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(Pages : 2)

Name.....

Reg. No.....

FIFTH SEMESTER (CBCSS–UG) DEGREE EXAMINATION, NOVEMBER 2023

Physics/Applied Physics

PHY 5B 07/APH 5B 07—QUANTUM MECHANICS

(2019 Admission onwards)

Time : Two Hours

Maximum : 60 Marks

Section A (Short Answer Type)

Answer **all** *questions in two or three sentences, each correct answer carries a maximum of 2 marks.*

1. A particle confined in a box must have, a certain minimum energy called zero point energy. Comment.
2. State and explain Bragg's law.
3. Write down Einstein's photoelectric equation.
4. What are stationary states ? Explain the significance of Franck Hertz experiment.
5. Show that the eigenvalues of a Hermition operator are real.
6. State Wien's displacement law.
7. Discuss Rutherford atom model.
8. Explain the postulates of Bohr with regard to hydrogen atom.
9. Prove the nonexistence of electron in the nucleus on the basis of uncertainty principle.
10. What is a wave packet ?
11. What is magnetic quantum number ? Explain its significance.
12. For what state of hydrogen atom, the electrons probability density distribution is spherically symmetric.

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Section B (Paragraph /Problem type)

Answer **all** *questions in a paragraph of about half a page to one page, each correct answer carries a maximum of 5 marks.*

13. State and prove correspondence principle.
14. At what wavelength does a room temperature object emit the maximum thermal radiation ? Take T = 27°C. To what temperature must we heat it until its peak thermal radiation is in the red region of the spectrum (680 nm).

Turn over

15. You are using a radiometer to observe the thermal radiation from an object that is h
maintain its temperature at 1278 K. The radiometer records radiation in a wave length in
10.5 nm. By changing the wavelength at which you are measuring, you set radiometer t
the most intense radiation emission from the object. What is the intensity of the emitted r
in this interval ?

16. Explain Davisson and Germer experiment with proper diagram.

17. An eigen function of the. operator d^2/dx^2 is $\psi = e^{2x}$. Find the corresponding eigen value

18. For an electron in a one dimensional infinite potential well of width $1\,A^0$, calculate the se
between the two lowest energy levels and find the frequency and wavelength of th
corresponding to a transition between these two levels.

19. A sample of a certain element is placed in a 0.300 T magnetic field and suitably excited
apart are the Zeeman components of the. 450 nm spectral line of this element ?

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Section C (Essay type)

Answer in about two page., any one question,
the question carries 10 marks.

20. Derive the one dimensional time dependent Schrodinger equation.

21. Write the Schrodinger equation for hydrogen atom and obtain the expression for Φ
using separation of Variables.

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