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(Pages : 3) Name.....

Reg. No.....

FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2015

(CUCBCSS—UG)

Core Course—Physics/Applied Physics

PHY 1B01/APY 1B01/APY 1C01—METHODOLOGY OF SCIENCE AND PHYSICS

Time : Three Hours Maximum : 80 Marks

Section A

Answer **all** *questions.*

1. ———— is a systematic enterprise that builds and organizes knowledge.
2. ———— is a creature in Jewish mythology.
3. The general theory of relativity was proposed by ————.
4. Michelson Morley experiment disproved the presence of ————.
5. Most famous journal ———— is published by American Association for the Advancement of Science.
6. ———— is assumed to be the quanta of gravitational force.
7. European Organization for Nuclear Research (CERN) is in ————.
8. The cold fusion was claimed by Fleischmann and Pons in the year ————.
9. Resultant of two equal forces is numerically equal to either of the forces, then angle between the forces = ————.
10. Gradient of a scalar quantity is ————.

(10 × 1 = 10 marks)

Section B

Answer **all** *questions.*

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

11. Distinguish between null and alternate hypotheses.
12. How do we quantify error in the outcome of a hypothesis ?
13. How X-rays are produced ?
14. What are coherent sources of light ?
15. Define one radian.

Turn over

16. What is a diagonal matrix ?

17. Define threshold energy for photoelectric emission.

(7 × 2 = 14 marks)

Section C

Answer any **five** *questions.*
Write in **one paragraph**.

18. Curl of a gradient is zero. What do we mean by this ?

19. What is de Broglie's hypothesis ?

20. How do we distinguish qualitative and quantitative researches ?

21. Write a note on the significance of research.

22. Obtain the expression for an area element in spherical polar system.

23. What is meant by a curlless field ?

24. What is a unitary matrix ?

(5 × 4 = 20 marks)

Section D

Solve any **four** *problems.*

25. An alpha-particle moves with a velocity = 6×10^6 m/s. Obtain its de Broglie wavelength ? Mass of helium nucleus is 6.6×10^{-27} kg.

26. A star of radius 1000 km at 2 light years away is found deliver a power of 10^{-9} W/m^2 on the surface of earth. Estimate the average temperature of the star. ($\sigma = 5.67 \times 10^{-8}$ W /m^{2}K^4).

27. Find the angle between the two vectors of sides $(4i + 3j)$ and $(3i + 4j)$ units.

28. If $A = 2i - 3j + k$, $B = 2i - 3j + 2k$ and $C = i - j + 2k$. Find A. (B × C).

29. Find the work done in moving a body moved from $2i + 4j + k$ to $4i + 6j + 4k$ applying a force normal to the displacement.

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 $V = 3/(x^2 + y^2)$.

(4 × 4 = 16 marks)

Section E

Answer any **two** *questions.*

32. Briefly explain the important aspects and steps in formulating a hypothesis for a scientific research.

33. Explain the twin paradox in the theory of relativity.

34. Solve the linear equations : $x + 2y - k = 4$; $3x - 3y - k = 7$; $2x + 2y - 3k = 4$.

35. What are Eigen vectors of a matrix ? How do we obtain them ?

$(2 \times 10 = 20$ marks)