S–3235

Sub. Code
23MPH1C1

M.Sc. DEGREE EXAMINATION, APRIL 2026

First Semester

Physics

MATHEMATICAL PHYSICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define linear vector space.

2. Give the conditions for orthonormal set.

3. Give Residue theorem.

4. Classify the types of singularities.

5. Give example of symmetrix matrix.

6. What is Hermitian matrix?

7. Give Fourier cosine transforms.

8. What is the inverse Laplace transform?

9. Give the Generating function of Legendre polynomial.

10. Give the unique property of Dirac delta function.

Part B (5 × 5 = 25)

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

11. (a) Find the basis for the eigen space corresponding to listed eigen value, where $A = \begin{pmatrix} 4 & 2 & 3 \\ -1 & 1 & -3 \\ 2 & 4 & 9 \end{pmatrix}$ and $\lambda = 3$.

Or

(b) Verify whether the given vectors $u = (7, 3, -1, 9)$ $v = (-2, -2, 1, 3)$ are linearly independent.

12. (a) Expand $\cos z$ in a Taylor series about $z = \frac{\pi}{4}$.

Or

(b) Evaluate $\int_c \frac{1+z}{z(2-z)} dz$ where c is the circle $|z| = 1$.

13. (a) Prove that a matrix can be expressed as the sum of symmetric and skew symmetric matrix.

Or

(b) Find the characteristic roots of the matrix $\begin{pmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{pmatrix}$.

14. (a) Find $L(\sin at)$.

Or

(b) Find the Fourier cosine transform of $f(x) = 5e^{-2x} + 2e^{-5x}$.

15. (a) State and prove Sturm - Liouville theory.

Or

(b) Prove the orthogonality Property of Hermite" polynomial.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Construct an orthonormal set of vectors from the set $x_1 = (1,2,1)$, $x_2 = (2,1,4)$, $x_3 = (4,5,6)$.

17. Evaluate $\oint_c \frac{dz}{z^3(z+3)}$, c is he contour $|z| = 2$ using the residue theorem.

18. Diagonalise the matrix given below $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 3 & -1 \\ 0 & -1 & 3 \end{pmatrix}$.

19. Find the Fourier sine and cosine transform of $f(x) = e^{-ax}$.

20. Prove

(a) $(n+1)\, P_{n+1}(x) = 2n+1 \;\; x P_n(x) - n P_{n-1}(x)$.

(b) $P_n^1(x) = x P_{n-1}^1 + n p_{n-1}^1(x)$.

———————

S–3236

Sub. Code
23MPH1C2

M.Sc. DEGREE EXAMINATION, APRIL 2026

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 holonomic constraints?

2. What is generalized coordinates?

3. State D'Alembert's principle.

4. What is projectile motion?

5. Define cyclic coordinates.

6. Write Hamilton's canonical equation of motion.

7. What are frequency of normal modes?

8. Give an example of a linear triatomic molecule.

9. What are non-inertial frames?

10. Write Einstein's mass-energy relation.

Part B (5 × 5 = 25)

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

11. (a) Explain the conservation laws for a system of particles.

Or

(b) Discuss generalized velocity in detail.

12. (a) Explain D'Alembert's principle.

Or

(b) Discuss the application of Lagrange equation of motion by Atwoods Machine.

13. (a) Write a note on conjugate momentum.

Or

(b) Explain Simple Pendulum using Hamilton's equation of motion.

14. (a) Discuss transformation of normal coordinates.

Or

(b) Explain the frequencies of normal modes.

15. (a) Write a notes on length contraction and time dilation.

Or

(b) Derive Einstein mass energy relation.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the conservation of energy in system of particles.

17. Derive Lagrange equation of motion.

18. Derive Hamilton's equation of motion.

19. Explain Linear triatomic molecule with its example.

20. Explain vector notation and their transformation for velocity, momentum and acceleration.

———————

S–3237

Sub. Code
23MPH1E1

M.Sc. DEGREE EXAMINATION, APRIL 2026

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 is an Op-Amp?

2. Draw the symbol of IC 741.

3. Write the applications of linear Op-Amp.

4. What is called divider circuit?

5. Why are active filters preferred?

6. List the applications of PLL.

7. What is the purposes of a voltage regulator in power supply circuit?

8. What is an analog to digital converter?

9. Draw NAND gate with its truth table.

10. What is called shift register?

Part B (5 × 5 = 25)

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

11. (a) Draw and explain the pin configuration of IC 741.

Or

(b) Explain the characteristics of ideal Op-Amp.

12. (a) With necessary circuit diagram explain voltage to current converter.

Or

(b) Draw a sample and hold circuit and explain its operation with its uses.

13. (a) Draw and explain high pass filter.

Or

(b) Explain low pass filter.

14. (a) Explain the working principle of a linear voltage regulator.

Or

(b) Describe the details of weighted register DAC.

15. (a) Explain the voltage transfer characteristics of a CMOS inverter.

Or

(b) Describe the working of shift register.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the various types of ICs.

17. Elaborate the working principle of Schmitt trigger.

18. With neat sketch explain the various blocks of PLL.

19. Explain the working principle of a Successive Approximation Register (SAR) with neat diagram.

20. Discuss the advantages and limitations of using demultiplexer in comparison to direct wiring in large-scale digital system.

———————

S–3238

Sub. Code
23MPH1E2

M.Sc. DEGREE EXAMINATION, APRIL 2026

First Semester

Physics

Elective – ENERGY PHYSICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What are conventional and non conventional energy sources?

2. Name the sources of chemical energy.

3. What is Tidal energy?

4. What is the principle of OTEC system?

5. Mention any two advantages wind energy conversion system.

6. Write down any two applications of wind energy.

7. Define photosynthesis.

8. Write the properties of biogas.

9. What are solar cells?

10. Discuss about solar green house briefly.

Part B (5 × 5 = 25)

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

11. (a) List out the availability of non-conventional energy source with an examples.

Or

(b) Discuss about the following

(i) Chemical energy

(ii) Nuclear energy.

12. (a) Explain the energy utilization from tides.

Or

(b) Write the basic principle of tidal power.

13. (a) Explain the basic principles of wind energy conversion.

Or

(b) Discuss the applications of wind energy.

14. (a) Describe the wet and dry process.

Or

(b) What are the properties of biogas?

15. (a) Explain the direct conversion of solar energy to electrical energy using solar cells.

Or

(b) Describe the working of a solar water heater.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain energy storage and distribution.

17. Describe the principle and working of OTEC system.

18. Explain the process of wind energy conversion. Mention its advantages.

19. Discuss in detail about aerobic and anaerobic digestion and their advantages.

20. Write in detail about the following

    (a) Solar distillation

    (b) Solar cooker.

———————

S–3239

Sub. Code
23MPH2C1

M.Sc. DEGREE EXAMINATION, APRIL 2026.

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 third law of thermodynamics.

2. What are critical indices?

3. Define ensemble.

4. What is entropy?

5. Define density of states.

6. State energy fluctuations.

7. Define degeneracy.

8. What is ideal bose gas?

9. Write the first virial coefficient in the cluster expansion.

10. Give the transport phenomenon.

Part B (5 × 5 = 25)

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

11. (a) State and explain Gibb's phase rule.

Or

(b) Describe scale transformations.

12. (a) With a suitable examples explain phase spauce.

Or

(b) Using microconical ensemble explain the entropy of an ideal gas.

13. (a) State and explain Lionville's theorem.

Or

(b) Calculate statistical quantities.

14. (a) Describe the statistics of ensembles.

Or

(b) Explain Bose-Einstein condensation with a neat sketch.

15. (a) Describe correlation of space time dependent fluctuations.

Or

(b) Explain the Fokker-Planck equation.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Describe the Landau's theory of phase transitions.

17. Write a note on

    (a) Entropy of mixing

    (b) Gibb's pardox.

18. Explain canonical and grand canonical ensembles.

19. Explain Fermi-Dirace statistics.

20. Describe mean-field theories of the ising model in three, two and one dimensions.

———————

S–3240

Sub. Code
23MPH2C2

M.Sc. DEGREE EXAMINATION, APRIL 2026

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. Show that the eigen values of a Hermitian operator are real.

3. What are the Bloch functions?

4. State the zero-point energy of harmonic oscillator.

5. Prove that a symmetry transformation conserves probabilities.

6. Why time-reversal operator is not linear?

7. What is the principle of perturpation theory?

8. What do you mean by turning points?

9. Define spin angular momentum.

10. Write recursion relation between Clebsch Gordan coefficients.

Part B (5 × 5 = 25)

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

11. (a) Derive time independent Schrodinger equation.

Or

(b) Prove that $(A)\,(B) \geq \frac{\langle C \rangle}{2}$.

12. (a) Discuss square potential barrier with a suitable diagram.

Or

(b) Give account on Rigid rotator.

13. (a) Explain Dirac's bra and Ket notation.

Or

(b) Deduce the equation of motion in the momentum representation.

14. (a) Discuss the hydrogen atom in the ground state does not show a first order stark effect.

Or

(b) Write a note on Connection formulae.

15. (a) Show that the raising and lowering operators J_+ and J_- are Hermitian conjugates.

Or

(b) Differentiate symmetric and anti-symmetric wave functions with examples.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. State and explain the postulates of quantum mechanics.

17. In a one-dimensional crystal, the periodicity of the potential led to the concept of energy bands. Explain.

18. Explain the effect of parity operator on the observables r, p and L.

19. Describe W.K.B. approximation method and give an application of this method.

20. Derive the Clebsh-Gordan coefficient.

S–3241

Sub. Code
23MPH2E2

M.Sc. DEGREE EXAMINATION, APRIL 2026

Second Semester

Physics

Elective — ADVANCED OPTICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. What are a quarter wave plates?

2. What is double refraction?

3. Define stimulated emission.

4. List out the components of laser.

5. What is meant by numerical aperture?

6. Define coherent bundle.

7. How does self focusing occur?

8. Define phase matching.

9. What is Faraday effect?

10. Define Voigt effect.

Part B (5 × 5 = 25)

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

11. (a) What is half wave plate? Explain.

Or

(b) Discuss about production of polarized light.

12. (a) Describe the construction and working of ruby laser.

Or

(b) Explain the construction and working of HCl laser.

13. (a) Explain the parabolic index fiber.

Or

(b) Discuss about pulse dispersion in multimode optical fiber.

14. (a) Elaborate the concept of optical mixing.

Or

(b) Write a note on self focusing of light.

15. (a) Explain the pockel's electro optic effect.

Or

(b) Discuss about Kerr magneto optic effect.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain polarization by double refraction.

17. Describe the construction and working of a semiconductor laser.

18. Explain the working of a precision vibration sensor and precision displacement sensor.

19. Derive the expression to prove the existence to second harmonic generation.

20. Write a note on Zeeman effect and stark effect.

———————

S–3242

Sub. Code
23MPH2E3

M.Sc. DEGREE EXAMINATION, APRIL 2026

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** the questions.

1. What are the functional types used in control words of 8251 a?

2. Show the operating modes in 8254 timer/counter.

3. State the principle of Stepper motor control system.

4. What is interfacing in 8085 microprocessor?

5. List the alternative functions assigned to port 3 pins of 8051 microcontroller.

6. What are the main features of 8051 microcontrollers?

7. Give the flags available in 8051.

8. What is subroutine?

9. Define interrupt vector table.

10. State the interrupts of 8051 microcontroller.

Part B (5 × 5 = 25)

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

11. (a) Explain in detail about programmable DMA Controller.

Or

(b) Describe the comparision of I/O mapped and mapped I/O interfacing.

12. (a) Discuss about the stepper motor interface in 8085 microprocessor.

Or

(b) How to measure the electrical quantities (Voltage and Current) in 8085 interfacing.

13. (a) Discuss the internal memory organization of 8051 microcontroller.

Or

(b) Write a short note on external data memory and program memory.

14. (a) Explain different JUMP and CALL instructions of 8051 microcontroller.

Or

(b) Explain the data transfer instructions of 8051 microcontroller.

15. (a) Show and explain the ADC interfacing with 8051 microprocessor.

Or

(b) With the help of a neat diagram, show the interfacing of 7 - segment display with 8051 microcontroller and explain its operation.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain different types of addressing modes available in 8085 with an example for each.

17. Draw and describe the interfacing of A/D and D/A converter interfacing to 8085 microprocessor.

18. Explain the central processing unit (CPU) of 8051 microcontroller.

19. What are the various addressing modes of 8051? Explain with Suitable example.

20. Explain the stepper motor control using 8051.

———————

S–3243

Sub. Code
23MPH2S1

M.Sc. DEGREE EXAMINATION, APRIL 2026

Second Semester

Physics

SOLAR ENERGY UTILIZATION

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define solar radiation.

2. What is conduction in heat?

3. What are solar collectors?

4. How to convert solar radiation into heat?

5. Define solar ponds.

6. What is solar heater?

7. What is the principle of photo voltaic?

8. Define amorphous silicon.

9. What is fuel cell?

10. List of some ceramic catalysts.

Part B (5 × 5 = 25)

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

11. (a) Explain the determination of solar time.

Or

(b) How to estimate solar radiation?

12. (a) Give the general characteristics of solar collectors.

Or

(b) Write a note on focusing collector system.

13. (a) Discuss about solar heating system.

Or

(b) Write a note on solar ponds.

14. (a) Distinguish between crystalline silicon / amorphous silicon.

Or

(b) Explain about thermo electric conversion.

15. (a) Summarize notes on hydrogen fuel cell.

Or

(b) Discuss about high and low temperature fuel cells.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Explain the construction and working of solar energy measuring instruments.

17. Describe the construction and working of solar flat plate collectors.

18. Discuss about the various types of solar water heater.

19. Write about photovoltaic cell and its advantages.

20. Explain in detail about hydrogen storage methods.

———————

S–3244

Sub. Code
23MPH3C1

M.Sc. DEGREE EXAMINATION, APRIL 2026.

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 scattering cross-section?

2. Define scattering length.

3. State Fermi Golden rule.

4. What is meant by sudden approximation?

5. What is dirac matrices?

6. Give the value of magnetic moment of an electron.

7. What are gamma matrices?

8. What is positron?

9. State Noether's theorem.

10. What is meant by Annihilation?

Part B (5 × 5 = 25)

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

11. (a) Explain about scattering by a Screened Coulomb potential.

Or

(b) Write short note on optical theorem.

12. (a) Write short note on constant and harmonic perturbations.

Or

(b) Explain about selection rules for dipole readiation.

13. (a) Explain about current and charge density.

Or

(b) Write short note on interpretation of negative energy state.

14. (a) Obtain the Dirac equation in covariant form.

Or

(b) Write short note on Bilinear covariant.

15. (a) Discuss about Hamiltonian formulation.

Or

(b) Explain about quantization of real and complex scalar fields.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Discuss Born approximation in scattering calculation.

17. Calculate the transistion probability per unit time and per unit of radiation evaluate the Einstein's coefficients.

18. Use relativistic Dirac equation to show that electron is endowed with spin ½.

19. Explain about relativistic invariance of dirac equation.

20. Discuss about second quantization of K.G. Field.

———————

S–3246

Sub. Code
23MPH3C3

M.Sc. DEGREE EXAMINATION, APRIL 2026

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 Gauss law in Electrostatics.

2. What is meant by Polarization?

3. State the Ampere's law of electric current.

4. Write the equation for the Magnetostatic energy.

5. Write the Faraday's law of Electromagnetic Induction.

6. State the Poynting theorem in an electromagnetic fields.

7. What is a wave guide?

8. What are kinematic properties?

9. What is plasma frequency?

10. What are Magneto hydrodynamic waves.

Part B (5 × 5 = 25)

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

11. (a) Derive the Laplace and Poisson's equation in electrostatics.

Or

(b) Explain the dielectric sphere in a uniform electric field.

12. (a) State and explain the Biot-Savart's law and write any one applications of it.

Or

(b) Write short notes on Uniformly magnetized sphere.

13. (a) Explain the physical significance of displacement current.

Or

(b) Discuss about the conservation laws for a system of charges and electromagnetic fields.

14. (a) Derive an expression for the plane of electromagnetic waves in non-conducting media.

Or

(b) Briefly explain the oscillating electric dipole.

15. (a) What are magneto-hydrodynamic waves? Derive an expression for it.

Or

(b) Write short notes on plasma confinement in a magnetic field.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Discuss about the Laplace equation in three dimension and derive the solution for spherical Laplace equation.

17. Describe the magnetic vector potential and magnetic field of a localized current distribution.

18. What are Gauge transformations? Explain the Coulomb gauge in detail.

19. Describe the reflection and Refraction of electromagnetic waves at a plane interface.

20. Write short notes on : Boltzmann equation the Debye shielding problem.

———————

S–3247

Sub. Code
23MPH3E1

M.Sc. DEGREE EXAMINATION, APRIL 2026

Third Semester

Physics

Elective — PHYSICS OF NANOSCIENCE AND TECHNOLOGY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. What is the historical perspective of nanomaterial?

2. Write the applications of quantum dots.

3. What is the specific heat capacity of nanomaterials?

4. Define super paramagnetism.

5. Explain chemical vapour deposition method.

6. Give the applications of nanolithography.

7. Define photoluminescence.

8. Write the applications of vibrating sample magnetometer.

9. Define nano bio sensor.

10. What is GMR read/write heads?

Part B (5 × 5 = 25)

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

11. (a) Discuss the classification of nanomaterials.

Or

(b) Explain the quantum well in detail.

12. (a) What are the mechanical behaviour of nanomaterials? Explain.

Or

(b) Briefly explain about diluted magnetic semiconductor.

13. (a) Explain the working and construction of sol-gel method.

Or

(b) Explain Photolithography in detail.

14. (a) With neat examples explain the powder X ray diffraction.

Or

(b) Briefly discuss about the scanning probe microscopy.

15. (a) What is electro chemical sensors?

Or

(b) Explain air purification.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain about the metal and semiconductor nanomaterials.

17. Briefly discuss about the magnetic properties of nanomaterials.

18. Discuss ball milling technique with neat diagram.

19. Explain the X ray photo electron spectroscopy.

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

———————

S–3249

Sub. Code
23MPH3S1

M.Sc. DEGREE EXAMINATION, APRIL 2026

Third Semester

Physics

SOLID WASTE MANAGEMENT

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define – Solid waste.

2. What is meant by Hazardous Waste?

3. Write down any two physical characteristic of solid waste.

4. What is meant by SW generation?

5. What are tool for dispose technique?

6. What is meant by filling technique?

7. What is meant by Linking SWM?

8. What is Marine litter.

9. Which places are preferred for industrial visit for SWM?

10. What is data collection?

Part B (5 × 5 = 25)

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

11. (a) Discuss about types of solid waste.

Or

(b) Write short note on Resource Conservation.

12. (a) Explain about chemical characteristics of solid waste.

Or

(b) Give an account of SWM hierarchy.

13. (a) Explain about transportation.

Or

(b) Discuss about disposal techniques.

14. (a) Discuss about SWM for economic development.

Or

(b) Write short note on climate change.

15. (a) Write short on analysis.

Or

(b) Write short note on SWM industrial visit.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain about Hazardous non-municipal solid waste.

17. Discuss about factors affecting SW generations.

18. Discuss about compositing and land filling technique.

19. Explain about SWM for environmental protection.

20. Discuss about presentation of industrial visits for SWM.

———————

S–3250

Sub. Code
23MPH4C1

M.Sc. DEGREE EXAMINATION, APRIL 2026

Fourth Semester

Physics

NUCLEAR AND PARTICLE PHYSICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. Give an account of nuclear spin.

2. Define mirror pair.

3. Write the properties of nuclear forces.

4. Define tensor forces.

5. State scattering cross section.

6. Write the Breit Wigner one level formula.

7. What is parity violation?

8. Define angular correlation.

9. Draw Su(2) symmetry.

10. Distinguish kaons and hyperons.

Part B (5 × 5 = 25)

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

11. (a) Discuss about electric quadrapole moment.

Or

(b) Give the essential features of the shell model of a nucleus.

12. (a) Briefly explain the working nucleon – nucleon scattering.

Or

(b) Write a short note on spin dependence of nuclear forces.

13. (a) Derive an expression for the Q value of a nuclear reaction.

Or

(b) Give an account of four factor formula for thermonuclear reaction.

14. (a) Explain the beta and gamma decay processes..

Or

(b) Write a short note on Fermi theory of beta decay.

15. (a) Discuss the conservation laws of elementary particles with examples.

Or

(b) Explain in detail about quark theory.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Obtain Weizacker semi empirical mass formula.

17. Discuss the Yukawa's meson theory of nuclear force.

18. Write the working of compound nuclear reactions.

19. Write a note on the continuous beta spectrum.

20. Explain classification of an elementary particle with the associated quantum numbers. Give examples.

———————

S–3251

Sub. Code
23MPH4C2

M.Sc. DEGREE EXAMINATION, APRIL 2026

Fourth Semester

Physics

SPECTROSCOPY

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** the questions.

1. What is rigid rotator?

2. Define intensity of spectral line.

3. Write any two applications of IR spectroscopy.

4. State zero point energy.

5. What is molecular polarizability?

6. State mutual exclusion principle.

7. Define Larmor precession.

8. State Chemical shift.

9. What is Lambert Beer law?

10. Define laws of absorption.

Part B (5 × 5 = 25)

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

11. (a) Write a short note on polyatomic molecules.

Or

(b) Explain in detail about symmetric top molecules.

12. (a) Illustrate about Fourier transform infrared spectroscopy.

Or

(b) Explain the simple harmonic oscillator of the vibrating diatomic molecules.

13. (a) Give an account of vibrational Raman spectra.

Or

(b) Write a short note on stokes and anti-stokes lines.

14. (a) Give the basic principle of ESR and ESR spectrometer.

Or

(b) Explain NMR chemical shift.

15. (a) Explain the origin of UV spectra.

Or

(b) Discuss about the effect of conjugation on chromophores.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Explain the techniques and instrumentation of microwave spectroscopy.

17. Draw and explain the schematic diagram of the typical double beam IR spectroscopy.

18. Describe the experimental setup of Raman spectroscopy and explain the results of it.

19. Explain the basic principle and construction of ESR spectroscopy.

20. Describe the construction and working of UV spectrophotometer.

———————

S–3252

Sub. Code
23MPH4E1

M.Sc. DEGREE EXAMINATION, APRIL 2026

Fourth Semester

Physics

Elective — MATERIALS SCIENCE

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define lattice matching.

2. What is meant by exciton quenching?

3. What are the desirable characteristics of glass ceramics?

4. What are refractories?

5. Define visco elasticity.

6. List out the application of biopolymers.

7. Define carbon/carbon composite.

8. State particle reinforced composites.

9. What are nano materials?

10. Define reverse transformation.

Part B (5 × 5 = 25)

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

11. (a) Write a short note on importance of optical materials and its properties.

Or

(b) Discuss briefly in light propagation materials.

12. (a) State the most important desirable characteristics of glass ceramics.

Or

(b) Explain the fabrication of ceramics in milling and sintering process.

13. (a) Write a short note on various polymerization techniques.

Or

(b) Describe about polymer processing technique.

14. (a) Explain about fiber reinforced composites.

Or

(b) List out the applications of carbon/carbon composites.

15. (a) Write the properties of nano crystalline materials.

Or

(b) Write a note on bulk metallic glass.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Describe the electro absorption modulation.

17. Discuss about the structural ceramics of Zirconia, Tungston carbide and silicon carbide.

18. Describe the glass transition temperature and its measurement.

19. Explain the fabrication methods of polymer matrix composites and metal matrix composites.

20. Discuss about thermo elasticity and pseudo elasticity with examples.

———————

S–3253

Sub. Code
23MPH4E2

M.Sc. DEGREE EXAMINATION, APRIL 2026

Fourth Semester

Physics

Elective – CONDENSED MATTER PHYSICS

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. State Brogg's law.

2. Define Atomic Form Factor.

3. What is primitive cell?

4. What do you meant by phonon momentum?

5. State Bloch theorem.

6. Define mobility.

7. State Hund's rule.

8. What is spin waves?

9. State Meissner effect.

10. State Coherence length.

Part B (5 × 5 = 25)

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

11. (a) Explain the different types of Lattices.

Or

(b) State and explain Brillouine zone.

12. (a) Arrive the relation between Group and Phase Velocities.

Or

(b) Describe Umkalapp processes.

13. (a) With a neat sketch explain band theory of metals and semiconductors.

Or

(b) Explain in detail about De Hass-Van Alphen effect.

14. (a) Describe the Quantum Theory of ferromagnetism in detail.

Or

(b) Explain Heisenberg's interpretation of Weiss field.

15. (a) Differentiate Type I and Type II superconductors.

Or

(b) Describe the thermodynamics of super conducting transistion.

Part C

(3 × 10 = 30)

Answer any **three** questions.

16. Derive the Atomic packing for SCC, BCC and FCC.

17. Obtain an expression for the specific heat capacity of solids on the basis of Debye's theory.

18. With a suitable diagram explain Kronig-Penney model.

19. Describe in detail about adiabatic demagnetization.

20. Discuss the BCS theory for superconductivity with experimental evidence.

———————

S–3254

Sub. Code
23MPH4S1

M.Sc. DEGREE EXAMINATION, APRIL 2026

Fourth Semester

Physics

SEWAGE AND WASTE WATER TREATMENT AND REUSE

(CBCS – 2023 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 2 = 20)

Answer **all** questions.

1. Define waste water.
2. Mention the imitations of reuse of sewage.
3. What is mean by disinfection?
4. Define bacteriostatic.
5. What is meant by chemical coagulation?
6. Define perikinetic flocculation.
7. What is the role of distillation in physical disinfection?
8. Define solar disinfection.
9. What is the necessity of industrial visit?
10. How to collect the data's from the industrial visit?

Part B (5 × 5 = 25)

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

11. (a) Discuss about methods of recovery.

Or

(b) What are the steps takes place during filtration process.

12. (a) Distinguish between disinfection and sterilization.

Or

(b) Discuss the various types of chlorination.

13. (a) Write a note on disinfection by products (DBPs).

Or

(b) Give the characteristics of chemical disinfection.

14. (a) Discuss about physical disinfection.

Or

(b) Explain solar disinfection in physical disinfections.

15. (a) Explain, what type of key things to observe during visit.

Or

(b) How to prepare the report for about the visit.

Part C (3 × 10 = 30)

Answer any **three** questions.

16. Discuss the slow sand filter and rapid sand filter with suitable diagram.

17. Explain the factors affecting disinfection.

18. Write a brief note on chemical disinfection treatments requiring.

19. Explain the process of electrochemical oxidation water disinfection by microwave heating.

20. Explain how to prepare the documents for presentation at the time of industrial visit.

———————