

## Pg. 122

### ▶ *Practice*

#### Understanding Concepts

1. (a) What does “uniform” mean in the expression “uniform circular motion”?  
(b) Give some examples of uniform circular motion, other than those in the text.
2. How can a car moving at a constant speed be accelerating at the same time?

## Pg 123

### ▶ *Practice*

#### Understanding Concepts

3. A sports car moves through a horizontal circular arc at a constant speed.
  - (a) What is the direction of the instantaneous acceleration at every point in the arc?
  - (b) Draw a sketch showing the directions of the instantaneous velocity and instantaneous acceleration at two different positions.
4. If the direction of an object moving with uniform circular motion is reversed, what happens to the direction of the centripetal acceleration?

 **Practice****Understanding Concepts**

5. **Figure 6** shows a particle undergoing uniform circular motion at a speed of 4.0 m/s.
- State the direction of the velocity vector, the acceleration vector, and the radius vector at the instant shown.
  - Calculate the magnitude of the centripetal acceleration.
6. You are whirling a ball on the end of a string in a horizontal circle around your head. What is the effect on the magnitude of the centripetal acceleration of the ball if
- the speed of the ball remains constant, but the radius of the circle doubles?
  - the radius of the circle remains constant, but the speed doubles?
7. At a distance of 25 km from the eye of a hurricane, the wind is moving at 180 km/h in a circle. What is the magnitude of the centripetal acceleration, in metres per second squared, of the particles that make up the wind?
8. Calculate the magnitude of the centripetal acceleration in the following situations:
- An electron is moving around a nucleus with a speed of  $2.18 \times 10^6$  m/s. The diameter of the electron's orbit is  $1.06 \times 10^{-10}$  m.
  - A cowhand is about to lasso a calf with a rope that is undergoing uniform circular motion. The time for one complete revolution of the rope is 1.2 s. The end of the rope is 4.3 m from the centre of the circle.
  - A coin is placed flat on a vinyl record, turning at  $33\frac{1}{3}$  rpm. The coin is 13 cm from the centre of the record.
9. A ball on a string, moving in a horizontal circle of radius 2.0 m, undergoes a centripetal acceleration of magnitude  $15 \text{ m/s}^2$ . What is the speed of the ball?
10. Mercury orbits the Sun in an approximately circular path, at an average distance of  $5.79 \times 10^{10}$  m, with a centripetal acceleration of magnitude  $4.0 \times 10^{-2} \text{ m/s}^2$ . What is its period of revolution around the Sun, in seconds? in "Earth" days?

**Applying Inquiry Skills**

11. Graph the relationship between the magnitude of centripetal acceleration and
- the speed of an object in uniform circular motion (with a constant radius)
  - the radius of a circle (at a constant speed)
  - the radius of rotation (at a constant frequency)