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**INDIAN SCHOOL SOHAR
FINAL EXAM- 2016
PHYSICS – THEORY**

**CLASS: XI
DATE: 03/03/2016**

**MARKS: 70
TIME: 3Hrs**

General Instructions

- a. *All questions are compulsory.
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 a value based carrying four marks and questions 24 to 26 carry five marks each.*
 - b. *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.*
 - c. *Use of calculator is not permitted.*
 - d. *You may use the following physical constants wherever necessary*
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SECTION-A

1. Two particles, each of mass m , go round a circle of radius R under the action of their mutual gravitational attraction. Find the speed of each particle. (1)
2. Name the physical quantities whose dimensions are ML^2T^{-2} and $ML^{-1}T^{-2}$ (1)
3. Calculate the temperature whose value is the same on the celsius and fahrenheit scale. (1)
4. Write the values of Reynold number indicating streamline flow and turbulent flow. (1)
5. If the momentum of an object is doubled. How does its K.E. change? (1)

SECTION-B

6. Establish the relationship between torque and moment of inertia.
OR
6. Define radius of gyration. On what factors does it depend. (2)
7. Each side of a cube is measured to be 7.203m. What are the total surface area and the volume of the cube to appropriate significant figures? (2)
8. What is buckling. How can it be avoided. Justify with the help of diagram. (2)
9. Two balls are thrown simultaneously. A vertically upwards with a speed of 20m/s from the ground, and B vertically downwards from a height of 40 m with the same speed and along the same line of motion. At which point do the two balls collide? Take $g=9.8m/s^2$ (2)

10. Show that the average kinetic energy of a gas molecule is directly proportional to the temperature of the gas.

SECTION-C

11. What do you mean by inelastic collision? For an inelastic collision, find an expression for the loss of kinetic energy after the collision. (3)

12.(a) Mention the principle of the technology of electric generator and aeroplane.

(b) A drop of olive oil of radius 0.25mm spreads into a circular film of radius 10cm on the water surface. Estimate the molecular size of olive. (3)

13. Draw and discuss the position-time graphs of two objects moving along a straight line, when their relative velocity is (i) zero (ii) positive (iii) negative. (3)

14.(a) Mention the mathematical expressions of cosine law and sine law of vector addition.

(b) Two forces whose magnitudes are in the ratio 3:5 give a resultant of 35N. If the angle of inclination is 60° , calculate the magnitude of each force. (3)

15. What is impending motion. An aeroplane requires a speed of 80km/hr for take-off, the run on the ground being 100m. The mass of the aeroplane is 10^4 kg and the coefficient of friction between the plane and the ground is 0.2. Assume that the plane accelerates uniformly during the take off. What is the maximum force required by the engine of the plane for take-off ? (3)

16. Obtain a relation between kinetic energy and momentum of a body . If the linear momentum of a body increases by 20%, what will be the percentage increase in the kinetic energy of the body?

OR

16. A ring of diameter 0.4 m and of mass 10 kg is rotating about its axis at the rate of 2100 rpm. Find (i) moment of inertia (ii) angular momentum and (iii) rotational kinetic energy of the ring. (3)

17. Why does earth impart same acceleration to all the bodies? Obtain an expression for the variation of 'g' with the altitude. (3)

18. Define impulse of a force. How can it be measured graphically. Mention two applications of impulse of force. (3)

19. A ball is thrown at an angle θ and another ball is thrown at an angle $(90^\circ - \theta)$ with the horizontal direction from the same point with velocity 39.2m/s. The second ball reaches 50 m higher than the first ball. Find their individual heights. Take $g=9.8\text{m/s}^2$. (3)

20. What is the analogue of mass in rotational motion? Derive an expression for K.E. of a rotating body. (3)

21. Derive an expression for work done in an adiabatic process.

22. Describe an activity to explain the term thermal conductivity and hence derive its formula with help of a diagram. Write its unit. "Cooking vessels have copper at its bottom". Justify your answer. (3)

SECTION-D

23. "Mahesh and Ramesh were performing an experiment in the chemistry laboratory. The experiment was to determine the boiling point of water. Ramesh was a bit naughty, he started

playing with the stand on which the beaker of water was kept. Mahesh noticed this and stopped Ramesh immediately from playing thus avoiding an accident.

- (a) What values were displayed by Mahesh? (4)
(b) Illustrate the dependence of pressure on boiling point of water with the help of an activity.

SECTION-E

24.(a) Explain Doppler effect in sound. Obtain an expression for apparent frequency of sound when source moves and listener is at rest.

- (b) A progressive wave is given by $y(x,t) = 8\cos(300t - 0.15x)$ where x is in meters and t is in seconds. What is the amplitude, frequency, wavelength and wave number of the wave.

OR

24.(a) What are damped oscillations. Derive an equation for the damped oscillations. Justify the solution of the equation with the help of diagram.

- (b) The amplitude of an oscillating simple pendulum is doubled. What will be its effect on the (i) periodic time (ii) total energy (iii) maximum velocity? (5)

25.(a) Derive an equation of the stationary wave for two waves.

- (b) Calculate the position for the formation of node and the antinode.

OR

25.(a) Explain with the help of diagram how the motion of bob in a simple pendulum performs S.H.M. Justify your answer graphically.

- (b) Explain the relation in phase between displacement, velocity and acceleration in S.H.M., graphically and mathematically. (show the diagram) (5)

26.(a) Explain the types of thermal expansions with the help of mathematical expressions.

- (b) Two rods A and B are of equal length. Each rod has its ends at temperatures T_1 and T_2 . What are the conditions that will ensure equal rates of flow of heat through the rods A and B?

OR

26.(a) Derive an expression for the rise of liquid in a capillary tube. What will happen if the length of the capillary tube is smaller than the height to which the liquid rises? Explain briefly.

- (b) A steel wire of length 4.7 m and cross-sectional area $3 \times 10^{-5} \text{ m}^2$ stretches by the same amount as a copper wire of length 3.5 m and cross-sectional area $4 \times 10^{-5} \text{ m}^2$ under a given load. What is the ratio of the Young's modulus of steel to that of copper?