

I'm not robot!

- experience magnetic force due to the motion of the rod. Explain.
- (f) What is the restoring force on the rod when K is closed?
- (g) How much power is required by an external agent to keep the rod moving at the same speed ($v = 12 \text{ cm/s}$) when K is closed? How much power is required when K is open?
- (h) How much power is dissipated as heat in the closed circuit? What is the source of this power?
- (i) What is the induced emf in the moving rod if the magnetic field is parallel to the rails instead of being perpendicular?
- 6.15 An air-cored solenoid with length 30 cm, area of cross-section 25 cm^2 and number of turns 500, carries a current of 2.5 A. The current is suddenly switched off in a brief time of 10^{-4} s . How much is the average back emf induced across the ends of the open switch in the circuit? Ignore the variation in magnetic field near the ends of the solenoid.
- 6.16 (a) Obtain an expression for the mutual inductance between a long straight wire and a square loop of side a as shown in Fig. 6.21. (b) Now assume that the straight wire carries a current of 50 A and the loop is moved to the right with a constant velocity, $v = 10 \text{ m/s}$. Calculate the induced emf in the loop at the instant when $x = 0.2 \text{ m}$. Take $a = 0.1 \text{ m}$ and assume that the loop has a large resistance.

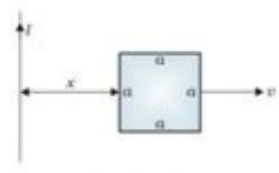


FIGURE 6.21

- 6.17 A line charge λ per unit length is lodged uniformly onto the rim of a wheel of mass M and radius R . The wheel has light non-conducting spokes and is free to rotate without friction about its axis (Fig. 6.22). A uniform magnetic field extends over a circular region within the rim. It is given by
- $$\mathbf{B} = -B_0 \hat{k} \quad \text{if } 0 \leq r \leq R$$
- $$= 0 \quad \text{(otherwise)}$$
- What is the angular velocity of the wheel after the field is suddenly switched off?

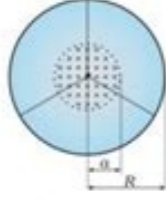
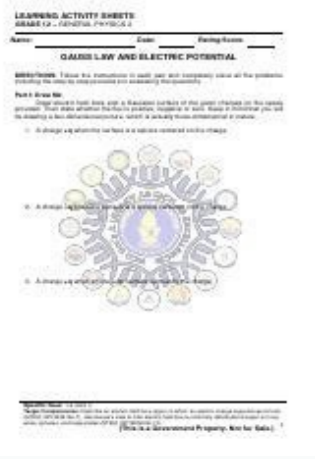


FIGURE 6.22



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1. A particle is moving along a circular path with a constant speed. The angular velocity is ω and the radius is r . The linear velocity is v . The centripetal acceleration is a_c . The angular acceleration is α . The tangential acceleration is a_t . The total acceleration is a .

2. A particle is moving along a circular path with a constant speed. The angular velocity is ω and the radius is r . The linear velocity is v . The centripetal acceleration is a_c . The angular acceleration is α . The tangential acceleration is a_t . The total acceleration is a .

3. A particle is moving along a circular path with a constant speed. The angular velocity is ω and the radius is r . The linear velocity is v . The centripetal acceleration is a_c . The angular acceleration is α . The tangential acceleration is a_t . The total acceleration is a .

4. A particle is moving along a circular path with a constant speed. The angular velocity is ω and the radius is r . The linear velocity is v . The centripetal acceleration is a_c . The angular acceleration is α . The tangential acceleration is a_t . The total acceleration is a .

5. A particle is moving along a circular path with a constant speed. The angular velocity is ω and the radius is r . The linear velocity is v . The centripetal acceleration is a_c . The angular acceleration is α . The tangential acceleration is a_t . The total acceleration is a .

6. A particle is moving along a circular path with a constant speed. The angular velocity is ω and the radius is r . The linear velocity is v . The centripetal acceleration is a_c . The angular acceleration is α . The tangential acceleration is a_t . The total acceleration is a .

11th Grade Midterm Workbook

- Which of the following is *not* an example of approximate simple harmonic motion?
 - a ball bouncing on the floor
 - a child swinging on a swing
 - a piano wire that has been struck
 - a car's radio antenna waving back and forth
- Vibration of an object about an equilibrium point is called simple harmonic motion when the restoring force is proportional to
 - time
 - displacement
 - a spring constant
 - mass
- Tripling the displacement from equilibrium of an object in simple harmonic motion will change the magnitude of the object's maximum acceleration by what factor?
 - one-third
 - 1
 - 3
 - 9
- A mass attached to a spring vibrates back and forth. At the equilibrium position, the
 - acceleration reaches a maximum
 - velocity reaches a maximum
 - net force reaches a maximum
 - velocity reaches zero
- A mass attached to a spring vibrates back and forth. At maximum displacement, the spring force and the
 - velocity reach a maximum
 - velocity reach zero
 - acceleration reach a maximum
 - acceleration reach zero
- A simple pendulum swings in simple harmonic motion. At maximum displacement,
 - the acceleration reaches a maximum
 - the velocity reaches a maximum
 - the acceleration reaches zero
 - the restoring force reaches zero
- A mass-spring system can oscillate with simple harmonic motion because a compressed or stretched spring has which kind of energy?
 - kinetic
 - mechanical
 - gravitational potential
 - elastic potential
- The angle between the string of a pendulum at its equilibrium position and at its maximum displacement is the pendulum's
 - period
 - frequency
 - vibration
 - amplitude
- For a mass hanging from a spring, the maximum displacement the spring is stretched or compressed from its equilibrium position is the system's
 - amplitude
 - period
 - frequency
 - acceleration
- A pendulum swings through a total of 28° . If the displacement is equal on each side of the equilibrium position, what is the amplitude of this vibration? (Disregard frictional forces acting on the pendulum.)
 - 28°
 - 14°
 - 56°
 - 7.0°
- A child on a playground swings through a total of 32° . If the displacement is equal on each side of the equilibrium position, what is the amplitude of this vibration? (Disregard frictional forces acting on the swing.)
 - 8.0°
 - 16°
 - 32°
 - 64°

Since the initial velocity is zero, the average velocity, \bar{v} is

$$\bar{v} = \frac{v_f}{2}$$

or

$$\bar{v} = \frac{v}{2}$$

The distance travelled by the ball before it hits the empty plastic bottle is given by the equation

$$d = \bar{v}t$$

where \bar{v} refers to the average velocity

$$d = \frac{v}{2}t$$

Let's put the equations together. Since $W = Fd$ and $F = \frac{mv}{t}$, we get

$$W = \frac{mv}{t}d$$

$$W = \frac{mv}{t} \left(\frac{1}{2}vt \right)$$

$$W = \frac{1}{2}mv^2$$

This shows that the work done in accelerating an object is equal to the kinetic energy gained by the object.

$$KE = \frac{1}{2}mv^2$$

From the equation, you can see that the kinetic energy of an object depends on its mass and velocity. What will happen to the KE of an object if its mass is doubled but the velocity remains the same? How about if the velocity is doubled but the mass remains the same?

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