

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. THIRD SEMESTER DEGREE EXAMINATION JANUARY 2023

PHYSICS
Physics Theory - III

Duration:2 Hours

Max Marks:60

PART - A

Answer any five questions, selecting minimum of one question from every unit: 5×9=45

UNIT I

- 1 a) What is the expression for the differential equation of wave motion? Explain the relevant terms used.
b) Derive an expression for a simple harmonic wave. (2+7)
- 2 a) How does humidity and pressure affect the velocity of sound?
b) With neat diagram explain frequency of vibrations in a rod clamped at one end. (2+7)

UNIT II

- 3 a) Explain Lissajous figure when phase difference between two waves is $\pi/2$, $3\pi/4$, $\pi/4$,
b) Obtain an expression for the resultant wave and its amplitude, when two collinear waves with equal frequencies from harmonic oscillators superimpose. (2+7)
- 4 a) Mention any three requirements of good acoustics.
b) What is absorption coefficient? Determine the formula for absorption coefficient. (2+7)

UNIT III

- 5 a) What are the conditions for constructive and destructive interference?
b) Describe with suitable theory, the method to determine wavelength of sodium light using biprism. (2+7)
- 6 a) Write the conditions for constructive and destructive interference for light reflected by a thin film?
b) Describe the construction of Michelson interferometer with a neat labelled diagram and explain its working. (2+7)

UNIT IV

- 7 a) Give two differences between grating and prism spectra.
b) Discuss the theory of a plane diffraction grating for oblique incidence. (2+7)
- 8 a) What is linearly and circularly polarized light?
b) What are retarders? Deduce expressions for the thickness required for a quarter wave plate and half-wave plate light of given wavelength. (2+7)

PART - B

Answer any three questions:

3×5= 15

- 9 An addition of 20 kg to the tension of a string of a sonometer wire changed its frequency to three times its original frequency. What is the original frequency? Given linear density of the wire is 1.68×10^{-3} kg/m, length of the sonometer wire is 0.27 m
- 10 A hall of volume 5500 m^3 is found to have a reverberation time of 2.3s. The sound absorbing surface of the hall has an area of 750 m^2 . Calculate the average absorption coefficients.
- 11 Newton's rings are formed by reflected light of wavelength 5895 \AA with a liquid between the plane and curved surface. If the diameter of the 5th bright ring is 3 mm and the radius of curvature of the curved surface is 100 cm, calculate the refractive index of the liquid.
- 12 0.02 kg cane sugar is dissolved in water to make 50 cc of solution, 0.2 m length of this solution causes 53.5° optical rotation. Calculate the specific rotation of sugar.

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
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MATHEMATICS

Mathematics Theory - III: Ordinary Differential Equations and Real Analysis - I

Duration: 2 Hours

Max Marks: 60

PART - A

I. Answer any 6 questions. Each question carries 2 marks: (2×6= 12 Marks)

- a. Check whether the differential equation $(xy^2 + y - x)dx + x(xy + 1)dy = 0$ is exact or not
- b. Find the integrating factor to solve the differential equation $2(2y^2 + 5xy - 2y + 4)dx + x(2x + 2y - 1)dy = 0$
- c. Find the complementary function of $(D^2 - 5D + 6)y = e^{4x}$.
- d. Find the particular integral of $(D^2 + 36)y = \sin 5x$.
- e. Define real sequence. Give an example.
- f. Show that $\lim_{n \rightarrow \infty} \frac{1}{n} \left\{ 1 + \frac{1}{2} + \dots + \frac{1}{n} \right\} = 0$
- g. Check whether the series $\sum_{n=1}^{\infty} \frac{1}{n^{\frac{5}{3}}}$ is convergent or divergent.
- h. Check whether the series $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{1}{n\sqrt{n}}$ is absolutely convergent.

PART - B

2. Answer any 2 questions. Each question carries 6 marks: (6×2= 12 Marks)

- a. Solve : $(2x^3 - xy^2 - 2y + 3)dx - (x^2y + 2x)dy = 0$
- b. Solve: $(x^2 + y^2 + 1)dx + x(x - 2y)dy = 0$
- c. Solve: $p^2 - x^2y^2 = 0$
- d. Find the orthogonal trajectories of the family of curves $ax^2 + by^2 = c$

PART - C

3. Answer any 2 questions. Each question carries 6 marks: (6×2= 12 Marks)

- a. Solve : $(D^2 - 4D - 8)y = 4 \cos 2x$
- b. Solve : $(D^2 - 1)y = x^3 + 4x^2 - 6$.

c. Solve $:(D^4 - 1)y = e^x \cos x$

d. Solve: $x^2 y_2 + x y_1 + 2y = x^2$.

PART - D

4. Answer any 2 questions. Each question carries 6 marks: (6×2= 12 Marks)

a. Prove that the positive term geometric series $1 + r + r^2 + \dots$ converges for $r < 1$ and diverges for $r \geq 1$.

b. Prove that the sequence $\left\{ \frac{n}{2n+1} \right\}$ converges to $\frac{1}{2}$ by using the definition.

c. Check whether the following series are convergent or divergent .

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

d. Check whether the following series are convergent or divergent .

(i) $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n^2+4n}}$ (ii) $\sum_{n=1}^{\infty} \frac{1}{(n^2+2)^{\frac{1}{3}}}$

PART - E

5. Answer any 2 questions. Each question carries 6 marks: (6×2= 12 Marks)

a. Determine whether series $\sum_{n=1}^{\infty} (-1)^{n+1} \frac{3^n}{n!}$ is convergent or divergent.

b. Determine whether the series $\sum_{n=1}^{\infty} \frac{\cos \frac{1}{3} n\pi}{n^2}$ is absolutely convergent or conditionally convergent.

c. Determine whether the series $\sum_{n=1}^{\infty} \frac{(\ln n)^2}{n}$ is convergent or divergent using integral test.

d. Determine whether the series $\sum_{n=1}^{\infty} \frac{3^{2n}}{n^n}$ is convergent or divergent.

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
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MICROBIOLOGY

Microbiology Theory - III: Microbial Diversity

Duration:2 Hours

Max Marks:60

SECTION - A

Answer the following strictly observing the internal choice provided:

4×5=20

UNIT 1

- 1) Write a note on insitu method of conservation of microbial diversity.

OR

- 2) Write a note on Chemotaxonomy.

UNIT 2

- 3) Write any five general characters of Spirochaetes.

OR

- 4) Write a note on Streptomyces.

UNIT 3

- 5) Write a short note on specialized locomotor organelles of Protozoa.

OR

- 6) Define Eukaryotes and draw a neat labelled diagram of an eukaryotic cell.

UNIT 4

- 7) Write a short note on the symptoms and prevention of Tobacco Mosaic Disease.

OR

- 8) Write a short note on cultivation of viruses using Tissue culture method.

SECTION - B

Answer the following strictly observing the internal choice provided:

4×10=40

UNIT 1

- 9) Define biodiversity and explain the concept of biodiversity in detail.

OR

10) Explain the methods adopted to study and measure microbial diversity.

UNIT 2

11) Describe the morphology, cultural characters and pathogenicity of Escherichia coli.

OR

12) Explain in detail the general characters of prokaryotes.

UNIT 3

13) Explain about Eumycota in detail according to Ainsworth classification method.

OR

14) Write in detail about Cosmorium with diagram.

UNIT 4

15) Describe about HIV in detail with a neat labelled diagram.

OR

16) Write in detail about the T 4 Bacteriophage with a neat labelled diagram.

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. THIRD SEMESTER DEGREE EXAMINATION JANUARY 2023
COMPUTER SCIENCE

Computer Science Theory - III: Object Oriented Programming Concepts & Java

Duration: 2 Hours

Max Marks: 60

PART A

Answer any FIVE questions:

(5×2= 10)

- 1) How can you initialize variables in java?
- 2) What are static members?
- 3) How do we tell in java that we want to use a particular package in a file?
- 4) Which are the different ways to create threads?
- 5) What are run time errors?
- 6) Write the general form of the switch statement.

PART B

Answer any FIVE questions :

(5×6= 30)

- 7) What are the unique advantages of an object-oriented programming paradigm?
- 8) Write a program to input an array of integers and sort them in ascending order.
- 9) Describe the different levels of access protection available in java.
- 10) Explain the different attributes of an APPLET tag.
- 11) List and explain the separators available in java.
- 12) Explain any one entry controlled loop with syntax and example.

PART C

Answer any TWO questions :

(2×10= 20)

- 13) Explain the features of java.
- 14) Explain any ten string methods of the class String with examples.
- 15) Explain multilevel inheritance with an example code.

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CHEMISTRY

Chemistry Theory - III: Analytical and Organic Chemistry - II

Duration:3 Hours

Max Marks:60

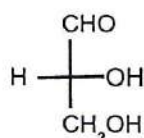
PART - A

I. Answer any Six from the following:

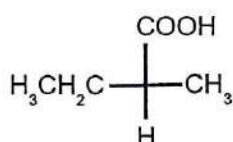
(2×6= 12 Marks)

1. Draw the vector representation of electromagnetic radiation .
2. Define the term Turbidimetry.
3. Write two applications of paper chromatography.
4. State Nernst distribution law.
5. What are carbenes?
6. How is chlorobenzene converted to aniline?
7. Designate R&S rotation.

i.



ii.



8. What is meant by conformation?

PART - B

II. Answer any SIX of the following choosing at least one question from each unit:

(6×8= 48 Marks)

UNIT I

9. a. State and derive Lambert's law.
 b. A 0.25M solution in a test tube with pathlength of 1cm has an absorbance of 0.075 at 560nm.
 - i) What is the molar absorptivity of the solution?
 - ii) What will be the absorbance if the concentration of the solution is 0.65M. (4+4)

- 10 a. Explain the working of double beam spectrophotometer.
b. Explain the instrumental deviations from Beer-Lambert's law. (4+4)

UNIT II

11. a. Explain the separation of ions using anion exchange resin.
b. Explain the criteria for the selection of mobile phase. (4+4)
- 12 a. Briefly explain the procedure involved in paper chromatography.
b. Write a note on continuous extraction. (5+3)

UNIT III

13. a. Explain the stability of alkyl free radicals.
b. Explain the formation of free radicals. (4+4)
- 14 a. What are the important methods to determine reaction mechanisms?
b. Explain 'Product Analysis' in predicting reaction mechanism. (3+5)

UNIT IV

15. a. Write a short note on Optical Isomerism.
b. What are Chiral and achiral objects? Give examples. (5+3)
- 16 a. Explain E & Z designations of geometrical isomers.
b. Draw the structures of Maleic acid & Fumaric acid. (5+3)

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc THIRD SEMESTER DEGREE EXAMINATION JANUARY 2023
BOTANY

Botany Theory - III: Plant Anatomy and Development Biology

Duration: 2 Hours

Max Marks: 60

I. Answer any Five of the following :

(5×2= 10 Marks)

1. What are bast fibers?
2. What is quiescent centre?
3. What are annular rings? Mention its components.
4. Write the features of stele in dicot root.
5. What is plant polarity? Mention its types.
6. Name the different types of senescence.
7. What is ruminant endosperm? Give an example.
8. Define Geitonogamy & Xenogamy.

II. Answer any FOUR of the following :

(4×5= 20 Marks)

9. Discuss the difference between Collenchyma and Sclerenchyma.
10. Write the functions of cell wall.
11. Mention the significance of nodal anatomy.
12. Draw a neat labeled diagram of T.S. of monocot leaf.
13. Briefly explain the transmission of vegetative shoot to reproductive apex.
14. Explain the structure of dicot seed.
15. Explain oil glands in detail.
16. Mention the contributions of K.C. Mehta.

III. Answer any THREE of the following :

(3×10= 30 Marks)

17. Discuss the genetic control of flower development using ABC model.
18. Explain different types of vascular bundle.
19. Explain monosporic type of embryo sac development with neat labelled sketches.
20. Explain the structure of anther with a neat labeled diagram.

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. THIRD SEMESTER DEGREE EXAMINATION JANUARY 2023
STATISTICS

Statistics Theory - III: Calculus and Probability

Duration: 2 Hours

Max Marks: 60

Answer any THREE of the following :

(3×2= 06)

1. Evaluate $\lim_{x \rightarrow 0} \frac{\sqrt{4+x}-2}{x}$.
2. If X and Y are independent Gamma variates with parameters n_1 and n_2 , then what is the distribution of $\frac{X}{X+Y}$?
3. If $X \sim F(3,4)$ then what is the mode of $1/F$.
4. Name any two time series data.
5. What is deseasonalized data?

Answer any FOUR of the following in not more than a page each :

(4×6= 24)

6. Distinguish between convergence in Probability and Convergence in Law.
7. Deduce the p.d.f of $Y=X(n)=\text{Max}(x_1, x_2, \dots, x_n)$ when $X \sim U(0, \theta)$.
8. Write a note on Sampling distribution and degrees of freedom.
9. Deduce the p.d.f of Snedekors F distribution with n_1 and n_2 degrees of freedom.
10. How do you apply method of simple averages to obtain seasonal indices? Explain.
11. How do you generate random observations from Uniform Distribution?

Answer any THREE of the following in not more than two page each :

(3×10= 30)

12. Solve $\int_0^{\infty} \frac{y}{(1+y^3)^2} dy$.
13. Let $X \sim N(0,1)$ and $Y \sim N(0,1)$ be independent random variables. Find the probability function of X/Y and identify the distribution.
14. Derive an expression for the mean and variance of t Variate with n degrees of freedom.
15. Suppose the two independent variates $X \sim \chi^2(n_1)$ and $Y \sim \chi^2(n_2)$ then show that a ratio $\frac{X}{Y} \sim \beta_2\left(\frac{n_1}{2}, \frac{n_2}{2}\right)$.
16. How do you identify the types of data using Correlogram?

CHOICE BASED CREDIT SYSTEM SEMESTER SCHEME
B.Sc. THIRD SEMESTER DEGREE EXAMINATION JANUARY 2023
ZOOLOGY

**Zoology Theory - III: Molecular Biology, Bio instrumentation and Techniques in
Biology**

Duration:2 Hours

Max Marks:60

SECTION - A

Answer the following strictly observing the internal choice provided:

4×5=20

UNIT 1

- 1) Comment on Central dogma and Central Dogma reverse.

OR

- 2) Explain Chargaff's rule in relation with Structure of DNA.

UNIT 2

- 3) Write a note on miRNA and siRNA.

OR

- 4) Write a note on role of Chromatin in gene expression

UNIT 3

- 5) Mention the applications of the different types of light microscopes?

OR

- 6) What is the principle of fluorescence microscopy? Mention its applications?

UNIT 4

- 7) What is colorimetry? Add a note on its advantages and disadvantages.

OR

- 8) Write the limitations of SDS-PAGE.

SECTION - B

Answer the following strictly observing the internal choice provided:

4×10=40

UNIT 1

- 9) Give an account of prokaryotic transcription.

OR

- 10) Give an account of protein synthesis in Eukaryotes.

UNIT 2

- 11) Give a note on the significance of intracellular protein degradation and explain protein degradation by lysosomal autophagy with a diagram.

OR

- 12) What are the various methods of post translational protein modifications?

UNIT 3

- 13) Give the principle of chromatography and explain the classification of chromatographic techniques.

OR

- 14) Explain the various types of centrifugation techniques and the different types of centrifuges.

UNIT 4

- 15) Explain the principle and working of autoradiography.

OR

- 16) Explain in detail the procedure of southern blot.
