

Date :11.02.2021

(M)

Reg. No

PG

PAPER CODE: PHY231AP

NMPH (2019-21



**ANDHRA LOYOLA COLLEGE (AUTONOMOUS): VIJAYAWADA – 520
008**

III - SEMESTER END EXAMINATIONS FEBRUARY – 2021

II M.Sc – PHYSICS (PAPER-I)

ATOMIC PHYSICS

**Time: 2Hrs
100M**

Max Marks:

40M

Pass Mark:

**Answer ONE question from each unit. All questions carry equal marks
5X20=100M**

1. a. Derive an expression for the spin-orbit interaction energy. Discuss the fine structure of $H\alpha$ line.

OR

- b. State and explain Pauli's exclusion principle. Show that the possible state function is symmetric for bosons and anti-symmetric for fermions.

2. a. Explain He atom spectrum quantum mechanically. Calculate the energy of He atom in its ground state.

OR

- b. Discuss the postulates of the central field approximation. Explain Hartree's self-consistent method.

3. a. State and explain the Lande interval rule. Determine the spectral terms for L-S Coupling.

OR

- b. Distinguish between L-S and j-j coupling schemes. Give the selection rules for j-j Coupling.

4. a. What is Zeeman effect? Discuss normal and anomalous Zeeman effect.

OR

b. Discuss the weak field and strong field effect in hydrogen.

5. a. Explain Nuclear spin and hyperfine structure of spectral lines..

OR

b. Discuss Back-Goudsmit effect in hyperfine structure.

ANDHRA LOYOLA COLLEGE(Autonomous):: VIJAYAWADA-520008

IIM. Sc (PHYSICS)- III SEMESTER-PAPER-I

SEMESTER END EXAMINATION

Course Code: PHY231AP

SCHEME OF EVALUATION

ATOMIC PHYSICS (core)

TIME: 2 Hrs

MAX MARKS: 100

I. ANSWER THE FOLLOWING(5x20=100)

1. (a) expression for the spin-orbit interaction energy-10M fine structure of $H\alpha$ line-10M.

(OR)

(b) State and explain Pauli's exclusion principle-10M. Show that the possible state Function is symmetric for bosons and anti-symmetric for fermions-10M.

2. (a) Explain He atom spectrum quantum mechanically-10M. Calculate the energy of He atom in its ground state-10M.

(OR)

(b) Discuss the postulates of the central field approximation-10M. Explain Hartree's self-Consistent method-10M.

3. (a) State and explain the Lande interval rule-10M. Determine the spectral terms for L-S Coupling-10M.

(OR)

(b) Distinguish between L-S and j-j coupling schemes-10M. Give the selection rules for j-j

Coupling-10M.

4. (a) Zeeman effect-4M normal Zeeman effect-8M and anomalous Zeeman effect-8M
(OR)
(b) Discussion of the weak field-10M and strong field effect in hydrogen-10M.
5. (a) Explanation of the Nuclear spin-8M and hyperfine structure of spectral lines-12M.
(OR)
(b) Discussion-8M derivation-6M schematic representation-6M.

Date :13.02.2021

(M)

Reg. No

PG

PAPER CODE: PHY233PS

NMPH (2019-21



III - SEMESTER END EXAMINATIONS FEBRUARY – 2021

II M.Sc – PHYSICS (PAPER-III)

PROPERTIES OF SOLIDS

**Time: 2Hrs
100M**

Max Marks:

40M

Pass Mark:

**Answer ONE question from each unit. All questions carry equal marks
5X20=100M**

1. a. Describe the classification of lattice defects

OR

b. Discuss the effect of temperature on the formation of lattice defects

c. Explain the Frank-Read mechanism

2. a. Explain the optical, thermal and electronic excitations in ionic crystals.

OR

b. Explain the formation of color centers resulting from excess of metal.

c. Describe the photo electric effect in alkali halides.

3. a. Explain the phenomena of (i) Fluorescence (ii) Phosphorescence

OR

b. Discuss the decay mechanisms associated with luminescence

4. a. Explain the formation of optical modes in crystal lattice

OR

b. Distinguish between Debye's theory and Einstein's theory of specific heat of solids.

5. a. Discuss the quantum theory of Para magnetism

b. Explain the quenching of orbital angular momentum

OR

c. Discuss the quantization of spin waves

SCHEME OF VALUATION

1 (a) Classification of lattice defects – 20

(OR)

(b) Effect of temperature on the formation of lattice defects – 10

(c) Frank-Read mechanism – 10

2 (a) Optical, thermal and electronic excitations in ionic crystals – 20 .

(OR)

(b) Formation of color centers resulting from excess of metal – 10

(c) Photo electric effect in alkali halides – 10

3 (a) Explain the phenomena of (i) Fluorescence – 10

(ii) Phosphorescence – 10

(OR)

(b) Decay mechanisms associated with luminescence – 20

4 (a) Formation of optical modes in crystal lattice – 20

(OR)

(b) Distinguish between Debye's theory and Einstein's theory of specific heat of solids – 20

5 (a) Quantum theory of Para magnetism – 10

(b) Quenching of orbital angular momentum – 10

(OR)

(c) Quantization of spin waves – 20

Date :15.02.2021 (M)

Reg. No

PG

PAPER CODE: PHY234GT

NMPH (2019-21



**ANDHRA LOYOLA COLLEGE (AUTONOMOUS): VIJAYAWADA – 520
008**

III - SEMESTER END EXAMINATIONS FEBRUARY – 2021

II M.Sc – PHYSICS (PAPER-IV)

GLASS SCIENCE AND TECHNOLOGY

Time: 2Hrs

Max Marks: 100M

Pass Mark: 40M

**Answer ONE question from each unit. All questions carry equal marks
5X20=100M**

1. a. Discuss the various theories of glass transition.

OR

- b. What are the glass forming systems? Explain the structure and topology of glass forming

Systems and coordination number.

2. a. Explain the structural models for alkali Boro silicate glasses

OR

- b. Discuss the structural models for alkaline earth alumino silicate glasses

3. a. Describe the working of (i) Rotation visco meters (ii) Sphere falling viscometers

OR

- b. Write a note on temperature dependence of viscosity on silicate melts

4. a. Explain the method of Differential Scanning Calorimetry in determining the glass Transition

temperature.

OR

- b. Discuss isothermal crystallization and dynamic crystallization

5. a. Give an account on bulk optical properties of glasses

OR

- b. Explain radiation induced colors and slorization in glass materials

PAPER CODE: PHY234GT
BATCH)

NMPH (2019-21

ANDHRA LOYOLA COLLEGE (AUTONOMOUS): VIJAYAWADA – 520
008

III - SEMESTER END EXAMINATIONS FEBRUARY – 2021

II M.Sc – PHYSICS (PAPER-IV)

GLASS SCIENCE AND TECHNOLOGY

Time: 2Hrs
100M

Max Marks:

40M

Pass Mark:

SCHEME OF VALUATION

1 (a) Various theories of glass transition (thermo dynamics, entropy, relaxation process) – 20

(OR)

(b) Glass forming systems, structure and topology of glass forming systems and coordination number – 20

2 (a) Structural models for alkali Boro silicate glasses – 20

(OR)

(b) Structural models for alkaline earth alumino silicate glasses – 20

3 (a) Working of (i) Rotation visco meters – 10

(ii) Sphere falling viscometers – 10

(OR)

(b) Temperature dependence of viscosity on silicate melts – 20

4 (a) Differential Scanning Calorimetry in determining the glass Transition temperature – 20

(OR)

(b) Isothermal crystallization and dynamic crystallization – 20

5 (a) Bulk optical properties of glasses – 20

(OR)

(b) Radiation induced colors and colorization in glass materials – 20

Date :16.02.2021

(M)

Reg. No

PG

PAPER CODE: PHY235DF

NMPH (2019-21



**ANDHRA LOYOLA COLLEGE (AUTONOMOUS): VIJAYAWADA – 520
008**

III - SEMESTER END EXAMINATIONS FEBRUARY – 2021

II M.Sc – PHYSICS (PAPER-V)

DIELECTRICS, FERROELECTRICS & HIGH TEMPERATURE

SUPER CONDUCTORS

**Time: 2Hrs
100M**

Max Marks:

Pass Mark:

40M

**Answer ONE question from each unit. All questions carry equal marks
5X20=100M**

- Explain the electronic and orientational polarisation in dielectrics.
 - Obtain Clausius-Mosotti equation relating macroscopic dielectric constant with microscopic polarisabilities.

OR

- Derive an expression for internal field according to Lorentz.
 - Explain complex dielectric constant and dielectric loss.
- Classify the ferroelectric materials and explain their properties.
 - Write notes on ferroelectric domains.

OR

- Explain dipole theory of ferroelectricity.
 - What are ionic displacements? Explain the behavior of BaTiO_3 above the Curie temperature.
- Write notes on Type - I and Type – II superconductors
 - Explain the BCS theory of superconductivity.

OR

- c. Discuss the quantum tunneling effect in superconductors.
 - d. Explain Meissner effect and isotope effect.
4. a. Explain the Ginzburg Landau theory of superconductivity.
- b. Obtain an expression for AC Josephson current.

OR

- c. Explain Macroscopic quantum interference.
- d. Explain any five applications of superconductivity.

P.T.O

5. a. Write notes on High temperature superconductivity.
- b. Discuss the properties of oxide superconductors.

OR

- c. Discuss the physical properties of Cuprate superconductors.
- d. Draw the generic phase diagram of Cuprate superconductors and explain the phases.

ANDHRA LOYOLA COLLEGE (Autonomous):: VIJAYAWADA-8

DEPARTMENT OF PHYSICS

M.Sc., Physics – Syllabus w. e. f. (2020 – 2021)

SEMESTER III

Course - V: DIELECTRICS, FERROELECTRICS & HIGH TEMPERATURE SUPERCONDUCTOR
(Skill based)

TIME: 2 Hrs

MAX.

MARKS: 100

SCHEME OF VALUATION

1. a) Electronic polarisation; Orientational polarisation (5+5=10M)
b) Derivation of Clausius-Mosotti equation (10M)
(OR)
c) Derivation of expression for internal field according to Lorentz. (10)
d) Explanation of complex dielectric constant and dielectric loss. (5+5)
2. a) Classification of ferroelectric materials and explanation of their properties.(4x2.5=10M)
b) Notes on ferroelectric domains. (10M)
(OR)
c) Dipole theory of ferroelectricity. (10M)
d) Ionic displacements (5M); Behavior of BaTiO₃ above the Curie temperature. (5M)
3. a) Type - I and Type – II superconductors (5+5=10M)
b) BCS theory of superconductivity. (10)

(OR)

- c) Quantum tunneling effect in superconductors. (10)
- d) Meissner effect and isotope effect. (5+5=10)

- 4. a) Ginzburg Landau theory of superconductivity. (10)
- b) Expression for AC Josephson current. (10)

(OR)

- c) Macroscopic quantum interference. (10M)
- d) Any five applications of superconductivity. (5x2=10M)

- 5. a) High temperature superconductivity. (10M)
- b) Properties of oxide superconductors. (10M)

OR

- c) Five physical properties of Cuprate superconductors. (5x2=10)
- d) Generic phase diagram of Cuprate superconductors; (4M) and explanation of phases. (6M)

Date

:12.02.2021 (M)

Reg. No

PG

PAPER CODE: PHY232NP

NMPH (2019-21



**ANDHRA LOYOLA COLLEGE (AUTONOMOUS): VIJAYAWADA – 520
008**

III - SEMESTER END EXAMINATIONS FEBRUARY – 2021

II M.Sc – PHYSICS (PAPER-II)

NUCLEAR AND PARTICLE PHYSICS - I

**Time: 2Hrs
100M**

Max Marks:

40M

Pass Mark:

**Answer ONE question from each unit. All questions carry equal marks
5X20=100M**

1. a. Discuss about the terms nuclear radius, binding energy and mirror nuclei.

OR

- b. Explain the Magnetic Dipole moment and Quadrupole Moment of the Nucleus.

2. a. Explain the characteristics of nuclear forces.

OR

- b. Discuss Yukawa's meson theory of nuclear forces.

3. a. Discuss the basic assumptions of liquid drop model and derive semiempirical formula.

OR

- b. Explain how the shell model can account for the existence of magic numbers.

4. a. Discuss the Selection rules for Beta decay transitions.

OR

- b. Explain the detection and properties of neutrino.

5. a. Explain various types of nuclear reactions and obtain an expression for Q-value.

OR

- b. Discuss Breit-Wigner Resonance formula.

ANDHRA LOYOLA COLLEGE(Autonomous): VIJAYAWADA-520008

IIM. Sc (PHYSICS)- III SEMESTER-PAPER-II

SEMESTER END EXAMINATION

Course Code: PHY232NP

SCHEME OF EVALUATION

NUCLAR AND PARTICLE PHYSICS-I(core)

TIME: 2Hrs MAX MARKS: 100

6. ANSWER THE FOLLOWING

(5X20=100)

1. (a) nuclear radius-5M binding energy-5M Mirror nuclei-10M.
(OR)
(b)Magnetic Dipole moment-10M and Quadrupole Moment of the Nucleus-10M.
2. (a) characteristics of nuclear forces spindependent-10,charge independent-10M.
(OR)
(b) properties-5M, discussion-10M, graph-5M
3. (a) Discussion of liquid drop model-10M derivation-10M.
(OR)
(b) Explanation of shell model-10M spin-orbit interaction-10M
4. (a) Discussion of the Selection rules for Beta decay transitions-10M each.
(OR)
(b) Explanation of the detection-10M and properties of neutrino-10M.
5. (a) Explanation of various types of nuclear reactions-10M and expression for Q-value-10M.
(OR)
(b) Discussion-10M and derivation-10M.
