

**St. Mary's School, Dwarka**  
**Holiday Homework**  
**Class XI**  
**Subject: Physics**  
**Worksheet 1**

- Q1. What is the value of Young's modulus of a perfectly rigid body? Explain. 1
- Q2. Which is more elastic rubber or steel? Explain. 1
- Q3. A simple pendulum is mounted inside a spacecraft. What should be its time period of vibration and why? 1
- Q4. What is the phase difference between particle acceleration and particle displacement in SHM? 1
- Q5. If earth were to shrink suddenly, what would happen to the length of the day? Justify. 1
- Q6. Define angle of contact. Draw a diagram to show angle of contact for a liquid with concave meniscus as well as for a liquid with convex meniscus. 2
- Q7. The displacement of a particle at  $t = 0.25\text{s}$  is given by expression  $x = (4.0\text{m}) \cos (3.0\pi t + \pi)$ , where  $x$  is in meters and  $t$  is in seconds. Determine (i) frequency (ii) period of the motion (iii) The displacement of the particle at  $t = 0.25\text{s}$  2
- Q8 (a) At what speed will the velocity head of stream of water be 40cm?  
(b) What should be the average velocity of water in a tube of radius 0.005m so that the flow is just turbulent?  
The viscosity of water is 0.001Pa-s. 3
- Q9 (a) Show graphically the variation of K.E., P.E. and total energy of a simple harmonic oscillator with respect to its mean position. (b) How much is K.E. for displacement equal to half the amplitude? 3
- Q10. What are standing waves? Explain the formation of standing waves in a pipe closed at one end and derive an expression for the frequency of first three harmonics of the standing waves formed. Draw the diagram showing formation of the three harmonics 5

## Worksheet 2

- Q1. Water rises in a glass capillary tube but descends if the bore of the capillary tube is coated with paraffin wax. Why? 2
- Q2. A drop of oil poured on water surface spreads out, but a water drop poured on oil is compressed in globule. Why? 2
- Q3. The third overtone of a closed organ pipe is found to be in unison with the first overtone of an open pipe. Find the ratio of the lengths of the pipes. 2
- Q4. What is the largest average velocity of blood flow in an artery of radius  $2 \times 10^{-3} \text{m}$ , if the flow must remain laminar? 2
- Q5. Water is flowing through a tube of non-uniform cross-section. If the radius of the tube at the entrance and exit is 3:2, find the ratio of velocity of liquid entering and leaving the tube. 2
- Q6. (i) The diameter of ball A is twice that of B. What will be the ratio of their terminal velocities in water?  
(ii) Plot a graph between terminal velocity of spherical body and the square of its radius. 2
- Q7. a) At what speed will the velocity head of stream of water be 40cm?  
(b) What should be the average velocity of water in a tube of radius 0.005m so that the flow is just turbulent?  
The viscosity of water is 0.001Pa-s. 3
- Q8. Draw stress-strain curve for a metallic wire and label its elastic limit, region of plastic behavior and fracture point on the graph. A structural steel rod has a radius of 20 mm and a length of 1 m. A 200 kN force F stretches it along its length. Calculate (a) the stress (b) the elongation, (c) strain on the rod. Given Young's modulus Y of the structural steel is  $2 \times 10^{11} \text{N/m}^2$ . 3
- Q9 (i) Water is flowing with a speed of 2 m/s in a horizontal pipe with cross-sectional area decreasing from  $2 \times 10^{-2} \text{m}^2$  to  $1 \times 10^{-2} \text{m}^2$  at pressure  $4 \times 10^4 \text{Pascal}$ . What will be pressure at smaller cross section (ii) Define surface tension. Explain the role of detergents in washing of clothes. (iii) State Stokes' law. Deduce an expression for the terminal velocity of a sphere. (1.5+1.5+2=5)
- Q10. State Bernoulli's principle and derive it mathematically. Draw a neat and labeled diagram as well. 5

### Worksheet 3

- Q1. State two factors on which the speed of a wave travelling along a stretched string depends. Write the expression also. (1)
- Q2. A simple harmonic motion is described by  $a = -16x$ . Where  $a$  is acceleration and  $x$  is displacement. Find its time period. (1)
- Q3. In an open organ pipe third harmonic is 450Hz. What is the frequency of fifth harmonic? (1)
- Q4.. What is the minimum distance between two points in a wave having a phase difference of  $5\pi/2$  ? (1)
- Q5. Can a body be periodic but not oscillatory? Justify. (1)
- Q6. List two points of differences between progressive waves and stationary waves. (2)
- Q7. How will the time period of a seconds' pendulum change, when taken from the equator to the poles? Explain. (2)
- Q8. A spring stretches by 3.9cm when a 10g mass is hung from it. If a 25g mass attached to this spring oscillates in simple harmonic motion, calculate the period of motion. (2)
- Q9. Two sitars A and B, plying the note 'Dha' are slightly out of tune and produce beats of frequency 5Hz. The tension of the string B is slightly increased, and the beat frequency is found to decrease to 3Hz. Find the original frequency of B if the frequency of A is 427 Hz. (2)
- Q10. At a time when the displacement is half the amplitude, what fraction of the total energy is kinetic and what fraction is potential in SHM? At what displacement from the mean position is the energy half kinetic and half potential? (2)
- Q11. Show that for small oscillations the motion of a simple pendulum is simple harmonic. Derive an expression for its time period. (2)
- Q12. The equation of a transverse wave travelling along a coil spring is:  $Y = 4.0 \sin \pi (0.01X - 2.0t)$ . Where  $Y$  and  $X$  are in cm and  $t$  in sec. Find the: amplitude, wavelength and initial phase at origin. (2)