

**INDIAN SCHOOL SOHAR
SECOND TERM EXAM- 2015
PHYSICS – THEORY**

**CLASS: XI
DATE: 24/11/2015**

**MARKS: 70
TIME: 3 hrs**

General Instructions

- a. All questions are compulsory.
- b. There are 26 questions in total. Questions 1 to 5 carry one mark each Questions 6 to 10 carry two marks each, Questions 11 to 22 carry three marks each, Question 23 is value based and Questions 24 to 26 carry five mark each.
- c. There is no overall choice. However, internal choice has been provided in one question of two marks, one question of three marks and all questions of five marks. You have to attempt only one of the given choices in such questions.
- d. Use of calculator is not permitted.
- e. You may use the following physical constants wherever necessary

$$c = 3 \times 10^8 \text{ m/s}$$

$$h = 6.626 \times 10^{-34} \text{ Js}$$

$$e = 1.6 \times 10^{-19} \text{ C}$$

SECTION-A

1. Define the term percentage error and write down its expression.
2. Draw a velocity –time graph for the motion of a body in (a) positive direction and positive acceleration. (b) positive direction with negative acceleration.
3. What is moment of inertia of (a) solid sphere about its diameter (b) hollow sphere about its axis? Write down the formula.
4. Two satellites orbit the earth in circular orbits of radii r and $3r$ respectively. What is the ratio of their orbital speed?
5. What is cyclic process ? What is the change in internal energy of a system after it completes one cycle of such process ?

SECTION-B

6. The distance of Sun from the earth is 1.496×10^{11} m. If the angular diameter of the Sun is $2000''$, find the diameter of the Sun.
 7. A car moving along a straight highway with speed of 126 km/h is brought to stop within a distance of 200 m. What is the retardation of the car and how long does it take for the car to stop?
 8. Derive an expression for work-done by spring force using diagram.
 9. What is a Geostationary satellite ? How does it work? Mention its use.
- OR**
9. What is a polar satellite? How does it work? Mention its use.
 10. State and explain first law of thermodynamics.

SECTION-C

11. Derive an expression for the maximum velocity of a car moving on a banked road with the help of a diagram.

12.(a) Define Bulk Modulus of elasticity and hence compressibility.

(b) The compressibility of water is 4×10^{-5} per unit atmospheric pressure. What will be the decrease in volume of 100cm^3 of water under pressure of 100 atmosphere?

13. If an object of mass “m” is placed at depth “d” below surface of the earth of mass M. Then derive an expression for the value of acceleration due to gravity of object at depth “d”. Consider the radius of earth to be “R”. How does the value of acceleration due to gravity change as the depth decrease.

14. Define escape velocity. If the earth has a mass 9 times and radius twice of the planet Mars, calculate the minimum speed required by a rocket to pull out of the gravitational force of Mars. Escape speed on the surface of the earth is 11.2 km/s.

15. Derive an expression for Young modulus. Describe an experiment to determine the Young Modulus of the material of a wire with the help of diagram.

16. State Hooke’s law of elasticity. A wire cable 10m long consists of 40 strands of steel each $5 \times 10^{-6} \text{m}^2$ in cross section. By how much does the cable stretch when it is used to lift a crate weighing 4000 N. Young Modulus of steel = $20 \times 10^{10} \text{Nm}^{-2}$.

17. If a particle performing rotational motion has an angular momentum “L”, then show time rate of change of angular momentum of the particle is equal to the torque acting on it.

OR

17. Obtain an expression for the moment of inertia of (a) a rigid massless rod of length “l” with a pair of small masses M/2 at its ends rotating about an axis through the center of mass perpendicular to the rod.

(b) A rod of mass M length l about an axis perpendicular to the rod through one of the ends of the rod .

18. State the parallelogram law of vectors with the help of diagram. Two billiard balls are rolling on a flat table one has the velocity components $v_x=1\text{m/s}$, $v_y=\sqrt{3}\text{m/s}$ and the other has the components $v_x=2\text{m/s}$, $v_y=2\text{m/s}$. If both the balls start moving from the same point, what is the angle between their paths.

19. Prove that the maximum horizontal range is four times the maximum height attained by a projectile which is fired along the same direction as required for the maximum range.

20. A body of mass 1kg initially at rest explodes and breaks into three segments of masses in the ratio 1:1:3. The two masses fly off perpendicular to each other with a speed of 30 m/s each. What is the velocity of heavier fragment?

21. Mention the conditions for the work done to be zero. Calculate the amount of work done by a boy when (i) the boy holds a bundle of books of 5kg for 5 minutes. (ii) the boy walks with bundle of books along a level road at a speed of 5m/s. (iii) the boy lifts up the same bundle of books by 1m in order to keep it on a book shelf. ($g = 9.8 \text{m/s}^2$).

22. Define adiabatic process and state two essential conditions for such a process to take place. Derive an expression for the work done during the adiabatic expansion of an ideal gas.

SECTION - D

23. Ravinder, a student of class XI. He had two identical spheres one hollow and the other solid. He told his younger brother that he had the power to spin these two spheres with different speeds. His told his younger brother that this is a magic. However, Sham was also standing there. Sham told the younger brother of Ravinder that it is not magic. He can also do the same.

(i) How can two identical spheres, one hollow and the other solid spin with different speed? (ii) What values are shown by Sham?

SECTION - E

24.(a) A satellite of mass 'm' revolves around the earth of mass "M". What should be the velocity of the satellite such that it revolves in an orbit around the earth. Obtain an expression.

(b) The radius of earth is 6×10^6 m. At what distance from the centre of earth, the weight of the body becomes half.

OR

24. (a) What should be the velocity of body such that it escape into space. Derive an expression.

(b) Assume that earth and mars move in circular orbits around sun. With the martian orbit 1.52 times the orbital radius of the earth. What is the length of martian year in days ?

25. Explain the stress strain curve with the help of graph.

OR

25.(a) Explain types of strain

(b) A wire of length L and radius r is fixed at one end and a force F applied to the other end produces an extension of l. What will be the extension produced in another wire of the same material of length 2L and radius 2r by a force 2F.

26. (a) State and prove the Pascal's law for fluids.

OR

26. (a) Obtain an expression for kinetic energy of a rotating body.