Mr. Jenkins
Physics I

Assignment Sheet
Uniform Circular Motion and Gravitation

Objectives
You will be able to:

A. Explain why an object moving around a circle with a constant speed is accelerating.
   Convert between angular velocity or frequency and linear velocity.
   Convert between frequency and period.
   Explain the meaning of tangential quantities in a circular motion problem.
   Analyze the free-body diagram of an object moving in a circle and apply Newton's second law relating centripetal force to centripetal acceleration. (horizontal circles, banked curves with and without friction, gravitron, vertical circles, artificial gravity)
B. Compute the gravitational force that one object exerts on another.
   Calculate the orbital velocity or orbital radius of a satellite.
   Explain why an object orbiting the earth is said to be falling freely. Use your explanation to point out why objects appear weightless under certain circumstances. Explain why a person in a rotating space station in deep space can feel like they have weight.
C. Calculate the acceleration of gravity on the surface of a spherical body.
   Relate the acceleration of gravity on one spherical body to that on another.
D. Derive and apply Kepler's Third Law relating period and orbital radius.

Reading

A. 6-5, Circular Motion, p. 169–175
B. 12-1, Newton's Law of Universal Gravitation, p. 379–382
C. 12-2, Gravitational Attraction of Spherical Bodies, p. 382–387
D. 12-3, Kepler's Laws of Orbital Motion, p. 387–394

Laboratory

Calculate the coefficient of friction between a stopper and a horizontal disk.
Calculate the weight of an object using a cyclotron.
Centripetal force apparatus.

Focus Questions

1. You are a passenger in a car and not wearing a seat belt. Without increasing or decreasing its speed, the car makes a sharp left turn, and you find yourself colliding with the right-hand door. Explain.
2. Why does an astronaut in orbit of the Earth feel weightless?