

**SECOND SEMESTER U.G. DEGREE (SUPPLEMENTARY) EXAMINATION
DECEMBER 2012**

Core Course

PH 2B 03—PROPERTIES OF MATTER, WAVES AND ACOUSTICS

Three Hours

Maximum : 30 Weightage

Section I (Objective Type Questions)*Answer all questions.*

1. When the amplitude of a particle executing SHM increases, the time period _____.
2. The expression for energy stored in a wire when it is twisted through an angle θ is _____.
3. The velocity of longitudinal waves in a rod depends upon _____ of the material besides its density.
4. The quality of sound is related to _____ of the sound wave.
5. The Young's modulus of a wire of length 'L' and radius 'r' is 'Y Nm²'. If the length is reduced to $\frac{1}{2}$ and radius to $\frac{r}{2}$, its Young's modulus will be :
 - (a) Y/2.
 - (b) Y.
 - (c) 2Y.
 - (d) 4Y.
6. A particle moving with SHM has a period 0.0015 and amplitude 0.5 cm. The acceleration of the particle when it is 0.2 cm apart from its mean position is :
 - (a) $7.897 \times 10^4 \text{ m/s}^2$.
 - (b) $7.897 \times 10^6 \text{ m/s}^2$.
 - (c) $2.563 \times 10^4 \text{ m/s}^2$.
 - (d) $2.563 \times 10^6 \text{ m/s}^2$.
7. Which of the following statement is not true :
 - (a) Velocity of body executing SHM is maximum at the equilibrium position.
 - (b) Period of oscillation of a simple pendulum is independent of its mass.
 - (c) The acceleration of a body executing SHM is maximum at the equilibrium position.
 - (d) The total energy of a body executing SHM is always a constant.

8. Which is the correct relation ?

(a) $V_p \cdot V_g = C$.

(b) $V_p \cdot V_g = C^2$.

(c) $\sqrt{V_p \cdot V_g} = C^2$.

(d) $V_p / V_g = C^2$.

9. Write the limiting values of Poisson's ratio.
 10. Give one example for a fixed vibration system.
 11. Write the equation representing a plane progressive harmonic wave.
 12. What is the value of quality factor for an undamped oscillator ?

(12 × ¼ = 3 weightage)

Section II (Short Answer Type Questions)

Answer all questions.

13. Define bending moment of a beam.
 14. Name the factors on which the depression at the free end of a cantilever depend.
 15. What is a torsion pendulum ?
 16. Define amplitude resonance of forced harmonic oscillator.
 17. Explain the variation of velocity of sound waves in air with pressure.
 18. Define a wavefront.
 19. Sketch the graphical representation showing the variation of potential and kinetic energies of particle executing SHM.
 20. What are ultrasonic waves ?
 21. What do you mean by reverberation of sound waves ?

(9 × 1 = 9 weightage)

Section III (Short Essay/Paragraph Questions)

Answer any five questions.

22. Find the expression for the twisting couple of a wire.
 23. Show that a hollow shaft is better than a solid shaft of same length and same material transmitting torque.
 24. Derive the expression for average power dissipation for a damped harmonic oscillator.
 25. A particle executing SHM has a maximum velocity 0.3 m/s and maximum acceleration 0.4 m/s². Find the amplitude and period of oscillation.
 26. The frequency of the fourth harmonic in a stretched string of length 20 cm is 600 per sec. What is the velocity of the wave in the string ?
 27. Discuss the modes of transverse vibrations of a string.
 28. If the intensity of sound wave is increased by a factor of 20, by how many decibels is the sound level increased ?

(5 × 2 = 10 weightage)

Section IV (Essay Questions)

Answer any two questions.

29. Describe an experiment with necessary theory to determine the Young's modulus of the given material using a cantilever.
30. Deduce the differential equation for a damped harmonic oscillator and discuss in detail the cases of critical damping and under damping.
31. Derive an expression for velocity of sound waves in air.

(2 × 4 = 8 weightage)