



DELHI PUBLIC SCHOOL SURAT
PHYSICS(THEORY)

Roll No:

Class: XI

Marks: 70

Time Allowed: 3Hrs

Instructions:

- i. Answer all questions.
- ii. Q.No.1 to 5 are very short answer questions and carry 1 mark each.
- iii. Q.No.6 to 12 are short answer questions and carry 2 marks each.
- iv. Q.No. 13 to 24 are also short answer questions and carry 3 marks each.
- v. Q.No. 25 to 27 are also long answer questions and carry 5 marks each.
- vi. No overall choice is given.
- vii. Use of Calculators is not allowed. However, if required use of Log tables is permitted.

1. What is the law of conservation of Charge? [1]
 2. If an angular projectile is fired with a velocity of 'U' m/s, what will be the velocity of the projectile when it hits back the ground. ? [1]
 3. When two masses moving with different velocities collide and then stick together, what type of collision is it? What is the coefficient of elasticity for this collision? [1]
 4. What is the Kinetic Interpretation of temperature according to KTOG? [1]
 5. What is prevost theory of radiation? [1]
 6. Write the dimensions of a and b in relation $P = (b-x^2) / t$ where P is power 'x' is distance and 't' is time? [2]
 7. What is the work done on a body of mass of 2 kg to increase its speed from 5 m/s to 10 m/s? [2]
 8. If the earth were to suddenly contract to 1/n of its present radius, without any change in its mass, then what will be the duration of the day? [2]
 9. Define (i) Damped Oscillation and (ii) Undamped Oscillation. Also give the differential equation of both types of oscillation? [2]
- OR**
- Draw a graph to represent the phase relation between displacement, velocity and acceleration of a body executing SHM. [2]
10. A flywheel rotating at a speed of 600 rpm about its axis is brought to rest by applying a constant torque for 10 seconds. Find the angular retardation and angular velocity after 4 seconds of application of torque. [2]
 11. Slope of Adiabatic Curve is steeper than isothermal Curve. Justify [2]
 12. Deduce the expression of particle velocity and particle acceleration from the basic equation of a wave. [2]
 13. A body covers 12m in 2nd second and 20m in 4th second. How much distance will it cover in 4 seconds after the 5th second? [3]

OR

What is free fall? Give the equation of position, velocity and acceleration with time for free fall motion of a body and draw the graphs for the same. [3]

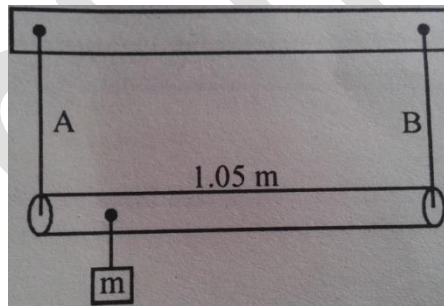
14. A circular track of radius 100m is banked at an angle of 30° . If the coefficient of friction between the wheels of a car and the road is 0.5, then what is the (i) optimum speed of the car to avoid wear and tear on its tyres, & (ii) maximum permissible speed to avoid slipping? [3]
15. Derive an expression for Potential energy stored in a spring. Draw a graph to show variation of Potential energy, Kinetic Energy and Total Energy with position of a spring. Also draw a graph showing the variation of spring force with displacement. [3]
16. Derive an expression of Gravitational Potential at a point due to a given mass M. [3]

OR

- Derive an expression for escape speed of a body from the surface of earth. Also, what is the ratio of escape speed and orbital speed of a satellite orbiting close to surface of earth.
17. Draw a graph to show variation of Friction with External force and label it completely. Newton's second law is the real law of motion. Justify [3]
18. Two masses 10 kg and 100kg are lying 10 m apart. Find a point between the two mass where the net gravitational field intensity is zero and also find the total potential energy of the system. [3]
19. Two wires, one of steel and another of aluminium each 2 m long and of diameter 2.0 mm, are joined end-to-end to form a composite wire of length 4 m . What tension in the wire will produce a total extension of 0.9 mm? [Y for Steel is : $2 \times 10^{11} \text{ N/m}^2$ Y for Al is : $1 \times 10^{11} \text{ N/m}^2$] [3]

OR

A rod of length 1.05 m having negligible mass is supported at its ends by two wires of steel (wire A) and aluminium (wire B) of equal lengths as shown in the adjacent figure. The cross – sectional area of wires A and B are 1 mm^2 and 2 mm^2 respectively. At what point along the rod should a mass m be suspended in order to produce (a) equal stresses and (b) equal strains in both steel and aluminium wires [Y for Steel is : $2 \times 10^{11} \text{ N/m}^2$ Y for Al is : $1 \times 10^{11} \text{ N/m}^2$]



20. Define Surface Tension and Surface Energy. Derive the relation between Surface tension and Surface energy. [3]
21. Prove that the work done in stretching a wire = $\frac{1}{2} \times \text{tension} \times \text{extension}$. Also deduce the expression of Energy density of a stretched wire. What does are under stress v/s strain curve indicate? [3]
22. A fully loaded Boeing aircraft has a mass of $3.3 \times 10^5 \text{ kg}$. Its total wing area is 500 m^2 . It is in level flight with a speed of 960 km/hr.
- (a) Estimate the pressure difference between the lower and upper surface of the wing. [1.5]
- (b) Estimate the fractional increase in the speed of the air on the upper surface of the wing relative to the lower surface (Density of air = 1.2 kg/m^3) [1.5]
23. A Carnot engine absorbs 1000J of heat energy from a reservoir at 127°C and rejects 600J of heat energy during each cycle. Calculate i) Efficiency of the engine, ii) temperature of sink & iii) amount of useful work done per cycle?
24. What is Newton's law of thermal conduction? Draw a flow diagram of Heat pump and Heat Engine.
25. What is Doppler's effect? Derive an expression of apparent frequency of sound when both Source and observer are moving towards each other. [5]

OR

What is Newton's formula for velocity of sound? What was Laplace correction. Deduce the Laplace corrected formula for velocity of sound. How does sound depend on Temperature?

26. (a) Prove that a column of liquid placed in a U-tube can execute SHM. Also calculate the Time period of Oscillation. [3]

(b) A body of mass 1 kg is executing S.H.M. given by $Y = 6.0 \sin \left(100 \pi t + \frac{\pi}{3} \right)$ cm
Find (i) amplitude (ii) frequency and angular frequency (iii) velocity and (iv) Initial phase. [2]

OR

(i) Define damped oscillation. Give differential equation and solution of Damped oscillation. [1.5]

(ii) Define Forced oscillation, giving the differential equation and solution of the equation. [2]

(iii) Discuss the case of Resonance. Draw the required graph to represent resonance. [1.5]
[5]

27. What is Kinetic Theory of gases? Give the assumptions in the study of kinetic theory. Derive an expression of pressure in a container according to KTOG. (Take standard notations) [5]

OR

What is law of equi-partition of Energy given by Maxwell? Find the following for a mono-atomic and di-atomic gases

(i) Degrees of freedom (ii) Value of C_v (iii) Value of C_p (iv) Adiabatic constant

-----END OF EXAMINATION-----