CBSE Class – XI

Physics

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. All constants are dimensionless. Comment.

2. When can an object in motion be considered as a point object?

3. A particle is moving in a straight line. Is it possible for it to maintain the motion in the same direction while the acceleration is in the reverse direction.

4. On what factors does the value of angle of contact depend?

5. Plot a graph showing the variation of specific heat of water with temperature.

Section B

6. What are the important steps involved in a scientific method to understand a natural phenomenon?

7. Determine the maximum acceleration of the train in which a box lying on its floor will remain stationary, given that the coefficient of the static friction between the box and the train's floor is 0.15.

8. State and explain work-energy theorem.

9. The excess pressure inside a soap bubble is thrice the excess pressure inside a moving soap bubble. What is the ratio between the volume of the first and second bubble?

10. State the principle of superposition of waves. What happens when phase differences between two waves are (i) 0 and (ii) π ?

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Or

A harmonic oscillator is oscillating with a frequency of 3 Hz. Its acceleration amplitude is $0.36\pi^2 m/s^2$. Determine its velocity amplitude and the amplitude of displacement.

Section C

11. What are systematic errors? What is their cause? How can these be minimised?

12. A 100 m sprinter uniformly increases his speed from rest at the rate of $1m/s^2$ up to $\frac{3}{4}th$ of the total run and then covers the balance $\frac{1}{4}th$ run with uniform speed. 4 How much time does he take to complete the race?

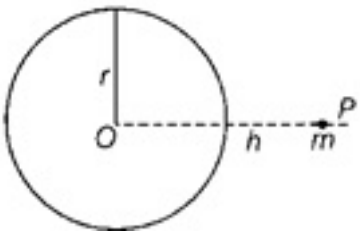
13. An object of mass m is moving in a circular motion of radius r at a constant speed v. Obtain an expression for the magnitude of acceleration of the object.

14. Find the instantaneous acceleration of a 1.0 kg mass suspended from a spring constant of force constant 5.0 N/cm, when the spring is stretched 10.0 cm. The mass is initially at rest.

15. How can you show that when a particle suffers an oblique elastic collision with another particle of equal mass and initially at rest, the two particles would move in mutually perpendicular directions after collision?

16. How is angular velocity related to linear velocity of a particle of the body in rotational motion? Does pure rotation take place at uniform velocity or at uniform linear velocity?

17. A mass m is placed at P a distance h along the normal through the centre O of a thin circular ring of mass m and radius r as shown in figure.



If the mass is removed further away such that OP becomes 2h, by what factor the force of gravitation will decrease, if h = r?

18. Two identical solid ball, one of irony and the other of wet clay are dropped from the same height on the floor. Which one will rise to a greater height after striking the floor and why?

Or

During summer in India, one of the common practice to keep cool is to make ice balls of crushed ice, dip it in flavoured sugar syrup and sip it. For this, a stick is inserted into crushed ice and is squeezed in the palm to make it into the ball. Equivalently in winter, in those areas where it shows, people make snow balls and throw around. Explain the formation of ball out of crushed ice or snow in the light of p-T diagram of water.

19. If the coefficient of performance of a refrigerator is 5 and operates at the room temperature $27°C$. Find the temperature inside the refrigerator.

20. Using equipartition law of energy, obtain the value of molar specific heat capacity of water. Does it agree with the experimental result?

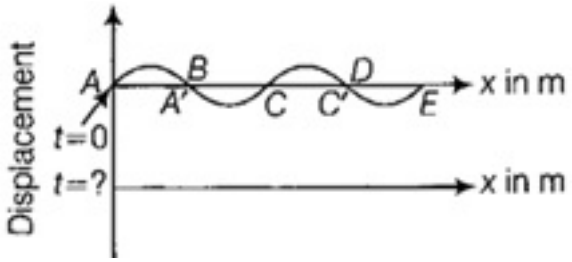
21. A particle is executing SHM with amplitude A and has a maximum velocity v_0.

(i) At what displacement will its velocity be $\frac{v_0}{2}$?

(ii) What is the velocity at displacement $\frac{A}{2}$?

22. The pattern of standing waves formed on a stretched string at two instants of time are shown below.

The velocity of two waves superimposing to form stationary waves is 360 m/s and their frequencies are 256 Hz.



(i) Calculate the time at which the second curve is plotted.

(ii) Make nodes and anti-nodes on the curve.

(iii) Calculate the distance between A' and C'.

Section D

23. Shikhaj went to a hill station with his family. On his way, he was fascinated by the beauty of mountains all around him. But a question started creeping in his mind that how such roads have been made in the mountains which seem so unapproachable. He asked his father the same question who told him about remote sensing satellites which are used to get information of places which can't be reached directly.

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(i) What values are displayed by Shikhaj?

(ii) What kind of orbit does remote sensing satellite follow?

(iii) A remote sensing satellite of the earth in a circular orbit at a height of 400 km above the surface of the earth. What is the

(a) orbital speed?

(b) period of revolution of satellite?

(Take radius of the earth = $6\times10^{6}m$ and g = $10m/s^{2}$.)

Section E

24. Discuss how the principle of conservation of momentum is used in the launching of rockets. Deduce an expression for

(i) velocity at any instant.

(ii) acceleration of the rocket and force experienced

Or

If the earth supposed to be a uniform sphere, contracts slightly so that its radius becomes less by R/n than before, show that the length of the day shouters by $\left(\frac{48}{n}\right)h$.

25. (i) Define streamline.

(ii) Write any two properties of streamlines.

(iii) Draw streamlines for a clockwise spinning sphere.

(iv) Derive equation of continuity.

Or

(i) Define the conduction process of transfer of heat.

(ii) Two rods A and B are of equal length. Each rod has its ends at temperature T_1 and T_2. What are the conditions that will ensure equal rates of flow of heat through the rods A and B?

(iii) Two rods of the same area of cross-section but of length l_1 and l_2 and conductivities K_1 and K_1 are joined in series. Show that the combination is equivalent of a material of

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conductivity, K = $\frac{l_1 + l_2}{\left(\frac{l_1}{K_1}\right) + \left(\frac{l_2}{K_2}\right)}$

26. Prove that the angle between the line of motion of two equal masses undergoing elastic oblique collision is $\frac{\pi}{2}$ after collision if one of them was at rest initially.

Or

Define molar specific heat capacities at constant volume and pressure? Considering thermodynamical process in a cylinder with parameters p, V and T, derive the Mayer's relation.