

[This question paper contains 4⁽¹³⁾ printed pages.]

Your Roll No.....^{16/5/19}

Sr. No. of Question Paper : 48 G

Unique Paper Code : 234461

Name of the Paper : CSPT-404 : Operating System

Name of the Course : B.Sc. (Phy. Sc.) / B.Sc. (Math. Sc.)

Semester : IV

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Question No. 1 is compulsory.
3. Attempt any **five** from remaining **seven** questions.
4. All parts of a question must be done together.

1. (a) Define Operating System. (1)
(b) Which scheduling policy is suitable for time sharing systems ? Also give reason. (2)
(c) List one main advantage of acyclic graph directory structure. (2)

P.T.O.

(d) Consider a logical address space of 32 pages of 1024 words each, mapped onto a physical memory of 16 frames.

(i) How many bits are there in the logical address ?

(ii) How many bits are there in the physical address ? (2)

(e) What are system calls ? Discuss any two system calls regarding to process management. (3)

(f) Explain bit vector method of free disk space management. (4)

(g) What is race condition and how does it occur ? (4)

(h) Define process. Explain various states of process execution. Also draw the diagram. (7)

2. Define the following : (10)

(a) System programs

(b) Page fault

(c) Convoy effect

(d) Virtual memory

(e) Context switch

3. (a) Distinguish among Long term, Medium term and Short-term scheduler. (6)

(b) Distinguish between internal and external fragmentation by taking suitable example. (4)

4. (a) Describe various scheduling criteria for comparing different CPU scheduling algorithms. (5)

(b) Consider the following page reference string :

1,2,3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6

Determine the number of page faults for the FIFO page replacement algorithm. Assume that there are four available frames and all of them are initially empty. (5)

5. Consider the following set of processes, with the length of the CPU burst time given in ms

Processes	Burst Time	Arrival Time
P1	12	1
P2	6	0
P3	3	2

- (i) Draw four Gantt charts illustrating the execution of these processes using FCFS, SJF (non-preemptive), and a RR (time quantum=1) scheduling. (1+1.5+1.5=4)
- (ii) Calculate average waiting time and average turnaround time for all above mentioned scheduling algorithms. (6)
6. (a) Explain how virtual memory is implemented using demand paging technique. (6)
- (b) Explain the following terms with respect to file :
- File open count
- Access rights (4)
7. (a) Why the page size is always the power of 2 in paging memory allocation scheme? Give reason. Also explain with the help of a suitable example. (5)
- (b) What is multithreaded programming? What are its benefits? (5)
8. (a) List various methods of allocating disk space. Explain linked allocation scheme in detail. (5)
- (b) Explain microkernel approach to Operating System design. (5)

(4)
[This question paper contains 6 printed pages.]

04/6/17
Your Roll No.....

Sr. No. of Question Paper : 49 G

Unique Paper Code : 235466

Name of the Paper : MAPT-404 : Differential Equations
(Mathematics-IV)

Name of the Course : **B.Sc. (H) Comp. Sc./B.Sc.
(Appl. Phy. Sc.) Analytical
Chemistry/Industrial Chemistry/
B.Sc. Mathematical Science/
B.Sc. Physical Science**

Semester : IV/VI

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **two** parts from each question.
3. **All** questions are compulsory.
4. Marks are indicated against each question.

UNIT - 1

1. (a) Solve the initial value problem

$$(2x \cos y + 3x^2 y) dx + (x^3 - x^2 \sin y - y) dy = 0, \quad y(0) = 2. \quad (6\frac{1}{2})$$

- (b) Solve

$$(3x^2 y^4 + 2xy) dx + (2x^3 y^3 - x^2) dy = 0. \quad (6\frac{1}{2})$$

- (c) Solve

$$x^2(y - px) = yp^2 \quad (6\frac{1}{2})$$

2. (a) Solve

$$\frac{d^3 y}{dx^3} - 7 \frac{dy}{dx} - 6y = e^{2x}(1+x). \quad (6\frac{1}{2})$$

- (b) Solve

$$x^2 \frac{d^2 y}{dx^2} - 4x \frac{dy}{dx} + 4y = 4x^2 - 6x^3. \quad (6\frac{1}{2})$$

- (c) Consider the differential equation

$$x^2 \frac{d^2 y}{dx^2} - 2x \frac{dy}{dx} + 2y = 0.$$

- (i) Show that x and x^2 are linearly independent solutions of this equation in the interval $0 < x < \infty$.

- (ii) Write the general solution of the given equation.

- (iii) Find the solution that satisfies the conditions $y(1) = 3$, $y'(1) = 2$. Is this solution unique? Justify. (6\frac{1}{2})

3. (a) Use the method of variation of parameters to find the general solution of

$$(x+1)^2 \frac{d^2 y}{dx^2} - 2(x+1) \frac{dy}{dx} + 2y = 1$$

given that $y = x + 1$ and $y = (x + 1)^2$ are linearly independent solutions of the corresponding homogeneous equation. (6\frac{1}{2})

- (b) Given that $y = x$ is a solution of

$$(x^2 - 1) \frac{d^2 y}{dx^2} - 2x \frac{dy}{dx} + 2y = 0$$

find a linearly independent solution of the above equation by reducing its order. Write also the General solution. (6\frac{1}{2})

- (c) A large tank initially contains 50 gal of brine in which there is dissolved 10 lb of salt. Brine containing 2 lb of dissolved salt per gallon, flows into the tank at the rate of 5 gal/min. The mixture is kept uniform by stirring, and the stirred mixture simultaneously flows out at a slower rate of 3 gal/min. How much salt is there in the tank at any time $t > 0$? (6½)

4. (a) Solve

$$\frac{d^2x}{dt^2} - \frac{dy}{dt} = e^t$$

$$\frac{dx}{dt} + \frac{dy}{dt} - 4x - y = 2e^t \quad (6\frac{1}{2})$$

(b) Solve

$$\frac{dx}{x^2(y^3 - z^3)} = \frac{dy}{y^2(z^3 - x^3)} = \frac{dz}{z^2(x^3 - y^3)} \quad (6\frac{1}{2})$$

(c) Solve

$$(y+z)dx + (z+x)dy + (x+y)dz + 0. \quad (6\frac{1}{2})$$

UNIT - II

5. (a) Obtain the partial differential equation by eliminating the arbitrary function ϕ from the relation

$$z = \phi\left(\frac{xy}{z}\right) \quad (5\frac{1}{2})$$

- (b) Find the general solution of the differential equation

$$2y(z-3)p + (2x-z)q = y(2x-3) \quad (5\frac{1}{2})$$

- (c) Find the complete integral of the equation

$$p^2q^2 + x^2y^2 = x^2q^2(x^2 + y^2). \quad (5\frac{1}{2})$$

6. (a) Find the complete integral of the equation

$$(p^2 + q^2)y = qz \quad (6)$$

- (b) Show that the first order partial differential equations

$$p = P(x, y), \quad q = Q(x, y)$$

are compatible if

$$\frac{\partial P}{\partial y} = \frac{\partial Q}{\partial x} \quad (6)$$

(c) Reduce the equation

$$r + 2s + t = 0$$

to canonical form.

6

5

[This question paper contains 4 printed pages.]

09/5/17

Your Roll No.....

Sr. No. of Question Paper : 121

G

Unique Paper Code : 223451

Name of the Paper : Molecular Biology (LSPT 407)

Name of the Course : **B.Sc. (Prog.) Life Science**

Semester : IV

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Answer **five** questions in all, including Q. No. 1 which is compulsory.
3. Illustrate your answers with appropriate diagrams wherever necessary.

1. (a) Expand the following terms :

(5)

(i) ORC

(ii) UTR

(iii) f-met

(iv) ESC

(v) RBS

(b) Define :

(i) Chaperons

(ii) Plasmid

(iii) Polyribosome

(iv) Central Dogma

(v) Autophagy

(vi) Charged tRNA

(c) Write the major contribution of following scientists : (5)

(i) Meselson and Stahl

(ii) Francis Crick

(iii) Rosalind Franklin

(iv) E. Chargaff

(v) Roberts and Sharp

(d) Differentiate between :

(i) B DNA and Z DNA

(6)

(6)

(ii) Prokaryotic and Eukaryotic Ribosomes

(iii) Purines and Pyrimidines

(iv) Hereditary and Sporadic Cancer

(e) State true or false giving reasons (Attempt **any five**) :

(5)

(i) Metastasis is associated with benign tumours.

(ii) Okazaki fragments are formed on 5' → 3' DNA strand.

(iii) Anticodons are located on rRNA.

(iv) Transcription and translation are the coupled processes in prokaryotes.

(v) Telomere shortening helps to promote cancer.

(vi) snRNPs are part of spliceosome involved in cutting/removal of introns.

2. (a) Define and differentiate between inducible and repressible operons with examples. (6)

(b) Explain the working of tryptophan operon in prokaryotes. (6)

3. (a) Explain how structural organization of DNA influences the gene transcription in eukaryotes. (6)

- (b) Discuss post-transcriptional changes during conversion of pre mRNA into functionally mature mRNA in eukaryotes. (6)
4. (a) Discuss double helical model of DNA proposed by Watson and Crick. (6)
- (b) Explain rolling circle model of replication. (6)
5. (a) Explain clover leaf model of tRNA molecule. (6)
- (b) Discuss briefly various types of carcinogens. (6)
6. (a) Differentiate between prokaryotic and eukaryotic translation. (8)
- (b) Describe the role of mitochondria in the process of apoptosis. (4)
7. Write short notes on any **THREE** :
- (i) Oncogenes
 - (ii) RNA Polymerases
 - (iii) Genetic code
 - (iv) Bacterial transformation
 - (v) Nucleosome (4+4+4)

6

[This question paper contains 6 printed pages.]

09/5/17

Your Roll No.....



Sr. No. of Question Paper : 122

G

Unique Paper Code : 222463

Name of the Paper : Physics – IV : Electricity, Magnetism and Electromagnetic Theory (PHPT-404)

Name of the Course : B.Sc. (Physical Science)

Semester : IV

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **Five** questions in all.
3. Question No. **1** is compulsory. Attempt **four** questions from the rest of the paper.
4. Use of non-programmable scientific calculator is allowed.

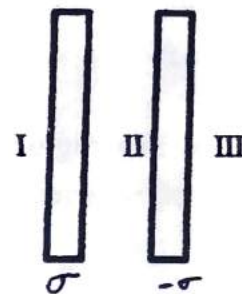
1. Attempt any **five** of the following : (5×3=15)

(a) What is Lenz's law ?

P.T.O.

- (b) When does magnetic forces do no work on a moving point charge ?
- (c) How Maxwell modified Ampere's Law ?
- (d) What is the difference between circular and elliptical polarisation ?
- (e) Why do the electric field lines never cross ? Explain.
- (f) For the electrostatic potential $V = \frac{1}{r} + 2$ determine whether \vec{E} is rotational or irrotational.
- (g) What is the critical damping resistance in a ballistic Galvanometer ?
- (h) A magnetic vector potential \vec{A} is given by $3x^3 \hat{i} + yz \hat{j}$. Obtain \vec{B} , the magnetic field at the point (1,3,5).
2. (a) State and prove Gauss's theorem of electrostatics for a spherical surface. (6)
- (b) Find the electric field inside a sphere which carries a charge density proportional to the distance from the origin given by $\rho = k r$, for some constant k . (5)

- (c) Two infinite parallel planes carry equal but opposite uniform charge densities $\pm \sigma$. Find the electric field in the three regions shown. (4)



3. (a) A thin spherical shell of radius R carries a uniform charge density. Find the expression of electric field at a point lying inside and outside this spherical shell. Use these values to calculate the electric potential at an arbitrary point inside and outside the shell. (7+3)
- (b) Find the electric-energy associated with an electric field for a uniformly charged solid sphere of total charge Q and radius R . (5)
4. (a) State the Biot Savart Law. Using the Biot Savart Law find the magnetic field at a distance a due to long straight wire carrying a current I along the positive y -axis. (7)

(b) A circular loop of radius $r = 2$ cm carries a steady current, $I = 16$ A in anti-clockwise direction. What magnetic field will be observed at the center of this loop. (5)

(c) The magnetic field in a region is given by $\vec{B} = 3\hat{i} + 4\hat{k}$ Tesla. Calculate the magnetic flux across the surfaces each of area 2m^2 in

(i) $x - y$ plane

(ii) $y - z$ plane

(iii) $z - x$ plane. (3)

5. (a) List the various torques that act on the coil of a moving coil galvanometer. Using them write the equation of motion of the coil. Under what conditions does it show 'ballistic' behaviour. (2+2+3 = 7)

(b) Using Ampere's Circuital Law find the magnetic field (i) inside and (ii) outside a very long solenoid, consisting of n closely wound turns per unit length on a cylinder of radius R and carrying a current I . (5)

(c) The first and the eleventh throw of a ballistic galvanometer are 20 cm and 16 cm respectively. Calculate the value of the logarithmic decrement. (3)

6. (a) Define self inductance. Does it have dependence on the geometry of the circuit? Find the self inductance of a solenoid of radius R and n number of turns per unit length. (7)

(b) Prove that $\text{curl } \vec{E} = -\frac{\partial \vec{B}}{\partial t}$. (5)

(c) A 50 mH coil carries a current of 2A. Find the energy stored in the magnetic field. (3)

7. (a) Obtain the wave equation for electric and magnetic field vectors in free space and show that electromagnetic waves are transverse in nature. (7)

(b) Write Maxwell's equations for electromagnetic field in integral form and explain their physical meaning. (8)

8. (a) Derive the boundary conditions for the \vec{D} , \vec{B} , \vec{E} and \vec{H} fields using Maxwell's equations at the interface between two dielectrics. (8)

(b) Deduce Brewster's law on the basis of Fresnel's equations and explain the concept of polarisation by reflection. (7)

Physical Constants

$$\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{Nm}^2$$

$$\mu_0 = 4\pi \times 10^{-7} \text{ Wb/Am}$$

$$c = 3 \times 10^8 \text{ m/s}$$

$$e = 1.6 \times 10^{-19} \text{ C}$$

7

[This question paper contains 4 printed pages.]

09/5/17
Your Roll No.....

Sr. No. of Question Paper : 123

G

Unique Paper Code : 222465

Name of the Paper : Waves and Optics (PHPT-303)

Name of the Course : **B.Sc. (Prog.)**

Semester : IV

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **five** questions.
3. **All** questions carry equal marks.

1. (a) Define Lissajous Figures. (3)
(b) Trace graphically the form of the Lissajous Figure traced out by a particle subjected to two perpendicular simple harmonic motions of unequal amplitudes, frequencies in the ratio 1:2 and phases differing by (i) 0 and (ii) $\pi/4$. (12)

P.T.O.

2. (a) Establish the equation of motion of a damped harmonic oscillator. If the damping is less than critical damping condition, show that the motion of the system is oscillatory with its amplitude decaying exponentially with time. (9)
- (b) Define and write an expression for logarithmic decrement, relaxation time and quality factor of weakly damped oscillator. (6)
3. (a) What are normal coordinates and normal modes? Explain their significance. (5)
- (b) Find the normal mode frequencies and normal mode shapes of the following system executing longitudinal vibrations. (10)



4. (a) Using the principle of superposition, derive the expression for standing waves formed in a string of length L bounded at the two ends. Also write the expression for normal mode frequencies of the modes and draw the shapes of first two normal modes. (12)
- (b) What are stationary waves? Why are they called so? (3)

5. (a) Explain the formation of Newton's rings and derive an expression for the diameter of dark rings formed by reflected light. (10)
- (b) In a Newton's ring experiment, the diameter of the 10th ring changes from 1.40 cm to 1.27 cm when a liquid is introduced between the lens and the plate. Calculate the refractive index of the liquid. (5)
6. (a) Discuss the intensity distribution of Fraunhofer diffraction pattern obtained with a narrow slit illuminated by a parallel beam of monochromatic light. (10)
- (b) Light of wavelength 6000\AA is incident on a slit of width 0.30 mm. The screen is placed at a distance of 2 m from the slit. Find the distance between the first minima and the central maximum. (5)
7. (a) Explain the construction and working of a zone plate. Derive an expression for the focal length of zone plate. Explain how it acts as a converging lens having multiple foci. (12)
- (b) What are the similarities and dissimilarities between a zone plate and a converging lens? (3)

8. (a) Explain Rayleigh's criterion of resolution. (5)
- (b) Derive an expression for resolving power of a grating. (5)
- (c) What is double refraction and how is it used to obtain polarised light ? (5)

[This question paper contains 6 printed pages.]

11/5/17
Your Roll No.....

Sr. No. of Question Paper : 125

Unique Paper Code : 216251

Name of the Paper : Biology – 11 (LSPT–202)

Name of the Course : B.Sc. (Prog.) / B.Sc. (Hons.)

Semester : II / IV

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **Five** questions including the Question No. 1 which is compulsory.

1. (a) Expand the following (any **five**) : (1×5=5)

(i) GERL

(ii) SEM

(iii) Cp DNA

(iv) SER

P.T.O.

(v) ATP

(vi) tRNA

(b) Fill in the blanks (any five) : (1×5=5)

(i) 70 S ribosomes are found in cell.

(ii) The organelle, which is known as the power house of a cell is

(iii) The name 'cell' was given by

(iv) The distinct region in the prokaryotes containing the genetic material is

(v) Thylakoids are presents in the cell organelle known as

(vi) Mitotic spindle is made up of protein.

(vii) are cytoplasmic channels or bridges that connect adjacent plant cells.

(c) Describe the contribution of the following (any five) : (1×5=5)

(i) Matithias Schleiden and Theodor Schwann

(ii) Benda

(iii) Singer and Nicolson

(iv) Robert Brown

(v) Camillo Golgi

(vi) Christian de Duve

2. Answer any three from the following : (5×3=15)

(a) Write short note on x-ray diffraction techniques.

(b) Write down the functions of mitochondria and chloroplast.

(c) Give an account on the polymorphic forms of lysosome.

(d) Write a short note on phase contrast microscopy

3. Differentiate between the following (any five) : (3×5=15)

(a) Euchromatin and Heterochromatin

(b) Prokaryotic cell and Eukaryotic cell

(c) Active transport and passive transport

(d) SEM and TEM

(e) Primary and secondary Cell wall

(f) Primary and secondary lysosome

(g) Centromere and kinetochore

4. Write short notes on any **three** : (5×3=15)

(a) Cell cycle check points

(b) Fluid mosaic model

(c) N-linked glycosylation

(d) Chloroplast DNA

5. Draw well labeled diagram (any **three**) : (5×3=15)

(a) Mitochondria

(b) Stages of mitosis

(c) Chloroplast

(d) Golgi Bodies

(e) Nuclear pore complex

6. Answer the following : (3×5=15)

(a) What is vesicle-mediated transport and how does endocytosis differ from exocytosis ?

(b) What is meant by the cell theory and what is the significance of this theory for biology ?

(c) What three features of plant cell distinguish them from animal cell ?

(d) Why are mitochondria and chloroplast known as semiautonomous organelles ?

(e) Write down the functions of plant cell wall.

7. (a) What is the endosymbiotic hypothesis regarding the origin of mitochondria ? What molecular facts support this hypothesis ? To which other cellular organelles can the hypothesis also be applied ? (5)

(b) What are marker enzymes ? Give two examples. (3)

- (c) Write down the function of peroxisomes and glyoxisomes in animals and plants. (3)
- (d) What are the factors effecting fluidity of the cell membrane? (4)

09

Roll No.

11/5/17

Sl. No of Question Paper: 126

Unique Paper Code: 107465

Name of the Paper: EL 310(vi) Intellectual Property Rights(IPR)

Name of the Course: B. Sc. (Programme)

Semester: IV

G

Time : 3 hours

Maximum Marks 75



Instructions: Attempt five questions in all. All questions carry equal marks.

1. What are the different types of Intellectual property under the TRIPs agreement. Explain the role of judiciary and other legal agencies like customs in enforcement of Intellectual property rights.
2. What is a trademark, certification mark and collective mark. Give examples. Explain the procedure for obtaining a trade mark.
3. Explain the importance of patent system. What are the benefits of international registration under Patent Cooperation Treaty (PCT). How would you balance the grant of pharmaceutical patents and the public health issues. What are the flexibilities provided by TRIPs agreement in this regard.
4. Write a note on the following:
 - (i) IP rights of Plant Breeders
 - (ii) IPR and Biological Diversity
5. What is a design. What designs are prohibited from registration and what is the procedure for registration of design.
6. Explain the term 'Geographical Indication'. What is the procedure for registering a geographical indication. Explain its importance and how its illegal exploitation can be prevented.
7. Discuss the objectives of Copyright law. What are the works in which copyright subsist. Explain giving examples. How does the copyright law maintains a balance between exclusive rights of owners and the rights of users. Discuss with special emphasis on free uses for educational purposes and the rights of owners associated with it.
8. Write short notes on any two:
 - a) Layout designs and Integrated circuits
 - b) Software patents
 - c) Trade Secrets

70

[This question paper contains 4 printed pages.]

2017
Your Roll No.....

Sr. No. of Question Paper : 128

G

Unique Paper Code : 216453

Name of the Paper : LSPT-408 Biodiversity III – Plants

Name of the Course : B.Sc. (Prog.)

Semester : IV

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **five** questions in all.
3. Q. No. 1 is compulsory.
4. Attempt all parts of a question together.
5. Draw well labelled diagrams wherever necessary.

1. (a) Define (**any five**) :

(5×1=5)

(i) Ligule

(ii) Protonema

(iii) Siliqua

P.T.O.

- (iv) Transfusion tissue
- (v) Epipetalous
- (vi) Coenosorus
- (vii) Collenchyma

(b) Match the following :

(5×1=5)

Column A

- (i) *Funaria*
- (ii) Resin canal
- (iii) Caryopsis
- (iv) Horse tail
- (v) Capitulum

Column B

- Poaceae
- Multicellular rhizoids
- Pinus*
- Sunflower
- Equisetum*

(c) Write the botanical name and family (**any five**) :

(5×1=5)

- (i) Black pepper
- (ii) Wheat
- (iii) Gram
- (iv) Tea
- (v) Cotton
- (vi) Teak
- (vii) Rauwolfia

2. Draw labelled diagrams (**any three**) : (3×5=15)

- (i) L.S. sporophyte of *Funaria*
- (ii) T.S. stem of *Selaginella*
- (iii) T.S. coralloid root of *Cycas*
- (iv) C.S. mericarp of Fennel
- (v) T.S. Monocot stem

3. Differentiate between (**any three**) : (3×5=15)

- (i) Natural and Phylogenetic system of classification
- (ii) Apogamy and Aposory
- (iii) Manoxylic and Pycnoxylic wood
- (iv) Rhizoids of liverworts and mosses
- (v) Cotton fibre and Jute fibre
- (vi) Monocot and Dicot root

4. Write short notes (**any three**) : (3×5=15)

- (i) Stelar evolution
- (ii) Adaptations of bryophytes to land habit
- (iii) Polyembryony in *Pinus*
- (iv) Economic importance of Rice
- (v) Sclerenchyma
- (vi) Floral characters of Solanaceae and Brassicaceae

5. (a) Discuss the significance of heterospory with special reference to *Selaginella*. (5)
- (b) With the help of suitable diagram(s) explain archegoniophore of *Marchantia*. (5)
- (c) Expand the following : (5×1=5)
- (i) Linn.
 - (ii) Hook.f.
 - (iii) D.C.
 - (iv) APG
 - (v) ICN
6. (a) *Equisetum* shows xerophytic and hydrophytic characters. Discuss. (5)
- (b) *Cycas* is a living fossil. Discuss. (5)
- (c) Discuss merits and demerits of Bentham and Hooker's system of classification. (5)
7. (a) Discuss the centres of origin as given by Vavilov. (5)
- (b) With the help of suitable diagram(s) explain the structure of female cone of *Pinus*. (5)
- (c) Explain the methods of asexual reproduction in *Funaria*. (5)

[This question paper contains 6 printed pages.]

2017
Your Roll No.....

Sr. No. of Question Paper : 130

G

Unique Paper Code : 107455

Name of the Paper : Bioinformatics (LSPT-409)

Name of the Course : B.Sc. Life Science

Semester : IV

Duration : 3 Hours

Maximum Marks : 75



Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Answer Section A and section B on separate sheet.
3. Attempt all the parts of the questions together.
4. Each section is for 37.5 marks.

Section A

Attempt three questions in all, including Question No. 1 which is compulsory.

1. (a) Expand the following term : (0.5×7=3.5)

(i) DDBJ

P.T.O.

- (ii) Pfam
- (iii) GIB
- (iv) PIR
- (v) Uniprot
- (vi) TrEMBL
- (vii) PDB

(b) Fill in the blanks (**any four**) (1×4=4)

- (i) Bioinformatics centre is present in _____ .
- (ii) _____ was the first protein to be sequenced.
- (iii) Atlas of protein sequences and structure, 1965 was written by _____ .
- (iv) The first genome of a free living organism was published of _____ in 1995.

2. Write short notes on : (**any three**) (5×3=15)

- (i) Genomics
- (ii) FASTA

- (iii) GenBank
- (iv) PubChem
- (v) BLink

3. (a) What is BLAST and Discuss about the various Specialized Tools ? (7.5)

(b) Define Biological databases and explain their Features. (7.5)

4. (a) Differentiate between (**any two**) (3×2=6)

- (i) Primary database and secondary database
- (ii) Enterz and SRS
- (iii) Unigene and Homologene

(b) Define LIBRA and discuss its function. (6)

(c) Explain the resources of PIR. (3)

Section B

Attempt **three** questions in all including Question No. 1, which is compulsory.

1. (a) Expand the following (**any five**): (5×1=5)

- (i) MSA
- (ii) ORF
- (iii) PAUP
- (iv) DPA
- (v) QSAR
- (vi) CINEMA

(b) Differentiate between **any two** of the following: (2×2=4)

- (i) Local and Global Sequence Alignment
- (ii) Orthologous and Paralogous sequences
- (iii) Rooted and Unrooted phylogenetic tree

(c) Define **any three** of the following: (3×1.5=4.5)

- (i) Optimal alignment

(ii) Unitary matrix

(iii) Domain

(iv) Transcriptomics

2. (a) What do you understand by Scoring Matrix?

(b) How does PAM differ from BLOSUM matrix?

(c) Find out the best alignment score for the given two sequence alignments based on similarity (S) and Distance (D) methods, provided that the gap penalty for 1nt (or wk1) = 2 and 2nt (or wk2) = 6:

(i) ATCAGACGA_TTG

ATC_GA_GACT_G

(ii) ATCAGACGATTG

ATCAGACGAT__

(1+2+9)

3. (a) Describe various features of a phylogenetic tree.

(b) Describe NJ method of constructing phylogenetic tree with a suitable example.

(c) Discuss the advantages of NJ method over UPGMA method of constructing phylogenetic tree. (2+7+3)

4. (a) Discuss the bioinformatics analysis of microbial genome.
- (b) How the QSAR techniques involve in drug designing process ? (6+6)
5. Write short notes on **any two** of the followings : (6+6)
- (a) CLUSTAL W
- (b) Molecular Docking
- (c) PHYLIP

This question paper contains 4 printed pages]

Roll No.

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S. No. of Question Paper : 133

Unique Paper Code : 217463

G

Name of the Paper : **Industrial Chemistry-IV (ICPT-404) :**
Pharmaceuticals, Fermentation,
Pesticides & Perfumes

Name of the Course : **B.Sc. (Prog.) Applied Physical**
Sciences

Semester : **IV**

Duration : **3 Hours**

Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *six* questions in all.

Question No. **I** is compulsory.

1. Attempt any *five* of the following :

5×3

(a) Differentiate between broad spectrum and narrow spectrum antibiotics.

(b) Give the production of chloramphenicol.

P.T.O.

- (c) Differentiate between bacteriostatic and bactericidal action.
- (d) What are suntan lotions ? Write its main composition.
- (e) Discuss the production of ethyl alcohol by fermentation.
- (f) Give the uses of Geraniol and Civetone.
2. (a) What are oxidation dyes/permanent hair dyes ? Enlist the ingredients used in preparing these. Give *one* such formulation. 1,1,2,2
- (b) Give the formulations of any *three* of the following : 3×2
- (i) Lipstick
- (ii) Shaving Cream
- (iii) Nail Enamel
- (iv) Talcum Powder.
3. (a) Differentiate between aerobic and anaerobic fermentation. 3
- (b) Write a short note on synthetic penicillin. 3
- (c) Name an organochlorine pesticide and give its synthesis. 1,2

- (d) Give the industrial (fermentation) production of citric acid. 3
4. (a) What are anti-inflammatory agents ? How is paracetamol synthesized ? 1,2
- (b) Classify any *three* of the following drugs & give their uses : 3×3
- (i) Ibuprofen
- (ii) Phenobarbital
- (iii) AZI-Zidovudine
- (iv) Sulphanethoxazol.
5. (a) Give the synthesis and uses of any *two* of the following : 2×3
- (i) Parathion
- (ii) Carbaryl
- (iii) Butachlor.
- (b) Write notes on any *two* of the following : 2×3
- (i) Eugenol
- (ii) Jasmone
- (iii) Civetone.

6. Write short notes on any *four* of the following : 4×3
- (a) Antiperspirants
 - (b) Merits and Demerits of Pesticides' use
 - (c) Streptomycin
 - (d) Antiviral agents
 - (e) Talcum powder.
7. (a) What do you understand by the structure activity relationship in case of pesticides ? 3
- (b) Explain the concept of Retrosynthetic approach for drug development. 3
- (c) Give the fermentation process for vitamin C production. 3
- (d) What are artificial flavoring agents ? Explain with *one* example. 3
8. (a) Give the uses of glyceryl trinitrate. 2
- (b) Give the fermentation process for the synthesis of Lysine. 3
- (c) Which conformer of BHC makes Gammexane ? Write main health hazards associated with it. 1.3
- (d) What is the difference between vanishing and cold cream (composition and uses) ? 3

(13)

[This question paper contains 6 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 135

Unique Paper Code : 217461

Name of the Paper : Chemistry of s- and p-block Elements,
States of Matter and Phase Equilibrium

Name of the Course : B.Sc. (Prog.)

Semester : IV

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Use separate answer sheets for Sections A and B.

SECTION – A
(Inorganic Chemistry)

Attempt any three questions.
Question No. 1 is compulsory.

Marks: 37½

1. (a) Why is carbon used as the most common reducing agent ?
What are the drawbacks of using carbon as a reducing agent ?
(4)

P.T.O.

- (b) What do you know about 3 centre-2 electron bond ? Explain with examples. (4)
- (c) Define Electronegativity and explain Pauling's scale of electronegativity. (4)
- (d) H_3PO_3 is a dibasic acid in nature. Explain by giving its structure. (1½)
2. (a) Carbon monoxide is an excellent reducing agent below 983K, but above this temperature, the reverse is true. Explain. (4)
- (b) What is the van Arkel and de Boer's process for the preparation of pure zirconium ? What are its limitations ? (4)
- (c) Describe any **two** of the following : (4)
- (i) Mond's Process
- (ii) Kroll's Process
- (iii) Electrolytic Refining.
3. (a) What is inert pair effect ? PbCl_4 is a strong oxidising agent. Explain. (4)

- (b) Discuss the different allotropic forms of Phosphorus. (4)
- (c) Explain the followings : (4)
- (i) Oxygen exists as O_2 while Sulphur exists as S_8 molecule ?
- (ii) Diagonal relationship amongst certain elements.
4. (a) What do you understand by covalent hydrides ? Give methods of the preparation of LiAlH_4 and NaBH_4 . (4)
- (b) Write the formulas of Marshall and Caro's acid and draw their structures. (4)
- (c) Write methods of preparation of hydrazine. How does it react with following ?
- (i) AgNO_3
- (ii) HNO_2 (4)

SECTION -B
(Physical Chemistry)

Use of scientific calculator is allowed.

*Attempt **three** questions in all.*

Question No. 1 is compulsory.

$$R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1} \quad k = 1.38 \times 10^{-23} \text{ J K}^{-1} \quad N_A = 6.023 \times 10^{23}$$

Marks: 37½

1. (a) Roughly sketch the Maxwell distribution curve for the gas molecules in terms of molecular speeds. Label both axes and explain the effect of temperature on the distribution curve. (3)
- (b) What are Miller indices? Calculate miller indices for planes having Weiss indices : (a) 2a, 3b, c (b) 2a, -3b, -3c (3)
- (c) Explain the dependence of surface tension on temperature and why the surface tension of a liquid becomes zero at its critical temperature. (3)
- (d) Differentiate between order and molecularity of a reaction giving examples. (3)
- (e) Why the crystals of NaCl appear yellow in colour on heating in sodium vapour? (1½)

2. (a) Describe the reasons for deviation of gases from ideal behaviour. Derive van der Waals equation of state for a real gas. (4)
- (b) Calculate the collision number, Z_1 and mean free path, λ of oxygen gas at 1 atm pressure and 27°C. The collision cross-section is 0.27 (nm)^2 . (4)
- (c) What do you understand by the term viscosity? What are its units? Describe the Ostwald viscometer method for the measurement of viscosity of a liquid giving expression. (4)
3. (a) Derive expression for Bragg's Law sketching labeled diagram and explain the significance of n in the equation. (4)
- (b) The density of Li metal is 0.53 g cm^{-3} and the separation of (100) planes is 350 pm. Determine whether the lattice is f.c.c. or b.c.c. $M(\text{Li}) = 6.941 \text{ g mol}^{-1}$. (4)
- (c) Explain the concept of activation energy of reaction. Derive expression for its calculation from Arrhenius equation. (4)
4. (a) Derive expressions to determine order of reaction using half-life method and van't Hoff differential method. (4)

(b) The rate constant for a second order reaction is $5.7 \times 10^{-5} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$ at 25°C and $1.64 \times 10^{-4} \text{ dm}^3 \text{ mol}^{-1} \text{ s}^{-1}$ at 40°C . Calculate the activation energy of the reaction. (4)

(c) Write short note on any **two** of the following :

- (i) Effect of temperature on viscosity of a liquid using Arrhenius concept
- (ii) Frankel and Schottky defect in crystals
- (iii) Postulates of kinetic theory of gases (2,2)

(74)

This question paper contains 4 printed pages.

Your Roll No. 09/5/17.....

Sl. No. of Ques. Paper : 2941

GC-4

Unique Paper Code : 42344403

Name of Paper : Computer System Architecture

Name of Course : B.Sc. (Prog.) (Math. Sciences)

Semester : IV

Duration : 3 hours

Maximum Marks : 75



*(Write your Roll No. on the top immediately
on receipt of this question paper.)*

**Question No. 1 is compulsory. Attempt five questions
out of Q. Nos. 2 to 8. Parts of a question
must be answered together.**

1. (a) What is a flip-flop? Give the drawback of SR Flip-Flop and explain how it is removed in JK Flip-Flop. 1+1+2=4
- (b) Draw the logic diagram and truth table of a 2-to-4 line decoder using only NAND gates with an enable input. 2+2=4
- (c) Perform the following arithmetic operation using signed 2's complement notation for negative numbers. Use 8 bits to accommodate each number together with its sign.
$$(-36) + (-18)$$
 3
- (d) Show the block diagram of the hardware that implements the following register transfer statement:

P.T.O.

P: R2 ← R1 2

- (e) Give two differences between hardwired control and microprogrammed control processors organization. 3
- (f) Explain any *two* addressing modes with the help of suitable examples. 2+2=4
- (g) Differentiate between isolated and memory mapped I/O. 2
- (h) Draw instruction format for a 16 bit instruction that uses 11 bits for address, 3 bits for op code and two bits to specify the addressing mode. 3
2. (a) Simplify the Boolean function F together with don't care conditions d in sum-of-product form using K-Map:

$$F(A, B, C, D) = \Sigma(1, 2, 3, 7, 8, 10)$$

$$d(A, B, C, D) = \Sigma(5, 6, 11, 15)$$
 6
- (b) Given the following Boolean function:

$$F = XY'Z + X'Y'Z + XYZ$$
- (i) Simplify F using Boolean algebra.
- (ii) Draw the logic diagram of the simplified Boolean expression. 2+2=4
3. (a) Explain the working of 4×1 line multiplexer with the help of a logic diagram and function table. 5
- (b) Memory unit is specified by the number of words times the number of bits per word. In 4G×64 memory unit:
- (i)

What are the number of address lines and input-output data lines?

- (ii) What is the number of bytes that can be stored in the memory? 2+1=3
- (c) How many flip-flops will be complemented in a 10-bit binary counter to reach the next count after 0011111111? 2
4. (a) Represent decimal number $(687.25)_{10}$ in Binary and then convert from Binary to Hexadecimal and Octal number systems. 2×3=6
- (b) Represent the number $(+46.5)_{10}$ as a floating point binary number with 24 bits. The normalized fraction mantissa has 16 bits and the exponent has 8 bits. 4
5. (a) Register A holds the 8-bit binary 11011001. Determine the B operand and the logic micro-operation to be performed in order to change the value in A to 11111101. 5
- (b) Explain and design a 4-bit adder-subtractor circuit. 5
6. (a) Define instruction cycle. Describe the sequence of micro-operations of fetch and decode phases of a basic computer. 2+4=6
- (b) Describe the sequence of micro-operations of the following instructions in the basic computer:
- (i) ADD 2+2=4
- (ii) ISZ

7. (a) An instruction is stored at location 300 with its address field at location 305. The address field has the value 400. A processor register R1 contains the number 200. Evaluate the effective address if the addressing mode used is:

(i) Direct

(ii) Indirect

(iii) Relative

$$2 \times 3 = 6$$

(b) Evaluate the arithmetic statement:

$$X = (A * B) + (C - D)$$

Using three address instructions use the symbols ADD, SUB, MUL and DIV for the four arithmetic operations, MOV for the transfer-type operation, and LOAD and STORE for transfers to and from memory and AC register. Assume that memory operands are in memory addresses A, B, C and D and the result must be stored in memory at address X.

$$2 + 2 = 4$$

8. Write short notes on any *two* of the following:

(a) Daisy chain priority interrupt

(b) RISC and CISC

(c) CPU registers.

$$5 \times 2 = 10$$

(15)

This question paper contains 4 printed pages]

Roll No.

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2415/17

S. No. of Question Paper : 2943

Unique Paper Code : 42224412

GC-4

Name of the Paper : Waves and Optics

Name of the Course : B.Sc. (Prog.)

Semester : IV

Duration : 3 Hours

Maximum Marks : 75



(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt Five questions in all.

Question Number 1 is compulsory.

1. Attempt any five parts from the following :

(a) If two simple harmonic motions having angular frequencies 440 radian/sec and 396 radian/sec are superimposed, calculate the time period of beats and the number of beats produced.

(b) Explain the physical characteristics that determine quality, pitch and loudness of a musical sound.

P.T.O.

- (c) Distinguish between Fresnel and Fraunhofer class of diffraction.
- (d) Explain why the reverberation time is larger for an empty hall than for a crowded hall.
- (e) Give the statements of Huygen's principle of propagation of wave front.
- (f) Why do thin films appear coloured in white light ?
- (g) Why are Newton's rings circular ?
- (h) How is a zone plate different from a convex lens ? $5 \times 3 = 15$
2. (a) Trace graphically or analytically the motion of a particle which is subjected to two perpendicular simple harmonic motions of equal frequencies, different amplitudes and having a phase difference of :
- (i) $\alpha = 0$
- (ii) $\alpha = \pi/2$
- (b) Derive the expression for total energy contained in a simple harmonic motion. $10 + 5 = 15$

3. (a) Explain the formation of standing waves on a stretched string.
- (b) A string 50 cm long is stretched by a load 25 kg and has a mass of 1.44 gm. Find the frequency of the second harmonic. $10 + 5 = 15$
4. (a) What do you understand by electromagnetic waves ? Show that electromagnetic waves are transverse in nature.
- (b) If intensity is increased by a factor of 20, then how many decibel is the sound level increased ? $10 + 5 = 15$
5. (a) Show that in Young's double slit experiment, the fringe width is directly proportional to the wavelength of light.
- (b) In case of Newton's ring experiment, calculate the diameter of ninth bright ring having radius of curvature of plano convex lens 10 cm and wavelength of light $\lambda = 40 \text{ nm}$. $10 + 5 = 15$
6. (a) A zone plate has focal length of 50 cm at a wavelength of 6000 \AA . What will be its focal length at a wavelength of 5000 \AA ?
- (b) Explain with the help of diagram the intensity distribution due to Fresnel diffraction at a straight edge. $4 + 11 = 15$

7. (a) Give the necessary theory to derive expression for the intensity distribution pattern in a plane transmission grating.
- (b) A grating of width 2 inches is ruled with 15000 lines per inch. Find the smallest wavelength separation that can be resolved in second order at a mean wavelength of 5000 Å. 12,3
8. (a) Give the difference between Haidinger fringes and Fizeau fringes.
- (b) Explain how Michelson's interferometer can be used to determine the wavelength of monochromatic light ?
- (c) Prove that the diameters of dark Newton's rings are proportional to the square roots of natural numbers in reflected mode for normal incidence. 3,6,6

76

[This question paper contains 6 printed pages.]

19/5/17
Your Roll No.....

Sr. No. of Question Paper : 2944 GC-4

Unique Paper Code : 42234406

Name of the Paper : Genetics and Evolutionary Biology

Name of the Course : B.Sc. Life Sciences

Semester : IV

Duration : 3 Hours

Maximum Marks : 75



Instruction for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **both** the sections i.e. **Section A** and **B** on separate sheets.

SECTION A – GENETICS

*Attempt three questions including
Question No. 1 which is compulsory.*

1. (i) Define the following (any five) : (5)
 - (a) Pleiotropy
 - (b) Chiasmata
 - (c) Nullisomy

P.T.O.

- (d) Lethal alleles
- (e) Pseudodominance
- (f) Homogametic sex

(ii) Differentiate between the following (any three):

- (a) Back mutation and suppressor mutation
- (b) Incomplete dominance and co-dominance
- (c) Transition and transversion
- (d) Deamination and depurination

(6)

(iii) Name the syndromes in the following human karyotypes

- (a) 47, XXY
- (b) 47, +21
- (c) 46, 5p-
- (d) 45, XO
- (e) 47, +18
- (f) 47, +13

(3)

2. (a) Explain epistasis. Discuss the basis of deviation from Mendelian dihybrid ratio giving two examples. (2,3,3)
- (b) If a man of blood-group AB marries a woman of blood group B whose father was of blood group O, what are the expected blood groups of their children? (4)
3. (a) A test-cross in *Drosophila* between female F1 flies heterozygous at three loci on the third chromosome, cu/cu^+ (curled versus straight wings), e/e^+ (ebony versus gray bodies) and st/st^+ (scarlet versus red eyes) and completely homozygous recessive ($cu\ e\ st/cu\ e\ st$) male flies. The results obtained are as follows:

Genotype	Number of progeny
$cu\ e\ st^+/cu\ e\ st$	366
$cu^+ e^+ st/cu\ e\ st$	380
$cu\ e\ st/cu\ e\ st$	24
$cu^+ e^+ st^+/cu\ e\ st$	30
$cu^+ e\ st/cu\ e\ st$	89
$cu\ e^+ st^+/cu\ e\ st$	105
$cu\ e^+ st/cu\ e\ st$	2
$cu^+ e\ st^+/cu\ e\ st$	4

Based on the given data,

(i) Determine the order of genes. (2)

(ii) Draw a linkage map and calculate the map distance between the genes. (3)

(iii) Calculate the coefficient of coincidence and interference. (3)

(b) Discuss somatic cell genetics. (4)

4. Write short notes on **(any three)**: (4,4,4)

(a) Sex-linked inheritance

(b) Extra-chromosomal inheritance

(c) Polyploidy

(d) Dosage compensation

(e) Mutagens

SECTION B – EVOLUTIONARY BIOLOGY

Attempt three questions in all, including Question No. 1 which is compulsory.

1. (i) Define the following **(any four)**: (4)

(a) Pangenesis

(b) Index fossils

(c) Sibling species

(d) Missing link

(e) Phyletic evolution

(ii) Distinguish between : (6)

(a) Trace fossil and body fossil

(b) Hybrid sterility and hybrid breakdown

(c) Coacervates and microspheres

(iii) Mention the contribution of the following : (3)

(a) H.B.D. Kettlewell

(b) Ernst Mayr

(c) Karpechenko

2. (a) Describe the phylogeny of horse with suitable diagrams.

(b) "Incompleteness of fossil record does not disprove the theory of evolution." Justify. (8,4)

3. (a) Discuss the macro-evolutionary principles with examples.
- (b) Discuss the role of organic variation in evolution.
- (6,6)
4. Write short notes on **any three** of the following :
- (a) Neo-Darwinism
- (b) Artificial selection
- (c) Role of extinction in evolution
- (d) Pre-mating isolating mechanisms
- (e) Endosymbiotic theory
- (4,4,4)

(17)



[This question paper contains 4 printed pages]

Your Roll No. :

Sl. No. of Q. Paper : **2945** **GC-4**

Unique Paper Code : 42164401

Name of the Course : **B.Sc. Life Sciences**

Name of the Paper : Plant Physiology and
Metabolism

Semester : IV

Time : 3 Hours **Maximum Marks : 75**

Instructions for Candidates :

- (a) Write your Roll No. on the top immediately on receipt of this question paper.
- (b) Attempt **five** questions in **all**.
- (c) Including Question No. **1** which is compulsory.
- (d) Draw well-labelled diagrams wherever necessary.

- 1.** (a) Name any **five** of the following (1×5=5)
- (i) Channels for transport of water across membranes.
 - (ii) The stress hormone in plants.
 - (iii) The site of dark reactions during photosynthesis.

P.T.O.

- (iv) A calcium-binding regulatory protein.
- (v) The most abundant sugar transported in the phloem.
- (vi) The non-protein part of an enzyme.

(b) Define/explain any **five** of the following :
(1×5=5)

- (i) Chlorosis
- (ii) K_m
- (iii) Symplast
- (iv) Apical dominance
- (v) RQ
- (vi) Florigen

(c) Write **True** or **False** against the following.
Attempt any **five**. (1×5=5)

- (i) Transpiration is a necessary evil.
- (ii) N, P, and K are macronutrients.
- (iii) Water potential and solute potential mean the same.
- (iv) Auxins bring about cell elongation.
- (v) Antocyanin is a photosynthetic pigment.
- (vi) Allosteric site is another name for active site.

2. Write short notes on any **three** of the following :
(5×3=15)

- (a) Aeroponics
- (b) Aphid stylet technique
- (c) Vernalization
- (iv) Lon theory of stomatal movements

3. Differentiate between the following. Attempt any **three**.
(5×3=15)

- (a) Transpiration and guttation
- (b) Competitive and non-Competitive inhibition of enzymes
- (c) Passive and active transport
- (d) Anaerobic and aerobic respiration

4. Attempt any **three** of the following :
(5×3=15)

- (a) What is meant by water potential ? Explain the components of water potential.
- (b) Diagrammatically represent the Calvin cycle.
- (c) Briefly discuss the pressure-flow model to explain translocation in the phloem.
- (d) Write an account on glycolysis.

5. Answer any **three** of the following :
(5×3=15)

- (a) Discuss the mechanism of enzyme action
- (b) Describe the process of nitrate reduction in plants.
- (c) Write an account on phytochrome under the heads discovery, structure and role.
- (d) Discuss the role of GA in mobilization of food reserves in cereal grains.

6. Attempt any **three** of the following :

(5×3=15)

- (a) Explain the criteria of essentiality of mineral nutrients.
- (b) Briefly describe the nodulation process in legumes.
- (c) Using a labelled diagram describe the glycolate pathway (photorespiration).
- (d) Define photoperiodism. How was it discovered ? Explain the role of the dark period in the phenomenon.

7. Give brief answers to the following. Attempt any **five** .

(5×3=15)

- (a) Explain the function of leghemoglobin in legume nodules.
- (b) Discuss the effect of temperature on enzymes.
- (c) Explain what would happen to plant cells when placed in a hypertonic solution ?
- (d) Discuss the role of antennae molecules in photosynthesis.
- (e) Describe what happens when the dissolved gases in water in the xylem come out of the solution ?
- (f) Explain what is meant by climacteric fruits ?
- (g) Give one major contribution of (i) Munch, (ii) Englemann, and (iii) Hans Krebs

(78)

[This question paper contains 4 printed pages.]

22/5/17
Your Roll No.....

Sr. No. of Question Paper : 2946

GC-4

Unique Paper Code : 42354401

Name of the Paper : Real Analysis

Name of the Course : **B.Sc. Mathematical Sciences**
B.Sc. (Prog.)

Semester : IV

Duration : 3 Hours

Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
 2. This question paper has six questions in all. Attempt any two parts from each question.
-
1. (a) State the completeness property of real numbers. Show that the set Q of rational numbers is not complete.

(b) Let A be a non-empty set of real numbers and is bounded above. If $B = \{x \mid -x \in A\}$, then show that B is bounded below and $\inf B = -\sup A$.

(c) Define finite, infinite, countable and uncountable sets and give one example of each of these sets. (6,6)

P.T.O.

2. (a) Define limit point of a set $S \subseteq \mathbb{R}$. Show that '0' is the

only limit point of the set $S = \left\{ \frac{1}{n} : n \in \mathbb{N} \right\}$.

(b) Let (x_n) and (y_n) be sequence of real numbers that converge to x and y respectively, such that $y_n \neq 0 \forall n \in \mathbb{N}$ and $y \neq 0$ then show that the sequence

$\left(\frac{x_n}{y_n} \right)$ converges to $\frac{x}{y}$.

(c) If $\lim_{n \rightarrow \infty} a_n = L$, then prove that $\lim_{n \rightarrow \infty} \frac{a_1 + a_2 + \dots + a_n}{n} = L$
(6,6)

3. (a) State Cauchy's Convergence Criterion for sequences and hence check the convergence of (S_n) , where

$$S_n = \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \dots + \frac{1}{n!} \quad \forall n \in \mathbb{N}.$$

(b) Let (a_n) be a sequence defined as $a_1 = \frac{3}{2}$,
 $a_n = 2 - \frac{1}{a_n} \quad \forall n \geq 1$. Show that (a_n) is monotonically decreasing and bounded below. Hence show that (a_n) converges to 1.

(c) Let $\sum_{n=1}^{\infty} u_n$, be a positive term series such that

$\lim_{n \rightarrow \infty} u_n^{1/n} = L$ then show that $\sum_{n=1}^{\infty} u_n$ converges if $L < 1$ and diverges if $L > 1$. What happens when $L = 1$?
(6½, 6½)

4. (a) State and prove the necessary condition for the convergence of an infinite series. Is the condition sufficient? Justify.

(b) Test the convergence of the following series :

(i) $\sum_{n=1}^{\infty} (\sqrt{n^3+1} - n^{3/2})$

(ii) $\sum_{n=1}^{\infty} \frac{n!}{n^n}$

(c) Define absolute convergence for an infinite series of

real numbers. Show that the series $1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \dots$ is absolutely convergent for all real x .
(6½, 6½)

5. (a) State Weierstrass M-test for the convergence of a series of functions and hence test the convergence of the

series $\sum_{n=1}^{\infty} \frac{1}{n^2 + n^4 x^2}$, for every x .

(b) Show that the sequence (f_n) , where $f_n(x) = nx e^{-nx^2}$, $x \geq 0$ is not uniformly convergent in $[0, k]$, $k > 0$.

(c) Determine the interval of convergence of the power

$$\text{series } \sum_{n=1}^{\infty} \frac{x^n}{n}. \quad (6\frac{1}{2}, 6\frac{1}{2})$$

6. (a) Prove that a bounded function is integrable on $[a, b]$ if for every $\varepsilon > 0$ there exists a partition P of $[a, b]$ such that $U(P, f) - L(P, f) < \varepsilon$.

(b) Show that the function f defined as

$$f(x) = \frac{1}{2^n}, \quad \text{when } \frac{1}{2^{n+1}} < x \leq \frac{1}{2^n}, \quad (n = 0, 1, 2, 3, \dots)$$

$$f(0) = 0$$

is integrable on $[0, 1]$.

(c) Show that if a function f defined on $[a, b]$ is continuous then it is integrable on $[a, b]$. (6,6)

This question paper contains 3 printed pages

(19)

Roll No.

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2017

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S. No. of Question Paper : 2948

Unique Paper Code : 42174406

Name of the Paper : Industrial Chemistry – 4 : Pharmaceuticals, Fermentation, Pesticides & Perfumes

Name of the Course : B.Sc. (Prog) Industrial Chemistry

Semester : IV

Duration: 3 Hours

Maximum Marks: 75

(Write your Roll No. on the top immediately on receipt of the question paper)

Attempt six questions in all

Question No. 1 is compulsory.



1. (a) Draw the structure of the following:

i) Chloramphenicol

ii) Malathion

iii) Alachlor

(b) Match the following:

i) Organophosphate

Gamma-xene

ii) Organochlorine

Carbofuran

iii) Carbamate

Parathion

(c) What is the difference between bacteriostatic and bactericidal action?

(d) What are essential oils? Give their importance in daily life?

(e) Write a brief note on Penicillin.

(3, 3, 3, 3, 3)

2. (a) Explain herbicide with their types and mode of action.

(b) How many isomers exist for BHC? Write the name of isomeric form which shows insecticidal properties. Which organ of human body gets affected by BHC?

(c) Write merit and demerit of Pesticides.

(4, 4, 4)

3. (a) Write Preparation of the following Drugs (any three):

i) Paracetamol

ii) Trimethoprim

iii) Sulphonamide

iv) Aspirin

(b) What do you understand by the term "antilaprosy drugs"? Name an antilaprosy drug and give its method of preparation.

(c) What do you mean by antipyretic agent? Name any one antipyretic drug.

(6, 3, 3)

4. (a) Differentiate between

(i) Hair dye and Hair spray

(ii) Face powder and Talcum powder

(b) Write a short note on

(i) Sandalwood oil

(ii) Rose oil

(c) Give the formulation of the following products:

(i) Lipstick

(ii) Shampoo

(iii) Hair spray

(iv) Cold cream

(4, 4, 4)

5. (a) Explain pesticide with their classification.

(b) Define Organophosphates. Write their properties and their mode of action.

(c) How you discover, design and develop a drug?

(4, 4, 4)

6. (a) Write down the structure and synthesis of chloromycetin.

(b) Why Vitamin B₁₂ is essential for human body? What are the symptoms of its deficiency?

(c) Describe briefly the function and synthesis of Vitamin C.

(4, 4, 4)

7. (a) How ethanol can be prepared by molasses? Mention the uses of ethanol.

(b) Explain the classification of drugs with their uses and examples.

(c) How do you synthesize AZT-Zidovudine? Explain its mode of action.

(4, 4, 4)

90

[This question paper contains 6 printed pages.]

Your Roll No. 30/5117

Sr. No. of Question Paper : 2950

GC-4

Unique Paper Code : 42174404

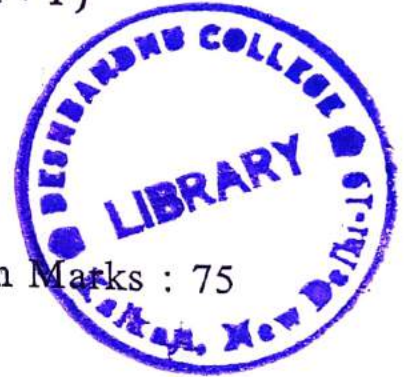
Name of the Paper : Chemistry of s and p block elements, states of matter & Chemical Kinetics (I + P)

Name of the Course : B.Sc. (Prog.)

Semester : IV

Duration : 3 Hours

Maximum Marks : 75



Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

Section A

(Inorganic chemistry)

Attempt any three questions.

1. (a) Many metal oxides are reduced by carbon, if required temperature is provided. Explain it with the help of Ellingham diagram.

P.T.O.

(b) Write short notes on :

(i) Mond's process for extraction of nickel.

(ii) Electrolytic refining with suitable example.

$$(4\frac{1}{2} + 4 + 4 = 12\frac{1}{2})$$

2. (a) Explain the followings (any **three**) :

(i) Ga has smaller size than Al.

(ii) Ionization potential of nitrogen (N) is greater than oxygen (O).

(iii) Chlorine (Cl) has more electron affinity value than fluorine (F), although fluorine (F) is more electronegative.

(iv) PbO_2 is an oxidizing agent.

(b) Calculate the electronegativity value of Pb (Lead) from the following data; $r = 1.53 \text{ \AA}$ and $Z = 82$, $\text{Pb} = 1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^{10}, 4s^2, 4p^6, 4d^{10}, 4f^{14}, 5s^2, 5p^6, 5d^{10}, 6s^2, 6p^2$.

(c) In contrast to diamond, graphite conducts electricity. Explain it.

$$(6 + 3\frac{1}{2} + 3 = 12\frac{1}{2})$$

3. (a) Write the names and structures of four oxoacids of chlorine (Cl).

(b) Draw and explain the bonding structure of diborane.

(c) PCl_5 is a Lewis acid while PCl_3 is a Lewis base. Explain.

$$(6 + 4\frac{1}{2} + 2 = 12\frac{1}{2})$$

4. (a) What is inert pair effect? Explain with suitable example.

(b) Li resembles Mg in its chemical properties though it is placed in group I. Explain.

(c) Draw the structures of the following compounds,

(i) SOCl_2

(ii) SO_2Cl_2

(d) Between NH_3 and NH_2OH , which one is more basic? Justify your answer.

$$(4\frac{1}{2} + 3 + 1\frac{1}{2} \times 2 + 2 = 12\frac{1}{2})$$

Section B
(Physical Chemistry)

Attempt three questions in all.

Question No. 1 is compulsory.

All questions carry equal marks.

Use of scientific calculator is allowed.

1. Explain (any 5) :

(a) Drop of a liquid is spherical.

(b) Unit cell and space lattice.

(c) Viscosity of liquids decreases while viscosity of gas increases with temperature.

(d) Effect of temperature on the mean free path.

(e) Pseudounimolecular reactions with example.

(f) Difference between Schottky and Frenkel Defect.

(g) Generally order of the reaction is not more than three.

(h) Excluded volume and how it is related to actual volume.

(2.5×5=12.5)

2. (a) Discuss in detail the drop number method of determining the surface tension of a liquid.

(b) Write short notes (any 2) :

(i) Law of crystallography

(ii) Liquid crystal

(iii) Boyle's Temperature

(iv) Viscosity

(c) (i) Derive an expression for Bragg's equation with diagram.

(ii) When a certain crystal was studied by Bragg's method using X-rays of wavelength 0.229 nm, an X-ray reflection was observed at an angle of $23^{\circ}20'$. What is the corresponding interplanar spacing? [$\sin(23^{\circ}20') = 0.396$]. (4,4,4.5)

3. (a) With the help of graph, discuss the Andrew's isotherm of CO_2 gas.

(b) Derive the equation for collision frequency z , in case of gas.

(c) Calculate the root mean square speed of CO_2 gas at 27°C . (4,4,4.5)

4. (a) Derive an expression for the rate constant for a reaction of first order.

(b) Half life time of 1st order reaction is 60 minutes. Calculate rate constant of reaction. How long will it take for 90% of this reaction to be completed ?

(c) Write short notes on :

(i) Arrhenius equation

(ii) Collision theory

(4,4,4.5)