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Holiday Homework

Class: XI **Subject: Physics**

Instructions:

a) Write all the answers in class work.

b) Refer class work, textbook and physics materials sent to the tabs to solve the questions.

1. Why can speed of a particle not be negative?
2. Is it possible in straight line motion a particle has zero speed and a non-zero velocity?
3. Suggest a situation in which an object is accelerated and have constant speed.
4. Two balls of different masses are thrown vertically upward with same initial velocity. Maximum heights attained by them are h1 and h2 respectively what is h 1/h2?
5. A car moving with velocity of 50 km/h on a straight road is ahead of a jeep moving with velocity 75 km/h. How would the relative velocity be altered if jeep is ahead of car?
6. What will be the effect on horizontal range of a projectile when its initial velocity is doubled keeping angle of projection same?
7. The greatest height to which a man can throw a stone is h. What will be the greatest distance upto which he can throw the stone?
8. A person sitting in a train moving at constant velocity throws a ball vertically upwards. How will the ball appear to move to an observer? (i) Sitting inside the train (ii) Standing outside the train
9. A gunman always keeps his gun slightly tilted above the line of sight while shooting. Why?
10. For an object projected upward with a velocity Vo, which comes back to the same point after some time, draw (i) Acceleration-time graph (ii) Position-time graph (iii) Velocity-time graph.
11. The V-t graphs of two objects make angle 30° and 60° with the time axis. Find the ratio of their accelerations.
12. On a 60 km straight road, a bus travels the first 30 km with a uniform speed of 30 km/h. How fast must the bus travel the next 30 km so as to have average speed of 40 km/h for the entire trip?

13. The displacement x of a particle varies with time as $x = 4t^2 – 15t + 25$. Find the position, velocity and acceleration of the particle at t = 0.

14. A driver takes 0.20 second to apply the brakes (reaction time). If he is driving car at a speed of 54 km/h and the breaks cause a deceleration of 6.0 m/s^2. Find the distance travelled by car after he sees the need to put the brakes.

15. A body covers 12 m in 2nd second and 20 m in 4th second. How much distance will it cover in 4 seconds after the 5th second?

16. A ball thrown vertically upwards with a speed of 19.6 m/s from the top of a tower returns to the earth in 6s. Find the height of the tower ($g = 9.8$ m/s^2)

17. Two towns A and B are connected by a regular bus service with a bus leaving in either direction every T min. A man cycling with a speed of 20km/h in the direction A to B notices that a bus goes past him every 18min in the direction of his motion, and every 6 min in the opposite direction. What is the period T of the bus service and with what speed do the buses ply of the road?

18. A motorboat is racing towards north at 25 km/h and the water current in that region is 10 km/h in the direction of 60° east of south. Find the resultant velocity of the boat.

19. An aircraft is flying at a height of 3400 m above the ground. If the angle subtended at a ground observation point by the aircraft position 10 second apart is 30°, what is the speed of the aircraft?

20. A stone tied to the end of a string 80 cm long is whirled in a horizontal circle with a constant speed. If the stone makes 14 revolutions in 25 seconds, what is the magnitude and direction of acceleration of the stone?

21. A cyclist is riding with a speed of 27 km/h. As he approaches a circular turn on the road of radius 30 m, he applies brakes and reduces his speed at the constant rate 0.5 m/s^2. What is the magnitude and direction of the net acceleration of the cyclist on the circular turn?

22. Briefly explain different types of systematic errors.

23. A point object is thrown vertically upward at such a speed that it returns to the thrower after 6s. With what speed was it thrown up and how high did it rise? Plot speed-time graph for the object and use it to find the distance travelled by it in the last second of its journey. Take g = 10 m/s.

24. State parallelogram law of vector addition. Find analytically the magnitude and direction of the resultant of two vectors inclined at an angle.

25. State the laws of conservation of linear momentum. Prove it by using the second law of motion. Give two situations where linear momentum remains conserved.

26. A man getting out of a moving bus runs in the same direction for a certain distance. Comment.

27. A particle of mass 0.3 kg is subjected to a force of F = -kx with k = 15 N/m. What will be its initial acceleration if it is released from a point 20 cm away from the origin?

28. A 50 g bullet is fired from a 10 kg gun with a speed of 500 m/s. What is the speed of the recoil of the gun?

29. A spring balance is attached to the ceiling of a lift. When the lift is at rest spring balance reads 49 N of a body hang on it. If the lift moves:- (i) Downward (ii) upward, with an acceleration of 5 m/s (iii) with a constant velocity.

30. What will be the reading of the balance in each case? (24N, 74 N, 49N)

31. It is easier to pull a roller than to push it. Why?

32. A horse cannot pull a cart and run in empty space. Why?

33. A block of mass 500g is at rest on a horizontal table. What steady force is required to give the block a velocity of 200 cm/s in 4 s?

34. Calculate the force required to move a train of 200 quintal up on an incline plane of 1 in 50 with an acceleration of 2 m/s^2. The force of friction per quintal is 0.5 N.

35. A mass less pan is placed on an elastic spring. Spring is compressed by 0.01 m when a sand bag of mass 0.1 kg is dropped on it from a height 0.24 m. From what height should the sand bag be dropped to cause a compression of 0.04 m?

36. Show that in a head on collision between two balls of equal masses moving along a straight line the balls exchange their velocities.

37. Show that at any instant of time during the motion total mechanical energy of a freely falling body remains constant. Show graphically the variation of K.E. and P.E. during the motion.

38. In lifting a 10 kg weight to a height of 2m, 230J energy is spent. Calculate the acceleration with which it was raised?

39. A bullet of mass 0.02 kg is moving with a speed of 10m/s. It can penetrate 10 cm of a wooden block, and comes to rest. If the thickness of the target would be 6 cm only find the KE of the bullet when it comes out.

40. A ball bounces to 80% of its original height. Calculate the mechanical energy lost in each bounce.

41. A pendulum bob of mass 0.1 kg is suspended by a string of 1 m long. The bob is displaced so that the string becomes horizontal and released. Find its kinetic energy when the string makes an angle of (i) 0°, (ii) 30° with the vertical.

42. Prove that the rate of change of angular momentum of a system of particles about a reference point is equal to the net torque acting on the system.

43. Derive a relation between angular momentum, moment of inertia and angular velocity of a rigid body.

44. Three masses 3 kg, 4 kg and 5 kg are located at the corners of an equilateral triangle of side 1m. Locate the centre of mass of the system

45. The angular speed of a motor wheel is increased from 1200 rpm to 3120 rpm in 16 seconds. (i) What is its angular acceleration (assume the acceleration to be uniform) (ii) How many revolutions does the wheel make during this time?

46. A metre stick is balanced on a knife edge at its centre. When two coins, each of mass 5 g are put one on top of the other at the 12.0 cm mark, the stick is found to be balanced at 45.0 cm, what is the mass of the metre stick?

47. An automobile moves on a road with a speed of 54 km/h. The radius of its wheels is 0.35 m. What is the average negative torque transmitted by its brakes to a wheel if the vehicle is brought to rest in 15s? The moment of inertia of the wheel about the axis of rotation is 3 kg m^2.

48. Two bodies of masses 1kg and 2 kg are located at (1, 2) and (-1, 3) respectively. Calculate the coordinates to the centre of mass.

49. What is the analogue of mass in rotational motion? Derive the expression for the kinetic energy of a rotating body.

50. Derive the relation between linear velocity and angular velocity? Explain the examples of law of conservation of momentum.
