S–1074

Sub. Code
23MPH1C1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

First Semester

Physics

MATHEMATICAL PHYSICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. Give two example of a vector space?

2. Show that the vectors (1, 4, 3), (0, 3, 1) and (3, –5, 4) are linearly independent.

3. State de Moivre's theorem.

4. Give Cauchy Riemann conditions.

5. What is an idempotent matrix.

6. Give one example for skew Hermitiam matrix.

7. Find Laplace transform of 't'.

8. State convolution theorem.

9. Give the orthogonality property of Hermite polynomial.

10. What is reciprocity theorem?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Find the eigen values of the matrix $\begin{pmatrix} 2 & 2 \\ 3 & 1 \end{pmatrix}$.

Or

(b) Show that the vectors $X_1 = (2, 3, 1, -1)$, $X_2 = (2, 3, 1, -2)$, $X_3 = (4, 6, 2, 1)$ are lineary dependent.

12. (a) Determine whether $\frac{1}{z}$ is analytic or not.

Or

(b) Expand $f(z) = \cosh z$ about πi.

13. (a) Find the eigen values of the matrix $A = \begin{pmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 0 & 0 & 1 \end{pmatrix}$.

Or

(b) Arrive Cayley-Hamilton's theorem.

14. (a) Find the Fourier transform of $f(x) = \begin{cases} 1 & \text{for } |x| < a \\ 0 & \text{for } |x| > a \end{cases}$.

Or

(b) Find $L(t^n)$.

15. (a) Derive the generating function of Legendre polynomial.

Or

(b) Discuss Dirac-delta function.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Elaborate Gram–Schmidt orthogonalization procedure.

17. Obtain the Laurent series expansion of the following function $f(z) - \frac{z^4}{1+z}$ around $z = 0$ for $|z| > 1$.

18. Verify Cayley-Hamilton theorem for the following matrix $A = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$ and find A^{-1}.

19. Evaluate $L\left[e^{-4t}\frac{\sin 3t}{t}\right]$.

20. Prove that $H_{2n}(0) = (-1)^n \cdot 2^{2n}\left(\frac{1}{2}\right)^n$.

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S–1075

Sub. Code
23MPH1C2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

First Semester

Physics

CLASSICAL MECHANICS AND RELATIVITY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What are constraints?

2. Define principle of virtual work.

3. Define D'Alembert's principle.

4. Write Lagrange equation of motion.

5. What is phase space?

6. What are canonical transformations?

7. What are normal coordinates?

8. What is a linear triatomic molecule?

9. What are inertial frames?

10. What is Minkowski's space?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Explain the types of constraints.

Or

(b) Discuss generalized momentum.

12. (a) Explain the application of Lagrange equation of motion using simple pendulum.

Or

(b) Write a short note on projectile motion.

13. (a) Give a detail study about cyclic coordinates.

Or

(b) Write the equation for one dimensional simple harmonic oscillator using Hamilton's equation of motion.

14. (a) Discuss the formulation of the problem in small oscillation.

Or

(b) Explain the frequencies of normal modes.

15. (a) Explain Lorentz transformation equation.

Or

(b) Derive Einstein mass energy relation.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the conservation of angular momentum in system of particles.

17. Derive Lagrange equation of motion.

18. Explain Linear Tri atomic molecule in detail.

19. Explain the application of motion of Particle in a central force field using Hamilton's equation of motion.

20. Give an account on four vector space.

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S–1076

Sub. Code
23MPH1E1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

First Semester

Physics

Elective – LINEAR AND DIGITAL ICs AND APPLICATIONS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What are the classifications of IC?
2. List out the ideal characteristics of op-amp.
3. Give the significant features of instrumentation amplifier.
4. What is called multiplier circuit?
5. Define filter.
6. List the basic building blocks of PLL.
7. What is a voltage regulator?
8. Brief about sampling rate of ADC.
9. Draw the NOR gate with its truth table.
10. Define encoder.

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Write a note on the basics of op-amp.

Or

(b) Explain the various features of op-amp.

12. (a) Draw and explain voltage to current converter.

Or

(b) Explain the operation of triangular wave generator with proper circuit.

13. (a) With neat sketch explain about band reject filter.

Or

(b) Explain low pass filter.

14. (a) Explain the working of 723 general purpose regular.

Or

(b) Describe the significance of the integration time in a Dual slope DAC.

15. (a) Explain the operation of a CMOS NAND gate.

Or

(b) Write a note on shift register.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the internal circuit with the characteristics of op-amp.

17. With neat sketch explain Instrumentation Amplifier.

18. Draw and explain the functional diagram of a 555 timer.

19. Explain the working principle of an R-2R ladder DAC with a neat circuit diagram.

20. What is 7-segment decoder and how does it work in converting binary i/p to 7-segment display output.

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S–1077

Sub. Code
23MPH1E2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

First Semester

Physics

Elective – ENERGY PHYSICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define renewable and non-renewable energy sources.
2. Mention the advantages of nuclear energy.
3. What is tidal power?
4. What are the basic components of an ocean energy conversion system?
5. Define wind energy conversion.
6. What are the main component of a wind energy conversion system?
7. What is biogas?
8. What is aerobic digestion?
9. State the principle os solar cell.
10. What are the factors affecting solar cell efficiency?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) What are the prospects of renewable energy sources?

Or

(b) Explain energy storage and distribution.

12. (a) Discuss the basic principle of tidal power.

Or

(b) Explain the principle of ocean thermal energy conversion system.

13. (a) Write the basic principles of wind energy.

Or

(b) What are the applications of wind energy?

14. (a) Discuss the wet and dry process in biomass conversion technologies.

Or

(b) Mention the properties of biogas.

15. (a) How solar cells are used for direct conversion of solar energy to electric power?

Or

(b) Describe the working of solar cooker.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Compare conventional and non-conventional energy sources and discuss their availability.

17. Explain the utilization of tidal energy.

18. Discuss the wind energy conversion process and mention its advantages and disadvantages.

19. Explain aerobic and anaerobic digestion. Mention their advantages.

20. What is solar pond? Explain. Also mention its applications.

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S–1078

Sub. Code
23MPH2C1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Second Semester

Physics

STATISTICAL MECHANICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. State phase equilibrium.

2. Define Gibb's phase rule.

3. Define phase space.

4. What is Gibb's paradox?

5. State Liouville's theorem.

6. Define Partition function.

7. Give the conditions for fermions.

8. Write down formula for plank radiation.

9. State cluster expansion for a classical gas.

10. What is a Ising model?

Part B

$(5 \times 5 = 25)$

Answer **all** questions choosing either (a) or (b).

11. (a) Explain thermodynamic potentials.

Or

(b) State and explain third law of thermodynamics.

12. (a) Explain the posulates of statistical mechanics.

Or

(b) Describe micro canonical ensemble.

13. (a) With a suitable example explain density of states.

Or

(b) Differentiate energy and density fluctuations.

14. (a) Explain Maxwell – Boltzmann statistics.

Or

(b) Describe ideal fermi gas.

15. (a) State and explain virial equation of state.

Or

(b) Explain Brownian motion.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. State and explain Ehrenfest's classifications.

17. Show that connection between statistics and thermodynamics.

18. Differentiate canonical and grand canonical ensembles.

19. Derive Plank radiation formula.

20. State and explain fluctuation dissipation theorem.

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S–1079

Sub. Code
23MPH2C2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Second Semester

Physics

QUANTUM MECHANICS – I

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is Hilbert space?

2. What are the eigen values and eigen functions of an operator?

3. State and explain Bloch theorem.

4. What is zero point energy? Explain its significance.

5. Outline Dirac's bra and ket notation.

6. Define Heisenberg picture.

7. What is quadratic stark effect?

8. What is the validity condition for WKB approximation?

9. What are ladder operators?

10. Explain the symmetry and antisymmetry of wavefunctions.

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Prove that

(i) $[x, p] = i\hbar$,

(ii) Operators having common set of eigen functions commute.

Or

(b) A particle constrained to move along x-axis in the domain $0 \le x \le L$ has a wave function $\Psi(x) = \sin \frac{n\pi x}{L}$ where n is an integer. Evaluate the expectation value of its momentum.

12. (a) Obtain the expression for transmission coefficient for a particle in a square potential barrier.

Or

(b) Obtain the energy eigen values of a rigid rotator.

13. (a) Obtain equation of motion for an operator in Schrödinger picture.

Or

(b) Explain how the momentum operator is the generator of infinitesimal translation in space.

14. (a) List the connecion formulas in WKB and explain them.

Or

(b) Explain briefly the principle of time independent perturbation theory.

15. (a) Obtain the commutation relation for L_x, L_y and L_z the components of angular momentum operator.

Or

(b) Evaluate the Clebsch-Gordan coefficients for a system having $j_i = \frac{1}{2}$ and $j_2 = \frac{1}{2}$.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Define the uncertainty (ΔA) in the measurement of a dynamical variable.

17. Obtain the solution for radial equation for a particle moving in a spherically symmetric potential.

18. Deduce the equation of motion in momentum representation.

19. Discuss the effect of electric field on ground state of hydrogen atom using perturbation method.

20. Using as a basis the eigenvector $|jm>$ of J^2 and J_z Obtain the matrix representation of angular momentum.

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S–1081

Sub. Code
23MPH2E2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Second Semester

Physics

Elective – ADVANCED OPTICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. State the Brewster's law.

2. What is an optical activity?

3. Write a short note an optical pumping.

4. List out the types of laser and its applications.

5. What is numerical aperture?

6. What is called the fibre attenuation?

7. Give a short note on self-focusing of light.

8. Write a short note an optical mixing.

9. State the Voigt effect.

10. Define the stark effect.

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Discuss the principles of polarization by reflection.

Or

(b) Give the detailed explanation of wire grid polarizer and Polaroid.

12. (a) Explain about the chemical laser.

Or

(b) Explain the principles of semiconductor laser.

13. (a) Explain the ray dispersion in multimode step index fibers.

Or

(b) Give a brief note on fibre optic sensors in healthcare.

14. (a) Describe the basic principles of non-linear optics.

Or

(b) Discuss the third harmonic generation.

15. (a) Explain the kerr magneto-optical effect.

Or

(b) Explain the cotton-mouton effect.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Explain the phenomenon of double refraction with normal incidence and oblique incidence.

17. Describe the construction and working of a carbon dioxide laser.

18. Describe the parabolic index fiber with a neat diagram.

19. Explain the phase matching and parametric generation of light.

20. Elaborate stark effect and inverse stark effect.

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S–1082

Sub. Code
23MPH2E3

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Second Semester

Physics

Elective – MICROPROCESSOR 8085 AND MICROCONTROLLER 8051

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is the need for ALE signal in 8085 microprocessor?

2. What is the need for interfacing?

3. What are the applications of D/A converter interfacing with 8255?

4. Define step angle.

5. List the features of 8051 microcontroller.

6. How does 8051 differentiate between the external and internal program memory?

7. What is the jump range?

8. Differentiate between program memory and data memory.

9. What is the necessity of interfacing DAC with microcontroller?

10. List the interrupts of 8051 microcontroller.

Part B $(5 \times 5 = 25)$

Answer **all** questions choosing either (a) or (b).

11. (a) Explain the different addressing modes of 8085 with suitable examples.

Or

(b) Describe with suitable examples the data transfer and control instructions in 8085 microprocessor.

12. (a) Draw and explain the interfacing of A/D converter to 8085 microprocessor.

Or

(b) Explain the interfacing of seven segment display with 8085.

13. (a) Draw the Pin Diagram of 8051.

Or

(b) Write a short note on Register set of 8051 Microcontroller.

14. (a) List the various Instructions available in 8051 microcontroller and explain.

Or

(b) Explain addition and subtraction instructions of 8051.

15. (a) Explain the various interrupts of 8051 Microcontroller.

Or

(b) Explain how to interface an 8-bit DAC with 8051 Microcontroller.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. With neat block diagram explain Programmable peripheral interface(PPI).

17. Describe with the diagram, Stepper Motor interfacing with 8085.

18. Draw and explain the Pinouts of 8051 microcontroller.

19. Discuss the addressing modes of 8051 with example.

20. Draw the schematic for interfacing a stepper motor with 8051 microcontroller and write 8051 ALP for keypad scanning.

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S–1084	Sub. Code 23MPH2S1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Second Semester

Physics

SOLAR ENERGY UTILIZATION

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What are the types of solar radiation?

2. Define convection.

3. What is the purpose of liquid heating collectors?

4. State Wien's law.

5. What are the types of solar water heater?

6. What are the characteristics of working fluid used in cooling system?

7. What are the disadvantages of photo voltaic solar energy conversion?

8. Define efficiency of solar cells.

9. What is the purpose of electrolytes in fuel cells?

10. What do you meant by redox reaction?

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) What are the reasons for variation in solar radiation reaching the earth received at the outside of the atmosphere?

Or

(b) Write a note on solar time.

12. (a) List the advantages of flat-plate collectors.

Or

(b) Write a note on focusing collector system.

13. (a) Explain the vapour compression system used in solar cooling system.

Or

(b) Discuss the selective coating used in solar hot water collector.

14. (a) Explain the silicon solar cell.

Or

(b) Write a note on thermo-electric conversion.

15. (a) Explain the types of fuel cells.

Or

(b) Write a note on cathode and anode reactions.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Describe thermal conduction, convection and radiation processes with suitable examples.

17. Explain the physical principles of the conversion of solar radiation into heat.

18. Explain the passive solar heating systems in detail.

19. Describe the principles of photo-voltaic cell in detail.

20. Discuss the principle working of fuel cells.

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S–1085

Sub. Code
23MPH3C1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Third Semester

Physics

QUANTUM MECHANICS – II

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What is meant by scattering amplitude?

2. State optical theorem.

3. What are Einstein's transition probability?

4. What is Adiabatic approximations?

5. What is meant by current density?

6. What is Anti particle?

7. Write down probability density of Dirac equation.

8. Define - Traces.

9. What is meant by classical field?

10. Define - Complex scalar field.

Part B (5 × 5 = 25)

Answer **all** the questions, choosing either (a) or (b)

11. (a) Deduce an expression for the scattering cross section of particle.

Or

(b) Outline the main features of partial wave analysis.

12. (a) State and prove Fermi Golden rule.

Or

(b) Discuss about sudden approximation.

13. (a) Give simple derivation of Klein - Gorden equation.

Or

(b) Derive Dirac equation.

14. (a) Note on - properties gamma matrics.

Or

(b) Explain about current Four vector.

15. (a) Derive an expression for Eulear -Lagrange equation.

Or

(b) Discuss about Fock state.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Explain about Transformation from centre of mass to laboratory frame.

17. Develop time dependent perturbation theory.

18. Find plane wave solution of Dirac equation.

19. Discuss about Feyaman's theory of positron.

20. Explain about creation, Annihilation and Number operators.

S–1086

Sub. Code
23MPH3C2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Third Semester

Physics

NUMERICAL METHODS AND COMPUTER PROGRAMMING

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define zeros of a polynomial.

2. Formula for Newton-Raphson.

3. What is the main difference between Gaussian elimination and the Gauss Jordan method?

4. What is an eigen value of a matrix?

5. Write a formula for Newton backward interpolation.

6. What is curve fitting?

7. What is numerical integration?

8. What is an Ordinary Differential Equation (ODE)?

9. What is flowchart?

10. Write an example for a floating point arithmetic expression.

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Explain the steps of the Bisection method with an example.

Or

(b) Find by Newton Raphson method, the real root of $3x - \cos x - 1 = 0$.

12. (a) Solve the system of equations using the matrix inversion method $2x + 3y = 5$, $4x + 7y = 10$.

Or

(b) Explain the Jacobi method.

13. (a) Explain the concept of Lagrange interpolation.

Or

(b) Use the method of least squares to determine a and b in the formula $v = ax + bx^2$.

x:	1	2	3	4	5
y:	1.8	5.1	8.9	14.1	19.8

14. (a) Explain the Trapezoidal Rule with example.

Or

(b) Discuss the Euler's Method.

15. (a) Discuss executable and non executable statements.

Or

(b) Write a C program for Newton's forward interpolation.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the Newton-Raphson method for finding the roots of a real valued function and discuss its limitations.

17. Solve, by Gauss elimination method

$$5x - y - 2z = 142$$
$$x - 3y - z = -30$$
$$2x - y - 3 = 5$$

18. Use Newton's forward interpolation to estimate $f(2.5)$.

x:	2	3	4	5
f(x):	1	4	9	16

19. Solve the system of differential equations $\frac{dy}{dx} = xz + 1$, $\frac{dz}{dx} = -xy$ for $x = 0.3$. Using fourth order RK method, $x = 0$, $y = 0$ and $z = 1$.

20. Write a program for Newton-Raphson method.

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S–1087

Sub. Code
23MPH3C3

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Third Semester

Physics

ELECTROMAGNETIC THEORY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. State the uniqueness theorem in electrostatics.

2. What is meant by Polarization?

3. Define the magnetic moment.

4. What is meant by magnetic induction?

5. State the physical significance of displacement current.

6. State the Poynting vector.

7. What are Linear and Circular polarizations?

8. Briefly explain the retarded potentials.

9. What are plasmons?

10. What are magnetosonic waves?

Part B (5 × 5 = 25)

Answer **all** the questions, choosing either (a) or (b).

11. (a) Explain the boundary value problems in electrostatics.

Or

(b) Derive an expression for Multipole expansion.

12. (a) Explain the Ampere's circuital law and force on a current carrying conductors.

Or

(b) Derive an expression for Magnetostatic energy.

13. (a) Explain the Faraday's laws of Electromagnetic induction.

Or

(b) State and explain the Poynting theorem.

14. (a) Describe the plane waves in non-conducting media and wave propagation.

Or

(b) Briefly explain about the inhomogeneous wave equations an the retarded potentials.

15. (a) Derive an expression for the Boltzmann equation.

Or

(b) Write short notes on Alfven waves and magnetosonic waves.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Discuss about the boundary value problems in dielectric sphere on an uniform field.

17. Derive Biot-Savart's law and calculate the magnetic field of a Long straight conductor and solenoid.

18. What are Maxwell's equation. Derive the Maxwell's equations and explain its physical significance.

19. Explain the linear, circular polarization reflection and refraction at a plane interface.

20. Write short notes on :

    (a) Magneto-hydrodynamic equations

    (b) Plasma confinement in a magnetic field.

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S–1088

Sub. Code
23MPH3E1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Third Semester

Physics

Elective – PHYSICS OF NANOSCIENCE AND TECHNOLOGY

(CBCS – 2022 & 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Classify the nanomaterial.
2. What is 1D and 2D nanostructured material?
3. What is the lattice constant of nanomaterials?
4. Define quantum size effect.
5. Explain wet deposition techniques.
6. Give the applications of nanolithography.
7. Define UV-visible spectroscopy.
8. Write the applications of scanning tunnelling microscopy.
9. Define nano boats.
10. What are the photocatalytic applications?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Discuss metal and semiconductor nanomaterials.

Or

(b) Explain the quantum wires in detail.

12. (a) What are the optical properties of nanomaterials? Explain.

Or

(b) Briefly explain about magnetic properties of nanomaterials.

13. (a) Explain the working of plasma arching.

Or

(b) Explain nano manipulator in detail.

14. (a) With neat examples explain the X ray photo electron spectroscopy.

Or

(b) Briefly discuss about the transmission electron microscopy.

15. (a) What is nano sensors based on optical properties?

Or

(b) Explain water purification.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Explain about the surface effect of nanomaterials.

17. Briefly discuss about the diluted magnetic semiconductor in detail.

18. Discuss electrospinning method.

19. Explain the powder X-ray diffraction with neat diagram.

20. Mention the principles and working of carbon nanotube emitters.

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S–1090

Sub. Code
23MPH3S1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Third Semester

Physics

SOLID WASTE MANAGEMENT

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. What is solid waste?

2. What is Hazardous waste?

3. What are the four characteristics of waste?

4. What is hierarchy of SWM?

5. What are the equipment used in waste disposal?

6. What is transportation of solid waste?

7. What is economic development in management?

8. How does climate change affect marine?

9. What is the cause of marine litter?

10. What is meant by industrial visit?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Write the types of solid waste management.

Or

(b) What are the categories of municipal solid waste?

12. (a) Write down the physical characteristics of SWM.

Or

(b) What are the effects of solid waste generation?

13. (a) Describe the role of transportation equipment in SWM.

Or

(b) What is the function of a landfill compactor?

14. (a) What are the economic benefits of efficient solid waste management for a country?

Or

(b) Explain the impact of marine litter on the environment and human health.

15. (a) What are the key observations from your industrial visit to a solid waste management facility?

Or

(b) Discuss the role of statistical tools in analyzing solid waste management data.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Differentiate the municipal solid waste and non-municipal solid waste.

17. What are the different types of solid waste based on their characteristics. Explain with example.

18. Explain the working of an incineration plant for waste disposal.

19. Discuss the role of recycling and waste to energy technologies in economic and environmental sustainability.

20. Explain the different stages of solid waste management you observed during the industrial visit?

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S–1091

Sub. Code
23MPH4C1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Fourth Semester

Physics

NUCLEAR AND PARTICLE PHYSICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. State Bohr Wheeler theory of fission.

2. Give the drawbacks of liquid drop model.

3. Define exchange forces.

4. Write any two properties of nuclear forces.

5. State nuclear resonance.

6. What are the major conclusions that can be arrived from the partial wave analysis?

7. Define gamma decay process.

8. Give the parity selection rules.

9. What are elementary particles?

10. Define strangeness.

Part B (5 × 5 = 25)

Answer **all** questions, choosing either (a) or (b).

11. (a) Write the salient features of liquid drop model.

Or

(b) Explains the Bohr and Mottelson collective model.

12. (a) Discuss the Yukawa theory of nuclear forces.

Or

(b) List out the properties of nuclear forces.

13. (a) Describe the nuclear chain reaction with neat diagram.

Or

(b) Drive Breit Wigner dispersion one level formula for spinless nuclei.

14. (a) Explain the classification of beta decay based on comparative half life values.

Or

(b) Write a short note on nuclear isomerism with examples.

15. (a) Explain the Gell Mann matrices.

Or

(b) Write a note on Higgs boson.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Discuss the role of spin orbit coupling in obtaining all magic numbers from the shell model.

17. Explain the properties of ground state of deuteron and show that it is a loosely bounded system.

18. Write a short note on :

    (a) Kind of nuclear reaction

    (b) Nuclear reaction kinematics

19. Write a short note on Fermi – Kurie plot.

20. Elaborate Gell Mann Okuba mass formula.

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S–1092

Sub. Code
23MPH4C2

M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

Fourth Semester

Physics

SPECTROSCOPY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define non rigid rotator.

2. What is meant by centrifugal distortion constant?

3. What is anharmonic oscillator?

4. Give some applications of vibrational spectra.

5. Give the examples of Raman active molecules.

6. Distinguish stokes and anti-stokes lines.

7. Define double resonance.

8. Write the medical applications of ESR.

9. State Lambert Bouguer law.

10. What is meant by chromophores?

Part B (5 × 5 = 25)

Answer **all** questions choosing either (a) or (b).

11. (a) Define hyperfine structure. Discuss detail about stark effect.

Or

(b) Obtain an expression for the rotational levels of a diatomic molecule taking it as a rigid rotator.

12. (a) Explain the fundamental modes of vibrations of H_2O and CO_2.

Or

(b) How to interpret the vibrational spectra diatomic molecule?

13. (a) Give the classical theory of Raman Effect.

Or

(b) Explain the pure rotational Raman spectra of linear molecule.

14. (a) Elaborate the technique of NMR spectroscopy.

Or

(b) Explain the population of energy levels in resonance spectroscopy.

15. (a) How to choice solvent in UV spectroscopy and define solvent effect?

Or

(b) List out some applications of UV spectroscopy.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Write a short note on symmetric and asymmetric top molecules.

17. Briefly discuss about the Fourier transform spectroscopy.

18. Describe the quantum theory of Raman Effect.

19. Discuss about the construction and working of ESR spectroscopy.

20. Explain the instrumentation techniques of UV spectroscopy.

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