25U116 (Pages: 2) Name : ....

Reg. No : ....

FIRST SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2025

(FYUGP)

(Regular/Supplementary/Improvement)

CC24UPHY1CJ102 - ELEMENTS OF MODERN PHYSICS

(B.Sc. Physics - Major Course)

(2024 Admission onwards)

Time: 2.0 Hours

Maximum: 70 Marks

Credit: 4

Part A (Short answer questions)

Answer *all* questions. Each question carries 3 marks.

1. Write down the energy momentum relation and explain the terms. [Level:1] [CO1]

2. Sustantiate why the result of Michelson-Morley experiment is mentioned as "negative"? [Level:2] [CO1]

3. Write down Lorentz transformation equations. [Level:1] [CO1]

4. Explain relativistic doppler effect. [Level:2] [CO1]

5. Distinguish Photoelectric effect and Compton effect. [Level:4] [CO2]

6. Explain the photon absorption. [Level:2] [CO2]

7. Give the properties of De Broglie Waves. [Level:1] [CO3]

8. Write down the expressions for phase velocity and group velocity. [Level:1] [CO3]

9. Explain the experimental setup of Davisson and Germer experiment. [Level:2] [CO3]

10. Explain the mechanism of Frank-Hertz experiment. [Level:2] [CO4]

(Ceiling: 24 Marks)

Part B (Paragraph questions/Problem)

Answer *all* questions. Each question carries 6 marks.

11. Anu is 25 years old and her father Anand is 50 years old. Anand travels in a spaceship and comes back to Earth. On returning from the spaceship, Vinod finds himself only 60 years old whereas his son became 65 years old on earth. Calculate the velocity of the spaceship. [Level:3] [CO1]

12. Mesons has mean life of 2x10-6 s. What is the mean life when it is moving with a speed 0.98 c. How far does it travel in this time?   [Level:3] [CO1]

13. Derive Braggs law.   [Level:3] [CO2]

14. Discuss the laws of Photoelectric effect.   [Level:2] [CO2]

15. Explain absorption and emission spectra.   [Level:2] [CO4]

16. Compute the oscillation frequency of the electron in Thomson model hydrogen atom.Use R=0.053 nm. Compare with the observed wavelength in hydrogen which is 122 nm.   [Level:3] [CO4]

17. Explain and analyse Heisenberg's uncertainity relationships.   [Level:4] [CO3]

18. Sound waves travel through air at a speed of 330m * s ^ - 1 . A whistle blast at a frequency of about 1.0 kHz lasts for 0.2 s.a) Over what distance in space does the wave train representing the sound extend.b) What is the wavelength of the sound.e) Estimate the precision with which an observer could measure the wavelength.d) Estimate the precision with which an observer could measure the frequency.   [Level:3] [CO3]

(Ceiling: 36 Marks)

Part C (Essay questions)

Answer any *one* question. The question carries 10 marks.

19. Explain the theory of Compton effect and derive the expression for the Compton shift.   [Level:4] [CO2]

20. Describe Bohr model of an atom. Derive an expression for the energy levels of hydogen atom and draw the energy level diagram.   [Level:2] [CO4]

(1 × 10 = 10 Marks)

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