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

**CLASS: XI** **MARKS: 70**
**DATE: 13/9/2015** **TIME: 3Hrs**

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**General Instructions:**
**1. All questions are compulsory**.
**2. There are 26 questions in all .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 question carrying four marks and questions 24 to 26 carry five marks each.**
**3. There is no overall choice. However, internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each.**
**4. You have to attempt only one of the given choices in such questions.**
**5. Use of calculator is not permitted.**
**6. You may use the following physical constants wherever necessary.**

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1. Name the field with which microscopic domain of physics deals. (1)

2.Mention the scientific principle used for the following technology (i)Aeroplane (ii) Computers. (1)

3. A retarding force is applied to stop a motor car. If the speed of the motor car is doubled , how much more distance will it cover before stopping under the same retarding force. (1)

4. Draw the variation of potential energy , kinetic energy and mechanical energy stored in a spring as a function of extension. (1)

5. One of the component of velocity of 80 km/h is 40km/h. Find the other component. (1)

6. Check whether the equation $F.S = \frac{1}{2} mv^2 - \frac{1}{2} mu^2$ is dimensionally correct, where m is mass of the body, v its final velocity,u its initial velocity, F is force applied and S is the distance moved. (2)

7. Obtain an expression for the horizontal range of a projectile. Hence deduce an expression for maximum range. (2)

8. A bullet fired at an angle of $15^0$ with the horizontal hits the ground 3km away. Can we hit the a target at a distance of 7km by adjusting the angle of projection. (2)

9. A fighter jet makes a loop of 1000 m with a speed of 250 m/s. Compare its centripetal acceleration with the acceleration due to gravity. (2)

10.State Newtons's second law of motion and hence deduce F = ma. (2)

OR

10. State the Hooke's law. Hence deduce the work done by the spring force when extended by a block at one end and the other attached to a rigid support. (2)

11.Obtain an expression for centripetal acceleration for a body performing circular motion.(3)

12. (a) Define instantaneous and average acceleration. Write down its mathematical expression. (b) Draw a position time graph for motion a body with (i) positive acceleration (ii) negative acceleration. (3)

13. (a) Explain the term relative velocity.
(b) Two cars A and B are running at velocities of 60 km/hr and 45 km/hr respectively. Calculate the relative velocity of car A if : (i) they are both travelling eastwards and (ii) car A is travelling eastwards and car B is travelling westwards. (3)

14. Define instantaneous velocity. Write down its mathematical expression. Describe the graphical method of obtaining the direction of acceleration. (3)

15. The position of a particle is given by: $\mathbf{r} = 3.0\,t\,\mathbf{i} - 2.0\,t^2\mathbf{j} + 4\mathbf{k}$ meters. Where t is in seconds, **r** is in meters (a) Find the velocity v and acceleration a. (b) What is the magnitude of velocity of the particle at t = 2s ? (3)

16. Define work in vector form. Describe the method to find the work done by graphical method. (3)

OR.

16.Define scalar product of two vectors. Mention all its properties. (3)

17. Define impulse. A cricket ball of mass 150 gm moving with speed of 12 m/s is hit by a bat so that the ball is turned back with a velocity of 20 m/s. Calculate the impulse received by the ball. (3)

18. Explain with the help of diagram the condition to be obtained for a body to be in equilibrium when (i) two forces (ii) three forces (iii) n forces are applied on the body. (3)

19. State work energy theorem. Prove the theorem by integration method. (3)

20. A particle starts from the origin at t=0 with a velocity of 5**j** m/s and moves in x-y plane with a constant acceleration of( $2\mathbf{i} + 1\,\mathbf{j}$) $m/s^2$ . Calculate (i) the time after which the x-coordinate of the particle is 4m.(ii) the y-cooordinate of the particle at that time and (iii) the speed of the particle at that time. (3)

21. Two mutually perpendicular forces of 8N and 6N acts on the same body of mass 10kg. Calculate (i) net force acting on the body (ii) magnitude of the acceleration of the body (iii) direction of acceleration of the body. (3)

22. Derive an expression for potential energy. Using the principle of conservation of energy find an expression for velocity at a height h and the velocity at the ground for a body falling from a height H. (3)

23. In a tug of war between two teams A and B , team A won the event. During the event, some members of team B got injured as the team A dragged them on the ground. Players of team A were laughing at the players of team B. Howerver, Ashok , the captain of team A went to the doctor and informed him that some players have been injured on the ground. Doctor came to the ground with the first aid box and treated the injured players.
(i) What type of work is done by team A and B?
(ii) What values are shown by Ashok? (4)

24. (a) With the help of a diagram obtain an expression for the maximum possible speed that can be obtained by a car on a leveled road.

A force of 10N gives a mass $m_1$ an acceleration of $10m/s^2$ and a mass $m_2$ , how much acceleration would it give if both the masses are tied together ?

OR

24. (a) With the help of diagram obtain an expression for the maximum possible speed that can be obtained by a car on a banked road.
(b) A Diwali rocket is ejecting 0.04kg of gases per second at a speed of 400 m/s. What is the accelerating force on the rocket? (5)

25. (a) Derive an expression for final velocities of two balls A and B after elastic collision in one dimension and hence find their final velocities if(i) their masses are equal (ii) one of the mass is greater than the other.

OR

25. (a) Derive an expression for the loss of kinetic energy for a completely inelastic collision in one dimension.
(c) Obtain the expression for conservation of kinetic energy and linear momentum along x-axis and y-axis for a elastic collision in two dimension. (5)

26.(a) State the parallelogram law of vectors for vector addition. Hence obtain an expression for the law of cosines.
(b) When a ball is thrown up vertically with the velocity $v_0$ , it reaches a maximum height of h. If one wishes to triple the maximum height, then what should be the velocity of the body.

OR

26.(a) With the help of diagram.Show that the path of projectile is a parabola.
(b) The angle of projection of a projectile with the horizontal direction for the maximum height attained by the projectile is equal to the range of the projectile, what is angle of Projection. (5)