



HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY

NAAC A (3.02) State University

PATAN - 384265

Faculty of Science

B.Sc. Physics

Sem 3 & 4

Syllabus /Scheme

With Semester / CBCS / Grading Pattern

W.E.F. June -2021 (and thereafter)

Recd.
3.3.1.1
25-6-21

Phy
DATE: 09/06/2021

TOTAL PAGE - 23

Hemchandracharya North Gujarat University, Patan

B.Sc. Programme for semester 3 & 4

(CBCS-Semester-Grading pattern)

Semester end Examination

Format for Question paper Elective Courses (Subject) in Physics
w.e.f. June-2021

There will be three questions.

First question will be from Unit - I,

Second question from Unit-II, and

Third question will be from both the Units.

All the questions are detailed as under.

Time: 2Hrs

Total Marks: 35

- | | |
|--|----------|
| 1 (a) Attempt Any One out of Two (Theory questions) | 06 Marks |
| (b) Attempt any two Out of Three
(Theory type or Application/Example/Problem) | 06 Marks |
| 2 (a) Attempt Any One out of Two (Theory questions) | 06 Marks |
| (b) Attempt any two Out of Three
(Theory type or Application/Example/Problem) | 06 Marks |
| 3 (a) Attempt any three out of Five (Short or objective type questions) | 06 Marks |
| (b) Attempt any Five Out of Eight (Objective / MCQ) | 05 Marks |

Hemchandracharya North Gujarat University, Patan

B.Sc. Programme for semester 3 & 4

(CBCS-Semester-Grading pattern)

Semester end Examination

Format for Question paper Core Compulsory Courses in Physics
w.e.f. June-2021

There will be four questions. All questions are of 18, 17, 18, 17 marks each.

First question will be from Unit - I, Second question will be from Unit-II,
Third question will be from Unit-III, Fourth question will be from all three Units.
Detailed about all the questions is as under.

Time: 2.5 Hrs

Total Marks: 70

- | | | |
|-------|---|----------|
| 1 (a) | Answer any One out of Two (Long Theory type questions) | 07 Marks |
| (b) | Answer any Two Out of Three
(Short Note/Application/Example/Problem) | 10 Marks |
| 2 (a) | Answer any One out of Two (Long Theory type questions) | 08 Marks |
| (b) | Answer any Two Out of Three
(Short Note/Application/Example/Problem) | 10 Marks |
| 3 (a) | Answer any One out of Two (Long Theory type questions) | 07 Marks |
| (b) | Answer any Two Out of Three
(Short Note/Application/Example/Problem) | 10 Marks |
| 4 (a) | Answer the following (Any Six out of Eight)
(Short answer or objective type questions) | 12 Marks |
| (b) | Answer the following (Any Five out of Seven)
(Very Short answer or MCQ type questions) | 06 Marks |

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
CBCS SEMESTER GRADING PATTERN
B. Sc. SEMESTER III
(PHYSICS SYLLABUS Effective from June - 2021)

CC - PHYSICS - 301

UNIT I THERMODYNAMICS AND SOUND

Heat and Thermodynamics:

Characteristic functions, Enthalpy(11.1), The Helmholtz and Gibb's function(11.2), Two Mathematical Theorems(11.3), Maxwell's equation(11.4), The T dS equations (11.5), Internal-Energy equation(11.6), Heat capacity equation, The Thermal Exapansivity (11.9), Compressibility(11.10), Joule-Kelvin effect (Porous plug Experiment) (12.1) Liquification of Gases by Joule-Kelvin Effect (12.2) *Related Examples, Problems, MCQ & Short Questions*

Basic Reference: *Heat and Thermodynamics by Mark W. Zeemansky (5th Edition)*

Kinetic Theory of Gases:

Maxewell's Distribution Law of Velocities, Deduction of Maxwell-Boltzmann law, Determination of the values of constants 'a' and 'b' (6.5), Experimental Test of Maxwell's Law (6.6) *Related Examples, Problems, MCQ & Short Questions*

Basic Reference :

Thermodynamics and Statistical Physics by Singhal - Agarwal - Prakash Pragati Prakashan, Meerut.

Sound : Microphones (20.1), Carbon Microphone(20.2), Condenser Microphone(20.3), Loudspeaker- (i)Fixed coil or moving iron type loudspeaker and (ii) Moving coil type loudspeaker(20.8) Recording of sound : Miller Phonodiek(21.1) *Related MCQ & Short Questions*

Basic Reference :

A Textbook of oscillations, waves and acoustics by Dr M Ghosh and D Bhattacharya (S Chand)

Other References:

1. University Physics by Sears, Zeemansky and Young. (6th Edi) Narosa publication, New Delhi.
2. Heat Thermodynamics and Statistical Physics by Brijlal, Dr. Subrahmanyam, P.S. Hemne S. Chand.
3. Waves and Oscillations by N Subrahmanyam, Brijlal.

UNIT II ATOMIC PHYSICS

(A) Atomic Spectra: Franck -Hertz Experiment(2.16), Critical Potentials (2.17), Shortcoming of Bohr's Theory(2.19) , Sommerfield extension of Bohr theory (2.20), Limitations of Sommerfield Model *Related Examples, Problems, MCQ & Short Questions*

Basic Reference: *Atomic and Molecular Physics by Raj Kumar (Campus Books)*

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(B) Atomic Spectra :

Orbital and Magnetic Dipole Moment (4.1), Larmor Precession (4.2), Space quantization(4.3), electron spin (4.4), Vector model of atom (4.5), Spectroscopic terms and their notations(4.6), Stern Gerlach Experiment(4.7), Pauli's Exclusion Principle(4.8). Zeeman Effect-Normal Zeeman Effect and anomalous Zeeman Effect(12.1), Explanation of Normal Zeeman Effect(12.2), Explanation of Anomalous Zeeman Effect(12.3), Paschan Back effect (12.4). Stark Effect of Hydrogen (13.1) Weak field and strong field of stark effect in Hydrogen (13.2, 13.3)

Related Examples, Problems, MCQ & Short Questions

Basic Reference: *Atomic & Molecular spectra by Rajkumar Kedarnath Prakashan Meerut.*

Other Reference:

1. Spectroscopy Vol-1 by Walker & Straw
2. Atomic Physics by J.B. Rajam (5th Edition – 1960) S. Chand & Co.
3. Physics of Atoms and Molecules by B.H.Brandsden & C.J.Joachagh, Pearson Education.
4. Modern Physics by Kenneth Krane, Jon wiley & sons
- 5 Elements of Spectroscopy S L Gupta, V Kumar & R C Sharma (24th Edition) Pragati Prakashan
6. Molecular Structure and Spectroscopy G Aruldas, Prentice Hall of India Private Limited

UNIT III SOLID STATE PHYSICS

Crystal Structure:

Crystalline and Amorphous Solid(1.1) , Crystal Lattice and Crystal structure(1.2) , translational Symmetry, Space, Unit Cell and Primitive Cell(1.3), Symmetry Elements in Crystals(1.4-1.4.1 to 1.4.6), The Seven crystal Systems(1.5), Coordination Number(1.5.1), Some important crystal structure(1.6) , Simple Cubic Structure(1.6.1), Body Centered Cubic (BCC) Structure(1.6.2), Face Centered Cubic (FCC) Structure(1.6.3), Wigner-Seitz Cells (1.7), Miller Indices (1.8), The inter planar spacing of crystal planes (1.11). *Related Examples, Problems, MCQ & Short Questions*

Basic Reference: *Solid State Physics By Ajay Kumar Saxena (Macmillan India Limited)*

Atomic Cohesion and Crystal Binding

Cohesion of Atoms(2.1), Primary Bonds(2.2), The Covalent Bond(2.2.1), The Metallic Bond(2.2.2), The Ionic Bond(2.2.3), Mixed Bond(2.2.4), Secondary Bonds(2.3), The Van-der wall's Bond (2.3.1), The Hydrogen Bond(2.3.2), The Cohesive Energy(2.4), Ionic Crystal-Medaling Energy (2.4.1), Noble Gas Crystal (2.4.2), Atomic Radius and Lattice Constant (2.5), Elastic Constants of Crystals(2.6), Elastic Stress(2.6.1), Elastic Energy Density (2.7.1), Application to Cubic Crystal (2.7.2). *Related Examples, Problems, MCQ & Short Questions*

Basic Reference : *Elements of Solid State Physics (2003) by J. P. Shrivastav, PHI*

Other Reference :

1. Introduction to solid state Physics By C.Kittle (John Willey)
2. Fundamental of solid state Physics By Saxena, Gupta, Saxena (pragati Prakashan)
3. Solid State Physics By Ajay Kumar Saxena (Macmillan India Limited)
- 4 Solid State Physics by S O Pillai

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN

CBCS SEMESTER GRADING PATTERN

B. Sc. SEMESTER III

(PHYSICS SYLLABUS : Effective from June - 2021)

CC - PHYSICS – 302

UNIT I ELECTROSTATICS AND MAGNETOSTATICS

(a) Electrostatics in Dielectric :

Introduction to polar and non polar dielectrics, Gaseous Non Polar Dielectrics (2.11), Gaseous Polar Dielectrics (2.12), Non Polar Liquids (2.13), Solid Dielectrics Electrets(2.14), Methods of Electrostatics Images (3.11 i to v),

(b) Magnetostatics :

The Magnetic Potential (4.9 - a & b) Magnetic Vector Potential due to small Current Loop(4.12), An Alternative method for finding the Vector Potential A and the field B due to Current Loop(4.13), Magnetization(4.15), Magnetic Field Vector (4.16),Magnetic susceptibility and Permeability (4.17), Boundary Conditions(4.18), Uniformly Magnetized Sphere in External Magnetic Field (4.19), A comparison of Static Electric and Magnetic Field (4.20)

(c) Practical Applications of Electromagnetic Induction :

Use of earth inductor – measurement of Horizontal Component H of the Earth Magnetic Field (12.3-1), Measurement of Vertical Component V of the Earth Magnetic Field using a search coil (12.4). *Related Examples, Problems, MCQ & Short Questions*

Basic Reference:

1. *Electromagnetics by B.B. Laud, New Age Publisher (For chapt. a & b)*
2. *Electricity and Magnetism by K.K. Tewari, S.Chand. (For Chapt. c)*

Other Reference:

1. *Electricity and Magnetism by Mahajan and Rangwala, THM*
2. *Electricity and Magnetism Berkeley Phy Vol.-II by Edward M Purcell, McGraw-Hill Publi*
3. *Electricity and Magnetism by D. C. Tayal, Himalaya Publishing House*

UNIT II OPTICS

Diffraction: Distinction between Interference and diffraction (17.6), Fresnel and Fraun hoffer types of diffraction(17.7), Fraun hoffer diffraction at a double slit (18.4), Fraunhoffer diffraction at double slit (Calculus method)(18.4.1), Distinct between single slit and double slit diffraction pattern (18.4.2), Fraunhoffer diffraction at N slit(18.6 & 18.6.1), Plane Diffraction Grating (18.7), Theory of plane transmission grating (18.7.1), Dispersive power of Grating (18.7.7)
Related Examples, Problems, MCQ & Short Questions

Resolving Power:

Resolving Power of Optical Instrument(19.5); Resolving Power of a telescope(19.7), Relation between magnifying power and resolving power of a telescope(19.7.1).

Related Examples, Problems, MCQ & Short Questions

Polarization:

Introduction(20.1), Polarization by double refraction(20.5.5) , Double refraction(20.8.3), Huygens' explanation of double refraction(20.9 & 20.9.1), Types of Polarized light(20.15), Retarders or Wave plate (Quarter wave plate) (20.17.1), (Half wave plate)(20.17.2), Production of Elliptically polarized light(20.18), Detection of Elliptically polarized light(20.18.1). *Related Examples, Problems, MCQ & Short Questions*

Basic Reference:

A text book of OPTICS by Dr. N.Subrahmanyam, Brijlal, Dr, M, N, Avadhanulu - S Chand

Other Reference:

1. A Text book of light by D.N.Vasudev – Atmaram & sons, New Delhi .
2. Fundamentals of Optics by F A Jenkin and H E White Tata McGraw Hill Book Co. Ltd.
3. Optics by Ajoy Ghatak Tata McGraw Hill Book Co. Ltd
4. Principles of Optics by B.K. Mathur

UNIT III ELECTRONICS

Basic Transistors: (Review of Construction of Transistor) Transistor Current Component(4.18), Detailed Transistor Leakage Currents (4.18-1) (Collector to Base and Collector to Emitter Leakage Current), C-B configuration static (Input and Output)characteristics(4.09-1), Load Line(4.21), Operating Point(4.22) *Related Examples, Problems, MCQ & Short Questions*

Transistor Biasing and Stabilization:

Bias Stabilization (Operating Point stabilization) (8.7, 8.7.1 & 8.7.2), Stability factor (8.8), Stabilization by Collector Base Resistance (8.9) Stabilization by potential divider and Emitter resistor (8.10) *Related Examples, Problems, MCQ & Short Questions*

Basic Transistor Amplifier:

Transistor as four pole (9.2), h-parameters with h-parameters equivalent circuit (9.5 complete), Ground Emitter Circuit – Mathematical analysis using h-parameters only (9.6), Comparative study of three types of Amplifiers(9.9). *Related Examples, Problems, MCQ & Short Questions*

Basic Reference:

1. *Hand book of Electronics by Gupta & Kumar 30th Revised Edition, 2002 Pragati Prakashan*
2. *Electronics and Radio Engineering by M.L.Gupta (9th Edition-2002) DhanRaj & Sons. (For Ch-(9))*

Other Reference :

1. Electronic Devices and Circuits by A. Mottershead prentice- Hall of India
2. Integrated Electronics by Milliman & Halkias
3. Basic Electronics and Linear Circuits by N. N. Bharagava, D.C.Kulshreshtha, S.C. Gupta.

HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN
CBCS SEMESTER GRADING PATTERN

B. Sc. SEMESTER III

(PHYSICS PRACTICAL SYLLABUS : Effective from June - 2021)

(PC – PHY - 301)

LABORATORY EXPERIMENT

- 1) To Find out Viscosity co- efficient of liquid using co-axial viscometer.
સમઅક્ષીય વિસ્કોમીટર ની મદદથી પ્રવાહીનો શ્યાનતા ગુણક શોધવો.
- 2) To determine young modulus 'Y' for metal rod using Kund 's tube .
કુંડ ની નળીની મદદથી ધાતુના સળિયા નો યંગ મોડ્યુલસ શોધવો.
- 3) To find out the value of e/k using power transistor (PNP →CK 100 or NPN→SL -100).
પાવર ટ્રાન્ઝિસ્ટર ની મદદથી e/k નું મૂલ્ય શોધવું. (PNP→ CK 100 or NPN→ SL -100)
- 4) To Determine Self Inductance of inductor by Anderson Bridge.
એન્ડરસનબ્રીજ વડે આત્મપ્રેરકત્વ મેળવો.
- 5) To determination of 'l₀', 'r' and 'a' for resonance pendulum.
અનુનાદ લોલક માટે 'l₀', 'r' અને 'a' મેળવવો.
- 6) To Determine Unknown Wave Length of Light 'λ' using Hartzmann Formula.
હાર્ટમેનની રીત વડે અજ્ઞાત પ્રકાશની તરંગલંબાઈ શોધવી.
- 7) To Find out The Refractive Index of Ordinary and Extra Ordinary Rays using Dual Refraction From Calcite Prism. કેલ્સાઈટ પ્રીઝમ(રફ્ટિક)થી દ્વિવ વક્રીભવનની ઘટનાનો ઉપયોગ કરી સામાન્ય અને અસામાન્ય કિરણોના વક્રીભવનાંક શોધવા.
- 8) To Find out The Wave Length of Light using Newton's Rings.
ન્યુટનના વલયોની મદદથી પ્રકાશની તરંગલંબાઈ શોધવી.

જગતની સૌ કેડીઓમાં સ્નેહ સહુથી વડી

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CBCS SEMESTER GRADING PATTERN

B. Sc. SEMESTER III

(PHYSICS PRACTICAL SYLLABUS : Effective from June - 2021)

(PC – PHY - 302)

LABORATORY EXPERIMENT

- 1) To determine the Absolute Value of Capacity using B.G or S.G
B.G ની મદદથી વીજ સંગ્રાહકની નિરપેક્ષ ક્ષમતા શોધવી.
- 2) Obtain the Characteristics of UJT and Determination of R_{BB} , V_d & η
UJT ની લાક્ષણિકતાઓ મેળવો અને R_{BB} , V_D તેમજ η દર્શાવો.
- 3) To Verify De Morgan's Theorems using IC-7400.
IC-7400 ની મદદથી દે-મોર્ગનના પ્રમેય ચકાસો.
- 4) Absorption Co-Efficient of Liquid using Photocell.
ફોટોસેલની મદદથી પ્રવાહીનો શોષણાંક શોધવો.
- 5) Obtain the Characteristics of PNP Common Base Transistor.
PNP કોમન બેઝ ટ્રાન્ઝીસ્ટરની લાક્ષણિકતાઓ મેળવો.
- 6) A Study of Characteristics of JFET & Determination of μ , r_d , g_m
JFETની લાક્ષણિકતાઓ મેળવો અને μ , r_d , g_m દર્શાવો.
- 7) Construction of AND, OR, NOT Gates Using NAND & NOR Universal Gates.
યુનિવર્સલ NAND અને NOR ગેટની મદદથી AND, OR અને NOT ગેટ બનાવો.
- 8) Numerical Analysis (Minimum Class Method)
સંખ્યાત્મક પૃથ્થકરણ (લઘુત્તમ વર્ગની રીત)

ભૂલો ભલે બીજું બધું મા-બાપને ભુલશો નહિ