g)   The emf of following cell reaction at 298k is 0.6753 volt

       $Zn + cu^{2+} \longrightarrow Zn^{2+} cu$ Calculate the free energy change.

   h)   Define and explain the solubility product.

Q2) Answer the following (Any Four) [4 × 4 = 16]

a) Draw the phase diagram of sulphur system and apply gibbs phase rule to it.

b) Write a note on.

   i) Abnormal molecular weight

   ii) Vant Hoff 's factor

c) Write the cell reaction and calculate the e.m.f. of the following cell at 25 °C

$$Zn \big| Zn^{2+}(0.25N) \big\| Cu^{2+}(0.75N) \big| Cu$$

   Given: $E^o_{zn(oxd)} = 0.76V$ & $E^o_{cu(red)} = 0.34V$

d) Define and explain the formation of ionic bond and co - ordinate bond with suitable example.

e) Explain the QSAR theory and synthesis of methyl orange.

f) Draw the different conformations of n - butane and comment on the stability and energy with the help of energy profile diagram.

Q3) Answer the following (Any Four) [4 × 4 = 16]

a) Explain the colligative properties and show that osmotic pressure is a colligative property.

b) Draw a phase diagram of two components system and explain it, in which the two components forms a eutectic mixture.

c) Write a note on cell constant and explain the variation of equivalent conductance with concentration.

d) For a certain reaction the rate constant k is 2. 46 × 10^{-5} sec^{-1}at 293k and 4. 63 × 10^{-5} sec^{-1} at 303k. Calculate the energy of activation of the reaction. given : R = 1.987 cal/deg/mole.

e) What is a single electrode potential ? Derive the Nernst equation for the following reaction.

$$aA + bB \rightleftharpoons cC + dD$$
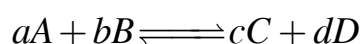
f) State the rules to determine the oxidation number.

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Q4) Attempt the following (Any Two) [2 × 8 = 16]

    a) Derive an expression for emf of the following cells.

        i) Chemical cell without transference.

        ii) Concentration cell without transference.

    b) What is first order reaction? Derive an expression for first order reaction and explain the characteristics of second order reaction.

    c) Draw and explain the any four plots of conductometry titration.

Q5) Attempt the following (Any One) [1 × 16 = 16]

    a) Give and explain the postulates of kinetic theory of gases and derive the kinetic gas equation, $PV = \dfrac{1}{3} nmu^2$

    b) What does mean by isomerism? Give the classification of isomers and explain each class briefly.

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[4819] - 1002

F.Y. B.Sc.

BIOTECHNOLOGY

Bb - 102 : Fundamentals of Physics

(2013 Pattern)

Time :3 Hours]   *[Max. Marks :80*

Instructions to the candidates:

   1)   *All questions are compulsory.*

   2)   *Figures to right indicate full marks.*

   3)   *Use of color pencils restricted to diagrams.*

Q1) Attempt the following in two - three sentences.   **[8 × 2 = 16]**

   a)   Enlist an example exhibiting interrelationship between physics and life sciences.

   b)   Give the symbol representing the matrix prefix "mega" and "micro" SI units.

   c)   Define stress and draw a diagram illustratingtensile, compressive and shearing stress.

   d)   Convert 745.0 mmHg to atm.

   e)   What is the concentration of a 0.5 % (w/v) solution when expressed as $mg\ mL^{-1}$?

   f)   What is the role of xanthan gum within some liquid formulations?

   g)   Assign the application of laser in the following – eye surgery, microsurgery in embryology, sealing of dental enamel and general surgery i.e. cutting the liver.

   h)   Write the use of sound waves in medicine and navigation.

Q2) Attempt any four of the following: **[4 × 4 = 16]**

a) With the appropriate formula justify that surface tension decreases with the increase of temperature, reaching a value of 0 at the critical temperature.

b) The core of a refrigeration system is the compressor, which is designed to pump cool refrigerant gas from the evaporator into the condenser. Give reasons that compressor should never pump liquid, which will not only damage the compressor, but can create a potential safety hazard.

c) The concept of entropy and the second law of thermodynamics suggest that systems naturally progress from order to disorder. If so, how do biological systems develop and maintain such a high degree of order? Is this a violation of the second law of thermodynamics?

d) Justify if the radio waves of transmitter are polarized, the sound quality of portable radio is improved by adjusting the orientation of the aerial.

e) Give reasons that biomagnetism can- i) normalize the body's bioelectricity, ii) balance cell's pH, iii) help the immune system detect the pathogenic microorganisms and iv) detoxify the body's organs.

f) Justify that the Reynolds's number is - i) dimensionless and ii) it increases with increase in hydraulic diameter of the pipe.

Q3) Write short notes on any four of the following: **[4 × 4 = 16]**

a) Pascal's Principle.

b) Bernoulli's theorem.

c) Van der Wall's equation.

d) Viscometer.

e) Optical pumping.

f) Para, di and ferromagnetism.

Q4) Attempt any two of the following: **[2 × 8 = 16]**

a) Explain when a builder designs the drainage system for the roof of a house; what factors should influence the choice of the size of the downpipe? Would he be correct in basing his calculations on Poiseuille's Law?

b) A corner reflector, much used in optical, microwave consists of three plane mirrors fastened together as the corner of the cube. It has the property that an incident ray is returned, after three reflections, with its direction exactly reversed. Prove this result.

c) What would the delta U, change in internal energy, be after one Carnot Cycle? Why don't we have "delta work" in terms of difference between the work and internal energy function? Overall, why is the Carnot engine the most efficient engine?

Q5) Compare and contrast venturimeter and Pitot tube with respect to construction, equation and working. **[16]**

OR

Describe the energy band gap with the help of energy band diagram. Distinguish between conductors, insulators and semiconductors.

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F.Y. B.Sc.

BIOTECHNOLOGY

Bb - 103 : Basics of Plant And Animal Sciences

(2013 Pattern)

Time :3 Hours]   *[Max. Marks :80*

Instructions to the candidates:

1) *Answer to the two sections should be written in separate answer books.*

2) *All questions are compulsory.*

3) *Neat diagrams must be drawn wherever necessary.*

4) *Figures to the right indicate full marks.*

SECTION - I

BOTANY

Q1) Answer the following questions.   **[8]**

    a)   What are stilt roots?

    b)   What is alteration of generation.

    c)   Differentiate between isogamy and anisogamy.

    d)   What is diffusion?

Q2) Write short notes on (any two)   **[8]**

    a)   Plant growth regulators.

    b)   Unique features of plant cell.

    c)   Reproductive part of Angiospermic flower.

Q3) Attempt the following (any two)   **[8]**

    a)   Economic importance of algae.

    b)   Osmosis

    c)   Mechanism and applications of vernalization.

Q4) Answer in detail (any two)   **[16]**

   a) Explain glycolysis pathway in detail.

   b) Describe the internal anatomy of Dicot and monocot leaf.

   c) Explain the role of essential elements in plants with respect to physiology.

SECTION II

ZOOLOGY

Q5) Answer the following: **[8]**

   a) Enlist two characteristics of phylum porifera with examples.

   b) Name 2 protozoan parasites.

   c) Define connective tissue.

   d) What are respiratory pigments.

Q6) Write short notes on (Any Two)   **[8]**

   a) Effect of PCO_2 on oxygen dissociation curve.

   b) Different methods of malaria control.

   c) Salient features of class Mammalia.

*Q7***)** Attempt the following (Any Two)   **[8]**

   a) Comment on Role of Hormones in mammalian reproduction.

   b) Describe colony organization in Honey bees.

   c) Parasitic adaptations of Fasciola. Species.

Q8) Answer the following in detail (Any Two)   **[16]**

    a)   Give an illustrated account of life cycle of <u>Taenia</u> <u>Solium.</u>

    b)   Give detailed account on sericulture.

    c)   Describe central Nervous system of frog.

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F.Y. B.Sc.

BIOTECHNOLOGY

Bb - 104 : Mathematics And Statistical Methods For Biologists

(2013 Pattern)

Time :3 Hours]   *[Max. Marks :80*

Instructions to the candidates:

   1)   *All questions are compulsory.*

   2)   *Use separate answer books for each section.*

   3)   *Use of scientific calculator and statistical table is allowed.*

   4)   *Figures to the right indicate full marks.*

SECTION - I

(Mathematics)

Q1) Attempt each of the following: **[4 × 2 = 8]**

a)   If $\quad A = \begin{bmatrix} 2 & -1 & 0 \\ 3 & 5 & 1 \end{bmatrix}$ and $\quad B = \begin{bmatrix} 1 & 1 \\ 0 & 3 \\ 5 & 2 \end{bmatrix},$

     then find determinant of AB.

b)   Prove that.

$$\left| Z_1 + Z_2 \right|^2 + \left| Z_1 - Z_2 \right|^2 = 2\left| Z_1 \right|^2 + 2\left| Z_2 \right|^2.$$

c)   If $u = x \, log \, (xy)$, then find $\dfrac{\partial^3 u}{\partial x^2 \partial y}$.

d)   Using $\in$ definition, show that the sequence $\left\{ \dfrac{1}{n+3} \right\}$ converges to 0.

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Q2) Attempt Any Four of the following   **[4 × 4 = 16]**

a) Discuss the convergence of the series $\sum\limits_{n=1}^{\infty} \dfrac{3^n}{n!}$.

b) Find rank of the following matrix: $A = \begin{bmatrix} 1 & 2 & -1 & 3 \\ 3 & 5 & 2 & 0 \\ 0 & 1 & 2 & 1 \\ -1 & 0 & 2 & 7 \end{bmatrix}$

c) Show that the following sequence is convergent.

$1 + \dfrac{1}{1!} + \dfrac{1}{2!} + \text{...........} + \dfrac{1}{n!}$

d) Solve: $x^6 - x^5 + x^4 - x^3 + x^2 - x + 1 = 0$.

e) Solve the following system of linear equations.

$x + y + 2Z + 3w = 13$
$x - 2y + Z + w = 8$
$3x + y + Z - w = 1$

f) Check for exactness and hence Solve the following differential equation.
$(x^2 - 2xy - y^2)\,dx - (x+y)^2\,dy = 0$.

Q3) Solve any two of the following: **[2 × 8 = 16]**

a) A body cools from 80°C to 50°C in the room temperature of 25°C in 30 minutes.

i) Find the temperature of a body after 1 hour.

ii) What will be the required time to cool to 30°C.

b) State and prove De'Moivre's theorem. for positive integers.

c) Find all eigenvalues and eigenvectors of the following matrix.

$A = \begin{bmatrix} 4 & 0 & 1 \\ -2 & 1 & 0 \\ -2 & 0 & 1 \end{bmatrix}$

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d) Find the stationary points and determine the nature of the given function at those points.

$$f(x, y) = x^2 + 3y^2 + 2xy + 2x + 1oy + g$$

SECTION - II

(Statistics)

Q4) Given below is a problem solve any five questions asked. **[10]**

Estumates of prevalence of Alzheimer's disease are provided as below.

Agegroup	Males	Females
65-69	1.6	0.0
70-74	0.0	2.2
75-79	4.9	2.3
80-84	8.6	7.8
85+	35.0	27.9

Suppose an unrelated 77 year man, 76 year women and 82 year old women are selected.

a) What is the probability that all three will have disease?

b) What is the probability that at least one women of three will have AIDS?

c) What is the probability that one of three person will have the disease?

d) Suppose we know one of the three people has Alzheimers, but we do not know which one what is conditional probability that the affected in dividual is women?

e) If two of three people have disease. What is conditional probability that both are women?

f) What is expected overall prevalence of Alzheimer's disease in community?

Q5) Attempt any four: [4 × 2.5 = 10]

   a)   Define kurtosis and explain two types of kurtosis.

   b)   Compute the standard deviation and C .V for the following data: 36, 15, 10,14

   c)   Determine the mode for the following distribution

x	10	11	12	13	14	15
f	2	5	10	21	12	13

   d)   For Poisson distribution with mean 4. find $P(x \geq 1)$

   e)   Define correlation coefficient with notation and write its formula.

   f)   Explain the difference between primary data and secondary data.

Q6) Attempt the any two [2 × 5 = 10]

   a)   Define the terms

       i)   Sample Space

       ii)   Type 1 error

       iii)   Null hypothesis

       iv)   Level of significance

       v)   Test statistic

   b)   The mortality rate for certain disease is 0.10 then find the probability that out of 10 people with this disease exactly four will survive?

   c)   If P(A)= 0.4 P(B)= 0.5 A and B are independant then calculate P(AUB.)

Q7) Attempt any one of the following [1 × 10 = 10]

   a)   Explain one way ANOVA.

   b)   For the following data: n = 20, x=20, y = 45

       var (x) = var(y) = 10.6 , r_{xy} = 0.96

       i)   C.V of y

       ii)   Regression coefficients

       iii)   Regression lines

       iv)   Estimate y for x = 18

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[4819] - 1005

F.Y. B.Sc.

BIOTECHNOLOGY

Bb - 105 : Fundamentals of Biological Chemistry

(2013 Pattern)

Time :3 Hours]   *[Max. Marks :80*

Instructions to the candidates:

1) *All questions are compulsory.*

2) *Neat diagrams must be drawn wherever necessary.*

Q1) Attempt the following:

a) Write Henderson Hasselbalch equation.

b) Define redox reaction & give it's example.

c) Draw the structures of α D glucose and β D glucose in Haworth projection.

d) Give any two examples of unsaturated fatty acids.

e) Enzyme reverse transcriptase has EC number as EC 2.7.7.49 which class of enzyme does it belong to?

f) What is the importance of prime ',' while writting the direction of DNA strand i.e. 5' – 3'?

g) Define prosthetic group.

h) What is the pitch of α helix.

Q2) Attempt any four of the following:

a) Describe the mechanism by which buffer resist change in pH.

b) Describe the similarities and differences between glycogen and amylopectin.

c) Write note on effect of hypertonic and hypotonic solution on cell.

d) Myoglobin exhibits tertiary structure of protein. Explain.

e) Comment on the role of lipoic acid and niacin in biochemical reaction.

Q3) Attempt any four of the following.

a) Define Gibb's free energy. How ΔG for any chemical reaction is determined.

b) Describe the types and features of RNA.

c) Describe the formation of covalent bond. Comment on various non covalent interactions present in Biomolecule.

d) Write note on active site of enzyme.

e) Water is a universal solvent. Explain.

Q4) Attempt any two of the following.

a) Describe fluid mosaic model of cell membrane and comment on movement of lipid in membrane.

b) What are mucopoly saccharides? Give structure and function of any two mucopoly saccharides.

c) Discuss competitive and non - competitive inhibition of enzyme.

Q5) Attempt any one of the following.

a) Explain the protein sequencing by Edman's method in detail.

b) i) What are phospholipids. Elaborate the structure and functions of it.

ii) Describe the structure of polynucleotide and discuss various forces stabilizing nucleic acid structure.

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F.Y. B.Sc.

BIOTECHNOLOGY

Bb - 106 : Biophysics And Instrumentation

(2013 Pattern)

Time :3 Hours]   *[Max. Marks :80*

Instructions to the candidates:

    1)   *All questions are compulsory.*

    2)   *Draw neat and labelled diagram wherever necessary.*

    3)   *Figures to the right indicate full marks.*

    4)   *Use of scientific calculator is allowed.*

Q1) Attempt the following: **[8 × 2 = 16]**

    a)   State pauli's Exclusion principle.

    b)   What do you mean by fluorescence spectroscopy?

    c)   Define Molar Absorbance cofficient.

    d)   Give an application of radiowaves and infrared rays.

    e)   Define decay constant of radioactive element.

    f)   Define two units of radioactivity.

    g)   Define aberrations. State its types.

    h)   State Nernst's Equation and give its significance.

Q2) Attempt any four of the following: **[4 × 4 = 16]**

    a)   State Lambert Beer's law and explain its use in colorimetry.

    b)   Compare and Contrast Properties of Alpha (α), Beta (β) and Gamma (γ) rays.

    c)   Discuss in brief the Process of active transport across the membrane.

    d)   Explain the principle of thermocouple thermometer and write its advantages.

    e)   Write a note on dark field microscope.

    f)   Define pH and pOH. Give its relation. Explain principle of pH meter.

Q3) Attempt any four of the following. **[4 × 4 = 16]**

    a)   Discuss electromagnetic wave spectra in brief.

    b)   Write useful biological application of radioactive isotopes.

    c)   The series wavelength for Balmer series of hydrogen spectrum is 3645 A˚. Calculate value of Rydberg's constant.

    d)   List out various biopotentials and write a short note on Electrocardiogram.

    e)   What is the principle of bimetallic thermometer? Give its advantages.

    f)   Enlist the differences between phase contrast microscope and electron microscope.

Q4) Attempt any two of the following. **[2 × 8 =16]**

    a)   Explain construction of compound microscope with the help of neat diagram.

    b)   What is Mass spectrometry? Explain construction and working of Bainbridge mass spectrometer.

    c)   What is radioimmunoassay? Describe its principle, mechanism and advantages in detail.

    d)   Explain emission spectra of sodium (Na) atom.

Q5) Attempt any one of the following. **[1 × 16 = 16]**

    a)   i)   Fluid Mosaic Model of plasma membrane with the help of diagram.

           ii)   Bohr's Atomic Model and its salient features.

    b)   i)   Principle, working and applications of scintillation counter.

           ii)   Chemical composition of plasma membrane.

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[4819] - 1007

F.Y. B.Sc.

BIOTECHNOLOGY

Bb - 107 : Microbiology

(2013 Pattern)

Time :3 Hours]   *[Max. Marks :80*

Instructions to the candidates:

  1)   *All questions are compulsory.*

  2)   *All questions carry equal marks.*

  3)   *Figures to the right indicate full marks.*

  4)   *Neat diagrams must be drawn wherever necessary.*

Q1) Answer the following: **[8 × 2 = 16]**

  a)   Define an acidic stain. Give suitable example.

  b)   State two distinguishing characters of Algae.

  c)   State the use of peptone in nutrient medium.

  d)   Define a synthetic medium.Give an example.

  e)   What is a mordant? Give an example.

  f)   State the doctrine of abiogenesis.

  g)   State the function and source of Agar in a nutrient medium.

  h)   State two aseptic handling techniques.

Q2) Answer the following:(Any Four)   **[4 × 4 = 16]**

  a)   Describe lyophilization as a method of preservation of bacteria.

  b)   Describe in brief sexual reproduction in fungi.

  c)   Describe colony formation in bacteria with respect to margin and elevation.

  d)   What is meant by differential medium? Give an example.

  e)   State the principle of autoclave and State its use in microbiology laboratory.

  f)   State the principle of acid fast staining and state its procedure in short.

Q3) Answer the following.(Any Four) [4 × 4 = 16]

   a) Classify bacteria on the basis of oxygen requirement. Give suitable examples.

   b) State Rivers postulates for viral diseases.

   c) Describe the structure of cytoplasmic membrane of bacteria with a suitable diagram.

   d) Calculate the T.V.C. of a sample using the following data.

      i) Volume of sample plated is 0.1 ml.

      ii) Dilution of sample is 10^{-5}

      iii) Number of colonies obtained is 53.

   e) Describe an animal - microbe interaction with suitable example.

   f) Explain the process of lysogeny in a temperate bacteriophage.

Q4) Answer the following. (Any two) [2 × 8 =16]

   a) Classify viruses on the basis of genetic material. Give suitable examples.

   b) Describe blood staining for differential leucocyte count.

   c) State the use of haemocytometer for enumeration of bacteria.

   d) Describe a plant microbe interaction with suitable diagram.

Q5) Answer the following.(Any One) [1 × 16]

   a) Describe in detail the structure of bacterial cell wall with respect to.

      i) Structure

      ii) Chemical composition

      iii) Function

   b) Describe the lytic cycle of bacteriophage with suitable diagram.

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[4819] - 1008

F.Y.B.Sc.

BIOTECHNOLOGY

Bb - 108 : Computers and Applications

(2013 Pattern)

Time : 3 Hours]   *[Max. Marks : 80*

Instructions to the candidates:
1) *All questions are compulsory.*
2) *Figures to right indicate full marks.*
3) *Use of color pencils restricted to diagrams.*

Q1) Attempt all of the following: **[8 × 2 = 16]**
    a). Define the following terms:
        i) CD-ROM
        ii) Data Abstraction
    b) What is www?
    c) Write a note on firewall.
    d) Define Minicomputer. Give its features.
    e) What is multitasking operating system? Give examples.
    f) Which are the data processing software's?
    g) List functions in MS Excel with it use.
    h) What is Menu bar? List menus in Menubar.

Q2) Attempt any four of the following: **[4 × 4 = 16]**
    a) Write an algorithm and draw flowchart to find factorial of given number.
    b) Explain indexing in computer database.
    c) Explain use of search engine in biotechnology.
    d) What are the functions of computer system?
    e) What is microcomputer? Explain its features.
    f) What is operating system? Explain Windows XP operating system.

Q3) Attempt any four of the following: [4 × 4 = 16]

a) Write note on hierarchical data model.

b) Write and algorithm and draw flowchart to find maximum between three numbers.

c) Explain the different types of databases.

d) What is server? Explain its services provided by server.

e) Differentiate between primary memory and secondary memory.

f) Explain terms titlebar, menubar, statusbar and scrollbar with suitable example.

Q4) Attempt any two of the following: [2 × 8 = 16]

a) Explain MS-Power Point with its uses.

b) Write short note on storage devices.

c) What is meant by network? Explain network topologies.

Q5) Attempt the following [16]

a) Explain generations of computer system with respect to memory, power, cost, size, real-time, online, offline.

OR

What is internet? What is Networking? How internet and networking is related to each other? Which are the devices used to access internet in LAN?

b) Draw block diagram of computer system and explain each block with its examples.

OR

Write a note on Algorithm and Flowchart. Explain characteristics of algorithm and flowchart. List symbols used in flowchart with its use.

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