

**St. Joseph's College of Arts & Science (Autonomous)
Cuddalore – 607001**

**PG & RESEARCH DEPARTMENT OF PHYSICS
SUBJECT: PROPERTIES OF MATTER AND ACOUSTICS
SUBJECT CODE: PH101
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SECTION – A

1. Define Poisson's ratio and give its limits.
2. What is a torsional pendulum?
3. Define Young's modulus and give its unit.
4. Draw the diagram for uniform bending.
5. Write down the dimensional formula for surface tension and coefficient of viscosity.
6. Mention any two applications of viscosity.
7. Define resonance of sound.
8. What are organ pipes?
9. Write down the Sabine's formula.
10. Give any two applications of Ultrasonics.
11. State Hooke's law and define rigidity modulus.
12. Write down the expression for work done in twisting a wire.
13. Define internal bending moment.
14. What do you mean by uniform bending?
15. Draw the diagram for the variation of surface tension with temperature.
16. Define coefficient of viscosity.
17. What are beats?
18. What is Decibel in acoustics?
19. Write down the Sabine's formula.
20. Mention any two applications of ultrasonics.
21. Draw the stress-strain diagram.
22. Define Poisson's ratio and give its limits.
23. What is a cantilever?
24. What do you mean by non-uniform bending?
25. Define surface tension and give its unit.
26. Mention any two applications of viscosity.
27. What is resonance in acoustics?
28. State Doppler effect.
29. Give any two applications of ultrasonics.
30. Define absorption coefficient.
31. Define Hook's law?
32. What is moment of inertia? Write its unit.
33. Give ideas about bending moment in cantilever?
34. Define young's modulus.
35. What is surface tension?
36. Write definition of viscosity and its unit.
37. What is superposition of waves?

38. Define loudness of sound and write its unit.
39. What is Piezo electric effect?
40. Give ideas about reverberation of sound?
41. Define stress and strain?
42. Write a short note on Poisson's ratio.
43. What do you mean by bending moment?
44. Define non- uniform bending?
45. Write the dimension of surface tension
46. State the Poiseuille's formula
47. What do you mean by interference of sound?
48. Give the brief idea about beats?
49. What do you mean by piezoelectric crystal?
50. Give the idea about absorption co-efficient?
51. Define the three elastic moduli.
52. Define Hooke's law in elasticity
53. What is the difference between uniform bending and non uniform bending of a beam?
54. Define bending moment and give the expression for it.
55. What happens when a capillary tube is immersed in a liquid? Why?
56. Define surface tension. Give its units.
57. Distinguish between progressive waves and longitudinal waves.
58. What are stationary waves and how are they formed?
59. Give any three applications of ultrasonics.
60. What is reverberation and on what factors does it depend?
61. Define Stress.
62. State Poisson's ratio.
63. What is a Cantilever?
64. Write the equation of young's modulus for uniform bending.
65. Define surface tension with its unit.
66. State Poiseuille's formula.
67. Define longitudinal waves.
68. State Doppler Effect.
69. What is piezo-electric effect?
70. Define absorption co-efficient?
71. State Hooke's law.
72. Explain moment of inertia.
73. Write the equation of young's modulus for non-uniform bending.
74. What is a cantilever?
75. Define surface tension with its unit.
76. What is co-efficient of viscosity?
77. Define transverse and longitudinal waves.
78. State Doppler Effect.
79. What is piezo-electric effect?
80. What is absorption co-efficient?

SECTION – B

1. Derive an expression for work done in stretching a wire.
2. Obtain an expression for time period of a torsional pendulum.
3. Calculate the depression at the free end of a rectangular cantilever of length 0.6 m loaded with 0.2 kg, breadth = 0.02 m; thickness = 0.02 m; Young's modulus of the material of the beam = 1×10^{10} N/m².
4. The bar of length 1 m and cross-section 5×10^{-3} sq.m is supported at its two ends and loaded in the middle. The depression observed in the middle is 1.96×10^{-3} m when a load kg is placed. Calculate the Young's modulus of the material.
5. Explain how surface tension of a liquid is determined by Jaeger's method.
6. Write a note on variation of viscosity of a liquid with temperature.
7. Explain intensity of sound.
8. Write a note on Doppler effect.
9. Describe magnetostriction oscillator.
10. Discuss acoustics of buildings.
11. Determine the rigidity modulus of a wire using torsion pendulum.
12. Determine the rigidity modulus of a rod by static torsion method.
13. Obtain an expression for the depression of the loaded end of a cantilever.
14. Give the theory of non- uniform bending.
15. Derive an expression for the excess of pressure inside a cylindrical liquid drop.
16. Water flows through a horizontal tube of length 0.2 m and internal radius 8.1×10^{-4} m under a constant head of the liquid 0.2 m high in 12 minutes 8.64×10^{-4} m³ of liquid issues from the tube. Calculate the coefficient of viscosity of water. (The density of water = 1000 kg m^{-3})
17. Obtain an expression for the equation of wave motion.
18. Explain the theory of interference of sound waves.
19. Explain reverberation and reverberation time.
20. Write a note on acoustic aspects of halls and auditorium.
21. Obtain the relation between elastic constants.
22. Derive an expression for work done in stretching a wire.
23. Obtain an expression for the depression of the loaded end of a cantilever.
24. Derive an expression for elevation of a beam in the case of uniform bending.
25. Derive an expression for the excess of pressure inside a spherical liquid drop.
26. Obtain Poiseuille's formula.
27. Derive an expression for the intensity of sound.
28. Write a note on organ pipes.
29. The average reverberation time of a hall is 1.5 seconds and the area of the interior surface is 334 m^2 . If the volume of the hall is 12000 m^3 , find the absorption coefficient.
30. Calculate the fundamental frequency of a quartz crystal of thickness 1.5 mm which is vibrating at resonance. Given Young's modulus for quartz = 7.9×10^{10}

N/m^2 and density of quartz 2650 kg/m^2 .

31. Derive Poisson's ratio in terms of elastic constants.
32. Write notes on all relation between elastic constants?
33. Write a note on uniform and non uniform bending of a beam.
34. Describe the oscillation of the cantilever.
35. What is surface tension? Give the relationship between surface tension and surface energy.
36. Define viscosity. Derive Poiseuille's formula.
37. Define transverse and longitudinal wave.
38. Derive the wave equation of motion?
39. What is magnetostriction effect? Give brief idea about piezoelectric crystal generator.
40. Write the precursion for making hall and auditorium? Give idea about absorption co-efficient.
41. Determine the rigidity modulus by using static torsion method?
42. Give idea about torsional pendulum.
43. Explain the depression of cantilever.
44. Determine the young's modulus and explain the types of bending?
45. Give the molecular interpretation of surface tension.
46. Derive the variation of viscosity of liquid with temperature and pressure.
47. Derive the wave equation for plane progressive wave. Obtain an equation for velocity transverse wave on a string.
48. Explain the intensity and loudness of sound?
49. Explain the piezoelectric effect.
50. Explain the reverberation and time reverberation of sound.
51. Obtain an expression for the couple per unit twist on a cylinder.
52. Explain the method of determination of rigidity modulus by torsional pendulum.
53. What is a cantilever? Obtain an expression at the free end of a thin light beam clamped horizontally at one end and loaded at the other.
54. Describe the method of determination of Young's modulus of a bar by vibration method.
55. How will you compare the viscosity of two liquids experimentally?
56. Describe Jaeger's method of studying the vibration of surface tension with temperature.
57. Derive the formula for the velocity of a plane progressive wave in a fluid.
58. What are beats? Explain graphically their formation.
59. The volume of a room is 600 m^3 , the wall area of the room is 220 m^2 , the floor area average sound absorption coefficient (i) for the walls is 0.03 (ii) for the ceiling is 0.80 and (iii) for the floor is 0.06. Calculate the average sound absorption coefficient and the reverberation time.
60. Piezo-electric X-cut quartz plate has a thickness of 1.5 mm. If the velocity of propagation of longitudinal sound waves along the X-direction is 5760 m/s, calculate the fundamental frequency of the crystal.
61. Explain the relation between elastic constants.
62. Explain the work done in stretching and twisting a wire.
63. Derive the expression for depression.

64. Explain how to determine young's modulus using pin and microscope.
65. Explain the variation of surface tension with temperature.
66. Explain how to determine the Co-efficient of viscosity of a liquid.
67. Explain reflection and transmittance of waves.
68. Explain Doppler Effect.
69. Explain the working of magnetostriction generator.
70. Explain Absorption Co- efficient.
Explain the relation between elastic constants
71. Explain the rigidity modulus by static torsion.
72. Derive the expression for bending moment.
73. Explain young's modulus by Koenig's method with neat sketch.
74. Explain the variation of surface tension with temperature.
75. Explain the rate of flow of liquid in a capillary tube.
76. Discuss the experiment to determine coefficient of viscosity of a liquid.
77. Explain Doppler Effect.
78. Explain the working of magnetostriction generator.
79. Write a short note on reverberation and time of reverberation.

SECTION - C

1. Give the method of determining the elastic constants by Searle's method.
2. Define cantilever. Derive an expression for the depression produced at the free end of a cantilever and
3. Determine the Young's modulus of a material by using cantilever.
4. Derive the relation between curvature, pressure and surface tension. Discuss the excess pressure inside over outside in the case of spherical soap bubble and cylindrical bubble.
5. Derive the equation of wave motion for plane progressive waves and
6. Write a note on loudness of sound.
7. What is Piezo electric effect? With a neat diagram explain the production of Ultrasonics using Piezo electric oscillator.
8. Explain the method of determining Young's modulus, rigidity modulus and Poisson's ratio by Searle's method.
9. Explain the method of determining Young's modulus of a bar using uniform bending.
10. Describe with necessary theory Rankine's experiment for the measurement of viscosity of a gas.
11. Derive an expression for the velocity of transverse wave on a stretching string.
12. (a) Explain the production of ultrasonics waves from the magnetostriction generator with a circuit diagram.
(b) Write a note on absorption coefficient.
13. Determine the rigidity modulus of a wire using torsional pendulum.
14. A uniform metal disc of diameter 0.1 m and mass 1.2 kg is fixed symmetrically to the

- lower end of a torsion wire (length 1 m and diameter 1.44×10^{-3} m), the upper end of which is fixed. The time period of torsional oscillation is 1.89 s. Calculate the modulus of rigidity of the material of the wire.
15. Describe Koenig's method for the determination of Young's modulus of a beam.
 16. With neat diagram explain Jaegar's method of finding surface tension.
 17. Derive an expression for the velocity of transverse wave on a stretched string.
 18. What is ultrasonics? Explain the production of ultrasonics using Piezo electric method.
 19. Define reverberation and reverberation time.
 20. Explain Twisting couple on a cylinder. Explain rigidity modulus and moment of inertia.
 21. Explain Young's modulus by Koenig's method by non-uniform bending.
 22. Derive the dimension of surface tension. Explain and verify Jaegar's method?
 23. What are the stationary waves? Derive the Doppler effect in sound. Give ideas about organ Pipes.
 24. Derive Sabine's formula. Write the application of reverberation and time of reverberation.
 25. Give an expression for poisson's ratio in terms of elastic constant?
 26. Give an expression of bending moment and depression of cantilever?
 27. Derive Rankine's method. Write the applications of of spherical, cylindrical drop and bubble method.
 28. Derive the wave equation of motion. Explain the superposition of waves. Derive reflection and transmission wave equation.
 29. Explain the magnetostriction generator and write its application.
 30. Give the idea about acoustic aspects of making halls and auditorium.
 31. Define the elastic constants. Establish the relation's between them
 32. Describe Koenig's method for the determination of Young's modulus of a beam.
 33. Derive Poiseuille's formula for the flow of a liquid through a capillary tube. Mention its limitations. Discuss the Poiseuille's method for determining the coefficient of viscosity of a liquid.
 34. What is Doppler Effect? Derive an expression for the apparent frequency received by a stationary observer when the source of sound is in motion.
 35. Derive Sabine's reverberation formula and explain its significance
 36. Derive the equation of torsional pendulum with mass and without mass.
 37. Explain how to determine the young's modulus by Koenig's method with a neat sketch.
 38. Explain the variation of viscosity of a liquid with temperature and pressure.
 39. Explain superposition of waves.
 40. Write a short note on reverberation and time of reverberation.