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INDIAN SCHOOL SOHAR

TERM-1 EXAMINATION (2017-18)

Date: 19-09-2017 Time allowed: 3 hours

CLASS: XI Physics (Theory) Maximum Marks: 70

General Instructions:

(i) All questions are compulsory.

(ii) There are 26 questions in total. Questions 1 to 5 are very short answer type questions and carry **one** mark each.

(iii) Questions 6 to 10 carry **two** marks each, questions 11 to 22 carry **three** marks each and questions 24 to 26 carry **five** marks each.

(iv) There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks each. You have to attempt only one of the choices in such questions.

(v) Question 23 is a **value based question** carrying **four** marks.

(vi) Use of calculator is not permitted. However, you may use log tables if necessary.

Section A (1 mark)

1. The displacement time graphs for two particles A and B are straight lines inclined at angles of 30° and 45° respectively with the time axis. What is the ratio of the velocities v_A: v_B.
2. Which of the following measurement is more accurate and why?

   (i) 500.0 cm (ii) 0.0005 cm (iii) 6.00 cm.
3. State the triangle law of vector addition.
4. Define 1 parsec.
5. A light body and a heavy body have the same momentum, which one will have greater kinetic energy?

Section B (2 marks)

6. Why do we need Quantum theory in physics?
7. Force (F) and density (d) are related as F= $\frac{a}{b+\sqrt{d}}$ Find out the dimensions of a and b
8. A ball is thrown vertically up with a velocity of 20 ms^{-1} . Construct acceleration – time and displacement -- time graph.
9. (a) Is uniform circular motion an example of uniform acceleration. Why?

   (b) Name the physical quantities which remain same in a uniform circular motion.

10. Why does a gun recoil? Derive the recoil velocity of a gun.

Section C (3 marks)

11. Show dimensionally that the frequency n of a transverse waves in a string of length l and mass per unit length m under a tension T is given by n = $\frac{K}{l}\sqrt{\frac{T}{m}}$; where K is a constant.

12. The position of a particle is given by $\vec{r} = 9t\hat{i} + 6t^2\hat{j} + 8\hat{k}$, where t is in seconds

    (i) Find velocity (v) and acceleration of the particle.

    (ii) Find the magnitude and direction of v at t=2s

13. Explain

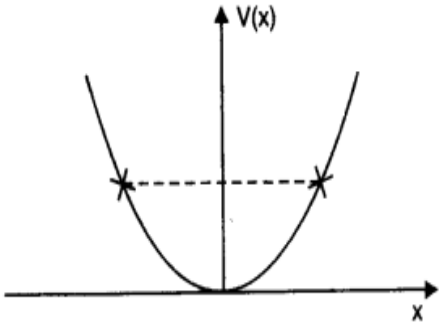
    (i) Why ball bearings are used in machinery?

    (ii) Why does a horse have to apply more force to start a cart than to keep it moving?

    (iii) What is the cause of friction?

14. What are the properties of conservative forces? Prove that gravitational force is a conservative force.

15.



The potential energy function for a particle executing the simple harmonic motion is given by $V = kx^2/2$, where k is the force constant of the oscillator. For $k = 0.5 Nm^{-1}$, the graph of V(x) verses x is shown in figure. Show that a particle of total energy 1J moving under this potential must turn back when it reaches $x = \pm 2m$.

16. A mass m moving with a speed u collides with a similar mass m at rest elastically and obliquely. Prove that they will move in directions making an angle 90^0 with each other.

17. Derive the equations of motion by calculus method

Or

Draw velocity time graph of uniformly accelerated motion in one dimension. Hence deduce the equations of motion

18. Derive the expression for the acceleration of a body of mass m moving with a uniform speed v in a circular path of radius r.

19. Prove that the path of the projectile is a parabola

20. Define the term 'work'. Give different physical situations when work can be zero, negative and positive

21. An electron and a proton are detected in a cosmic ray experiment, the first with kinetic energy 10KeV and the second with 100KeV. Which is faster, the electron or the proton? Obtain the ratio of their speeds ($m_e = 9.1 \times 10^{-31}$ kg, $m_p = 1.6 \times 10^{-27}$ kg)

22. If two resistances of values $R_1 = (2.0 \pm 0.1)\ \Omega$ and $R_2 = (12.3 \pm 0.2)\ \Omega$ are connected in parallel and in series, find the equivalent resistance in each case.

Section D (4 marks)

23. Suraj went to a mall to purchase certain goods .There he noticed an old lady struggling with her shopping. Immediately he showed her the lift and explained to her how it carries the load from one floor to the next. Even then the Old lady was not convinced. Then Suraj took her in the lift and showed her how to operate it. That old lady was very happy.

    a) What values does Suraj possess?

    b) A man of mass 80 kg stands on a weighing machine in a lift which is moving

        (i) Upwards with uniform speed of 10 m/s.

        (ii) downwards with a uniform acceleration of 5 m/s^2

        (iii) Upwards with a uniform acceleration of 5 m/s^2. What would be the reading on the scale in each case? (Take g= 10 m/s^2)

Section E (5 marks)

24. a). A body starts accelerating uniformly with acceleration 'a' with initial velocity 'u' and travels in a straight line. Derive an equation for the distance covered by it in n th second of its motion.

    (b) A ball is dropped from the roof of a tower of height h. The total distance covered by it in the last second of its motion is equal to the distance covered by in its first three seconds, what is the value of h.

OR

(a) A body is projected at an angle θ with the horizontal with velocity 'u'. Derive an expression for its (i) Time of flight (ii) Horizontal range.

(b) Show that there are two angles of projection for which the horizontal range is same.

25. What is meant by banking of road? What is the need of banking? 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 wheels and the road is μ_s.

OR

(a) What do you mean by impulse of force? Show that impulse of a force is equal to the change in momentum produced by the force.

(b) A ball of mass 200 g hits a wall at an angle of 45^0 with a velocity of 15 m/s. If the ball rebounds at 90^0 to the direction of incidence, calculate the impulse received by the ball.

26. a) Define elastic and inelastic collision.

b). Derive the expression for the energy loss in completely inelastic collision.

c). Show that in case of one dimensional elastic collision of two bodies of mass m_1 and m_2 (initially at rest), if $m_2 >> m_1$, the heavier mass m_2 will be undisturbed while the lighter mass reverses its velocity.

OR

(a) An elastic spring of force constant K is stretched by an amount x. Obtain an expression for the potential energy stored in it.

(b) Plot spring force F_s versus x graph and show that area under the graph gives the work done by the spring force. Also draw the potential and kinetic energy versus displacement 'x' curve which are complementary.