

**SECOND SEMESTER B.Sc. DEGREE (SUPPLEMENTARY/
IMPROVEMENT) EXAMINATION, APRIL/MAY 2015**

(UG-CCSS)

Core Course – Physics

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

(2009–2012 Admissions)

Time : Three Hours

Maximum : 30 Weightage

Section I*Answer all questions.*

- Which of the following substance has the highest elasticity?
 - Steel.
 - Copper.
 - Rubber.
 - Sponge.
- The breaking stress for a wire of unit cross-section is called as :
 - Yield point.
 - Tensile strength.
 - Elastic fatigue.
 - Young's modulus.
- The practical limits of Poisson's ratio lies between :
 - $-\infty$ to $+\infty$.
 - 0 and 1.
 - 0 and $\frac{1}{2}$.
 - 0 and -1 .
- The theoretical ratio of Poisson's ratio lies between :
 - 0 and $\frac{1}{2}$.
 - $-\frac{1}{2}$ to $+\frac{1}{2}$.
 - 1 and $\frac{1}{2}$.
 - -1 and $\frac{1}{2}$.
- The total energy of a particle executing SHM is proportional to the :
 - Displacement from equilibrium position.
 - Frequency of oscillation.
 - Velocity in equilibrium position.
 - Square of amplitude of motion.
- What is the length of seconds pendulum where $g = 9.8 \text{ m/s}^2$?
 - 0.78 m.
 - 0.88 m.
 - 0.992 m.
 - 1.024 m.

7. The potential energy U of a simple harmonic oscillator when the particle is half way to its extreme point is :
- (a) $U/4$. (b) $U/8$.
(c) $2U/3$. (d) $3U/2$.
8. The magnitude of acceleration of a particle executing simple harmonic oscillation at the position of maximum displacement is :
- (a) Zero. (b) Minimum.
(c) Maximum. (d) Neither a maximum nor a minimum.
9. Ripples on the surface of water is an example of :
- (a) Longitudinal waves. (b) Non-mechanical waves.
(c) Transverse waves. (d) None of the above.
10. If the particles of a medium are in the same phase of vibration at every point on a surface then it is :
- (a) Longitudinal waves. (b) Wave front.
(c) Transverse waves. (d) Interference.
11. Intensity of sound has :
- (a) An objective existence. (b) A subjective existence.
(c) No existence. (d) All are true.
12. Decibel is :
- (a) Musical instrument. (b) A measure of.
(c) Measure of sound level. (d) A measure of periodicity.

(12 × ¼ = 3 weights)

Section II

Answer all questions.

13. Define Stress and Strain.
14. State Hooke's law.
15. Why is a cantilever of uniform cross-section more likely to break near its fixed end?
16. What is meant by Periodic motion? Give an example.
17. When will the motion of a simple pendulum be harmonic?
18. Give two important characteristics of wave motion.
19. Discuss the distribution of energy in a plane progressive wave.
20. State Fourier's theorem.
21. What is absorption Coefficient?

Section III

Answer any five questions.

22. A gold wire 3.2×10^{-4} m in diameter elongates by 10^{-3} m when stretched by a force of 0.33 kgwt. Find the Young's modulus of the material if the length of the wire is 0.6 metre.
23. A wire 4 metre long and 3×10^{-4} m in diameter is stretched by a force of 8 kgwt. If the extension in length is 1.5×10^{-3} m, calculate the energy stored in the wire.
24. Derive an expression for the couple per unit twist of a uniform solid cylinder.
25. A body having a mass of 4×10^{-3} kg executes SHM. The force acting on the body when displacement is 0.08 m is 24×10^{-3} kgwt. Find the period.
26. What are Lissajous's figures? How are they formed?
27. A source of sound has a frequency of 512 Hz and an amplitude of 25×10^{-4} m. What is the flow of energy across unit area per second? Density of air = 1.29×10^6 kg/m³ and velocity of sound in air = 340 m/s.
28. A sitar wire is under a tension of 30 N and the length of the bridges is 0.8 m. If 10 m of the sitar wire weighs 2.2×10^{-3} kg, find (a) Speed of the transverse waves on the wire ;
(b) Fundamental frequency of vibration.

(5 × 2 = 10 weightage)

Section IV

Answer any two questions.

29. What is bending moment? Derive an expression for the depression at a point distant x from the fixed end of a cantilever.
30. Derive an expression for the velocity of propagation of a transverse disturbance in a stretched string and hence deduce the law of transverse vibrations of strings.
31. How are ultrasonic waves experimentally produced? Describe a method to determine the velocity of ultrasonic waves through a liquid.

(2 × 4 = 8 weightage)