Phys 220
Exam 3

Name: _____

1.a. What would happen to a satellite in orbit around the earth if the satellite's mass were to become twice its original mass?

A. Nothing
B. It would go faster but stay in the same orbit.
C. It would go slower but stay in the same orbit.
D. Its orbit would degrade and it would crash into the earth

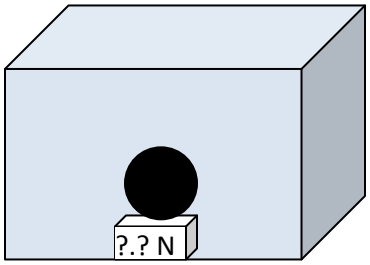
1.b. Demonstrate mathematically your answer to #1.

2.a. If a person measures their blood pressure in the following two positions, the readings will be

A. Higher for A
B. Higher for B
C. The same at both positions.

2.b. What is the pressure difference between two points in a container of water 0.20 m from the surface of the water and 0.50 m from the surface? Clearly specify at which point the pressure is higher.

3. A student demonstrates that a bowling ball of mass 6 kg *sinks*. 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 is 0.0053 m^3.
   a. What is the mass of the water that is displaced?
   b. What weight in Newtons would a scale that is sitting on the bottom of the container measure for the submerged bowling ball?



4. A jet of gas shoots straight up from Jupiter's surface and reaches an altitude of 1.2 x 10^6 m before falling back to the surface. At what speed did it erupt from the surface?

5. A 10.0 meter long, 500 kilogram steel beam is suspended 4.0 meters from one end by a cable and raised up to the top of a sky scraper. One 85 kg man sits 2.0 meters from the cable on the short side, where would a second much larger man, 120kg, have to sit to balance the beam?

Jupiter's "useful data": Mass: 1.90 x 10^{27}kg mean radius: 6.99 x 10^7m
period around the sun: 3.74 x 10^8s Mean Distance from the sun: 7.78 x 10^{11}m.

G = 6.67 x 10^{-11} Nm^2/kg^2 $PE_G = -Gm_1m_2/r$ $F_G = Gm_1m_2/r^2$ 1 radian = 57.3°

$T^2 / r^3 = 4\pi^2 / (GM) = K$ $v = 2\pi r / T$ $v/r = \omega$

$KE = \frac{1}{2} m v^2$ $PE = mgh$ $KE_R = \frac{1}{2} I \omega^2$ $L = I \omega$

$\tau = F r \sin \theta$ $x_{CM} = \Sigma x_i m_i / M$

$\rho = m/V$ $P = F/A$ $A_1v_1 = A_2v_2$ $P_1 + \frac{1}{2}\rho v_1^2 + \rho g h_1 = P_2 + \frac{1}{2}\rho v_2^2 + \rho g h_2$

$F_b = mg = \rho V g$ $\Sigma \vec{F} = m\vec{a}$ $g = 9.8 m/s^2$ $w = mg$

1 atm = 1.013 x 10^5 Pa density of air = 1.29 kg/m^3 density of water = 1000 kg/m^3