



PHYSICS

BOOKS - BINA LIBRARY PHYSICS (ASSAMESE ENGLISH)

KINEMATICS-II

Example

1. A cyclist is with a speed of 8m/s . As he approaches a circular turn on road of radius

80m, he applies break and the speed is reduced at the rate of 0.5 m/s every second. What is the magnitude and direction of net acceleration of the cyclist on the turn?



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Exercise

1. What is the basic different between a vector and a scalar?



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2. What is a null vector? Define a unit vector.



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3. State triangle law of addition of vectors.



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4. What is a projectile?



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5. What do you mean by time of flight in projectile?



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6. What is the velocity of a projectile at the highest point?



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7. What do you mean by horizontal range of a projectile?



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8. In uniform circular motion which physical quantities remain constant?

A. velocity

B. acceleration

C. momentum

D. speed

Answer:



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9. What is the direction of acceleration of a body moving in a curved path with a constant speed?



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10. Can a particle accelerate if its speed is constant?



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11. Can a particle accelerate when its velocity is constant?



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12. Is it possible for a body to move in a curved path without being accelerated?



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13. Show that the trajectory of projectile is parabolic.



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14. Find an expression for maximum vertical height of an inclined projectile.



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15. Show that the linear speed of a particle rotating along a circular path is r times the angular speed of the particle.



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16. Why is a body moving in uniform circular motion accelerated?



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17. What are radial and tangential acceleration of a body moving in a uniform circular motion?



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18. Obtain an equation of a body moving in two dimensions.



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19. Find an expression for the horizontal range of an inclined projectile.



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20. A projectile is thrown upward with a velocity of V , in a direction making an angle Θ with the horizontal. Derive the equation of its trajectory.



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21. Find the range of projectile. At what elevation angle the range will be maximum?



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22. Show that the path of the body projected in a horizontal direction from a height is a parabola.



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23. Find the path of projectile, time of flight, horizontal range and maximum height, when a projectile is projected with velocity v making an angle Θ with the vertical direction.



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24. What is centripetal acceleration? Find its magnitude and direction in case of circular uniform motion.



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25. Is it possible that the velocity of a particle changes in magnitude and direction though the acceleration acting on it is constant in magnitude and direction?



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26. Can there be motion in two dimensions with an acceleration in only one dimension?



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27. Is the rocket in flight an example of a projectile?



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28. At what point of the projectile path the speed become maximum and minimum?



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29. Why does the direction of a projectile become horizontal at the highest point of its trajectory?



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30. Explain why a body dropped from rest and another projected horizontally from the same height strike the ground at the same time.



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31. Can an object be accelerated without speeding up and slowing down?



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32. Can a body have a constant speed and still have a varying velocity?



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33. Can a body have a constant speed and still have a varying velocity?



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34. What is the angle between velocity and acceleration vector in a circular motion?



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35. Can momentum of a system be changed without changing its K.E.?



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36. Explain why a particle moving with a constant speed along a circular path has radial acceleration.



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37. Can a body with uniform acceleration always move in straight line?



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38. A body projected with a velocity 25m/s just clears a wall 5m high after 2 seconds. Find the angle of projection and maximum height reached by the body.



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39. An aeroplane is flying in a horizontal direction with a velocity of 360kmh^{-1} at a height of 490m . How far from a given target

should it release a bomb so as to hit the target?



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40. A particle is projected with a velocity of 40ms^{-1} . After two seconds, it crosses a vertical pole of height 20.4m. Calculate the angle of projection.



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41. Find the angle of projection so that a body when projected has the horizontal range equal to the maximum height attained.



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42. An artificial satellite is orbiting around the earth with a speed of 4 km s^{-1} at a distance of 10^4 km from the earth. Calculate the centripetal acceleration.



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43. A bomber plane is moving horizontally with a speed of 500ms^{-1} and a bomb released from it strikes the ground in 10s. The angle it strikes the ground is

A. $\tan^{-1} 5$

B. $\tan^{-1} 1$

C. $\tan^{-1} \left(\frac{1}{5} \right)$

D. $\sin^{-1} \left(\frac{1}{5} \right)$

Answer:



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44. The height and horizontal distance of a projectile are $y=8t - 5t^2$ m and $x=6t$ m. its projection velocity is

A. 8m/s

B. 6m/s

C. 10m/s

D. not obtainable

Answer:



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45. A particle moves in a plane with a constant acceleration in a direction different from initial velocity. The path of the particle is

- A. straight line
- B. arc of a circle
- C. parabola
- D. ellipse

Answer:



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46. When a body moves with constant speed along a circle

- A. Its velocity remains constant
- B. no force acts on it
- C. no work is done on it
- D. no acceleration is produced on it

Answer:



47. Which quantity is fixed on object on object which moves in a horizontal circle at constant speed

- A. velocity
- B. acceleration
- C. kinetic energy
- D. force

Answer:



48. A particle of mass m is moving in a circular path of radius r such that its centripetal acceleration is varying with time t as $a_c = k^2 r t^2$, where k is constant. The power delivered to the particle by the forces acting on it is

A. $2\pi m k^2 r^2 t$

B. $m k^2 r^2 t$

C. $(m k^4 r^2 t^5)/3$

D. zero

Answer:



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49. Which of the following is a vector?

A. work

B. mass

C. energy

D. momentum

Answer:



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50. Identify the vector quantity among the following:

A. heat

B. energy

C. angular momentum

D. distance

Answer:



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51. Which of the following is not a vector quantity?

- A. electric field
- B. velocity
- C. angular momentum
- D. electrostatic potential

Answer:



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52. Which of the following quantities is a scalar?

A. speed

B. velocity

C. torque

D. displacement

Answer:



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53. Identify the concept that represents a vector quantity.

A. electrostatic potential

B. gravitational potential

C. electric current

D. current density

Answer:



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54. During projectile motion the quantities that remain unchanged are

- A. force and vertical velocity
- B. acceleration and horizontal velocity
- C. kinetic energy and acceleration
- D. acceleration and momentum

Answer:



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55. The position of a particle moving in xy plane at time t is given by $x = (3t^2 - 6)$ and $y = (t^2 - 2t)$. Which one is correct statement for its motion?

A. velocity is zero at $t=0$

B. velocity is zero at $t=1s$.

C. acceleration is zero at $t = 0$

D. velocity and acceleration are never zero

Answer:



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