ST. XAVIER'S SENIOR SECONDARY SCHOOL, DELHI - 110 054
Annual Examination in **PHYSICS**

Std. 11 Time : 3 hrs.
27-2-2018 Max. Marks : 70

INSTRUCTIONS*:*

i) Q. Nos. 1 to 5carry 1 mark each.
ii) Q. Nos. 6 to 10 carry 2 marks each.
iii) Q. Nos. 11 to 22 carry 3 marks each.
iv) Q. No. 23 carries 4 marks.
v) Q. Nos. 24 to 26 carry 5 marks each.
vi) Use pencil for the diagrams and graphs.
vii) Answers should be to the point.
viii) Use log tables if necessary.

Section A

1. State parallelogram law of addition of vectors. (1)

2. What are the basic requirements of a cooking utensil in respect of specific heat, thermal conductivity? (1)

3. Why is it easier to open a tap with two fingers than with one finger? (1)

4. What do you mean by 'permanent set' in a body? (1)

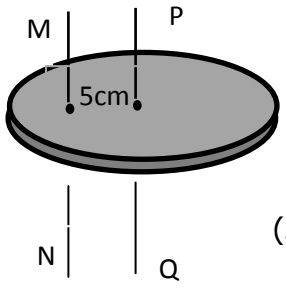
5. A wave of wave length 2m propagates through a medium. What is the phase difference between two particles on the line of propagation? Given that the distance between the particles is 75m.(1)

Section B

6. Rain drops are falling vertically downwards with speed of 20m/s. A woman rides a bicycle with a speed of 15m/s towards east. Find the direction along which the drops appear to fall for the woman. (2)

7. A force vector A of 20N acts at an angle of 60^{O} above positive x axis and another force vector B of 10N acts an angle of 30^{o} with positive y axis in the second quadrant. Express the vectors in terms of their rectangular components and find the resultant force vector. (2)

8. In the following figure, the axes PQ and MN are passing perpendicular to the plane of a solid disc. Axis PQ passes through the center of mass of the disc and axis MN passes through a point on the disc as shown. Calculate the moment of inertia of the disc about the axis MN. Given mass of the disc = 2kg and radius of the disc=10 cm. (2)



9. Three identical spheres each of radius 'r' and mass 'm' are placed on a vertical plane such that each spheres touching other two and stay in equilibrium. Find the position of center of mass. (2)

(OR)

State the principle of conservation of angular momentum. Find the new time period of rotation of earth if the earth shrinks suddenly to 1/8 of its original volume. (2)

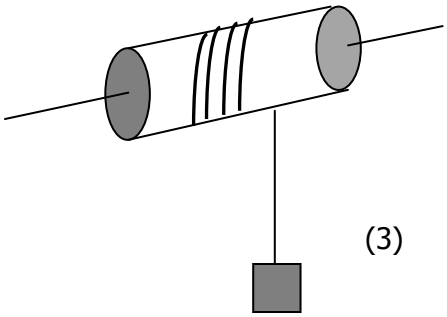
10. A body is constrained to move along the z-axis of a coordinate system is subjected to a constant force F given by F = -**i**+2**j**+3**k** N. Calculate the work done by the force if the displacement is 12m. (2)

Section C

11. State the law used to determine the direction of cross product of two vectors. Show that the cross of product of two unit vectors **A** and **B** has a direction perpendicular to the x-y plane. Given $\hat{A}=\hat{\imath}+\hat{\jmath}$ and $\hat{B}=\hat{\imath}-\hat{\jmath}$ (3)

12. A body takes twice the time to slide down a rough plane inclined at 60° to an identical smooth inclined plane. What is the coefficient of friction of rough plane? (3)

13. A solid cylinder of mass 'M' and radius 'R' is supported on its own axis as shown in the figure. A mass less string is wound around the surface of the cylinder and an object of mass 'm' is attached to the free end of the string. Draw a force diagram and explain how torque is produced on the cylinder and hence obtain the expression for linear acceleration and angular acceleration. (3)



14. A particle oscillates simple harmonically and the follows the equation ξ= A sinωt. Obtain the equations of velocity and acceleration. Show their variation graphically with time. (3)

15. Derive an expression for the pressure difference across the soap bubble. (3)

16. Define gravitational field intensity. Derive the variation of gravitational field intensity with depth. Draw a graph showing the variation with distance r from the center of the earth. (3)

17. What are geostationary satellites? Give any two conditions for a satellite to be geostationary.

(OR)

Define escape velocity. Derive an expression for the escape velocity of a body from the surface of the earth. Write any two significant features of this velocity. (3)

18. A simple pendulum is set up with an effective length of 'l'. The pendulum is slightly disturbed an then released. Show that the pendulum oscillates simple harmonically and obtain the time period of oscillation. (3)

19. A block of ice having mass 'm' at –10 °C is dropped in to 200 gm of water at 40 °C. The temperature of the mixture when the entire ice melts completely is 20 °C. Calculate the mass of ice block. Given that, Latent heat of ice = 80 Cal /gm, specific heat of water = 1 Cal /gm°C, specific heat of ice = 0.5 Cal /gm °C. (3)

20. A mechanical wave travels along a string is described by ξ(x,t)= 0.005sin(3.0t-80x) in which numerical constants are in SI units. Calculate

a)	Amplitude of displacement	b)	Amplitude of velocity
c)	Wavelength	d)	Amplitude of acceleration
e)	The time period	f)	Frequency of oscillation. (3)

21. An object of mass 'm' is attached to one end of string of length 'l'. The string is held at other end and whirled in a vertical circle.
    a) Write the equation for the tensions at the lowest point and highest point.
    b) Obtain the minimum velocity required at the lowest point if the length of the string is 2m. (3)

22. a) Explain how banking of roads help in negotiating curved roads with more speed as compared to plane circular roads.
    b) Write the expression for maximum velocity with which a car can move the on a banked circular road. Deduce the formula for the maximum velocity of a train on banked tracks. (3)

Section D

23. Once Anil had visited his uncle's garment factory in Delhi. Anil happened to hear lot of noise from the work shop where lot of machineries was running. Anil asked some details about the machines and suggested few tips about the maintenance and saving electricity. Anil's uncle listened to the suggestions and implemented. There after Anil's uncle found the machines were running smoothly and there was huge fall in the electricity bill.
    a) What could have been suggested by Anil to his uncle?
    b) How electricity is saved by Anil's suggestion?
    c) Write two values reflected by Anil and his uncle? (4)

Section E

24. Explain how a small spherical rigid body attains terminal velocity while falling through a viscous liquid. Hence derive an expression for the terminal speed. (2+3)

    OR

    State and prove Bernoulli's theorem. Explain with the help of a neat diagram how is this concept used in dynamic lift of an aero plane? (3½ + 1½)

25. a) Write two important assumptions of kinetic theory of gases.
    b) Compare the RMS velocities of molecules of oxygen gas at the temperatures of $23^{o}C$ and $123^{o}C$
    c) Write the difference 'green hot' and 'red hot' iron rod using Wien's displacement law of thermal radiation. (1+2+2)

    (OR)

    a) Derive the expression for the pressure exerted by a gas.
    b) Show that average kinetic energy of molecules of a gas is directly proportional to the absolute temperature of the gas.
    c) State and prove Avogadro's law (3+1+1)

26. a) Write the relation between momentum and kinetic energy. Two bodies of masses m_1 and m_2 have same linear momentum, what is the ratio of their kinetic energies?
    b) Derive an expression for the potential energy of an elastic stretched spring. Plot the variation of potential energy with displacement. (2+3)

    (OR)

    a) The momentum of a particle increases by 20%. Calculate the percentage change in its kinetic energy.
    b) A body 'A' of mass 14kg moves along an inclined plane that makes an angle of 30° with the horizontal. Block 'A 'is connected to another block of 14kg by a mass less string that runs around a friction less and mass less pulley. The block 'B' moves downwards with a constant velocity. What is the magnitude of the frictional force and coefficient of the kinetic fiction? (2+3)

-x-x-x-x-x-x