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PGIVS - O 1540 A - 16
M.Sc. IVth Semester (Non-CBCS) Degree Examination
Physics
(Quantum Mechanics - II)
Paper : 4.1
(Old)

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates:

1. Answer any Six questions of **12** marks and two questions of **4** marks.
2. Question no 9 is compulsory

1. Determine the time dependent Perturbation theory for a Quantum mechanical system & deduce Fermi Golden rule. **(12)**

2. a) Obtain Einstein coefficients A & B.

b) Write a note on harmonic perturbation. **(9+3)**

3. a) Discuss the principle of indistinguishability of identical particles

b) Explain symmetric wave functions. **(9+3)**

4. a) Explain the addition of angular momentum in quantum mechanics

b) Calculate the Clebsch-Gordon coefficients for $J_1=1/2$ & $J_2=1/2$ **(9+3)**

5. a) What are space time symmetries?

b) Show that the displacements in space leads to conservation of linear momentum. **(4+8)**

6. a) Obtain Schrodinger relativistic equation & explain its silent features and its draw backs

b) List the Properties of Dirac matrices **(9+3)**

7. a) Obtain Diracs relativistic equation for a free particle.

b) Write a note on negative energy states **(9+3)**

8. a) Obtain classical and quantum field equations.

   b) Write a note on second quantization. (9+3)

9. Write a note on spontaneous and induced eission (4)

10. Write a note on Pauli matrices (4)

11. Write a note on Time reversal invariance (4)

12. Obtain the classical Lagrangian equation (4)

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PGIVS - N 1538 A - 16
M.Sc. IVth Semester (CBCS) Degree Examination
Physics
(Nuclear Physics-II)
Paper : SCT : 4.2
(New)

Time : 3 Hours Maximum Marks : 80

Instructions : ***Answer ALL questions***

1. Give an account of the statistical theory of nuclear reactions **(15)**

(OR)

2. What is an optical potential? How does it explain the basic features of nuclear reactions? **(15)**

3. Give an elementary theory of stripping and pick-up reactions. Mention relevant experimental evidence **(15)**

(OR)

4. Treat the remote (distant) collisions of heavy ions under sudden approximation and obtain an expression for the single Coulomb excitation cross section. **(15)**

5. Compare and contrast proportional counter and solid state detectors for nuclear radiations with regard to the principle of detection, efficiency and range of application. **(15)**

(OR)

6. What is dose? Discuss in detail about biological effects of ionizing radiations. **(15)**

7. Explain classification of neutron in terms of energy. Enumerate the advantages of neutron diffraction over the x-ray diffraction. **(15)**

(OR)

8. What is X-ray fluorescence? Describe a method of characterization of a sample by X-ray Fluorescence technique. **(15)**

9. Write a note on Resonance reactions **(10)**

(OR)

10. Write a note on special characteristics of heavy ion reaction. **(10)**

11. Describe the working of Pelletron Accelerator **(10)**

(OR)

12. Explain briefly the working Proton Induced x-ray Emission (PIXE) and mention few applications **(10)**

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PGIVS-N 1539 A-16

M.Sc. IVth Semester(CBCS Scheme) Degree Examination

PHYSICS

(Biophysics-II)

Paper : SCT-4.2

(New)

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates :

Answer all questions

1. What are carbohydrates? Explain their structure and functions. **(15)**

(OR)

2. Explain the Primary and Secondary structure of Proteins. Write note on conformational analysis of proteins. **(15)**
3. Describe the construction and working of X-ray spectrometer and discuss its applications **(15)**

(OR)

4. Explain the principle of Electrophoresis and give the details of experimental setup. **(15)**
5. Write a detailed note on radiation detection, measurement and dose estimation of radiation. **(15)**

(OR)

6. Discuss in detail, the Biological effects of ionizing radiations at the molecular, cellular and tissue levels. **(15)**
7. Explain the principle, working and applications of Tomography technique.

(OR)

8. Write a detailed note on Diagnostic and therapeutic uses of ionizing radiations. **(15)**
9. Write a note on Circular Dichroism. **(10)**

(OR)

10. Give the principle and working of ESR spectrometer. **(10)**
11. Write a note on genetic effects. **(10)**

(OR)

12. Distinguish between directly and indirectly ionizing radiations. **(10)**

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PGIVS - N 1537 A - 16
M.Sc. IV Semester (CBCS) Degree Examination
Physics
(Materials Physics - II)
Paper : SCT - 4.1
(New)

Time : 3 Hours Maximum Marks : 80

Instructions : ***Answer ALL questions***

1. a) Explain the terms elastic and anelastic behaviors of solids.

   b) Distinguish between ductile and brittle fracture. Explain Ductile-Brittle transition. **(6+9)**

(OR)

2. a) Discuss the tensile stress-strain curve under elastic and plastic deformations for both ideal and real crystals.

   b) What is creep in a solid? Explain. **(10+5)**

3. a) What are glasses? How these are different from crystalline materials?

   b) Explain the composition and properties of sodalime glass, lead glass, borosilicate glass and fibre glass. **(5+10)**

(OR)

4. a) Write the basic concepts of polymers. Explain the mechanism of polymerization.

   b) Discuss the terms : i) elastomers, ii) cross-linking of polymers iii) Polymer melting and glass transition. **(7+8)**

5. a) Explain various types of polymerization.

   b) Discuss the basic theory of Calusius-Mosotti relation and explain the Maxwell and Lorentz fields in a dielectric medium. **(7+8)**

(OR)

6. a) What is the physical origin of molecular field? Explain.

b) Discuss in detail, the various energy terms that control the size and shape of ferromagnetic domain formation. **(8+7)**

7. a) What are the liquid crystals? Explain.

b) Discuss the broad classifications of liquid crystalline materials and mention their important optical properties. **(5+10)**

(OR)

8. a) Give the principle of corrosion.

b) Discuss in detail i) Electrochemical corrosion, ii) High temperature corrosion, iii) Galvanic corrosion and iv) Crevice corrosion. **(4+11)**

9. Give an account of various methods that protect the material fractures. **(10)**

(OR)

10. Write a note on the structure and property of general polymers. **(10)**

11. Explain soft and hard ferrites and mention their applications **(10)**

(OR)

12. Explain the various factors that influence the corrosion of materials. **(10)**

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PGIVS - N 1536 A - 16
M.Sc. IVth Semester (CBCS Scheme) Degree Examination
Physics
(Solid State Physics - II)
Paper : SCT : 4.1
(New)

Time : 3 Hours Maximum Marks : 80

Instructions to Cadidates :

Answer all questions.

1. Define electrical conductivity. Use of Boltzmann transport equation to express the electrical conductivity of electron gas in a metal, assuming that electron gas obeys Fermi-Dirac statistics. **(15)**

(OR)

2. a) Discuss in detail thermal conductivity and thermo electric effect in semiconductor.

   b) Write a note on high frequency conductivity in metals. **(10+5)**

3. a) Explain different types of Polarization in Dielectrics.

   b) Arrive at the relation between the dielectric constant and atomic polarizability **(8+7)**

(OR)

4. State why the simple dipole theory fails to explain Ferroelectricity. Describe the ionic displacement theory and show how it explains the ferroelectric nature of barium titanate. **(15)**

5. How does paramagnetic susceptibility of a substance vary with temperature? Derive an expression for paramagnetic susceptibility of a substance on the basis of free electron theory **(15)**

(OR)

6. Give an account of Heisenberg's theory of the origin of the Weiss magnetic field. Establish the criteria for ferromagnetism and point out the experimental evidence in favour. **(15)**

7. Explain the two fluid model of a superconductor. Arrive at London equations and explain how they are accountable for zero resistivity and Meissner effect. **(15)**

(OR)

8. How does cooper pairs formed? Explain the BCS theory of superconductivity and discuss the energy gap based on the theory. **(15)**

9. Write note on

   i) Relaxation time

   ii) Acoustical optical scattering by electrons in metals **(5+5)**

(OR)

10. Explain how the dielectric constant of a ferroelectric varies with temperature. **(10)**

11. Explain in detail, the concept of ferromagnetic domains and explain how it was experimentally established **(10)**

(OR)

12. Discuss a.c Josephson's effects and mention its applications **(10)**

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PGIVS-N 1535 A-16
M.Sc. IVth Semester(CBCS Scheme) Degree Examination
Physics
(Quantum Mechanics-II)
Paper : HCT-4.2
(New)

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates:

Answer all questions

1. Determine the first and second order transition amplitudes and their physical significances. **(15)**

(OR)

2. a) Explain spontaneous and induced emission. Obtain Einsteins A and B coefficients. **(10+5)**

   b) Obtain the selection rule for the dipole transition.

3. a) Discuss the symmetry of wave function and spin and how the Bosons and Fermions are represented by this wave function. **(10+5)**

   b) Explain addition of any two angular momentum.

(OR)

4. a) Show that the spin of an electron is a natural consequences of Dirac theory.

   b) Calculate the Clebsch-Gordon coefficients for $J_1=1$ & $J_2=1/2$. **(10+5)**

5. a) What are symmetry and degeneracy?

   b) Show that the displacements in time leads to conservation of energy **(6+9)**

(OR)

6. a) Write the Dirac equation for a particle in an electromagnetic field. **(10+5)**

   b) Write the properties of Dirac matrices.

7. a) Define classical field and obtain the Euler-Lagrange equation for the classical field. **(10+5)**

b) Write a note on Quantum field equations.

(OR)

8. a) Discuss the quantization of non relativistic Schrodinger wave equation.

b) Obtain the Hamilton's equation. **(10+5)**

9. Write a note on sudden approximation. **(10)**

(OR)

10. Explain space Inversion. **(10)**

11. Write a note on time reversal invariance **(10)**

(OR)

12. Write a note on second quantization. **(10)**

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PGIVS - N 1534 A - 16
M.Sc. IVth Semester (CBCS Scheme) Degree Examination
Physics
(Statistical Mechanics)
Paper : HCT 4.1
(New)

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates :

Answer ALL questions

1. a) State and Explain the first and third law of thermodynamics and deduce the three basic heat equations using the first law.

b) What are the thermodynamic potentials? Explain. **(9+6)**

(OR)

2. a) Explain the concept of Phase space, μ -space and Γ - space

b) What is canonical ensemble? Describe the probability of distribution of energies among the system of ensemble and find its most probable distribution. **(5+10)**

3. Describe the rotational partition function of a diatomic molecule and discuss at low and high temperatures regions for specific heat and total energy of the system. **(15)**

(OR)

4. a) State and prove the Boltzmann equipartition theorem.

b) Explain the electronic partition function and obtain the thermodynamic quantities of Helmotz free energy, internal energy, entropy and specific heat. **(8+7)**

5. a) Explain symmetric and antisymmetric wave functions.

b) Derive the expression for Bose-Einstein condensation. Discuss the process at high and low temperature regions. **(5+10)**

(OR)

6. a) What are Bosons and Fermions? Explain.

b) Derive the Fermi-Dirac distribution function for electron gas in metals using grand partition function and discuss the function at low and high temperatures. **(5+10)**

7. a) Explain the fluctuations in canonical ensemble and discuss at different cases of solid particles.

   b) Explain the effect of fluctuations on pressure. **(9+6)**

(OR)

8. a) Derive Onsagar reciprocity relations.

   b) Explain thermoelectric phenomena. **(10+5)**

9. Explain Microcanonical ensemble and obtain thermodynamic quantities from canonical ensembles. **(10)**

(OR)

10. Write a note on Gibb's Paradox and obtain Sackur Tetrode equation. **(10)**

11. Write a note on Bose-Einstein distribution function **(10)**

(OR)

12. Describe the random walk problem. **(10)**

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PGIVS-O 1541 A-16
M.Sc. IV Semester(Non-CBCS) Degree Examination
Physics
(Electronics and Instrumentation)
Paper : 4.2
(Old)

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates :

1) Answer any SIX questions of 12 Marks each.

2) Question No. 9 is compulsory

1. a) With the help of neat circuit diagrams, explain the working of Adder and Subtractor using OP-AMP.

   b) Explain the working of Voltage to Current converter. **(8+4)**

2. a) Explain the working of a successive approximation type ADC with a suitable circuit diagram.

   b) With a neat diagram explain the working of Schmitt trigger. **(6+6)**

3. Explain the working of multiplexers and demultiplexer with suitable circuit diagrams. **(12)**

4. With the help of a neat diagram explain the internal architecture of 8085 microprocessor. **(12)**

5. a) Explain the principle and working of Photoconductive cell.

   b) Explain the working of semiconductor photodiode. **(6+6)**

6. Discuss the methods of signal conditioning and Instrumentation in Transducer **(12)**

7. Discuss the principle and working of the scanning electron microscopy (SEM). **(12)**

8. a) Discuss the working of diffusion pump in vacuum systems.

   b) Discuss the principle and working of the Pirani and Penning gauges. **(5+7)**

9. Writ note on any **two** of the following

   a) Input and out impedance of an OP-AMP. **(4)**

   b) Ripple counter **(4)**

   c) Instrumentation amplifier. **(4)**

   d) Thermo gravimetric analyser **(4)**

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PGIVS-O 1542 A-16
M.Sc. IVth Semester (Non-CBCS) Degree Examination
PHYSICS
(Nuclear Physics - II)
Paper : 4.3
(Old)

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates :

Answer any SIX questions of **12** Marks and Two questions of **4** marks.

1. What are nuclear reactions? Give an outline of the formal theory of nuclear reactions.(4+8)
2. What is an optical potential? How does it explain the basic features of nuclear reactions?(3+9)
3. Outline the plane wave born approximation theory of direct reactions. (12)
4. Treat the remote (distant) collisions of heavy ions under sudden approximation and obtain an expression for the single Coulomb excitation cross section. (12)
5. Compare and contrast proportional counter and solid state detectors for nuclear radiations with regard to the principle of detection, efficiency and range of application. (12)
6. Outline the biological effects of ionizing radiation and give the tolerance limits. (12)
7. Explain neutron diffraction. Obtain an expression for coherent scattering cross section.(12)
8. Define the X-ray fluorescence? Describe the method characterization of the sample by X-ray Fluorescence technique. (12)
9. Classification of neutrons in terms of energy (4)
10. Dosimeters (4)
11. Resonance reactions (4)
12. Proton Induced X-ray Emission (4)

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PGIVS-O 1543 A-16
M.Sc. IVth Semester Degree Examination
Physics
(Solid State Physics - II)
Paper : 4.3
(Old)

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates:

*Answer any **six** questions of 12 marks and two questions of 4 marks.*

1. Discuss with relevant theories the thermo electric effects in metals. **(12)**

2. Discuss the magnetic and thermo electric effects in a semiconductors. **(12)**

3. a) Explain different kinds of polarisation. **(6+6)**

b) Derive the clausins Mossotti relation.

4. a) Explain the general properties and classification of ferro - electric materials.

b) Give brief description of the dipole thoery. **(7+5)**

5. a) Classify different kinds of magnetic materials with examples.

b) Discuss the Langevin theory of diamagnetism. **(5+7)**

6. a) Discuss the weiss theory of paramagnetism and arrive at curie - Weiss law.

b) Explain Heisenberg exchange interaction. **(8+4)**

7. a) Discuss the magnetic effect on a Superconductor.

b) Explain.

i) Penetration depth.

ii) Cooper pair. and

iii) Coherence length (6+6)

8. a) Explain Josephson Junctions what are their applications?

b) Give a brief account of structure and properties of high temperature super conductors. (7+5)

9. Write a note on lattice conduction in a metal. **(4)**

10. Explain the kind of phose transistion in Ferro electric materials. **(4)**

11. What is Block wall? Explain. **(4)**

12. Explain the structure of iron garnet **(4)**

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PGIVS-O 1545 A - 16

M.Sc. IVth Semester(Non CBCS scheme) Degree Examination

Physics

(Biophysics - II)

Paper : 4.4

(Old)

Time : 3 Hours Maximum Marks : 80

Instructions to candidates :

Answer any six Questions of 12 Marks and two Questions of 4 Marks

1. Explain the strong and weak molecular bindings relevant to biomolecular interactions. **(12)**
2. What are nucleotides? Give the structure and functions of DNA molecules. **(12)**
3. Describe the basic principle of a chromatographic technique in biophysical investigations. **(12)**
4. Explain the utility of NMR in biomolecular identification and structural information. **(12)**
5. Outline the methods of detection and measurement of nuclear radiations. **(12)**
6. What are ionizing radiations? Give an account of the biological effects of ionizing radiations. **(12)**
7. Discuss the diagnostic and therapeutic uses of laser radiation. **(12)**
8. Outline the underlying principles of Tomographic techniques and their medical applications. **(12)**
9. What is HPLC? **(4)**
10. Give the principle of Ultrasonic technique. **(4)**
11. What is meant by Nuclear Medicine? **(4)**
12. Write a note on Proteomics. **(4)**

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PGIVS -O 1544 A - 16
M.Sc. IVth Semester (Non - CBCS) Degree Examination
Physics
(Materials Science - II)
Paper : 4.4
(Old)

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates :

Answer any six questions of 12 marks and two questions of 4 marks.

1. a) Define i) true stress and strain ii) Engineering stress and strain of materials

b) Explain i) the creep and the stress relaxation experiments on a maxwell element and ii) the strain - time relationship for a Voigt-kelvin element of a Viscoelastic material **(4+8)**

2. a) Define i) brittle fracture ii) ductile fracture iii) fatigue fracture and iv) fracture toughness of a material.

b) Discuss the mechanisms of creep by dislocation climb vacancy diffusion and grain boundary sliding **(4+8)**

3. a) Explain Polymorphism in silica

b) Discuss the electrical resistivity, electrical conductivity, thermal conductivity and heat capacity of ceramics **(4+8)**

4. a) What are the conditions necessary for the glass formation? Explain.

b) List the classification of commercial glanes. Explain their properties and applications mentioning the percent content of various oxides **(4+8)**

5. a) Explain i) Principle of corrosion and ii) the mechanism of oxidation.

b) What is a galvanic series? sketch and explain the working of a Zn-Cu galvanic cell **(4+8)**

6. a) What are polymers? Give examples.

b) Explain the method of determination of Tg of a polymer using Differential Thermal Analyser **(4+8)**

7. a) What are the characteristic features of smectic and nematic liquid crystals? Explain.

b) Discuss i) dielectric properties and ii) applications of liquid crystals (4+8)

8. a) Explain quantum size effects in nano materials
   b) Describe the various properties and applications of nanomaterials (4+8)

9. Explain slip and twinning modes of plastic deformation (4)

10. Write a note on thermal shock resistance of ceramics (4)

11. Explain briefly the types of corrosion (4)

12. Distinguish between hard and soft ferrites (4)
