Department of Humanities and Sciences

Department of Humanities and Sciences

Course File

APPLIED PHYSICS

(Course Code: AP202BS)

I B.Tech II Semester

2023-24

Dr.Ummar Pasha
Dr. Sivanagi Reddy Emani
Dr.Ujwal P Prabhu

Ananthagiri, Kodad, Telangana 508 206, India.

Anurag ENGINEERING COLLEGE (An Autonomous Institution)

Department of Humanities and Sciences

APPLIED PHYSICS

Check List

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Int. Marks:40 Ext. Marks:60 Total Marks:100

Applied Physics (AP202BS)

(Common for all branches)

Course Code: AP202BS

UNIT-I: WAVE OPTICS

Huygen's principle, superposition of waves, interference, interference in thin films by Reflection, Newton's rings (theory & experiment), diffraction, types of diffraction, Farunhofer diffraction at single slit, plane diffraction gratings, resolving power of grating, polarization, polarization by reflection, polarization by double refraction, Nicol's prism.

UNIT - II: QUANTUM PHYSICS AND SOLIDS

Quantum Physics: blackbody radiation and Planck's law (Qualitative), De Broglie hypothesis, Davisson – Germer experiment, Heisenberg uncertainty principle (Qualitative), Born interpretation of the wave function, time independent Schrodinger wave equation, particle in one dimensional potential box.

Solids: free electron theory (Drude & Lorentz, Sommerfeld) (Qualitative), Bloch's theorem, Kronig-Penney model (Qualitative), E-K diagram, effective mass of electron, origin of energy bands, classification of solids.

UNIT - III: SEMICONDUCTORS AND DEVICES

Intrinsic and extrinsic semiconductors, energy band diagrams, Hall effect, direct and indirect band gap semiconductors, Formation of P-N junction diode, energy level diagram of P-N junction, V-I characteristics of P-N Junction, Zener diode and bipolar junction transistor (BJT), Construction, working and characteristics of LED, photo diode and solar cell.

UNIT - IV: NANOTECHNOLOGY

Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, combustion methods, top-down fabrication: ball milling. physical vapor deposition (PVD) , Chemical vapor deposition (CVD), Characterization techniques - XRD, SEM &TEM, applications of nanomaterials.

UNIT - V: LASER AND FIBER OPTICS

Lasers: Interaction of radiation with matter: Absorption, Spontaneous emission and stimulated emission, Einstein coefficients and their relations, Laser beam characteristics, important components of laser-active medium, pumping source, optical resonator, Construction and working

principle- Nd:YAG laser, He-Ne laser, semiconductor laser, applications of laser.

Fiber Optics: Introduction to optical fiber, advantages of optical fibers, total internal reflection, construction of optical fiber, acceptance angle, numerical aperture, classification of optical fibers-step index and graded index optical fiber, losses in optical fiber, optical fiber for communication system, applications of optical fiber.

TEXT BOOKS:

1. **M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy" A Text book of Engineering Physics"- S. Chand Publications, 11/e 2019.**
2. **Shatendra Sharma and Jyotsna Sharma, Engineering Physics, Pearson Publication,2019**
3. P.K. Palanisamy A Text Book of Engineering Physics, Scietech Publications.

REFERENCE BOOKS:

1. Halliday, Resnick and Walker, Fundamentals of Physics, John Wiley &Sons,11th Edition, 2018.
2. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2ndEdition,2022.
3. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical CreativesNANO DIGEST, 1st Edition, 2021
4. **A.K. Katiyar, C. K. Pandey Engineering Physics 2/e, Wiley India pvt Ltd.2017.**

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2. Timetable

I B.Tech. II Semester – CSE (A Sec)

Day/Hour	9.30-10.20	10.20-11.10	11.20-12.10	12.10-12.50	12.50-1.35	1.35-2.20	2.30-3.15	3.15-4.00
Monday		AP						
Tuesday		AP						
Wednesday	AP							
Thursday					AP			
Friday		AP						
Saturday		AP						

I B.Tech. II Semester – CSE (B Sec)

Day/Hour	9.30-10.20	10.20-11.10	11.20-12.10	12.10-12.50	12.50-1.35	1.35-2.20	2.30-3.15	3.15-4.00
Monday	AP							
Tuesday					AP			
Wednesday						AP		
Thursday		AP						
Friday					AP			
Saturday			AP					

I B.Tech. II Semester – CSE (C Sec)

Day/Hour	9.30-10.20	10.20-11.10	11.20-12.10	12.50-1.35	1.35-2.20	2.30-3.15	3.15-4.00
Monday					AP		
Tuesday				AP			
Wednesday		AP					
Thursday						AP	
Friday					AP		
Saturday	AP LAB						AP

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Vision of the Institute

To be a premier Institute in the country and region for the study of Engineering, Technology and Management by maintaining high academic standards which promotes the analytical thinking and independent judgment among the prime stakeholders, enabling them to function responsibly in the globalized society.

Mission of the Institute

To be a world-class Institute, achieving excellence in teaching, research and consultancy in cutting-edge Technologies and be in the service of society in promoting continued education in Engineering, Technology and Management.

Quality Policy

To ensure high standards in imparting professional education by providing world-class infrastructure, top-quality-faculty and decent work culture to sculpt the students into Socially Responsible Professionals through creative team-work, innovation and research.

Vision of the Department

To foster the students with excellence in education and moral values, thereby transform them to be eminent professional engineers and responsible citizens of tomorrow.

Mission of the Department

To metamorphosis the students' community to get conversant with Scientific, Mathematical concepts and communication skills by providing perpetual thought provoking teaching, tremendous training and relentless research.

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Program Educational Objectives (B.Tech. – CSE)
Graduates will be able to

PEO 1: Excel in professional career and/or higher education by acquiring knowledge in mathematical, computing and engineering principles.

PEO 2: Be able to analyze the requirements of the software, understand the technical specifications, design and provide novel engineering solutions and efficient product designs.

PEO 3: Adopt professionalism, ethical attitude, communication skills, team work, lifelong learning in their profession.

Program Outcomes (B.Tech. –CSE)
At the end of the Program, a graduate will have the ability to

PO 1: Gain an ability to apply knowledge of mathematics, science and engineering fundamentals appropriate to the discipline.

PO 2: Develop the competence to identify, analyze, formulate and solve engineering problems.

PO 3: Acquire an ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.

PO 4: Are capable of design and conduct experiments, analyze and interpret data in the field of computer science and engineering.

PO 5: Gain expertise to use the techniques, skills and modern engineering tools with proficiency in the basic area of computer science and engineering.

PO 6: An ability to analyze the local and global impact of computing on individuals, organizations, and society.

PO 7: Knowledge of contemporary issues

PO 8: Sensitive to engage in activities with conscious social responsibility adhering to ethical values.

PO 9: An ability to function effectively individually and on teams, including diverse and multidisciplinary, to accomplish a common goal.

PO 10: An ability to articulate professional ideas clearly and precisely in making written and oral presentations.

PO 11: Recognition of the need for and an ability to engage in continuing professional development.

PO 12: An understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects.

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COURSE OBJECTIVES

On completion of this Subject/Course the student shall be able to:

S.No	Objectives
1	Understand the phenomenon of diffraction, interference and polarization
2	Recognize the basic principles of quantum physics and band theory of solids
3	Understand the underlying mechanism involved in construction and working principles of various semiconductor devices
4	Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
5	Study the characteristics of lasers and optical fibers

COURSE OUTCOMES

The expected outcomes of the Course/Subject are:

S.No	Outcomes
1.	Understand various optical phenomena of light
2.	Apply basic the principles of quantum mechanics to classify solids based on band theory.
3.	Identify the role of semiconductor devices in science and engineering Applications.
4.	Understand the features and applications of Nanomaterial's in various fields
5.	Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

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Note: Please refer to Bloom's Taxonomy, to know the illustrative verbs that can be used to state the outcomes.

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GUIDELINES TO STUDY THE COURSE / SUBJECT

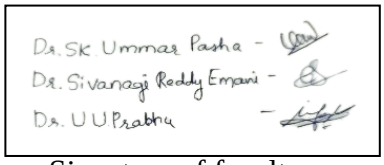
Course Design and Delivery System (CDD):

- The Course syllabus is written into number of learning objectives and outcomes.
- Every student will be given an assessment plan, criteria for assessment, scheme of evaluation and grading method.
- The Learning Process will be carried out through assessments of Knowledge, Skills and Attitude by various methods and the students will be given guidance to refer to the text books, reference books, journals, etc.

The faculty be able to –

- Understand the principles of Learning
- Understand the psychology of students
- Develop instructional objectives for a given topic
- Prepare course, unit and lesson plans
- Understand different methods of teaching and learning
- Use appropriate teaching and learning aids
- Plan and deliver lectures effectively
- Provide feedback to students using various methods of Assessments and tools of Evaluation
- Act as a guide, advisor, counselor, facilitator, motivator and not just as a teacher alone

Signature of HOD
Date:5-2-2024



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Date:5-2-2024

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COURSE SCHEDULE

The Schedule for the whole Course / Subject is:

S. No.	Description	Duration (Date)		Total No. of Periods
		From	To	
1.	**Unit-I: WAVE OPTICS** Huygen's principle, superposition of waves, interference, interference in thin films by Reflection, Newton's rings (theory & experiment), diffraction, types of diffraction, Farunhofer diffraction at single slit, plane diffraction gratings, resolving power of grating, polarization, polarization by reflection, polarization by double refraction, Nicol's prism	5.2.2024	22.2.2024	14
2.	**Unit-II: QUANTUM PHYSICS AND SOLIDS** Quantum Physics: blackbody radiation and Planck's law (Qualitative), De Broglie hypothesis, Davisson – Germer experiment, Heisenberg uncertainty principle (Qualitative), Born interpretation of the wave function, time independent Schrodinger wave equation, particle in one dimensional potential box. Solids: free electron theory (Drude & Lorentz, Somerfield) (Qualitative), Bloch's theorem, Kronig-Penney model (Qualitative), E-K diagram, effective mass of electron, origin of energy bands, classification of solids	23.2.2024	12.3.2024	14
3.	**Unit-III: SEMICONDUCTORS AND DEVICES** Intrinsic and extrinsic semiconductors, energy band diagrams, Hall effect, direct and indirect band gap semiconductors, Formation of P-N junction diode, energy level diagram of P-N junction, V-I characteristics of P-N Junction, Zener diode and bipolar junction transistor (BJT), Construction, working and characteristics of LED, photo diode and solar cell	16.3.2024	25.4.2024	10
4.	**Unit-IV: NANOTECHNOLOGY** Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, combustion methods, top-down fabrication: ball milling. physical vapor deposition (PVD), Chemical vapor deposition (CVD), Characterization techniques - XRD, SEM &TEM, applications of nanomaterials	26.4.2024	4.5.2024	12
5.	**Unit-V: LASER AND FIBER OPTICS** Lasers: Interaction of radiation with matter: Absorption, Spontaneous emission and stimulated emissio, Einstein coefficients and their relations, Laser beam characteristics, important components of laser-active medium, pumping source, optical resonator, Construction and working principle-	6.5.2024	12.6.2024	13

	Nd:YAG laser, He- Ne laser, semiconductor laser, applications of laser. Fiber Optics: Introduction to optical fiber, advantages of optical fibers, total internal reflection, construction of optical fiber, acceptance angle, numerical aperture, classification of optical fibers- step index and graded index optical fiber, losses in optical fiber, optical fiber for communication system, applications of optical fiber.			

Total No. of Instructional periods available for the course: 63 Hours + 2hr (Mid-I Exam)

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SCHEDULE OF INSTRUCTIONS - COURSE PLAN

Unit No.	Lesson No.	Date	No. of Periods	Topics / Sub-Topics	Objectives & Outcomes Nos.	References (Textbook, Journal)
1.	1	8.2.2024 9.2.2024	2	Course Introduction, Huygen's principle	1 1	A.K. Katiyar, C. K. Pandey Engineering Physics 2/e Wiley India Pvt Ltd., 2017
	2	12.2.2024 13.2.2024	2	superposition of waves, Interference	1 1	A.K. Katiyar, C. K. Pandey Engineering Physics 2/e Wiley India Pvt Ltd., 2017
	3	14.2.2024 15.2.2024 16.3.2024	3	Interference in thin films by Reflection, Newton's rings (theory & experiment),	1 1	A.K. Katiyar, C. K. Pandey Engineering Physics 2/e Wiley India Pvt Ltd., 2017
	4	17.2.2024	1	diffraction, types of diffraction	1 1	A.K. Katiyar, C. K. Pandey Engineering Physics 2/e Wiley India Pvt Ltd., 2017
	5	19.2.2024	2	Fraunhofer diffraction at single slit, plane diffraction gratings	1 1	A.K. Katiyar, C. K. Pandey Engineering Physics 2/e Wiley India Pvt Ltd., 2017
	6	20.2.2024	1	resolving power of grating,	1	A.K. Katiyar, C. K. Pandey Engineering Physics 2/e Wiley India Pvt Ltd., 2017
	7	21.2.2024	1	polarization, polarization by reflection, polarization by double refraction	1	Shatendra Sharma and Jyotsna Sharma, Engineering Physics, Pearson, 2019
	8	22.2.2024	2	Nicol's prism	1 1	Shatendra Sharma and Jyotsna Sharma, Engineering Physics, Pearson, 2019
2.	1	23.2.2024 24.2.2024	2	blackbody radiation and Planck's law (Qualitative), De Broglie hypothesis,	2 2	Shatendra Sharma and Jyotsna Sharma, Engineering Physics, Pearson, 2019
	2	26.2.2024	1	Davisson – Germer experiment	2 2	A.K. Katiyar, C. K. Pandey Engineering Physics 2/e Wiley India Pvt Ltd., 2017
	3	27.2.2024	1	Heisenberg uncertainty principle (Qualitative), Born interpretation of the wave function	2 2	A.K. Katiyar, C. K. Pandey Engineering Physics 2/e Wiley India Pvt Ltd., 2017
	4	28.2.2024	1	time independent Schrodinger wave equation	2 2	A.K. Katiyar, C. K. Pandey Engineering Physics 2/e Wiley India Pvt Ltd., 2017
	5	29.2.2024 1.3.2024	2	particle in one dimensional potential box.	2 2	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand, 11/e 2019
	6	2.3.2024 5.3.2024	2	free electron theory (Drude & Lorentz, Sommerfeld)	2 2	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand, 11/e 2019

	7	6.3.2024 11.3.2024	2	Bloch's theorem, Kronig-Penney model (Qualitative),	2 2	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand, 11/e 2019
	8	12.3.2024	1	E-K diagram, effective mass of electron,	2 2	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand, 11/e 2019
	9	14.3.2024 15.3.2024	1	origin of energy bands, classification of solids.	2 2	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand, 11/e 2019
3.	1	16.3.2024 19.3.2024	1	Intrinsic and extrinsic semiconductors, energy band diagrams, direct and indirect band gap semiconductors	3 3	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand, 11/e 2019
	2	27.3.2024	1	Hall effect	3 3	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand, 11/e 2019
	3	30.3.2024	1	Revision	1,2.3 1,2,3	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand, 11/e 2019
		1.4.2024	2	**Mid-I Exam**		
	4	10.4.2023	1	PN junction diode	3 3	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand, 11/e 2019
	5	23.4.2024	1	Zener diode	3 3	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand , 11/e 2019
	6	24.4.2024	2	bipolar junction transistor (BJT)	3 3	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand , 11/e 2019
	7	25.4.2024	1	Construction, working and characteristics of LED	3 3	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand , 11/e 2019
	8	26.4.2024	1	Construction, working and characteristics of photo diode	3 3	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand , 11/e 2019
	9	26.4.2024	1	Construction, working and characteristics of solar cell	3 3	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand , 11/e 2019
4	1	27.4.2024	2	Nanoscale, quantum confinement, surface to volume ratio,	4 4	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand , 11/e 2019
	2	29.4.2024	2	Bottom-up fabrication: sol gel, combustion methods	4 4	M. N. Avadhanulu, A Text book of Engineering Physics"

						S. Chand , 11/e 2019
	3	30.4.2024	2	Top-down fabrication: ball milling	4 4	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand , 11/e 2019
	4	1.5.25024	2	Physical vapor deposition (PVD)	4 4	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand , 11/e 2019
	5	3.5.2024	1	Chemical vapor deposition (CVD)	4 4	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand , 11th Edition 2019
	6	3.5.2024	1	Characterization techniques - XRD	4 4	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand, 11th 2019
	7	4.5.2024	1	Scanning Electron Microscope (SEM)	4 4	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand, 11/e, 2019
	8	4.5.2024	1	Transmission Electron Microscope (TEM), Applications of nanomaterials	4 4	M. N. Avadhanulu, A Text book of Engineering Physics" S. Chand, 11/e, 2019
5	1	6.5.2024	2	Interaction of radiation with matter: Absorption, Spontaneous emission and stimulated emission,	5 5	Shatendra Sharma and Jyotsna Sharma, Engineering Physics, Pearson, 2019
	2	7.5.2024	2	Einstein coefficients and their relations Laser beam characteristics	5 5	Shatendra Sharma and Jyotsna Sharma, Engineering Physics, Pearson, 2019
	3	8.5.2024	1	Important components of laser-active medium, pumping source, optical resonator	5 5	Shatendra Sharma and Jyotsna Sharma, Engineering Physics, Pearson, 2019
	4	9.5.2024	1	Construction and working principle- Nd: YAG laser, He-Ne laser	5 5	Shatendra Sharma and Jyotsna Sharma, Engineering Physics, Pearson, 2019
	5	9.5.2024	2	semiconductor laser applications of laser, Introduction to optical fiber advantages of optical fibers	5 5	Shatendra Sharma and Jyotsna Sharma, Engineering Physics, Pearson, 2019
	6	10.5.2024	1	total internal reflection construction of optical fiber	5 5	Shatendra Sharma and Jyotsna Sharma, Engineering Physics, Pearson, 2019
	7	4.6.2024 5.6.2024	2	acceptance angle, numerical aperture, classification of optical fibers- step index and graded index optical fiber	5	Shatendra Sharma and Jyotsna Sharma, Engineering Physics, Pearson, 2019

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	8	6.06.2024 10.6.2024	2	losses in optical fiber, optical fiber for communication system, applications of optical fiber.	5 5	Shatendra Sharma and Jyotsna Sharma, Engineering Physics, Pearson, 2019

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Signature of faculty

Date:

Date:

Note:

1. Ensure that all topics specified in the course are mentioned.
2. Additional topics covered, if any, may also be specified in bold.
3. Mention the corresponding course objective and outcome numbers against each topic.

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LESSON PLAN (U-I)

Lesson No: 01, 02 Duration of Lessons: 3hr 20 min

Lesson Title: Interference

Instructional / Lesson Objectives:

- To make students understand course structure and phenomenon of wave optics
- To familiarize students on wave fronts and generation of interference
- To understand students the concept of interference.
- To provide information on conditions for interference.

Teaching AIDS : PPTs, Black board

Time Management of Class : 200 minutes

15 mins for taking attendance 15 mins for previous lecture 150 min for the lecture delivery 20 min for doubts session

Refer assignment – I & tutorial-I sheets

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LESSON PLAN (U-I)

Lesson No: 03, 04 Duration of Lesson: 3 hr20 min

Lesson Title: Interference and diffraction

Instructional / Lesson Objectives:

- To make students understand formation of newton rings and interference in thin films
- To familiarize students on formation of interference pattern
- To understand students the concept of diffraction.
- To provide information on types of diffraction and daily life examples.

Teaching AIDS : PPTs, Black board
Time Management of Class : 200 minutes

15 mins for taking attendance 15 mins for previous lecture 150 min for the lecture delivery 20 min for doubts session

Refer assignment – I & tutorial-I sheets

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LESSON PLAN (U-I)

Lesson No: 05, 06 Duration of Lesson: 2 hr30 min

Lesson Title: Diffraction & Polarization

Instructional / Lesson Objectives:

- To make students understand the concept of resolving power and polarization.
- To familiarize students on single slit and diffraction gratings.
- To understand students the diffraction at single slit &resolving power of grating.
- To provide information on methods of generation of polarized light

Teaching AIDS : PPTs, Black board

Time Management of Class : 150 min.

10 mins for taking attendance 20 for revision of previous class 100 min for lecture delivery 20 min for doubts session

Refer assignment – I & tutorial-I sheets

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LESSON PLAN (U-I)

Lesson No: 07,08 Duration of Lesson: 2hr 30 min

Lesson Title: Nicol's prism

Instructional / Lesson Objectives:

- To make students understand working and applications of Nicol's prism.
- To familiarize students on polarization methods
- To understand students the concept of double refraction and total internal reflection
- To provide information on applications of polarizers.

Teaching AIDS : PPTs, Black board
Time Management of Class : 150 min

05 mins for taking attendance 10 min for revision of previous class. 120 min for the lecture delivery 15 min for doubts session

Refer assignment – I & tutorial-I sheets

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LESSON PLAN (U-II)

Lesson No: 01,02 Duration of Lesson: 1hr30 MIN
Lesson Title: blackbody radiation & Davisson – Germer experiment,

Instructional / Lesson Objectives:

- To make students understand the concept of black body radiation & dual nature of matter.
- To familiarize students on plank's law, de Broglie hypothesis
- To understand students' limitations of classical physics and dual nature of matter
- To provide information on Davission - Germer experiment

Teaching AIDS : PPTs, Black board
Time Management of Class : 150 min.

5 mins for taking attendance 10 min for revision of previous class. 120 min for the lecture delivery 15 min for doubts session

Refer assignment-II & tutorial-II sheets.

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LESSON PLAN (U-II)

Lesson No: 03,04 Duration of Lesson: 1hr 40 min.

Lesson Title: Heisenberg uncertainty principle (Qualitative), Born interpretation of the wave function, time independent Schrodinger wave equation.

Instructional / Lesson Objectives:

- To make students understand Heisenberg uncertainty principle and TISWE.
- To familiarize students on HUP and TISEW.
- To understand students the concept of uncertainty and probability density of wave functions.
- To provide information on wave functions and TISWE.

Teaching AIDS : PPTs, Black board
Time Management of Class : 100 min.

10 mins for taking attendance 10 min for revision of previous class 70 min for the lecture delivery 10 min for doubts session

Refer assignment-II & tutorial-II sheets.

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LESSON PLAN (U-II)

Lesson No: 05 Duration of Lesson: 1hr 40 min.

Lesson Title: particle in one dimensional potential box.

Instructional / Lesson Objectives:

- To make students understand potential in quantum mechanics
- To familiarize students on one dimensional box and its significance.
- To understand students the concept of wave functions, quantization of energy.
- To provide information on energy levels and probability of finding electron in particular region.

Teaching AIDS : PPTs, Black board
Time Management of Class : 100 min.

10 mins for taking attendance 10 min for revision of previous class 70 min for the lecture delivery 10 min for doubts session

Refer assignment-II & tutorial-II sheets.

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LESSON PLAN (U-II)

Lesson No: 06, 07,08 Duration of Lesson: 3 hr20 min

Lesson Title: free electron theory (Drude & Lorentz, Sommerfeld), Bloch's theorem, Kronig-Penney model (Qualitative),E-K diagram, effective mass of electron,

Instructional / Lesson Objectives:

- To make students understand the concept of free electron, periodic potential, effective mass
- To familiarize students on free electron theories and K-P model.
- To understand students the conduction of electrons in different materials.
- To provide information on solution for kronig-penny model and E-K diagram.

Teaching AIDS : PPTs, Black board
Time Management of Class : 200 min

15 mins for taking attendance
15 mins for previous lecture
150 min for the lecture delivery
20 min for doubts session

Refer assignment-II & tutorial-II sheets.

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LESSON PLAN (U-II)

Lesson No: 09 Duration of Lesson: 50 min
Lesson Title: origin of energy bands, classification of solids.

Instructional / Lesson Objectives:

- To make students understand origin of energy bands and classification of solids.
- To familiarize students on conduction and valence bands, conductors, semiconductors and insulators.
- To understand students the concept fermi level, acceptor and donor levels
- To provide information on band structures of materials.

Teaching AIDS : PPTs, Black board
Time Management of Class : 50 min

5 mins for taking attendance 5 mins for previous lecture 30 min for the lecture delivery 10 min for doubts session

Refer assignment-II & tutorial-II sheets.

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LESSON PLAN (U-IIII)

Lesson No: 01,02 Duration of Lesson: 2hr30 min

Lesson Title: Intrinsic and extrinsic semiconductors, energy band diagrams, Hall effect

Instructional / Lesson Objectives:

- To make students understand Hall effect
- To familiarize students on direct and indirect bandgap semiconductors
- To understand students the concept of doping to form intrinsic and extrinsic semiconductors.
- To provide information on structure and applications of semiconductors

Teaching AIDS : PPTs, Black board
Time Management of Class : 100 min

10 mins for taking attendance 20 for revision of previous class 60 min for lecture delivery 10 min for doubts session

Refer assignment-III & tutorial-III sheets.

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LESSON PLAN (U-III)

Lesson No: 04 Duration of Lesson: 50 min

Lesson Title: pn junction diode

Instructional / Lesson Objectives:

- To make students understand the concept of diodes and biasing.
- To familiarize students on formation and working of pn junctions
- To understand students the difference between forward and reverse bias.
- To provide information on I- V Characteristics and applications of pn junction diode

Teaching AIDS : PPTs, Black board
Time Management of Class : 50 min

5 mins for taking attendance 5 mins for previous lecture 30 min for the lecture delivery 10 min for doubts session

Refer assignment-III & tutorial-III sheets.

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Dr. U U Prabha -

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LESSON PLAN (U-III)

Lesson No: 05,06 Duration of Lesson: 2hr 30 min

Lesson Title: Zener diode, Bipolar junction transistor (BJT)

Instructional / Lesson Objectives:

- To make students understand difference between pn and zenar diode.
- To familiarize students on functioning of n-p-n and p-n-p transistor.
- To understand students the concept of different working regions in BJT.
- To provide information on applications of diode and transistor.

Teaching AIDS : PPTs, Black board

Time Management of Class : 150 min

5 mins for taking attendance 10 min for revision of previous class. 120 min for the lecture delivery 15 min for doubts session

Refer assignment-III & tutorial-III sheets.

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LESSON PLAN (U-III)

Lesson No: 07,08 Duration of Lesson: 1hr 40 min

Lesson Title: LED and Photo diode

Instructional / Lesson Objectives:

- To make students understand construction and working of LED and photodiode.
- To familiarize students on I-V characteristics of LED and photodiode.
- To understand students the concept of electroluminescence and photovoltaic effect.
- To provide information on applications of LED and Photodiode.

Teaching AIDS : PPTs, Black board
Time Management of Class : 100 min

10 mins for taking attendance 15 for revision of previous class 60 min for lecture delivery 15 min for doubts session

Refer assignment-III & tutorial-III sheets.

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LESSON PLAN (U-III)

Lesson No: 09 Duration of Lesson: 50 min

Lesson Title: Solar Cell

Instructional / Lesson Objectives:

- To make students understand the concept of photovoltaic effect and efficiency of solar cell'
- To familiarize students on construction and working of solar cell.
- To understand students the difference between solar cell and photodiode.
- To provide information on applications of solar cell.

Teaching AIDS : PPTs, Black board
Time Management of Class : 50 min.

5 mins for taking attendance 5 mins for previous lecture 30 min for the lecture delivery 10 min for doubts session

Refer assignment-III & tutorial-III sheets.

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LESSON PLAN (U-IV)

Lesson No: 01, 02 Duration of Lesson: 2 hr 30 min

Lesson Title: Nano science and Bottom-up fabrication: sol-gel, combustion methods

Instructional / Lesson Objectives:

- To make students understand the synthesis methods of nanomaterials
- To familiarize students on nanoscale and significance of nanomaterials.
- To understand students the concept of quantum confinement, surface to volume ratio
- To provide information on sol-gel process and combustion methods.

Teaching AIDS : PPTs, Black board
Time Management of Class : 150 min

5 mins for taking attendance 10 min for revision of previous class. 120 min for the lecture delivery 15 min for doubts session

Refer assignment – IV & tutorial-IV sheets

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LESSON PLAN (U-IV)

Lesson No: 03, 04 Duration of Lesson: 3 hr20 min

Lesson Title: Top-down fabrication: ball milling, Physical vapor deposition (PVD)

Instructional / Lesson Objectives:

- To make students understand top down and bottom-up methods.
- To familiarize students on ball milling and PVD
- To understand students the concept of milling and vapor deposition.
- To provide information on advantages, limitation and applications of the method.

Teaching AIDS : PPTs, Black board

Time Management of Class : 200 min

15 mins for taking attendance 15 mins for previous lecture 150 min for the lecture delivery 20 min for doubts session

Refer assignment – IV & tutorial-IV sheets

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LESSON PLAN (U-IV)

Lesson No: 05 Duration of Lesson: 1hr30 MIN

Lesson Title: Chemical vapor deposition (CVD)

Instructional / Lesson Objectives:

- To make students understand the concept of CVD
- To familiarize students on procedure to synthesize nanomaterials.
- To provide information on applications of CVD.

Teaching AIDS : PPTs, Black board
Time Management of Class : 50 min

5 mins for taking attendance 5 mins for previous lecture 30 min for the lecture delivery 10 min for doubts session

Refer assignment – IV & tutorial-IV sheets

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LESSON PLAN (U-IV)

Lesson No: 06, 07 Duration of Lesson: 1 hr 40 min

Lesson Title: Characterization techniques – XRD, SEM

Instructional / Lesson Objectives:

- To make students understand significance of characterization of nanomaterials.
- To familiarize students on characterization of nanomaterials using XRD and SEM
- To understand students the analysis of XRD and SEM diagrams of nanomaterials.
- To provide information on crystal structure analysis and morphological studies of nanomaterials.

Teaching AIDS : PPTs, Black board
Time Management of Class : 100 min

10 mins for taking attendance
15 for revision of previous class
60 min for lecture delivery
15 min for doubts session

Refer assignment – IV & tutorial-IV sheets

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LESSON PLAN (U-IV)

Lesson No: 08 Duration of Lesson: 50 min

Lesson Title: Transmission Electron Microscope (TEM), Applications of nanomaterials

Instructional / Lesson Objectives:

- To make students understand the construction and working of TEM
- To familiarize students on TEM image analysis
- To understand students the concept of single crystal, polycrystalline and amorphous
- To provide information on nanoparticle size distribution and defects in materials.

Teaching AIDS : PPTs, Black board
Time Management of Class : 50 min

5 mins for taking attendance 5 mins for previous lecture 30 min for the lecture delivery 10 min for doubts session

Refer assignment – IV & tutorial-IV sheets

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LESSON PLAN (U-V)

Lesson No: 01,02 Duration of Lessons: 3hr 20 min

Lesson Title: Interaction of radiation with matter & Einstein coefficients and their relations

Instructional / Lesson Objectives:

- To make students understand the concept of absorption and stimulated emission
- To familiarize students on interaction of matter with radiation.
- To provide information on Einstein coefficients and relations.

Teaching AIDS : PPTs, Black board
Time Management of Class : 200 min

15 mins for taking attendance
15 mins for previous lecture
150 min for the lecture delivery
20 min for doubts session

Refer assignment- V & tutorial-V sheets.

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LESSON PLAN (U-V)

Lesson No: 03,04 Duration of Lesson: 1hr 40 min

Lesson Title: Laser beam characteristics, Important components of laser-active medium, pumping source, optical Resonator, Construction and working principle- Nd: YAG laser, He-Ne laser

Instructional / Lesson Objectives:

- To make students understand working of laser
- To familiarize students on components of laser and its functioning
- To understand students the concept of population inversion and lasing action
- To provide information on Construction and working of Lasers.

Teaching AIDS : PPTs, Black board
Time Management of Class : 100 min

10 mins for taking attendance 15 for revision of previous class 60 min for lecture delivery 15 min for doubts session

Refer assignment- V & tutorial-V sheets.

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LESSON PLAN (U-V)

Lesson No: 05 Duration of Lesson: 1hr40 min

Lesson Title: semiconductor laser and applications of laser,

Instructional / Lesson Objectives:

- To make students understand working of semiconductor laser.
- To familiarize students on laser characteristics and applications
- To provide information on applications of lasers in different fields.

Teaching AIDS : PPTs, Black board
Time Management of Class : 100 min

10 mins for taking attendance 15 for revision of previous class 60 min for lecture delivery 15 min for doubts session

Refer assignment- V & tutorial-V sheets.

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LESSON PLAN (U-V)

Lesson No: 06, 07 Duration of Lesson: 2hr30 min

Lesson Title: Introduction to optical fibers and classification

Instructional / Lesson Objectives:

- To make students understand the concept of total internal reflection, acceptance angle and numerical aperture.
- To familiarize students on construction and types of optical fibers.
- To understand students, step and graded index fibers.
- To provide information on advantages of optical fibers

Teaching AIDS : PPTs, Black board
Time Management of Class : 150 min

5 mins for taking attendance 10 min for revision of previous class. 120 min for the lecture delivery 15 min for doubts session

Refer assignment- V & tutorial-V sheets.

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LESSON PLAN (U-V)

Lesson No: 08 Duration of Lesson: 1hr 40 min

Lesson Title: losses in optical fiber, optical fiber for communication system, applications of optical fiber.

Instructional / Lesson Objectives:

- To make students understand losses in optical fibers.
- To familiarize students on communication systems in optical fibers.
- To understand student applications of optical fibers

Teaching AIDS : PPTs, Black board
Time Management of Class :100 min

10 mins for taking attendance
15 for revision of previous class
60 min for lecture delivery
15 min for doubts session

Refer assignment- V & tutorial-V sheets.

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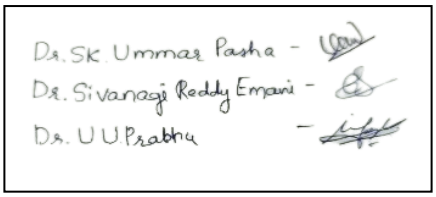
ASSIGNMENT – 1

This Assignment corresponds to Unit No. 1

Question No.	Question	Objective No.	Outcome No.
1	Demonstrate Newton's rings Experiment with neat diagram and derive expression for calculation of radius of curvature of Plano convex lens.	1	1
2	Explain construction and working of Nicol prism and mention its applications.	1	1
3	Apply the concept of path difference to explain the bright and dark conditions of Interference in thin films by reflection.	1	1



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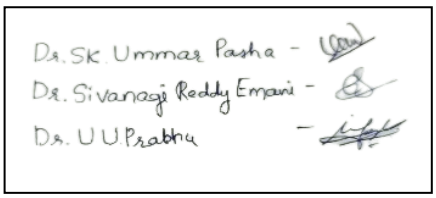
ASSIGNMENT – 2

This Assignment corresponds to Unit No. 2

Question No.	Question	Objective No.	Outcome No.
1	Develop expression for one dimensional Schrödinger time independent wave equation.	2	2
2	Explain Kronig-Penny model with neat diagram	2	2
3	Demonstrate Davisson-Germer experiment with neat diagram mention its significance.	2	2



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ASSIGNMENT – 3

This Assignment corresponds to Unit No. 3

Question No.	Question	Objective No.	Outcome No.
1	what is Hall Effect and develop an expression for Hall coefficient (note illustrate with neat diagram.	3	3
2	Explain the V-I characteristics of P-N junction diode in forward and reverse bias conditions.	3	3
3.	Explain principle, construction, working and characteristics of LED and solar cell.	3	3

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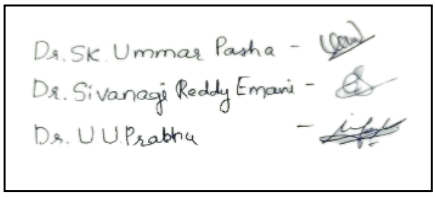

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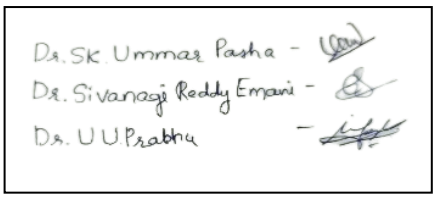
ASSIGNMENT – 4

This Assignment corresponds to Unit No. 4

Question No.	Question	Objective No.	Outcome No.
1	Explain sol-gel method & CVD method to synthesise nanomaterials with neat schematic diagram.	4	4
2	Explain synthesis of nanomaterials by using Ball milling with neat sketch and write its applications.	4	4
3	What is the principle behind the Transmission of Electron Microscope? Explain construction and working of TEM with neat sketch.	4	4



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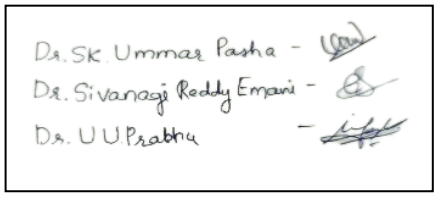
ASSIGNMENT – 5

This Assignment corresponds to Unit No. 5

Question No.	Question	Objective No.	Outcome No.
1	Solve Einstein coefficients to demonstrate lasing action.	4	4
2	Analyze the operation of He-Ne Laser system using a neat energy level diagram	4	4
3	Explain acceptance angle and deduce the expression for numerical aperture.	4	4



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TUTORIAL – 1

This tutorial corresponds to Unit No. 1 (Objective Nos.: 1, Outcome Nos.: 1)

Q1. 1 The phenomena of interference of light have proved

A) Wave nature B) Particle nature C) Wave and Particle nature D) None of the above

Q2. What is the phase difference between two points situated on a wavefront?

A) $\pi/2$ B) 2π C) π D) 0

Q3. In Newton's Ring experiments, the diameter of dark rings is proportional to

A) Odd Natural numbers B) Natural Number

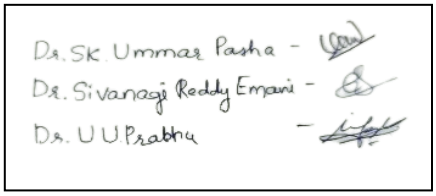
C) Even Natural Number D) Square root of natural number

Q4. Significant diffraction of x-rays can be obtained

A) by a single slit B) by a double slit C) by a diffraction D) by an atomic crystal

Q5. Polarised light can be produced by

A) reflection B) refraction C) Double refraction D) All of these



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TUTORIAL – 2

This tutorial corresponds to Unit No. 2 (Objective Nos.: 2, Outcome Nos.: 2)

Q1. Dual nature [particle and wave] of matter was proposed by
A) de Broglie B) Planck C) Einstein D) Newton

Q2. Which of the following phenomena cannot be explained by the classical theory?
A) Photoelectric effect B) Compton effect C) Raman effect D) All the above

Q3. To electron gas, which of the following statistics is applicable?
A) Maxwell–Boltzmann B) Bose–Einstein C) Fermi–Dirac D) Stefan–Hawking

Q4. The Kronig–Penney model is based on the assumption
A) Electrons move in a periodic potential field C) Electrons move in a zero potential field
B) Electrons move in a constant potential field D) Electrons move with constant potential energy

Q5. Classical free electron theory failed to explain
A) Specific heat of metals B) Thermionic emission C) Magnetic susceptibility of metals D) All the above

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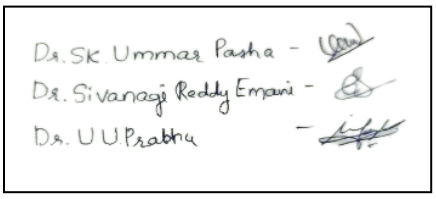

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TUTORIAL SHEET – 3

This tutorial corresponds to Unit No. 3 (Objective Nos.: 3, Outcome Nos.: 3)

Q1. Pure semiconductor behaves as an insulator at

A) 273 K B) -273 K C) 0 K D) None of these

Q2 N-type semiconductor is formed by adding …… impurity atoms to a pure semiconductor

A) trivalent B) penta valent C) zero valent D) tetra valent

Q3. Which type of semiconductor material has negative Hall coefficient

A) p-type B) n-type C) intrinsic D) None of these

Q4. Which of the following devices convert light energy to electric energy?

A) LED B) Semiconductor laser C) Solar cells D) Optical fibers

Q5. The main application of a Photodiode is

A) Light sensing B) Power regulation C) Signal amplification D) Energy storage

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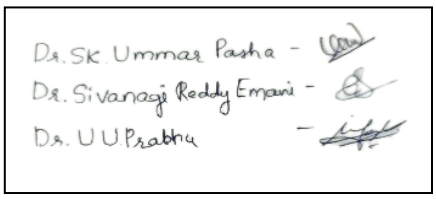

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TUTORIAL – 4

This tutorial corresponds to Unit No. 4 (Objective Nos.: 4, Outcome Nos.: 4)

Q1. Quantum dot is an example of
A) one-dimensional nanomaterial C) two-dimensional nanomaterial
B) three-dimensional nanomaterial D) zero-dimensional nanomaterial
Q2. For a cubic nanoparticle of side ‘a’, surface area to volume ratio is given by
A) 3/ a B) 5/ a C) 4/ a D) 6/ a
Q3. Crystal structure of nanomaterials is known by
A) XRD B) CVD C) SEM D) PVD

Q4. The size range of nanomaterial is
A) 1 to 100 Å B) 1 to 100 nm C) 1 to 100 mm D) 1 to 100 µm

Q5. What is the standard form of TEM
A) Transmission Electron Microscope C) Transceiver Electrical Microscope
B) Transformer Electrode Microscope D) None of the above

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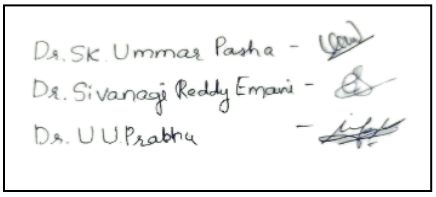

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TUTORIAL SHEET – 5

This tutorial corresponds to Unit No. 5 (Objective Nos.: 5, Outcome Nos.: 5)

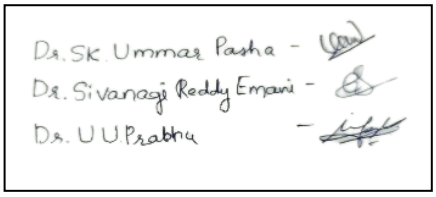
Q1. Laser has a high degree of
A) monochromacity B) coherence C) intensity D) All of these
Q2. Numerical aperture represents _____ capacity of a optical fiber.

A) light gathering B) light dissipation C) heat dissipation D) heat dissipation

Q3. Pick out the losses present in the optical communication system
A) absorption losses B) scattering losses C) distortion losses D) All of these

Q4. Population inversion cannot be achieved by
A) optical pumping B) chemical reaction C) electric discharge D) thermal process

Q5. In He–Ne laser, the ratio of He and Ne in gas mixture is
A) 1:10 B) 10:1 C) 20:1 D) 1:20



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EVALUATION STRATEGY

Target (s)

a. Percentage of Pass : 85%

Assessment Method (s) (Maximum Marks for evaluation are defined in the Academic Regulations)

a. Daily Attendance
b. Assignments
c. Online Quiz
d. Continuous Internal Assessment
e. Semester / End Examination

List out any new topic(s) or any innovation you would like to introduce in teaching the subjects in this semester

Case Study of any one existing application

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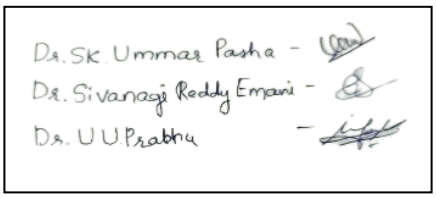

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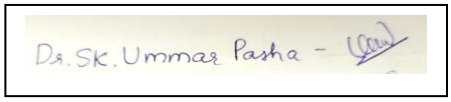
COURSE COMPLETION STATUS

Actual Date of Completion & Remarks if any

CSE-A

Units	Remarks	Objective No. Achieved	Outcome No. Achieved
Unit 1	completed on 23.02.2024	1	1
Unit 2	completed on 17.03.2024	2	2
Unit 3	completed on 25.04.2024	3	3
Unit 4	completed on 06.05.2024	4	4
Unit 5	completed on 11.06.2024	5	5



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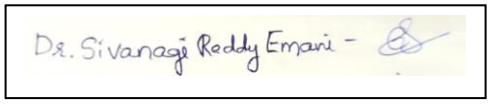
CSE-B

Units	Remarks	Objective No. Achieved	Outcome No. Achieved
Unit 1	completed on 22.02.2024	1	1
Unit 2	completed on 15.03.2024	2	2
Unit 3	completed on 26.04.2024	3	3
Unit 4	completed on 04.05.2024	4	4
Unit 5	completed on 10.06.2024	5	5



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CSE-C

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Units	Remarks	Objective No. Achieved	Outcome No. Achieved
Unit 1	completed on 24.02.2024	1	1
Unit 2	completed on 16.03.2024	2	2
Unit 3	completed on 23.04.2024	3	3
Unit 4	completed on 06.05.2024	4	4
Unit 5	completed on 11.06.2024	5	5

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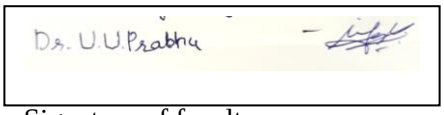
Date: 5-02-2024



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Mappings

1. **Course Objectives-Course Outcomes Relationship Matrix**
(Indicate the relationships by mark "X")

Course-Outcomes / Course-Objectives	1	2	3	4	5
1	H		M		
2		H			
3			H		
4				H	
5					H

2. **Course Outcomes-Program Outcomes (POs) & PSOs Relationship Matrix**
(Indicate the relationships by mark "X")

P-Outcomes / C-Outcomes	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PSO 1	PSO 2
1	H			M										
2	M	H	M											
3	H													
4	M	L	M	L										
5	H	L		M	M									

H-HIGH M-MODERATE L-LOW

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Rubric for Evaluation

Performance Criteria	Unsatisfactory	Developing	Satisfactory	Exemplary
	1	2	3	4
Research & Gather Information	Does not collect any information that relates to the topic	Collects very little information some relates to the topic	Collects some basic Information most relates to the topic	Collects a great deal of Information all relates to the topic
Fulfill team role's duty	Does not perform any duties of assigned team role.	Performs very little duties.	Performs nearly all duties.	Performs all duties of assigned team role.
Share Equally	Always relies on others to do the work.	Rarely does the assigned work - often needs reminding.	Usually does the assigned work - rarely needs reminding.	Always does the assigned work without having to be reminded
Listen to other team mates	Is always talking—never allows anyone else to speak.	Usually doing most of the talking-- rarely allows others to speak	Listens, but sometimes talks too much.	Listens and speaks a fair amount.

Department of Humanities and Sciences

AP Mid exam papers

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I B.TECH II SEMESTER I MID EXAMINATIONS - APRIL 2024

Branch : B.Tech. (CSE & CSE-AIML) **Subject : Applied Physics,AP202BS** **Max. Marks: 30**
Date : 01.04.2024 **Time: 120 Minutes**

PART - A

ANSWER ALL QUESTIONS **10 X 1M = 10M**

Q.No	Question	CO	BTL
1.	Brewster's law in terms of refractive index (μ) can be expressed as ( ) (A). $\mu=\sin i_p$ (B). $\mu=\tan i_p$ (C). $\mu=\cos i_p$ (D). $\mu=\cot i_p$	CO1	L1
2.	In Newton's Ring experiments, the diameter of dark rings is proportional to ( ) (A). Odd Natural numbers (B). Even Natural Number (C). Even Natural Number (D). Square root of natural number	CO1	L1
3.	In Newton's rings, the central spot in reflection mode is ( ) (A). Always bright (B). Always dark (C). Bright or Dark (D). of blue colour	CO1	L2
4.	Huygens wave theory of light cannot explain ( ) (A). Interference (B). Photoelectric effect (C). Diffraction (D). Polarization	CO1	L1
5.	First Brillouin zone corresponds to K value extending from ( ) (A). $-\frac{3\pi}{a}$ to $+\frac{3\pi}{a}$ (B). $-\frac{2\pi}{a}$ to $+\frac{2\pi}{a}$ (C). $-\frac{\pi}{a}$ to $+\frac{\pi}{a}$ (D). $-\frac{\pi}{a}$ to $+\frac{2\pi}{a}$	CO2	L2
6.	Dual nature [particle and wave] of matter was proposed by ( ) (A). de Broglie (B). Einstein (C). Planck (D). Newton	CO2	L1
7.	To electron gas, which of the following statistics is applicable? ( ) (A). Maxwell–Boltzmann (B). Fermi–Dirac (C). Bose–Einstein (D). Stefan–Hawking	CO2	L3
8.	The Kronig–Penney model is based on the assumption ( ) (A). Electrons move in a periodic potential field (B). Electrons move in a constant potential field (C). Electrons move in a zero potential field (D). Electrons move with constant potential energy	CO2	L2
9.	Which type of semiconductor material has negative Hall coefficient ( ) (A). p-type (B). n-type (C). intrinsic (D). None of these	CO3	L2
10.	Fermi level in N-type semiconductor lies between ( ) (A). Valance band and conduction band (B). Valance band and donar level (C). Conduction band and donar level (D). Valance band and accepter level	CO3	L2

PART - B

ANSWER ANY FOUR **4 X 5 M = 20 M**

Q.No	Question	CO	BTL
11.	Analyse the intensity maxima and minimum conditions of Fraunhofer Diffraction at single slit with necessary derivation.	CO1	L4
12.	Analyze and describe the intensity distribution of a Fraunhofer diffraction of a single slit.	CO1	L4
13.	Demonstrate Davisson-Germer experiment with neat diagram mention its significance.	CO2	L3
14.	Distinguish the solids based on band theory with neat energy level diagrams.	CO2	L2
15.	Differentiate between intrinsic and extrinsic semiconductors with energy level diagram.	CO3	L2
16.	what is Hall Effect and develop an expression for Hall coefficient (note illustrate with neat diagram	CO3	L3

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I B.TECH II SEMESTER II MID EXAMINATIONS - JUNE 2024

Branch : B.Tech. (CSE & AIML) **Max. Marks : 30M**
Date : 18-Jun-2024 **Session : Afternoon** **Time : 120 Min**
Subject : Applied Physics,AP202BS

PART - A

ANSWER ALL THE QUESTIONS **10 X 1M = 10M**

Q.No	Question		CO	BTL
1.	The function of a BJT (Bipolar Junction Transistor) is (A). Amplify signals (B). Regulate voltage (C). Generate alternating current (D). Store energy	( )	CO3	L1
2.	The working principle of a LED is (A). Photoelectric effect (B). electroluminescence (C). Photovoltaic effect (D). thermal breakdown	( )	CO3	L2
3.	For a cubic nanoparticle of side 'a', surface area to volume ratio is given by (A). 3/ a (B). 4/ a (C). 5/ a (D). 6/ a	( )	CO4	L2
4.	Quantum dot is an example of (A). one-dimensional nanomaterial (B). three-dimensional nanomaterial (C). two-dimensional nanomaterial (D). zero-dimensional nanomaterial	( )	CO4	L1
5.	The size range of nanomaterial is (A). 1 to 100 Å (B). 1 to 100 mm (C). 1 to 100 nm (D). 1 to 100 μm	( )	CO4	L1
6.	Widespread use of nano technology is due to (A). Small scale miniaturization (B). The fact that it is faster and cheaper (C). Its lower cost (D). All the above	( )	CO4	L2
7.	The refractive index of core and cladding are 1.563 and 1.498 respectively and then numerical aperture (NA) is (A). 0.346 (B). 0.199 (C). 0.246 (D). 0.446	( )	CO5	L2
8.	If an electron excites from lower state to higher state then that process is called (A). spontaneous emission (B). stimulated emission (C). absorption (D). systematic emission	( )	CO5	L2
9.	Step index fiber can be a (A). multimode fiber only (B). monomode fiber only (C). monomode as well as multimode fiber (D). either monomode or multimode (cannot be both)	( )	CO5	L1
10.	Numerical aperture represents _____ capacity of a optical fiber. (A). light gathering (B). heat dissipation (C). heat absorption (D). light dissipation	( )	CO5	L2

PART - B

ANSWER ANY FOUR **4 X 5M = 20M**

Q.No	Question	CO	BTL
11.	What is photo diode?. Explain the principle, working and characteristics of photo diode.	CO3	L3
12.	Discuss the V-I characteristics of zenar diode under forward & reverse bias conditions. Mention at least 2 differences between ordinary P-N junction diode and zenar diode.	CO3	L4
13.	Explain construction and working of Scanning Electron Microscope (SEM) with neat diagrams.	CO4	L3
14.	Explain sol-gel method to synthesis nanomaterials with neat schematic diagram	CO4	L3
15.	Solve Einstein coefficients to demonstrate lasing action	CO5	L3
16.	Explain the construction and working of Nd-YAG laser.	CO5	L4

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Department of Humanities and Sciences

Continuous Internal Assessment (R-22)

Internal Marks (CSE-A)

Programme**: B Tech** Year: **I** Course: **Theory** **A.Y: 2023-24**

Course: Applied Physics Section: CSE A Faculty Name: Dr. SK.UMMAR PASHA

S. No	Roll No	MID-I (35M)	MID-II (35M)	Avg. of MID I & II	Viva-Voce/Poster Presentation (5M)	Total Marks (40)
1	22C11A0549	20	9	15	4	19
2	22C11A05H5	18	5	12	3	15
3	23C11A0501	19	16	18	5	23
4	23C11A0502	35	34	35	5	40
5	23C11A0503	22	19	21	3	24
6	23C11A0504	16	14	15	4	19
7	23C11A0505	19	12	16	3	19
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9	23C11A0507	34	26	30	5	34
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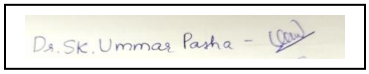
No. of Absentees: 00

Total Strength: 58

Signature of HoD



Signature of Faculty

Department of Humanities and Sciences

Internal Marks (CSE-B)

Programme**: B.Tech. (CSE)** Year: **I** Course: **Theory** **A.Y: 2023-24**

Course: **Applied Physics** Section: **B** Faculty Name: **Dr. Sivanagi Reddy Emani**

S. No	Roll No	MID-I (35M)	MID-II (35M)	Avg. of MID I & II	Viva-Voce/Poster Presentation (5M)	Total Marks (40)
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7	23C11A0567	29	22	26	4	30
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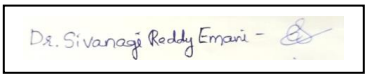
No. of Absentees: 01

Total Strength: 59



Signature of HoD **Signature of Faculty**

Department of Humanities and Sciences

Internal Marks (CSE-C)

Programme**: B Tech** Year: **I** Course: **Theory** **A.Y: 2023-24**

Course: APPLIED PHYSICS Section: CSE A Faculty Name: Dr. U U Prabhu

S. No	Roll No	MID-I (35M)	MID-II (35M)	Avg. of MID I & II	Viva-Voce/Poster Presentation (5M)	Total Marks (40)
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15	23C11A05D6	25	23	24	5	29
16	23C11A05D7	14	16	15	1	15
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Department of Humanities and Sciences

53	23C11A05H4	17	15	16	1	17
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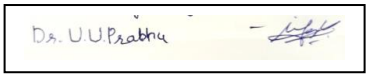
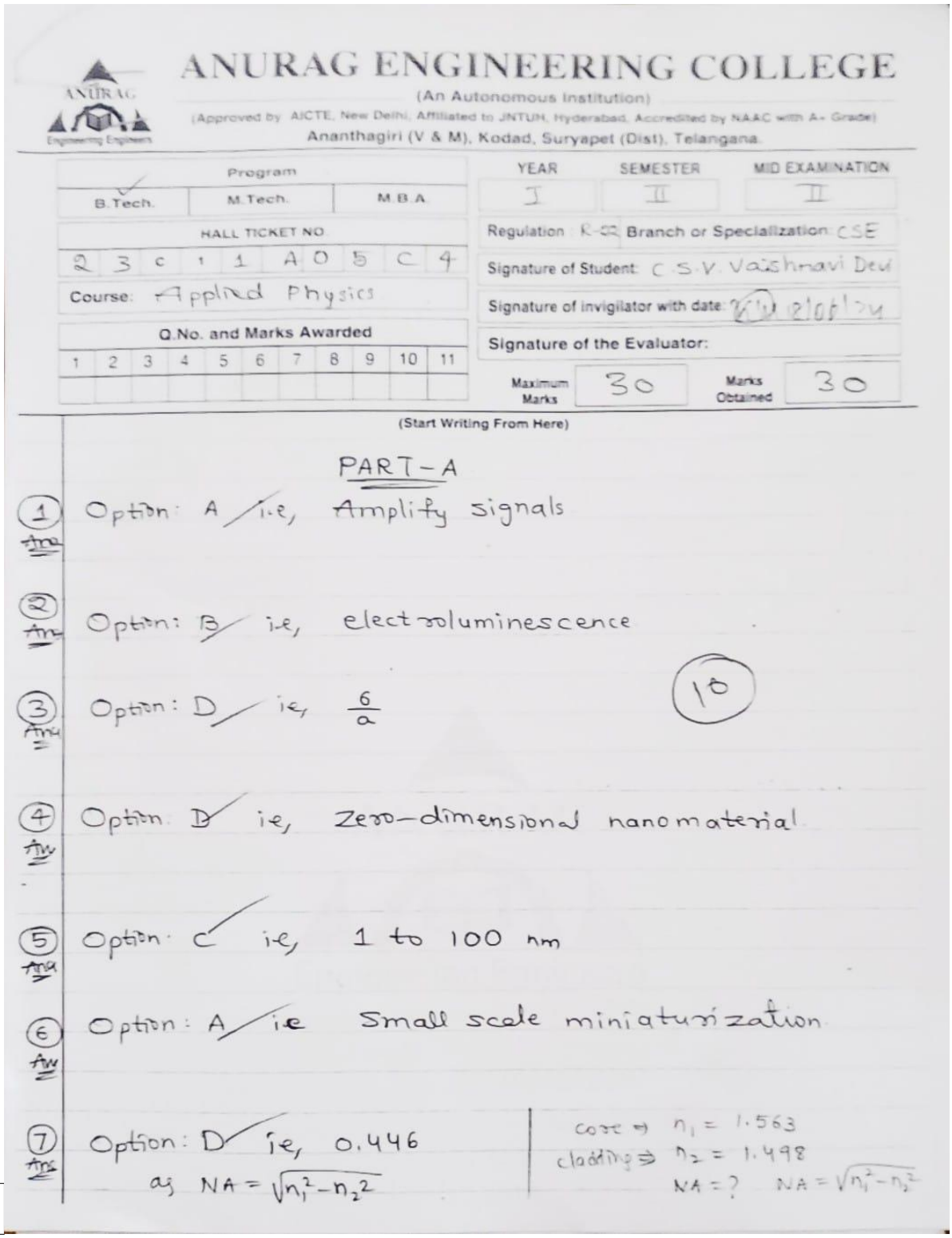
No. of Absentees: 01

Total Strength: 56



Signature of HoD **Signature of Faculty**

Sample Mid Exam Answer scripts



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Ananthagiri (V & M), Kodad, Suryapet (Dist), Telangana.

Program			YEAR	SEMESTER	MID EXAMINATION
B.Tech. ✓	M.Tech.	M.B.A.	I	II	II

HALL TICKET NO: 2 3 C 1 1 A 0 5 C 4

Regulation: R-22 Branch or Specialization: CSE

Signature of Student: C.S.V. Vaishnavi Devi

Course: Applied Physics

Signature of invigilator with date: 21/01/24

Q.No. and Marks Awarded

1	2	3	4	5	6	7	8	9	10	11

Signature of the Evaluator:

Maximum Marks: 30 Marks Obtained: 30

(Start Writing From Here)

PART-A

(1) Ans: Option: A ✓ i.e, Amplify signals

(2) Ans: Option: B ✓ i.e, electroluminescence

(3) Ans: Option: D ✓ ie, $\frac{6}{a}$ (10)

(4) Ans: Option: D ✓ ie, Zero-dimensional nanomaterial

(5) Ans: Option: C ✓ ie, 1 to 100 nm

(6) Ans: Option: A ✓ ie Small scale miniaturization

(7) Ans: Option: D ✓ ie, 0.446

as $NA = \sqrt{n_1^2 - n_2^2}$

core ⇒ $n_1 = 1.563$

cladding ⇒ $n_2 = 1.498$

$NA = ?$ $NA = \sqrt{n_1^2 - n_2^2}$

PART-B

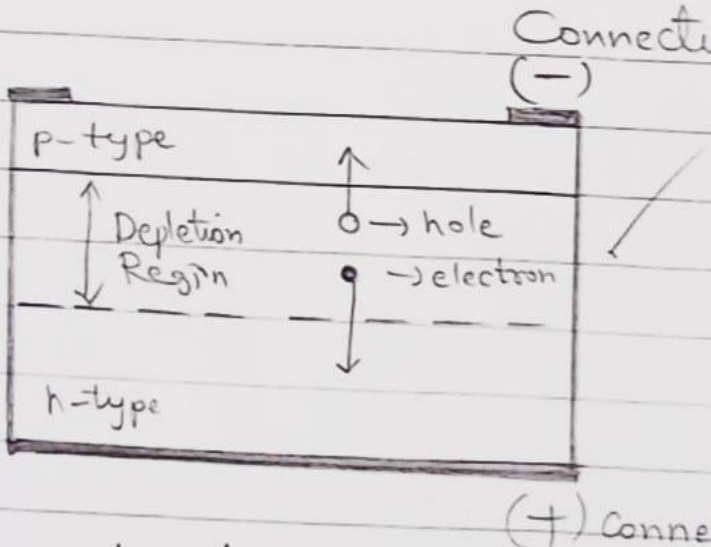
Photo Diode

Photo Diode is a pn-junction diode that mai operates in reverse bias condition It takes source and after performing action it e electricity.

Principle:

The principle of photo diode is - "photoconductive mode" of operation.

Working & Construction:



The construction of photo diode consists of n-type semiconductor material on that a t p-type semiconductor is placed.

Then, we observe ...

Sol-Gel Method

Sol-Gel method is one type of Bottom-Up Approach to fabricate the nanomaterials.

In this, there are silica gels, zirconium gels, etc are formed

We use some materials to form these gels

For example;

Tetra methoxy Silane, Tetra Ethoxy silane materials are used to get silica gels

Some oxides like TiO_2, SiO_2, ZrO_2 are synthesised by this Sol-Gel Method

In this method, there are 4 Stages

1. Hydrolysis
2. Condensation.
3. Growth of particles.
4. Agglomeration of particles.

* 1 Hydrolysis

The process of -

- Addition of water is called "Hydrolysis"

To the required precursor/material add wat that can replace "OR" group with "OH" grou

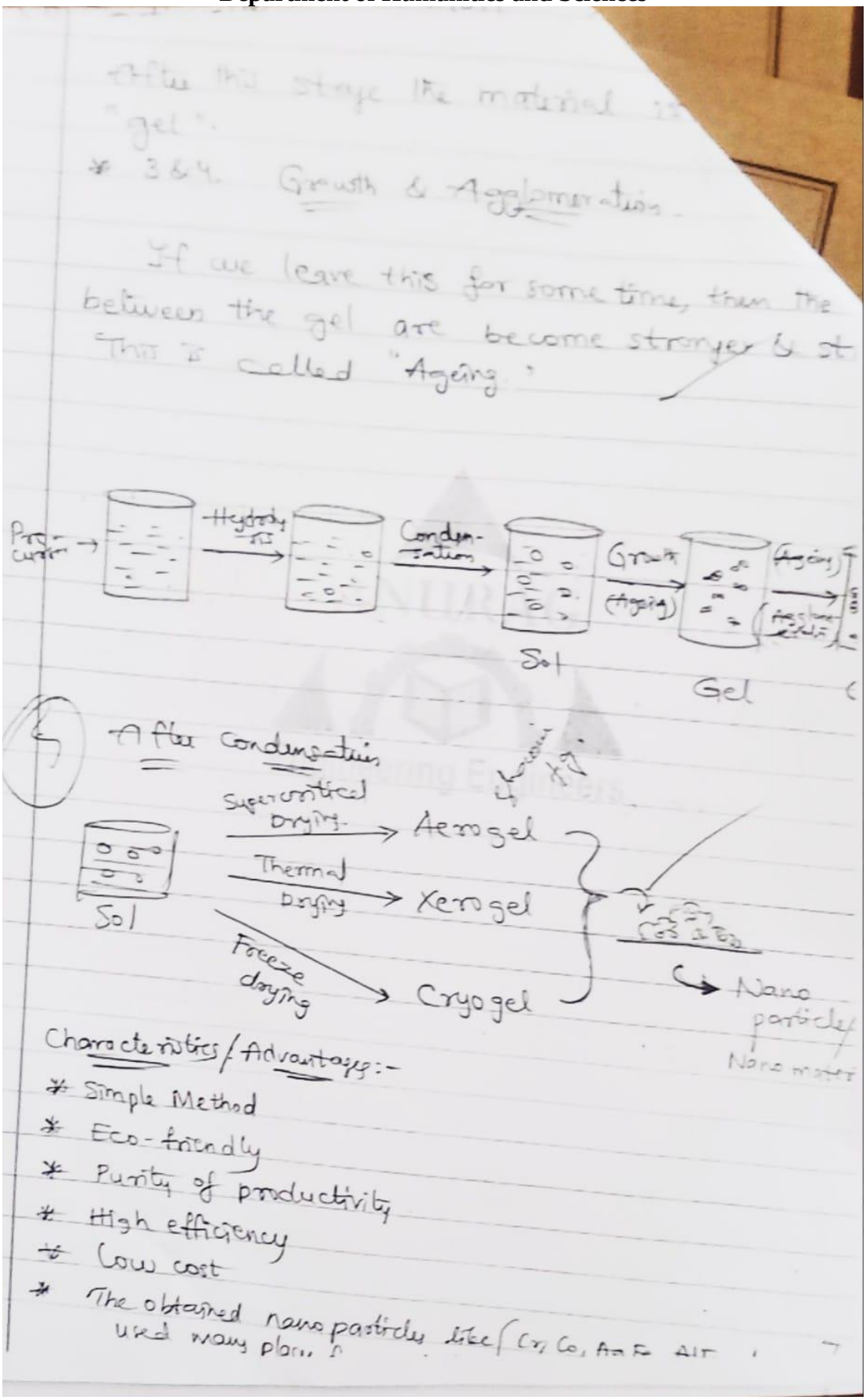
Ex:

$$MOR + H_2O \longrightarrow MOH + ROH$$

If we see the above reaction, MOR is replaced MOH. This can be done in this stage of "Hydrol

* 2. Condensation.

This reacti...


Hydrolysis
Condensation
Growth
(Ageing)
Sol
Gel
After Condensation
Supercritical drying
Thermal drying
Freeze drying
Aerogel
Xerogel
Cryogel
Sol
Nano particle
Characteristics / Advantages:-
* Simple Method
* Eco-friendly
* Purity of productivity
* High efficiency
* Low cost
* The obtained nano particles like

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Ananthagiri (V & M), Kodad, Suryapet (Dist), Telangana.

Hall Ticket No: 23C11A0504 | ADDITIONAL SHEET NO: 01
Date of Examination: 18-06-2024 | SIGNTURE OF INVIGILATOR:

(Start Writing From Here)

16 Ans

Nd-YAG Laser

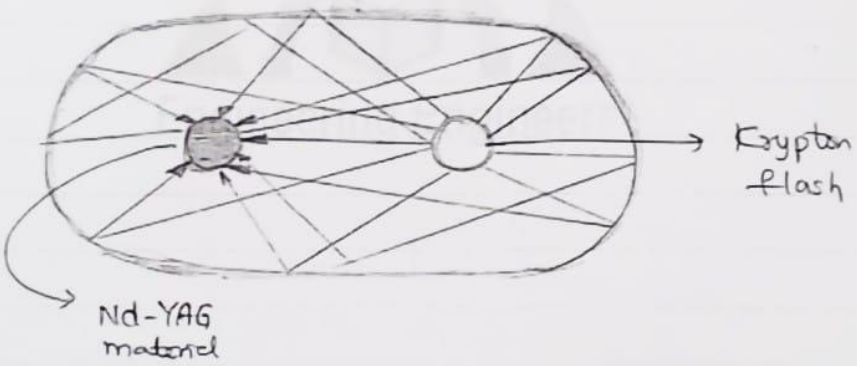
YAG → Yttrium Alluminium Garnet

Nd → Neodynium

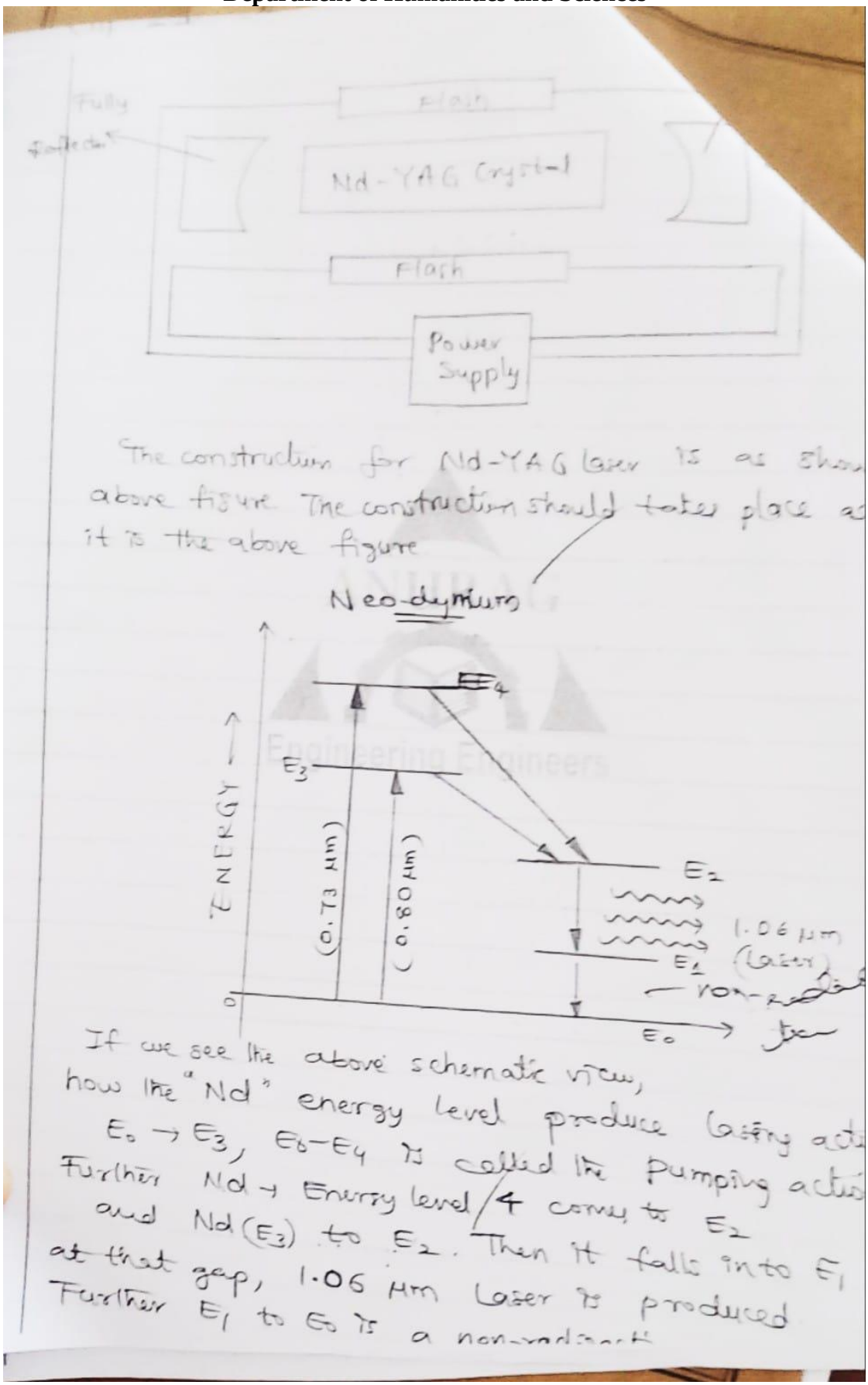
In Nd-YAG laser, Yttrium, Alluminum, Oxygen are consist of a compound. It is doped with 1% of Neodynum for lasing action to achieve population inversion.

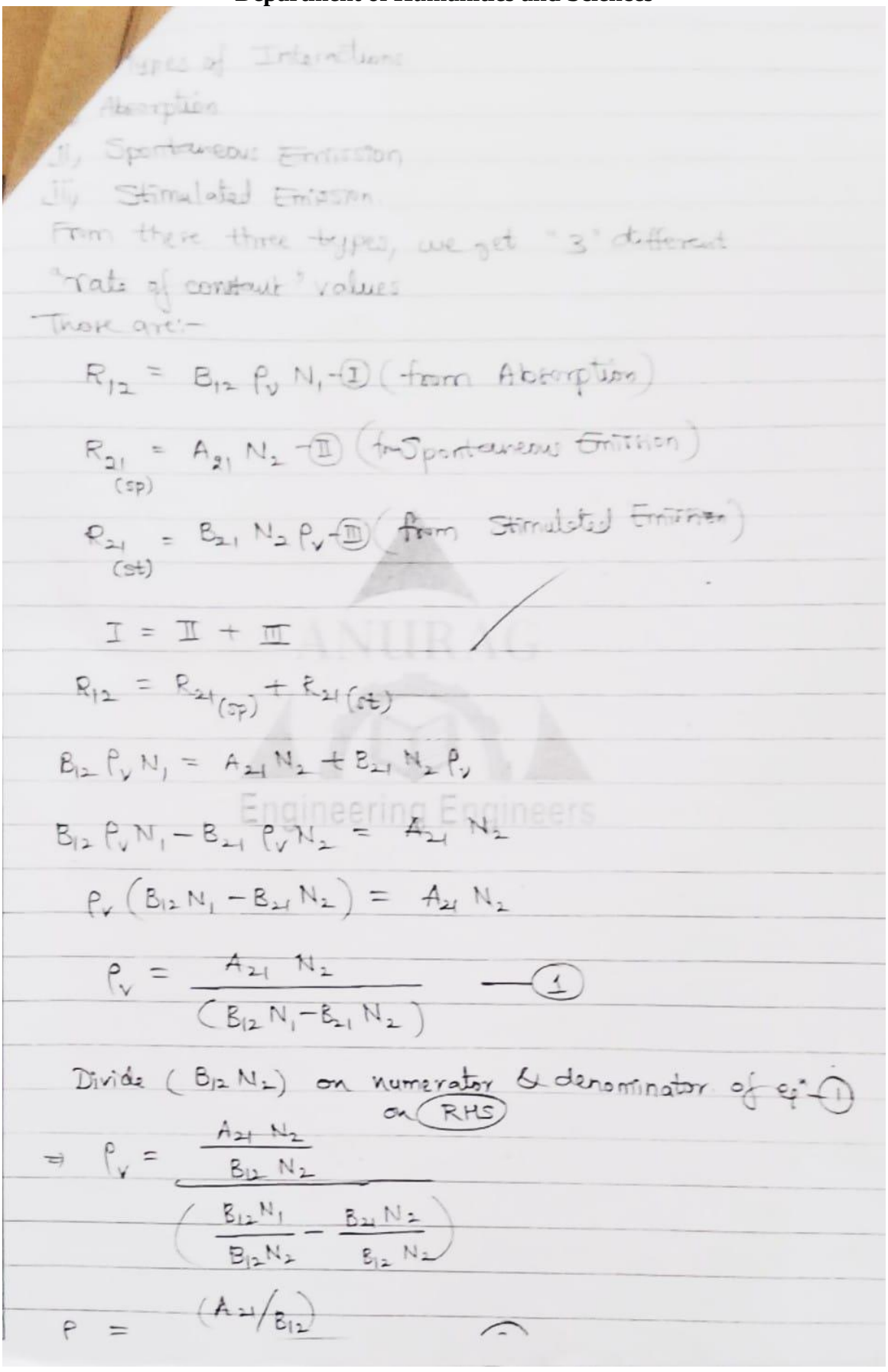
If the YAG material, and krypton flash are arranged in an elliptical shape, those are located

5



at both foci, the rays/light comes from that flash reflects to YAG material. By this, it achieves population inversion. Then lasing action takes place. The excited state (atoms) number is greater than the no. of atoms/electrons/particles in ground state


Fully
Flash
Nd-YAG Crystal
Flash
Power Supply
The construction for Nd-YAG laser is as shown above figure. The construction should take place as it is the above figure
Neo-dymium
E4
E3
E2
E1
E0
ENERGY
(0.73 μm)
(0.80 μm)
1.06 μm
(Laser)
non-radiative
If we see the above schematic view, how the "Nd" energy level produce laser action
E0 → E3, E0-E4 is called the pumping action
Further Nd + Energy level 4 comes to E2
and Nd (E3) to E2. Then it falls into E1
at that gap, 1.06 μm Laser is produced
Further E1 to E0 is a non-radiative



Types of Interactions

i) Absorption

ii) Spontaneous Emission

iii) Stimulated Emission

From these three types, we get "3" different "Rate of constant" values

Those are:-

$R_{12} = B_{12} \rho_\nu N_1$ — (I) (from Absorption)

$R_{21}{}_{(sp)} = A_{21} N_2$ — (II) (from Spontaneous Emission)

$R_{21}{}_{(st)} = B_{21} N_2 \rho_\nu$ — (III) (from Stimulated Emission)

$I = II + III$

$R_{12} = R_{21}{}_{(sp)} + R_{21}{}_{(st)}$

$B_{12} \rho_\nu N_1 = A_{21} N_2 + B_{21} N_2 \rho_\nu$

$B_{12} \rho_\nu N_1 - B_{21} \rho_\nu N_2 = A_{21} N_2$

$\rho_\nu (B_{12} N_1 - B_{21} N_2) = A_{21} N_2$

$$\rho_\nu = \frac{A_{21} N_2}{(B_{12} N_1 - B_{21} N_2)} \quad \text{— (1)}$$

Divide $(B_{12} N_2)$ on numerator & denominator of eq^n (1) on (RHS)

$$\Rightarrow \rho_\nu = \frac{\frac{A_{21} N_2}{B_{12} N_2}}{\left(\frac{B_{12} N_1}{B_{12} N_2} - \frac{B_{21} N_2}{B_{12} N_2}\right)}$$

$$\rho = \frac{(A_{21}/B_{12})}{}$$

ANURAG ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi, Affiliated to JNTUH, Hyderabad, Accredited by NAAC with A+ Grade)

Ananthagiri (V & M), Kodad, Suryapet (Dist), Telangana.

Program			YEAR	SEMESTER	MID EXAMINATION
B.Tech	M.Tech	M.B.A	I	II	I

HALL TICKET NO: 2 3 C 1 1 A 0 5 C 5

Regulation: 22 Branch or Specialization: CSE

Signature of Student: ch Srikari

Course: Applied physics

Signature of invigilator with date: 28/4/23

Signature of the Evaluator:

Q.No. and Marks Awarded										
1	2	3	4	5	6	7	8	9	10	11

Maximum Marks: 30 Marks Obtained: 3

(Start Writing From Here)

15

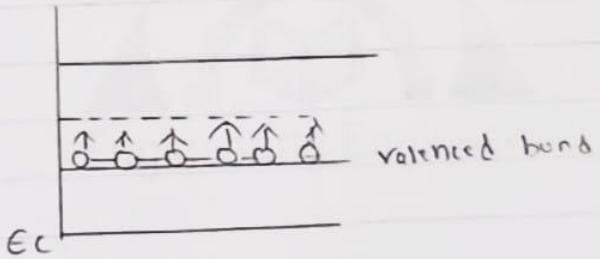
Ans: Intrinsic (P-TYPE) Semiconductor:

(i) In the P-Type semiconductor the majority of the current formed by the atoms like Al

(ii) In the P-TYPE semiconductor the energy level is very less

(iii) In the P-TYPE semiconductor the heralent bond is formed.

(iv) In the P-TYPE semiconductor the atoms are represented by Ec.

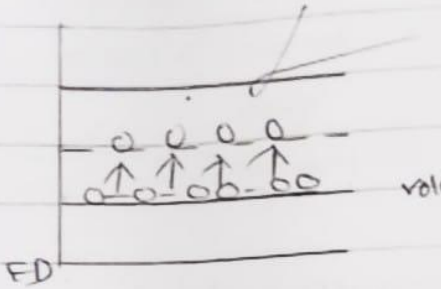


Extrinsic (N-TYPE) semiconductor:

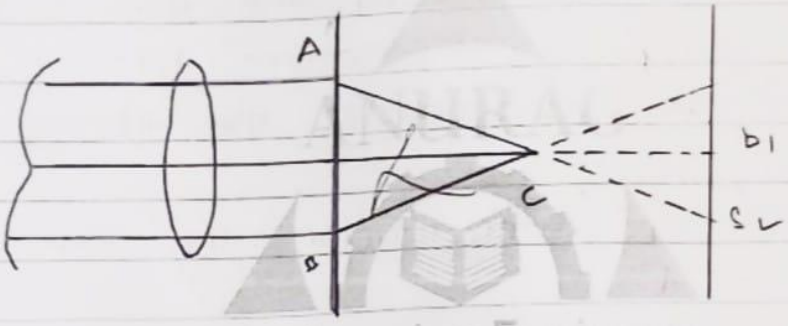
(i) In the N-Type semiconductor the minority

(iii) In N- Type semiconductor the covelent bond is formed.

(iv) In N- Type semiconductor the atoms are represented by ⊖



12. Ans:-



Path difference = $e + d\sin\theta$.

phase difference = $\frac{2\pi}{\lambda}(e + d\sin\theta)$

$$R = \frac{a\sin n\frac{2\pi}{\pi}(e + d\sin\theta)}{\frac{2\pi}{\lambda}(e + d\sin\theta)}$$

$$= 2a \sin n \frac{\frac{2\pi}{\lambda}(e + d\sin\theta)}{\frac{2\pi}{\lambda}(e + d\sin\theta)}$$

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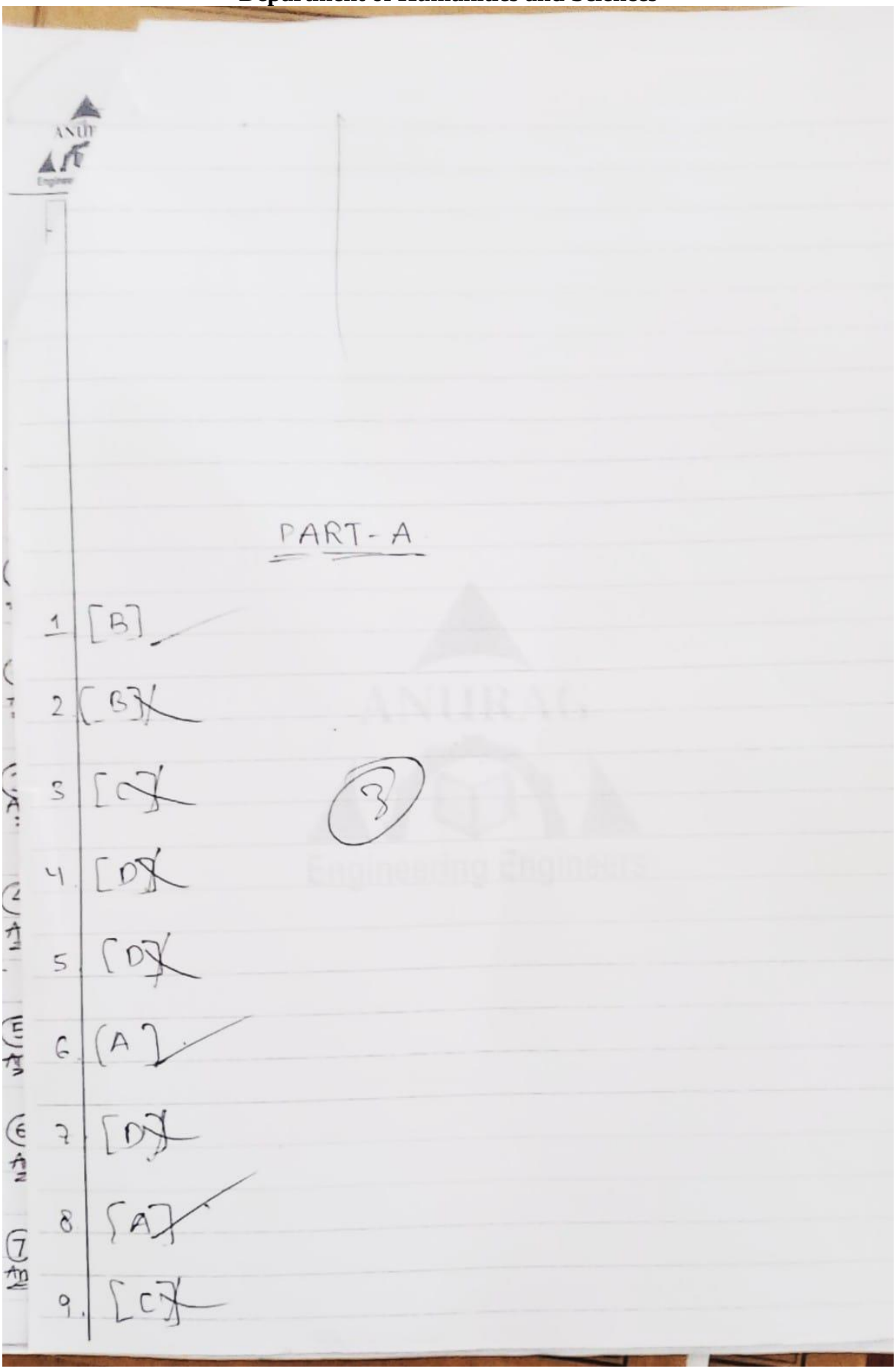

PART - A

1 [B]

2 [B]

3 [C]

4 [D]

5 [D]

6 [A]

7 [D]

8 [A]

9 [C]

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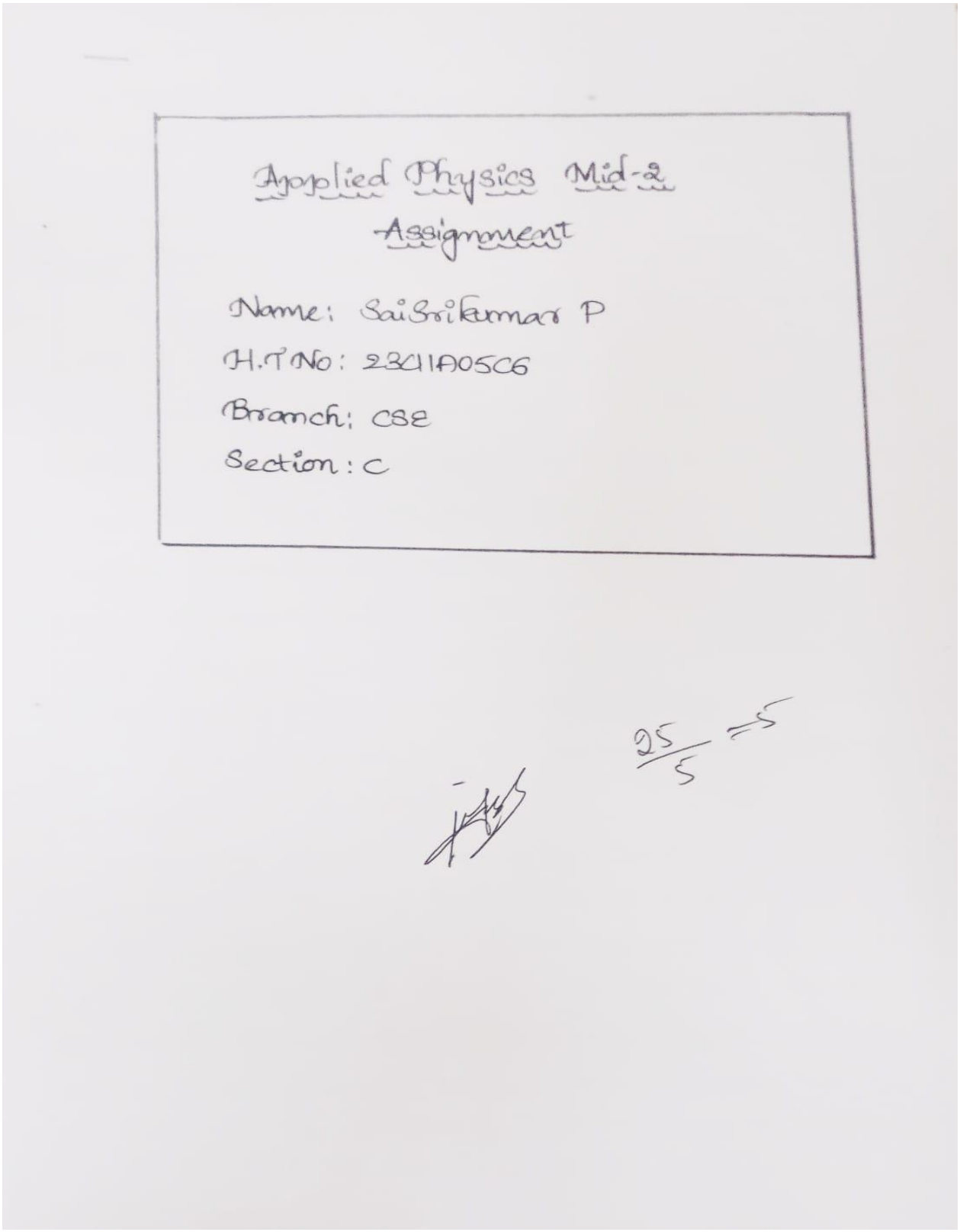
Sample Assignments



AP ASSIGNMENT

Unit-II

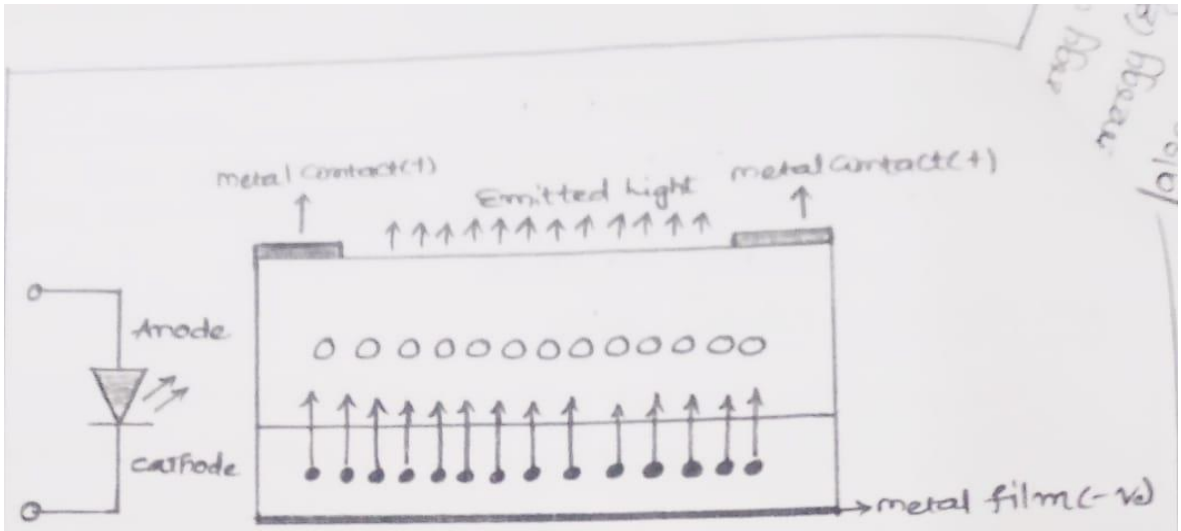
SCIIA05C6 Sasikumar.P CSE-C

Explain the principle, construction, working and characteristics of a light emitting diode (LED) and Solar cell with necessary diagrams.

A: Light Emitting Diode (LED):

The principle behind LED is electroluminescence. A LED is specially made forward biased PN junction diode. They emit spontaneous radiation in UV, visible and infrared regions. Semiconductor having energy band gap larger than this limit must be used. For visible LED, Gallium arsenide and gallium phospide are used, which are transparent. Here GaAs emits IR, GaAsP emits either red or yellow, GaP emits red or green, Ga emits blue light. LED's are fabricated from GaP and GaAsP. LED's operate at low voltages and currents, typically at 1.5V and 10mA.

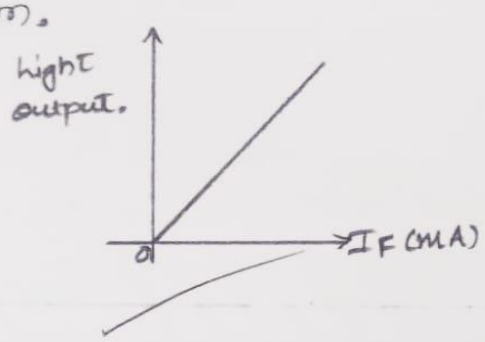
Construction: At first an N-type layer is grown on a substance and then a P-type layer is deposited on it by the process of diffusion. Metal contacts (Anode) are made at the outer edge of the P-layer so that more upper surface is left free for light to escape. For making cathode connections, a metal film is coated at the bottom of the substrate. This film also reflects as much light as possible to the surface of the device.



working:

On forward biasing a LED, the majority carriers present in the respective regions of diode across the p-n junction. The free electrons at the n-side move towards p-side and holes from p-side move towards the n-side of the diode. The free electrons that enter the p-side from the n-side are called minority charge carriers in the p-region and vice versa. This increases the local minority carriers population than the normal value. This is known as minority carrier injection The excess minority carriers diffuse away from the junction and produce recombination with majority carriers. For example the excess minority electron in the conduction band of the p-region recombine with the majority holes in the valence band of the p-region recombine with the majority holes. and emit photons. these the electrons make downward transition from conduction band to valence band for recombination with holes and the difference

ergy will be emitted in the form of photons of energy (E_g). Similar action takes place in the n-region also. Under reverse Bias, no photons are emitted. It is essential that light should be emitted from one side of the junction and most of the light emitted should come out of the device. For this, the device is made of an asymmetrically doped junction. The impurity concentration in the n-region should be higher than in the p-region so that injection of carriers proceeds in one direction.



Solar cell:

principle: A photovoltaic cell or solar cell is nothing but a p-n junction device based on the principle of photovoltaic effect. It directly converts light into electricity.

Construction and working: The cell is a p-n junction diode with doped semiconductors. Doping of n junction is very high. n junction is made very thin so that light radiations can penetrate the junction. Its working is similar to photodiode except that solar cell do not require any external voltage biasing.

Explain sol-gel method and chemical Vapour Deposition methods of synthesising nano materials with neat schematic Diagram.

A) Sol-gel method:

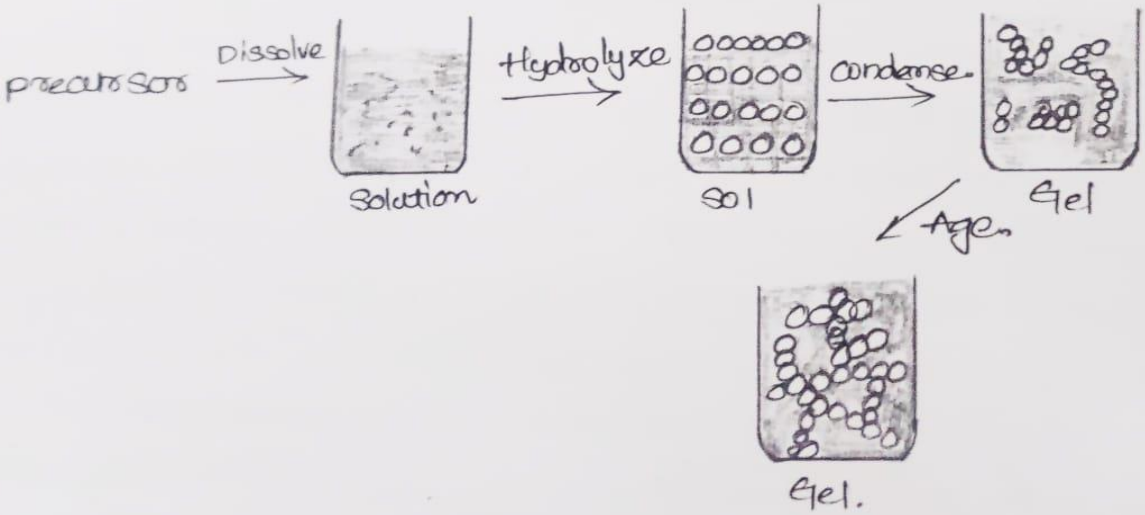
Using the sol-gel method, silica gels, zirconia and yttrium gels and alumino silicate gels are formed. The continuous porosity at the nanoscale is used as a place for loading secondary materials. This method has the ability of synthesizing many mineral oxides such as TiO_2, SiO_2 and ZrO_2. Sol is particles in a liquid. A colloid that is suspended in a liquid is called a sol. Sol-gel formation occurs in four stages: i) Hydrolysis ii) Condensation iii) Growth of particles and iv) Agglomeration of particles.

The precursor for synthesizing these colloids consists of ions of metal oxide, alkoxides and aloxy silanes. For preparation of alumina and zirconia, aluminium propoxide and zircanium propoxide are used respectively as precursor.

i) Hydrolysis: During hydrolysis, addition of water results in the replacement of [OR] (alkyl or alkoxy group bonded to the oxygen atom) with [OH⁻] (hydroxyl group which is a functional group consisting oxygen). Hydrolysis occurs by attack of oxygen on silicon atoms in silica gel. Hydrolysis can be accelerated by adding catalyst

gel is placed in the atmosphere after production two day spontaneously. The gel obtained from this method is called Xerogel. In the second method, called supercritical method, The material obtained from this method has porous networks and low strength and is "hollow". This product is called Aerogel. Aerogels are said to be the lightest and least dense solids, so that about 50-95% of its volume is air. The aerogels are known as the best Thermal insulation material.

The basic process of Sol-Gel method:



drogen (H_2), Nitrogen (N_2), Argon, Helium gases are used as carrier gas to carry precursor and other gases inside the chamber. Carrier gas do not involve in any reactions inside the chamber.

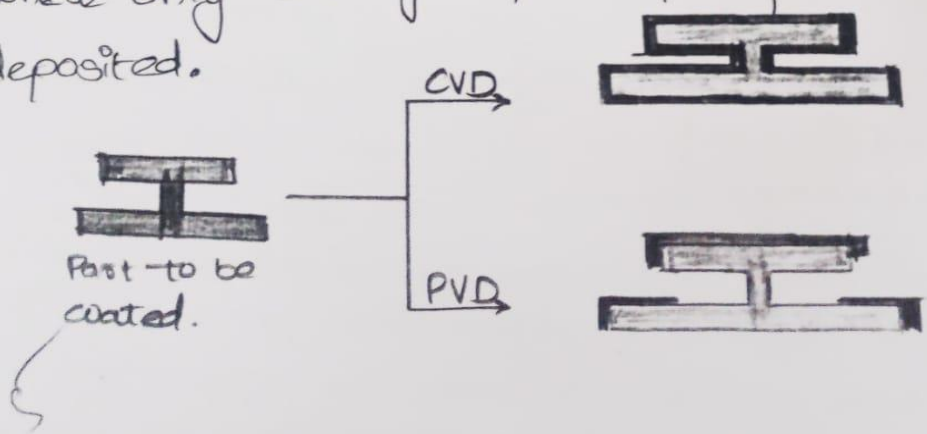
In order to deposit silicon dioxide, precursor used are silane (SiH_4) and oxidizing gas used is O_2.

$$SiH_4 + O_2 \longrightarrow SiO_2 + 2H_2.$$

Similarly, if we want to bond silicon to a surface (substrate) we may use a trichloro silane ($SiHCl_3$) as precursor. when the trichloro silane is heated in the coating chamber the decomposition and coating reaction may look like this.

$$SiHCl_3 \longrightarrow Si + Cl_2 + HCl.$$

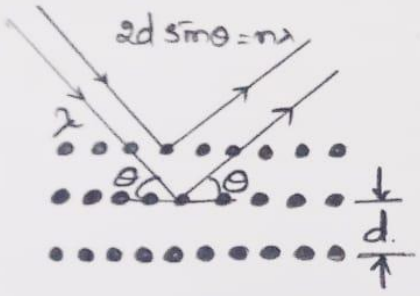
In this method complete samples of any shape can be coated as shown in Fig unlike PVD method where only directly exposed part of substrate are deposited.

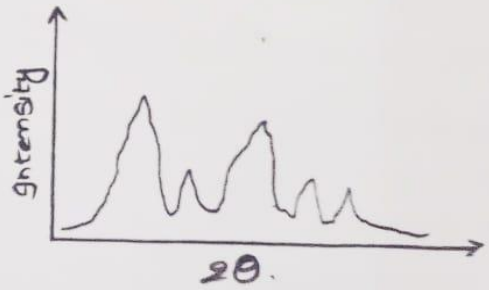


2) with the help of diagram discuss in detail the various steps involved in sem, techniques of nano material characterisation.

4) XRD: X-Ray Diffraction:

XRD is a technique used to determine the crystal structure of a material. It involves shining an x-ray beam at a sample and measuring the angles and intensities of the diffracted beams. x-rays are used to produce the diffraction pattern because their wavelength λ is often the same order of magnitude as the spacing, d, between the crystal planes [1-100A°]. The results of an x-ray study of a sample are usually presented as a plot of reflected intensities versus detected angle 2θ, called as diffraction pattern.



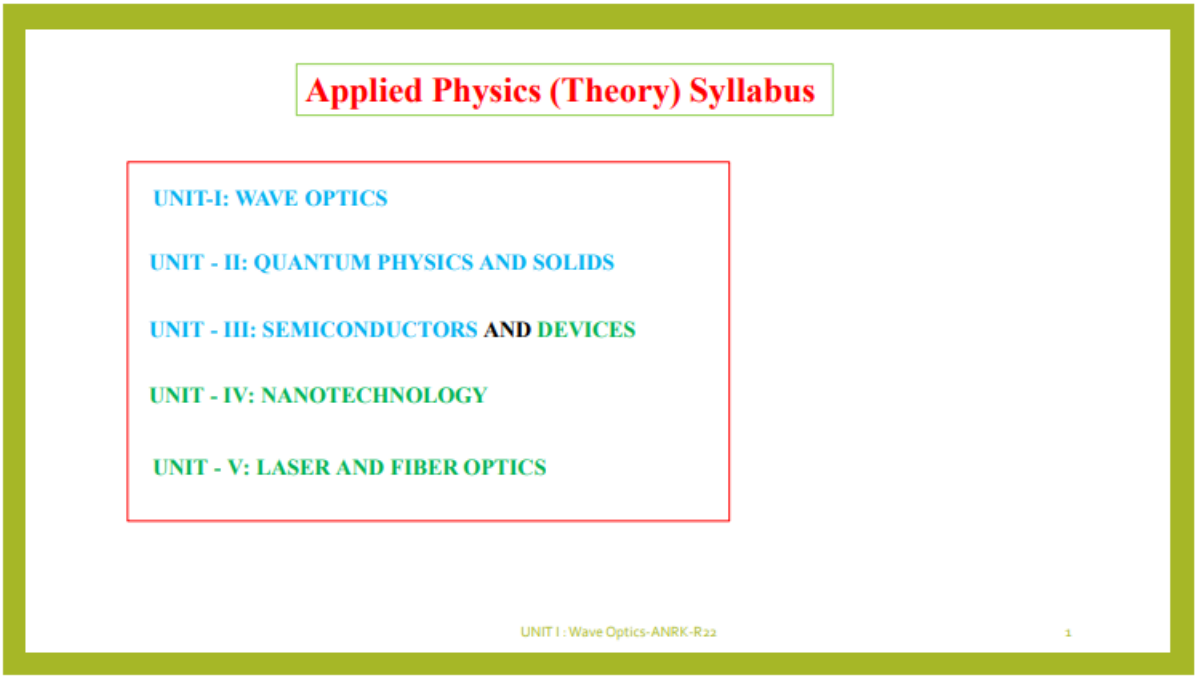


In a x-ray diffractometer, different crystalline phases give different diffraction patterns. Phase identification can be performed by comparing x-ray diffraction patterns. Phase identification can be

Course materials like Notes, PPT's, etc.

Will be attached.

Sample PPT:



Sample Notes:

UNIT-I: WAVE OPTICS

Optics is the branch of physics in which we study the nature of light and the phenomenon exhibited by it. On the basis of wave nature of light we can explain the phenomena of interference, diffraction and polarization (also called wave optics). However, photoelectric effect and Compton effect can be explained by particle nature of light.

Huygen's principle

The wave theory of light was first put forward by Christian Huygens in 1678. Huygen's suggested that light creates periodic disturbance which travels as waves in a manner very similar to that of sound waves. He gave the concept of wavefront. A wavefront refers to an imaginary surface containing points that are in phase—that is, points that have the same phase or displacement from equilibrium—at any given time during the propagation of a wave. **According to this theory, every point on a wavefront serves as the source of secondary spherical wavelets. The envelope formed by these secondary wavelets at any given moment represents the new position of the wavefront.**

Superposition of waves

When two or more waves of the same nature travel past a point at the same time, the instantaneous amplitude there is the sum of the instantaneous amplitudes of the individual waves.

(a) (b)

When two or more trains of light waves meet in a region, they interfere to produce a new wave there whose instantaneous amplitude is the sum of those of the original waves. Constructive interference (fig. a) refers to the reinforcement (adding) of waves with the same phase to produce a greater amplitude, and destructive interference (fig. b) refers to the partial or complete cancellation of waves whose phases differ (opposite phases).

If y_1 and y_2 are the displacements of the two waves, then the resultant displacement y is given by

SEMICONDUCTORS & DEVICES

Semiconductor Fundamentals: -

→ The materials whose electrical properties lie between those of conductors and Insulators are known as semiconductors.

→ The examples ofsuch materials are germanium (Ge), Silicon (Si), gallium arsenide (Ga As), Cadium Sulfide (Cds), lead telluride etc,.

→ At absolute zero temperature (ie at 0K) there are no elctrons in the conduction band of semiconductors and the valence band is completely filled. Thus the semiconductor behaves like an insulator at 0K.

→ If the temperature is increased the width of the energy gap reduces, consequently, some of the electrons jump into condition band and semiconductors show some conductivity.

→ It is thus obvious, that the conductivity of semiconductors increases with the increases in temperature.

Commonly used semiconductors: -

→ The most frequency used materials are germanium (Ge), and Silicon (Si).

→ It is because then energy required to break their co-valent bonds is every small; being 0.7 eV for Ge and 1.1 eV for Silicon.

Chemically pure semiconductors are known as intrinsic semiconductors. A semiconductor is considered to be pure when there is less than one impurity atom in a billion host atoms.

At 0K an Intrinsic Semiconductor Behaves as a Perfect Insulator. As all the valence electrons are engaged in covalent bonds, the bonds are complete. The energy available at 0K is not sufficient to break the covalent bonds.

LIMITATIONS OF INTRINSIC SEMICONDUCTOR

Intrinsic semiconductors are not useful for device manufacture because of low conductivity and the strong dependence of conductivity on temperature.

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UNIT - IV: NANOTECHNOLOGY

Nanoscale, quantum confinement, surface to volume ratio, bottom-up fabrication: sol-gel, combustion methods, top-down fabrication: ball milling. physical vapor deposition (PVD) , Chemical vapor deposition (CVD), Characterization techniques - XRD, SEM &TEM, applications of nanomaterials.

The term nanotechnology was first coined in 1974 by Norio Taniguchi of the Tokyo Science University. Nanoscience is the study of objects having size less than hundred nanometers at least in one dimension, whereas nanotechnology is the engineering of these objects using different techniques. Nanotechnology is all about the techniques and tools to come up with a nanoscale design or system. It all started with a lecture "There's Plenty of Room at the Bottom" delivered by Richard P. Feynman on December 29, 1959 in which he predicted the possibilities of manipulating atoms and making atomic level machines.

Nano is a Greek word that means dwarf (small). On the other hand, **nanotechnology** is a branch in which we study the design, characteristics, production and application of structure, devices and systems on the nanoscale.

The materials developed under nanotechnology show very different properties at nanoscale in comparison to macroscale though the properties hardly change at microscale. For instance, opaque substances at macroscale become transparent at nanoscale (Cu). Materials having inert properties attain catalytic properties (Pt), stable materials turn into combustible materials (Al), solids turn into liquids (Au), insulators become conductors (Si), etc.

Nanoscale

The prefix nano in the word nanotechnology means a billionth ($1 \times 10–9$). Materials with at least one of the dimensions measuring less than 100 nm are known as nanomaterials. We define nanomaterials as those which have a characteristic length scale within about 100 nm. One nanometer spans 3 to 5 atoms lined up in a row. For comparison, a single human hair is about 80,000 nm wide, Water molecules is about 0.3 nm. Diameter of (human) DNA strand 2.5 nm, and a red blood cell is approximately 7,000 nm wide. The nanoscale, may be taken as 0.2 nm to 100 nm.

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UNIT 5 LASER AND FIBER OPTICS

The word 'LASER' is the acronym for Light Amplification through Stimulated Emission of Radiation. Einstein gave the theoretical basis for the development of laser in 1916, when he predicted the possibility of stimulated emission. In 1954, C. H. Townes and his co-workers put Einstein's prediction for practical realization. They developed a microwave amplifier based on stimulated emission of radiation. It was called a maser. Shortly thereafter, T. H. Maiman built the first laser device in 1960. In 1961, A. Javan and associates developed the first gas laser, the helium-neon laser.

ABSORPTION AND EMISSION OF RADIATION

Absorption An atom or molecule in the ground state E_1 can absorbs a photon of energy hν and go to the higher energy state E_2. This process is known as absorption.

The rate of upward transition R_{12} from ground state E_1 to excited state E_2 is proportional to the population of the lower energy level N_1 (number of atoms per unit volume) and to the energy density of radiation ρ_ν

$$R_{12} \alpha \rho_\nu$$
$$\alpha N_1$$
$$R_{12} = B_{12} \rho_\nu N_1$$

where proportionality constant B_{12} is known as the Einstein's coefficient of absorption of radiation.

Normally, the higher energy state is an unstable state and hence, the atoms will make a transition back to the lower energy state with the emission of a photon. Such an emission can take place by one of the two methods given below.