

**23U112S**

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Name: .....

Reg. No: .....

**FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2023**

(CUCBCSS-UG)

**CC15U PH1 B01 - METHODOLOGY OF SCIENCE AND PHYSICS**

(Physics - Core Course)

(2017 to 2018 Admissions – Supplementary)

Time: Three Hours

Maximum: 80 Marks

**Section A**

Answer *all* questions. Each question carries 1 mark.

1. Expand the term LASER.
2. What is inductive reasoning?
3. What is scientific knowledge?
4. What is hypothesis?
5. What is not Science?
6. What is Falsification?
7. Wave nature of particles was proposed by .....
8. Give the orthogonality condition for a square matrix.
9. What is a null vector?
10. Write the scalar triple product of three vectors X, Y and Z.

**(10 × 1 = 10 Marks)**

**Section B**

Answer *all* questions. Each question carries 2 marks.

11. What are the aspects of scientific temper?
12. Mention the situations, where Newtonian Mechanics fails.
13. State the postulates of special theory of relativity.
14. Write a short note on Spherical polar coordinates.
15. State Gauss divergence theorem.
16. Find the gradient of  $r = (x^2+y^2+z^2)^{1/2}$
17. What is meant by divergenceless and curl less fields?

**(7 × 2 = 14 Marks)**

**Section C**

Answer any *five* questions. Each question carries 4 marks.

18. Explain Compton effect.
19. What is Twin Paradox?

20. Explain the different types of knowledge.
21. Distinguish between spontaneous emission and stimulated emission
22. Distinguish between auxiliary and adhoc hypothesis.
23. What is LASER? Explain its properties and applications.
24. Using spherical polar co-ordinates find the volume of sphere.

**(5 × 4 = 20 Marks)**

### Section D

Answer any *four* questions. Each question carries 4 marks.

25. Solve the system of equations using Cramers rule.  $x + 2y + 3z = 10$ ,  $2x - 3y + z = 1$   
and  $3x + y - 2z = 9$
26. Prove that  $\text{div}(\text{curl } A)$  vanishes.
27. Check the matrix  $\begin{bmatrix} 1 & 2 & -3 \\ 2 & 4 & -5 \\ 3 & -5 & 6 \end{bmatrix}$  is symmetric or not.
28. Discuss the different steps involved in scientific methods with an example.
29. Make two scientific and non-scientific statements and distinguish between them.
30. Calculate de Broglie wavelength associated with an electron accelerated through a potential of 150 Volts.
31. Using the cylindrical coordinates, find the volume of a cylinder of radius  $r$  and height  $h$ .

**(4 × 4 = 16 Marks)**

### Section E (Essays)

Answer any *two* questions. Each question carries 10 marks.

32. Explain how the X-rays are produced, with the help of diagram.
33. Discuss the cylindrical curvilinear coordinate system.
34. Explain with example, how inconsistency between theory and experiment give rise to new concepts in science.
35. Find the eigen values and eigen vectors of the matrix  $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$  as first row and [1,2] as second row.

**(2 × 10 = 20 Marks)**

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