

[This question paper contains 4 printed pages.]

Your Roll No. ....



Sr. No. of Question Paper : 7275

Unique Paper Code : 42344304

Name of the Paper : Operating Systems

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

Semester : III

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) Name two services provided by operating system.  
(2)

(b) How does an operating system prevent the CPU from being infinitely over run by user program?  
(2)

P.T.O.

- (c) Differentiate between pre-emptive and non pre-emptive scheduling. (3)
- (d) List two system calls each used for process control, file management and device management. (3)
- (e) Differentiate between multiprogramming and multiprocessing. (3)
- (f) What is use of a page table in paging memory management? (3)
- (g) What is address binding? (3)
- (h) Explain different commands to compare files in unix operating system. (3)
- (i) List three benefits of “the ability of operating system to execute a program that is only partially in memory”. (3)

2. (a) Consider the following set of processes, with the length of the CPU burst times given in milliseconds : (3×2=6)

| Process | Burst Time | Priority | Arrival Time |
|---------|------------|----------|--------------|
| P1      | 8          | 3        | 0.0          |
| P2      | 4          | 2        | 0.4          |
| P3      | 1          | 1        | 1.0          |

- (i) Draw Gantt charts illustrating the execution of these processes using FCFS, SJF( non-preemptive), a preemptive priority (small priority number means high priority), and a RR (quantum=1) scheduling.
- (ii) Calculate average waiting time and average turnaround time for all above mentioned scheduling algorithms.
- (b) Describe multilevel feedback queue scheduling. (4)
3. (a) Define process. Explain different process states. (6)
- (b) Explain “Layered Approach” to Operating System design. (4)
4. (a) Differentiate between static and dynamic linking. (6)
- (b) What are the reasons for a parent process to terminate execution of its child processes? (4)
5. (a) Describe challenges in programming for multicore systems. (6)
- (b) Assuming the 1-KB page size, what are the page numbers and offsets for the following address references under paging scheme of memory allocation?

- (i) 2375
- (ii) 4075
- (iii) 33
- (iv) 14866 (4)

6. (a) Given memory partitions of 200KB, 600KB, 100KB, 300KB and 500KB (in order). How would each of the first fit, best fit and worst fit algorithm place processes of 350 KB, 150KB, 250KB and 450KB (in order)? Which algorithm makes the most efficient use of memory? (6)

(b) What is external fragmentation? How can it be solved? (4)

7. (a) Explain three modes of **vi** editor and explain how can you switch from one mode to another. (6)

(b) Write a shell program to compute  $1/n!$  for a given  $n$ . (4)

8. Write short notes on **any two** : (2×5)

(a) Segmentation scheme of memory Allocation

(b) Unix System Architecture

(c) Demand paging and page fault

[This question paper contains 4 printed pages.]

Your Roll No.....



Sr. No. of Question Paper : 7277

Unique Paper Code : 42354302

Name of the Paper : Algebra

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

Semester : III

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.
3. Attempt any **two** parts from each question.
4. **All** questions are compulsory.
5. Marks are indicated.

**UNIT – I**

1. (a) Let  $G = \left\{ \begin{bmatrix} a & a \\ a & a \end{bmatrix}; a \in \mathbb{R}; a \neq 0 \right\}$

Show that G is an abelian group under matrix multiplication. (6)

P.T.O.



- (b) Describe the symmetries of a non-square rectangle. Construct the corresponding Cayley table. (6)
- (c) Let  $H = \{x \in U(20) : x \equiv 1 \pmod{3}\}$ . List all elements of  $H$ . Prove or disprove that  $H$  is a subgroup of  $U(20)$ . (6)
2. (a) Prove that an abelian group with two elements of order 2 must have a subgroup of order 4. (6)
- (b) Define Cyclic Group. Is  $U(8)$  with the operation of multiplication modulo 8 a cyclic group? Justify. (6)
- (c) Let  $a, b \in S_n$ . Prove that  $a^{-1}b^{-1}ab$  is an even permutation. (6)
3. (a) State Lagrange's theorem for finite groups. Prove that in a finite group, the order of each element of the group divides the order of the group. (6)
- (b) Let  $H$  be a subgroup of  $G$  and  $a, b \in G$ . Prove that either  $aH = bH$  or  $aH \cap bH = \phi$ . (6)
- (c) Let  $H = \left\{ \begin{bmatrix} a & b \\ 0 & d \end{bmatrix}; a, b, d \in \mathbb{R}; ad \neq 0 \right\}$ . Is  $H$  a normal subgroup of  $GL(2, \mathbb{R})$ ? Justify. (6)

## UNIT - II

4. (a) Define center of a ring  $R$ . Prove that center of a ring is a subring of  $R$ . (6.5)
- (b) Define field and an integral domain. Prove that every field is an integral domain. Is the converse true? Justify. (6.5)
- (c) Find all zero divisors in  $\mathbb{Z}_{20}$ . What is the relationship between the zero divisors and the units of  $\mathbb{Z}_{20}$ ? (6.5)

## UNIT - III

5. (a) Determine whether or not the set

$$\left\{ \begin{bmatrix} 2 & 1 \\ 1 & 0 \end{bmatrix}, \begin{bmatrix} 0 & 1 \\ 1 & 2 \end{bmatrix}, \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} \right\}$$

is linearly independent over  $\mathbb{Z}_5$ . (6.5)

- (b) Let  $V = \left\{ \begin{pmatrix} a & b \\ b & c \end{pmatrix}; a, b, c \in \mathbb{Q} \right\}$  be a vector space over  $\mathbb{Q}$ . Find a basis of  $V$  over  $\mathbb{Q}$ . (6.5)
- (c) Which of the following is a subspace of  $\mathbb{R}^3$ ? Justify.

$$(i) \ S = \{(a, b, c) \in \mathbb{R}^3 : 2a + 3b = 4c\}$$

$$(ii) \ T = \{(a, b, c) \in \mathbb{R}^3 : a^2 + b^2 = c^2\} \quad (6.5)$$

6. (a) Which of the following function  $T$  from  $\mathbb{R}^2$  into  $\mathbb{R}^2$  is a linear transformation? Justify

$$(i) \ T(a, b) = (a - b, 0)$$

$$(ii) \ T(a, b) = (a^2, b) \quad (6.5)$$

(b) Let  $T: \mathbb{C}^3 \rightarrow \mathbb{C}^3$  be a linear transformation defined by

$$T(x, y, z) = (x - y + 2z, 2x + y, -x - 2y + 2z).$$

If  $(a, b, c) \in \mathbb{C}^3$ , what are the conditions on  $a$ ,  $b$  and  $c$  so that the vector be in range of  $T$ ? What is the rank of  $T$ ? (6.5)

(c) Let  $T: \mathbb{R}^2 \rightarrow \mathbb{R}^2$  be a linear transformation such that  $T(1, 2) = (2, 3)$  and  $T(0, 1) = (1, 1)$ . Find  $T(a, b)$  for any  $(a, b) \in \mathbb{R}^2$ . (6.5)

[This question paper contains 4 printed pages.]

Your Roll No. ....



Sr. No. of Question Paper : 7334

Unique Paper Code : 42234301

Name of the Paper : Physiology and Biochemistry

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

Semester : III

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, **two** each from Section **A** and Section **B**.
3. Question No. **1** is compulsory.
4. Use separate sheets for Section **A** and Section **B**.

1. (a) Define the following terms :

- (i) Pericardium
- (ii) Bohr effect
- (iii)  $K_m$
- (iv) Transamination

P.T.O.

(v) Phosphorylation

(vi) Chylomicron

(vii) Gluconeogenesis (7)

(b) Differentiate between the following :

(i) EDV and ESV

(ii) Glucogenic and Ketogenic Amino acids

(iii) Tidal volume and Residual volume

(iv) Competitive and Non-Competitive inhibition (8)

(c) Expand the following :

(i) ACTH

(ii) CCK

(iii) BPG

(iv) PDH

(v) FMN

(vi) PLP (3)

(d) Give the exact location and function of the following :

(i) Podocyte

(ii) AV Node

(iii) Brunners gland

(iv) Glial cells (6)

(e) Mention one contribution of the following biochemists

(i) Koshland

(ii) E.Knoop

(iii) Peter Mitchell (3)

### SECTION A

2. (a) Describe the process of digestion and absorption Proteins in gastrointestinal tract. (6)

(b) Explain the process of propagation of impulse in a non myelinated nerve fiber. (6)

3. (a) Describe the mechanism of urine production in nephron. (6)

(b) Discuss the origin and conduction of heart beat. (6)

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

(i) Adrenal gland



- (ii) Oogenesis
- (iii) Ultra structure of skeletal muscle
- (iv) Platelet Plug formation

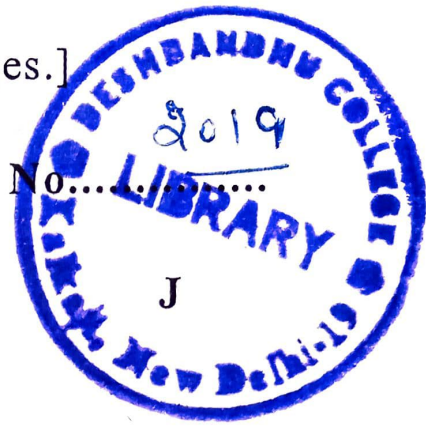
### SECTION B

*(Structural Formulae to be given for all pathways)*

5. (a) Describe the various steps involved in  $\beta$ -Oxidation of Fatty Acid. (7)
- (b) Discuss the effects of substrate concentration on enzyme catalysed reactions. (5)
6. (a) Give the sequence of reactions involved in Glycolytic pathway. (7)
- (b) Briefly explain the components of Electron Transport chain. (5)
7. Write short notes on any **three** of the following : (4,4,4)
- (i) Glycogenolysis
  - (ii) Biosynthesis of Palmitic acid
  - (iii) Urea cycle
  - (iv) Mechanism of action of enzyme

[This question paper contains 4 printed pages.]

Your Roll No.....



Sr. No. of Question Paper : 7335

Unique Paper Code : 42164301

Name of the Paper : Plant Anatomy and Embryology

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

Semester : III

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** question in all, including question number 1, which is compulsory.
3. Attempt **all** parts of questions together.
4. Draw well labelled diagrams wherever necessary.

1. (a) Fill in the blanks (attempt any **five**) (1×5=5)

(i) The spongy multiple epidermis found in aerial roots of epiphytes is known as .....

(ii) The Tunica-Corpus theory is proposed by .....

P.T.O.

- (iii) Lateral roots originate from .....
- (iv) Type of collenchyma in which the thickenings are mainly at the angles of the cells is known as .....
- (v) ..... is the fleshy outgrowth of integument at the micropylar region in seed that helps in dispersal and germination.
- (vi) Persistent nucellus in black pepper is known as .....

(b) Define the following (attempt any five) (1×5=5)

- (i) Chalazogamy
- (ii) Entomophily
- (iii) Hypostase
- (iv) Obturator
- (v) Lithocyst
- (vi) Rhytidome
- (vii) Fascicular cambium

(c) Match the following (attempt any five) (1×5=5)

- (i) Composite endosperm    a) Absence of endosperm
- (ii) Quiescent centre        b) Lorantheae
- (iii) Pollination by water    c) Root

- (iv) Sunken stomata        d) *Zea mays*
- (v) Bulliform cells         e) Korper-kappe theory
- (vi) Schuepp                f) Hydrophily
- (vii) Podostemaceae        g) Xerophyte

2. Write short notes on any **five** of the following :

(3×5=15)

- (i) Microgametogenesis
- (ii) Double Fertilisation
- (iii) Apomixis
- (iv) Metcalfe and Chalk's classification of stomata
- (v) Types of Tapetum
- (vi) Sclerenchyma

3. Differentiate between any **three** of the following :

(3×5=15)

- (i) Nuclear and Cellular endosperm
- (ii) Monosporic and Tetrasporic embryo sac
- (iii) Sapwood and Heartwood
- (iv) Monocot and Dicot Stem

4. Draw well labelled diagrams of any **three** of the following :

(5×3=15)

- (i) T.S. tetrasporangiate anther at tetrad stage
  - (ii) L.S. monocot embryo
  - (iii) T.S. monocot leaf
  - (iv) V.S. *Nerium* leaf
  - (v) L.S. anatropous, bitegmic ovule showing *Polygonum* type of embryo sac
5. (a) Discuss the adaptive features of plants pollinated by wind and water with suitable example. (7.5)
- (b) Describe anatomical adaptations of hydrophytes with suitable examples. (7.5)
6. (a) Describe secondary growth in dicot roots with the help of suitable diagrams. (7.5)
- (b) Define polyembryony and give its classification. (7.5)
7. (a) Describe various types of ovules in angiosperms with help of suitable examples. (7)
- (b) Discuss various theories explaining the organisation of root apex. (3)
- (c) Write a brief essay on the structure and functions of tracheary elements. (5)



[This question paper contains 4 printed pages.]

Your Roll No. 2019.....



Sr. No. of Question Paper : 7336

Unique Paper Code : 42224303

Name of the Paper : Thermal Physics & Statistical Mechanics

Name of the Course : B.Sc. Prog.

Semester : III

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. Q. 1 is compulsory.
3. Attempt **five** questions in all.
4. **All** questions carry equal marks.

1. Attempt any **five**.

(a) Using third law of thermodynamics explain why it is not possible to attain absolute zero.

(b) Distinguish between reversible and irreversible processes.

P.T.O.

- (c) Calculate mean free path of a gas molecule whose diameter is  $3 \text{ \AA}$  and number of molecules/cc is  $3 \times 10^{19}$ .
- (d) What is the wavelength at maximum intensity of radiation emitted by a body maintained at temperature  $3000^\circ\text{C}$ . Given Wien's constant =  $2.898 \times 10^{-3} \text{ m K}$ .
- (e) Describe all the possible microstates for a system obeying B-E statistics and having two particles and two quantum states.

- (f) Establish the T-dS equation

$$T dS = C_v dT + T \left( \frac{\partial P}{\partial T} \right)_V dV$$

- (g) Using Clausius-Clapeyron equation discuss the effect of pressure on boiling point of a liquid.  
(5×3)

2. (a) Show that the work done in a Carnot cycle is the area enclosed by the two isotherms and two adiabatics in P-V diagram and hence derive the expression for efficiency.
- (b) A Carnot engine has an efficiency of 50% when the temperature of the sink is  $27^\circ\text{C}$ . Calculate the temperature of the source so that the efficiency becomes 60%.  
(10,5)

3. (a) State first law of thermodynamics. What is its physical significance and discuss its limitations?
- (b) One mole of an ideal gas ( $\gamma = 1.4$ ) initially kept at  $17^\circ\text{C}$  is adiabatically compressed so that its pressure becomes 10 times its original value. Calculate
- its temperature after compression
  - work done on the gas.
- (c) Calculate the change in entropy of a perfect gas in terms of temperature and pressure. (5,5,5)

4. (a) Using thermodynamic potentials derive Maxwell's four thermodynamical relations.
- (b) Using appropriate Maxwell's relations prove

$$C_p - C_v = T \left( \frac{\partial P}{\partial T} \right)_V \left( \frac{\partial V}{\partial T} \right)_P$$

and hence show that for an ideal gas  $C_p - C_v = R$ .  
(10,5)

5. (a) What is transport phenomenon? Derive the expression for coefficient of viscosity of a gas using Kinetic Theory.

- (b) Explain the porous plug experiment and discuss its results. Prove that enthalpy remains constant in Joule-Thomson expansion. (9,6)
6. (a) Starting from the Maxwell's law of velocity distribution obtain expressions for root mean square velocity, average velocity and most probable velocity.
- (b) Calculate the root mean square velocity of hydrogen molecule at  $27^{\circ}\text{C}$ . Given mass of hydrogen molecule =  $3.34 \times 10^{-27}\text{Kg}$  and  $k = 1.38 \times 10^{-23}\text{J}/^{\circ}\text{K}$ .
- (c) State the law of equipartition of energy and hence determine the ratio of specific heat capacities ( $\gamma$ ) for a monoatomic and diatomic gas. (6,3,6)
7. (a) Explain the spectral distribution of radiation emitted by a black body and its variation with temperature.
- (b) Derive Planck's law of black body radiation and hence derive Rayleigh-Jean's law and Wien's law. (3,12)
8. (a) Differentiate between MB, BE and FD statistics.
- (b) Derive Maxwell-Boltzmann distribution law for an ideal gas having  $N$  particles and energy  $E$ . (5,10)
- (3300)



[This question paper contains 8 printed pages.]

Your Roll No. 2019.....



Sr. No. of Question Paper : 7341

Unique Paper Code : 42174304

Name of the Paper : Solutions, Phase Equilibrium  
& Functional Group Organic  
Chemistry

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

Semester : III

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 **six** questions in all, **three** questions from each Sections.
3. Use of scientific calculator is allowed.

### SECTION A

*Attempt **three** questions in all. Questions No. 1 is compulsory. All questions carry equal marks.*

1. Answer any **five** questions:

(a) State Nernst distribution law and give its limitations.

P.T.O.



(b) If the molar conductivities at infinite dilution of NaCl, HCl and CH<sub>3</sub>COONa are 126.4, 426.1 and 91.0 ohm<sup>-1</sup> cm<sup>2</sup> mol<sup>-1</sup> respectively, what will be the molar conductivity of Acetic acid?

(c) The role of salt bridge is to reduce the liquid junction potential. Comment.

(d) What is azeotropic mixture? Is it possible to separate the components of an azeotropic system using distillation?

(e) Can a solution of 1 M Copper Sulphate be stored in a vessel made of Nickel metal? Given that  $E_{Ni^{+2}/Ni}^{\circ} = -0.25$  V and  $E_{Cu^{+2}/Cu}^{\circ} = 0.34$  V.

(f) Effect of increasing the pressure and temperature on the triple point of water. Explain.

$$(2\frac{1}{2} \times 5 = 12\frac{1}{2})$$

2. (a) Drive the integrated form of Clapeyron-Clausius equation for liquid-gas equilibria.

(b) State and explain the phase rule. Explain that Sulphur system at any of its triple point is a non-variant system.

(c) What is Critical Solution Temperature? Explain with reference to Phenol water system.

$$(4, 4, 4\frac{1}{2})$$

3. (a) Define EMF of a cell. Give the method for its experimental determination.

(b) Between 0°C and 90°C, the potential of the cell  
Pt | H<sub>2</sub> (g, 1 atm) | HCl (m = 0.1) | AgCl (s) | Ag  
is given by

$$E_{(\text{volts})} = 0.3551 - 0.3422 \times 10^{-4}t$$

Where t is the temperature in Celsius. Write the cell equation and calculate ΔG, ΔH and AS for the cell at 50°C.

(c) State the principal underlying the potentiometric titrations. What are the advantages of potentiometric titrations over volumetric titrations. Draw the potentiometric titration curve involving strong acid and strong base. (4, 4, 4½)

4. (a) Specific conductivity of a saturated solution of AgCl at 25°C was found to be  $3.41 \times 10^{-5}$  ohm<sup>-1</sup> cm<sup>-1</sup>. The specific conductivity for water used to make up the solution was  $1.60 \times 10^{-6}$  ohm<sup>-2</sup> cm<sup>-1</sup>. Determine the solubility of AgCl in water. Ionic conductances of Ag<sup>+</sup> and Cl<sup>-</sup> at 25°C are 60.3 ohm<sup>-2</sup> cm<sup>-1</sup> and 78.0 ohm<sup>-2</sup> cm<sup>-1</sup> respectively.

(b) Write short note on any two :

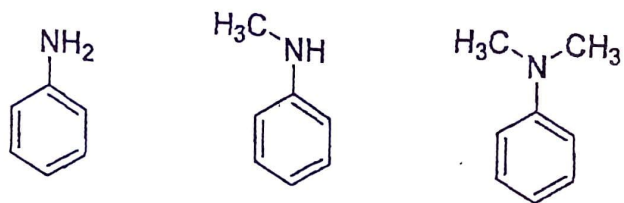
- (i) Hydrogen half Cell
- (ii) Congruent and incongruent meeting points
- (iii) Steam distillation
- (iv) Conductometric titration of  $\text{CH}_3\text{COOH}$  vs  $\text{NaOH}$   
(4½,4,4)

### SECTION B

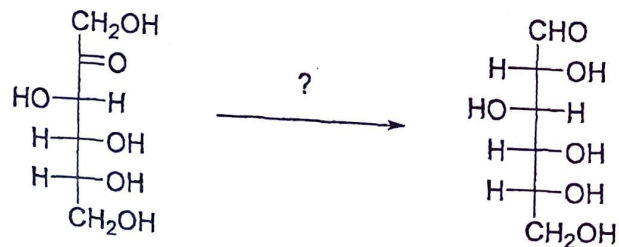
Attempt **three** questions in all. All questions carry equal marks.

5. Answer the following :

(a) How will you differentiate the following?

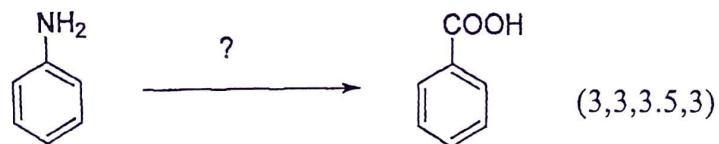


(b) Convert fructose to glucose.



(c) Explain Edmann degradation.

(d) Convert aniline to benzoic acid.



6. Answer the following :

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

- (i) Hell-Volhard-Zelinsky reaction
- (ii) Electrophoresis
- (iii) Schotten-Baumann reaction

(b) What are essential and non-essential amino-acids?

(c) Name the components of starch.

(d) Give test to differentiate the following :

- (i) Sucrose and fructose
- (ii) Aniline and methylamine (6,1.5,1,4)

7. Answer the following :

(a) Write short note on the following:

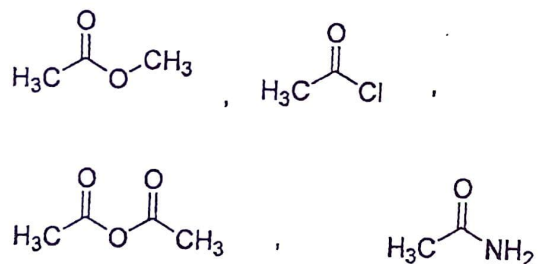
(i) Gabriel phthalimide synthesis

(ii) Secondary structures of proteins

(b) Write the structures of dipeptides abbreviated as follows :

Gly-Tyr

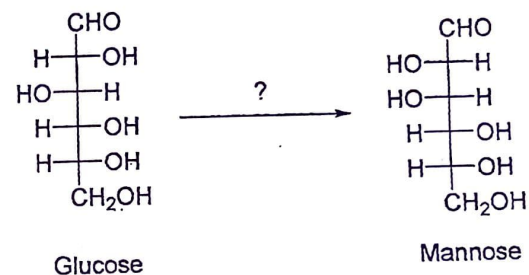
(c) Give and explain the relative reactivity order of the following derivatives of carboxylic acids towards nucleophilic substitution reaction :



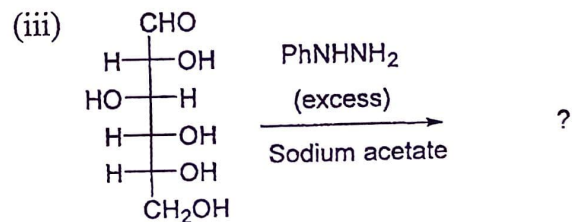
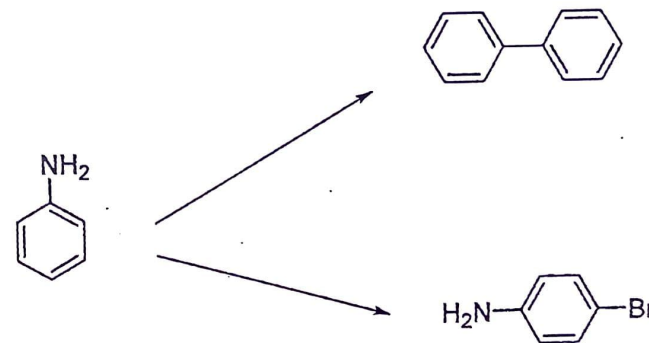
(d) Explain the miscibility of carboxylic acid in water. (6,1.5,3,2)

8. (a) Convert the following :

(i) Glucose to mannose



(ii) Aniline to biphenyl and 4-bromoaniline



(b) Outline the solid phase synthesis of Gly-Ala.

(3,3,3,3.5)



[This question paper contains 4 printed pages.]

Your Roll No. ....



Sr. No. of Question Paper : 7342

Unique Paper Code : 42174303

Name of the Paper : Inorganic Materials

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

Semester : III

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 **six** questions in all.
3. Question No. 1 which is compulsory.

1. Attempt any **five** questions :

(a) Discuss the importance of annealing in the manufacturing of the glass.

(b) What is glazing? Why it is performed?

(c) Differentiate between soda lime and borosilicate glass.

P.T.O.

- (d) What is meant by paint failure?
- (e) What are the characteristics of ideal battery?
- (f) What are the characteristics of a good catalyst?
- (g) What is Eco-friendly paints? (5×3)
2. (a) What are the various steps involved in the manufacture of Portland cement by rotary kiln technology? Explain the reactions taking place in different parts of the kiln.
- (b) Give diagrammatic representation of manufacturing of glass.
- (c) Describe properties of ceramics. Write different uses of ceramics. (3×4)
3. (a) Write a short note on hardening and setting of cement.
- (b) What are earthenware and stoneware?
- (c) Write the discharging and charging reactions of a lead storage battery and explain how the battery works. (3×4)

4. (a) What are fertilizers? How they can be classified on the basis of their applications?
- (b) Explain the manufacture of calcium ammonium nitrate fertilizer including reactions involved.
- (c) What are the essential requirements of a good fertilizer? (3×4)
5. (a) Write the requisites of a good paint.
- (b) Discuss the objectives and process for electroplating for metallic coatings.
- (c) Differentiate between paint and pigment. (3×4)
6. (a) Explain the steps involved in the manufacture of steel.
- (b) Discuss the heat treatment of steel and give its importance?.
- (c) Differentiate between ferrous and non-ferrous alloys. (3×4)
7. (a) How is RDX manufactured?
- (b) What is deactivation of a catalyst and how it can be regenerated?

(c) Differentiate between physical and chemical adsorption. (3×4)

8. Write short notes on (any **three**)

(a) Carbon Nanotubes

(b) Urea

(c) Solar Cells

(d) Zeolites

(e) Rocket Propellants (3×4)

2/N-17



4/12/19

Sl. No. of Q.P. : 8772

Unique Paper Code : 235366  
 Name of the Course : B.Sc.Physical Sciences/Mathematical Sciences/  
 Analytical Chemistry/Industrial Chemistry-III  
 Name of the Paper : MAPT 303-Maths-III, Algebra  
 Semester : III  
 Duration : 3Hours  
 Maximum Marks: 75

J

**Instructions for Candidates**

1. Write your roll no. on the top immediately on the receipt of this question paper.
2. This question paper has six questions in all.
3. Attempt any two parts from each question.
4. All questions are compulsory.
5. Marks are indicated.

**UNIT - I**

- 1.(a) Discuss the symmetries of an equilateral triangle. (6)
- (b) Show that  $G = \left\{ \begin{bmatrix} a & a \\ a & a \end{bmatrix} : a \in \mathbb{R}, a \neq 0 \right\}$  is a group under matrix multiplication. (6)
- (c) Let  $G$  be a group and  $H$  a non-empty subset of  $G$ . Then prove that  $H$  is a subgroup of  $G$  if  $ab^{-1}$  is in  $H$  whenever  $a$  and  $b$  are in  $H$ . (6)
- 2.(a) Show that  $U(10)$  under the operation of multiplication modulo 10 is a cyclic group. Find all its generators. (6)
- (b) If  $H$  and  $K$  are subgroups of  $G$ , show that  $H \cap K$  is a subgroup. What can you say about  $H \cup K$ ? Justify your answer. (6)
- (c) Let  $H$  be a subgroup of  $G$  such that index of  $H$  in  $G$  is 2. Show that  $H$  is normal in  $G$ . (6)
- 3.(a) State and prove Lagrange's theorem for finite groups. (6)
- (b) Find left cosets of  $H = \{1, 11\}$  in  $U(30)$ . (6)
- (c) If  $\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 3 & 2 & 4 & 1 & 7 & 5 & 6 \end{pmatrix}$  and  $\tau = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ 2 & 3 & 1 & 6 & 7 & 4 & 5 \end{pmatrix}$   
 Find (i)  $\sigma\tau$  (ii)  $\tau\sigma$  (iii)  $\sigma^{-1}$  (iv)  $\tau^{-1}$  (v)  $\tau\sigma\tau^{-1}$  (vi)  $\sigma\tau\sigma^{-1}$ . (6)

**UNIT - II**

- 4.(a) Define center of a ring  $R$ . Prove that center of a ring is a subring of  $R$  (6.5)
- (b) Prove that a finite integral domain is a field. (6.5)
- (c) Find all zero divisors in  $\mathbb{Z}_{20}$ . What is the relationship between the zero divisors and the units of  $\mathbb{Z}_{20}$ ? (6.5)

**UNIT - III**

- 5.(a) Are the vectors  
 $a = (1,1,2,4), b = (2, -1, -5,2), c = (1, -1, -4,0), d = (2,1,1,6)$   
 linearly independent in  $\mathbb{R}^4$ ? (6.5)
- (b) Let  $V = \left\{ \begin{bmatrix} a & a+b \\ a+b & b \end{bmatrix} ; a, b \in \mathbb{R} \right\}$  be a vector space over  $\mathbb{R}$ . Find a basis of  $V$  over  $\mathbb{R}$ . (6.5)



(c) Check whether or not the set  $W = \{(x_1, x_2, x_3) : 3x_1 - 2x_2 + x_3 = 0\}$  is a subspace of  $\mathbb{R}^3$ . If it is find a basis for the subspace and compute its dimension. (6.5)

6.(a) Define a linear transformation from a vector space  $V$  to vector space  $W$  over the same field  $F$ . Show that  $T : \mathbb{R}^2 \rightarrow \mathbb{R}^3$  defined by  $T(x, y) = (y, x + 2y, x + y)$  is a linear transformation. (6.5)

(b) Let  $T : \mathbb{R}^2 \rightarrow \mathbb{R}^2$  be a linear transformation such that  $T(1,2) = (2,3)$  and  $T(0,1) = (1,1)$ . Find  $T(a,b)$  for any  $(a,b) \in \mathbb{R}^2$ . (6.5)

(c) Find the range, rank, kernel and nullity of  $T$  where  $T : \mathbb{R}^2 \rightarrow \mathbb{R}^3$  is a linear transformation defined by  $T(x, y) = (x+y, x-y, y)$ . (6.5)

16/12/19



Sr. No. of Question Paper : 8783  
Unique Paper Code : 217361  
Name of the Paper : CHPT-303 Chemistry -3 (Solutions. Conductance. Electrochemistry and Functional Group Chemistry-2)  
Name of the Course : B.Sc. (Programme) (Physical Sciences and Life Sciences)  
Semester : III  
Duration : 3 Hours  
Maximum Marks : 75 Marks

J

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Use of scientific calculators and log tables is allowed.
3. Answer six questions in all, three questions from each section.
4. Use separate answer sheets for Section A and B.

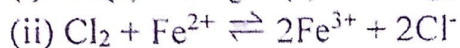
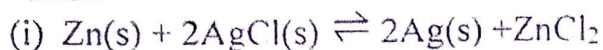
Section A

Attempt *any three* questions in this section.

Question No. 1 is compulsory.

1. Explain *any five*:
    - (a) All feasible electrochemical cells should have positive EMF values.
    - (b) Triple point is an invariant point.
    - (c) Equivalent conductance of a solution of an electrolyte increases on dilution whereas the specific conductance decreases.
    - (d) Addition of NaCl in water phenol system increases Critical Solution Temperature (CST).
    - (e) Electrode potential of a single electrode cannot be determined.
    - (f) The advantages of conductometric titrations over volumetric titrations.
    - (g) The fusion curve in phase diagram of water is inclined towards pressure axis.
- (2.5 x 5 = 12.5)

2. (a) Write the half-cell reactions for electrochemical cells involving the following cell reactions:



- (b) Write a short note on *any two* the following:

(i) Reference electrodes

(ii) Azeotropic mixture

(iii) Conductometric titrations

- (c) What is meant by transport number of an ion? Describe any one method to determine it.

(4, 4, 4.5)

3. (a) Derive the relationship between degrees of freedom (F), number of components (C) and number of phases (P).

(b) Draw schematically the phase diagram for sulphur and discuss it.

(c) Define equivalent conductance. A solution of salt (1.0 N) surrounding two platinum electrodes 4.2 cm and 8.4 cm<sup>2</sup> in area was found to offer a resistance of 50 ohms. Calculate the equivalent conductance of the solution.

(4, 4, 4.5)

4. (a) State and explain the Kohlrausch's law for weak electrolytes.

(b) In water-phenol system, determine the number of phases, components and degrees of freedom:

(i) inside the solubility curve

(ii) outside the solubility curve

(c) The molar conductance at infinite dilution for NaCl, HCl and CH<sub>3</sub>COONa are 126, 420 and 91 S cm<sup>2</sup> mol<sup>-1</sup> respectively, calculate molar conductance of acetic acid at infinite dilution.

(4, 4, 4.5)



## Section B

(Attempt Any *Three* questions.)

All questions carry equal marks.

5. (a) State the order of reactivity of the following compounds towards a nucleophile and explain your answer.

acid chloride, acid amide, acid anhydride, ester

(b) In the preparation of acids, alkaline hydrolysis of an ester is preferred than acid hydrolysis. Justify.

(c) Explain Hell-Volhard-Zelinsky reaction and give its synthetic application.

(d) How will you prepare ethylacetoacetate by using the Claisen Ester Condensation reaction? Show the mechanism involved. (3.5, 2, 3, 4)

6. (a) Briefly discuss the following tests:

(i) Carbylamine test

(ii) Hinsberg test

(b) Synthesize the following using ethylacetoacetate as the starting material:

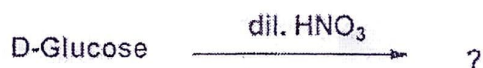
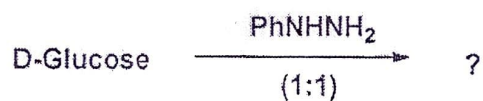
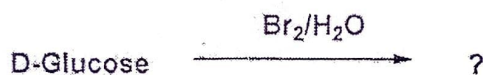
(i) propionic acid

(ii) adipic acid

(iii) 2-butanone (6, 6.5)

7. (a) Explain why sucrose is a non-reducing sugar.

(b) Write the products of the following reactions:



(c) What happens when an aqueous solution of  $\alpha$ -D glucose is kept for some time? What is the name of this phenomenon and discuss the mechanism involved.

(d) Give a detailed account of the Hofmann elimination and compare it with Saytzeff elimination.

(1.5, 3, 4, 4)

8. (a) Write short notes on any *three* of the following:

(i) keto-enol tautomerism

(ii) Reformatsky reaction

(iii) Gabriel phthalimide synthesis

(iv) Preparation of diazonium salts



(b) Organic compound **A** with molecular formula  $C_3H_7O_2$  turns blue litmus paper red and gives a positive test with  $NaHCO_3$ . The compound **A** on treatment with  $PCl_5$  gives compound **B**. **B** on treatment with  $NH_3$  gives **C**.

(i) Write the reactions involved to identify **A**, **B**, **C**.

(ii) How can compound **C** be converted to compound **A**? Write the reaction involved?

(9, 3.5)

A



3/12/19

[This question paper contains 2 printed pages]

Sf. No. of Q.P.: 8799

Your Roll No.....

Name of the course: B.Sc. Physical Science/Applied Physical Sciences

Paper No. PHPT-404

Name/Title of the Paper: Physics-III: Electricity, Magnetism and E.M. Theory

Unique Paper Code 222563

Semester III

Time: 3 Hours

Maximum Marks: 75

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

Attempt any five questions in all.

Question no. 1 is compulsory.

1 Attempt any five

- (a) State Gauss Law in Electrostatic. Express it in differential and integral form.
- (b) Deduce a relation between electric field intensity  $\vec{E}$  and electric potential V.
- (c) Find the expression for torque on a current loop placed in a uniform magnetic field.
- (d) Explain current sensitivity and charge sensitivity of B.G.
- (e) Write Maxwell's Equations of electromagnetism(in vacuum).
- (f) Define self induction and mutual induction. State Lenz's law.
- (g) What do you mean by polarization of E.M. waves?
- (h) State Faraday's laws of induction.

2 (a) Using Gauss Law of electrostatic find electric intensity at a point lying outside (i) for a line of charge (ii) point charge (iii) for a uniformly charged sphere.

(b) Prove  $div \vec{E} = \frac{\rho}{\epsilon_0}$ . (12+3)

3) Starting with Ampere circuital law find expression for B (i) for a long straight wire (ii) for field inside a solenoid. 3+5+7

- 4 (a) State and prove Biot-Savart's Law.
- (b) Find expression for magnetic force between two parallel current carrying conductors. (9+6)
- 5 (a) Starting with working principle of B.G., find expression for (i) current sensitivity (ii) charge sensitivity (iii) critical damping resistance.
- (b) What do you mean by electromagnetic damping? (12+3)
- 6 (a) Define the terms  $\vec{D}$ ,  $\vec{E}$  and  $\vec{P}$ . Find relation between them. 9
- (b) Obtain Gauss law for dielectrics. 6
- 7 (a) Derive the plane wave equation for EM WAVE. 9
- (b) What was Maxwell's modification to Ampere circuital law? How it helped Amperes law to be consistent with continuity equation? 6
- 8 Write short note on any two of the following:
- (a) Linear, surface, volume charge distribution.
- (b) Polarization of a dielectric in the presence of an external field.
- (c) Reflection and transmission of E.M. waves. (7.5X2)



13/12/19

[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 8779 Your Roll No. ....

Unique Paper Code : 223355

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

Name of the Paper : LSPT -306: Introduction to Medical Diagnostics

Semester : III

Time : 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.
3. Question No. 1 is compulsory.

Q1. (a) Expand the Following:

(6)

1. DLC
2. ANOVA
3. MRI
4. NMR
5. HPLC
6. AIDS

(b) Define the following:

(5)

1. Pathogen
2. Ageing
3. Molecular Modeling
4. Hypertension
5. Geometric Mean



(c) Differentiate between the following:

(6)

1. Infectious and Non-Infectious disease

2. CT scan & MRI

3. Type I & Type II Diabetes

(d) Match the following:

(5)

|    |                     |      |              |
|----|---------------------|------|--------------|
| a) | Hashimoto's disease | i.   | HIV          |
| b) | AIDS                | ii.  | Placenta     |
| c) | UV                  | iii. | Analysis     |
| d) | t-test              | iv.  | Thyroid      |
| e) | Ultrasound          | v.   | Spectroscopy |

(e) State whether the given statements are True/False.

(5)

- i. Echo helps detect placental abnormalities in a pregnant female.
- ii. Malaria is spread by Tse Tse fly.
- iii. Systemic Lupus Erythematosus (SLE) is an immunologic disorder.
- iv. MRI works on the principle of NMR.
- v. The median of a given data is always equal to its mode.

Q2. (a) Explain the Causes, Symptoms and Management of Tuberculosis.

(7)

(b) Enlist various Social and Economic factors of Diseases occurring in India.

(5)

Q3. (a) Explain, in detail, the Principle and Applications of HPLC.

(9)

(b) Enlist the advantages of a Scanning Electron Microscope.

(3)

Q4. (a) Write the details involved in ECG. Comment on the advantages of ECG in Medical Physiology.

(8)

(b) Enlist various Histopathology, Biochemistry, Haematology and Microbiology techniques used in hospital laboratories.

(4)

Q5. (a) A new Drug was tested on three groups- A, B & C of Hepatitis patients in a clinical trial and the

following results were obtained:

| A | B | C |
|---|---|---|
| 8 | 2 | 3 |
| 9 | 4 | 5 |
| 6 | 3 | 4 |
| 7 | 5 | 2 |
| 3 | 1 | 3 |

Perform ANOVA to find any significant difference in treatment

(6)

(b) Calculate mean, mode and median of the given glucose detection results:

10, 5, 9, 19, 10, 9, 11, 13

(3)

(c) Describe Chi-square test and discuss its application.

(3)

Q6. Write short notes on any **three** of the following:

(4,4,4)

- (a) Cancer
- (b) ANOVA
- (c) NMR
- (d) Ultrasound