

CBSE Class – XI
Physics (Set 3)
Last year Paper (2015-16)

Time: 3 Hrs. M.M: 70

General Instructions:

- (i) Question 1 to 5 one mark.
- (ii) Question 6 to 10 each two mark.
- (iii) Question 11 to 22 each three mark.
- (iv) Question 23 is value based question and carry four marks.
- (v) Questions 24 to 26 each five mark.

Section A

- 1. Find the dimensional formula for coefficient of viscosity (η).
- 2. Write properties of an ideal fluid.
- 3. If pressure is made 16 times, what will be the effect on the velocity of sound?
- 4. Given that for two vectors A and B, $|A \times B| = |A||B|$. Find the acute angle between A and B.
- 5. A body of mass m is oscillating harmonically suspended from a mass less spring of spring constant k. What is the time period?

Section B

6. If $a = 2\hat{i} + 3\hat{j} - 4\hat{k}$ and $b = 4\hat{i} + 3\hat{j} - 2\hat{k}$. Find the angle between a and b.

Or

Establish the given vector inequality geometrically or otherwise $|a + b| < |a| + |b|$ When does the equality sign above apply?

From the properties of a triangle, one side of a triangle is always less than the sum of the lengths of its two other sides.

- 7. Define inertial and non-inertial frame of references. What is pseudo force?
- 8. Solve the expression for potential energy of a spring when elongation in the spring is x.

9. Write expression for work done in blowing a soap bubble from radius r_1 to r_2 . Calculate it to increase radius from r to $2r$.

10. A Carnot's engine has the same efficiency

(i) between 500 K and 100 K

(ii) between 1000 K and T K

Find the value of T .

Section C

11. (i) Using the relation $E = hv$, obtain the dimensions of Planck constant.

(ii) The resistance R is given by relation

$R = V/I$. If potential difference V is $100 \pm 5\%$ and current I is 10 ± 0.2 A. Calculate the percentage error in R .

12. A car accelerates from rest to a constant rate a for some time, after which it decelerates at a constant rate p to come to rest. If t is the total time elapsed, then calculate

(i) the maximum velocity attained by the car.

(ii) the total distance travelled by the car.

13. A projectile is fired horizontally from the top of a tower. Find the expression for its time of descent and horizontal range.

14. Distinguish between static friction, limiting friction and kinetic friction. How do they vary with the applied force, explain by diagram.

15. Two pendulums with identical bobs and lengths are suspended from a common support such that in rest position the two bobs are in contact as shown in figure alongside. One of the bobs is released after being displaced by 10° so that it collides elastically head-on with the other bob.



(i) Describe the motion of two bobs.

(ii) Draw a graph showing variation in energy of either pendulum with time, for $0 \leq t \leq 2T$, where T is the time period of each pendulum.

16. $(n-1)$ equal point masses each of mass m are placed at the vertices of a regular n polygon. The vacant vertex has a position vector a with respect to the centre of the polygon. Find the position vector of centre of mass.

17. Obtain an expression for escape velocity from energy considerations.

18. (i) Write the Hooke's law.

(ii) A steel wire of length 4 m and diameter 0.5 mm is stretched by a one-kilogram weight.

Find the increase in its length if the Young's modulus of steel wire is $2.4 \times 10^{11} \text{ N/m}^2$

Or

Two mercury droplets of radii 0.1 cm and 0.2 cm collapse into one single drop. What amount of energy is released? The surface tension of mercury is $435.5 \times 10^{-3} \text{ N/m}$.

19. Consider a cycle tyre being filled with air by a pump. Let V be the volume of the tyre (fixed) and at each stroke of the pump ΔV ($\ll V$) of air is transferred to the tube adiabatically. What is the work done when the pressure in the tube is increased from p_1 to p_2 ?

20. A gas mixture consists of molecules of types A, B and C with masses $m_A > m_B > m_C$. Rank three types of molecules in decreasing order of

(i) average KE

(ii) rms speeds

21. A cylindrical piece of cork of density ρ , base area A and height h floats in a liquid of density ρ_1 . The cork is depressed slightly and then released. Show that the cork oscillates up and down simple harmonically with a period

$$T = 2\pi \sqrt{\frac{h\rho}{\rho_1 g}}$$

where, ρ is the density of cork. (Ignore damping due to viscosity of the liquid).

22. Show that when a string fixed at its two ends vibrates in 1 loop, 2 loops, 3 loops and 4 loops, then frequencies are in the ratio 1 : 2 : 3 : 4.

Section D

23. Kailash and Kamal were going to the market when they spotted a man who left a black bag in the corner of a stall and ran away. They went near to it and heard some sound tic-tic coming from it. They immediately informed the police and alerted the people nearby. By their alertness, a major tragedy was averted.

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