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MANAVA BHARATI

INDIA INTERNATIONAL SCHOOL

MID-TERM EXAMINATION -SEPTEMBER 2016
CLASS XI - PHYSICS

TIME : 3 HRS. MAX. MARKS: 60

General Instructions:

1. *All questions are compulsory.*
2. *There are 23 questions in total. Question nos. 1 to 6 are very short answer type questions and carry one mark each.*
3. *Question no. 7 to 10 carry two marks each. Question nos. 11 to 19 carry 3 marks each. Question no. 20 carries 4 marks and question no. 21 to 23 carry 5 mark each.*
4. *There is no overall choice. However, an internal choice has been provided one question of three mark and all three questions of five marks each.*
5. *Use of calculator is not permitted.*

1. Name three fundamental units used in daily life. 1
2. Under what conditions will the distance and displacement of a moving object will have the same magnitude. 1
3. What do you conclude that the vectors **A** and **B**, if **A** + **B** = 0? 1
4. What is the mathematical relation for momentum of a particle? 1
5. Force and displacement both are vectors, yet their product, work is a scalar, Why? 1
6. Which fundamental force governs the large scale motion in the universe? 1
7. Obtain the dimensional equation of universal constant of gravitation G. 2
8. A cricketer can through a ball to a maximum horizontal distance of 100m. How much high above the ground can the cricketer throw the same ball? 2
9. State the law of conservation of linear momentum and derive it from the Newton's second law of motion. 2
10. The relation t and distance x is $t=ax^2+bx$, where a and b are constants. Express the instantaneous acceleration in terms of instantaneous velocity. 2
11. The displacement (in meters) of a particle moving along x-axis is given by $x=18t+5t^2$. Calculate (i) instantaneous velocity at t=2s, (ii) average velocity between t=2s and t=3s (iii) instantaneous acceleration. 3

12. Establish the relation $v^2 - u^2 = 2as$ by calculus method. 3

13. A man walks on a straight road from his house to a market 2.5km away with a speed of 5km/h. What is the

(a) Magnitude of the average velocity, and
(b) Average speed of the man over the interval of time (i) 0 to 30 min, (ii) 0 to 50 min., (iii) 0 to 40min. 3

14. Show that $(A + B) + C = A + (B + C)$. 3

15. Show that the path of the projectile at an angle θ from horizontal is parabolic in shape. 3

16. Write the expression for the magnitude and the direction of the resultant of two vectors inclined at an angle θ. Discuss special cases when value of θ is (i) 0^0, (ii) 180^0 and (iii) 90^0. 3

17. (i) Briefly explain the walking of a man.

(ii) A constant retarding force of 50N is applied to a body of mass 20kg moving initially with a speed of 15m/s. How long does the body take to stop?

OR

Two bodies of masses 10kg and 20kg respectively kept on a smooth, horizontal surface and tied to the ends of a light string. A horizontal force F = 600N is applied to (i) A, (ii) B along he direction of string. What is the tension in the string in each case? 3

18. Explain why: 3

(a) A horse cannot pull a cart and run in empty space.

(b) Passengers are thrown forward from their seats when a speeding bus stops suddenly.

(c) A cricketer moves his hands backwards while holding a catch.

19. Consider a simple pendulum, having a bob attached to a string that oscillates under the action of force of gravity. Suppose that the period of oscillation of the simple pendulum depends on (i) mass m of the bob, (ii) length l of the pendulum and (iii) acceleration due to gravity g at the place. Derive the expression for its time period using method of dimensions. 3

20. Mohinder Singh lived on the first floor flat of a four storey building. One day only Mohinder Singh and his aged grandmother were at home and other family members are gone out of station due to some family reason. Suddenly Mohinder observed that there is dense smoke all around his flat. Soon he observed flames of fire coming from the neighbouring flat in the same building. There was a lot of hue and cry in the building and people were panicked. Each one wants to leave the building. There was a huge rush in the staircase. Mohinder could escape easily but he thought about how to save her aged and weak grandmother.

Mohinder got an idea. He used a turban cloth and suspended it downward from the balcony of his flat and asked a person standing on ground to hold the other end of turban cloth. Now he asked his grandmother to gently sit on the turban cloth. She hesitated but after persuation sat on the suspended piece of turban cloth. She comfortably reached the ground and the turban cloth remained intact.

(a) What value and qualities were exhibited by Mohinder Singh?
(b) What is the principle in your opinion which was employed by Mohinder Singh?
(c) What will be the tension of a cord / piece of cloth inclined at an angle 30^0 from horizontal when a person of mass 40kg falls through it with an acceleration $2m/s^2$? 4

21. A body is projected with velocity u at an angle θ upward from horizontal. Prove that the trajectory is parabolic. Deduce expression for :
(i) Horizontal range
(ii) Maximum height attained

OR

Define the term relative velocity. Derive an expression for the relative velocity of one body with respect to the other, when (i) both of them are in motion in same direction, They are moving in mutually opposite directions. 5

22. What is the need of banking of the road? Obtain an expression for the maximum speed with which a vehicle can safely negotiate a curved road banked at an angle θ. The coefficient of friction between the wheel and the road is μ. Hence write expression for optimum speed.

OR

Distinguish between static friction, limiting friction and kinetic friction. How do they vary with the applied force. Explain by a diagram. 5

23. A electron travelling with the speed of $5 \times 10^3 m/s$ passes through an electric field with an acceleration of $10^{12} m/s^2$.(i) How long will it take for the electron to double its speed? (ii) What will be the distance covered by the electron in this time?

OR

A ball is thrown vertically upwards with a velocity of 20m/s from the top of the multistoreyed building. The height of the point from where the ball is thrown is 25m above the ground. (i) How high will the ball rise and (ii) How long will it be before the ball hits the ground? 5