Total No. of Questions : 5]

P636

SEAT No. :

[Total No. of Pages : 3

[5019]-11
F.Y.B.Sc.
BIOTECHNOLOGY
Bb - 101 : Fundamentals of Chemistry
(2013 Pattern)

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

Instructions to the candidates:-

1) ***Neat diagrams must be drawn wherever 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) State and explain Avogadros principle.

b) Find out the order of reaction,

$2A + ½ B \rightarrow P$

if the reactant 'B' is in large excess.

c) Determine the number phases, component and degree of freedom for the following system in closed vessel.

$CaCO_{3(s)} \rightleftharpoons CaO_{(s)} + CO_{2(g)}$

d) State and explain faradays second law of electrolysis.

e) What is liquid junction potential? How it can be eliminated?

f) Define the terms,

i) enantiomers

ii) Racemic mixture

g) Distinguish between sigma bond and π bonds.

h) Define, oxidation and reduction process.

P.T.O.

Q2) Answer the following (any four) **[4 × 4 = 16]**

a) Explain Graham's law of diffusion and Daltons law of partial pressure as well as deduce these laws from kinetic gas equation.

b) Draw a neat diagram of water system and apply the phase rule to it.

c) State and explain Kohlrausch's law. Derive the relationship between transport number and equivalent conductance of ions.

d) Write the cell reaction and calculate the emf of the following cell at 25°C.

$Zn|Zn^{2+}$ (a=0.1) || Ag^{+} (a=0.1) | Ag

Given : The standard oxidation potential of $E^{o}_{zn} = 0.76v$ and $E^{o}_{Ag} = -0.799v$

e) What is hydrogen bond? What are the effect of hydrogen bonding on physical properties of substances.

f) What are alkylhalides? Give their classification and explain any one method of preparation.

Q3) Answer the following (any four) **[4 × 4 = 16]**

a) Explain the assumptions of kinetic theory of gases.

b) Calculate the boiling point of solution containing 0.55 gm of camphor (mol.wt.152) dissolved in 40gm of propane (boiling point 56.3°C), if K_b of solvent is 1.72 K.kg. $mole^{-1}$

c) Draw a phase diagram of silver-lead system and apply gibbs phase rule to it.

d) Explain the moving boundary method to determine the transport number of ions with the help of neat diagram.

e) Write a note on optical isomerism.

f) Explain the synthesis of following molecules.

i) Aspirin

ii) Paracetamol

Q4) Answer the following (any two) **[2 × 8 = 16]**

a) What is Vapour pressure? Discuss the Raoult's law of lowering of vapour pressure. Describe the method for determination of osmotic pressure of a solution with the help of neat diagram.

b) Explain with the help of molecular orbital energy level diagram that oxygen is paramagnetic where as nitrogen is dimagnetic.

c) Draw the different conformations of ethane and n-butane. Comment on the stability and energy with the help of energy profile diagram.

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

a) What is a second order reaction? Derive the rate constant expression for second order reaction

i) At equal initial concentration and

ii) at unequal initial concentration

Explain the characteristics of first order reaction

b) What are the types of electrodes? Discuss the each electrode with reference to

i) Formation of electrode

ii) Representation of electrode

iii) Electrode reaction

iv) Expression for electrode potential.

Total No. of Questions : 5]

P637

SEAT No. :

[Total No. of Pages : 3

[5019]-12
F.Y.B.Sc. (Biotechnology)
PHYSICS
Bb - 102 : Fundamentals of Physics
(2013 Pattern)

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

Instructions to candidates:-

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of calculator is allowed.***

Q1) Answer the following questions. **[16]**

a) Define atomic mass unit (amu)

b) What is Poisson's ratio? What are its limits?

c) Distinguish between streamline and turbulent flow.

d) What are longitudinal waves? Give one example.

e) What is an isolated system?

f) Explain fresnel diffraction.

g) What is a refrigerant?

h) Define magnetic susceptibility.

Q2) Answer any four of the following. **[16]**

a) Explain the role of physics in life sciences.

b) Define pressure in a fluid. Derive an expression for pressure energy.

c) The original length of rubber strip is 100cm and it is stretched to 105 cm by applying external force. Due to this the diameter of the strip changes from 0.5cm to 0.495 cm. Calculate the Poisson's ratio.

d) Define Kelvin Scale of temperature. State the relationship between celcius and Fahrenheit scale of temperature. Express boiling point of water on Kelvin, celcius and fahrenheit scale.

P.T.O.

e) Water flowing in a horizontal pipe has a speed 20cm/s at one end point and 15cm/s at another point. Determine the pressure drop between two points.

f) Define surface tension. Discuss with examples the effect of temperature, contamination and solute on the surface tension of a liquid.

Q3) Answer any four of the following. **[16]**

a) Define beats. Explain what is waxing and waning. How many beats are produced when two tuning forks of frequencies 450 Hz and 510 Hz are sounded together.

b) Describe a carnot's engine. What are the essential parts of a carnot heat engine?

c) Explain the term thermal equilibrium.

d) Differentiate between laevo-rotatory and dextro-rotatory optically active substances.

e) Write a note on extrinsic semiconductors.

f) What is biomagnetism? How it is useful in health care?

Q4) Answer any two of the following. **[16]**

a) With the help of suitable diagram, explain the principle construction and working of venturimeter. Derive the necessary formula.

b) Show that the relationship between young's modulus, modulus of rigidity and poisson's ratio is $Y = 2\eta(1+\sigma)$

c) Define the terms

i) Spontaneous absorption

ii) Spontaneous emission

iii) Stimulated emission

iv) Population inversion

State and explain any four applications of laser.

d) Differentiate between paramagnetic and ferromagnetic materials.

A current of 10nA is established in a circular loop of radius 5cm. Find the magnetic dipole moment of current loop.

Q5) Attempt the following **[16]**

a) Define the terms

i) Electric Intensity

ii) Electric potential

iii) Electric Flux

iv) Electric lines of force

A source of alternating e.m.f. $e = 300 \sin \omega t$ is connected to lamp whose filament is of resistance 1000Ω. Calculate

A) Peak current

B) r.m.s current passing through the lamp

b) Define entropy. Explain the change in entropy during a reversible process.

Calculate the change in entropy when 8 gm of ice at 0^oC is converted into water at the same temperature. The latent heat of ice is 80 cal/gm

OR

a) State and explain Doppler's effect

b) Describe the capillary rise method to determine surface tension of a liquid. Derive the necessary formula.

Total No. of Questions : 8]

P638

SEAT No. :

[Total No. of Pages : 2

[5019]-13
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) Enlist two biotechnologically important fungi.

b) Give two unique features of plants.

c) What is turgor pressure

d) Define phytochrome.

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

a) Modified leaves

b) Plant cell wall

c) Auxins

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

a) Explain Nastic movements in plants.

b) Active and passive absorption of water.

c) Structure of ovule.

P.T.O.

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

a) Describe the internal anatomy of dicot and monocot root.

b) Give a detailed account of algae group. Add a note on importance of algae in Biotechnology.

c) Explain Krebs cycle in detail

SECTION - II

ZOOLOGY

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

a) Enlist two characteristics of phylum platyhelminthes, with examples.

b) Name two Nematode parasives

c) Define nervous tissue

d) What are endoparasites? Give examples.

Q6) Write short notes on (any two) **[8]**

a) Oxygen dissociation curve.

b) Host - parasite relationship.

c) Salient features of Hemichordata.

Q7) Attempt the following (any two) **[8]**

a) Write a note on structure and function of pitutary gland.

b) Salient features of Mollusca.

c) Parasitic adaptations of Taenia Solium.

Q8) Answer the following in detail (any two) **[16]**

a) Give detailed account on social organization of Honey bee.

b) Give an illustrated account on vermiculture.

c) Describe the male urinogenital system of frog.

Total No. of Questions : 8]

P639

SEAT No. :

[Total No. of Pages : 3

[5019]-14
F.Y.B.Sc.
BIOTECHNOLOGY
Bb - 104 : Mathematics & Statistical Method for Biologists
(2013 Pattern)

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

Instructions to the candidates:-

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of non programmable scientific calculator is allowed.***
4) ***Solve each section on separate answer paper.***

SECTION - I

Q1) Attempt each of the following **[5 × 2 = 10]**

a) Define linearly dependent and independent vectors.

b) Compute the modulus $z = (-1 + i)^2$

c) Evaluate : $\lim_{x \to 2} \frac{x^2 - 4}{x - 2}$

d) Define stationary point

e) Discuss the convergence of the series, $\sum_{n=0}^{\infty} \left(\frac{2}{3} \right)^n$

Q2) Attempt any four of the following **[4 × 2.5 = 10]**

a) Determine whether the vectors (1,0,1), (0,1,–1), (0,2,2) in vector space R^3 are linearly independent.

b) Test the following system of linear equations for consistency $2x + y - 2z = 8$, $3x - 2y - 4z = 15$, $5x - 4y - z = 1$

c) Sovle $\frac{dy}{dx} = e^{x-y} + x^2 e^{-y}$

P.T.O.

d) Find modulus and argument of, z = 3 + 4i

e) Examine the convergence of the series $\sum_{n=1}^{\infty} \frac{3n+2}{7n+8}$

Q3) Attempt any two **[2 × 5 = 10]**

a) Solve $\frac{dy}{dx} = \frac{x^2 + y^2}{x^2}$

b) If $u = \frac{xy}{x+y}$ show that $x^2 f_{xx}(u) + 2xy, f_{xy}(u) + y^2 f_{yy}(u) = 0$

c) Test the convergence of the series whose n^{th} term is $\sum\left(\frac{4n+5}{5n+4}\right)^n$

Q4) Attempt any one **[1 × 10 = 10]**

a) Find eigenvalues and eigenvectors of matrix A, if $A = \begin{bmatrix} 6 & 6 & 4 \\ 2 & 3 & 1 \\ -3 & -4 & -1 \end{bmatrix}$

b) Find stationary points and determine the nature of function $f(x,y) = x^3 + 3xy + y^3$

SECTION - II

Q5) Attempt each of the following **[5 × 2 = 10]**

a) State the classical definition of probability

b) Define : kurtosis

c) Explain the term coefficient of variation

d) Define Poisson distribution

e) Compute arithmetic mean for data : 210, 150, 130, 160, 195.

Q6) Attempt any four of the following **[4 × 2.5 = 10]**

a) State merits and demerits of standard deviation

b) Write a short note on normal distribution

c) State the test statistic used in chi - square test for independence of two attributes.

d) Explain : Stratified random sampling.

e) Find range and coefficient range of the data given 55, 75, 80, 95, 120, 200, 250, 100, 67, 90.

Q7) Attempt any two **[2 × 5 = 10]**

a) Define binomial probability distribution and also states it additive property.

b) Compute mode of the following frequency data.

Marks	10-20	20-30	30-40	40-50	50-60	60-70
No. of Students	6	50	44	26	3	1

c) Explain : test statistic & level of significance

Q8) Attempt any one of the following **[1 × 10 = 10]**

a) Describe tests based on χ^2 distribution

b) Explain the technique of two way ANOVA

Total No. of Questions : 5]

P640

SEAT No. :

[Total No. of Pages : 2

[5019]-15
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) *Figures to the right indicate full marks.*

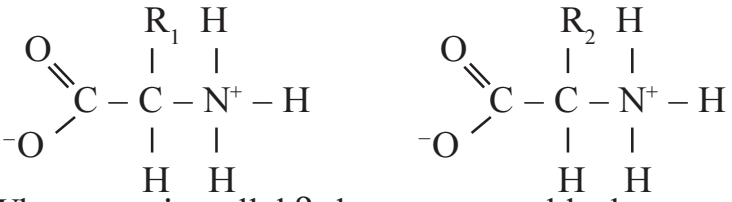
Q1) Attempt the following in 2-3 sentences **[8 × 2 = 16]**

a) Define the following terms

i) Anti parallel

ii) Complementary base pairing

b) Circle the functional groups that are eliminated in the formation of a peptide bond between aminoacids shown below. Draw the structure of dipeptide.



c) Why are antiparallel β sheets more stable than parallel β sheets?

d) The Heme moiety by itself can bind O_2. What physiological function does the globin serve?

e) Draw structures of the following fattyacids

i) 18:0 octadecanoic acid

ii) $20:4^{\Delta 5,8,11,14}$ eicosatetraenoic acid

f) What will be the effect of the following on V_{max} and KM–

i) Irreversible inhibitor ii) Competitive inhibitor

iii) non-competitive iv) uncompetitive

g) Draw and name a typical triacylglycerol.

h) Distinguish between enthalpy and energy. Under what conditions they are equivalent.

P.T.O.

Q2) Write notes on the following (any four) **[4 × 4 = 16]**

a) Haemoglobin as allosteric enzyme

b) Transition state hypothesis of enzyme action

c) Cellulose and chitin as structural polysaccharides

d) Biological significance of lipids.

e) Hyper and hypotonic solutions.

f) Forces stabilizing the structures of nucleic acids.

Q3) Draw the structures of following (any 4) **[4 × 4 = 16]**

a) Lactose and sucrose

b) Phospotidyl choline and phosphotidyl ethanolamine

c) Cholesterol and ceramide as complex lipids.

d) Glycine, lysine, valine and glutamic acid

e) Adenine and thymine

f) Guanine and cytosine

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

a) Describe the sigmoidal curve of allosteric enzyme action with example.

b) Explain the role of thiamin, riboflavin, lipoic acid and panthothenic acid

c) Outline the classification of carbohydrates giving examples of each.

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

a) Compare and contract the sangens method and edman degradation method of protein sequencing.

b) i) Write in details of Ramachandran plot, show the following values on the plot.

No.	Structure	ψ Value	Φ Value
1	α helix	–50	–60
2	Anti parallelβ sheets:	145	–160
3	Parallel β sheets:	80	–130
4	Left handed helix	55	60

ii) Explain in detail the partial double bond character of peptide bond and add a note on bonds stabilizing tertiary structure of proteins.

⊖⊖⊖

Total No. of Questions : 6]

P641

SEAT No. :

[Total No. of Pages : 2

[5019]-16
F.Y.B.Sc. (Biotechnology)
Bb - 106 : Biophysics and Instrumentation
(2013 Pattern)

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

Instructions to the candidates:-

1) ***Answer any five questions.***
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. **[2 × 8 = 16]**

a) Define Emission spectra.

b) Enlist applications of electromagnetic spectrum

c) Define

i) Half life

ii) Isotope

d) What are the properties of α - rays

e) Define & give principle of pH meter

f) Define & give example for fascilitated diffusion.

g) What do you mean by ion channel protein in membrane? Give its significance.

h) Define chromatic & achromatic aberrations.

Q2) Answer the following (any 4) **[4 × 4 = 16]**

a) Discuss asymmetry & fluid property of cell membrane

b) Give applications of platinum resistance thermometer.

c) Define & explain active electrical properties of cell.

d) Explain about shell model

e) Enlist applications of AAS

f) Define & explain dissecting microscope

P.T.O.

Q3) Answer the following (any 4) **[4 × 4 = 16]**

a) What do you understand by resolving power & Magnification of microscope

b) Distinguish - active transport & passive transport

c) Discuss in brief the technique of RIA (Radioimmuno assay)

d) What is electromagnetic spectrum? Give applications of colorimeter.

e) Give a note on Homeastusis with example.

f) Discuss biological effects of Radiation.

Q4) Answer the following (any 4) **[4 × 4 = 16]**

a) Discuss advantages & disadvantages of thermocouple thermometer.

b) Give a short note on nuclear forces.

c) Enlist the types of centrifuges.

d) Explain

i) Emission spectra

ii) Rotational spectra

e) Discuss the terms

i) Poikilothermic animals

ii) Hibernating animals

f) Describe sommerfield's relativistic atom model

Q5) Answer the followig (any 2) **[2 × 8 = 16]**

a) Give construction & working of GM counter

b) Describe the biological handling of radioisotopes

c) Explain - radius of Bohr's orbit

d) Distinguish optical (Compound) & electron microscope

Q6) Answer the following (any one) **[16]**

a) i) Scanning electron microscope

ii) Light driven active transport

b) i) Nernst equation for membrane potential

ii) What is mass spectrometer? Explain Bainbridge mass spectrometer

Total No. of Questions : 5]

P642

SEAT No. :

[Total No. of Pages : 4

[5019]-17
F.Y.B.Sc.
BIOTECHNOLOGY
Bb - 107 : Microbiology
(2013 Pattern)

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

Instructions to the candidates:-

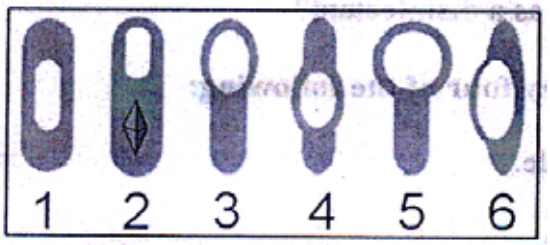
1) ***All questions are compulsory.***
2) ***Figures to right indicate full marks.***
3) ***Use of color pencils restricted to diagrams.***

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

i) Match the Noble laureates with their contribution to Microbiology:

a)	Alexander Fleming (1945 Noble prize)	i.	wasting disease of Kuru
b)	Wendell Stanley (1946 Noble prize)	ii	Bacteriophages mutate.
c)	Salvador Luria, Alfred Day Hershey (1969 Noble prize)	iii.	Effect of penicillin G (+ve) bacteria
d)	D.Carleton Gajdusek(1976 Noble prize)	iv.	Crystalize tobacco mosaic virus.

ii) Assign the positions of endospore of G (+ ve) bacteria in the adjoining diagram and name the chemical which accounts 10 – 20% dry weight of the spore.



iii) Name any two Quaternary ammonium compounds and Halogens used for sterilization.

iv) Enlist two examples each of plant- microbe and animal–microbe interaction.

P.T.O.

v) _____ will be the nutritional requirements of achemolithotrophic heterotroph. The bacterium might be found at ____ places.

vi) Suppose that you carry out a serial dilution of a 0.1 ml sample. The 10^{-3} plate gives 80 colonies and the 10^{-4} plate yields four colonies. Calculate the concentration (bacteria/ml) of the original, undiluted sample.

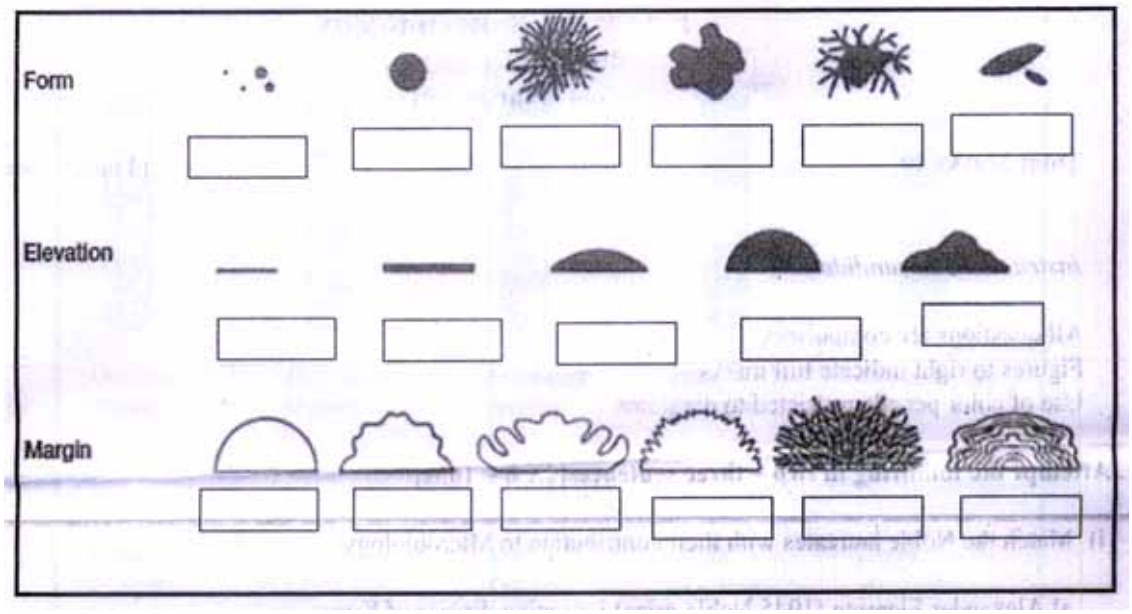
vii) If the generation time is 90 minutes and the initial population contains 10^3 cells, howmany bacteria will there be after 8 hours of exponential growth?

viii) Why are continuous culture systems so useful to microbiologists?

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

i) Describe and contrast the ways in which flagella and cilia propel micro organisms through the water.

ii) In the diagram below variations in bacterial colony morphology as seen with naked eye are shown complete the diagram by assigning names given to forms, elevation and margins of colony morphology.



iii) Discuss the reasons why a culture might have a long lag phase after inoculation.

iv) Why can't one always tell when a culture enters the death phase by the use of total cell counts?

v) Define thermal death point (TDP), thermal death time (TDT), decimal reduction time (D) or D value, Z value, and the F value.

vi) in Q1. (iii) you have named two quaternary amines and halogens as sterilizing agents what is their mode of action and How would you determine whether that agent is suitable for use as an antiseptic rather than as a disinfectant?

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

i) Lipopolysaccharide.

ii) Acid fast staining.

iii) Biofilm formation.

iv) Lysogeny.

v) Saprophyte.

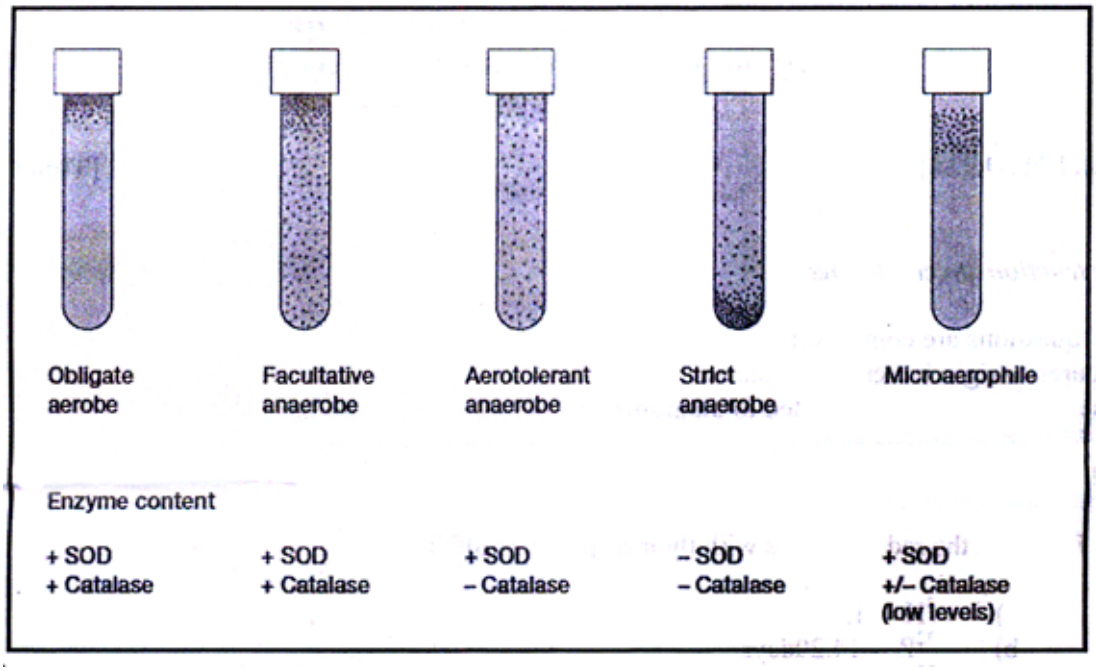
vi) Chemolithoautotrophy.

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

i) Define and signify the following- fixative, dye, chromophore, basic dye, acid dye, simple staining, mordant, negative staining, and differential staining. How would you visualize capsules, endospores, and flagella?

ii) Explain in detail the five kingdom classification system.

iii) Describe the correlation between the microbial growth and oxygen looking in the diagram given below. Justify the need of the SOD and catalase.



Q5) Attempt the following: **[16]**

i) Describe how an autoclave works. What conditions are required for sterilization by moist heat'? And what three things must one do when operating an autoclave to help ensure success?

ii) What are depth filters and membrane filters, and how are they used to sterilize liquids'? Describe the operation of a biological safety cabinet.

OR

i) What are pure cultures, and why are they important? How are spread plates, streak plates, and pour plates prepared?

ii) Describe the following kinds of media and their uses: defined or synthetic media, complex media, general purpose media, enriched media, selective media, and differential media. Give an example of each kind.

Total No. of Questions : 5]

P643

SEAT No. :

[Total No. of Pages : 2

[5019]-18
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 following terms:
   i) Digital Tape
   ii) RAID
b) What is parallel processing Computer?
c) Write a note on Linux operating system.
d) Define DVD?
e) Draw symbols used in flowchart with its use.
f) Draw symbols used in E-R diagrams with its use.
g) What is need of database?
h) What is multimedia database?

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

a) Explain input devices of computer.
b) What are the virus symptoms in computer? How they get transmitted?
c) Explain MS-Word with its uses.
d) Write short note on network protocol.
e) How security is provided in networking and internet?
f) Explain biological databases.

P.T.O.

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

a) Explain uses of computer in Biotechnology.

b) Explain features of workstations.

c) Write short note on Multiprocessing, multithreading operating system.

d) Explain text based searching with suitable examples.

e) What is router in networking? Explain its working.

f) Explain Medline and Pubmed.

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

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

b) What are the uses of search engines? Explain Google and Yahoo.

c) What is super computer? Explain it is useful in processing of big data?

Q5) Attempt the following : **[16]**

a) 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?

OR

Explain MS-Power Point with its uses.

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

OR

Write a note on MS-Excel. Explain functions provided in MS-Excel.