(21)

[This question paper contains 6 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 6805 **HC**

Unique Paper Code : 42344403

Name of the Paper : Computer System Architecture

Name of the Course : **B.Sc. (Prog.) / Mathematical 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. Question No. **1** is compulsory.
3. Attempt any **5** of Question Nos. **2** to **8.**
4. Parts of a question must be answered together.

1. (a) How many 128 words x 8 bits per word RAM chips are needed to provide a memory capacity of 4096 words x 16 bits per word? (2)

(b) Differentiate between Combinational Circuit and Sequential Circuit. (2)

(c) Convert the binary number 11011000111 in octal and hexadecimal. (2)

(d) How many address lines and input-output data lines are needed for 2K words x 16 bits per word? (2)

(e) Write micro-operations for the following memory reference instructions :

(i) ADD to AC

(ii) LDA: Load to AC (2×2=4)

(f) Convert the following numbers to the indicated base :

(i) $(110110100)_2$ to $(\ldots\ldots\ldots\ldots)_{10}$

(ii) $(7562)_{10}$ to $(\ldots\ldots\ldots)_8$ (2×2=4)

(g) Give characteristic tables of SR and JK flip-flop. (3)

(h) Simplify the following expressions using Boolean algebra.

(i) AB + A(CD+CD′)

(ii) A′BC + AC (2×3=6)

2. (a) A computer uses a memory unit with 256K words of 32 bits each. A binary instruction code is stored in one word of memory. The instruction has 4 parts: an indirect bit, an operation code, a register code part to specify one of 64 registers and an address part.

(i) How many bits are there in the operation code, the register code part and address part?

(ii) Draw the instruction word format and indicate the number of bits in each part.

(iii) How many bits are there in the data and address inputs of the memory. (3+2+2=7)

(b) Write a short note on Input-Output interface. (3)

3. (a) Define half adder. Illustrate the same with the help of its truth table and logic diagram. Also write Boolean expressions for carry and sum. (6)

(b) The content of the registers are as follows –

Register A (before operation)	1010
Register B (logic operand)	1100

Perform the following operations on the contents of A using the contents of B-

(i) Selective Complement

(ii) Selective Clear (4)

4. (a) Write short notes on the following :–

(i) Addressing modes

(ii) Types of ROM (3+3=6)

(b) Explain Direct Memory Access (DMA) with the help of a block diagram. (4)

5. (a) Draw the block diagram of 3x8 decoder using 2x4 decoders. Also explain its working. (4)

(b) Perform the arithmetic operations (+70) + (–80) and (–70) – (–80) in binary using signed 2's complement representation for negative numbers. (3+3=6)

6. (a) Write a program to evaluate the arithmetic statement :

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

using two and three address instructions. Use the symbols ADD, SUB, MUL for arithmetic operations and MOV for the transfer-type operation. Assume that memory operands are in memory addresses A, B, C and D and the result must be stored in memory address X. (3+3=6)

(b) Represent the following conditional control statement by two register transfer statements with two control functions :

If (P=1) Then ($R_1 \leftarrow R_2$) Else if (Q=1) Then ($R_1 \leftarrow R_2$) (4)

7. (a) Differentiate between direct and indirect address instructions with the help of an example? How many references to memory are needed for each type of instruction to bring an operand into a processor register? (4+2=6)

(b) Show the value of all bits of a 12-bit register that holds the number equivalent to decimal 215 in –

(i) Binary

(ii) BCD (4)

8. (a) List phases of the instruction cycle. Draw flowchart of the instruction cycle without interrupt. (5)

(b) Simplify the following Boolean function $F(x,y,z) = \Sigma(3,5,6,7)$ using three-variable K-Map. (5)

[This question paper contains 4 printed pages.]

(92)

Your Roll No.....

Sr. No. of Question Paper : 6807 HC

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.
3. Attempt any **two** parts from each question.

1. (a) State and prove Archimedean property of real numbers.

   (b) Find Supremum of the following sets :

   (i) $\{x \in R \mid 1 < x < 2\}$,

   (ii) $\left\{1 - \frac{1}{n}, n \in N\right\}$,

P.T.O.

(iii) $\left\{\frac{1}{n}+\frac{1}{m}, n, m \in N\right\}$.

(c) Show that a countable union of countable sets is countable. Deduce that the set $N \times N$ is countable. (6,6)

2. (a) State the Bolzano Weierstrass theorem for sets. Show that the hypotheses of the theorem cannot be relaxed. Justify your answer.

(b) If (x_n) is a sequence such that $x_n \geq 0 \ \forall \ n$ and (x_n) converges to x then show that $x \geq 0$.

(c) Show that $\lim_{n\to\infty} n^{1/n} = 1$. (6,6)

3. (a) Show that the sequence (a_n), where $a_n = \left(1+\frac{1}{n}\right)^n$ converges and $\lim_{n\to\infty} a_n$ lies between 2 and 3.

(b) State Cauchy's Convergence Criterion for sequences and hence show that the sequence (S_n), where $S_n = 1+\frac{1}{3}+\frac{1}{5}+\cdots\cdots+\frac{1}{2n-1}$ does not converge.

(c) Let $\sum_{n=1}^{\infty} u_n$ be a positive term series such that $\lim_{n\to\infty} \frac{u_{n+1}}{u_n} = L$, 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) Test the convergence of the following series :

(i) $\sum_{n=1}^{\infty} \sqrt{\frac{n}{n+1}}$

(ii) $\sum_{n=1}^{\infty} \cos\left(\frac{1}{n^2}\right)$

(iii) $\frac{1}{1.2}+\frac{1}{2.3}+\frac{1}{3.4}+\cdots\cdots$

(b) State Cauchy's nth Root Test for an infinite positive term series and hence test the convergence of the series $\sum_{n=1}^{\infty} \frac{(n+1)^n x^n}{n^{n+1}}$, $x > 0$.

(c) Define absolute convergence and conditional convergence for an infinite series. Prove that absolute convergence implies convergence but the converse is not true. (6½,6½)

5. (a) State the Weierstrass M-test for the convergence of a series of functions and hence test the convergence of the series $\sum_{n=1}^{\infty} r^n \text{Cos}(nx)$, $0 < r < 1$ for every real x.

(b) Show that the sequence (f_n) of functions, where $f_n(x) = x^n$, is uniformly convergent on $[0, k]$, $k < 1$ and only pointwise convergent on $[0, 1]$.

(c) Define Exponential function E(x) and Cosine function C(x) in terms of a power series. Find the domain of convergence of the respective power series.

(6½,6½)

6. (a) Show that a constant function k is integrable and $\int_a^b k\,dx = k\,(b - a)$.

(b) Show that if a function f defined on [a, b] is monotonic, then it is integrable on [a, b].

(c) Let f be a bounded real function defined on [a, b]. Let P be any partition of [a, b]. Define the upper and lower sum of f over P and show that

$$m\,(b\text{-}a) \leq L\,(P, f) \leq U(P, f) \leq M\,(b\text{-}a),$$

where M and m are bounds of f over [a, b]. (6,6)

(93)

[This question paper contains 4 printed pages.]

Your Roll No. 11/5/18

Sr. No. of Question Paper : 6927 **HC**

Unique Paper Code : 42224412

Name of the Paper : Waves and Optics

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. Question Number **1** is compulsory.

1. Attempt any **FIVE** parts from the following :

   (a) Calculate the minimum intensity of audibility in watt per sq.cm. for a note of 1000 c.p.s. If the amplitude of vibration is 10^{-9} cm. Assume the density of air = 0.0013 gm/c.c and velocity of sound = 340 m/sec.

P.T.O.

(b) If the phase velocity is given by, $v_p = \left(\frac{2\pi S}{\rho\lambda}\right)^{1/2}$ (Here, S and ρ are constant), then find the expression of group velocity.

(c) Give three differences between travelling waves and stationary waves.

(d) What is meant by the term reverberation?

(e) What do you understand by wave front?

(f) Name one experiment each, which is based on division of wave front and division of amplitude.

(g) What is the highest order spectrum which may be seen with monochromatic light of wavelength 5000 A° by means of diffraction grating with 5000 lines/cm.

(h) Write two conditions for observing a sustained interference pattern. (5×3)

2. (a) What are Lissajous Figures? For the cases mentioned below, give the graphical or analytical representation of the Lissajous Figures (with direction) for the motion of a particle which is subjected to two perpendicular simple harmonic motions given by,

$$x = 3\cos(\omega t)$$
$$y = 2\cos(2\omega t + \alpha)$$

Case (i) $\alpha = 0$

Case (ii) $\alpha = \pi/2$

(b) Prove that the principle of superposition holds for linear homogenous differential equation of ruler two. (10+5)

3. (a) Derive the expression for the differential equation of transverse vibrations of a uniform flexible stretched string fixed at the ends, $x = 0$ and $x = l$. Also find the expression for the velocity of transverse waves.

(b) Draw the shapes of first two modes of a stretched string. (11,4)

4. (a) Explain plane polarized, circularly polarized and elliptically polarized light? How can we analyze circularly polarized light?

(b) Derive an expression for the intensity of sound wave travelling in still air. (10,5)

5. (a) Describe briefly the construction of Michelson's interferometer. How it can be used to measure the (i) wavelength of a monochromatic light and (ii) refractive index of a thin transparent sheet.

(b) Show the formation of interference fringes due to Fresnel's biprism with the help of diagram. (12,3)

6. (a) Derive the expression for intensity distribution in case of Fraunhofer diffraction due to single slit.

(b) Find the positions of secondary minima and secondary maxima. (10,5)

7. What is zone plate and how is it made? Explain how a zone plate acts like a convergent lens having multiple foci. Derive an expression for its focal length. (15)

8. (a) Derive the expression for diameter of the Newton's ring pattern for reflected mode. How would you use Newton's rings to measure the wavelength of light?

(b) In Newton's ring experiment, the diameter of 10^{th} bright ring changes from 1.50 cm to1.25 cm when a liquid is introduced between the plate and the lens. Calculate the refractive index of the liquid. (12,3)

(29)

[This question paper contains 6 printed pages.]

18/5/18

Your Roll No.....

Sr. No. of Question Paper : 6928

Unique Paper Code : 42234406

Name of the Paper : Genetics and Evolutionary Biology

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 **both** the sections i.e. **Section A** and **B** on separate sheets.

SECTION A – GENETICS

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

1. (i) Define the following **(any five)** : (5)

   (a) Gynandromorphs

   (b) Suppressor mutation

P.T.O.

(c) Heterogametic sex

(d) Incomplete dominance

(e) Non-disjunction

(f) Reciprocal translocation

(ii) Differentiate between the following **(any three)** : (6)

(a) Pleiotropy and epistasis

(b) Heterochromatin and euchromatin

(c) Maternal effect and maternal inheritance

(d) Missense and nonsense mutation

(iii) Justify the following statements : (3)

(a) Recombination frequency can never exceed 50%.

(b) The frequency of haemophilia in males is much greater than in females.

(c) Even without any gain or loss of genetic material, inversions and translocations can still have profound effects.

2. (a) The data obtained from a three factor test-cross is as follows :

Genotype	Number of progeny
ABC/ abc	370
abc/ abc	385
Abc/ abc	45
aBC/ abc	50
ABc/ abc	2
abC/ abc	3
AbC/ abc	75
aBc/ abc	70

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) Describe somatic cell genetics in relation to mapping. (4)

3. (a) Describe Mendelian principles of inheritance. (4)

(b) Mendel crossed peas having round green seeds with peas having wrinkled yellow seeds. All F1 plants had seeds that were round and yellow. Predict the results of testcrossing these F1 plants. (4)

(c) Discuss dosage compensation in mammals. (4)

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

(a) Aneuploidies in humans

(b) Multiple alleles

(c) Sex determination in *Drosophila*

(d) Gene interactions

(e) Induced mutations

SECTION – B
EVOLUTIONARY BIOLOGY

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

1. (i) Define the following **(any five)** : (5)

(a) Frame-shift mutations

(b) Ethological isolation

(c) Biogeny

(d) Endosymbiotic theory

(e) Coprolites

(f) Subspecies

(ii) Distinguish between : (4)

(a) Autopolyploidy and allopolyploidy

(b) Stabilizing and disruptive selection

(iii) Fill in the blanks : (4)

(a) Book written by Lamarck is .....

(b) Increasing milk yield in cattle through artificial selection procedure is an example of .....

(c) ..... represents first grazer in the phylogeny of horse.

(d) Great dying is the common name of the .....

2. Describe Darwin's concept of Natural Selection. What were the main limitations of this concept? How was the concept later modified to overcome these limitations? (12)

3. (a) What are the causes of mass extinctions? Name five major mass extinction events.

(b) What are the various methods of dating fossils?

(8,4)

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

(4,4,4)

(a) Biological species concept

(b) Chemogeny

(c) Darwin's finches

(d) Post-mating isolating mechanisms

(e) Industrial melanism

(25)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 6929

Unique Paper Code : 42164401

Name of the Paper : Plant Physiology and Metabolism

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, Question No. **1** which is compulsory.
3. Draw well-labeled diagrams wherever necessary.

1. (a) Fill in the blanks. Attempt **any five** of the following : (1×5=5)

   (i) The reaction centre of PS I is _____ .

   (ii) Nickel is the component of the enzyme _____ .

   (iii) In a _____ mechanism two solutes are transported simultaneously across the membrane.

P.T.O.

(iv) The obstruction of a xylem element because of a gas bubble is referred to as _____.

(v) The water potential of pure water is _____.

(vi) Dinitrogenase has_____ components.

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

(i) Antenna molecules

(ii) Active site

(iii) Q_{10}

(iv) Sink

(v) Vernalization

(vi) Transamination

(c) Match the following : (1×5=5)

(i) Apoenzyme	a. Inner mitochondrial membrane
(ii) Photorespiration	b. Fruit ripening
(iii) Succinic dehydrogenase	c. Protein
(iv) Ethylene	d. Cytochrome
(v) Electron carrier	e. Peroxisome

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

(a) Essential elements and their role in plants

(b) Phloem loading

(c) Respiratory Quotient

(d) Phytochrome

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

(a) C_3 and C_4 plants

(b) Short-day and long-day plants

(c) Channels and carriers

(d) Water potential and solute potential

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

(a) Discuss the ion theory to explain stomatal movements.

(b) Schematically represent the Krebs cycle.

(c) Discuss the effect of temperature and pH on enzyme activity.

(d) Write an account on root pressure theory.

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

(a) Describe the fate of nitrate absorbed by plants.

(b) Describe the pathways for the movement of water in the root up to the xylem.

(c) Using a diagram explain the light reaction of photosynthesis.

(d) Discuss the cohesion-tension theory to explain the ascent of sap.

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

(a) Discuss the mechanism of ATP synthesis by ATP synthase.

(b) Describe the technique of hydroponics.

(c) Write an account on Munch's mass-flow hypothesis.

(d) Discuss the effects of light intensity and wind velocity on transpiration.

7. Give brief answers to the following. Attempt **any five** : (3×5=15)

(a) Explain the importance of girdling experiments in understanding transport of organic substances.

(b) What is RUBISCO? What are its substrates?

(c) Discuss the role of accessory pigments in photosynthesis.

(d) Give one commercial application of auxins, gibberellins, and ethylene.

(e) Write one important contribution of (i) Blackman, (ii) F.W. Went, and (iii) Emil Fischer

(f) Differentiate between constitutive and induced enzymes.

(g) Explain why adding excessive fertilizers to the soil without adequate irrigation is injurious to crops?

(26)

[This question paper contains 4 printed pages.]

Your Roll No. ....

Sr. No. of Question Paper : 6932 **HC**

Unique Paper Code	: 42174406
Name of the Paper	: Pharmaceuticals, Fermentation, Pesticides and Perfumes
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 **six** questions in all.
3. Question No. **1** is compulsory.

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

   DDT

   Parathion

   Paracetamol

   (b) Match the following :

Anti inflammatory	Dapsone
Anti-biotic	Aspirin
Anti-laprosy	Chloramphenicol

(c) Explain the benefits of using Pesticides.

(d) Differentiate between vitamin B2 and vitamin B12.

(e) Write a short note on artificial flavours. (3,3,3,3,3)

2. (a) Differentiate between :

(i) Vanishing cream and Shaving cream

(ii) Face Powder and Talcum Powder

(iii) Deo and Perfume

(b) Write the ingredients used in the preparation of

Nail enamel

Cold cream

Shampoo

Sun tan lotion (6,6)

3. (a) Write short notes on **(any two)** :

(i) Aspirin

(ii) Acyclovir

(iii) Diazepam

(b) Classify the following and explain their mode of action :

AZT-Zidovudine

Glyceryl trinitrate (6,6)

4. (a) Explain the synthesis and mode of action of malathion.

(b) Name any two elements which act as Pesticides.

(c) Fill in the blanks :

(i) ..... isomer of benzene hexachloride has insecticidal properties.

(ii) Parathion is an organo .....

(iii) Carbamates are the derivatives of .....

(iv) Herbicides are used to kill .....

(d) Write two advantages of carbamates. (4,2,4,2)

5. (a) What is an antibiotic? Write two requirements needed for a chemical substance to act as an antibiotic?

(b) Draw the structure of the following :

Also write the name of the diseases against which the following antibiotics are used.

(i) Cephalosporin

(ii) Chloromycetin

(iii) Streptomycin (3,9)

6. (a) How are pesticides a threat to aquatic bio-diversity?

(b) Write the importance of essential oils in cosmetic industries.

(c) Define antipyretic and analgesic drugs.

(d) Who discovered Penicillin? Draw Penicillin structure. Why Penicillin remains ineffective when taken orally?

(e) Name any two Anilides. Draw structure of any one. (2,2,2,3,3)

7. (a) Explain antifungal and antilaprosy with examples.

(b) Name the micro-organism used in the manufacture of Pencillin by fermentation.

(c) Draw structure of any carbamates.

(d) Classify the Pesticides according to their uses.

(e) Name any one natural dye.

(f) Write a short note on conditioning agents.

(4,1,2,2,1,2)

[This question paper contains 6 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 6934 **HC**

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) Discuss the slope of the line of CO gas in the Ellingham diagram.

(b) Write short notes on :

(i) Hydrometallurgy

P.T.O.

(ii) Van-Arkel de Boer process (4½+4+4=12½)

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

(i) Size of a cation is smaller as compared to parent atom.

(ii) Nitrogen has very low electron gain enthalpy value.

(iii) Magnesium oxide is formulated as Mg^{2+} O^{2-} and not as Mg^{+} O^{-}.

(iv) Electronegativity value of noble gases is zero, but the halogen has highest in each period.

(b) Write a note on concept of electronegativity and various scales for it.

(c) Inert pair effect increases on descending down the group in periodic table. Explain. (6+4+2½=12½)

3. (a) What is an electron deficient compound? Discuss the structure of diborane.

(b) Arrange the following acids according to descending order of acid strength. Draw their structures and comment on your answer.

H_3PO_2, H_3PO_3 and H_3PO_4

(c) Draw the structures of Caro's acid and Marshall's acid and suggests one reaction by which the two acids can be distinguished from each other. (4½+4+4=12½)

4. (a) Calculate the electronegativity value of carbon atom by using the following data, Z = 6 and r = 77 Å. Electronic configuration of carbon (C) is $1s^2$ $2s^2$ $2p^2$.

(b) Be shows greater resemblance with Al than with other alkaline earth metals.

(c) Write short notes on allotropes of phosphorus.

(d) Why is $SnCl_2$ a strong reducing agent? (4+3+3½+2=12½)

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)** :

(i) Drop of a liquid is spherical.

(ii) Unit cell and space lattice.

(iii) Viscosity of liquids decreases while viscosity of gases increases with temperature.

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

(v) Pseudounimolecular reactions with example.

(vi) Difference between Schottoky and Frenkel Defect.

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

(viii) Excluded volume and how it is related to actual volume. (2½×5=12½)

2. (a) Write short notes **(any 2)** :

(i) Laws of crystallography

(ii) Viscosity

(iii) Liquid crystal

(iv) Boyle's Temperature

(b) Describe in detail the drop number method of determining the surface tension of a liquid.

(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 pm, an X-ray reflection was observed at an angle of 23°20'. What is the corresponding interplanar spacing? [sin 23°20'=0.396] (4+4+4½=12½)

3. (a) With the help of a 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+4½=12½)

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

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

(c) Write short notes on :

(i) Arrhenius equation

(ii) Collision theory (4+4+4½=12½)

SET-A

Unique Paper Code : 217463

Name of Paper : Industrial Chemistry-IV (ICPT-404)
PHARMACEUTICALS, FERMENTATION, PESTICIDES & PERFUMES

Name of the course : B.Sc. (APS) Applied Physical Sciences

Semester : IV

Duration : 3 hours

Maximum Marks : 75 Marks

Instructions for Candidates

Write your roll no. on the top immediately after receipt of this question paper.

Attempt six questions in all

Question no. 1 is compulsory

Question 1: Attempt **any five** out of the following: **(3 X 5)**

a) Discuss the mode of action of sulpha drugs, e.g., sulfonamides.

b) Give the class and uses of the drug Phenobarbital.

c) Name any two organophosphate pesticides and mention their merits and demerits.

d) What are antiperspirants? Give their formulations.

e) Discuss the production of citric acid by fermentation.

f) Give the fermentation process for production of L-ascorbic acid.

Question 2:

a) What is the difference between analgesic and antipyretic agents? Give the synthesis of Paracetamol and Ibuprofen. **(1, 1, 2, 2)**

b) Classify the following (**any two**) drugs and give their advantages: **(2 * 2)**
   (i) Sulphacetamide
   (ii) Aspirin
   (iii) Diazepam

Question 3:

a) Write the formula of stereochemical form of chloramphenicol. How does it works in living organisms? What are its advantages? (2, 2, 2)

b) Name an antiviral drug and give its advantages and disadvantges. (1, 3)

c) Give uses of glyceryl trinitrate. (2)

Question 4:

a) What are sulphone? Name a sulphone which is used as antileprosy drug and give its benefits and harms. (2, 1, 3)

b) Why do we use sunscreens? Give its formulation. (1, 2)

c) Write a short note on muscone. (3)

Question 5:

a) Discuss the structure activity relationship with respect to the organophosphate pesticides. (4)

b) Give synthesis and mode of action of carbofuran. (2, 2)

c) Give full name, uses and adverse effeest of DDT. (1, 1, 2)

Question 6:

a) What are vitamins? Give fermentation method for the industrial production of riboflavin. (2, 3)

b) Discuss the uses of following essential oils in cosmetic industry. (2, 2)
   (i) Geraniol
   (ii) Rose oil

c) How lysine is produced by the fermentation process. (3)

Question 7: Write short notes on **any four** of the following: (3 X 4)

a) Drug design and development

b) Composition and preparation of lipsticks

c) Advantages and disadvantages of carbamate pesticides

d) Essential oils and their importance

e) Composition and preparation of nail enamel

Question 8: Differentiate between the following (**any three**): (4 X 3)

a) Antibiotics and antibacterial agents

b) Face powder and talcum powder

c) BHC and gammexene

d) Aerobic and anaerobic fermentation

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5034

Unique Paper Code : 235466

Name of the Paper : MAPT-404: Differential Equations

Name of the Course : **B.Sc. (H) Computer Sc., B.Sc. (Applied Physical Sc.), Analytical Chemistry/Industrial Chemistry/ B.Sc. Mathematical Science/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 **two** parts from each question.
3. **All** questions are compulsory.
4. Marks are indicated against each question.

1. (a) Solve the initial value problem

$$\left(2x\cos y + 3x^2 y\right)dx + \left(x^3 - x^3\sin y - y\right)dy = 0,\ y(0) = 2\ .$$

(6½)

P.T.O.

(b) Solve

$$y + px = p^2x^4 .$$ (6½)

(c) Solve

$$x^2y\,dx - (x^3 + y^3)dy = 0$$ (6½)

2. (a) Solve

$$(D^2 - 3D + 2)\,y = 4x^2.$$ (6½)

(b) Show that there exist two linearly independent solution y_1 & y_2 of the differential equation $a_0(x)y'' + a_1(x)y' + a_2(x)y = 0$ such that every solution y may be expressed as linear combination of y_1 & y_2, where a_0, a_1 & a_2 are continuous real functions on real interval $a \le x \le b$ and $a_1(x) \neq 0$ for any x on $a \le x \le b$. (6½)

(c) Solve

$$(x+1)^2\frac{d^2y}{dx^2} - 3(x+1)\frac{dy}{dx} + 4y = x^2.$$ (6½)

3. (a) Using method of variation of parameters, find the general solution of

$$\frac{d^2y}{dx^2} + y = \tan x .$$ (6½)

(b) A 8-lb weight is attached to the lower end of a coil spring suspended from a fixed support. 'The weight comes to the rest in its equilibrium position, thereby stretching the spring 6 in. The weight is then pulled down 9 in. below its equilibrium position and released at t = 0.

The medium offers a resistance in pounds numerically equal to $4\left(\frac{dx}{dt}\right)$, where $\frac{dx}{dt}$ is the instantaneous velocity in feet per second. Determine the displacement of the weight as a function of the time. (6½)

(c) Given that $y = e^x$ is a solution of

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

Find a linearly independent solution by reducing the order.

Write the general solution. (6½)

4. (a) Solve

$$\frac{dx}{dt} + 4x = t - 3y,$$

$$\frac{dy}{dt} + 2x = e^t - 5y.$$ (6½)

(b) Solve

$$\frac{dx}{x(y^2 - z^2)} = \frac{dy}{y(z^2 - x^2)} = \frac{dz}{z(x^2 - y^2)} .$$ (6½)

P.T.O.

(c) Solve

$$xz^3\,dx - z\,dy + 2y\,dz = 0. \qquad (6\frac{1}{2})$$

5. (a) Eliminate the arbitrary function f from the equation :

$$z = f\left(\frac{xy}{z}\right)$$

to form the corresponding partial differential equation. (5½)

(b) Find the general solution for the differential equation

$$(z^2 - 2yz - y^2)p + (xy + xz)q = xy - xz. \qquad (5\frac{1}{2})$$

(c) Find the complete integral of the equation

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

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

$$x^2p^2 + y^2q^2 = z^2. \qquad (6)$$

(b) Show that the equations

$$xp = yq,\ z(xp + yq) = 2xy$$

are compatible and find their solution. (6)

(c) Reduce the equation

$$\frac{\partial^2 z}{\partial x^2} - x^2\frac{\partial^2 z}{\partial y} = 0$$

to canonical form. (6)

Set BA

(30)

09/5/18

Sl. No. of Question Paper: 516
Name of Course: B.Sc (Prog) ~~Life Sciences~~
Name of paper: Molecular Biology (LSPT 407)
Unique Paper Code: 223451
Semester: IV
Duration: 3 hours
Maximum Marks: 75

Attempt five questions in all including Q1 which is compulsory. Illustrate your answers with diagrams wherever necessary.

Q1. i) Define the following

a. Polycistronic mRNA
b. Okazaki fragment
c. Open reading frame
d. Oncogenesis
e. Degenerative Genetic Code 5

ii) Expand the following

a. 5' UTR
b. IRES
c. PABP
d. ORC
e. RBS
f. LINEs 3

iii) Differentiate between the following

a. Apoptosis and Necrosis
b. Structure and function of 70s and 80s ribosomes
c. A DNA and B DNA
d. Leading strand and lagging strand
e. DNA polymerase I and DNA Polymerase III 10

iv) Mention the contribution of following scientists

a. Rosalind Franklin
b. Matthew Meselson and Frank Stahl
c. Marshall Nirenberg and H. Gobind Khorana
d. Arthur Kornberg 4

v) Match the following

a. Klenow Fragment	i. Cancer
b. Francis Crick	ii Replication
c. Nucleosome	iii. Central Dogma
d. Allolactose	iv. Lac Operon
e. Telomeres	v. DNA packing

5

Q2. a. Briefly describe the lac operon and how it controls the metabolism of lactose.
b. What are riboswitches and how do they control gene expression? 9,3

Q3. a. Describe the process of Replication in prokaryotes.
b. Differentiate between Eukaryotic and Prokaryotic replication of DNA. 8,4

Q4. a. Discuss the role of ribosomes, tRNA and protein factors in the process of protein biosynthesis.
b. ~~What are some types of~~ Explain the types of posttranslational modification of proteins? 6,6

Q5 a. Discuss the molecular mechanism regulating the activity of caspase during apotosis.
b. How did Hershey and Chase show that DNA is passed to new phages in phage reproduction. 5,6

Q6. a. What are the three basic stages of transcription? Briefly describe what happens at each stage.
b. What is genetic code? Briefly explain the experiment leading to discovery of genetic code. 6,6

Q7. Write short notes on any three of the following,
a. Wobble hypothesis
b. Chemicals and radiations as carcinogens
c. Telomere shortening
d. Griffith and Avery's transformation experiment 4,4,4

Sl-No 07 Q.P. 5117 (31) 09/5/18

Unique Paper Code	: 222463
Name of the Paper	: **Physics –IV: Electricity, Magnetism and Electromagnetic Theory (PHPT-404)**
Name of the Course	: **B.Sc. (Prog. ~~Physical Science~~)**
Semester	: **IV**
Duration	: **3 Hours**
Maximum Marks	: **75**

4

Instructions for Candidates

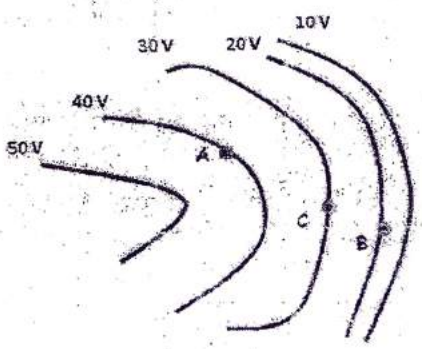
(Write your Roll No. on the top immediately on receipt of this question paper)

Attempt **Five** questions in all
(*Question No. 1 is compulsory*. Attempt four questions from the rest of the paper)

Note : Use of non-programmable scientific calculator is allowed.

Q1 Attempt any **five** of the following: $[5 \times 3 = 15]$

(a) Electric lines of force never cross. Why?
(b) Potential in the x-y plane is given as $V = 5(x^2 + xy)$ volts. Find the electric field at the point having coordinates $(1, -2, 0)$.
(c) The figure shows the lines of constant potential in a region in which an electric field is present. The values of potentials are as written. At which point A, B, C is the magnitude of the electric field greatest?



(d) What do you understand by polarisation of electromagnetic waves ? Describe how circularly and elliptically polarised waves can be obtained from two linearly polarised waves ?
(e) Give the working principle of a Ballistic Galvanometer.
(f) Explain Lenz's Law of electromagnetic induction.
(g) Derive the continuity equation and discuss what it signifies.
(h) A current of 5 A flowing through a coil is cut off completely in 0.5 s. Calculate the e.m.f. induced in the coil if it has a self inductance of 0.05 H.
(i) Explain Brewster's Law.

Q2

(a) Derive the expression for electric field at a point P distant r from the centre of a uniformly charged sphere of radius R both inside and outside the sphere using Gauss's theorem of electrostatics. [7]

(b) Can the following be a possible electrostatic field

$$\vec{E} = k[xy\hat{x} + 2yz\hat{y} + 3xz\hat{z}],$$

where k is a constant with appropriate units. Justify your answer. [4]

(c) Five thousand lines of force enter a certain volume of space and three thousand lines leave it. Find the total charge contained in it. [4]

Q3

(a) A thin spherical shell of radius R carries a uniform charge density. Write the electric field at a point P (distant r from its center) lying inside and outside this spherical shell. Use these values to calculate the electric potential at P (inside and outside) the shell. [7]

(b) Determine the electrostatic potential energy of a system of n point charges. [5]

(c) The electric potential at a point (x, y, z) is given by $V = y\,(3x^2y - xy^3 + z)$. Find the components of electrostatic field at that point. [3]

Q4

(a) State the Biot Savart Law. Using the Biot Savart Law find the magnetic field along the axis of a circular current loop of radius 'a' carrying current I. [7]

(b) Find the magnetic flux density at the center of a circular coil of radius 5 cm carrying a current of 12 A in clockwise direction. [4]

(c) The Lorentz force on a charge q moving with a velocity $\vec{v} = 5\,\hat{\imath} + 7\,\hat{k}$ m/s is zero when this charge enters a region with electric field $\vec{E} = 10\,\hat{\jmath}$ V/m and a magnetic field $\vec{B} = b\,\hat{k}$ T. Determine the value of b ? [4]

Q5

(a) State and prove Ampere's Circuital Law for any arbitrary closed path. Apply this law to obtain magnetic induction inside and outside a solenoid. [7]

(b) Find the magnetic field of an infinite uniform surface current $\vec{K} = k\hat{\imath}$ covering the x-y plane. [4]

(c) A long straight solid conductor of radius 5 cm carries a current of 2A, which is uniformly distributed over its circular cross section. Find the magnetic field induction at a distance of 3 cm from the axis of the conductor. [4]

Q6

(a) Name the different 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? [7]

(b) Define logarithmic decrement of a ballistic Galvanometer. The successive deflections to the right and left of the mean position in the case of Ballistic Galvanometer are found to be 25.0, 24.9 and 24.8 cms. Calculate the logarithmic decrement. [4]

(c) A long straight solid conductor of radius 5 cm carries a current of 2A, which is uniformly distributed over its circular cross section. Find the magnetic field induction at a distance of 3 cm from the axis of the conductor. [4]

Q7

(a) The expression for power spent is useful as energy spent in establishing the magnetic field. Use it to calculate the magnetic energy density associated with each point in space where the field is $\vec{B}$. [7]

(b) Consider two circular coils of radius R_1 and R_2 and closely packed turns N_1 and N_2 respectively. Find the mutual inductance assuming $R_2 << R_1$. [4]

(c) Two coils, a primary of 400 turns and a secondary of 20 turns are wound on an iron ring of mean diameter 20 cm and cross-section 2 cm radius. Calculate their mutual inductance, μ for iron is 800. [4]

Q8

(a) Establish Maxwell's equations for the electromagnetic field emphasizing the Ampere's modification of Ampere's Circuital Law. Deduce the transverse nature of electromagnetic waves. [8]

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

Physical Constants

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

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

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

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

(32) Part-III A-732 10/5/18 10/5 302

Roll No:

Sl-No. 09 9P:5119

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

~~B.Sc. (P) (Phy. Sci. / Life Sci./ ACPM./ B.Sc. (Hons.) Bot./Chem.~~

Semester : II/IV

Name of the Paper : Biology-II (LSPT-202)

Unique Paper Code : 216251

H

~~S. No. of Question Paper:~~

Duration: 3 hrs **Max. Marks: 75**

Important Instructions:

1. Write your roll number immediately on the top after receiving this question paper.
2. Attempt any Five questions including the Question No. 1 which is compulsory.
3. All questions carry equal marks.
4. Attempt all parts of a question together.

Q1. (a) Match the following: 1×5=5

i.	Light reaction	a.	Catalase
ii.	Cell	b.	Bacteria
iii.	Peroxisome	c.	Cdk
iv.	Nucleoid	d.	Thylakoids
v.	Cell cycle	e.	Robert Hook

(b) Fill in the blanks : 1×5=5

i. _____ is a vital stain used for staining mitochondria.

ii. The cytoplasmic connection between plant cell are called _____.

iii. An instrument used to measure the cell size is _____.

iv. TGN stands for_____.

v. Membrane of cell vacuole is called as _____.

Briefly describe

(c) ~~Define~~ **any five** of the following: 1×5=5

i. Diffusion

ii. Plasmolysis

iii. Middle lamella

iv. Centromere

v. Mesosome

vi. Nucleolus

Q.2. Write Short notes on **any three** of the following : 5×3=15

i. Phase contrast microscopy

ii. facilitated diffusion

iii. Components of extracellular matrix

iv. Cell secretion

v. Significance of cell division

Q3. Differentiate between **any three** of the following : 5×3=15

i. Euchromatin and Heterochromatin

ii. SER and RER

iii. Active transport and Passive transort

iv. Peroxisomes and Glyoxisomes

v. Prokaryotic and Eukaryotic cell

Q.4. Explain **any three** of following : 5×3=15

(a) Davson – Danielli model of cell membrane

(b) Nucleosome

(c) Structure of Plant cell wall

(d) Na^+/K^+ exchange pump

(e) Carbohydrates in membrane

Q5. (a) Give an overview of cell cycle. 5

(b) Explain Endosymbiont hypothesis. 5

(c) Explain the role of ER in N-linked glycosylation. 5

Q6. (a) Describe the types and functions of lysosomes. 7

(b) Describe the ~~composition~~ construction, principle ~~of working~~ and uses of electron microscope. 8
transmission

Q7. Draw ~~only~~ well labelled diagram of **any three** of the following: 5×3=15

i. Structure of Animal cell.

ii. Ultra-structure of Mitochondria

iii. Nuclear Pore Complex (NPC)

iv. Ultra-structure of Golgi-Complex

a Compound

v. Ray diagram of ~~Light~~ Microscope

(33)

Sl-No. of Q.P.: 5120

15/5/18

Unique Paper Code : 217461

Name of Paper : CHPT 404, Chemistry of s- and p-Block Elements, States of Matter and Phase Equilibrium

Name of Course : B.Sc. Physical Science/Life Science

Semester : IV

Duration : 3 Hours

Maximum Marks : 75 Marks

H

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

Attempt **six** question in all, **three** questions from each Section

Use separate answer sheets for **sections A** and **B**

Section – A

(Inorganic Chemistry) **Marks=37.5**

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

1. a) Explain the following

   (i) Second ionization energy is higher than that of first ionization energy.
   (ii) Atomic size of Gallium is smaller than Aluminium.
   (iii) Graphite is soft while diamond is hard in nature.
   (iv) Lithium resembles Magnesium in its chemical properties.
   (v) Oxygen atom in water has two lone pairs whereas nitrogen atom in ammonia has one lone pair. But, ammonia is stronger base than water.
   (vi) ΔG for oxidation reaction of metal is positive or negative depends on entropy change.

   (1.5, 2, 2.5×4=10)

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

   b) Why electronegativity of an element increases as s character increases in the hybrid orbital of its atom. Calculate electronegativity of Lead from following data: $Z = 82$, $r = 1.53$ Å.

   c) Orthophosphoric acid is tribasic while phosphorous acid is dibasic. Justify.

   (4, 4, 4)

3. a) What do you understand by inert pair effect? Give examples. How does it affect the oxidation state of elements in periodic table?

   b) Give hybridization and oxidation state of the central metal atom in,

   (i) $SOCl_2$

   (ii) SO_2Cl_2

   Also, write the names and comment on acidity/bascity of these compounds.

c) Define oxidising and reducing agents. Why Pb^{4+} acts as oxidizing agent but Sn^{2+} acts as reducing agent?

(4, 4, 4)

4. Write short notes (any three)
   (i) Arkel-de-Beer process
   (ii) Allotropy of Carbon
   (iii) Smelting
   (iv) Diborane compound
   (v) Application of hydrides of nitrogen

(3×4=12)

Section B

(Physical Chemistry)

Marks=37.5

Question No. 5 is Compulsory

Use of scientific calculators is allowed but they cannot be shared.

$N_A = 6.023 \times 10^{23}$ $k = 1.38 \times 10^{-23}\ JK^{-1}$ $R = 8.314\ JK^{-1}mol^{-1}$

5. Attempt the following

   a) Determine the value of d_{hkl} in terms of the cell constants for the orthorhombic and tetragonal unit cells.

   b) What is the effect of temperature on the Maxwell distribution curve?

   c) Calculate the Miller indices of the faces having the following intercepts with the three axes perpendicular to each other (i) $\frac{a}{2}, 2b, \infty c$ (ii) $2a, 3b, 4c$

   d) First order reaction never goes to completion. Explain

   e) Explain why small drops of liquid are spherical.

   f) The rate constant for a reaction is $1.5 \times 10^{-7}\ s^{-1}$ at 50°C and $4.5 \times 10^{-7}\ s^{-1}$ at 100°C. Calculate the value of activation energy for the reaction.

(2×5=10, 3½)

6. a) Derive the expression for the critical temperature, pressure and volume of a gas in terms of van der Waals constant of a real gas.

   b) The viscosity of oxygen is at 7°C is 208 *micropoise*. Calculate the mean free path and collision diameter of oxygen at STP.

   b) The half-life for the first order reaction is 2.3×10^3 s. How long will it take for 20% of the reactant to be left behind?

(6, 3, 3)

7. a) The reaction $A + B \leftrightarrows Prodcuct$ follows second order kinetics,
   (i) Write the differential rate law and unit of rate constant

(ii) Deduce integrated rate law, assuming equal concentration of A and B.

b) Calculate the collision number, Z_1 and mean free path, λ of oxygen gas at 1atm pressure and 27 °C temperature. Given that Collision cross section is 0.27 nm^2.

c) How many independent Bravais lattices are there in a cubic crystal system? Name them. Using a diagram show 100 and 110 planes in a primitive cubic lattice.

(6, 3, 3)

8. a) Derive Bragg's equation of X-ray crystallography.

b) In the determination of the surface tension of a liquid A by the drop number method, equal volumes of A and water gave 60 and 20 drops, respectively. Calculated the surface tension of A if density of A and water are 0.896 and 0.964 g cm^{-3} respectively. Given surface tension of water is 72.75×10^{-3} N m^{-1}.

c) Write short notes on two of the following

(i) Experimental determination of viscosity

(ii) Arrhenius theory for the chemical kinetics

(iii)Andrews isotherms of CO_2

(6, 3, 3)