**NAME _____ PERIOD ____**

**UNIT 8 PRACTICE PROBLEMS** **PHYSICS 1**

## 8.1 UNIFORM CIRCULAR MOTION

1. A 615-kg racing car completes one lap in 14.3 s around a circular track with a radius of 50.0 m. The car moves at a constant speed. (**a)** What is the acceleration of the car? **(b)** What force must the track exert on the tires to produce this acceleration?

2. Friction provides the force needed for a car to travel around a flat, circular race track. What is the maximum speed at which a car can safely travel if the radius of the track is 80.0 m and the coefficient of friction is 0.40?

3. A carnival clown rides a motorcycle down a ramp and around a vertical loop. If the loop has a radius of 18 m, what is the slowest speed the rider can have at the top of the loop to avoid falling?

4. A car goes around a curve on a road that is banked at an angle of 31.5°. Even though the road is slick, the car will stay on the road without any friction between its tires and the road when its speed is 227 m/s. What is the radius of the curve?

## 8.2 NEWTON'S LAW OF UNIVERSAL GRAVITATION

5. Tom has a mass of 70.0 kg and Sally has a mass of 50.0 kg. Tom and Sally are standing 20.0 m apart on the dance floor. Sally looks up and sees Tom. She feels an attraction. If the attraction is gravitational, find its size. Assume that both Tom and Sally can be replaced by spherical masses.

6. Two bowling balls are located next to each other and each have a mass of 6.8-kg. If the gravitational force that they exert on each other is $6.5 \times 10^{-8}$ N, then how far apart are their centers?

7. The gravitational force between two electrons that are 1.00 m apart is $5.54 \times 10^{-71}$ N. Find the mass of an electron.

8. The Moon's mass is $7.34 \times 10^{22}$ kg, and it is $3.8 \times 10^{8}$ m away from Earth. Earth's mass is $5.97 \times 10^{24}$ kg. **(a)** Calculate the gravitational force of attraction between Earth and the Moon. **(b)** Find Earth's gravitational field at the Moon.

**NAME _____ PERIOD ____**

**UNIT 8 PRACTICE PROBLEMS PHYSICS 1**

## 8.3 KEPLER'S LAWS AND SATELLITE MOTION

9. On Apollo missions to the Moon, the command module orbited at an altitude of 110 km above the lunar surface. How long did it take for the command module to complete one orbit?

10. Find the orbital speed of a satellite in a geosynchronous circular orbit $3.58 \times 10^7$ m above the surface of the Earth.

11. Phobos, one of the moons of Mars, orbits at a distance of 9378 km from the center of the red planet. What is the orbital period of Phobos?

12. GPS (Global Positioning System) satellites orbit at an altitude of $2.0 \times 10^7$ m. Find **(a)** the orbital period, and **(b)** the orbital speed of such a satellite.

13. An asteroid revolves around the Sun with a mean orbital radius twice that of Earth's. Predict the period of the asteroid in Earth years.

14. A planet's mean distance from the sun is $2.0 \times 10^{11}$ m. What is its orbital period?

15. Jupiter is 5.2 times farther from the Sun than Earth is. Find Jupiter's orbital period in Earth years.