Gravity Worksheet

Constants for problems:

$\text{mass}_{\text{earth}} = 6 \text{ x } 10^{24} \text{ kg}$ $\text{radius}_{\text{earth}} = 6.4 \text{ x } 10^{6} \text{ m}$ $G = 6.67 \text{ x } 10^{-11} \frac{\text{N m}^2}{\text{kg}^2}$ $\text{mass}_{\text{moon}} = 7.36 \text{ x } 10^{22} \text{ kg}$

1. The radius of the geosynchronous orbit is 42 200 km. What is the gravitational force on a satellite that has a mass of 500 x 10^5 kg at this height?

2. An object that has a mass of 10 kg is sitting on the radius of the earth. What is the gravitational force on this object? What is the acceleration due to gravity of this object?

3. An object has a mass of 10 kg is a distance 19.2 x 10^6 from the earth. What is the gravitational force between these two objects? What is the acceleration from this force of the object at this distance? Express your answer in scientific notation.

4. Tides are caused by the gravitational pull of the moon and to a lesser extent, the sun. The distance from the earth to the moon is 3.8 x 10^8, and the distance from the earth to the sun is 1.5 x 10^{11}. Take the mass of the sun to be 2 x 10^{30} kg. Find the gravitational force of the sun and the moon on a mass of 1000 kg that is on the earth. Express your answer in scientific notation.

5. We said we can never escape the gravitational force of the earth. Let's say we take a spaceship to Proxima Centauri, which is located 4 x 10^{16} m away. What is the gravitational force of the earth on us when we are on Proxima Centauri? On the surface of the earth, we weigh 980 N.

6. Joe Hannan has mass of 72.2 kg. What is his weight on the surface If he digs down a distance that is 2/5 of the way below to the surface, now what does he weigh?