

Reg. No.:



Name:

University of Kerala

W6888

Third Semester FYUGP Degree Examination, November 2025

Discipline Specific Core Course

PHYSICS

UK3DSCPHY202 - Solid State Physics and Spectroscopy

Academic Level: 200-299

2024 Admission

Time: 1 Hour 30 Minutes(90 Mins.)

Max. Marks: 42

Part A. 6 Marks.Time:6 Minutes.(Cognitive Level:Remember(RE)/Understand(UN)) Objective Type. 1 Mark Each.Answer all questions

Qn No.	Question	CL	CO
1	Recall the relation connecting lattice, basis and crystal structure	RE	1
2	Name any one trivalent dopant used in semiconductors.	RE	1
3	Describe the concept of stationary orbits.	UN	2
4	Explain any two modes of molecular excitation	UN	2
5	'Homonuclear diatomic molecules are IR inactive' - Explain	UN	2
6	Write the expression for zero point energy of a diatomic molecule, considering it as a harmonic oscillator.	UN	2

Part B.8 Marks.Time:24 Minutes.(Cognitive Level:Understand(UN)/Apply(AP))Short Answer. 2 marks each.Answer all questions

Qn No.	Question	CL	CO
7	Explain how a PN junction diode conducts under forward bias.	UN	1
8	Explain Mosley's law.	UN	2
9	The force constant of a bond in CO molecule is 187N/m. Calculate the frequency of vibration of the molecule.	AP	2
10	Calculate the Miller Indices for planes with the following set of intercepts (3a,3b,2c).	AP	1

Part C. 28 Marks.Time:60 Minutes (Cognitive Level:Apply(AP)/Analyse(AN)/Evaluate(EV)/Create(CR)) Long Answer:7 marks each.Answer all 4 Questions choosing among options * within each question

Qn No.	Question	CL	CO
11	A) Apply your knowledge of lattice parameters to demonstrate the seven crystal systems with suitable examples. OR B) Demonstrate the energy band diagram for solids and use it to explain the classification of solids to conductors, semiconductors and insulators. Illustrate the position of impurity levels in P and N type semiconductors.	AP	1, 1
12	A) Investigate the various quantum numbers associated with vector atom model OR B) Examine the spectral series of the hydrogen atom and explain how electron transitions between energy levels produce the observed spectral lines.	AN	2, 2
13	A) "Rotational spectral lines are equally spaced" Justify the statement with suitable explanations and energy level diagrams. OR B) Evaluate the total energy of an electron in the n^{th} orbit of hydrogen atom	EV	2, 2
14	A) Design an experimental set up of a grating spectrograph for recording and analyzing infrared spectra OR B) Develop a simple experimental set up for an absorption spectrometer and explain the process of recording the spectra.	CR	2, 2