



# St. Xavier's Sr. Sec. School

Delhi-54

Final Examination in **Physics**  
**Std. 11**

20-2-2017

M. Marks : 70

Time : 3 hrs.

Roll No:

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Total printed pages :	03
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. What will be the velocity of sound in air at 40°C? Given that velocity of sound in air at 0°C is 335m/s. (1)
2. How does Young's modulus of a steel wire change if its diameter is doubled? (1)
3. Why steering wheels of heavy vehicles have more radius than light vehicles? (1)
4. The rate of fall in temperature of hot water is more than warm water in the same surrounding. Why? (1)
5. Define emissive power? Write its SI unit. (1)

### Section B

6. A performer in a circus stands on a rotating platform and rotates with an angular velocity of 120rpm. The moment of inertia of the disc and the performer together is 80kgm<sup>2</sup>. On stretching the hands, the performer reduces the angular velocity by 25%. What is the percentage change in moment of inertia? (2)
7. Given below are the force and displacement vectors. Calculate the work done by the force and angle between angle between the force and displacement.  
 $\mathbf{F}=(2\mathbf{i}+2\mathbf{j}-4\mathbf{k})\text{N}$        $\mathbf{D}=(-3\mathbf{i}+1\mathbf{j}-2\mathbf{k})\text{m}$  (2)
8. Write a relation between momentum and kinetic energy? What is the percentage change in kinetic energy if the momentum is decreased by 20%? (2)
9. What are damped and undamped oscillations? Show the difference between them



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diagrammatically.

(2)

10. State and prove Kepler's third law of planetary motion.

(OR)

A body is at height equal to the radius of the earth from the surface of earth. With what velocity should be it thrown so that it goes out of the gravitational field of the earth?

$M_e = 6 \times 10^{24}$  kg,  $R_e = 6.4 \times 10^6$  m

(2)

## Section C

11. A woman pushes a trunk on a railway station which has a rough surface. She applies the force of 100N over a distance of 10m. Thereafter she gets progressively tired and her applied force reduces linearly with distance to 50N. The total distance by which the trunk has moved is 20m. Plot the force applied by woman vs distance travelled by the trunk. Calculate the work done by the force.

(3)

(OR)

a) How an inelastic collision is different from perfectly inelastic collision? Give an example.

b) Two particles of masses 'm' and '2m' are approaching with the velocities '2u' and 'u' respectively. The particles undergo a head on elastic collision. Find the velocities of the two particles after collision.

(3)

12. a) Prove that surface energy is numerically equal to surface tension.

b) The length of floating needle on water is 2.5cm. How much minimum force in addition to the weight of the needle will be needed to lift the needle above the surface of water? Surface tension of water is  $7.2 \times 10^{-2}$  N/m

(3)

13. A block of ice at  $-10^\circ\text{C}$  is to be converted to steam at temperature  $110^\circ\text{C}$ . Calculate the amount of heat required. Given that mass of the ice block is 500gm. Given specific heat capacity of ice =  $2100\text{Jkg}^{-1}\text{K}^{-1}$ , specific heat capacity water =  $4200\text{Jkg}^{-1}\text{K}^{-1}$ , specific heat capacity of steam  $2000\text{Jkg}^{-1}\text{K}^{-1}$ , latent heat of fusion of ice =  $3.36 \times 10^5\text{Jkg}^{-1}$  and latent heat of vaporization =  $2.25 \times 10^6\text{Jkg}^{-1}$ .

(3)

14. A disc of mass 'M' and radius 'R' is rolling down on a rough inclined plane of angle inclination ' $\theta$ '. Find the expression for acceleration and angular acceleration of the disc.

(3)

15. Give reasons of the following.

a) A glass rod glows in green at high temperature where as red in low temperature.

b) A small gap is provided between the rails of railway track.

c) Cricketers wear white cloths during a test match.

(3)

16. a) Define Orbital velocity of a satellite. Derive the expression for orbital velocity of a satellite.

b) Give any two characteristics of geostationary satellite

(2+1)

17. Define Gravitational field intensity. Show that at any point it is equal to the free



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- acceleration of the test mass placed at that point. Plot its variation with distance. (2+1)
18. The displacement of a simple harmonically oscillating particle is governed by the relation  $\xi = A \sin \omega t$ . Obtain the expressions for velocity and acceleration. Show graphically the variation of displacement, velocity and acceleration with respect to time. What is significance of phase difference? (3)
19. A segment of sonometer wire has a mass and length of 20gm and 1m respectively. The wire is under a tension of 800N. Calculate the fundamental frequency of vibration and the frequency of 5<sup>th</sup> overtone. (3)
20. Four particles of masses 2kg, 4kg, 6kg and 8kg are placed at the points (0,0)m, (2,0)m, (2,2)m and (0,2)m respectively. Find the position vector of center of mass. (3)
21. A cylindrical cork floats in a non viscous liquid. The cork is slightly depressed and then released. Show that the cork executes simple harmonic motion and obtain an expression for time period of oscillations. (3)
22. a) Derive the expression for potential energy stored in a spring.  
b) Plot potential energy of spring vs displacement, giving proper explanation. (3)

## Section D

23. Karan was returning home from the school. Karan saw an old man was struggling to walk. He kindly asked the old man regarding his health. The old man said that he is suffering from high blood pressure for a long time. Karan took him to nearby clinic and the doctor checked up his health condition. Doctor gave him some medicine and the doctor advised the old man to take less salt and sugar in his diet.  
a) Why the doctor has advised to take less salt in the diet?  
b) What are the values reflected in the behavior Karan? (4)

## Section E

24. a) Write four assumptions about the molecules of a gas. On these basis of assumptions, Derive the expression for pressure exerted by a gas.  
b) What will happen to root mean square velocity of oxygen molecules if the temperature the gas is doubled? (4+1)
- (OR)
- a) Show that root mean square velocity of the molecules of a gas is directly proportional to  $\sqrt{T}$ .  
b) If the temperature of air is increased from 27°C to 227°C. In what ratio will the average kinetic energy of its molecules be increased?  
c) State the law of equipartition of energy. How many degrees freedom does a diatomic molecule have at room temperature? (2+2+1)
25. a) What is meant by the term coefficient of viscosity. State Stoke's law. Define



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terminal velocity and find the expression for terminal velocity in case of a small sphere falling through a viscous liquid. What is meant by the term coefficient of viscosity and give its SI unit.

b) The lubricating oils used are generally of high viscosity. Why? (4+1)  
**(OR)**

a) Give the properties of ideal fluid.

b) State and prove Bernoulli's theorem for ideal fluid.

c) Discuss the motion of spinning cricket ball in stationary air. (1+3+1)

26. State the super position principle of waves. With the help of neat diagrams, explain how stationary waves are formed. What do you mean by nodes and antinodes? ( $\frac{1}{2}+3\frac{1}{2}+1$ )  
**(OR)**

a) What do you mean by Doppler's effect? A listener approaches a stationary source of sound with a speed of  $V_L$ . Explain the cause of change in frequency as heard by the listener and hence obtain the expression for apparent frequency.

b) A car passes by a stationary police constable with a speed of 72km/hr. The car blows a horn of frequency 1000Hz. Calculate the drop in frequency as heard by the constable. Given that velocity of sound in air is 335m/s. (3+2)

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