Answer on Question #62334 - Physics – Astronomy, Astrophysics

Two 10kg spheres are placed 500mm apart. Express the gravitational attraction acting on one of the spheres as percentage of its weight on Earth.

Solution:

According to the law of universal gravitation, attraction force, acting on the sphere, is equal to

$$F_{12} = G\frac{m_1 m_2}{r^2},$$

where $G = 6.674 \times 10^{-11} N(m/kg)^2$ is the gravitational constant, $m_1 = m_2 = 10kg$ are masses of the spheres, $r = 500mm = 0.5m$ are the distance between them. On Earth weight of the sphere is

$$F_1 = m_1 g,$$

where $g = 9.81 N/kg$ is gravitational acceleration on Earth. Then

$$\frac{F_{12}}{F_1} = \frac{Gm_1 m_2}{r^2 m_1 g} = \frac{Gm_2}{r^2 g} = \frac{6.674 \times 10^{-11} \times 10}{0.25 \times 9.81} = 2.731 \times 10^{-10} = 2.731 \times 10^{-8}\%.$$

Answer: attraction acting on the sphere is $2.731 \times 10^{-8}\%$ of its weight on Earth.