The mass of a spaceship is 1000 kg. It is to be launched from the earth's surface out into free space. The value of 'g' and 'R' (radius of the earth) is 10 m/s^2 and 6400 km respectively. The required energy for this work will be

(a) 6.4 x 10^{10} Joules

(b) 6.4 x 10^{11} Joules

(c) 6.4 x 10^8 Joules

(d) 6.4 x 10^9 Joules

Solution

The energy required is given by = GMm/R

= gR^2 x m/R ($\because$ g = GM/R^2)

= mgR

= 1000 x 10 x 6400 x 10^3

= 64 x 10^9 J

= 6.4 x 10^{10} J

Answer: (a) 6.4 x 10^{10} Joules