

**KENDRIYA VIDYALAYA SANGATHAN
SILCHAR REGION**

SESSION ENDING EXAMINATION (2017-18)

SUB: PHYSICS

Class- XI

MAX. MARKS- 70

Time Allowed = 3hrs.

General Instructions:

- (i) All questions are compulsory.
- (ii) Question numbers 1 to 5 are very short answer type questions and carry 1 mark each.
- (iii) Question numbers 6 to 10 are short answer type questions and carry 2 marks each.
- (iv) Question numbers 11 to 22 are also short answer type questions and carry 3 marks each.
- (v) Question number 23 is a value based question and carries 4 marks.
- (vi) Question numbers 24 to 26 are long answer type questions and carry 5 marks each.
- (vii) There is no overall choice in the paper, however, there is an internal choice in one question of 2 marks weightage, one question of 3 marks weightage and all the three questions of 5 marks weightage.
- (viii) Use of calculator is NOT permitted.

1. Why the speed of a wave changes as it goes from one medium to another while its frequency remains same?
2. Two bodies A and B having mass ratio 1:4 have same kinetic energy. Which will have higher momentum?
3. State Kepler's first law of planetary motion (law of orbits).
4. A student multiplied 23.2 kg with 4.08 m/s^2 and got the result 94.656 N. The student wrote the answer as such. Whether the student right or wrong in representing the answer as such. Justify your answer.
5. What is the value of gravitational acceleration due to earth at its surface and at its centre?

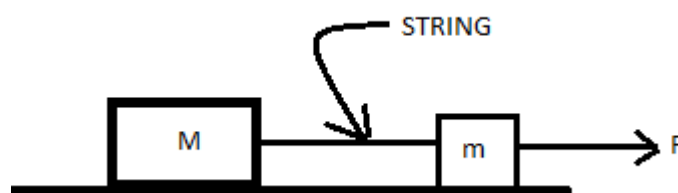
6. Find the angle of projection for which horizontal range and maximum height are equal.
7. A body of mass 0.5 kg travels in a straight line with velocity $v = kx$ where $k = 5 \text{ s}^{-1}$. What is the work done by the net force during its displacement from $x = 0$ to $x = 2 \text{ m}$?
8. Two billiard balls each of mass 0.05 kg moving in opposite directions with speed 10m/s collide and rebound with the same speed. What is the impulse imparted to each ball due to the other?
9. What are unit vectors? Find the unit vector in the direction of $\hat{i} + \hat{j} + \hat{k}$.

OR

Find the resultant magnitude of two vectors having magnitudes 10 and 12 units inclined to each other by angle of 60° .

10. Show all the forces acting on the body in different conditions mentioned below-
 - (a) A block is sliding down on a rough inclined plane.
 - (b) A small steel ball is moving vertically downwards in honey with constant speed
11. A body oscillates with SHM according to the equation $x = 5 \cos(2\pi t + \pi/4)$.
[all variables are in SI units].
 Calculate (a) displacement at $t = 0$ (b) magnitude of maximum velocity (c) acceleration at $t = 0$.
12. State parallel and perpendicular axis theorem. Using the appropriate theorem, find the moment of inertia of a disc of mass m and radius r about an axis passing through any of its diameter.
13. Give reasons for the following-
 - (a) Engine of 100 % efficiency is impossible.
 - (b) The coolant used in nuclear plants should have high specific heat.
14. A 14.5 kg mass, fastened to the end of a steel wire of unstretched length 1.0 m is whirled in a vertical circle with an angular velocity of 2 rev/s at the bottom of the circle. The cross-sectional area of the wire is 0.065 cm^2 . Calculate the stress on the wire when the mass is at the lowest point of its path.

15. What is the difference between perfectly elastic and perfectly inelastic collision? For a perfectly elastic collision in one dimension of a lighter body with a much more massive body at rest, prove that direction of the lighter body is reversed while massive body remains at rest.
16. What is the basic difference between streamline flow and turbulent flow of a fluid? For a streamline flow of a fluid in a rubber tube of non-uniform cross section area prove that velocity of flow is inversely proportional to the cross-section area.
17. For the figure given below, show all the forces acting on both the masses and calculate
(a) acceleration of the system and (b) tension in the string. [Friction between the blocks and the surface is assumed to be zero.]



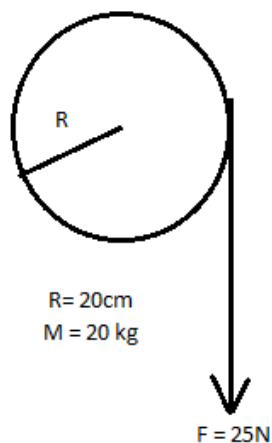
18. Two perfect gases at absolute temperatures T_1 and T_2 are mixed. There is no loss of energy. Find the temperature of the mixture if the masses of the molecules are m_1 and m_2 and number of molecules are n_1 and n_2 respectively.

OR

Explain the following –

- (a) Mean free path increases with decrease in pressure of gas
(b) Molar specific heat of diatomic gases is more than that of monatomic gases.
19. What is the difference between centripetal and centrifugal forces? What are the sources of centripetal and centrifugal force acting on a body moving on a horizontal circular road?

20. Deduce the expression of the time-period of a simple pendulum oscillating in small amplitudes. Find the length of a simple pendulum whose time period is 2 s.
21. A cord of negligible mass is wound round the rim of a fly wheel of mass 20 kg and radius 20 cm. A steady pull of 25 N is applied to the cord as shown in figure. The flywheel is mounted on a horizontal axle with frictionless bearings.
- Compute the angular acceleration of the wheel.
 - Find the work done by the pull, when 2m of the cord is unwound.
 - Find also the KE of the wheel at this point. Assume that the wheel starts from rest.



22. Four point objects of equal mass $m = 2\text{ kg}$ are placed at the corners of a square of side 10 cm. Find (a) the net gravitational force on any one mass due to the other three masses and (b) Find the gravitational potential energy of the system.
23. **(VBQ)** Rakesh had consumed some alcohol in a party. While returning to home from the party by car he hardly managed to save a dog which was crossing the road. He later studied that driving vehicles in drunk state increases reaction time and

increases vehicle's stopping distance. He decided not to drive again while drinking alcohol.

- What value(s) are displayed by Rakesh?
- What do you mean stopping distance? On what factors its value depend?
- Find the stopping distance of a car if the initial velocity of car is 20 m/s and reaction time of the driver is 0.01 s?

24. State Newton's law of cooling. Using this law, find the expression of temperature of a body as the function of time. [Take the mass of the body = m and specific heat capacity= s]

OR

State mathematically first law of thermodynamics and use it to find the expression for the work done in (a) adiabatic (b) isobaric process and (c) isochoric process.

25. (a) State and deduce the expression of Bernoulli's theorem.
- (b) Using Bernoulli's theorem, explain the working of Venturimeter to find velocity of flow of liquid through a tube.

OR

Using Bernoulli's principle explain the following-

- How does outswing of a cricket ball (moving of cricket ball away from batsman) occur?
- Why does the thatched roof of a hut blow away during storm?
- Two ships in a sea never pass each other close enough?

26. (a) What do you mean by fundamental mode or first harmonic of a musical instrument?

(b) Show that in an open organ pipe, all harmonics are present.

OR

- (A) What do you mean by interference of waves?
- (B) What would happen if two waves $y_1 = a \sin(kx - \omega t)$ and $y_2 = a \sin(kx - \omega t + \phi)$ interfere with each other? Mention all the changes.
- (C) How are standing waves produced?
- (D) Write the expression of standing wave produced on a string moving along x-axis and reflected back from the rigid boundary.