1. A planet has a mass of about 0.05 times the mass of Earth and a diameter of about 0.4 times the diameter of Earth. What is the acceleration of a body falling near the surface of the planet? (10 pt)

2. The two arms of a U-tube are not identical, one having twice the diameter of the other. A cork in the narrow arm requires a force of 16 N to remove it. The tube is filled with water and the wide arm is fitted with a piston. What is the minimum force that must be applied to the piston to push the cork out? (10 pt)

3. Two particles, each of mass m, are a distance d apart. To bring a third particle, with mass $2m$, from far away to a resting point midway between the two particles, how much work should be done? (10 pt)

4. A 210-g object apparently loses 30 g when suspended in a liquid of density 2.0 g/cm^3. What is the density of the object? (10 pt)

5. A spherical shell has inner radius R_1, outer radius R_2, and mass M, distributed uniformly throughout the shell. What is the magnitude of the gravitational force exerted on the shell by a point particle of mass m, located a distance d from the center, outside the inner radius and inside the outer radius? (10 pt)

6. A large water tank, open at the top, has a small hole in the bottom. When the water level is 30 m above the bottom of the tank, what is the speed of the water leaking from the hole? (10 pt)

7. Comets travel around the sun in elliptical orbits with large eccentricities. If a comet has speed 5.0×10^4 m/s when at a distance of 2.0×10^{11} m from the center of the sun, what is its speed when at a distance of 2.5×10^{10} m? The mass of the sun is 2.0×10^{30} kg. (10 pt)

8. Two hemispherical steel shells of the radius R are placed together to form a sphere. The pressure inside the sphere is p. How much force is required to pull them apart under the

atmospheric pressure p_0? (10 pt)

9. A landing craft with mass 10,000 kg is in a circular orbit 5.0×10^5 m above the surface of a planet. The period of the orbit is 5,000 s and the diameter of the planet is 1.0×10^7 m. The craft sets down at the north pole of the planet. What is the weight of an 80.0-kg astronaut as he steps out onto the planet's surface? (10 pt)

10. A hot-air balloon has a volume of 2,000 m^3. The balloon fabric (the envelope) weighs 500 N. The basket with gear and full propane tanks weighs 2,000 N. If the balloon can barely lift an additional 3,000 N of passengers, breakfast, and champagne when the outside air density is 1.0 kg/m^3. what is the average density of the heated gases in the envelope? (10 pt)