

SPH4U: Review Problems – Circular Motion

Circular motion textbook review problems:

p. 143 #42, 44 – 48, 51, 53, 54

1. A car rounds a corner with a radius of 5.5×10^2 m. The corner is banked at an angle of 5.7° . Draw a force diagram for the car, write net force equations, and find the speed of the car as it rounds the corner if it remains in a horizontal circle. (answer: 23 m/s)
 2. Mars travels in a nearly circular orbit of radius 2.28×10^{11} m around the sun. The mass of Mars is 6.27×10^{23} kg. The gravitational force of attraction between Mars and the sun has a magnitude of 1.63×10^{21} N.
 - (a) What is the speed of Mars? (answer: 2.4×10^4 m/s)
 - (b) Determine the period of revolution of Mars around the sun in earth years. (answer: 1.87 years)

3. In pairs figure skating, a female of mass 55 kg spirals in a horizontal circle of radius 1.9 m around a male skater of mass 88 kg. The frequency of revolution is 0.88 Hz.
- Determine the magnitude of the force causing the female skater to maintain her circular motion. (answer: 3.2×10^3 N)
 - What is the magnitude of the horizontal force on the male skater? (answer: 3.2×10^3 N)
4. A brick has been placed on the roof of a carousel, as shown below. The roof has an upwards slope of 20° and the brick is at a radius of 10.0 m from the centre of the carousel. The coefficient of static friction between the brick and the roof is 0.50. Calculate the maximum number of revolutions per minute at which the carousel may turn without the brick sliding off. (3.21 rpm)

