30/11/2018

(1)

[This question paper contains 8 printed pages]

Your Roll No. : .....

Sl. No. of Q. Paper : **140** **I**

Unique Paper Code : 42344304

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

Name of the Paper : Operating Systems

Semester : III

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) **Section - A** is compulsory.

(c) Attempt any **five** questions from **Section-B**.

(d) **All** parts of a question must be attempted together.

Section - A
(Compulsory)

1. (a) What is a fault tolerant system ? 2

(b) What system calls have to be executed by a command interpreter or shell in order to start a new process ? 2

(c) Explain the convoy effect in CPU scheduling. 2

(d) What is memory compaction ? 2

(e) Give difference between primitive and non-primitive scheduling. State why strict non-preemptive scheduling is unlikely to be used. 3

(f) Name **three** criteria based on which we can compare various CPU scheduling algorithms ? 3

(g) What is dynamic loading ? 2

(h) Explain how locality of reference helps in getting reasonable performance in demand paging ? 3

(i) Why threads are called light weight processes ? 2

(j) What is absolute pathname ? Explain with the help of an example. 2

(k) What is the difference between "cp" and "mv" command of Unix ? 2

Section - B

(Attempt any five)

2. (a) Explain **three** benefits of multi-threaded programming. 3

(b) How does cache help to improve system performance ? What problems do they cause? 4

(c) What are the **three** advantages of multiprocessor systems ? 3

3. (a) What is the purpose of the command interpreter ? Why is it usually separate from the kernel ? 3

(b) Consider a paging system with the page table stored in memory. 4

(i) If a memory reference takes 50 nanoseconds, how long does a paged memory reference take ?

(ii) If we add TLBs, and 75 percent of all page-table references are found in the TLBs, what is the effective memory reference time ? (Assume that finding a page-table entry in the TLBs takes 2 nanoseconds, if the entry is present.)

(c) Explain the difference between internal and external fragmentation. 3

4. (a) Draw a process state diagram and explain the state transitions. 5

(b) Write the shell script to perform the following : 1×5=5

(i) List the details of directories in the current working directory.

(ii) Remove a file interactively.

(iii) Compare two files while listing the unique lines of both the files

(iv) Count the number of users currently logged in the system

(v) Give permission to a file such that only the owner has execute permission

5. (a) Explain the layered approach of the OS structure. What are the advantages and disadvantages of layered approach to system design ? 5

(b) What is a page fault ? How is it handled ? 5

6. (a) What is the role of a dispatcher ? 2

(b) Explain how the following scheduling algorithms favor short processes : 3

(i) FCFS

(ii) RR

(iii) Multilevel feedback Queue

(c) What is the hardware support required for demand paging ? 2

(d) Give three cases where the entire program need not be in memory for execution. 3

7. Suppose the following processes arrive for execution at the time indicated :

Process	Burst Time	Arrival Time
P0	7	0
P1	4	1
P2	2	1
P3	3	3
P4	4	4

(i) Draw Gantt charts illustrating the execution of these processes using FCFS, SJF, RR (time quantum = 3). 3

(ii) What is the turnaround time for process P0, P3 in each of the scheduling algorithms ? 3

(iii) What is the average waiting time for the processes in each of the scheduling algorithms ? 3

(iv) Which algorithm gives minimum average waiting time ? 1

8. (a) Consider a logical address space of 64 pages of 1,024 bytes each, mapped onto a physical memory of 32 frames. 4

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

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

(b) What is degree of multiprogramming ? Which scheduler controls the degree of multiprogramming ? Why ? 3

(c) What is a privileged instruction ? Explain its use with the help of an example. 3

14/12/18

(2)

[This question paper contains 4 printed pages]

Your Roll No. : .....

Sl. No. of Q. Paper : **143** **I**

Unique Paper Code : 42354302

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

Name of the Paper : Algebra

Semester : III

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 any **Two** parts from each question.

(c) **All** questions are compulsory.

(d) **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 a group under matrix multiplication. 6

P.T.O.

(b) (i) Let G be a group such that if a, b, c $\in$ G and ab = ca $\Rightarrow$ b = c, then prove that G is abelian. 3

(ii) Let H={ x$\in \cup$(20) : x $\equiv$ 1 mod3 }.

List all elements of H.

Prove or disprove that H is a subgroup of $\cup$(20). 3

(c) Prove that the intersection of two subgroups of a group is a subgroup but their union is not so. 6

2. (a) Define cyclic group. Prove that every cyclic group is Abelian. Is the converse true ? Justify. 6

(b) Give an example of a non cyclic group all of whose proper subgroups are cyclic. 6

(c) Let $\alpha = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 2 & 1 & 3 & 5 & 4 & 7 & 6 & 8 \end{bmatrix}$

and $\beta = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 1 & 3 & 8 & 7 & 6 & 5 & 2 & 4 \end{bmatrix}$

(i) Write α and β as product of disjoint cycles. 2

(ii) Find o ($\alpha\beta$) and o (α^{-1}) 4

3. (a) Let 'a' be an element of a finite group G. Prove that $a^{o(G)} = e$. 6

(b) Consider the subgroup H = {1, 9} of group G = U(20) under multiplication modulo 20. Find the number of cosets of H in G and determine all the distinct cosets of H in G. 6

(c) Prove that the center Z (G) of a group G is a normal subgroup of G. 6

Unit- II

4. (a) Prove that a non empty subset S of a ring R is a subring of R if and only if

a-b$\in$ s and ab$\in$ S$\forall$ a, b $\in$S. 6.5

(b) Prove that $\mathbb{Q}[\sqrt{2}] = \{a + b\sqrt{2} : a, b \in \mathbb{Q}\}$ is an integral domain. 6.5

(c) (i) Let $\mathbb{Z}$ be the ring of integers and n be a fixed integer.

Show that I = <n> { nx : x $\in \mathbb{Z}$} is an ideal of $\mathbb{Z}$. 3.5

(ii) Give an example of a finite , non commutative ring . 3

Unit- III

5. (a) Determine whether or not the set

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

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

(b) Define the liner span of a subset of a vector space V (F) and prove that the linear span of a set S is a subspace of V(F) containing S. 6.5

(c) Determine whether or not { (1, 3, 2), (2, 0, 1), (1, 1, 1) } from a basis of R^3. 6.5

6. (a) Matrix of a linear transformation T with respect to basis {(1,2), (0,1)} of R^2 is given by $\begin{bmatrix} 2 & 1 \\ -3 & -2 \end{bmatrix}$.

Determine the linear transformation T. 6.5

(b) Let U and V be two finite dimensional vector spaces over F. Let T from U to V be a linear transformation. If $\{u_1, u_2, u_3, \ldots\ldots, u_n\}$ generates U then show that Range space of T is generated by
$\{T(u_1), T(u_2), T(u_3), \ldots\ldots, T(u_n)\}$. 6.5

(c) Find the range, rank, kernel (Null space) and nullity of T where linear transformation $T: R^2 \rightarrow R^3$ is defined by

$T(x, y) = (y, x + 2y, x + y)$. 6.5

5/12/18

(3)

[This question paper contains 4 printed pages]

Your Roll No. : .....

Sl. No. of Q. Paper : **209** **I**

Unique Paper Code : 42234301

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

Name of the Paper : Physiology and Biochemistry

Semester : III

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**, two each from **Section-A** and **Section-B**.

(c) Question **NO.1** is compulsory.

(d) Attempt both sections in same answer sheet.

P.T.O.

1. (a) Define the following terms : $1 \times 5 = 5$

(i) Dead space

(ii) Goitre

(iii) Peristalsis

(iv) K_m

(v) Aminotransferase

(b) Distinguish between the following : $2 \times 4 = 8$

(i) I bands and A bands

(ii) Tricuspid valve and Bicuspid valve

(iii) Transketolase and Transaldolase

(iv) Anabolic pathway and Amphibolic pathway

(c) Expand the following terms : $1 \times 4 = 4$

(i) GFR

(ii) PNS

(iii) LDH

(iv) NADPH

(d) Match the following : $1 \times 5 = 5$

(i) Aldosterone	(a) Axon
(ii) Pyruvate carboxylase	(b) Intestinal juice
(iii) Crypts of Lieberkuhn	(c) Adrenal cortex
(iv) Pentose Phosphate Pathway	(d) Gluconeogenesis
(v) Nodes of Ranvier	(e) Synthesis of Ribose

(e) Give one function of the following : $1 \times 5 = 5$

(i) Fibrinogen

(ii) Sertoli cells

(iii) Semilunar valves

(iv) Flavoproteins

(v) Coenzyme A

Section - A

2. (a) Explain "Sliding filament theory" in muscle contraction with appropriate diagram. 4

(b) Describe the processes involved in urine formation by the kidneys. 8

3. (a) Elaborate on the transport of O_2 and CO_2 in blood. 8

(b) Discuss the process of fat digestion and absorption in the Small intestine. 4

4. Write short notes on any **three** of the following : 4+4+4

(a) Thyroid gland

(b) Conduction of cardiac impulse

(c) Hormonal control of menstrual cycle

(d) Action potential

Section - B

5. Discuss the steps involved in Glycolysis. 12

6. (a) Describe the biosynthesis of Palmitic acid. 8

(b) Briefly explain the process of Oxidative deamination. 4

7. Write short notes on **any three** of the following : 4+4+4

(a) Glycogenolysis

(b) Competitive inhibition

(c) Cori cycle

(d) Lock and Key model

8/12/2018

(4)

[This question paper contains 4 printed pages]

Your Roll No. : .....

Sl. No. of Q. Paper : **210** **I**

Unique Paper Code : 42164301

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

Name of the Paper : Plant Anatomy and Embryology

Semester : III

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, including question number **one** which is **compulsory**.

(c) Draw well-labelled diagrams wherever necessary.

(d) All parts of the questions should be answered together.

1. (a) Fill in the blanks : 1×5=5

(i) Xylem is generally reduced in ..... plants.

(ii) Interfascicular cambium in dicot stem differentiates from cells belonging to .....

P.T.O.

(iii) The microgametophyte of angiosperms is commonly known as ..... .

(iv) In ..... type of embryo sac development, all the cells of embryo sac have the same genetic constitution.

(v) ..... is a fleshy out growth of integument which covers the seed more or less completely and is often considered as an integument.

(b) Give the appropriate term for the following : 1×5=5

(i) Stomata with three unequal subsidiary cells.

(ii) Maturation of male and female parts of a flower at different times.

(iii) Ovule in which micropyle , chalaza and funiculus are in one straight line.

(iv) Root tissue which gives rise to lateral roots.

(v) Tissue generally composed of dead cells with thick secondry walls.

(c) Draw well-labelled diagrams of the following : 2.5×2=5

(i) T. S. *Hydrilla* stem

(ii) T. S. tetrasporangiate anther with amoeboid tapetum and spore tetrads

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

(a) Heart wood

(b) Male germ unit

(c) Polyembryony

(d) Antipodal cells

(e) Root apex

(f) Stomata

3. Differentiate between any **three** of the following : 5×3=15

(a) Anemophily and Entomophily

(b) Tunica Corpus theory and Korper-Kappe theory

(c) Monocot root and monocot stem

(d) Apospory and Diplospory

4. Answer briefly any **five** of the following : 3×5=15

(a) What is the biological significance of seed dispersal phenomenon ? Elaborate on any **one** mechanism of seed dispersal.

(b) What is microgametogenesis ? Describe the process with suitable diagrams.

(c) What are annular growth rings and how are they formed ?

(d) What is the importance of endosperm ? How does nuclear endosperm develop ?

(e) What are the distinguishing features of collenchyma ? Write a note on the types and functions of collenchyma.

(f) What is periderm and how is it formed ?

5. Comment on any **three** of the following : 5×3=15

(a) Egg cell and synergid cells are structurally and functionally different.

(b) Phloem has cells with unique structure.

(c) Tapetum is an important anther wall layer.

(d) Xerophytes possess special anatomical features.

6. Attempt any **three** of the following : 5×3=15

(a) Write a brief account on development of a dicot embryo from a zygote.

(b) Discuss the significance of cross pollination. Write a note on the floral adaptations that favour cross pollination.

(c) With the help of suitable diagrams, describe secondary vascular growth in dicot roots.

(d) Write a detailed note on epidermis.

15/12/2018

(5)

[This question paper contains 7 printed pages]

Your Roll No. : .....

Sl. No. of Q. Paper : **216** **I**

Unique Paper Code : 42174304

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

Name of the Paper : Chemistry-2 (Solution, conductance, Electrochemistry and Functional Group)

Semester : III

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) Use separate answer sheets for **Section - A** and **Section - B**.

(c) Both sections carry equal marks.

(d) Attempt **six** questions in **all, three** questions from each Section.

(e) Log tables can be used for calculations.

P.T.O.

Section – A

Note : Attempt **THREE** questions in **all**. Question No. **1** is compulsory.

1. (a) The resistance of 0.01N NaCl solution at 25°C is 200 Ω. Cell constant of conductivity cell is unity. Calculate the equivalent conductivity. 2.5

(b) Plot the graph for conductometric titration between strong acid and strong base. Explain it also. 2.5

(c) Give Nernst equation for Calomel electrode. 2.5

(d) Define components and phase of system. 2

(e) What is minimum boiling azeotrope ? 2

(f) Define ionic mobility and transport number. 2

2. (a) Calculate the E_{red} of the following electrode. 4

$Pt/Cl_2(1.5\ atm)/\ 2Cl^-\ (0.01M)$

$E°Cl_2\ /2\ Cl^- = 1.36\ V$

(b) How will you calculate the pH of unknown solution using Hydrogen electrode ? 4

(c) Calculate the equilibrium constant for a reaction. 4

$Ni\ (s) + Cu^{2+}\ (aq) \rightarrow Cu(s) + Ni^{2+}\ (aq)$

Given, $E°Ni^{2+}/Ni = -0.25\ V$

$E°Cu^{2+}/Cu = +0.34\ V$

3. (a) Determine the solubility product of sparingly soluble salt using conductometric measurements. 4

(b) Explain Hittorf method to calculate transport number. 4

(c) Given the following molar conductivities at 25°C 4

$HCl=426\ \Omega^{-1}\ cm^2\ mol^{-1}$

$NaCl=126\ \Omega^{-1}\ cm^2\ mol^{-1}$

$NaC(Sodium\ Crotonate)=83\ \Omega^{-1}\ cm^2\ mol^{-1}$

Calculate the degree of dissociation and dissociation constant of crotonic acid.

The conductivity of 0.001 mol dm^{-3} acid solution in $3.83 \times 10^{-5}\ \Omega^{-1}\ cm^{-1}$.

4. Write short note on any **three** :

4, 4, 4

(a) Gibb's Phase Rule

(b) Ideal and Non-Ideal solution

(c) Steam distillation

(d) Critical Solution Temperature (CST) and effect of impurity on CST.

Section - B

Note : Attempt **THREE** questions in **all**. Question No. **1** is compulsory.

5. (i) Give the preparation of glycine using Streckers synthesis. 2

(ii) Giving suitable explanation, arrange the following in increasing order of their reactivity with phenol :

acetyl chloride, acetamide, methyl acetate

2

(iii) What is meant by isoelectric point with reference to amino acids ? 2

(iv) How will you distinguish between ethyl amine and aniline using HNO_2? Give the chemistry involved. 2.5

(v) What are polysaccharides ? What is the structural difference between starch and cellulose ? 2.5

(vi) A tetrapeptide on partial hydrolysis gave following dipeptides. Determine the structure and name of the tetrapeptide by overlapping method. 2.5

Ala–Gly + Gly–Val + Leu–Ala

6. (i) What happens when methyl α -D- glycoside is oxidized with periodic acid and the resultant compound is treated with bromine water, followed by hydrolysis with dilute acids ? What conclusion is drawn from these reactions regarding structure of D-(+) glucose. 4

(ii) What is mutarotation ? Explain taking the example of D-(+)glucose. 4

(iii) How can D-aldopentose be converted into D-aldohexose ? Give name of reaction involved. 4

7. (i) Explain the method used for determining the N & C-terminal amino acid present in a peptide. 4

(ii) Synthesize dipeptide ala-val by using t-BOC & DCC. Give the name and structure of protecting & activating groups. 4

(iii) Explain the formation of violet colour when amino acid reacts with ninhydrin. 4

8. (i) Convert : 2.5, 1.5

(a) Phenylacetic acid to benzylamine

(b) Aniline into p-bromoanilne

(ii) An aliphatic amine with molecular formula C_2H_5N exists in 2 isomeric forms 'A' and 'B'. When warmed with chloroform and KOH only 'A' reacts producing a foul smell. What are the structure and name of 'A' and 'B' ? Write name of reaction and chemical equation involved in it. Also predict which would behave as stronger base- 'A' or 'B' ? 4

(iii) Give a brief description, reaction and example of any **one** of the following : 4

(a) Perkin condensation

(b) Claisen condensation

(6) 13-12-15

[This question paper contains 3 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 217 **IC**

Unique Paper Code : 42174303

Name of the Paper : Inorganic Materials

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

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) Why it is necessary to add a retardant in cement? Give an example.

(b) What do you understand by glazing of ceramic ware? What is the importance of glazing?

(c) Why borosilicate glasses are preferred in chemical laboratories?

(d) Write different constituents of paint.

(e) Differentiate between primary and secondary batteries with suitable examples.

(f) What are the characteristics of a good catalyst?

(g) What is heat retardant paint? (5×3)

2. (a) Differentiate between wet and dry process for the manufacture of cement.

(b) Discuss the characteristics and applications of (i) Soda lime glass (ii) Photosensitive glass

(c) What is glassy state? Give its properties. (3×4)

3. (a) Write a short note on hardening and setting of cement.

(b) What is feldspar? Give their classification and uses.

(c) What do you understand by solid state battery? Give an example. (3×4)

4. (a) What are mixed fertilizers? Briefly explain about advantages and disadvantages of mixed fertilizers.

(b) Explain the manufacture of potassium 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 electroless plating. How it is beneficial over electroplating?

(c) What is pigment? What are the main functions of pigment? (3×4)

6. (a) Write the steps involved in the manufacture of steel.

(b) What property is imparted by carbon in steel? What are the various properties of steel that can be improved by adding nickel and cobalt in steel?

(c) What are alloys and how they are classified? (3×4)

7. (a) Write the manufacture of lead azide.

(b) Define poison and inhibitor.

(c) Differentiate between homogeneous and heterogeneous catalyst. (3×4)

8. Write short notes on (any three)

(a) Fullerenes

(b) Rocket Propellants

(c) Phase Transfer Catalyst

(d) Li-ion Battery (3×4)

(e) Superphosphates

SET-1

(1)

B.Sc. (Prog.) Industrial Chemistry – III Semester

~~Paper-106~~ Biochemistry and Environmental Chemistry

CHHT-514

Unique Paper code : 217365

Duration: 3 Hours
Maximum Marks: 75

Section A- Biochemistry

Attempt all four questions in this section.
Maximum Marks: 38

Q1. Answer the following questions: (2x4)

a) What is glycolysis?
b) Give the steps involved in the conversion of glucose to glyceraldehyde-3-phosphate during glycolysis.
c) Complete loss of alpha helical conformation take place, when a protein is dissolved in acidic solution. Explain.
d) Write a short note on DNA polymerase in replication of DNA.

Q2 Write short note on any four of the following: (2x4)

a) Protein synthesis.
b) Translation
c) β-pleated sheets
d) Mechanism of enzyme action
e) Phospholipids

Q3. Differentiate between the following: (2.5x4)

a) Nucleoside and nucleotide
b) Give the structure of 1-β-deoxyribofuranosylthymine. What is it commonly called?
c) Reversible and irreversible inhibition
d) Fibrous and globular protein

Q4. Answer any four following: (3x4)

a) Explain Kreb's cycle.
b) Explain how the activity of enzyme can be controlled?
c) How will you differentiate the secondary structure of protein from tertiary structure of protein?
d) Give the classification of enzymes with suitable examples.
e) Give the synthesis of cholesterol.

Section B- Environmental Chemistry

Attempt all four questions in this section.

Maximum Marks: 37

Q1. Answer the following: (3x3)

a) What is the importance of DO in water?

b) What are the pollution problems associate with disposal of sludge and effluent water?

c) Compare the nuclear energy to fossils fuel energy sources?

Q2. Differentiate between the following: (3x2)

a) Primary and secondary pollutants

b) Photochemical smog and reducing smog

Q3. Answer any four of the following: (2.5x4)

a) Briefly discuss different categories of chemical pesticides.

b) How are different forms of coal graded with reference to energy generation?

c) Derive chemical formula for CFC-115.

d) Draw a complete labelled self explanatory diagram a thermally satisfied tropical lake.

e) How chlorine deplete the ozone layer? Explain with mechanism.

Q4. Answer the following: (4x3)

a) What are the effects of municipal solid waste management? State the measures recommended for proper management of solid waste.

b) Discuss the methods to dispose-off the nuclear waste effectively.

c) With the help of labelled diagram, explain the biogeochemical cycle of carbon.

(This paper contains 2 printed pages)

Sr.No. of question paper © 1509 (2)

Your Roll No. 14TH DEC. 2018

Unique paper code: 216/223/151

Name of the Course: B.Sc.(P)/ B.Sc. (H) I

Name of the paper: Introduction to Biology LSPT-101

Semester-I / 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. Attempt five questions in all including Question No.1 which is compulsory.

1. (i) Define (any 5) 1X5=5 marks
   a) Phylogeny
   b) Codon
   c) Atherosclerosis
   d) Derived lipids
   e) Saponification number
   f) Central dogma

(ii) Give one word answer for the following 1X5 = 5 marks

a) Sugar present in milk.
b) Disease caused due to deposition of fat in blood vessels.
c) Bond between nucleotides in DNA.
d) Molecules that are mirror images of each other.
e) Tentative answer to a well-framed question.

(iii) Match the following 1X5=5marks

Nucleotide	Protein degradation
Sanger	Heredity
Collagen	DNA
Gene	Energy
ATP	Connective tissue

2. Differentiate between (any 5): 3X5=15 marks
   i. Fibrous and globular proteins
   ii. Saturated and Unsaturated fatty acids
   iii. Replication and Transcription
   iv. Starch and cellulose
   v. Primary and secondary structure of proteins
   vi. Macronutrients and Micronutrients

3. Write short notes on (any 5) 3X5=15 marks
   a. Phospholipids
   b. Speciation
   c. Enantiomers
   d. Mass extinction
   e. Ecosystem
   f. Fossils

4. (a) Briefly describe the key features of the Darwin's theory of Natural selection. 8marks
   (b) Describe the role of mass extinction and adaptive radiation in changing life on earth.7marks

5. (a) What are model organisms? Briefly explain any two model organisms widely used in biological research. 8marks
   (b) Discuss the main features of the domain Archaea. 7marks

6. (a) Mention different types of carbohydrates with suitable examples and the function of each. 10marks
   (b) What is the importance of weak bonds in biological macromolecules? 5marks

7. (a) Discuss the key events involved in the conversion of glucose to pyruvate in glycolytic pathway. Also mention the enzymes involved at each step. 10marks
   (b) Draw a well labeled diagram of a typical eukaryotic cell. 5marks

(3)

Sl. No. of Q.P. : 1512

Unique Paper Code: 235366

Name of Paper : MAPT-303, Algebra

Name of Course : B.Sc. Appl Phy Sci - Analytical Chemistry

B.Sc. Appl Phy Sci - Industrial Chemistry

B.Sc. Mathematical Sci

B.Sc. Phy Sci

Semester : III

Duration : 3 Hours

Maximum Marks : 75 Marks

Instructions for Candidates

Attempt any two parts from each question.

All questions are compulsory.

Marks are indicated.

Q1(a) Show that the set $\{5, 15, 25, 35\}$ is a group under multiplication modulo 40. What is the identity element of this group? 6

(b) Find the inverse of the element $\begin{bmatrix} 4 & 5 \\ 6 & 3 \end{bmatrix}$ in $GL(2, \mathbb{Z}_7)$. 6

(c) Prove that the set of all 2x2 matrices with entries from $\mathbb{R}$ and having non zero determinant, is a group under matrix multiplication. Is it Abelian? Explain. 6

Q2(a) Prove that the center of a group G is a subgroup of G. 6

(b) Let G be a group. Prove that

(i) $(ab)^{-1} = b^{-1}a^{-1}$ $\forall a, b \in G$

(ii) If $(ab)^2 = a^2b^2$ $\forall a, b \in G$, then G is Abelian. 6

(c) Define an even and an odd permutation. Determine whether the following permutations are even or odd:

(i) $\sigma = (1\,3\,5\,6\,7)$

(ii) $\gamma = (1\,2)(1\,3\,4)(1\,5\,2)$

(iii) $\beta = (1\,2\,4\,3)(3\,5\,2\,1)$ 6

Q3(a)(i) State Lagrange's theorem for groups.

(ii) Prove that a group of prime order is cyclic. 6

(b) Let $H = \left\{\begin{bmatrix} a & b \\ 0 & d \end{bmatrix} : a, b, d \in \mathbb{R},\ ad \neq 0\right\}$. Show that H is a subgroup of $GL(2, \mathbb{R})$. Is H a normal subgroup of $GL(2, \mathbb{R})$? 6

(c)(i) Define a cyclic group.

(ii) Give an example of a non-cyclic group, all of whose proper subgroups are cyclic. 6

Q4(a) Let $S = \{a + bi : a, b \in \mathbb{Z}, b \text{ is even}\}$. Show that S is a subring of the ring, $\mathbb{Z}[i]$, of Gaussian integers, but not an ideal of $\mathbb{Z}[i]$. $6\frac{1}{2}$

(b) Let R be a commutative ring. Prove that R is free from zero divisors iff $ab = ac$ implies $b = c$, where $a, b, c \in R$ & $a \neq 0$. $6\frac{1}{2}$

(c) Prove that the intersection of any set of ideals of a ring is an ideal. What about union?

$6\frac{1}{2}$

Q5(a) If $\beta = \{v_1, v_2, \ldots, v_n\}$ is a linear independent subset of a vector space $V(F)$. Prove that some superset of β is a basis of V.

$6\frac{1}{2}$

(b) Let $V = \mathbb{R}^3$ and $W = \{(a, b, c) \in V : a = 2b + 3c \text{ and } a, b, c \in \mathbb{R}\}$. Is W a subspace of V?. If so, what is its dimension ?

$6\frac{1}{2}$

(c) Let $V = \left\{\begin{bmatrix} a & b \\ b & c \end{bmatrix} : a, b, c \in \mathbb{Q}\right\}$. Prove that V is a vector space over $\mathbb{Q}$. Find a basis for V over $\mathbb{Q}$.

$6\frac{1}{2}$

Q6(a) Which of the following maps $T: \mathbb{R}^2 \to \mathbb{R}^2$ are linear transformations?

(i) $T(x_1, x_2) = (x_1,\ 1 + x_2)$

(ii) $T(x_1, x_2) = (0,\ x_2 - x_1)$.

$6\frac{1}{2}$

(b) Let $T: \mathbb{R}^2 \to \mathbb{R}^2$ be a linear transformation defined by

$$T(x, y, z) = (x + y,\ y + z) \quad \forall \quad x, y, z \in \mathbb{R}.$$

Find the range, rank, kernel and nullity of T.

$6\frac{1}{2}$

(c) Let T be a linear operator on a finite dimensional vector space V. Show that T is invertible if and only if T is surjective.

$6\frac{1}{2}$

Sl. No of Question Paper : 1516 1516

Unique Paper Code : 222363

Name of the Paper : Waves & Optics

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

Semester : III

I

(4)

Time: 3 Hrs

Attempt any 5 questions M. Marks 75

1. (a) State the Superposition Principle and prove that it is valid only for systems with linear homogeneous differential equations of motion of second order. 6

(b) What are beats? How many beats per second are produced by two tuning forks of frequencies 266 & 261 Hz when sounded together? 3

(c) Obtain 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 phase differing by $\pi/4$. 6

2. (a) Establish the equation of motion of a forced harmonic oscillator. Solve this equation to obtain the amplitude of steady state oscillations. 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) Two identical simple pendulums of same mass 'm' and length 'l' are coupled by a linear spring of force constant 'k'. Obtain normal co-ordinates, normal modes and normal mode configurations. 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 give the necessary theory. How would you use Newton's rings to measure wavelength of light? 10

lens being 10 cm and wavelength of the light used is 589 nm.

6. (a) Discuss the intensity distribution of Fraunhoffer diffraction pattern obtained with a narrow slit illuminated by a parallel beam of monochromatic light. 10

(b) Light of wavelength 6000A° is incident on a slit of width 0.30 mm. The screen is placed at a distance of 2m 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) What is double refraction and how is it used to obtain polarised light? 5

(b) What are the conditions required to obtain a sustained interference pattern? 4

(c) Derive an expression for resolving power of a grating. 6

Sl. No of Question Paper : 1519

Unique Paper Code : 223355

Name of the Paper : Introduction to Medical I

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

Semester : III (5)

M.M. 37.5

Attempt any five (question number one is compulsory).

1. Define 1x5=5

   Clotting time

   Packed cell volume

   NIDDM

   Leukaemia

   Antigen

2. Differentiate between 2.5x4=10

   DLC and TLC

   MRI and CT scan

   Hepatitis A and Hepatitis B

   Benign and malignant tumor

3. Describe the cause, symptoms, treatment and management of tuberculosis. 7.5

4. Describe the importance of Erythrocyte Sedimentation Rate (ESR) in diagnosis of diseases. 7.5

5. Describe the different types of Diabetes mellitus and its management. 7.5

6. What are the different types of cancer? Describe the various treatments available for the disease. 7.5

7. Write short note (any three): 2.5x3=7.5

   Leishman's Stain

   Polycythemia

   METASTASIS

   Hematouria

   Hypertension

[This question paper contains 2 printed pages.]

Your Roll No. 13TH DEC. 2018

Sr. No. of Question Paper : ~~508~~ 1521

Unique Paper Code : 217363

Name of the Paper : ICP1-303- Industrial Chemistry-III (Inorganic Materials)

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

Semester : III

Duration: 3 Hours

Maximum Marks: 75 Marks

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) What do you understand by glazing of ceramic ware? What is the importance of glazing?
(b) Why borosilicate glasses are preferred in chemical laboratories?
(c) Why it is necessary to add a retardant in cement? Give an example.
(d) Differentiate between silicate and non-silicate glasses.
(e) Write different constituents of paint.
(f) What do you understand by phase transfer catalyst and explain with example?
(g) What do you mean by pickling in coating of metal surfaces? What are the advantages of this process? (5 × 3)

2. (a) Differentiate between wet and dry process for the manufacture of cement.
(b) Discuss the characteristics and applications of
(i) Soda lime glass (ii) Safety glass.
(c) Describe properties of ceramics. Write different uses of ceramics. (3 × 4)

3. (a) What is the drawback of ammonium nitrate fertilizer? Outline the safety measures to be followed during its storage and packing.
(b) 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.
(c) What do you understand by solid state battery? Give an example. (3 × 4)

4. (a) What is the difference between ammonium polyphosphate and super phosphate?
(b) Why the coating of surfaces are necessary?
(c) What are the essential requirements of a good fertilizer? (3 × 4)

5. (a) Write the requisites of a good paint.
(b) Distinguish between physical vapor deposition and chemical vapor deposition.
(c) What are the additives in an emulsion paint formulation which prevent excessive foam formation during manufacturing? (3 × 4)

6. (a) Explain the steps involved in the manufacture of steel.
(b) Differentiate between ferrous and non-ferrous alloys.

(c) What are alloys and how they are classified? 3 x 4

7. (a) Discuss one method to determine the power of an explosive. 3 x 4
(b) Define poison and inhibitor.
(c) Differentiate between homogeneous and heterogeneous catalyst.

8. Write short notes on (any ***three***) 3 x 4
   a) Carbon Nanotubes
   b) Phase Transfer Catalyst
   c) Fullerenes
   d) Lead acid Battery
   e) TNT

SET B

Unique Paper Code : 217361

Name of the Paper : CHPT-303 (Solutions, Conductance, Electrochemistry and Functional Group Organic Chemistry-II)

Name of the course : B.Sc. ~~Life Sc./ Phy Sc./ Industrial Chem./Analytical Chem.~~

Semester : III

Duration : 3 Hours

Maximum marks : 75

Instructions for Candidate

1. Write your roll number on the top immediately on receipt of this question paper.
2. Answer six questions in all, three questions from each section.
3. Use of scientific calculator is allowed.
4. Use separate answer sheets for Section A and Section B.

SECTION A

Attempt 3 questions in all.
Question No. 1 is compulsory.
All questions carry equal marks.

1. Attempt any *five* questions:

(a) For a one component system, differentiate between melting point and triple point.

(b) Explain why, conductivity decreases while molar conductivity increases with dilution?

(c) Distinguish between a reversible and an irreversible cell.

(d) Azeotropic mixtures cannot be separated into pure components by simple distillation. Explain

(e) State and Explain Nernst distribution law.

(f) Write the cell reaction for the following cell at 25°C.

$$Mg(s)\left|MgI_2(aq)\right|I_2(s)\left|Pt\right.$$

(g) How does ionic velocity differ from ionic mobility?

(h) During thermal analysis the cooling curve of a eutectic mixture has no break point. Explain.

(2½ X 5 = 12½)

2. (a) Draw and explain the significant features of phase diagram of water.

(b) Phenol and water form partially miscible pair of liquids. What will be your observations on:

(i) Number of phases

(ii) Degrees of freedom

(iii) Composition of each phase

(iv) Quantities of layers if there is a phase separation as phenol is progressively added to a definite quantity of water at constant temperature below CST.

(c) Derive ΔG_{mix} and ΔS_{mix} for the formation of ideal binary solution.

(4, 4½, 4)

3. (a) What do you mean by transference number? Can it be positive, negative or zero? Explain why transference number of chloride ion in NaCl solution is greater than its value in HCl solution.

(b) At 25°C, the λ_m° values for Ag^+ and Cl^- ions are 61.92×10^{-4} and 76.34×10^{-4} S m^2 mol^{-1}, respectively and the specific conductance of water itself is 2.28×10^{-4} S m^{-1}. Assuming that Λ_m differs very slightly from Λ_m°, calculate the solubility product of AgCl at 25°C.

(c) In one component phase diagram, the slope dP/dT for solid-vapour transition is always greater than that of liquid-vapour transition. Give reasons.

(4½, 4, 4)

4. (a) What do you mean by reference electrodes? Describe the Standard Hydrogen electrode. What are its limitations associated with the use of Standard Hydrogen Electrode?

(b) The emf of the Standard Westson cell shown below is 1.0185 volt at 25°C.

$Cd(Hg), CdSO_4.8/3H_2O(s) | CdSO_4(sat.), Hg_2SO_4(s), Hg$ in which the cell reaction is

$$Cd(Hg) + Hg_2SO_4(s) + 8/3H_2O(l) \rightleftharpoons CdSO_4.8/3H_2O(s) + 2Hg(l)$$

Calculate the free energy change (ΔG), enthalpy change (ΔH) and entropy change (ΔS) of the cell reaction if $(\partial E/\partial T)_p$ for the cell is 5.00×10^{-5} V K^{-1}.

(c) Derive an expression for the Gibbs phase rule and define the terms used in the final expression.

(4½, 4, 4)

5. Write short note on the following:
   (a) Indicator electodes
   (b) Conductometric titrations
   (c) Steam distillation or Congruent melting system

(4½, 4, 4)

SECTION B

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

6. (a) Explain the basic difference in the structure of amylase and amylopectin.

(b) Draw the Haworth projection for: β-D-glucopyranose and α-D-fructofuranose.

(c) Glucose and fructose on reaction with excess of phenylhydrazine give same osazone. Justify the statement.

(d) What happens when an aqueous solution of D-glucose is kept for some time? Name the phenomenon and discuss the mechanism involved.

(4, 2, 3. 3½)

7. (a) Write reactions to differentiate between ketonic and acidic hydrolysis of ethyl acetoacetate?

(b) From ethylacetoacetate, how will you prepare the following:

(i) Hexanoic acid

(ii) 2- Butanone

(c) Write mechanism for the preparation of ethylacetoacetate using Claisen condensation.

(d) What do you mean by active methylene compounds? Give suitable example.

(3, 5, 3, 1½)

8. (a) Outline the chemistry of Hinsberg test?

(b) Predict the structure of products A to E in the following reactions:

(i) $C_6H_5NH_2 + C_6H_5COCl \xrightarrow{NaOH} A$

(ii) $CH_3NH_2 \xrightarrow{CHCl_3/KOH} B$

(iii) $(CH_3)_2NCH_2CH_2CH_3 \xrightarrow{CH_3CH_2Cl} C \xrightarrow{NaOH/Br} D \text{ (major)} + E \text{ (minor)}$

(c) Compare the basicity of ethylamine and aniline.

(d) How will you convert benzene diazonium chloride into azo dye?

(3, 5, 2½, 2)

9. (a) Arrange the following esters in decreasing order of reactivity towards alkaline hydrolysis and give suitable explanation:
CH_3COOCH_3, $CH_3COOC_2H_5$, $CH_3COOCH(CH_3)_2$, $CH_3COOC(CH_3)_3$

(b) How can you prepare carboxylic acid by alkaline hydrolysis of esters? Why it is preferred over acidic hydrolysis?

(c) Write short note on the following:
(i) Reformatsky Reaction
(ii) Perkin condensation

(d) Explain with mechanism Hell-Volhard-Zelinsky reaction and give its synthetic applications.

(2, 3, 4, 3½)