**Extra Credit quiz points (Ch 7-9)**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. A student demonstrates that a bowling ball of mass 4 kg will float. The student carefully measures the increase in water level when the ball is placed in the container and determines the volume of water that the ball displaced. If 75% of the ball is submerged,
   1. What is the mass of the water that is displaced?
   2. What is the volume of the water that is displaced?
   3. Draw a free body diagram indicating the forces on the bowling ball while it is floating in the water.
2. Would conservation of energy or Kepler’s third law help you find the solution for the following situations? *Do not solve these during class!*
   1. Find the escape speed of a 500 kg rocket from the surface of Mars. Mass of Mars is 6.42 x 1023 kg. Radius of Mars 3.37 x 106 m. Period of Mars around the sun is 5.94 x 107s and the mean distance from the sun is 2.28 x 1011 m.
   2. What is the altitude of a satellite in a geosynchronous orbit around earth? What is its orbital speed?
   3. An artificial satellite circling the Earth completes each orbit in 110 minutes. Find the altitude of the satellite.
   4. A satellite is launched from Mars at a speed 1200 m/s. What altitude can it reach?
3. Solve d.) above.
4. An ice skater is spinning with her arms outstretched and her legs in a normal stance. She then brings her arms in tight to her chest and crosses her feet, her speed increases to 10 revolutions per second! If she is spinning in place, find her kinetic energy. Assume she’s a solid cylinder with a moment of intertia of ½ *mr*2. Her mass is 55 kg and her average radius is 20 cm.
5. A 10.0 meter long, 500 kilogram steel beam is suspended by a cable and raised up to the top of a sky scraper. Two men, each 75 kg, sit at one end, where would a second much larger man, 120kg, have to sit to balance the beam?

G = 6.67 x 10-11 Nm2/kg2 PEG = -Gm1m2/r FG = Gm1m2/r2 1 radian = 57.3o

T2 / r3 = 42 / (GM) = K *v* = 2*r* / T KE = ½ *m v*2 *PE = mgh*

*KER = ½ I 2 L = I v/r =  = F r sin *

*xCM = ximi / M*

= m/V P = F/A *A1v*1 = A2*v*2 *P1 + ½v12 + gh1 = P2 + ½v22 + gh2*

*Fb = mg = Vg* = *m**g**= 9.8m/s2*

*1*atm = 1.013 x 105 Pa density of air = 1.29 kg/m3 density of water = 1000kg/m3