Answer on Question #51079 – Physics – Mechanics | Kinematics | Dynamics

1. Given that the mass and radius of Jupiter are respectively 1:90 x 1027 kg and 7:15 x 104 km, calculate the escape velocity from the surface of the planet

$M = 1.9 \cdot 10^{27}\ kg$ $r = 7.15 \cdot 10^{7}\ m$	*Solution.*
$v - ?$	To escape the surface of the planet of the radius r, an object of mass m must have the kinetic energy to overcome the gravitational attraction: $\frac{mv^2}{2} = G\frac{mM}{r}$.

One can find the escape velocity: $\boxed{v = \sqrt{\frac{2GM}{r}}}$.

$$[v] = \sqrt{\frac{\frac{N \cdot m^2}{kg^2} \cdot kg}{m}} = \sqrt{\frac{N \cdot m}{kg}} = \sqrt{\frac{kg \cdot \frac{m}{s^2} \cdot m}{kg}} = \frac{m}{s}.$$

$$v = \sqrt{\frac{2 \cdot 6.67 \cdot 10^{-11} \cdot 1.9 \cdot 10^{27}}{7.15 \cdot 10^{7}}} = 5.95 \cdot 10^{4}\left(\frac{m}{s}\right).$$

Answer: $5.95 \cdot 10^{4}\ \frac{m}{s}$.