BVN

Name __Jatin Soney__ Class & Section __XI -A__ Roll No. __21.__

FIRST TERMINAL EXAMINATION–2014-2015
Class–XI
Subject–Physics

Time Allowed : 3 Hrs. M.M. : 70

**Please Check the Total Marks**

Do not write any answers on the questions paper. Check the total marks.

INSTRUCTIONS :

1. All questions are compulsory. However, some internal choices have been provided in some of the questions.

2. Q1 to 5 are 1 mark.

3. Q6 to 10 are of 2 mark.

4. Q11 to 22 are of 3 marks.

5. Q23 is of 4 marks.

6. Q24 to 26 are of 5 marks.

7. Use of calculator is not allowed. Log and trigonometric tables can however be used if necessary.

1. Write the dimensions of (i) universal gravitational constant (G) and (ii) Plank's constant (h). (1)

2. A body starting from rest accelerates uniformly. Acceleration time graph for the body is shown. Find the velocity of the body at the end of 5 seconds. (1)
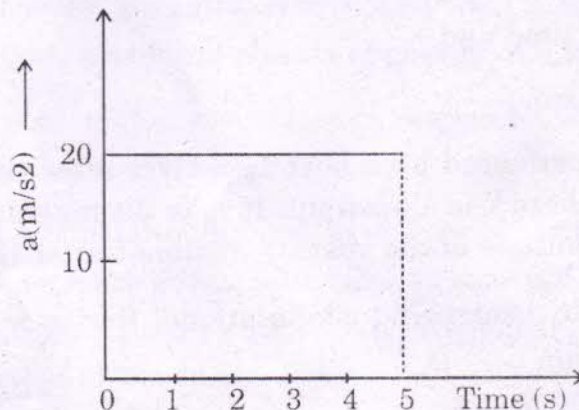

3. A vector is given by $\vec{A} = \hat{i} + \sqrt{2}\hat{j} + \hat{k}$ Find its unit vector. (1)

4. State work energy principle for variable force. (1)

5. For a given mass and size, moment of inertia of a solid disc is smaller than that of a ring. Why ? (1)

6. Force (F) and desity (d) are related as $F = a/(b + \sqrt{d})$ where a and b are constants. Find the dimensions of a and b. (2)

7. Plot velocity time graph for a body in uniformly accelerated motion. Derive 2nd equation of motion from this graph. (2)

8. Why propeller driven aero planes fly at lower altitude while jet planes fly at very high altitude ? (2)

9. A truck and a car moving with same kinetic energy are brought to rest by the application of the brakes which provide equal retarding force. Which of the two come to rest in shorter distance ? (2)

OR

Two bodies of masses m_1 and m_2 have equal kinetic energies. What is the ratio of their linear momenutum ? (2)

10. How can you distinguish between a raw and hard boiled egg by spinning each on the table top ? (2)

11. (a) Explain how parallax method can be used to find the distance of a far away star. Why this method is not suitable for stars more than 100 light years away ? (3)

    (b) How random errors are minimized ? (3)

12. A ball is dropped from a height. Taking downward direction as positive, plot graphs to show variation of

    (i) Acceleration with time

    (ii) Velocity with time and

    (iii) Position with time

13. The acceleration experienced by a boat in a river after the engine is cut off is given by $a = -kv^3$, where k is a constant. If v_0 is the magnitude of the velocity at cut-off, find the magnitude of the velocity at time t after the cut-off. (3)

14. What do you mean by centripetal acceleration ? Derive an expression for it by using suitable diagram. (3)

15. Resolve the vectors into their rectangular components and write the resultant of the vectors in terms of special unit vectors. (3)
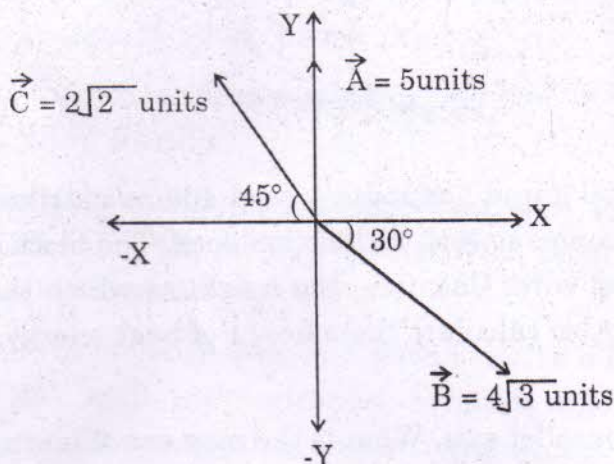
16. Give reason for the following :

    (i) Fruits and leaves fall down when branches are shaken.

    (ii) Apparent weight of a man decreases when lift accelerates downwards.

   (iii) Spikes and studs are used in the shoes of athletes. (3)

17. A block of mass 50g when places on an incline of angle 15°, slides down without acceleration. What would be the acceleration of the block if the angle of the incline is increased to 30° ? Take g = 10m/s². (3)

18. (a) The total work done by a body when it is moved over a closed path is zero. What is the nature of force experienced by the body ? Mention two other important properties of that type of force.

    (b) A body kept at height 'h' is dropped. Plot a graph showing the variation of kinetic energy, potential energy and total mechanical energy of the body with height, assuming no loss of energy due to friction. (1.5+1.5=3)

19. (a) Define coefficient of restitution in respect to collision. What is its value for perfectly elastic collision ?

    (b) The bob A of pendulum is released from 30° to the vertical hits another bob of the same mass at rest on a table as shown. How high does the bob A rise after collision ? Justify your answer. Neglect the size of the bobs and assume the collision to be elastic. (1.5+1.5=3)
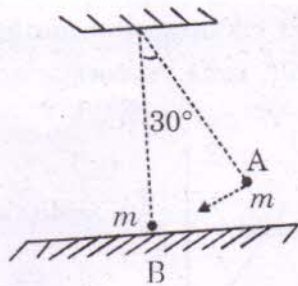
20. A bullet of mass 50 g and horizontal speed 400 m/s strikes a block of mass 4.95 kg and instantly comes to rest within the block. The block is suspended from the ceiling with strong wire. Calculate the height to which the block rises on being hit by the bullet. Also calculate the amount of heat energy produced Take g = 10 m/s². (3)

21. State theorem of parallel axis. What is the moment of inertia of a uniform circular disc of radius R and mass M about a tangent in the plane of the disc ? (3)

22. A metal bar 70 cm long and 4 kg is mass supported on two knife edges placed 10cm from each end. A 6 kg load is suspended at 30cm from one end. Find the reactions at the knife-edges. (Assume the bar to be of uniform cross section and homogeneous). g=10m/s².

OR

From a square of uniform desity, a portion is removed as shown. (shaded partion) Find the centre of mass of the remaining portion if the side of the square is 'a'. Assume the left corner of the square is lying at origin. (3)
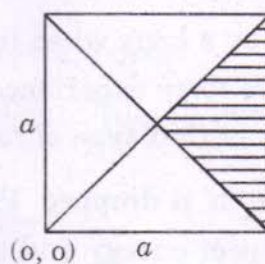
23. Priya had gone to village after appearing for her class XII board to visit her uncle and aunty. One morning, she was enjoying nature while walking through a large mango orchard. She saw two young boys of the village play with what looked like a real rifle. Suddenly one of the boys picked up the rifle to his shoulder and fired. As the bullet left the rifle, the boy was hurled back to the ground. She rushed to the boy even as the other boy ran away. She found out that the boy has hurt his shoulder, which may be fractured. She helped the boy to the village health center. remembering to collect the rifle as well. She then informed her uncle about the incident who contacted the boy's father and returned the rifle.

(i) Write two moral values displayed by Priya during this incident.

(ii) Why was the boy hurled to the ground when he fired the rifle ? What was his mistake, due to which he got injured ? (2+2=4)

24. (a) A stone is thrown vertically upwards and then it returns to the thrower. Is it a projectile ? Justify.

(b) Prove that the maximum horizontal range is four times the maximum height attained by the projectile, when fired at an inclination so as to have maximum horizontal range.

(c) A projectile of mass m is thrown with velocity u from the ground with an angle of 45° with the horizontal. What is the magitude of change in momentum between leaving and arriving at the ground ? (1+2+2=5)

OR

Path of an object moving on a plane is shown.
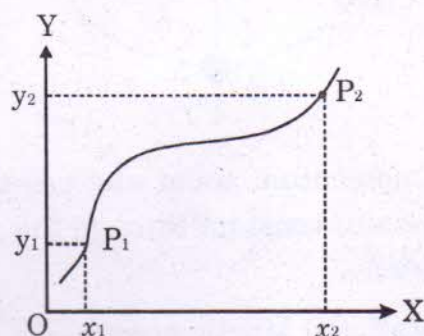
Draw

(i) Position vectors for the points P_1 and P_2.

(ii) Velocity vectors for the positions P_1 and P_2.

(iii) Displacement vector and change in velocity vector between P_1 and P_2.

Write expressions for position vectors and displacement vector in terms of rectangular components. (1+1+1+1+2=5)

25. (a) Find expression for the velocity of a block attached with a spring at the mean position, when it is released from the extreme position.

(b) Two springs A and B are identical except that A is stiffer than B, i.e. force constant of A> force constant of B. In which spring more work is done if they are stretched by same force ?

(c) Sketch a graph showing the variation of restoring force with displacement of a block of mass m attached with a spring. Name the two physical quantities that can be found from the graph. (1.5+1.5+2=5)

A bob of mass m is suspended by a light string of length L. It is imparted a velocity V_0 at the lowest point 'A' such that it completes a semi circular trajectory in the vertical plane with the string becoming slack only on reaching the top most point C. Obtain an expression for velocity at the highest point and lowest point which will ensure completion of the verticle circle. Find also the minimum tension at point A. (5)
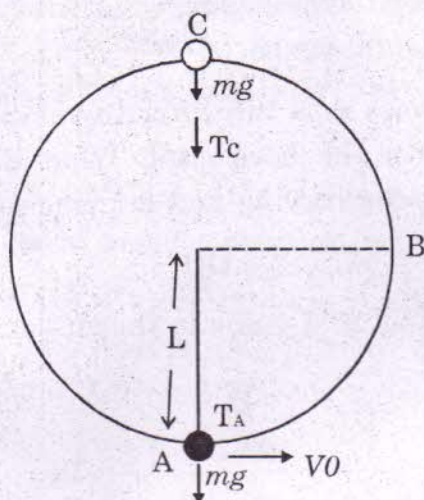
26. Show that the angular momentum about any point of a single particle moving with constant velocity remains constant through the motion. Is there any external torque acting on the particle? (3+2=5)

Derive expression for rotational kinetic energy of a rigid body.

OR

(a) A man climbs a tall, old step ladder that has a tendency to sway. He feels much more unstable when standing near the top than when near the bottom. Why ?

(b) Two circular discs A and B of the same mass and same thickness are made of two different metals whose densities are d_A and d_B ($d_A > d_B$). Their moments of inertia about the axes passing through their centres of gravity and perpendicular to their planes are I_A and I_B. Which is greater; I_A or I_B?

(c) A stick of length L has half the portion made of wood and the other half of steel. It is pivoted at the wooden end and a force is applied at the steel end at right angles to its length. Next, it is pivoted at the steel end and the same force is applied at the wooden end. In which case is the angular acceleration more and why ? (1+2+2=5)