

VIT
Vellore Institute of Technology

SCHOOL OF ADVANCED SCIENCES
CONTINUOUS ASSESSMENT TEST - II
FALL SEMESTER 2024-2025 (OCTOBER 2024)

SLOT: D2+TD2

Programme Name & Branch : B. Tech – All Branches
 Course Code and Course Name : BPHY101L-- Engineering Physics
 Faculty Name(s) : Amit Roy, Amrita Dey, Dhritiman Gupta, Krishnamoorthi, Sandeep Chakraborty, Sumangala, Tarun, and Uma Mahedra Kumar
 Class Number(s) : VL2024250106006, 010, 016, 020, 261, 502, 883, & 903
 Date of Examination : 16th October 2024
 Exam Duration : 90 minute Maximum Mark: 50

General instructions:

- This is open textbook and notebook test. Nonprogrammable calculator is allowed.
 - Answer All Questions** (5 Qs x 10 mark = 50 mark)
- Abbreviations:** M - Max mark,
 CO – Course Learning Outcome (CO3- Apply quantum mechanical ideas to microscopic systems.)
 BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyze, 5 – Evaluate, 6 – Create)

Q. No.	Question	M	CO	BL
1	Explain first experimental proof for the existence of matter waves, with suitable figure, equation and numeric values.	10	CO3	BL3
2	a) Write down quantum theory of radiation equation for blackbody spectral distribution curves. Briefly discuss the lower and higher wavelength limits of this equation to reach classical theories of blackbody radiation.	5	CO3	BL3
	b) What is the source for the uncertainty principle? Explain the position and momentum uncertainty principle with an example.	5		
3	a) Determine the velocity, kinetic energy, and potential energy of a free neutron (mass = 1.0087 amu) moving with de Broglie wavelength of 1 Å.	5	CO3	BL3
	b) X-rays of wavelength 2 Å are incident on a graphite target. Calculate the kinetic energy (in eV) of the recoiled electron, when the photon is scattered at right angle.	5		
4	a) A free particle motion is confined to a width of 3 Å while it has free motion along another 2 dimensions. It is found that when the energy of the particle is 210 eV, its eigenfunction has 4 antinodes. Calculate the mass and velocity of the particle.	5	CO3	BL3
	b) An electron with 1 eV energy has a transmission probability of 10^{-4} through a potential barrier height of 9 eV. Calculate the width (thickness) of the potential barrier.	5		
5	With reduction of materials size down to nanoscale, what are the major materials parameters modified with the size? Explain five important properties based on the changed materials parameters.	10	CO3	BL3

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