

D 73131

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Name.....

Reg. No.....

FIRST SEMESTER B.A./B.Sc. DEGREE EXAMINATION, NOVEMBER 2019

(CUCBCSS—UG)

Physics/Applied Physics

PHY 1B 01/APY 1B 01—METHODOLOGY OF SCIENCE AND PHYSICS

Time : Three Hours

Maximum : 80 Marks

Section A

Answer all questions.

1 mark each.

1. Who defined science as 'a process of human intellect' ?
2. Author of 'Principia Mathematica' is _____.
3. _____ is referred to as language of science.
4. The process of emission of electrons from a metal surface when light incident on it is called _____.
5. The expression for de Broglie wavelength in terms of Planck's constant and momentum is _____.
6. Compton effect confirms the _____ nature of light.
7. A vector divided by its magnitude is _____ vector.

State whether the statement is True or False :

8. Scientific theories must be tentative.
9. The divergence of curl is always zero.
10. A matrix having all its elements one is called identity matrix.

(10 × 1 = 10 marks)

Section B

Answer all questions.

Write in two or three sentences.

2 marks each.

11. What is a hypothesis ?
12. What are the main aspects of scientific temper ?

Turn over

13. Define cross product of two vectors.
14. Give expressions for scalar and vector triple products.
15. What is the geometrical meaning of gradient ?
16. State and explain Stoke's theorem.
17. What is meant by metastable state of an atom ?

(7 × 2 = 14 marks)

Section C

Write any five.

Write in one paragraph.

4 marks each.

18. Define and distinguish between induction and deduction.
19. Discuss the significance of corroboration and falsification in a hypothesis.
20. What are the assumptions made by Newton to develop mechanics ?
21. Given the wavelength of photon is 650 nm. Find the photon energy in eV ?
22. Differentiate spontaneous and stimulated emission ?
23. Show that the matrix $A = \begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix}$ is orthogonal.
24. Using spherical polar co-ordinates, find the volume of sphere of radius R.

(5 × 4 = 20 marks)

Section D

Solve any four problems.

4 marks each.

25. Find the value of 'α' if $A = \alpha \hat{i} + \hat{j} + \sqrt{5}\hat{k}$ subtends an angle of 60° with $B = 4\hat{i} - 5\hat{j} + \sqrt{5}\hat{k}$.

26. Show that the matrix $A = \begin{bmatrix} 1 & 2 & -3 \\ 2 & 4 & -5 \\ -3 & -5 & 6 \end{bmatrix}$ is symmetric.

27. Calculate the mass of an electron moving a velocity 90% of that of light.

28. If $F = 2xz^2\hat{i} - yz\hat{j} + 3xz^3\hat{k}$. Find Curl of Curl of F at the point (1,1,1).
29. Prove that $\text{Curl grad } \phi = 0$.
30. Find the area of a parallelogram whose sides A and B are in meters $A = \hat{i} + \hat{j} + \hat{k}$ and $B = 3\hat{i} + 2\hat{k}$.
31. Calculate divergence of the function $\vec{V} = xy\hat{i} + 2yz\hat{j} + 3zx\hat{k}$.

(4 × 4 = 16 marks)

Section E

Write any two.

10 marks each.

32. List various criteria for a theory to be scientific. Discuss each one in detail.
33. Discuss Photoelectric effect. Show the experimental arrangement and obtain the expression for maximum kinetic energy of photoelectrons.
34. Discuss gradient, divergence and curl. What are the different ways on which ∇ (del) operator can act?
35. What are eigen values and eigen vectors? Find the eigen values and eigen vectors of $A = \begin{bmatrix} 5 & 4 \\ 1 & 2 \end{bmatrix}$.

(2 × 10 = 20 marks)