# 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 ( $\eta$ ).
- 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,  $|A \times B| = |AB|$ . 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  $|a+b| \le |a| + |b|$  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.

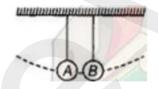
- 7. Define inertial and non-inertial frame of references. What is pseudo force?
- 8. Solve the expression for potential energy of a spring when elongation in the spring is  $\boldsymbol{x}$ .

- **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  $100 \pm 5V$  and current I is  $10 \pm 0.2$  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  $0 \le t \le 2t$ , 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  $2.4 \times 10^{11} N/m^2$

 $\mathbf{Or}$ 

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  $435.5 \times 10^{-3} N/m$ .

- 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  $\Delta V$  (<< 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 cock of density of base area A and height h floats in a liquid of density  $\rho_1$ . The cock is depressed slightly and then released. Show that the cock oscillates up and down simple harmonically with a period

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

where,  $\rho$  is the density of cock. (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.

