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

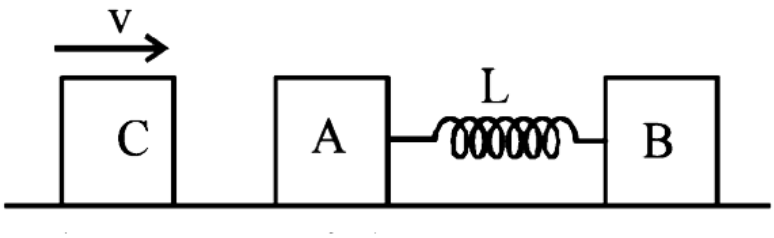
GENERAL INSTRUCTIONS:

1. **Write answers for this worksheet in your CW notebook.**
2. **Attempt all the questions.**
3. **Q no 1 to 4 are multiple choice questions of 1 mark each.**
4. **Q no 5 is a casestudy based question.**
5. **Q no 6 to 10 are of 2 marks each.**
6. **Q no 11 to 15 are of 3 marks each.**

Q1. A linear harmonic oscillator of force constant 2×10^6N/m and amplitude 0.01 m has a total mechanical energy of 160 joules. Its (1)

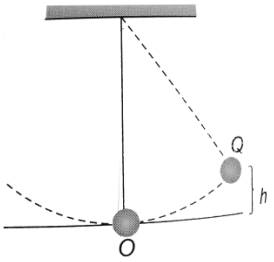
a) Maximum potential energy is 100 J
b) Maximum K.E. is 100 J
c) Maximum P.E. is 160 J
d) Maximum P.E. is Zero

Q2. Two blocks A and B each of mass m are connected by a massless spring of natural length L and spring constant K. The blocks are initially resting on a smooth horizontal floor with the spring at its natural length as shown in figure. A third identical block C also of mass m moves on the floor with a speed v along the line joining A and B and collides with A. Then (1)



a) The kinetic energy of the A-B system at maximum compression of the spring is zero
b) The maximum compression of the spring is $v\sqrt{\frac{m}{K}}$
c) The maximum compression of the spring is $v\sqrt{\frac{m}{2K}}$
d) The kinetic energy of the A-B system at maximum compression of the spring is $mv^2/4$

Q3. The bob of a simple pendulum is displaced from its equilibrium position O to a position Q which is at height h above O and the bob is then released. Assuming the mass of the bob to be m and time period of oscillations to be 2.0 sec, the tension in the string when the bob passes through O



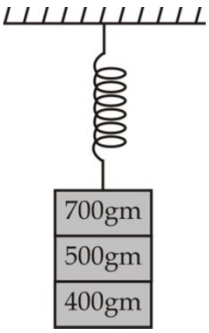
a) $m\,(g+\,\pi\sqrt{2gh}$

b) $m\,(g+\sqrt{\pi^2 gh}$

c) $m\left(g+\sqrt{\frac{\pi^2}{2}gh}\right)$

d) $m\left(g+\sqrt{\frac{\pi^2}{3}gh}\right)$ (1)

Q4. Three masses 700g, 500g, and 400g are suspended at the end of a spring a shown and are in equilibrium. When the 700g mass is removed, the system oscillates with a period of 3 seconds, when the 500 gm mass is also removed, it will oscillate with a period of (1)



a) 1 s
b) 2 s
c) 3 s
d) $\sqrt{\frac{12}{5}}s$

CASE STUDY:

Q NO 5: Rohan while performing experiment in the physics laboratory, on calculating co efficient of viscosity of glycerine, tried to pour glycerine through a pipe of different cross section with radii at one end as r_1= 0.1m and r_2 = 0.04 m at the other end. The pressure drop across the length of the pipe is 10 N/m ^{2} and the density of glycerine is 1.25 x 10 ^{3}kg/m^3.

(i) The ratio of r_2:r_1 of the pipe used by Rohan to pour glycerine will be

(a) 0.4 (b) 0.25 (c) 2.5 (d) 25

(ii) The ratio of velocity v_1 wrt v_2 of glycerine while flowing through the pipe used to pour it will be

(a) 0.06 (b) 0.016 (c) 0.16 (d) 1.6

(iii) Rohan used equation of continuity to find the value of velocity of flow of glycerine through area a_2. The value obtained by him will be

(a) 128m/s (b) 12.8m/s (c) 1.28 m/s (d) 0.128 m/s

(iv) What will be the rate of flow of glycerine through the pipe used by Rohan?

(a) $6.43 \times 10^{-4} m^3 s^{-1}$ (b) $6.43 \times 10^{4} m^3 s^{-1}$ (c) $6.43 \times 10^{-4} m^2 s$ (d) $6.43 \times 10^{-4} s/ m^3$

Q6. (i) A flask contains glycerine & the other contains water. Both are stirred vigorously & placed on the table. In which flask will the liquid come to rest earlier & why?(ii) An air bubble of radius 0.1mm is moving upwards in water with a velocity of 0.35 cm/s. If the density of water is 1.0×10^3 kg/m^3, gravitational acceleration is 9.8m/s^2 and the density of the air is negligible, then find out the coefficient of viscosity of water. (2)

Q7. (i) The acceleration due to gravity on the surface of moon is 1.7 m/s^2. What is the time period of simple pendulum on the surface of moon if its time period on the surface of the earth is 3.5 s? (ii) A particle executing SHM of period 8 s. After what time of its passing through the mean position will the energy be half kinetic and half potential? (2)

Q8. Write Newton's formula for the speed of longitudinal waves in any gas. Discuss Laplace's correction to this formula. (2)

Q9. Calculate the diameter of a capillary tube in which mercury is depressed by 0.012 m. Given that surface tension of mercury is 0.54 N/m, angle of contact for glass mercury interface is 140 º and density of mercury is 1.36 1x 10^4 kg/m^3. (2)

Q10.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)

Q11. (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.
(iii) Define modulus of rigidity and express it mathematically. Explain the application of elasticity in designing a beam for its use in construction of roofs and bridges. (1+1+1=3)

Q12. (i) Draw stress-strain curve for a metallic wire and label its elastic limit, region of plastic behavior and fracture point on the graph (ii) A structural steel rod has a radius of 10 mm and a length of 1 m. A 100 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 2×10^{11}N/m^2. (1+2=3)

Q13(i) A square plate of 10 cm side moves parallel to another plate with a relative velocity of 10 cms^{-1}, both plates immersed in water. If the viscous force is 2 x 10^{-3} N., calculate the perpendicular distance between the plates. (ii) The moisture in a field is retained on ploughing the field. Explain how. (2+1=3)

Q14. (i) 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. (ii) Water rises in a glass capillary tube, but descends if the bore of the capillary tube is coated with paraffin wax. Why? (iii) A drop of oil poured on water surface spreads out, but a water drop poured on oil is compressed in globule. Why? (1.5+0.5+1=3)

Q15. A 2.5 kg collar attached to a spring of force constant 1000 N m^{-1} slides without friction on a horizontal rod. The collar is displaced from its equilibrium position by 5.0 cm and released. Calculate (a) the oscillation period, (b) acceleration amplitude, and (c) velocity amplitude. (3)