D 52726 (Pages : 3) Name.....

Reg. No.....

FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2018

(CUCBCSS—UG)

Core Course (Physics/Applied Physics)

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

(Common with Applied Physics Core)

Time : Three Hours Maximum : 80 Marks

Section A

Answer **all** *questions.*

Each question carries 1 *mark.*

1. Knowledge attained through study or practice can be called ————.
2. In Jewish fclklore, ———— is an animated anthropomorphic being, created from inanimate matter.
3. In theory of relativity ———— assumed to be same irrespective of the nature of frame of reference.
4. The most famous 'failed' experiment in science is considered as ———— experiment.
5. The headquarters of the Nature Publishing Group, which brings out the journal Nature, is in ————.
6. Gravitational waves are one of the greatest predictions of Einstein's theory of ————.
7. CERN in Switzerland is an abbreviation of ————.
8. The famous electrochemist ———— proposed the table top cold fusion.
9. Is it possible to get a resultant of 20N using two forces of 5N and 4N ?
10. Curl of a gradient is equal to ————.

(10 × 1 = 10 marks)

Section B

Answer **all** *questions.*

Write in one **or** *two sentences.*

Each question carries 2 *marks.*

11. What is meant by Alternative hypothesis ?
12. What is meant by Type II error ?

Turn over

13. What is uncertainty Principle in quantum mechanics ?
14. Define metastable state.
15. What is meant by a unit vector ?
16. What is meant by stimulated emission ?
17. Do we consider volume as a vector quantity ?

(7 × 2 = 14 marks)

Section C

Answer any **five** *questions.*
Write in **one paragraph.**
Each question carries 4 *marks.*

18. How do we express a small area element (dA) in spherical polar system ?
19. What are matter waves ? How does the momentum of a particle related to the wavelength ?
20. Differentiate fundamental and applied researches.
21. Write a note on criteria of good research.
22. Describe how do we measure length in any one co-ordinate system.
23. What is meant by a divergenceless field ?
24. What is Hermitian Matrix ?

(5 × 4 = 20 marks)

Section D

Solve any **four** *problems.*
Each question carries 4 *marks.*

25. An electron is moving with a velocity 4×10^6 m/s. Calculate the De Broglie wave length of the electron. Mass of electron = 9.11×10^{-31} Kg and $h = 6.626 \times 10^{-34}$Js.
26. Calculate the emissive power of a perfect radiator kept at temperature 2×10^3 K ($\sigma = 5.67 \times 10^{-8}$ W/m^{2}K^{-4}).
27. Find area of a rhombus of sides $(2i + 3j + \sqrt{3}\,k)$ and $(i + \sqrt{3}\,j + 3k)$ units.
28. If $A = 2i - 3j + k$, $B = 2i - 3j + 2k$ and $C = i - j + 2k$, Find $(A \times B) \times C$
29. Find the work done in moving a body moved from $2i + 4j + k$ to $4i + 6j + 4k$ applying a force $4i + 6j + 4k$ N.

30. Check whether the matrix is orthogonal : $\begin{bmatrix} \cos\theta & \sin\theta \\ \sin\theta & -\cos\theta \end{bmatrix}$.

31. Find the Laplacian of the function $V = xy + yz + zx$.

(4 × 4 = 16 marks)

Section E

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

32. Briefly discuss the basic concepts of hypothesis testing.

33. Explain the concepts of time dilation and length contraction based on the theory of relativity.

34. Using Cramer's rule solve the equations : $x - 2y + 3k = 4$, $2x + 2y - k = 12$; $3x - 2y + 4z = 14$.

35. State and explain Gauss's theorem in vector calculus.

(2 × 10 = 20 marks)