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PGIIS-N 1042 A-16
MSc IIth Semester(CBCS) Degree Examination
Physics
(Elementary Concepts in Physics)
Paper : OET-2.1
(new)

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates:

Answer all the questions of 15 marks each and any two questions of 10 marks each.

1. a) Explain the three basic Newton's laws of motion.
   b) What are conservative and non-conservative forces? **(9+6)**

(OR)

2. a) State and explain the law of universal gravitation.
   b) Explain briefly the motions of planets and satellites. **(8+7)**
3. a) Describe the Young's double slit experiment with neat diagram.
   b) Derive a formula for resolving power of a microscope. **(9+6)**

(OR)

4. a) Explain a method of determination of width of single and double slits.
   b) Explain the concept of interference of light waves. **(9+6)**
5. a) Explain the Maxwell's law of electromagnetism.
   b) State and explain the Biot-Savart's law in magnetostatics. **(10+5)**

(OR)

6. a) Obtain Gauss law in differential and integral forms.
   b) State and explain Faraday's law of induction. **(9+6)**

7. a) Explain the principle and working of carnot's heat engine.

b) Discuss the concept of reversible and irreversible process in thermodynamics. (9+6)

(OR)

8. a) Derive expressions for surface energy and surface tension.

b) Give the stress-strain relationship and moduli of elasticity. (9+6)

9. Write a note on gravitational field. (10)

10. Derive expressions for kinetic and potential energies on the basis of SHM. (10)

11. Explain the working of electric generator. (10)

12. Deduce the second law of thermodynamics. (10)

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PGIIS - N 1040 A - 16
M.Sc. IInd Semester (CBCS) Degree Examination
Physics
(Atomic and Molecular Physics)
Paper : SCT 2.1
(New)

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates:

Answer **All** the questions of **15** marks each and any **two** questions of **10** marks each.

1. Give a brief account of vector model for coupling scheme in the case of two valence electron atom. **(10+5)**

(OR)

2. a) What is homogeneous and inhomogeneous broadenings of the spectra? Explain

b) What is LS coupling? Discuss the allowed terms, fine structure and relative intensities under LS coupling scheme. **(7+8)**

3. Describe how electronic states of atoms can be obtained using Zeeman effect. What is the influence of nuclear spin? **(15)**

(OR)

4. Explain the hyperfine structure of two electron system. Discuss the Stark effect in two electron system. **(15)**

5. a) Discuss with necessary theory, the rotation-vibration spectrum of a diatomic molecule.

b) Explain how the molecular constants obtained from the study of such spectra **(10+5)**

(OR)

6. a) Discuss the vibrational coarse structure of a diatomic molecule.

b) Explain the experimental determination of the vibrational constants of a diatomic molecule. **(7+8)**

7. a) Give the criterian for lasing and threshold condition for lasers.

   b) Explain spatial and temporal coherence (10+5)

(OR)

8. Explain the principle, construction and working of Nitrogen laser. (15)

9. Write a note on Thomas - Fermi potential. (10)

10. Write a note on Isotope shift (10)

11. Write a note on Born - Oppenheimer approximation (10)

12. Write a note on Reconstruction of holograms (10)

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PGIIS - N 1039 A - 16
M.Sc. IInd Semester (CBCS) Degree Examination
Physics
(Basic Solid State Physics)
Paper : HCT 2.2
(New)

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates:

Answer All the questions of **15** marks each and any two questions of **10** marks each.

1. a) Explain the formation of Wigner-Seitz cell.

b) Discuss the classification of crystal systems along with unit cell dimensions **(6+9)**

(OR)

2. a) Define reciprocal lattice vectors and mention their properties.

b) With neat diagrams, explain the structures of NaCl and ZnS unit cells. **(6+9)**

3. a) What is hydrogen bonding? Explain.

b) Obtain an expression for Vander Waals-London interaction energy **(5+10)**

(OR)

4. a) What is Debye's continuum model? Explain.

b) Discuss the relevant theory for vibrations of one dimensional monoatomic lattice and obtain dispersion relation. **(5+10)**

5. a) Explain the salient features of free electron theory of metals.

b) Obtain an expression for electrical conductivity of free electrons **(6+9)**

(OR)

6. a) Deduce the specific heat due to conduction electrons in metals.

b) Sketch and explain the formation of Fermi surface in case of free electron gas **(10+5)**

7. a) Explain the conversion of a semiconductor from an intrinsic state to an extrinsic state.

b) Discuss the carrier statistics of an intrinsic semiconductor and obtain the relations for its carrier concentrations. (5+10)

(OR)

8. Give an experimental survey of superconductivity. Mention some important applications of superconductors. (15)

9. With neat diagram, explain the Bragg's condition for diffraction. (10)

10. Discuss the estimation of Madelung constant for one dimensional chain of ionic lattice. (10)

11. Write a note on Frank-Reed mechanism of dislocation multiplication. (10)

12. Explain the Hall effect in an intrinsic semiconductors and give its importance. (10)

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PGIIS-N 1038 A-16
MSc IInd Semester(CBCS) Degree Examination
Physics
(Basic Nuclear Physics)
Paper : HCT-2.1
(New)

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates :

Answer all the questions of 15 marks each and any two questions of 10 marks each.

1. a) Estimate nuclear unit radius by mirror nuclei method

b) Obtain an expression for electric quadrupole moment. **(10+5)**

(OR)

2. a) Give two evidences for non central nature of nuclear force

b) Discuss in detail Yukawa's meson theory of nuclear forces. **(5+10)**

3. a) Distinguish between direct and compound nuclear reactions

b) Obtain Q-value equation of a nuclear reaction. **(5+10)**

(OR)

4. a) Draw binding energy curve and bring out important conclusions.

b) Obtain energy level scheme for nuclei with infinite square well potential. **(5+10)**

5. Give an account of Fermi theory of beta decay **(15)**

(OR)

6. a) Explain the term stopping power of a medium.

b) Give the energy loss mechanism of heavy charged particles in matter. **(5+10)**

7. a) Discuss in detail the Quark model of elementary particles.

   b) Discuss the features of fundamental interactions in nature (10+5)

(OR)

8. a) Give the construction and working of a nuclear reactor.

   b) Briefly discuss stellar nucleosynthesis. (10+5)

9. Write a note on Rutherford's alpha scattering experiment. (10)

10. Discuss briefly the stability limits against spontaneous fission. (10)

11. Give the working of a scintillation detector. (10)

12. Write a note on conservation laws of elementary particle interactions. (10)

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PGIIS-O 1043 A-16
M.Sc. IInd Semester(NON-CBCS) Degree Examination
Physics
(Statistical Mechanics)
Paper : 2.1

(old)

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates:

1) Answer any **six** questions of **12** marks each.
2) Question number **9** is compulsory.

1. a) State and explain the first and second laws of thermodynamic. **(6)**

b) Derive the Maxwell's relations from the thermodynamic potentials **(6)**

2. a) Explain the canonical, grand canonical and micro canonical ensembles. **(6)**

b) State and prove Liouville's theorem. **(6)**

3. Describe the rotational partition function of a diatomic gas and obtain an expression for its partition function and discuss the specific heat curves as a function of characteristic temperatures. **(12)**

4. What are Bosons? Give examples. Derive an expression for Bose-Einstein distribution function for bosons. **(12)**

5. a) Describe the limiting cases for which quantum statistics approaches to classical statistics **(6)**

b) Explain the strong and weak degeneracy in case of bosons and fermions. **(6)**

6. a) What is Brownian motion? Explain **(3)**

b) Derive the Langevin equation for random motion. **(9)**

7. Explain the idea of random walk and obtain an expression for in mean square displacement. **(12)**

8. a) Obtain onsager reciprocity relations **(6)**

b) Discuss non-equilibrium phenomena in liquid, helium **(6)**

9. Write notes on **any two** of the following:

a) Most probable distribution. **(4)**

b) Gibb's paradox. **(4)**

c) Symmetric and Anti-symmetric wave functions. **(4)**

d) Johnson noise. **(4)**

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PGIIS-O 1044 A-16
M.Sc. IInd Semester(Non-CBCS) Degree Examination
PHYSICS
(Applied Physics)
Paper : 2.1
(Old)

Time : 3 Hours Maximum Marks : 80

*Instruction to candidates: 1) Answer any **six** questions of **12** marks and two questions of **4** marks*

1. a) High light briefly the observational information on stars. **(6)**

b) Discuss the nature of Stellar Spectra **(6)**

2. Give and account of pulsars and quasars. **(12)**

3. What is biological complimentarity principle? Discuss the evolution of cell **(12)**

4. a) Distinguish between plant and animal cells. **(6)**

b) Describe the cell structure and its functioning **(6)**

5. What is Laser? Describe any two techniques of population inversion used in achieving Lasing action **(12)**

6. a) Explain the principle of Holography? **(3+9)**

b) Describe the recording and reconstruction of holograms

7. What is plasma? Mention the properties and parameters which describe the plasma state. **(12)**

8. Derive and discuss the magneto-hydrodynamic equations. **(12)**

9. Write a note on Black holes **(4)**

10. Comment on cell doctrine **(4)**

11. List any four applications of Lasers. **(4)**

12. Write a note on plasma oscillations. **(4)**

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PGIIS - O 1045 A - 16

M.Sc. IInd Semester (Non-CBCS) Degree Examination

Physics

(Atomic and Molecular Physics)

Paper : 2.2

(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 is meant by fine structure of spectral lines? Give an account of fine structure of emission of lines of hydrogen atom based on spinorbit interaction. **(12)**

2. Illustrate with example LS and jj couplings for atoms with two outer valence electrons. Calculate the possible j values for s,p,d and f electrons. **(12)**

3. Discuss how spin - orbit interaction explains fine structure of alkali spectra. Explain why each line of principal series of Na is a doublet where as each line of diffuse series is a triplet. **(12)**

4. Discuss the general quantum mechanical theory of anomalous Zeeman effect. With reference to Zeeman pattern for D_1 and D_2 lines of sodium. **(12)**

5. Give the theory of rotational spectra for rigid and non- rigid rotator diatomic molecules **(12)**

6. With a neat diagram explain the working of a double beam IR spectrometer **(12)**

7. a) Discuss how the energy difference between two electronic states is estimated from electronic vibration spectra.

b) Explain the following (i) v' progression, ii) sequence. **(6+6)**

8. With a neat diagram explain the working of a UV - Visible spectrophotometer. Mention its applications. **(12)**

9. Write a note on Stark effect. (4)

10. Write a note Frank-Condon principle (4)

11. High light meaning and significance of Pauli exclusion principle (4)

12. What is Born - Oppenheimer approximation? Explain. (4)

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PGIIS - O 1046 A - 16
M.Sc. IInd Semester (Non-CBCS) Degree Examination
Physics
(Elements of Nuclear Physics)
Paper : 2.3
(Old)

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates:

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

1. a) Estimate the nuclear radius from Rutherford α-scattering experiment

b) Find the radius of $_{82}Th^{208}$.[Ro=1.45X10^{-15} m] **(10+2)**

2. Give the ground state properties of deuteron. Justify that the deuteron ground state is loosely bound and greatly extended structure. **(12)**

3. a) What are the endoergic and exoergic reactions?

b) Give an account of the Bohr's compound theory of nuclear reactions. **(4+8)**

4. a) Give any six evidences for magic numbers.

b) Arrive at the energy levels of the nucleus based on the nuclear shell model assuming that the nucleons move in an infinite square well potential. **(3+9)**

5. Give an account of Fermi's theory of beta decay **(12)**

6. Discuss in detail the energy loss mechanisms of heavy charged particles moving in a medium **(12)**

7. a) Compare and contrast nuclear fission and fusion processes.

b) Arrive at four factor formula for a nuclear reactor. Bring out the significance of each term. **(3+9)**

8. Describe in detail the classification of elementary particles and the conservation laws obeyed by them. (12)

9. Explain nuclear quadrupole moment (4)

10. Write and explain semiempirical mass formula (4)

11. Discuss pair production (4)

12. Write a note on neutron activation analysis (4)

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PGIIS - O 1047 A - 16
M.Sc. IInd Semester (Non- CBCS) Degree Examination
Physics
(Elements of Solid State Physics)
Paper : 2.4
(Old)

Time : 3 Hours Maximum Marks : 80

Instructions to candidates:

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

1. a) Describe the Zn,S crystal structure **(8+4)**

b) Obtain the Miller indices of a plane whose intercepts are (4,1,2)

2. a) Explain Ewald's construction of reciprocal lattice

b) Define structure factor. Obtain the structure factor of the diamond structure for the basis of the interpenetrating fcc lattices (0,0,0) and (1/4, 1/4 1/4). **(4+8)**

3. a) Obtain the madelung constant for ionic crystals **(6+6)**

b) Give an account of the hydrogen bonded crystals

4. a) Explain the concept of Phonon. **(4+8)**

b) Discuss the vibrational modes of monoatomic lattices.

5. a) What is Fermi energy? Explain **(4+8)**

b) Discuss the behaviour of electrons in a periodic potential based on kronig-penny model.

6. a) Sketch the Frenkel defects in solids and explain. **(4+8)**

b) Obtain the equilibrium concentration of Frenkel defects

7. a) What are called majority and minority carriers in semiconductors (6+6)

   b) Derive expressions for electrons and holes concentrations in intrinsic semiconductors

8. a) Explain the concept of critical field in superconductors (4+8)

   b) Discuss the thermodynamics of superconducting transition

9. Obtain the packing fraction of the fcc treating the atoms as spherical (4)

10. Explain dislocation multiplication based on Frank-Read mechanism (4)

11. Write a note on metallic bonding. (4)

12. Write a note on Meissner effect (4)

Roll No. _____ [Total No. of Pages : 2

PGIIS - O 1047 A - 16
M.Sc. IInd Semester (Non- CBCS) Degree Examination
Physics
(Elements of Solid State Physics)
Paper : 2.4
(Old)

Time : 3 Hours Maximum Marks : 80

Instructions to candidates:

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

1. a) Describe the Zn,S crystal structure **(8+4)**

b) Obtain the Miller indices of a plane whose intercepts are (4,1,2)

2. a) Explain Ewald's construction of reciprocal lattice

b) Define structure factor. Obtain the structure factor of the diamond structure for the basis of the interpenetrating fcc lattices (0,0,0) and (1/4, 1/4 1/4). **(4+8)**

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b) Discuss the thermodynamics of superconducting transition

9. Obtain the packing fraction of the fcc treating the atoms as spherical (4)

10. Explain dislocation multiplication based on Frank-Read mechanism (4)

11. Write a note on metallic bonding. (4)

12. Write a note on Meissner effect (4)