Answer on Question#51970 - Physics - Other

Given that the mass and radius of Jupiter are respectively $M = 1.90 \times 10^{27}\text{kg}$ and $R = 7.15 \times 10^{4}\text{km}$, calculate the escape velocity from the surface of the planet.

Solution:

The escape velocity of the ball with mass m and radius r is given by

$$v = \sqrt{\frac{2Gm}{r}},$$

where $G = 6.672 \times 10^{-11}\,\frac{\text{m}^3}{\text{kg}\cdot\text{s}^2}$ – is the gravitational constant.

Therefore, the escape velocity of Jupiter is

$$v_e = \sqrt{\frac{2GM}{R}} = \sqrt{\frac{2 \cdot 6.672 \times 10^{-11}\,\frac{\text{m}^3}{\text{kg}\cdot\text{s}^2} \cdot 1.90 \times 10^{27}\text{kg}}{7.15 \times 10^{4}\text{km}}} = 59.5\,\frac{\text{km}}{\text{s}}$$

Answer: $v_e = \sqrt{\frac{2GM}{R}} = 59.5\,\frac{\text{km}}{\text{s}}$.