CBSE Class – XI

Physics (Set 1)

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. Write the dimensional formula of impulse and name of the physical quantity having same dimension.

2. Write the relation between two angles for which horizontal ranges will be equal.

3. On what factors does the two vectors a and b to be perpendicular to each other.

4. Write the condition for conservation of mechanical energy of a system.

5. What is the ratio of escape speed of the earth and escape speed of the moon?

Section B

6. Define wavelength. Why there is no transfer of energy by standing waves?

7. Is the heat supplied to a system always equal to the increase in its internal energy?

8. Resultant of two vectors of equal amplitude is equal in magnitude with one of the vectors, calculate the angle between them

Or

A woman throws an object of mass 500 g with a speed of 25 m/s.

(i) What is the impulse imparted to the object?

(ii) If the object hits a wall and rebounds with half the original speed, what is the change in momentum of the object?

9. If length of a pendulum is increased by x%. Find error in time per day.
10. Define coefficient of linear expansion and coefficient of volume expansion of solid. How are they related?

Section C

11. The density of a linear rod of length L varies as $\rho = \alpha + \beta x$, where x is the distance from the left end. Locate the centre of mass.
12. Two particles each of mass m go round a circle of radius a under the action of their mutual gravitational attraction. Find the speed of each particle. Also analyse in terms of kinetic energy and gravitational potential energy.
13. Find the angle made by a cyclist with the vertical while taking a circular turn of radius a. Also state the forces which are providing centripetal acceleration and maintain vertical equilibrium.
14. What is the moment of inertia of a solid sphere of radius R about one of its diameter. If moment of inertia about the parallel tangent is I_0. Also, state the theorem of perpendicular axes.
15. Find the expression for potential energy of a strained body.
16. State Torricelli's law for efflux speed of a liquid and prove it. Find the efflux speed if height is 5 m.
17. Establish ideal gas equation in terms of gas constant R, volume V, pressure p, temperature T and number of moles n.

Or

For an oscillating pendulum, find the time period of oscillation.

18. Two separate air bubbles formed of the same liquid (surface tension T) come together to form a double bubble. Find the radius and the sense of curvature of the internal film surface common to both the bubbles.
19. The position of a particle is given by r= $\left(3t\hat{i} - 2t^2\hat{j} + 4\hat{k}\right) m$ where, t is in second and the coefficients have the proper units for r to be in metres.
(i) Find the v and a of the particle?
(ii) What is the magnitude and direction of velocity of the particle at t = 2 s?
20. A10 kW drilling machine is used to drill a bore in a small aluminium block of mass 8 kg.

How much is the rise in temperature of the block in 2.5 min, assuming 50% of the power is used up in heating the machine itself or lost to the surroundings. Specific heat of aluminium is 0.91 J/g-K.

21. Ten one-rupee coins are put on top of each other on a table. Each coin has mass m. Give the magnitude and direction of

(i) the force on the 7th coin (counted from the bottom) due to all the coins on its top,

(ii) the force on the 7th coin by the eighth coin,

(iii) the reaction of the 6th coin on the 7th coin.

22. A gas mixture consists of molecules of types A, B and C with masses $m_A > m_B > m_C$. Rank the three types of molecules in decreasing order of (i) average KE (ii) rms speeds.

Section D

23. John found his mother suffering from viral fever and took her to the doctor for treatment. While examining her, the doctor used a thermometer to know the temperature of the body. He kept the thermometer in the mouth of the patient and recorded the reading as $102^{\circ}F$. Doctor gave the necessary medicines. After coming home, John asked his mother, why thermometer is used to know the temperature of body? Why mercury is used in a thermometer when there are so many liquids? Then, his mother explained him in detail.

(i) Comment upon the values displayed by John's mother.

(ii) A newly designed thermometer has its lower fixed point marked at 5° and 95°, respectively. Compute the temperature on this scale corresponding to 50° C.

Section E

24. Two identical springs each of force constant k are connected in (i) series and (ii) parallel, so that they support a mass m. Find the ratio of the time periods of the mass in the two systems.

Or

Draw the first three harmonics in an open organ pipe. Two piano strings A and B are playing slightly out of tune and produce beats of frequency 5 Hz. The tension in string B is slightly increased and the beat frequency is found to decrease to 3 Hz. What is the original frequency of B if the frequency of A is 500 Hz?

25. Two blocks A and B of masses 5 kg and 10 kg in contact with each other rest on a table against a rigid wall. The coefficient of friction between the bodies and the table is 0.15. A force of 200 N is applied horizontally to A. What

(i) are the reaction of the partition?

(ii) are the action-reaction forces between A and B?

(iii) happens when the wall is removed?

Or

State Newton's law of cooling. Express it mathematically. How can this law be verified experimentally?

26. What is a projectile? Derive the expressions for the time of flight and maximum height for the projectile thrown upwards at an angle0with the horizontal direction.

Or

The ceiling of a long hall is 25 m high. What is the maximum horizontal distance that a ball thrown with a speed of 40 m/s can go without hitting the ceiling of the hall?