Reg. No. : ....

Name : ....

I Semester B.Sc. Degree (CBCSS – Supplementary) Examination, November 2022
(2016-2018 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. Particles with integer spin are called _____

2. _____ is the weakest fundamental force.

3. The Laplacian operator ∇^2 in Cartesian coordinates is _____

4. The velocity of longitudinal waves in gases depends on the elasticity and _____ of gases. **(4×1=4)**

SECTION – B

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

5. Explain Hubble's law.

6. What are Higgs Bosons ?

7. Define gradient of a scalar. What is its geometrical meaning ?

P.T.O.

8. Show the spherical coordinates (r, θ, φ) of a point in a diagram.

9. State the fundamental theorem for divergence of a vector function.

10. What is meant by a conservative force ?

11. State Fourier's theorem.

12. What is a compound pendulum ? Give the equation for its angular frequency.

13. What is meant by simple harmonic motion ? Give its differential equation.

14. For small amplitude vibrations, what is the shape of the potential energy curve of a diatomic molecule ? Write down the expression for the frequency of such oscillations. **(7×2=14)**

SECTION – C

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

15. Give any three characteristics for each of the following basic forces :
    a) Gravitational force and
    b) Weak force.

16. Prove the fundamental theorem for gradients using the function $T = x^3y$ by integrating ∇T along a straight line between (1, 3) and (3, 3).

17. Calculate the divergence of the vector function $A = 3x^2y\hat{i} + x^3\hat{j} + xz\hat{k}$ at (1, − 1, 3).

18. Write down the expression for elementary volume in cylindrical coordinates and integrate it to obtain the volume of a cylinder of length L and radius R.

19. A 2 kg mass hangs from a spring. A 0.3 kg body hung below the mass stretches the spring 2 cm farther. If 0.3 kg body is removed and the mass is set into oscillation, find the period of motion.

20. If in air a plane wave of frequency 256 Hz and amplitude 0.001 mm is produced. Calculate the radiated energy per unit volume and the energy current. (Velocity of sound is 332 m/s and density of air is 1.29 kg/m³) **(4×3=12)**

SECTION – D

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

21. a) Explain Planck's hypothesis of quantum.

     b) Give the contributions of the following Indian scientist to the Physics – SN Bose, MN Saha and CV Raman.

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

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

24. Derive an expression for the kinetic energy, potential energy and total energy of a harmonic oscillator and represent these variations with displacement in a plot. **(2×5=10)**

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