Gravitation practice questions

Question 1 Calculate the period of revolution of Neptune around sun, given that diameter of its orbit is 30 times the diameter of earth's orbit around the Sun, both orbits being assumed to be circular.

Question 2 A rocket is fired from the earth towards the sun. At what point on its path is the gravitational force on rocket zero? Mass of sun = 2×10^{30} Kg, mass of earth $=6\times10^{24}$ Kg. Neglect the effect of other planets etc. Orbital radius of earth = 1.5×10^{11}m

Question 3 A stone let fall from the top of a tower transverses a distance of 24.5 m in the last second of its fall. Find the height of the tower.

Question 4 An object thrown vertically upwards from the top of a building reaches the foot of the building at time t_1. It takes a time t_2, if thrown vertically downwards with the same velocity. If the time of free fall is t show that $t = \sqrt{t_1 \times t_2}$

Question 5 The time period of satellite of earth is 5 hours. If the separation between earth and the satellite is increased to 4 times the previous value then find the new time period.

Question 6 Show that the Kepler's second law follows from the law of conservation of angular momentum.

Question 7 The moon revolves round the earth and the earth-moon system revolves around the sun. Of the earth could be removed without disturbing the motion of the moon, what would be the subsequent path of the moon?

Question 8 Explain why one could jump higher on the surface of the moon than on the earth.

Question 9 Determine the gravitational force of attraction between a uniform sphere of mass M and a uniform rod of length L and mass m, if the distance of the near end of the rod from the center of the sphere is r.

Question10 The radii of the planets are respectively R_1 and R_2 and their densities are respectively ρ_1 and ρ_2. What is the ratio of acceleration due to gravity at their surfaces?

Question 11 If the radius of earth shrinks by 5%, mass remaining the same, then how would the value of acceleration due to gravity change?

Question 12 Imagine a spacecraft going from earth to moon. How does its weight vary as it goes from the earth to the moon? Will there be any change in the mass?