22255 (Pages 3) Name.....

Reg. No.....

FIRST SEMESTER B.Sc. DEGREE EXAMINATION, JANUARY 2012

(CCSS)

Physics—Core Course

PH 1B 01—METHODOLOGY OF SCIENCE AND PHYSICS

Time : Three Hours Maximum : 30 Weightage

Section A

Answer **all** *questions.*
Each question carries ¼ weightage.

1. Which of the following frames of reference is non-inertial ?
   (a) A space ship cruising uniformly.
   (b) A boat is moving with constant speed.
   (c) An electron revolving uniformly around nucleus.
   (d) An apple at rest on a table.

2. Two photons are moving in opposite direction along same straight line. The relative velocity of one Photon with respect to other Photons is :
   (a) o. (b) 2c.
   (c) c. (d) $\frac{c}{2}$.

3. The degree of freedom of ideal mono atomic gas molecule is :
   (a) one. (b) two.
   (c) 4. (d) 3.

4. The frequencies of X - rays and U.V. radiations are respectively a, b and c, then :
   (a) $a < b < c$. (b) $a < b, b > c$.
   (c) $a > b, b > c$. (d) $a > b, b < c$.

5. The rest mass of a photon is :
   (a) $\frac{h\upsilon}{c^2}$. (b) $\frac{h\upsilon}{c}$.
   (c) $h\upsilon$. (d) zero.

Turn over

6. A metallic surface ejects photoelectrons when hit by green light, will the electrons be ejecte same surface is hit by red light :

   (a) Yes.

   (b) Yes if red beam is sufficiently intense.

   (c) Yes if red beam fall for enough time.

   (d) No.

7. The wavelength of De Broglie wave is independent of :

   (a) Charge. (b) Momentum.

   (c) Velocity. (d) Mass.

8. The life time an atom in metastable state is :

   (a) 10 S. (b) 10^{-8} S.

   (c) 10^{-3} S. (d) 10^{3} S.

9. The flux leaving any closed surface per unit volume in a vector field A is called :

   (a) grad A. (b) div A.

   (c) curl A. (d) flux A.

10. Which of the following operation not defined in vectors?

   (a) Division. (b) Multiplication.

   (c) Addition. (d) Subtraction.

11. Which among these is not science?

   (a) Determining frequency of a musical note.

   (b) Cooking food in a pressure cooker.

   (c) Distinguishing different smell.

   (d) Spray pointing.

12. A positively charged electrons is :

   (a) Positron. (b) Proton.

   (c) electron. (d) Neutron.

(12 × ¼ = 3 weight

Section B

Answer **all** *nine questions.*

13. Briefly explain about 'twin paradox'.

14. What is Compton effect ? Mention its significance.

15. "X-ray production is inverse of photoelectric effect". Explain the statement.
16. What are matter waves ?
17. Show that Planck radiation formula reduces to Raleigh-Jean Formula at low frequency range.
18. What is meant by pumping ? Mention any *two* mechanism of pumping in LASER.
19. State and explain Fundamental theorem for gradient ?
20. Distinguish between auxiliary and ad - hoc hypothesis.
21. What is the necessity of experimental design ?

(9 × 1 = 9 weightage)

Section C

Answer any **five** *questions from seven.*
Each question carries 2 *weightage.*

22. Distinguish between induction and deduction.
23. Find out eigen values of $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 2 & 3 \\ 0 & 0 & 2 \end{bmatrix}$.
24. $\vec{A} = A_y \hat{j} + A_z \hat{k}$ is transformed by rotating y, z about X-axis. Develop transformation equations.
25. Find out the gradient of $\vec{r} = \sqrt{x^2 + y^2 + z^2}$.
26. Find out change in wave length due to Compton scattering if angle of scattering is (a) 90°, (b) 180°.
27. Write down Planck radiation formula convert these equation interms of Wavelength.
28. Calculate divergence of V and Curl of V if $V = \hat{x}i + \hat{y}j + \hat{z}k$.

(5 × 2 = 10 weightage)

Section D

Answer any **two** *questions.*
Each question carries 4 *weightage.*

29. What are the postulates of special theory of relativity ? Hence explain time dialation.
30. Explain about the scientific revaluation in science and Technology that happed in 17th century.
31. Check the divergence theorem using the function $V = Y^2\hat{i} + (2xy + z^2)\hat{j} + (2yz)\hat{k}$ and unit cube situated at origin.

(2 × 4 = 8 weightage)