AP Physics

Rotational Motion HW

Part 1: Radians & Degrees

Convert each degree measure to radian measure and each radian to degrees .

1. 150o 2. 210o 3. 45o 4. 240o

5.  6.  7.  8. 

Part 2: Rotational Motion

9. What is the angular velocity of the second hand on the clock in (a) rev/hr (b) deg/min (c) rad/s

10. A carousel rotates once every 45 seconds. (a) What is the linear speed of a horse 2.75 m away from the axis of rotation? (b) What about the linear speed of a horse 1.75 meter away?

11. A bike is traveling forward at 6 m/s? (a) If the radius of the wheels of the bike are 30 cm what is the angular motion of the bike? (b) The biker squeezes the brakes, which apply an angular acceleration of -0.2 rad/s2 on the wheels. How long does it take the bike to stop?

12. A pulsar is a rapidly rotating neutron star that emits pulses of radio waves with each revolution. On earth we receive pulses of radio waves from a certain pulsar in the Crab Nebula once every 33 milliseconds. What is the angular speed of the pulsar?

13. A truck is traveling at 5 m/s initially. 7 seconds later the truck is traveling at 20 m/s. The truck tires have a radius of 45 cm. What is the angular acceleration of the truck’s tires during this interval?

Part 3: Rotational Kinematics

14. A fan that is turning at 10 rpm speeds up to 25 rpm in 10 seconds. How many radians and rotations does the blade require to alter its speed? (Note: You must first convert the rpm to rad/s. To use the equations, any angular quantities must be in radians.)

15. An old phonograph played some records at 45 rpm or 4.71 rad/sec. Let’s say the phonograph is turning at 45 rpm and then the motor is turned off, taking 0.75 seconds to come to a stop. (a) What is its average angular acceleration? (b) How many rotations did it make while coming to a stop?

16. A race car is on a circular track with a radius of 0.30 km (300 m). The driver accelerates from rest with a constant angular acceleration (α) of 4.5 x 10-3 rad/s2. The driver constantly accelerates as he drives one lap around the track. (a) How long does it take for the driver to make one lap around the track? (b) What is the driver’s angular velocity (ωf) as he finishes this first lap?

17. Starting from rest, the tub of a washing machine reaches an angular speed of 5.2 rad/s, with an average angular acceleration of 4.0 rad/s2. (a) How long does it take the spin cycle to come up to speed? (b) What angular displacement (in radians and rotations) does the tub rotate through as it reaches this angular velocity?