

## FIRST SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2017

(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.**Each question carries ½ mark.*

1. \_\_\_\_\_ does not make aesthetic judgement.
2. Name the physical phenomenon which is valid at all length scale.
3. Name the scientist who overthrown the idea of earth centered description of the planetary motion.
4. Newton's Laws are valid when  $v/c$  is \_\_\_\_\_ than one.
5. Any matrix similar to a \_\_\_\_\_ matrix has a linearly independent invariant vector.
6. Specify the nature of the field if  $\text{Curl } \mathbf{V} = 0$  and  $\text{div } \mathbf{V} = 0$
7. Strengthen with other evidence is called \_\_\_\_\_.
8. Write the mathematical form of Gauss divergence theorem.
9. The position vector  $\mathbf{r} = xi + yj + zk$  may be expressed in spherical co-ordinate as \_\_\_\_\_.
10. Hermitian matrix remain Hermitian under \_\_\_\_\_ transformation.

(10 × ½ = 5 marks)

## Section B

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

11. What is not Science ?
12. Why value judgments' are not scientific ?
13. What is Hypothesis ?
14. What is Occam's Razor ?
15. Give any two application of vectors in Physics.
16. Write down Stokes theorem and give its importance in physics.
17. What do you mean by transpose of a Matrix ?

(7 × 2 = 14 marks)

Turn over

**Section C**

Answer any **five** of the following.

Each question carries 5 marks.

18. Give an example to illustrate interaction of physics and life science.
19. What is the necessity of an experimental design ?
20. What are auxiliary Hypothesis ? Explain with suitable example.
21. What is a Laser ? Give the concept of ordinary and monochromatic light.
22. Explain blackbody radiation with suitable graph and point out its limitation.

23. Find the inverse of a matrix  $A = \begin{bmatrix} 3 & 0 & -1 \\ 1 & 2 & 1 \\ 3 & 4 & 0 \end{bmatrix}$

24. Show that the inverse of an elementary matrix is also an elementary matrix of the same type.

(5 × 5 = 25 marks)

**Section D**

Answer any **four** of the following.

Each question carries 4 marks.

25. Find the intensity of the laser beam of 20 mw and diameter 1.5 mm. Assume the intensity to be uniform throughout the beam.
26. A proton with rest mass  $1.67 \times 10^{-27}$  kg moving with the velocity  $2.7 \times 10^8$  m/sec. collides with a stationary nucleus of mass  $2.5 \times 10^{-26}$  kg and coalesces. What is the velocity of the combined particle ?
27. Show that the four dimensional volume element remains invariant under Lorentz transformation.
28. Show that every square matrix can be expressed uniquely as the sum of a Hermitian and a skew Hermitian matrix.
29. Prove that every matrix is equivalent to itself.
30. An electron and a positron, practically at rest, annihilate each other producing two photons of equal energy. Find the energy and equivalent mass of each photon ? The rest mass of electron =  $9 \times 10^{-31}$  kg.
31. Prove vectorially that the opposite sides of a parallelogram are equal and diagonals bisect each other.

(4 × 4 = 16 marks)

**Section E**

*Answer any two of the following.  
Each question carries 10 marks.*

32. Discuss in detail the significance of corroboration and falsification in a hypothesis.
33. Demonstrate with an example how inconsistency between experiment and theory give rise to new concepts in science.
34. With suitable example explain the physical interpretation of divergence and Curl.
35. Illustrate with suitable example the basic operations of a Matrices like addition and multiplication,  
(2 × 10 = 20 marks)