Physics Tangential Speed Problems Chapter 10

$$V_t = r\omega \qquad \omega = \frac{\Delta\,\theta}{t} \qquad \frac{x\ rev/2\pi\ rad}{/1\ rev}$$

V_t=tangential speed Θ=Change in angle ω=rotational speed r=radius

1. A woman passes through a revolving door with a tangential speed of 1.8 m/s. If she is 0.80m from the center of the door, what is the door's angular speed?

2. A softball pitcher throws a ball with a tangential speed of 6.93 m/s. If the pitcher's arm is 0.660 m long, what is the angular speed of the ball before the pitcher releases it?

3. An athlete spins in a circle before releasing a discus with a tangential speed of 9.0 m/s. What is the angular speed of the spinning athlete? The discus is 0.75 m from the athlete's axis for rotation.

4. The radius of a DVD working in a computer is 0.06 m. A microbe riding on the disc's rim has a tangential speed of 1.88 m/s. What is the rotational speed of the DVD?

5. The world's tallest columns, which stand in front of the Education Building in Albany, New York, are each 30 m tall. If a fly circles a column with an angular speed of 4.44 rad/s, and its tangential speed is 4.44 m/s, what is the radius of the column?

6. The longest dingo-proof wire fence stretches across southeastern Australia. Suppose this fence were to have a circular shape. A rancher driving around the perimeter of the fence with a tangential speed of 16.0 m/s has an angular speed of 1.82×10^{-5} rad/s. What is the fence's radius and length (circumference)?

7. The smallest self-sustaining gas turbine has a tiny wheel that can rotate at 5.24×10^{3} rad/s. If the wheel rim's tangential speed is 131 m/s, what is the wheel's radius?

8. Earth's average tangential speed around the sun is about 29.7 km/s. If Earth's average orbital radius is 4.5×10^{8} km/s, what is its angular orbital speed in rad/s?

9. Two English engineers designed a ride-able motorcycle that was less than 12 cm long. The front wheel's diameter was only 19.0 mm. Suppose this motorcycle was ridden so that the front wheel has an angular speed of 26.6 rad/s. What would the tangential speed of the front wheel's rim have been?

10. Suppose a wheel, having a diameter of 2.0 m rotates 5 revolutions in 5 s. Determine the rotational speed of the wheel. Determine the tangential speed of a particle at the edge of the wheel.

11. In about 45 min, Nicholas Mason inflated a weather balloon using only lung power. If a fly, moving with a tangential speed of 5.11 m/s, were to make exactly 8 revolutions around this inflated balloon in 12.0 s, what would the balloon's radius be?

12. A wheel, having a diameter of 0.80 m, rotates 10 rev in 1 sec. Determine the tangential speed of a particle that is halfway between the wheels axis of rotation and the edge of the wheel.