K23U 4229

I Semester B.Sc. Degree (C.B.C.S.S. – Supplementary/One Time Mercy Chance) Examination, November 2023
(2014 to 2018 Admissions)
CORE COURSE IN PHYSICS
1B01 PHY : Physics Primers

Time : 3 Hours

Max. Marks : 40

Instruction : *Write answers only in* **English**.

SECTION – A

Answer **all**. Very short answer type. **Each** question carries **one** mark.

1. Rest mass of photon is

2. The maximum mass theoretically possible for a stable white dwarf star is called

3. The velocity of a particle in m/s is $3\hat{i} + 4\hat{j} + \sqrt{11}\hat{k}$. The speed of the particle is _____ m/s.

4. The velocity of transverse waves in stretched strings depends on the _____ and mass per unit length of the string.

$(4×1=4)$

SECTION – B

Answer **any seven**. Short answer type. **Each** question carries **two** marks.

5. Give the postulates of special theory of relativity.

6. Give the scientific contributions of the Indian Scientist C.V. Raman.

7. State the fundamental theorem for curls.

8. Show the cylindrical coordinates (s, ϕ, z) of a point in a diagram.

9. Define divergence of a vector. What is its geometrical meaning ?

10. Define gradient of a scalar function. Find the gradient of $T = x^3yz^2$.

11. What is meant by energy density of a plane progressive wave ? Give its expression.

P.T.O.

12. State the principle of superposition for a number of waves travelling simultaneously.

13. What was the difference between Newton and Laplace about the speed of sound in gases ?

14. What are Lissajous figures ?

$(7\times2=14)$

SECTION – C

Answer **any four**. Short essay/problem type. **Each** question carries **three** marks.

15. Explain Planck's hypothesis of quantum.

16. Prove that for any vector v, the divergence of curl is zero. i.e. $\nabla.(\nabla \times v)=0$.

17. If $r = \sqrt{x^2 + y^2 + z^2}$, prove that $\nabla r = \hat{r}$.

18. Calculate the Laplacian of the following functions $T = x^2 + 2xy + 3z + 4$.

19. The potential energy of a harmonic oscillator in its resting position is 5 joule and the total energy is 9 joule. When the amplitude is 2 m, what is the force constant ?

20. Calculate the velocity of longitudinal waves in a rod. (Young's modulus of material is 2.91×10^{11} N/m^2 and density of the rod is 7.98×10^3 kg/m^3). $(4\times3=12)$

SECTION – D

Answer **any two**. Long essay type. **Each** question carries **five** marks.

21. Give a note on the following :
    a) Expanding universe and
    b) Unification of fundamental forces.

22. What are spherical polar coordinates ? Discuss the unit vectors, elementary lengths, elementary area and elementary volume.

23. Discuss the propagation of longitudinal waves in gases and derive an expression for its velocity.

24. What is meant by harmonic oscillator ? Solve the differential equation of a harmonic oscillator and find the expression for its velocity, displacement and period.

$(2\times5=10)$

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