



INDIAN SCHOOL SOHAR  
TERM I EXAMINATION (2019-20)  
PHYSICS – THEORY

No. of printed pages: 4

CLASS: XI  
DATE: 24/9/2019

MAXIMUM MARKS: 70  
DURATION: 3Hrs

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**General Instructions:**

1. All questions are compulsory.
  2. There are 37 questions in all. Questions 1 to 20 carry one mark each, questions 21 to 27 carry two marks each, questions 28 to 34 carry three marks each, questions 35 to 37 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.
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**MULTIPLE CHOICE QUESTIONS:**(1 mark each)

1. The sum of numbers 436.32, 227.2 and 0.301 in appropriate significant figures is  
(a) 663.821 (b) 664  
(c) 663.8 (d) 663.82
2. The displacement of a particle is given by  $x = (t-2)^2$  here x is in meters and t is in seconds. The distance covered by the particle in first 4 seconds is  
(a) 4 m (b) 8 m  
(c) 12 m (d) 16 m
3. Five equal forces of 10 N each are applied at a point and are all lying in one plane. If the angle between them are equal, the resultant of these forces will be  
(a) zero (b) 10 N  
(c) 20 N (d)  $10\sqrt{2}$  N
4. A body of mass "m" collides against a wall with the velocity "v" and rebounds with the same speed. Its change of momentum is:  
(a) - 2mv (b) mv  
(c) - mv (d) zero
5. Which of the following is not conserved in an inelastic collision?  
(a) momentum (b) kinetic energy  
(c) both momentum and kinetic energy (d) neither momentum nor kinetic energy
6. The length of a rod is  $(11.05 \pm 0.05)$  cm. What is the total length of 2 such rods?  
(a)  $(22.1 \pm 0.05)$  cm (b)  $(22.10 \pm 0.05)$  cm  
(c)  $(22.1 \pm 0.11)$  cm (d)  $(22.1 \pm 0.10)$  cm
7. In an elevator moving vertically up with an acceleration "g", the force exerted on the floor by a passenger of mass M is  
(a) Mg (b)  $\frac{1}{2}$  Mg  
(c) zero (d) 2 Mg

8. A ball of mass “m” moving with a velocity “v” collides with an identical ball at rest. After collision, the first ball comes to rest. The speed of the other ball is

- (a)  $v/2$  (b)  $2v$   
(c)  $v$  (d) zero

9. Action and reaction

- (a) act on two different objects (b) have opposite directions  
(c) occur one after the other (d) has a nonzero resultant

10. Which of the following represents the correct dimensions of torque

- (a)  $ML^2T^2$  (b)  $ML^{-2}T^2$   
(c)  $ML^2T^{-2}$  (d)  $ML^2T^1$

**COMPLETION TYPE QUESTIONS:(1 mark each)**

11. Dimensional formula of gravitational constant is -----

12. Domain that deals with macroscopic phenomenon is known as-----

13. Distance is always greater than or ----- to displacement of moving body in a given time interval.

14. For finite change in linear momentum in short interval of time force acting on a body is inversely proportional to-----.

**MATCH THE SCIENTIST NAME AGAINST THEIR DISCOVERY:(1 mark each)**

- 15.(i)Rutherford (a) Quantum model of hydrogen atom  
16.(ii)Chadwick (b) Nuclear model of the atom  
(c) Theory of relativity  
(d) Neutron

**TRUE/FALSE TYPE QUESTIONS:( 1 mark each)**

17.When work done by a force is independent of the path of motion of the body displaced, then the force applied is a conservative force.

18.When weight of the body doubles the coefficient of friction also doubles.

**ASSERTION AND REASONING:(1 mark each)**

In the following questions a statement of assertion is followed by a statement of reason. Mark the correct choice as:

- (a) If both assertion and reason are true and reason is correct explanation of assertion.  
(b) If both assertion and reason are true but reason is not correct explanation of assertion.  
(c) If assertion is true reason is false.  
(d) If both assertion and reason are false.

19. **Assertion:** The average speed of an object is greater than or equal to the magnitude of the average velocity over a given time interval.

**Reason:** The two are equal only if the path length is equal to the magnitude of the displacement.

20. **Assertion:** If unbalanced external force acting on a body is zero, its acceleration is zero.

**Reason :** This is simple form of Newton's second law of motion.

**SHORT ANSWER TYPE QUESTIONS:** (2 mark each)

21. Derive instantaneous velocity  $\mathbf{v}$  in its component form. Hence write the expression for its magnitude.

22. Define percentage error. The error in the measurement of radius of sphere is 2%. What would be the error in the volume of the sphere?

23. Define scalar product of two vectors. Give its geometrical interpretation with the help of diagram.

24. The length of a steel wire increases by 0.5 cm when it is loaded with a weight of 5 kg. Calculate (i) force constant of the wire (ii) work done in stretching the wire.

25. Derive an expression for the path of a projectile motion with the help of a diagram.

**OR**

25. Derive an expression for the range of a projectile. Hence find the expression for the maximum range.

26. If the linear momentum of the body increases by 20%, what is the % increase in kinetic energy of the body?

27. Derive an expression of law of cosines for two vectors **A** and **B**.

**OR**

27. Show with the help of diagram that the resultant of two vectors by using triangle law and parallelogram law of vector addition are equal vectors.

**SHORT ANSWER TYPE QUESTIONS:** ( three marks each)

28. State the law of static friction. A body is rolled on ice with a velocity of 8m/s comes to rest after travelling 4m. Compute the coefficient of friction. Given  $g = 10\text{m/s}^2$ .

29. Define work done as a product of two vectors. Hence derive an expression for the work done by variable force with help of a graph.

**OR**

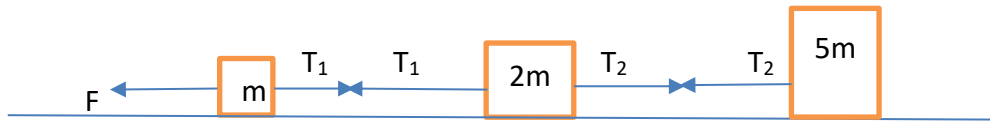
29. State the law of conservation of linear momentum. Derive it from Newton's second and third law of motion.

30. A ball is released from the top of a tower of height "h" metres. It takes "T" seconds to reach the ground. What is the position of the ball in "T/3" seconds?

31. The velocity of a body which has fallen freely under gravity varies as  $g^p h^q$ , where g is the acceleration due to gravity at the place and h is the height through which the body has fallen. Determine the value of q and p.

32. Write an expression for the position of centre of mass of n-particle system along x,y,z axis. Derive an expression for the acceleration of centre of mass of a body.

33. As shown in the figure, three masses  $m$ ,  $3m$  and  $5m$  connected together lie on a frictionless horizontal surface and pulled to the left by a force  $F$ . The tension  $T_1$  in the first string is  $24\text{ N}$ . Find (i) acceleration of the system (ii) tension in the second string and (iii) force  $F$ .



34. Write an expression for average acceleration and instantaneous acceleration for a body moving in x-y plane. Find the direction of instantaneous acceleration with the help of graphs.

**OR**

34. Show that the scalar product of two similar unit vectors is unity. Show diagrammatically that the scalar product of **A** and **B** is commutative.

**LONG ANSWER TYPE QUESTIONS:**(5 marks each)

35. (a) Derive an expression of centripetal acceleration.

(b) A body of mass  $0.4\text{ kg}$  is whirled in a horizontal circle of radius  $2\text{ m}$  with a constant speed of  $10\text{ m/s}$ . Calculate its (i) angular speed (ii) frequency of revolution (iii) time period (iv) centripetal acceleration.

**OR**

35. (a) Derive the equations of motion for uniformly accelerated motion from velocity time-graph.

(i)  $v = u + at$  (ii)  $s = ut + \frac{1}{2} at^2$ .

(b) A body starting from rest accelerates uniformly along a straight line at the rate of  $10\text{ m/s}^2$  for 5 seconds. It moves for two seconds with uniform velocity of  $50\text{ m/s}$ . Then it retards uniformly and comes to rest in 3 seconds. Draw velocity-time graph of the body and find the total distance travelled by the body.

36. (a) Derive an expression for maximum velocity of a body on a levelled road.

(b) A bullet fired at an angle of  $60^\circ$  with the vertical hits the ground at a distance of  $2\text{ km}$ . Calculate the distance at which the bullet will hit the ground when fired at an angle of  $45^\circ$ , assuming the speed to be the same.

**OR**

36.(a) Find an expression for the speed of a block attached to a spring when stretched and released at (i) any intermediate position (ii) the mean position.

(b) Mention the expressions for conservation of linear momentum and kinetic energy for a two dimensional elastic collision in the x-y plane when one body collides another body at rest.

37.(a) Derive an expression for the loss of kinetic energy for a completely inelastic collision in one dimension.

(b) Two billiard balls are rolling on a flat table. One has the velocity components  $v_x = 1\text{ m/s}$ ,  $v_y = \sqrt{3}\text{ m/s}$  and the other end has components  $v'_x = 2\text{ m/s}$  and  $v'_y = 2\text{ m/s}$ . If both the balls start moving from the same point, what is the angle between their paths?

**OR**

37.(a) Derive an expression for the maximum speed of a body on the banked road.

(b) A cyclist speeding at  $18\text{ km/h}$  on a level road takes a sharp circular turn of radius  $3\text{ m}$  without reducing the speed and without bending towards the centre of the circular path. The coefficient of static friction between the tyres and the road is  $0.1$ . Will the cyclist slip while taking the turn.