ST. XAVIER'S SENIOR SECONDARY SCHOOL, DELHI – 110054

Final Examination in **PHYSICS – Std. 11** M. Marks : 70

3-3-2015 Time : 3 hrs.

Roll No: | | |

Total printed pages : 02
Total printed questions : 26

INSTRUCTIONS:

i) Q. Nos. 1 to 5 carry 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. Springs A and B are identical except that the spring constant of A is more than spring constant of B. In which spring is more work expended if they are stretched by same amount. (1)

2. Where does the center of mass of a two particle system lie, if one particle is more massive than the other? (1)

3. Why do we prefer steel to copper in the manufacturing of springs? (1)

4. Why do the cricketers wear white cloth during a test match? (1)

5. What happens to internal energy to a thermo dynamical system during an isothermal expansion? (1)

Section B

6. Show the variation of elastic potential energy and kinetic energy with the position in case of spring attached with a mass. Justify shape of the graphs. (2)

7. State Hooke's law of elasticity. A wire is fixed at one end and is subjected to increasing load at the other end. Sketch and explain different points on the graph of stress and strain. (2)

8. A simple harmonic oscillation is represented by the equation $\xi=4\sin(440t+0.061)$. Here ξ and t are in cm and seconds respectively. Calculate the values of amplitude angular frequency of oscillations, time period and initial phase. (2)

9. The mean distance of sun from a planet is four times the distance of sun from earth. In how many years will the planet complete one revolution around the sun? (2)

10. Derive the relation for fundamental frequency of vibration produced by a closed organ pipe. (2)

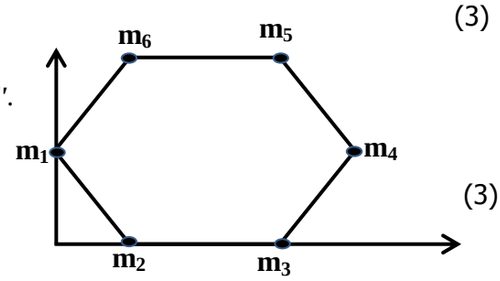
Section C

11. Prove that in a head on elastic collision between two bodies, the relative velocity of approach before collision is equal to the relative velocity of separation after the collision. Hence derive the expression for the velocities of the two bodies in terms of their initial velocities before collision. Discuss the special case when a light body collides against a massive stationary body. (3)

12. Giving the theorem and relevant diagram, find the moment of inertia of the disc about a tangent perpendicular to its plane. (3)

13. Define radius of gyration of the body rotating about an axis. Derive the expression for it. On what factors does it depend? (3)

14. In the adjoining system of particles, six particles are placed on the vertices of a regular hexagon of side *'l'*. Find the position vector of center of mass. Given that $m_1=m_3=m_5=2$kg and $m_2=m_4=m_6=4$kg. (3)



15. a) Derive an expression for acceleration due to gravity.
Plot variation of acceleration due to gravity with height and depth.
b) The radii of two planets are r and 2r respectively and their densities are d and d/2 respectively. What is the ratio of acceleration due to gravity at their surfaces? (3)

16. a) What are the different types of intermolecular forces?
b) What is the significance of Teflon coating in cooking wares?
c) What is the condition for the formation concave meniscus of a liquid in a capillary tube? (3)

17. Calculate the amount of heat energy required to convert 50g of ice at -15^{o}C to water at 15^{o}C latent heat of ice is 336Jg^{-1}, specific heat of ice is 2.1Jg^{-1} ^{o}C^{-1} and specific heat of water is 4.2Jg^{-1}. (3)

18. State the law of equipartition of energy. Obtain the value of C_p and C_v and hence find the ratio C_p to C_v for a diatomic gas. (3)

(OR)

At what temperature the root mean square speed of oxygen molecules is equal to rms speed of carbon di oxide molecules at -23^{O}C. Molecular weight of oxygen =32 and that of carbon di oxide = 44. (3)

19. Write any two important assumptions of kinetic theory of gases? On this basis, derive an expression for the pressure exerted by an ideal gas. (3)

20. State first law of thermo dynamics. Write its mathematical equation. Using first law of thermo dynamics, derive the expression for work done in an isothermal process. (3)

21. Why excess of pressure is created in a liquid drop? Derive the expression for excess of pressure in a liquid drop. (3)

22. Two tuning forks A and B produce 4 beats per second when they are sounded together. A little wax is placed on the prongs of the tuning fork B then it produces 2 beats per second. Calculate the frequency tuning fork B before and after waxing. Given that frequency of the tuning fork A is 256Hz. (3)

Section D

23. Once Tom visited Jerry's home to celebrate Jerry's birth day. The refrigerator at his home was making so much noise and the cool drink served was not chill. Tom gave a suggestion to Jerry's father to service the refrigerator or to buy a new one.
a) Why Tom suggested Jerry's father to buy a new refrigerator?
b) Write two advantages in buying a new refrigerator.
c) Why drinks were not chill? Give reasons on the basis law of thermo dynamics. (1+1+2)

Section E

24. a) Define escape velocity. Obtain the expression for the escape velocity of a body from the surface of earth, clearly mentioning the assumptions considered while deriving the result.
b) Why is the value of escape velocity different for different planets? If earth has a mass 9 times and radius twice that of Mars. Calculate the minimum velocity required by the rocket to pull out of gravitational force of Mars. (5)

(OR)

a) Define Gravitational potential energy. Derive the expression for Gravitational potential energy.
b) What is the relation between Gravitational potential energy and Gravitational potential? Two bodies of masses 10kg and 1000kg are at a distance 1m apart. At which point on the line joining them will the gravitational field intensity zero? (5)

25. State and prove Bernoulli's theorem for a non-viscous liquid. Explain one of its practical applications. (5)

(OR)

What do you mean by terminal velocity? A steel ball is dropped in a viscous liquid. Explain how it attains terminal velocity; hence derive the expression for co efficient of viscosity. (5)

26. a) What do you mean by Doppler's effect? Explain how frequency of sound heard by a moving listener changes. Assume that the source of sound is stationary.
b) A train stands at a platform blowing a whistle of frequency 400Hz in still air. What is the frequency of the whistle heard by a man running towards the engine with a speed of 10m/s? Speed of sound in air is 330m/s. (3+2)

(OR)

What are stationary waves? Explain the formation stationary waves with the help of neat sequential diagrams. What are nodes and antinodes? (5)

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